ENGLISH TRANSLATION

PERSONAL DIGITAL CELLULAR TELECOMMUNICATION SYSTEM ARIB STANDARD

RCR STD-27 L

Fascicle 1

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Association of Radio Industries and Businesses

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5. The original "Personal Digital Cellular Telecommunication System (RCR STD-27L)" is written in Japanese and has been approved by the 60th Standard Assembly Meeting (November 30, 2005).

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PERSONAL DIGITAL CELLULAR TELECOMMUNICATION SYSTEM ARIB STANDARD

INTRODUCTION

The Association of Radio Industries and Businesses (ARIB) has been investigating and summarizing the basic technical requirements for establishing standards for developing a digital mobile telephone system. These will appear in the form of standards and specifications governing the use of radio facilities and equipment for systems that transmit over radiowaves. The standards are being developed based on the participation of and discussions with the various radio equipment manufacturers, operators and users.

The standards and specifications contained herein will serve as guidelines for developing standards for private use based on the publicly established technical standards in Japan. Their purpose is to enable effective use of radio frequencies by avoiding interference among users, conflicts among the standards of individual operators, and so forth, so that all parties involved, including radio equipment manufacturers, users and others will be able to ensure the quality and compatibility of radio facilities and equipment.

These standards are being established principally for "Personal Digital Cellular Telecommunication System Radio Interface”. In order to ensure fairness, impartiality and openness among all parties involved, during the drafting stages, we invite radio equipment manufacturers, telecommunications operators and users both domestically and overseas to participate openly in the activities of the Standard Assembly so as to develop standards with the total agreement of all parties involved.

The scope of application of these standards covers the minimum requirements for communications. They are designed to serve as practical guidelines for telecommunications equipment operators in developing original specifications and systems that fall within the scope of the standards.

We hope that the standards will aid all parties involved, including radio equipment manufacturers, telecommunications operators, users and others in the development of an excellent radio telecommunication system.

Note : Although this Standard contains no specific reference to any Essential Industrial Property Right relating thereto, the holder of such Essential Industrial Property Right states to the effect that the rights listed in Attachments 1 and 2 which are the Industrial Property Rights relating to this Standard are held by the parties also listed therein and that to the users of this Standard, in the case of Attachment 1, such holders shall not assert any rights and shall unconditionally grant a license to practice such Industrial Property Rights contained therein and in the case of Attachment 2, the holders shall grant, under the reasonable terms and conditions, a non-exclusive and non-discriminatory license to practice the Industrial Property Rights contained therein. However, this does not apply to anyone who uses this ARIB Standard and also owns and lays claim to other Essential Industrial Property Right of which the scope is included in any or all parts of the provisions of this ARIB Standard.

Attachment 1 (1/5)

Patent applicant	Name of Patent	Registration No. / Application No.*		Remarks
NTT Mobile Communications Network	(1) Data transmission system	245128	(applied 1992)	
	(2) Deregistration method for communication, and communication network	44237	(applied 1993)	
	(3) LSP quantization method	110160	(applied 1993)	
	(4) Data transmission system	73016	(applied 1994)	
	(5) Data transmission system	136929	(applied 1994)	
	(6) Communication control method	205046	(applied 1994)	
	(7) Data transmission system & transmission method	3618	(applied 1995)	
	(8) Mobile communication system, method for communication, and mobile station	11552	(applied 1996)	Applied in U.S.A., Canada, Great Britain, Germany, France, Italy, Sweden, China, South Korea.
	(9) Terminal, network, and communication system	76899	(applied 1996)	
	(10) Method for paging mobile station	172671	(applied 1996)	
	(11) Mobile communication system and mobile station equipment	307337	(applied 1996)	
	(12) Communication system, mobile station, and network	11194	(applied 1996)	
	(13) Communication system and stations	6855	(applied 1996)	
	(14) Mobile communication system, network and mobile station	9387	(applied 1996)	
	(15) Communication system and transmission station	9388	(applied 1996)	
	(16) Radio communication system, network and mobile station	17805	(applied 1996)	
	(17) Mobile communication system	59469	(applied 1996)	
	(18) Telecommunications switching system and telecommunications switching method	WO96/21308		Applied in U.S.A, Australia, Belgium, Switzerland, Germany, Denmark, Spain, France, U.K., Greece, Ireland, Italy, Luxembourg, Monaco, Netherlands, Portugal, Sweden
	(19) Mobile packet communication network, mobile communication terminal and packet switching method	1772	(applied 1998)	
	(20) Random access control method of digital mobile communication	200342	(applied 1998)	
OKI Electric Industry Co. , Ltd.	(1) Code excited linear predictive coder	173596	(laid open 1993)	

Attachment 1 (2/5)

Patent applicant	Name of Patent	Registration No. / Application No.*	Remarks
KDD	(1) Maximum likelihood error correction method (2) Coding device (3) Maximum likelihood of error correcting technique (4) Error correcting method (5) Technique de correction d'erreurs à probabilité maximale	1460272 1564176 4462101 (U.S.A.) 2095517B (U.K.) 8204743 (applied France)	
NEC	(1) Mobile radio control method (2) Mobile communication method	1065976 103591 (applied 1986)	Applied jointly with NTT U.S. patent 4144409
LM Ericsson	(1) A method for dividing a frame structure in a mobile station	155231 (laid open 1991)	Applied in Australia, Canada, Sweden, USA
	(2) Method for synchronization in a cellular mobile radio station	500446 (laid open 1992)	Applied in Australia, Brazil, Canada, Germany, European Patent Office application, France, Great Britain, Hong Kong, South Korea, Mexico, Malaysia, New Zealand, Philippines, Pakistan, Taiwan, USA, WIPO
	(3) A method for providing access in a mobile radio system	276110 (laid open 1993)	Applied in Indonesia, Malaysia, Sweden

Attachment 1 (3/5)

Patent applicant	Name of Patent	Registration No. / Application No.*	Remarks
NTT	(1) Speech analyzer	1358638	
	(2) Call receiving method during communications	1434894	
	(3) Mobile radio communication method	51939 (applied 1983)	
	(4) Speech decoder	29205 (applied 1984)	
	(5) MS identification method	15086 (applied 1988)	
	(6) Voice signal transmission method	212370 (applied 1988)	
	(7) RF signal transmission method	139021 (applied 1989)	
	(8) RF signal transmission method	175474 (applied 1989)	
	(9) Location registration method	218058 (applied 1989)	Applied in U.S.A., W. Germany, U.K., Sweden
	(10) Signal transmission method	240500 (applied 1989)	
	(11) RF signal transmission method	240822 (applied 1989)	“ “
	(12) Configuration of RF control channel	240823 (applied 1989)	“ “
	(13) Transmission sync method	1777 (applied 1990)	
	(14) Control of location registration method	244575 (applied 1990)	
	(15) Mobile communication control method	277897 (applied 1990)	
	(16) Mobile communication control method	277898 (applied 1990)	
	(17) RF channel allocation control method	308373 (applied 1990)	
	(18) Mobile communication method	333536 (applied 1990)	
	(19) Zone decision method	336381 (applied 1990)	
	(20) Mobile radio control method	1065976	Applied jointly with NEC U.S. patent 4144409
	(21) Data retransmission method	36412 (applied 1991)	
	(22) Data retransmission method	50157 (applied 1991)	
	(23) Facsimile signal routing method occurring in mobile communications	149851 (applied 1990)	
	(24) Protocol signal conversion method	206711 (applied 1989)	
	(25) Protocol signal routing method	206710 (applied 1989)	
	(26) Non-telephone adapter mechanisms & facsimile signal routing method in mobile communications	245135 (applied 1989)	
	(27) Communication method	160493 (applied 1990)	
	(28) Signal routing method	276408 (applied 1990)	
	(29) All-pole digital filter	1494819	
	(30) Method and apparatus for multiplexed vector quantization	205638 (laid open 1989)	
	(31) Speech coding and decoding method	344699 (laid open 1992)	
	(32) Transmission method of vector quantization code	14207 (laid open 1993)	
	(33) Coding method of the frequency for excitation signal of speech	19794 (laid open 1993)	
	(34) Speech coding method	289698 (laid open 1993)	
	(35) Error protection method	172145 (applied 1992)	

Attachment 1 (4/5)

Patent applicant	Name of Patent	Registration No. / Application No.*	Remarks
Nokia	(1) Packet Data (2) Packet Data	9625538.5 (applied U.K.) 338727 (applied 1997) 9713250.0 (applied U.K.) 338728 (applied 1997)	
Matsushita Electric Industrial Co. , Ltd.	(1) The algorithm of the termination of the wireless telephone equipment.	35932 (published 1993)	
Mitsubishi Electric Corporation	(1) Speech coding and decoding apparatus	5700 (laid open 1992)	
Motorola	(1) Digital speech coder having improved vector excitation source	PCT/US88/04394 501333 (applied 1989)	U.S. patent 4817157/4896361
	(2) Digital speech coder having optimized signal energy parameters	PCT/US90/05693 514552 (applied 1990)	
	(3) Speech encoder using soft interpolation decision for spectral parameters	534820 (applied U.S.A.)	
	(4) Digital speech coder with vector excitation source having improved speech quality	PCT/US90/02469 508474 (applied 1990)	
	(5) Digital speech coder having improved sub-sample resolution long-term predictor	PCT/US90/03625 509641 (applied 1990)	
	(6) Radio arrangement having two radios sharing circuitry	507748 (applied 1988)	Applied in Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, U.K., Greece, Italy, South Korea, Liechtenstein, Luxembourg, Netherlands, Norway, Spain, Sweden, Switzerland, U.S.A.

Attachment 1 (5/5)

Patent applicant	Name of Patent	Registration No. / Application No.*	Remarks
Motorola	(7) Radiotelephone subscriber unit and method of system access for the unit	194462 (applied 1989)	Applied in Australia, Belgium, Canada, France, Germany, U.K., Greece, Italy, Ireland, Liechtenstein, Luxembourg, Mexico, Netherlands, Spain, Sweden, Switzerland, U.S.A.
Universite de Sherbrooke	(1) Dynamic Codebook for Efficient Speech Coding Based on Algebraic Codes	2010830 (applied Canada)	Applied in U.S.A., EP ※1
	(2) Algebraic Codebook with Signal-Selected Pulse Amplitude for Fast Coding of Speech	513571 (laid public 1998)	Applied in U.S.A., EP, PCT ※1
	(3) Depth-First Algebraic-Codebook Search for Fast Coding of Speech (complexity reduction)	3160852	Applied in U.S.A., EP, PCT ※1
	(4) Predictive Sprit-Matrix Quantization of Spectral Parameters for Efficient Coding of Speech	503531 (laid open 1999)	Applied in U.S.A., PCT ※1
Voicecraft inc.	(1) Improvement in Method for Compressing Digitally Encoded Speech	13200 (laid open 1989)	Applied in U.S.A., EP

* Japan unless otherwise indicated

※1 Nokia Corporation has right to sub-license under this patent for ACELP (IS-641) based speach codecs, and selects “case 1”.

Attachment 2

Patent applicant	Name of Patent	Registration No. / Application No.*	Remarks
NTT DoCoMo, Inc	(1) Channel Control Method in Mobile Radio Telecommunication Systems and Mobile Radio Telecommunication Systems and Base Station in Mobile Radio Telecommunication Systems.	183629 (applied 2000)	Note 2
Mitsubishi Electric Corporation	(1) Speech decoding apparatus and speech coding/decoding apparatus (2) Speech coding apparatus and speech coding method	005700 (laid open 1992) 166999 (laid open 1997)	Note 1 Note 1
Motorola	(1) Digital speech code having improved sub-sample resolution long-term predictor (2) Cellular phone System	509641 (applied 1990) 105975 (laid open 1995)	Applied in U.S.A., etc. Note 1 Note 2
Universite de Sherbrooke	(1) Dynamic Codebook for Efficient Speech Coding Based on Algebraic Codes (2) Algebraic Codebook with Signal-Selected Pulse Amplitude for Fast Coding of Speech (3) Depth-First Algebraic-Codebook Search for Fast Coding of Speech (complexity reduction) (4) Predictive Sprit-Matrix Quantization of Spectral Parameters for Efficient Coding of Speech	2010830 (applied Canada) 513571 (laid public 1998) 3160852 503531 (laid open 1999)	Applied in U.S.A., EP ※1 Applied in U.S.A., EP, PCT ※1 Applied in U.S.A., EP, PCT ※1 Applied in U.S.A., PCT ※1
NTT DoCoMo, Inc	A comprehensive confirmation form has been submitted with regard to RCR STD-27J.		Note 3

※ Sipro Lab Telecom has right to sub-license under this patent for CS-ACELP (G.729) based speech codecs, and selects “case 2”.
(Note 1) Applied to the revised portion of RCR STD-27H.
(Note 2) Applied to the revised portion of RCR STD-27I.
(Note 3) Applied to the revised portion of RCR STD-27J
* Japan unless otherwise indicated

CONTENTS

Fascicle 3

Annex 1 Authentication, Ciphering and Subscriber Data Registration Standard for the Personal Digital Cellular Telecommunication System

Annex 2 Data Transmission Standard for the Personal Digital Cellular Telecommunication System (G3 facsimile and modem (V.42 ANNEX))

Annex 3 High Speed Data Transmission Standard for the Personal Digital Cellular Telecommunication System

Annex 4 Standard for Interface between Mobile Station and Subscriber Information Module

Annex 5 Half-duplex packet communications standard for the Personal Digital Cellular Telecommunication System

Annex 6 Standard for the Radio Interface of the Wireless Local Loop System

Attachment Amendment History

Chapter 1 General

1.1 Overview

This standard specifies the radio frequency interface for the telecommunication system used for digital cellular telecommunications in accord with Article 49-6, Clause 3, 4 and Article 49-6-2 (include related notifications) of Ordinance Regulating Radio Equipment.

1.2 Scope of application

The digital cellular telecommunication system consists of land mobile stations and base station facilities as shown in Fig. 1.1.

This standard specifies the radio frequency interface for the digital cellular telecommunication system as indicated in Fig. 1.1 below.

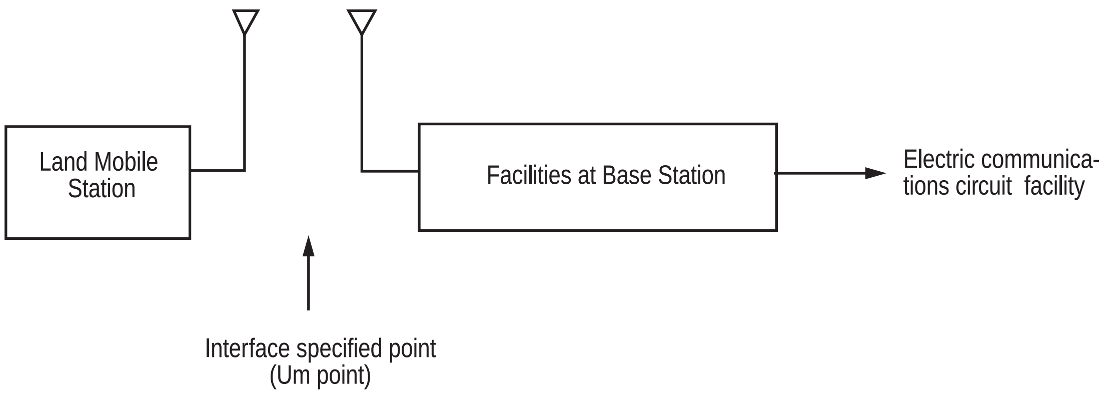


Fig. 1.1 Structure of the digital cellular telecommunications system

1.3 Scope of standardization

In terms of mutual connectivity and compatibility, this standard defines the minimum level of specifications required for basic connections and services as the essential requirement, and the minimum level of specifications required for what free choice is permitted, such as protocols, as optional standard to provide option and future expansion.
Further, in order to provide option and future expansion capabilities as much as possible, care has been taken not to place restrictions on non-standardized specifications.

Mobile stations in compliance with this revision of RCR STD-27 shall be capable of operation in accordance with every revision from RCR STD-27B to this revision. This means that mobile stations in compliance with this revision of RCR STD-27 shall be capable of operating in networks which do not support any functions newly introduced in this revision of RCR STD-27.

Fig. 1.2 outlines the relationship between standardized and optional services, etc.

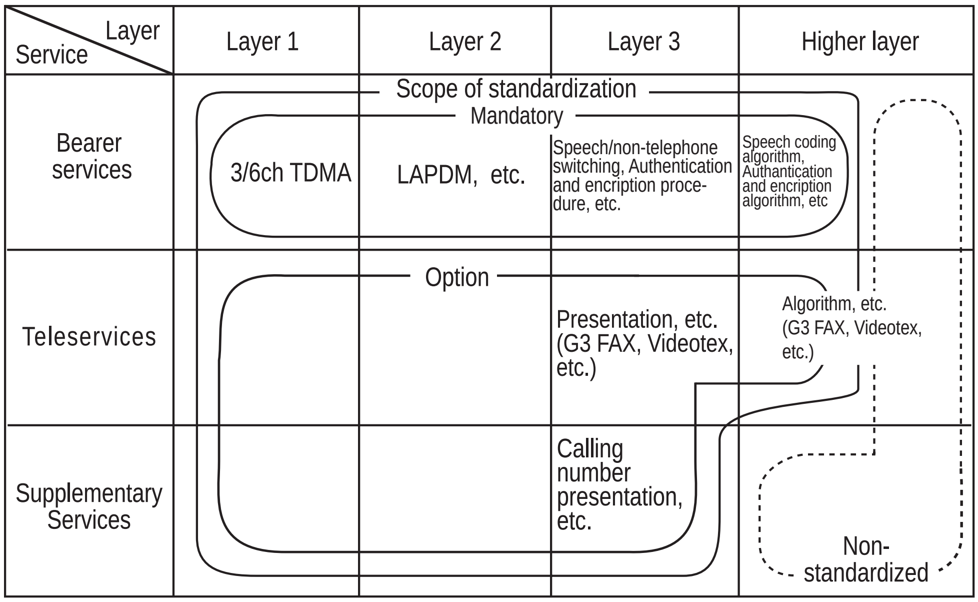


Fig. 1.2 The scope of standardization

Chapter 2 System Overview

2.1 Structure of the system

The digital cellular telecommunication system consists of land mobile stations and base station systems.

2.1.1 Land mobile stations

The land mobile station (MS) serves as the telecommunications terminal which enables a subscriber to make land mobile radio communications with the base station.

A land mobile station consists of one or more antennas, radio equipment , which includes both transmitter and receiver, a control circuit, a voice codec and a handset. More than one communication terminal equipment and/or PBX etc. can be connected with the land mobile station, if it is required.

2.1.2 Base station system

The base station system provides the radio communications capability to the land mobile stations.

The base station system is made up of base stations consisting of antennas and radio equipment including transmitter and receiver, and a control station which performs switching functions, billing functions and so on.

2.2 Definition of the interface

The points where the interface occurs in digital cellular telecommunication systems exist at four locations (Um, R, S, C) shown in Fig. 2.1.

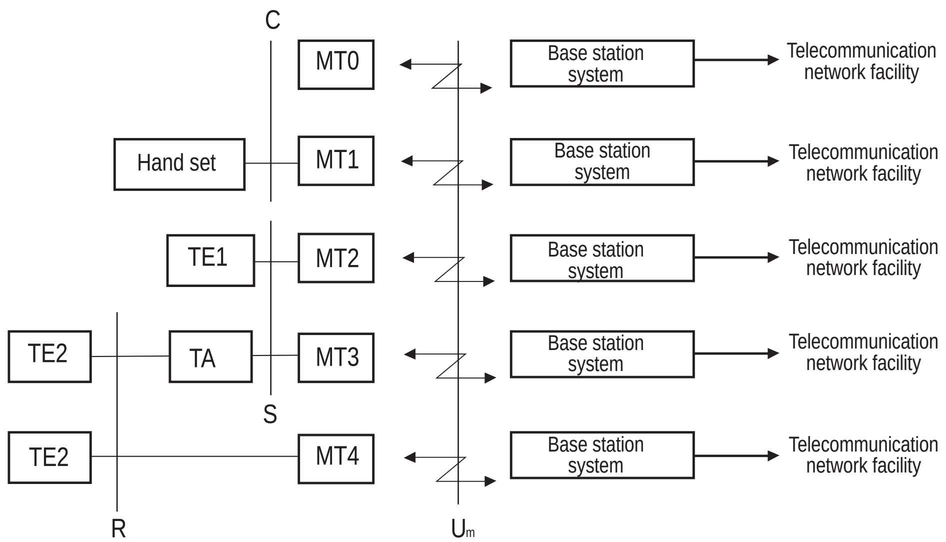


Fig.2.1 Interface points

The definition of each interface point in Fig. 2.1. is as follows.

i) Interface Um : Interface between the MS and base station system. This interface shall conform to this standard.

ii) Interface R : Interface between non-I interface terminal equipment and either mobile terminal equipment or terminal adapters. This interface is not specified in this standard.

iii) Interface S : Interface between either I interface terminal equipment or terminal adapters and the mobile terminal equipment. Conditions of this interface shall conform to the I interface standards.

iv) Interface C : Interface between the mobile terminal equipment and handset within the MS. This interface is not specified in this standard.

Elements in Fig. 2.1 are defined below:

MT0 : Mobile terminal equipments which contain man-machine interface facilities, such as terminals, as an integral part of it.

MT1 : Mobile terminal equipments which can be connected with an external handset via interface C.

MT2, MT3 : Mobile terminal equipments which offer connection point with external terminal equipment by means of I interface standards.

MT4 : Mobile terminal equipments which offer connection point with external terminal equipment by means of non-I interface standards.

TE1 : Terminal equipment conforming to I interface standards.

TE2 : Terminal equipment not conforming to I interface standards.

TA : Terminal adapters which perform conversion between non-I interface condition and I interface condition.

2.3 Basic functions of the system

The digital cellular telecommunication system is a digitized mobile telecommunications network providing comprehensive telecommunications services, including voice and data communications, through a unique general-purpose radio interface (interface Um). It meets the following requirements.

i) Digitized network

The system shall allow the efficient use of frequencies, along with offering communications quality and privacy at least equivalent to, or surpassing those of conventional analog cellular mobile telephone systems.

ii) Interconnectivity with other communications networks

The system shall be capable of being interconnected with conventional analog telephone networks, ISDN and packet data networks.

iii) ISDN services capability

Along with offering the basic mobile telephony services provided by conventional analog cellular telephone systems, the digital cellular telecommunication system shall also provide various services equivalent to those offered by ISDN and other services that are specific for mobile communications environment such as location information services.

2.3.1 System requirements

The system requirements for the digital cellular telecommunication system are described below.

2.3.1.1 Basic functions

The digital cellular telecommunication system shall support the following functions.

(1) The system shall be capable of being inter connected with public telecommunications networks which are operated by Class-1 telecommunication operating agencies under regulation in Japan.

(2) The system shall operate based on cellular communication technology.

a. Frequency reuse

The same radio channel frequency shall be simultaneously used by multiple base stations which are geographically separated each other by a distance which meets interference requirements.

b. Handover

Active communication shall be handed over on required basis from a base station which is serving the connection to an MS to another base station in order to maintain continuous communications while a vehicle is moving.

c. Cell split

A cell shall be sub-divided into smaller cells according to the traffic density in each area.

(3) Standardization of the radio interface shall allow independent development and deployment of the base station systems and land mobile stations.

(4) The system shall enable mobile stations to roam across the boundary of networks of different operators.

2.3.2 Services provided by the system

2.3.2.1 Service features

The services provided by the digital cellular telecommunication system consist of several attributes listed in Table 2.1 below. For the service attribute consisting of more than one service items, one of those items can be selected.

Table 2.1 Service attributes

Service attribute	Service item
Information transfer capability	Speech
	Alternate speech or non-telephone
	Unrestricted digital information
	3.1 kHz audio
Information transfer mode	Circuit
	Packet
Information transfer rate	11.2 kb/s
	5.6 kb/s
Structure	50 Hz
	25 Hz
Communication configuration	Point-to-point
	Point-to-multipoint
Establishment of communication	Demand
	Reserved

2.3.2.2 Service types

(1) Bearer services

The bearer services provided through the information transfer channel are listed in Table 2.2 below.

Table 2.2 Bearer services

Item	Service
11.2 kbps speech	Bearer function suitable for speech communications. A full-rate codec is used. Bit transparency is not guaranteed.
5.6 kbps speech	Bearer function suitable for speech communications. A half-rate codec is used. Bit transparency is not guaranteed.
8 kbps unrestricted digital	Service which enables communications between a user terminal at MS with transfer rate of 8 kbps and an ISDN terminal using the 8 kbps sub-rate.
64 kbps unrestricted digital	Service which enables communications between a user terminal at MS with transfer rate of 64 kbps and an ISDN terminal.
Alternate 11.2 kbps speech/data	Service which supports voice and data. After a call is established, the bearer function of the network becomes switchable between 11.2 kbps speech and 11.2 kbps-data according to requests by the user.
Alternate 5.6 kbps speech/data	Service which supports voice and data. After a call is established, the bearer function of the network becomes switchable between 5.6 kbps speech and 11.2 kbps data according to requests by the user.
Alternate 11.2 kbps speech/8 kbps unrestricted digital	Service which supports voice and 8 kbps unrestricted digital information. After a call is established, the network's transmission function can be switched between 11.2 kbps speech and 8kbps unrestricted digital information by the user.
Alternate 5.6 kbps speech/8 kbps unrestricted digital	Service which supports voice and 8 kbps unrestricted digital information. After a call is established, the network's transmission function can be switched between 5.6 kbps speech and 8 kbps unrestricted digital information by the user.
Packet	ISDN packet service (X.31) and X.25 packet service are available.

(2) Teleservices

The teleservices provided via the information transfer channel are listed in Table 2.3 below.

Table 2.3 Teleservices

Item	Service
G3 facsimile *	Service enabling communications between G3 fax terminals according to ITU-T. T.30 procedure.
G4 facsimile	Service enabling communications between G4 fax terminals.
Videotex	Video information transmission service using the Captain method.
JUST-PC	Service enabling data communications between personal computers using the MPT recommended method.
JUST-MHS	Message handling service using a higher layer of MPT recommended method for PC data communications.
Modem (V.42 ANNEX) *	Service enabling data communications between personal computers using a modem which conforms to V.42 ANNEX.
Short message	Service which sends a message to a single user or broadcasts a message to multiple users and subsequently reports a reception acknowledgment to the party who transmitted the message.
Automobile location information service	Service which reports location of the specified MS to the user requesting such information.

* Items marked with an asterisk are items stipulated by this standard.

(3) Supplementary services (Circuit switched)

Supplementary services which are provided for circuit switched services are listed in Table 2.4 below.

The numbers in parentheses in the item column of Table 2.4 are the referenced ITU-T recommendation numbers.

Table 2.4 Supplementary services

Item	Service
1. Number identification supplementary services	
Direct-dialing-in (DDI) (I.251.1)	Service enabling a user to dial another user directly on an ISPBX or a private network.
Multiple subscriber number (MSN) (I.251.2)	Service enabling assigning multiple ISDN numbers to one interface.
Calling line identification presentation* (CLIP) (I.251.3)	Service which reports the calling user's number (including the sub-address if one exists) to the called user.
Calling line identification restriction * (CLIR) (I.251.4)	Service which inhibits reporting of the calling user's number (including the sub-address if one exists) to the called user.
Connected line identification presentation (COLP) (I.251.5)	Service which reports the called user's number (including the sub-address if one exists) to the calling user.
Connected line identification restriction (COLR) (I.251.6)	Service which inhibits reporting of the called user's number (including the sub-address if one exists) to the calling user.
Malicious call identification (MCI) (I.251.7)	Service which allows the user to request the network to identify and memorize the information of the originator of the calls which are terminated by the user.
Sub-addressing (SUB) (I.251.8)	Service by which the network transparently transmits the sub-address between users.
2. Call offering supplementary services	
Call transfer * (CT) (I.252.1)	Service which allows the user to transfer an active call to a third party. This service applies to both originating calls and terminating calls. It also differs from the call forwarding service (which transfers a call from the called party before call establishment).
Call forwarding busy (CFB) (I.252.2)	Service whereby a call is forwarded to another user when the called user is busy. The served user's originating service is unaffected.
Call forwarding no reply (CFNR) (I.252.3)	Service whereby an unanswered call to a user is forwarded to another user. The served user's originating service is unaffected.

Item	Service
Call forwarding unconditional (CFU) (I.252.4)	Service whereby the network forwards the call of a registered user to another user, regardless of the condition of the termination.
Call deflection* (CD) (I.252.5)	A service which upon receiving a call, allows the user to choose if the call should be forwarded to another user or not.
Call forwarding no page response	A mobile communication specific service which forwards all incoming calls or incoming calls of specified basic service to another user when a paging response is not received.
Call forwarding not registered	A mobile communication specific service which forwards all incoming calls or incoming calls of specified basic service to another user when the location registration of the MS is not registered.
Call forwarding no radio resource	A mobile communication specific service which forwards all incoming calls or incoming calls of specified basic service to another user when the radio channel is congested.
Voice messaging function *	Function which on alerting, transfers the call to a voice messaging equipment to record a message instead of answering the call.
Line hunting (LH) (I.252.6)	Service which enables reception of a call by using a specific number of an interface featuring multiple channels and numbers.
3. Call completion supplementary services	
Call waiting * (CW) (I.253.1)	Service which notifies the user of an incoming call (upon a call basis) when no traffic channel is available.
Call hold (HOLD) (I.253.2)	Service which interrupts the existing call by setting it to the "hold" state. The held call may be reactivated if desired. After the call is interrupted, the traffic channel used for the call may be set on hold for use by newly incoming call.
Completion of calls to busy subscribers (CCBS) (I.253.3)	When the called user is busy, the network realerts the called user after it becomes idle. When the called user is available for the call, the network reports this to the originating user and may subsequently set up a call if necessary.
4. Multiparty supplementary services	
Conference calling (CONF) (I.254.1)	Service which enables the user to communicate with several other users simultaneously.
Three-party service* (3PTY) (I.254.2)	Service which allows the user to hold the active call and make an additional call to the third user. It subsequently allows switching between the two calls, and/or the release of one call while maintaining the other. Optionally, this service enables the conference calling so that all three parties can talk simultaneously.

Item	Service
5. Community of interest supplementary services	
Closed user group (CUG) (I.255.1)	Service which enables users to form a group to/from which user access is restricted. One user can be a member of one or more CUGs. Generally, a member user of a CUG can only communicate with other users in the same CUG, and cannot communicate with users outside the group. Specific CUG members are additionally allowed to originate calls outside the group or terminate calls from outside the group.
Private numbering plan (PNP) (I.255.2)	Service which allows users to originate or terminate calls using user defined private numbers.
6. Charging supplementary services	
Credit card calling (CRED) (I.256.1)	Service which puts call charges on a credit card account.
Advice of charge * (AOC) (I.256.2)	Service which advises the user of charging information on a call-by-call basis.
Reverse charging (REV) (I.256.3)	Service which puts call charges on the called party upon request by the originating party and at the consent of the called party .
Free phone	Service that puts call charges on the called party throughout the nation or a specified region when free phone number is dialed.
7. Additional information transfer supplementary service	
User-to-user signalling * (UUS) (I.257.1)	Service which allows the user to transfer the user-to-user information through the signalling channel in association with the call.
8. Origination and termination restriction supplementary services	
Outgoing call barring *	Service which restricts outgoing calls based on the called party number or the location of the called terminal. This service can be set for all or for specified basic services. However, it does not restrict termination of a call and origination of an emergency call.
Incoming call barring	Service which restricts incoming calls. This service is set for all or for specified basic services. Outgoing calls from a terminal are not restricted.

9. Other supplementary service	
Priority connection and channel hold	Service which allows the following operation by setting priority classes to an MS. 1) If an MS or a terminal of higher priority class originates a call when all radio CHs are busy, a radio channel used for an MS or a terminal of lower priority class is disconnected for subsequent use for higher priority class. 2) The radio channel used for the higher priority or important communication is held after such communications have been completed.

* Items marked with an asterisk are items stipulated by this standard.

2.4 Access method

2.4.1 Basic principle for network access

There are two types of mobile stations used in the personal digital cellular telecommunication system. One type handles only the full rate functionality. The other type handles both the full rate and half rate functionalities.

The mobile stations shall meet the following requirements, regardless of their its configuration.

(1) All mobile stations shall register their initiation of operation (start-up) to the network according to the procedures specified in Chapters 3 and 4.

(2) When a mobile station accesses to the network after it has registered its start-up, it shall operate in accordance with the procedures specified in Chapters 3 and 4. The principle of these procedures shall be such that mobile stations always operate in a slave mode controlled by the network.

2.4.2 TDMA system

The three and six channel multiplex TDMA system are used as the access method for the radio channel in the personal digital cellular telecommunication system. The six channel multiplex TDMA system is an optional function while the three channel multiplex TDMA system is a mandatory function.

Table 2.5 TDMA system parameters

Item	With full rate codec	With half rate codec
Multiplexed number of channels	3	6
Carrier frequency separation	50kHz (25KHz interleave)	
Modulation system	π/4 shift QPSK (Roll-off factor = 0.5)	
Transmission rate	42kbit/s	
Info. bit rate	11.2 kbits	5.6 kbits

2.4.3 Functional structure of radio channel

The functional structure of radio channels is shown in Fig. 2.5 below.

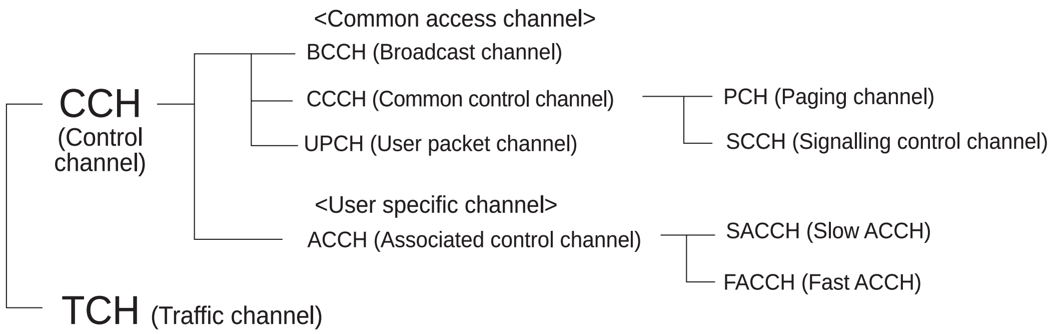


Fig.2.5 Functional structure of radio channels

2.4.3.1 BCCH (Broadcast channel)

BCCH is a unidirectional channel used by the base station system to broadcast the system control information related to location registration, channel structure, system state, etc. to land mobile stations.

2.4.3.2 CCCH (Common control channel)

CCCH is a bidirectional channel for transmitting signaling information. The following two types of CCCH exist.

(1) PCH (Paging channel)

PCH is a point-to-multipoint unidirectional channel used for transmitting the common information from the base station system to mobile stations within a wide area, i.e. paging area which is composed of multiple cells. It is used for paging and grouping control for intermittent reception by the MS.

(2) SCCH (Signalling control channel)

SCCH is a point-to-multipoint bidirectional channel used for transmitting information from/to the base station system to/from mobile stations when a cell area within which the mobile station is located is known to the base station system. A SCCH is prepared for transfer of the cell specific information by using different frequencies on a cell-by-cell basis. The uplink channel (from MS to base station system) is operating in the random access mode.

2.4.3.3 UPCH (User packet channel)

UPCH is a point-to-multipoint bidirectional channel which transfers the control signal and user packet data. The uplink channel is operating in the random access mode.

2.4.3.4 ACCH (Associated control channel)

ACCH is a point-to-point bidirectional channel associated with the TCH and is used for transferring signaling information and user packet data. The normal ACCH is called an SACCH (Slow ACCH). In addition to the SACCH, there is an FACCH (fast ACCH) which is established by temporarily stealing the TCH to perform high speed data transfer.

2.4.3.5 TCH (Traffic channel)

TCH is a point-to-point bidirectional channel which transfers the user information and its control signal. The TCH carries voice and facsimile signals.

2.4.4 Radio circuit control

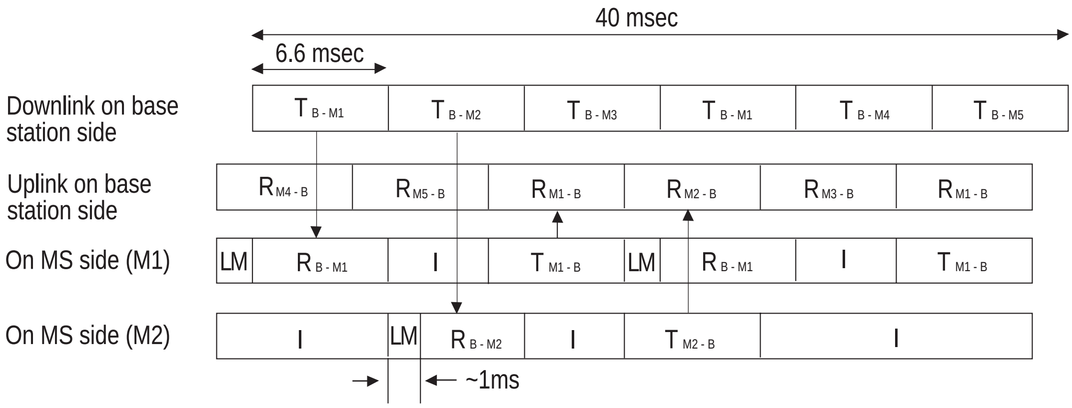
2.4.4.1 Control procedure

The control procedure is specified to enable the MS originating and terminating call connections, the location registration by mobile stations, the channel handover during a call, the service identification, etc. These controls shall be exactly performed by using commonly and independently assigned slots.

2.4.4.2 Slot configuration

The slot configuration shall be in accordance with Fig. 2.6. The configuration is designed to meet the following requirements:

(1) Uplink reception processing and downlink transmission processing can be carried out in a time sequential manner at a base station;
(2) The base station can transmit a downlink signal after having confirmed the reception of uplink signal, which enable collision control of the random access channel;
(3) Duplexer at the MS can be simplified;
(4) Antenna switching diversity can easily be implemented at the MS.



T : Transmission Ti → Ri : Correspondence of a transmission slot to a reception slot

R : Reception

LM : Level measurement for antenna switching diversity

I : Idle slot

M1 : A mobile station in full rate system

M2 - M5 : Mobile stations in half rate system

Fig. 2.6 : Slot configuration

2.5 Signal system

2.5.1 Signal system structure

The signal system structure of the digital cellular telecommunication system is shown in Fig. 2.7. The signal system shall have a layered structure made up of layers 1 to 3 which conforms to the OSI reference model.

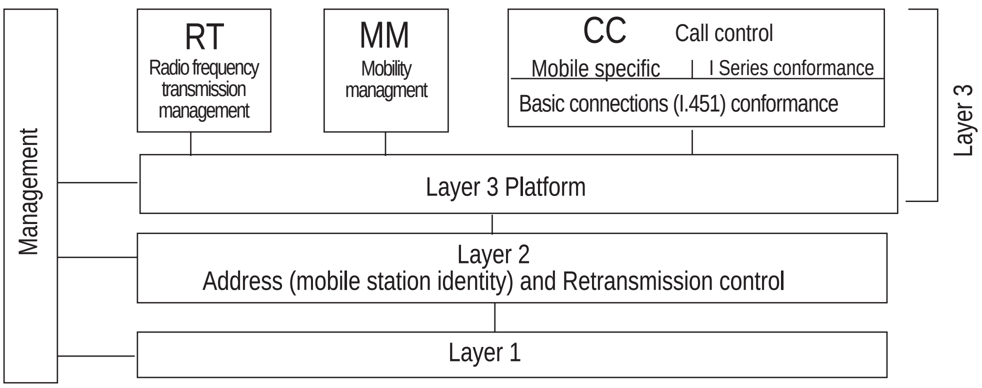


Fig. 2.7 : Signal system structure

2.5.2 Layered structure

The definitions of layers 1 to 3 of the signalling system are shown in Table 2.6.
The layer 3 shall be classified into CC (Call control), MM (Mobility management) and RT (Radio frequency transmission functions) according to CCIR and ITU-T recommendations.

Table 2.6 Definitions of Layers 1 to 3

Layer	Functional definition		Examples
Layer 1	Layer 1 ensures transmission of bit sequence using a communication circuit consisting of physical entities.		Radio signal transmission, frequency assignment, radio channel packet random access control, etc.
Layer 2	Layer 2 is located on layer 1 and offers highly reliable and transparent data transfer using the bit transmission function which is provided by layer 1.		Frame structure, procedural elements, data field format, procedural specifications, etc.
Layer 3	Layer 3 performs end-to-end data transfers between end system entities using the data transfer function which is provided by layer 2.	RT	RT specifies items related to radio frequency transmission control, and performs establishment, maintenance, handover, etc., of the radio channel.
		MM	MM specifies items related to mobility management control, and performs location registration and authentication.
		CC	CC specifies items related to call connection control. Basic call connections shall be in accordance with the ITU-T I-recommendations. For supplementary services which require a large number of signals, mobile specific sequences requiring less number of signals are adopted as well as the sequences of I-series recommendations, leading to reduction of time required for services.

2.5.3 Characteristics of the signaling system

The structure of layers 1 to 3 shall feature an expansible design, while ensuring high serviceability such as connection quality, etc. and system economy, i.e. signaling efficiency. The signaling format for each layer is depicted in Fig. 2.8.

(1) Layer 1 assembles and disassembles layers 2 and 3 using the error correction and bit interleaving. Signals of layers 2 and 3, along with the preamble, synchronization (sync) word and supplementary information, form a slot.

(2) Layer 2 shall consist of address part and control part.

(3) Layer 3 shall feature a common platform used by CC, MM and RT functions. This platform makes efficiency of signal transmission high as well as shortens the time required for the service. On call origination by an MS, for example, RT and CC of layer 3 shall report radio frequency condition information and setup information, respectively, to the base station. The layer 3 common platform allows layers 1 and 2 to deal with such information as a single signal so as to make the efficiency of signal transmission high and to shorten the service time.

(4) Layer 3 messages shall be configured as: (message) + (supplementary information)

(5) MM and RT messages shall have a fixed length, taking into account that these functions are rather limited.

(6) CC shall conform to the ISDN User-Network Interface Layer 3 Specifications (I.451), with emphasis on the harmonization with ISDN. The CC messages shall be based on the I.451 format. However, mobile specific format shall be used for coding of bearer capabilities, because the information transfer capability of digital cellular telecommunication system differs from that of fixed networks. In addition, the caller number reporting is shortened from a full octet to 4 bits.

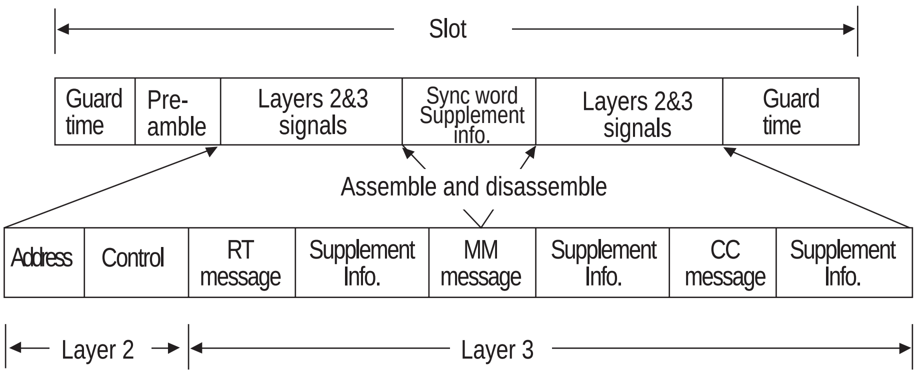


Fig. 2.8 Signal format outline (for layers 1 thru 3)

2.6 Numbering plan

This standard assumes that following three types of numbers shall be used for the digital cellular telecommunication system.

(1) Subscriber number : the number used to identify the registered subscriber to the service.

(2) Mobile station number : the number by which the mobile station can be identified.

(3) Mobile station serial number : the number which is assigned by the mobile station manufactures to identify respective mobile station units.

Chapter 3 Technical Requirements for Radio Facilities

3.1 Overview

This chapter specifies the technical requirements for facilities constituting the air interface in the personal digital cellular telecommunication system which shall conform to Article 49, clause 6, Items 3 and 4 Article 49, Item 6-2 (including relevant notice) of Ordinance Regulating Radio Equipment.

3.2 General conditions

3.2.1 Radio frequency bands

The radio frequency bands to be used are 800 MHz band (designated for the ranges 810 MHz through 828 MHz, 940 MHz through 958 MHz, 832 MHz through 834 MHz, 843 MHz through 846 MHz, 860 MHz through 885 MHz, 887 MHz through 889 MHz, 898 MHz through 901MHz, 915 MHz through 940 MHz, 838 MHz through 840 MHz, 893MHz through 895, 840MHz through 843MHz and 895 MHz through 898 MHz) and 1500 MHz band (designated for the ranges 1429 MHz through 1453 MHz, 1477 MHz through 1501 MHz, 1465 MHz through 1468 MHz and 1513 MHz through 1516MHz).

3.2.2 Carrier frequency spacing

The carrier frequency spacing shall be 50 kHz. In addition, a 25 kHz interleaving shall be adopted.

3.2.3 Transmit-receive frequency separation

The transmit-receive frequency separation shall be 130 MHz and 55 MHz in the 800 MHz band and 48 MHz in the 1500 MHz band.

3.2.4 Automatic transmit frequency control at mobile station

The authority shall be able to stipulate that the mobile station shall apply automatic frequency control to transmission.

3.2.5 Antenna feed power control

The facilities and equipment shall be capable of adjusting the antenna feed power to the minimally required level.

3.2.6 Diversity

Adoption of diversity to base stations and mobile stations shall be at the discretion of the operator. The home system operator shall be responsible for the quality of communication during roaming of its subscriber to other operator's network, in particular for mobile stations without diversity capability which roams into a network performing equalization.

3.2.7 Communication system

The duplex communication system which utilizes TDM (time division multiplex) for downlink (base station → mobile station) and TDMA (time division multiple access) for uplink (mobile station → base station) shall be used.

3.2.8 Number of multiplexed circuits

The number of multiplexed circuits on a TDMA channel shall be three when full rate codec is used, and six when half-rate codec is used.

3.2.9 Modulation method

The modulation method shall be a quadrature phase modulation in which the reference carrier phase is shifted by $\pi/4$ every 2 bits. This method is referred to as $\pi/4$ QPSK.

(The transmit filter shall be square root raised cosine roll-off filter with the roll-off factor of 0.5.)

3.2.10 Transmission bit rate

The transmission bit rate shall be 42 kbps.

3.2.11 Voice coding bit rate

The voice coding bit rate shall be 11.2 kbps (for full rate CODEC)/5.6 kbps (for half rate CODEC).

3.2.12 Frame length

The frame length shall be 40 msec (or six slots). 20 msec (or three slots) shall be a subframe length.

3.2.13 Waveform equalization

Adoption of waveform equalizers to base stations and mobile stations shall be at the discretion of individual operators. The home system operator shall be responsible for the quality of communication during roaming, particularly for the mobile station without waveform equalizer which roams into a network performing equalization.

3.2.14 Processing delay

The system delay caused during the process of voice coding and time division multiplexing etc., shall be maintained within a range which does not affect the naturality of voice communication.

3.2.15 VOX control

Adoption of the VOX operation to base stations and mobile stations shall be at the discretion of the operators.

3.2.16 Mobile station identification number

Assignment of mobile station identification numbers to mobile stations and the transmission procedure of mobile station identification numbers shall be designed taking into consideration free selection of networks by users, roaming, security of communication, supervision of the radio station and so on.

3.2.17 Security measures

The facilities and equipment shall be designed in accordance with "Annex 1 Authentication, Ciphering and Subscriber Data Registration Standard for the Personal Digital Cellular Telecommunication System" which will be disclosed in accordance with the "Disclosure Regulation on the Standard for Authentication, Ciphering and Subscriber Data Registration of the Personal Digital Cellular Telecommunication System" and the "Exceptional Disclosure Regulation on the Standard for Authentication, Ciphering and Subscriber Data Registration of the Personal Digital Cellular Telecommunication System" approved in the Standard Assembly. The facilities and equipment shall be also designed in accordance with "Annex 4 Standard for Interface between Mobile Station and Subscriber Information Module."

3.2.18 Counter-electromagnetic interference measures

Vehicle-mounted mobile stations shall be designed to prevent mutual electromagnetic interference between the mobile stations and electrical equipment for automobiles.

3.2.19 Operating environmental conditions

The mobile stations shall be designed so as to withstand the operation in an ambient temperature range of 20 ± 40˚C.

3.3 Conditions for modulation method

3.3.1 Modulation method

3.3.1.1 Modulation method

The modulation used shall be $\pi/4$ Shift QPSK.

3.3.1.2 Differential coding

Fig. 3.3-1 shows a schematic diagram which specifies the modulation method in this standard.

The input baseband serial signals are converted into symbols (X_k, Y_k) using a serial-to-parallel converter. They subsequently undergo differential encoding to form orthogonal signals (I_k,Q_k).
Every 2 bits from the start bit of the signal format shall form a modulation symbol.

(1) Conversion from (X_k,Y_k), to (I_k,Q_k) shall be performed using Eq. 3.3.-1 and the conversion rule shown in Table 3.3-1.

Conversion from the input baseband serial signal to (X_k, Y_k), (binary/quadrature conversion) shall be in accordance with the following rule.

Binary data time series	$\cdots a_{n-1},\ a_n,\ a_{n+1} \cdots$
$\downarrow \quad \downarrow$	$(a_n,\ a_{n+1})$
Symbol time series	$X_k \quad Y_k$

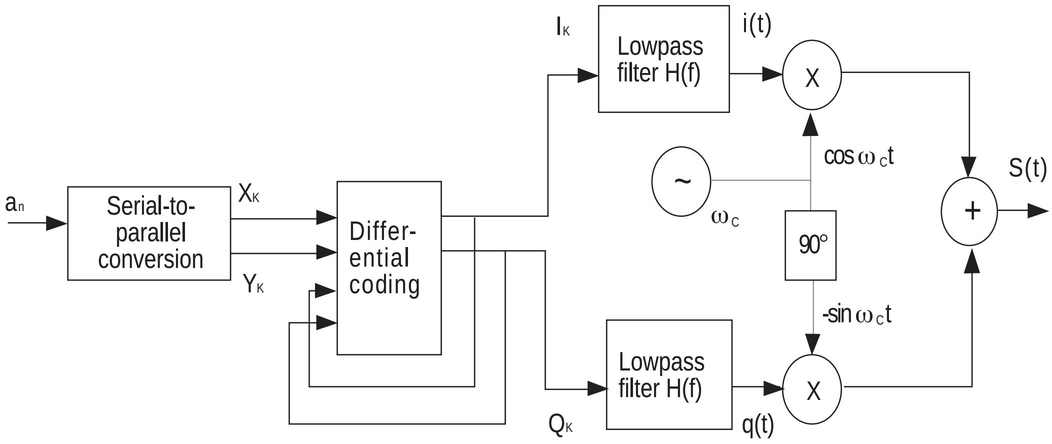


Fig. 3.3-1 : Schematic diagram of $\pi/4$ shift QPSK modulation circuit

$$I_K = I_{K-1} \cos[\Delta\phi(X_K, Y_K)] - Q_{K-1} \sin[\Delta\phi(X_K, Y_K)]$$
$$Q_K = I_{K-1} \sin[\Delta\phi(X_K, Y_K)] + Q_{K-1} \cos[\Delta\phi(X_K, Y_K)] \qquad \text{Eq. 3.3-1}$$

Table 3.3-1 Differential coding rules

X_K	Y_K	$\Delta\phi$
1	1	$-3\pi/4$
0	1	$3\pi/4$
0	0	$\pi/4$
1	0	$-\pi/4$

(2) Figure 3.3-2 below shows the phase diagram of $\pi/4$ shift QPSK signal.

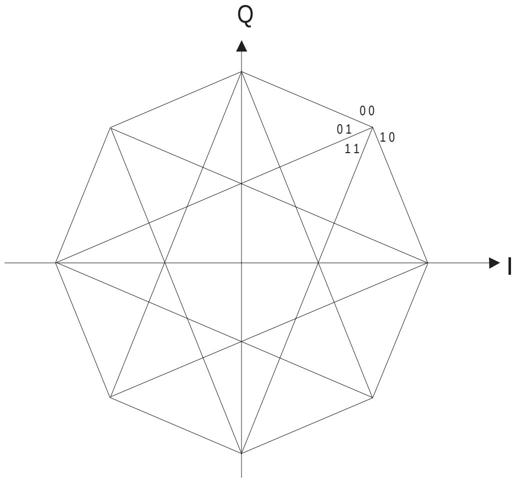


Fig. 3.3-2 : Phase diagram of $\pi/4$ QPSK signal

3.3.1.3 Spectrum shaping of baseband signal

(1) Square root raised cosine Nyquist spectrum H (f) shall be used for the spectrum shaping of the baseband signal.

$$|H(f)| = \begin{cases} 1 & 0 \le |f| < (1-\alpha) / 2T \\ \cos [(T / 4\alpha)(2\pi|f| - \pi (1-\alpha) / T)] & (1-\alpha) / 2T \le |f| < (1+\alpha) / 2T \\ 0 & (1+\alpha) / 2T \le |f| \end{cases}$$

Eq. 3.3-2

(2) The roll-off factor, α shall be = 0.5.

(3) The phase characteristics of H(f) shall be linear.

3.3.1.4 Orthogonal modulation

S(t) shown in Fig. 3.3-1 shall be in accordance with equations below.

$$\begin{aligned} S(t) &= \mathrm{Re}\,[\,\{ i(t) + j\,q(t)\} \exp(j\,\omega_c t)\,] \\ &= i(t) \cos \omega_c t - q(t) \sin \omega_c t \end{aligned}$$

Eq. 3.3-3

where

$$\begin{aligned} i(t) &= F^{-1}\ [H(f) \bullet F\{I_k(t)\}] \\ q(t) &= F^{-1}\ [H(f) \bullet F\{Q_k(t)\}] \end{aligned}$$

Eq. 3.3-4,

and F [x] and F^{-1} [X] represent Fourier transformation of x and inverse Fourier transformation of X, respectively.
I_k (t) and Q_k (t) are continual impulse functions; each impulse of which has energy proportional to the square of amplitude of orthogonal signals I_k and Q_k, respectively.

3.3.1.5 Transient characteristics of burst edges

The ramp at the beginning and end of burst shall be four bits, or two symbols, respectively.

3.3.1.6 Transmit signal spectrum

The spectrum of transmit signal shall conform to the specification stated in section 3.4.2.3.

3.3.2 Transmission bit rate

The transmission bit rate shall be 42 kbps.

3.4 Conditions relating to transmitter and receiver

3.4.1 Frequency bands and channel allocation

3.4.1.1 Frequency bands

[800 MHz band No.1]

(1) Base station transmit frequency : 810 MHz to 828 MHz

(2) Mobile station transmit frequency : 940 MHz to 958 MHz

(3) Frequency separation between transmit and receive carriers : 130 MHz

[800 MHz band No.2]

(1) Base station transmit frequency : 870 MHz to 885 MHz

(2) Mobile station transmit frequency : 925 MHz to 940 MHz

(3) Frequency separation between transmit and receive carriers : 55 MHz

[1,500 MHz band]

(1) Base station transmit frequency : 1477 MHz to 1501 MHz

(2) Mobile station transmit frequency : 1429 MHz to 1453 MHz

(3) Frequency separation between transmit and receive carriers : 48 MHz

[800 MHz band No.3]

(1) Base station transmit frequency : 838 MHz to 843 MHz

(2) Mobile station transmit frequency : 893 MHz to 898 MHz

(3) Frequency separation between transmit and receive carriers : 55 MHz

[1,500 MHz band No.2]

(1) Base station transmit frequency : 1513 MHz to 1516 MHz

(2) Mobile station transmit frequency : 1465 MHz to 1468 MHz

(3) Frequency separation between transmit and receive carriers : 48 MHz

3.4.1.2 Channel frequency separation

Separation between adjacent channels shall be in accordance with the requirements shown below.

(1) Frequency separation : 50 kHz

(2) Interleaved carrier freq. separation : 25 kHz

3.4.2 Transmission characteristics

3.4.2.1 Transmit power

(1) Definition

a. Facilities and equipment having antenna connector : Power fed to antenna.

b. Facilities and equipment in which antenna is installed : Antenna radiation power measured at the test site or measured using a RF coupler which is calibrated at the test site.

(2) Requirement

a. Mobile stations

Maximum transmit power : Shall be specified as the average power over the period of transmission burst and classified into four classes listed in Table 3.4-1.

Transmission power accuracy : Shall be within +20% and -50% of the specified value.

Table 3.4-1 : Maximum transmit power

Mobile Station Class	Maximum transmit power
I	3.0 W
II	2.0 W
III	0.8 W
IV	0.3 W

b. Base stations

The maximum transmit power is not specified. However, unused slots of a common carrier which is under use shall be transmitted continuously. The transmission power control scheme is specified in section 3.4.2.2 (2) and its data is specified in section 4.1.19.

3.4.2.2 Transmit power control characteristics

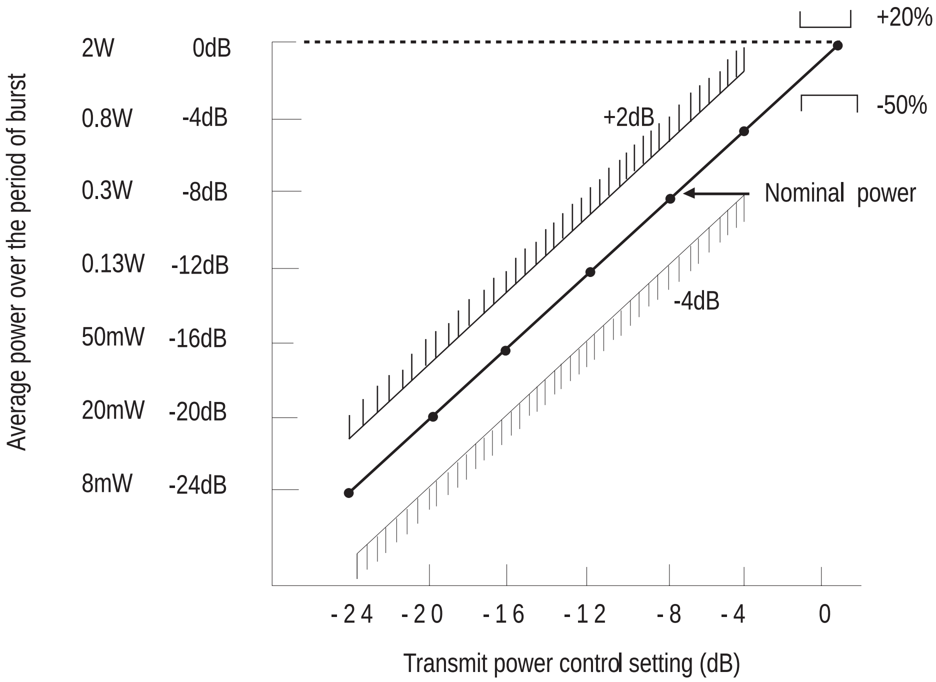
(1) Mobile stations

Control range : Shall be in accordance a with the specification in the Table 3.4-2.

Control step : 4 dB

Control error : Shall be within +2 dB and -4 dB of the specified value for each power step. The actual transmit power shall monotonously decrease as power setting is made lower.

The specification for power control errors are shown in Fig. 3.4-1 as an example for Class II Mobile Stations.



Note: Monotonons variation of power shall be maintained between each step.

Fig. 3.4-1 : Specification for transmit errors when power control is performed [Classs II MS]

Table 3.4-2 Control ranges

Mobile Station Class	Control range
I	0 to -28 dB
II	0 to -24 dB
III	0 to -20 dB
IV	0 to -16 dB

(2) Base stations

Adoption of transmit power control to base stations shall be at the discretion of individual operators. When it is implemented, the control characterislicts shall be in accordance with the following specification.

Control range	:	0 dB to -8 dB
Control step	:	4 dB
Control error	:	Within +2 dB and -4 dB of the specified value for each power step. The actual transmit power shall monotonously decrease as power setting is made lower.

3.4.2.3 Adjacent channel leakage power

(1) Definition

The adjacent channel interference power shall be defined as the power that is radiated within a bandwidth of ±10.5 kHz, of which center frequency is separated by Δ f kHz from the subject carrier frequency when the subject carrier is modulated with the reference coded test signal at the same bit rate as that of transmission bit rate.

(2) Specification

The specification described below shall apply to both mobile stations and base stations.

a. 50 kHz off : -45 dB or less
b. 100 kHz off : -60 dB or less

3.4.2.4 Transient response characteristics of mobile station burst transmission

(1) Definition

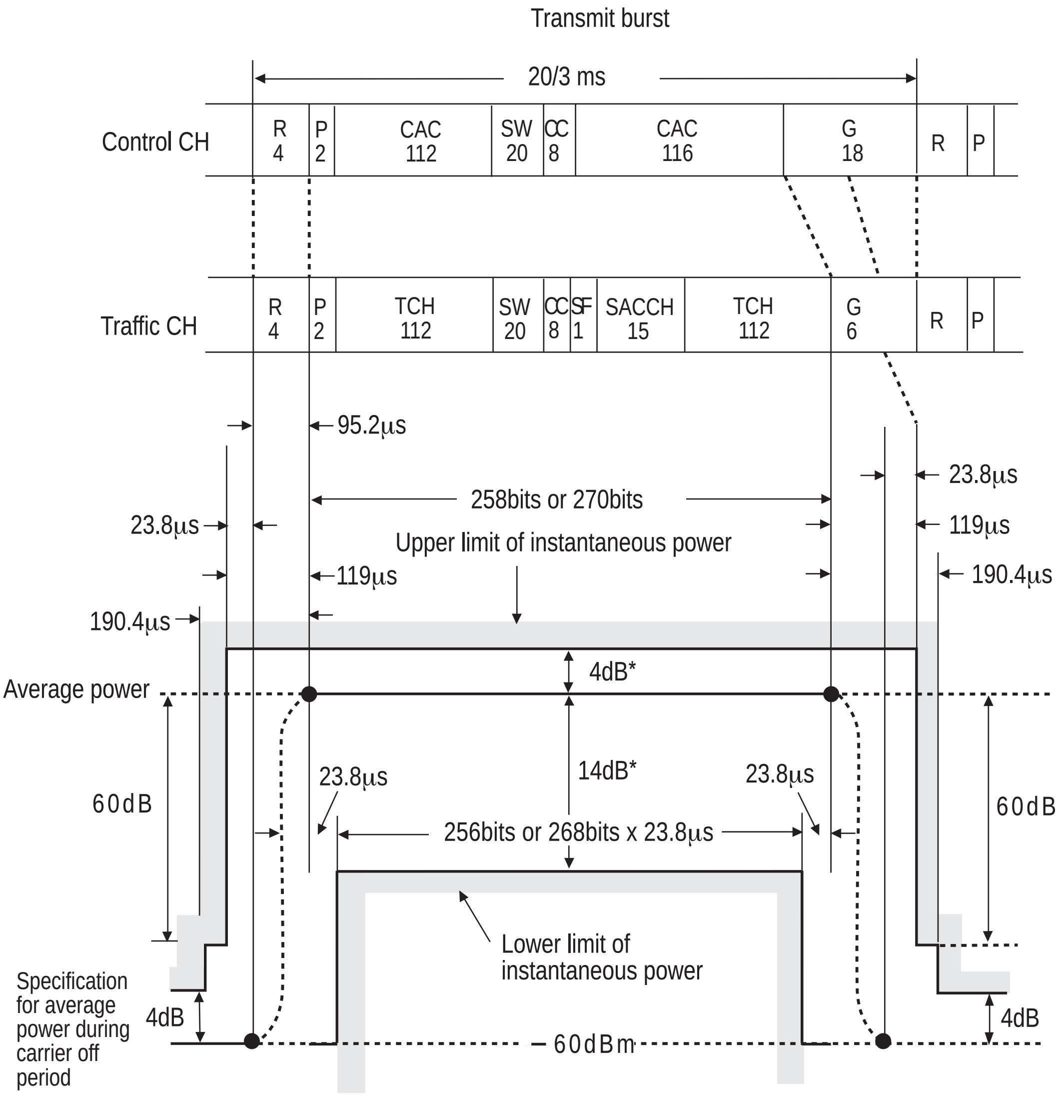
The transient response of burst transmission for mobile stations shall be defined by the duration of a burst signal modulated by the digital bit stream at the mobile station;

to fall off from (the power level in the range of +4 thru -14dB of the average power over the transmit burst) to - 60dBm
or
to rise from - 60dBm to (the power level in the range of +4 thru -14dB of the average power over the transmit burst).

(2) Specification

a. Time characteristics shall be in accordance with the specification in the Fig. 3.4-2

b. Transmit power of the carrier off period shall be in accordance with the specification given in the section 3.4.2.5.



* Upper and lower limits of the instantaneous power are determined by adding a margin (max. +1.1dB, min.-3dB) to the maximum and minimum power ratios (+2.9dB and -11dB, respectively)to the average power level of $\pi/4$ QPSK ($\sqrt{}$ roll-off $\alpha = 0.5$)
Each timing is referred to the section 4.1.9.1 "Reference transmission timing for the mobile station".

Fig. 3.4-2 : Specification for transient response of burst transmission in mobile station

3.4.2.5 Leakage power during carrier off period

(1) Definition

The leakage power during carrier off period shall be defined as the ratio of power radiated in the occupied frequency bandwidth of the subject carrier during carrier off period to the average power over the transmit burst.

(2) Specification

a. Mobile stations : The power shall be -60 dBm or less

b. Base station : The power shall be -60 dB or less compared with the power level during the carrier on period, or 2.5µW or less

3.4.2.6 Strength of spurious emissions or unwanted emissions

(1) Definition (Article 2, Clause 1 of Regulations for Enforcement of the Radio Law)

The "spurious emission" refers to radiowave emissions at one or more frequencies outside the necessary frequency bandwidth, the level of which can be reduced without affecting the performance of information transmission, including harmonic emissions, parastic emission and the intermodulation products, excluding out of band emissions. (Item 63 of the same Clause)
The "out of band emission" refers to radiowave emissions which are caused by the modulation process for information transmission at frequencies close to the necessary frequency bandwidth. (Item 63-2 of the same Clause)
The "unwanted emission" refers to spurious emissions and out of band emissions. (Item 63-3 of the same Clause)
The "spurious area" refers to frequency bands where spurious emissions outside the out of band area are dominant. (Item 63-4 in the same Clause)
The "out of band area" refers to frequency areas where out of band emissions outside the necessary frequency bandwidth are dominant. (Item 63-5 in the same Clause)

(2) Permissible values

Regardless of the stipulations of Ordinance Regulating Radio Equipment (Note 1), the following permissible values shall be applied.

a. Mobile stations

Permissible value for the strength of spurious emissions for out of band areas	Permissible value for the strength of unwanted emissions for spurious areas
0.25µW or less, or 60dB less than the average power of the fundamental frequency	0.25µW or less, or 60dB less than the carrier power of the fundamental frequency

b. Base station

Antenna power	Permissible value for the strength of spurious emissions for out of band areas	Permissible value for the strength of unwanted emissions for spurious areas
More than 50W	2.5µW or less, or 60dB less than the average power of the fundamental frequency	50µW or less, or 70dB less than the carrier power of the fundamental frequency
50W or less		2.5µW or less, or 60dB less than the carrier power of the fundamental frequency

(Note 1) Ordinance Regulating Radio Equipment Appendix table 3 item 17(1) stipulates the following values for mobile stations and base stations:

Antenna power	Permissible value for the strength of spurious emissions for out-of-band areas	Permissible value for the strength of unnecessary emission for spurious areas
More than 50W	2.5μW or less, or 60dB less than the average power of the fundamental frequency	50μW or less, or 70dB less than the carrier power of the fundamental frequency
More than 1W, and 50W or less		2.5μW or less, or 60dB less than the carrier power of the fundamental frequency
1W or less	25μW or less	25μW or less

Interim measures are provided (according to Supplementary Provisions of Ordinance Regulating radio Equipment (Ministry of Internal Affairs and Communications (MIC) Ordinance No. 119, issued on August 9, 2005)).

3.4.2.7 Permissible occupied frequency bandwidths

(1) Definition

The permissible occupied frequency bandwidth shall be defined as the frequency bandwidth which is determined by the edge frequencies, whereby the power of emissions averaged over the frequency range both above and below the edge frequencies is 0.5% of the total power of the radiation of a carrier.

(2) Specification

The permissible occupied frequency bandwidth shall be 32 kHz for both mobile stations and base stations.

3.4.2.8 Frequency stability

(1) Definition

Frequency stability shall be defined by the maximum allowable deviation of the center frequency of the occupied bandwidth of the subject transmission from the assigned frequency.

Frequency stability for mobile stations is regulated by any transmission burst interval.

(2) Specification

a. Mobile stations

Accuracy at 800 MHz band : $\pm 3 \times 10^{-6}$ or less

at 1500 MHz band : $\pm 2 \times 10^{-6}$ or less

Base station tracking error : $\pm 0.3 \times 10^{-6}$ or less

Under the environmental conditions given as follows;

1) Receiver input level : 10 dBμ or greater

2) Radio circuit quality : A quality equivalent to CIR of 15 dB or greater

3) Condition of Propagation : with Rayleigh fading (f_D = 0 to 80 Hz)

4) Modulation : The radio carrier shall be modulated by a bit stream conforming to the traffic physical channel (see section 4.1.4.3) format where the user traffic channel fields contain standard coded test signal (the standard coded test signal refers to the pseudo-random binary sequence of 511 bit length and conforms to ITU-T V.52).

b. Base station

Accuracy : $\pm$ 0.05 x 10^{-6} or less.

3.4.2.9 Modulation accuracy

(1) Definition

The modulation accuracy shall be defined by the rms value of errors in signaling points, ie. the square root of the value which is obtained by dividing the sum of squared errors over a slot by the number of symbols (refer to section 6.1.7).

(2) Specification

The modulation accuracy shall be 12.5% or less. In addition, the offset of origin shall be -20dBc or less.

3.4.2.10 Transmit intermodulation

(1) Definition

The transmit intermodulation shall be defined by the ratio of the output power of subject transmitted signal to the output power of intermodulation product when an interference signal (that differs from frequency of subject signal) is added at a level 30dB lower than that of the subject signal. The frequency of the interference signal shall be 100 kHz or more off the subject signal, however, as for interference signal whose frequency is in the range of 50kHz to 100kHz off the subject signal, adjacent channel leakage power is used instead of the output power of intermodulation product.

(2) Specification

The requirement for transmit intermodulation is not specified in this standard.

3.4.2.11 Transmission bit rate accuracy

Transmission bit rate accurancy shall be within $\pm 5 \times 10^{-6}$ of the nominal value for base stations. The transmission bit rate of mobile stations shall track the bit rate of signal received from base stations.

3.4.2.12 Cabinet radiation

a. Mobile station = 2.5μW or less

b. Base station = 25μW or less

3.4.3 Reception characteristics

3.4.3.1 Frequency tolerance of local oscillator

(1) Definition

Frequency tolerance of the local oscillator shall be defined by the maximum error of the oscillator frequency.

(2) Specification

Frequency tolerance of local oscillator is not specified in this standard.

3.4.3.2 Reception sensitivity

(1) Definition

Reception sensitivity shall be defined by the median of the receiver input level which yields a bit error rate (BER) of 1 x 10^{-2} or 3 x 10^{-2} when a signal with a length of 2556 bits or more modulated by binary pseudo noise sequence of 511-bit period in the TCH is received.
Specified reception sensitivity shall be defined by the reception sensitivity, the bit error rate (BER) of which during static state is 1 x 10^{-2}, and shall be 4 dBµ.

(2) Specification

The reception sensitivity shall meet the requirements listed below for both mobile stations and base stations.

BER		1%	3%
Static		4 dBµ (specified reception sensitivity) or less	2 dBµ or less
Fading	without diversity	14 dBµ or less	8 dBµ or less
	with post detection selection diversity	7 dBµ or less	4 dBµ or less

Fading conditions : Raleigh fading at maximum Doppler frequency f_D = 40Hz

3.4.3.3 Bit error rate performance

(1) Definition

Bit error rate performance shall be defined by the bit error rate measured with a signal whose TCH part is modulated by a pseudo random binary sequence having a 511 bit period at the specified reception level.

(2) Specification

The bit error rate performance is not specified.

3.4.3.4 Adjacent channel selectivity

(1) Definition

Adjacent channel selectivity shall be defined as the level ratio of the interfering signal to the desired signal, specified by the following statement:

The level of desired signal shall be set to +3dB higher level of the specified reception sensitivity.* The level of interfering signal shall be the one yielding a bit error rate of 1 x 10^{-2} on the desired TCH channel. The interference signal be detuned by Δf kHz and modulated by a pseudo random binary sequence with 32, 767-bit code length.

(* Refer to Section 3.4.3.2 for the specified reception sensitivity)

(2) Specification

The adjacent channel selectivity shall meet the following requirements for both base stations and mobile stations.

a. 1 dB or higher : at 25 kHz off
b. 42 dB or higher : at 50 kHz off
c. 57 dB or higher : at 100 kHz off

3.4.3.5 Intermodulation performance

(1) Definition

Intermodulation performance shall be defined as the level ratio of the either of the two interfering signal to the desired signal, specified by the following statement:

The level of desired signal shall be set to +3dB higher level of the specified reception sensitivity.* The level of interfering signal shall be those yielding a bit error rate of 1 x 10^{-2} on the desired TCH channel. The interference signal shall be detuned by 100 kHz and 200kHz.

(* Refer to Section 3.4.3.2 for the specified reception sensitivity)

(2) Specification

The intermodulation performance shall be 57 dB or higher for both base stations and mobile stations.

3.4.3.6 Spurious sensitivity

(1) Definition

Spurious sensitivity shall be defined as the level ratio of the interfering signal to the desired signal, specified by the following statement:

The level of desired signal shall be set to +3dB higher level of the specified reception sensitivity.* The level of interfering signal shall be one yielding a bit error rate of 1 x 10^{-2} on the desired TCH channel. The interference signal shall be detuned by 100 kHz and modulated.

(* Refer to Section 3.4.3.2 for the specified reception sensitivity)

(2) Specification

Spurious sensitivity shall be 57 dB or higher for both mobile stations and base stations.

3.4.3.7 Strength of secondary radio emissions

(1) Definition

The strength of secondary radio emissions shall be defined as the strength of radio waves emitted from the antenna terminal when the stations are in the receive mode.

(2) Specification

- The secondary radio emission shall be 0.3µV/m or less at the distance of 1.8 km from the emission point.
- The secondary radio emission shall be 4000 µµW or less for both mobile stations and base stations .

3.4.3.8 Carrier-to-interference ratio requirement (required CIR)

(1) Definition

Required CIR shall be defined as the level ratio of the interfering signal to the desired signal, specified by the following statement:

The level of desired signal shall be set to +30dB higher level of the specified reception sensitivity.* The level of interfering signal shall be the one yielding a bit error rate of 1×10^{-2} or 3×10^{-2} on the desired TCH channel under Rayleigh fading with the maximum Doppler frequency "fD". The interference signal shall be modulated by a pseudo random binary sequence with 32,767-bit code length.

(*Refer to Section 3.4.3.2 for the specified reception sensitivity)

(2) Specification

Carrier to interference ratio shall meet the following requirements for both mobile stations and base stations.

BER		1%	3%
Static		13 dB or less	11 dB or less
Fading	without diversity	22 dB or less	17 dB or less
	with post-detection selection diversity	16 dB or less	13 dB or less

Fading conditions : Raleigh fading with maximum Doppler frequency f_D = 40Hz

3.4.3.9 Cabinet radiation

Same specification shall apply to both the mobile and base stations. Cabinet radiation shall be 4nW for up to 1GHz; also it shall be 20nW or less between 1GHz and 3GHz for a receiver with one carrier wave.

3.4.3.10 Reception signal level detection

(1) Mobile stations

The reception signal level detection shall be specified as a required value for both absolute and relative accuracy.

a. Required value for absolute accuracy

The reception signal level detection value shall possess shows monotonicity increase characteristics in relation to the RF input level 4dBµV to 62dBµV (equivalent to a dynamic range of 58dB).
However, the absolute accuracy should be within +8dB/-4dB for an RF estimated level of 28dBµ or less and within +10dB/-6dB for an RF estimated level of more than 28dBµ.
The reception level detection range in relation to the RF input level from -5dBµV to 83dBµV and the requirement range for the detected RF level are shown in Fig. 3.4-3.

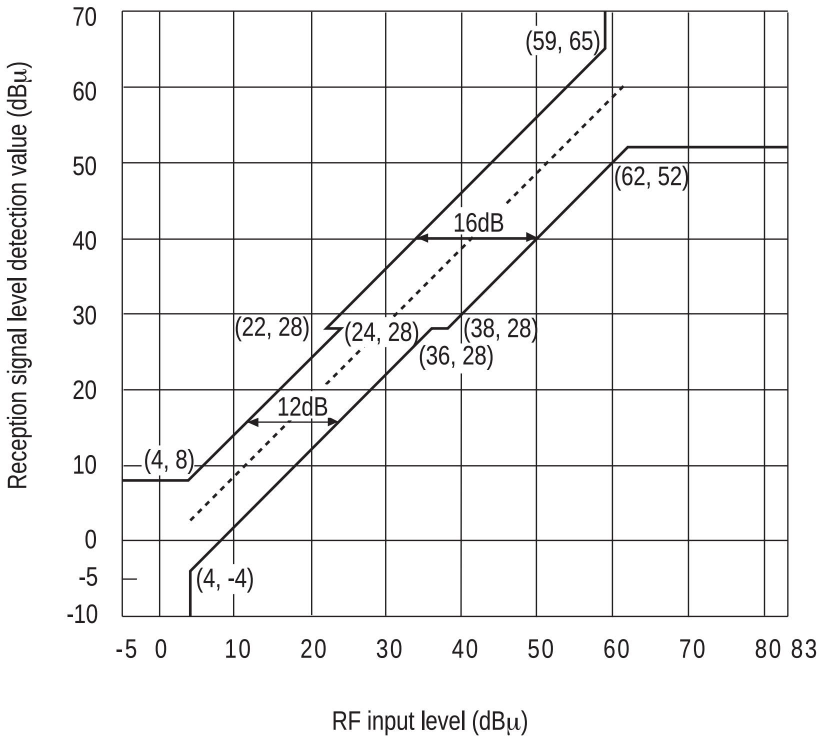


Fig. 3.4-3 Absolute accuracy of reception signal level detection

b. Required value for relative accuracy

i) Definition

Relative accuracy shall be defined by the reception level detection value using the home reception slot duirng call in progress and the reception level detection value using empty slots of the same RF input.

Relative accuracy = (Reception level detection value of home reception slot during communications)
- (Reception level detection value of empty slot)

ii) Required values

The required values for relative accuracy for the MS are as follows :
• RF input level between 4dBμ to 20dBμ : ±3dB or less
• RF input level between 20dBμ to 43dBμ : ±5dB or less

(2) Base stations

Not specified.

3.4.3.11 Radio circuit quality detection accuracy

(1) Definition

Radio circuit quality detection shall be defined by the BER of the downlink signal measured at the mobile station independent of the bearer attributes, such as voice and data.

(2) Specification

The bit error rate estimated by the radio circuit quality detector of the MS shall be within the range specified in the table below under both static and fading conditions for each reference error rate (bit error rate rigorously measured with the bit error meter).

Detection Accuracy :

reference BER (%)	estimated BER (%)
5.5	3 ≤ BER
1.6	1 ≤ BER< 3
0.55	0.3 ≤ BER< 1
0.10	BER< 0.3

Fading conditions : Rayleigh fading at maximum Doppler frequency f_D = 40 Hz

3.4.4 Antenna

(1) Base station : The antenna characteristics are not specified.

(2) Mobile station : The antenna shall have the gain of 5 dBi or less.

Chapter 4 Communications Control System

4.1 Layer 1 standards

4.1.1 Overview

These standards specify radio interface layer 1, which is the physical portion of the radio transmission layers utilized for the digital mobile telephone system. This chapter describes the different types of channels utilized, the signaling formats used, the structure of common access channels and random access control procedures so as to clarify the transmission conditions for signaling messages.

In addition, as part of the transmission procedure for signaling messages, this chapter also describes error correction methods, signal assembly/disassembly, the scrambling system used and VOX control.

4.1.2 Mobile station types and base station types

4.1.2.1 Mobile station types

Four classes of mobile stations are defined depending on differences in maximum transmission output (refer to 3.4.2.1). In addition, two types are defined in each class, namely those for full rate and full rate + half rate telephone communications.

4.1.2.2 Base station types

Not specified.

4.1.3 Service characteristics

4.1.3.1 Outline

Layer 1 (the physical layer) provides services to layer 2 (the data link layer) and the management entity, and in turn, receives services from the data link layer and management entity.

4.1.3.2 Service access points and the interface with transmission/tele- services

The service access points which exist between layers 1 and 2 and the interface with transmission/tele-services are shown in Fig. 4.1.3.2-1 below.

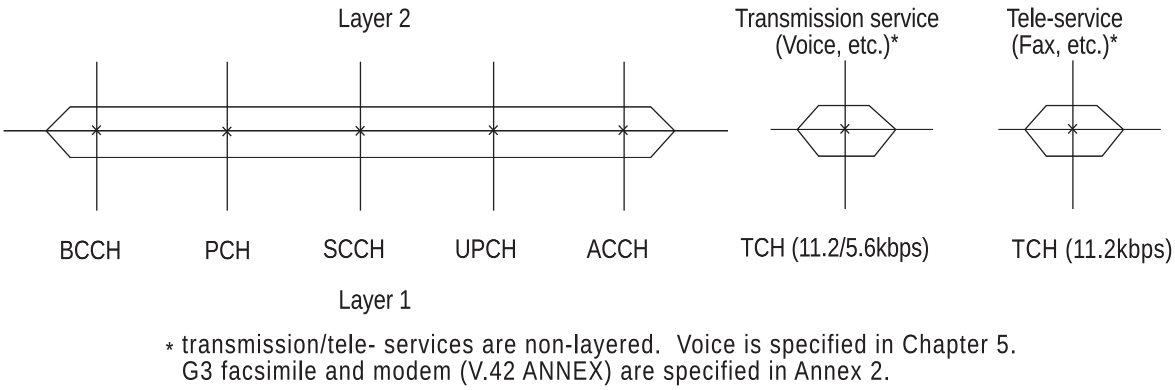


Fig. 4.1.3.2-1: Service access points between layers1 and 2 and interfacing with transmission/tele- service.

4.1.3.3 Services provided by layer 1

Layer 1 provides the following functional services for layer 2 and management entity.

4.1.3.3.1 Transmission function

Layer 1 provides transmission function, timing and synchronization function for the control channels and the traffic channels. (Random access control, Time alignment control)

4.1.3.3.2 Channel Activate/Deactivate

Layer 1 also provides signal transmission functions and procedures for turning the control and traffic channels Activate/Deactivate according to requests from terminals as well as from the network. (Common control CH Activate/Deactivate, Traffic CH Activate/Deactivate, User Packet CH Activate/Deactivate)

4.1.3.3.3 Maintaining the radio link

In addition to the above, layer 1 provides the functions and procedures for maintaining the radio link. (Channel quality supervision during call in progress, Peripheral channel level measurement, Transmission power control)

4.1.3.3.4 Maintenance

Layer 1 provides signal transmission functions, procedures, and layer 1 functions required for maintenance functions.

4.1.3.3.5 State indication

Layer 1 indicates layer 1 state information to the management entity.

4.1.3.3.6 Error detection/error correction

Layer 1 offers error detection and correction functions by the individual slot.

4.1.4 Channel types

4.1.4.1 Functional channels

There are two types of radio channels: user traffic channel (TCH) and control channel (CCH).

Control channel is further classified as shown in Fig. 4.1.4.1-1 below. In addition, RCH composed of housekeeping bits is provided.

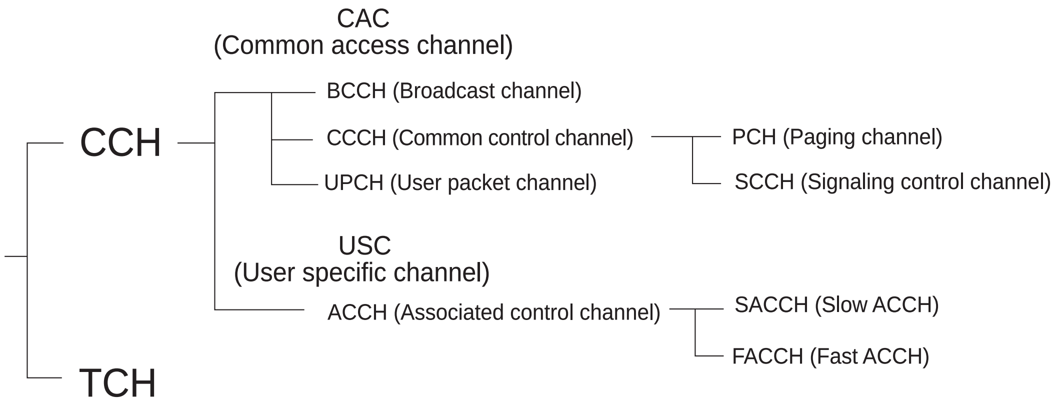


Fig.4.1.4.1-1 : Channel structures (Functional channels)

4.1.4.1.1 Broadcast channel (BCCH)

A unidirectional channel to broadcast control information from network to mobile units. This channel transmits location registration, channel structure and system information.

4.1.4.1.2 Common control channel (CCCH (PCH, SCCH))

A point-multipoint bidirectional channel for transmitting signaling information. In order to carry out intermittent reception at mobile station, the CCCH are further divided into PCH and SCCH as follows.

(1) Paging channel (PCH)

A unidirectional channel used for simultaneous transmission of the same information from the network to mobile units spreading over a wide "paging" area.

(2) Signaling control channel (SCCH)

A bidirectional channel used for transmitting information between the network and mobile units. This channel is used when the cell location of the mobile station is known by the network. Information is transmitted independently to each cell using different frequency resources. The uplink channel is a random access type.

4.1.4.1.3 Associated control channel (ACCH)

A point-point bidirectional control channel associated with the TCH for transmitting signaling information and user packet data. The FACCH is defined as a channel that temporarily steals the TCH to perform high speed data transmission. In relation to this, the normal ACCH is called SACCH.

4.1.4.1.4 User packet channel (UPCH)

A point-multipoint bidirectional channel which transfers the control signal information and user packet data. The uplink channel is of the random access type.

4.1.4.1.5 Traffic channel (TCH)

A point-point bidirectional channel which is used for transmitting user information and user information control signal. This is used for transferring voice and facsimile information, etc.

4.1.4.1.6 Housekeeping channel (RCH)

Housekeeping channel is constructed by bits on the slot which contains the TCH and is used for maintaining the radio channel. RCH is not layered.

4.1.4.2 Physical channel configuration

Physical channels are structured as follows.

The functional channels, the BCCH, PCH and SCCH, are assigned to the downlink control physical channels.
These channels form the superframe structure on the physical channel, being assigned to the specified portions in the superframe. (Refer to Fig. 4.1.10.2-1.) The uplink control channels are composed of the SCCH type only.

In the traffic physical channels, bits in the individual slots are assigned to the SACCH/RCH and TCH/FACCH which make up the structure for the respective functional channels.

A UPCH functional channel is assigned to a packet physical channel, which forms a superframe structure and a hyperframe structure made up of multiple superframes.

The minimum unit by which a message can be structured on the common access channel (CAC) is one slot. For the FACCH, however, the structure of a unit is composed of 2 slots (refer to 4.1.5.2.2), while a unit for the SACCH and the RCH is composed of 8 slots and 2 slots respectively. Forming a unit for the SACCH and the RCH is accomplished by collecting the specified number of slots, starting from the superframe synchronization word (SSW) position (refer to 4.1.5.2.3.)

4.1.4.2.1 Mapping of functional channels on the physical channel

The RF section has the signaling structure shown in Fig. 4.1.4.2-1 and is made up of a downlink TDM (which handles transmissions from the base station), and an uplink TDMA (which handles transmissions from the mobile station). 1 frame cycle is specified as 40 ms (6 slots). 20 ms (3 slots) is specified as subframe cycles in a frame. 1 superframe cycle must be 720 ms.

The control, traffic and packet physical channels, are set as independent physical channels to each slot and all three physical channels may exist on 1 carrier.

On the control physical channels, slots must always be used in subframe units (full rate). Fig. 4.1.4.2-2 is an example of assignment of BCCH, PCH and SCCH on the downlink control physical channel (refer to 4.1.10.2-1).

On the traffic physical channel, slots are used in frame (half rate) or subframe (full rate) units and half rate and full rate may exist within 1 carrier. Fig. 4.1.4.2-3 shows the assignment of SACCH and RCH on the traffic physical channel. (Refer to Figs. 4.1.5.2-5 and 4.1.5.2-9.) For packet physical channels, slots must always be used in subframe units, and either 1, 2 or 3 slots may be used on 1 carrier. A packet physical channel which utilizes 1 slot assigned to either of the following pair of slots, i.e. ST#0 and ST#3, ST#1 and ST#4, or ST#2 and ST#5; a packet physical channel which utilizes 2 slots assigned to either of the following combinations of slots. i.e. ST#0, ST#3, ST#1 and ST#4, ST#1, ST#4, ST#2 and ST#5, or ST#0, ST#3, ST#2 and ST#5. Packet physical channels for both uplink and downlink consist of UPCH functional channels as shown in Fig. 4.1.4.2-4. The relationships between the physical channels and functional channels are outlined in Table 4.1.4.2-1.

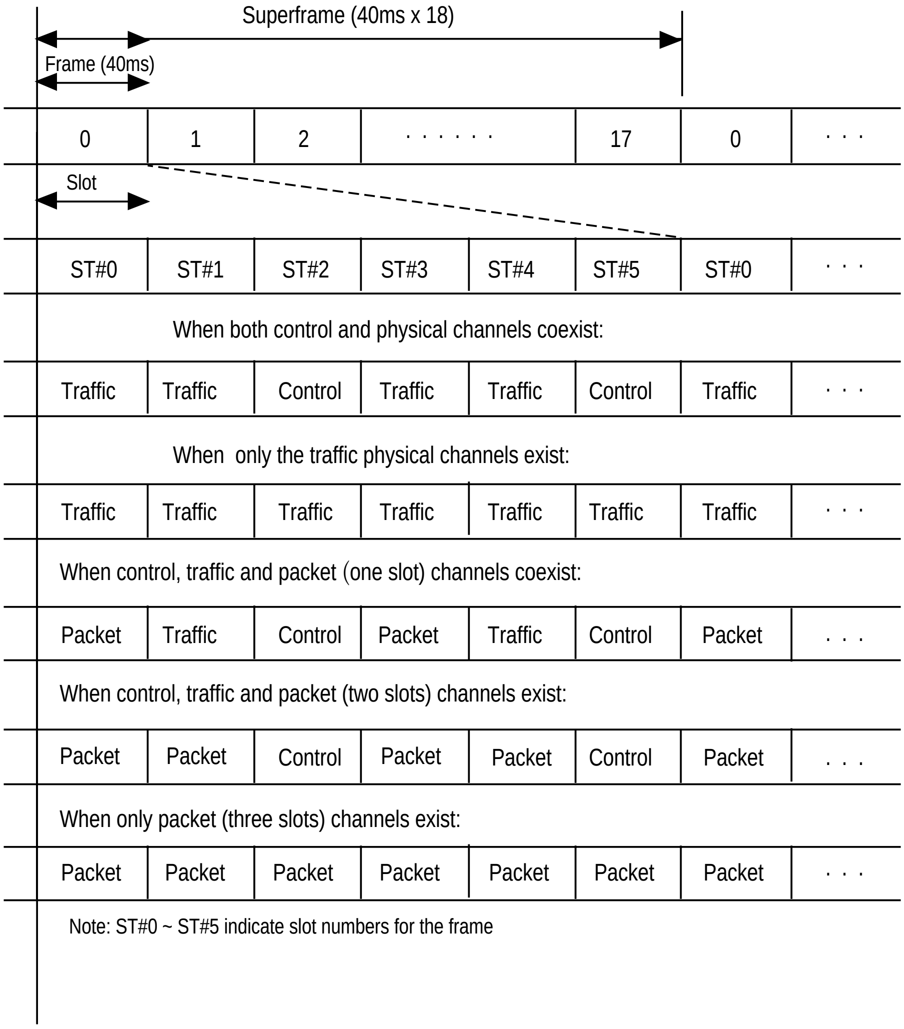


Fig. 4.1.4.2-1 : Examples of frame configuration

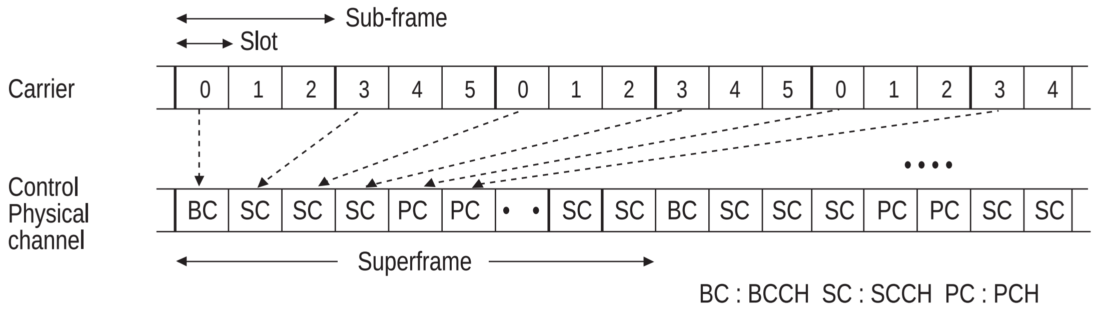
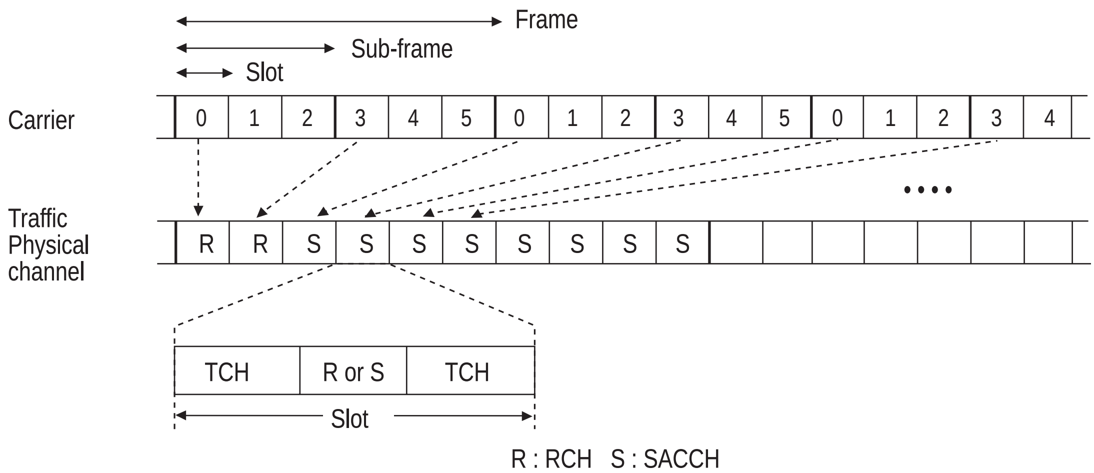
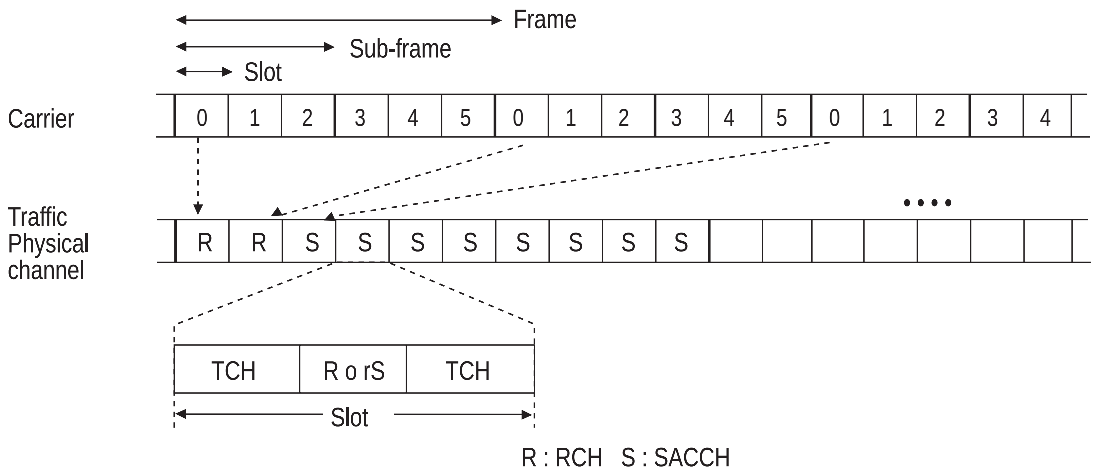


Fig. 4.1.4.2-2 : Example of BCCH, PCH and SCCH assignments in control physical channel



(a) Full rate



(b) Half rate

Fig. 4.1.4.2-3 : Assignments of SACCH and RCH in traffic physical channel

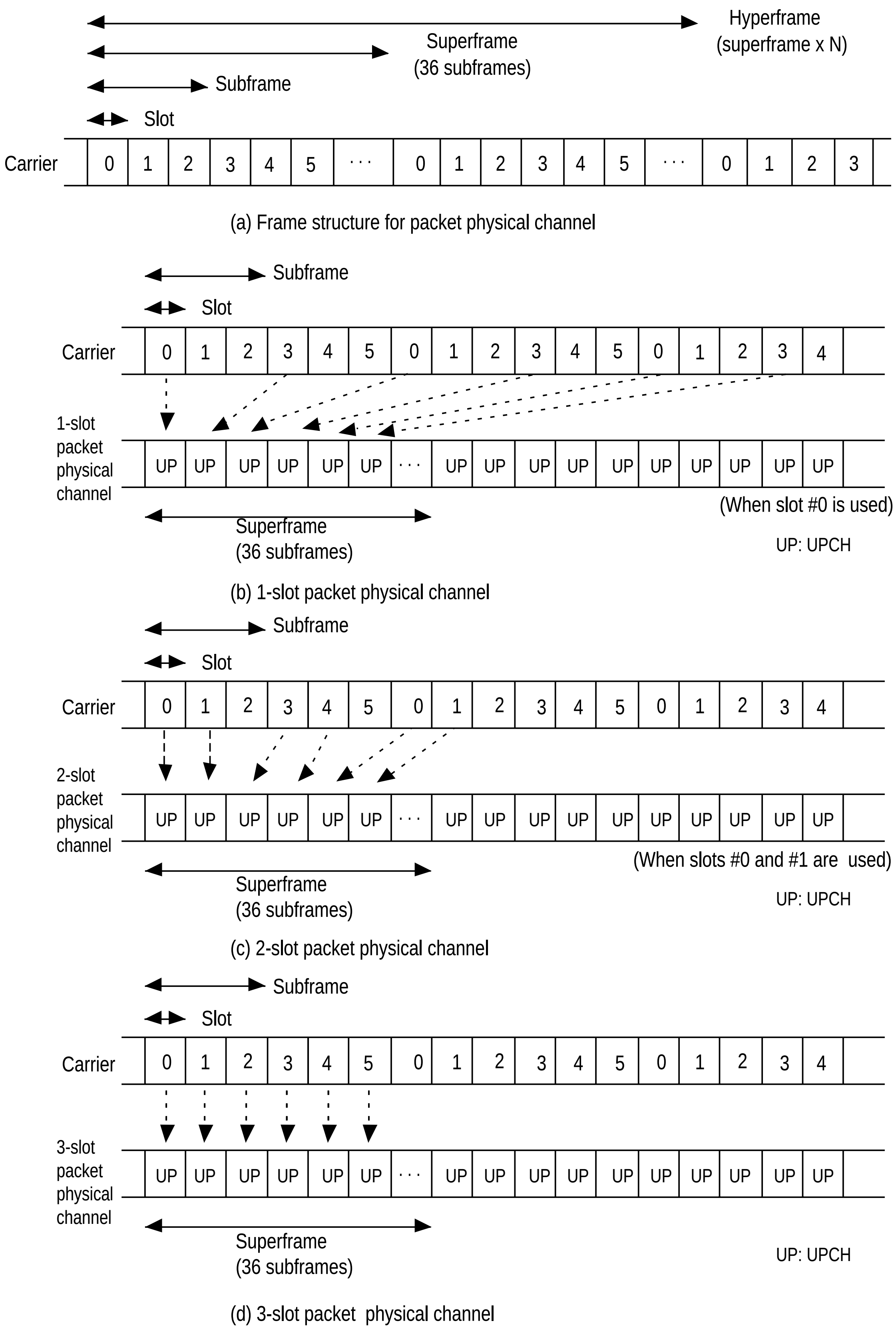


Fig. 4.1.4.2-4 : Assignment of UPCH in packet physical channel

Table 4.1.4.2-1 : Relationship between physical and functional channels

Physical channel		Functional channel
Control physical channel	Downlink	BCCH, PCH, SCCH
	Uplink	SCCH
Traffic physical channel	Downlink	TCH, SACCH, RCH, FACCH
	Uplink	TCH, SACCH, RCH, FACCH
Packet physical channel	Downlink	UPCH
	Uplink	UPCH

BCCH : Broadcast information channel
PCH : Paging channel
SCCH : Signaling control channel
UPCH : User packet channel
SACCH : Slow associated control channel (ACCH)
RCH : Housekeeping channel
FACCH : Fast associated control channel (ACCH)
TCH : User traffic channel

4.1.4.3 Signal format

The bit assignment should be set so that the transmission positions of the frame synchronization word are aligned.

4.1.4.3.1 Control physical channel

The signal format (bit assignment) for the control physical channel (280 bits) is given in Fig. 4.1.4.3-1.

(1) Uplink

1st unit

R	P	CAC	SW	CC	CAC	G
4	48	66	20	8	116	18

2nd unit and above

R	P	CAC	SW	CC	CAC	G
4	2	112	20	8	116	18

(2) Downlink

R	P	CAC	SW	CC	CAC	E
4	2	112	20	8	112	22

G : Guard time
R : Burst transient response guard time
P : Preamble
SW : Synchronization word
CC : Color code
CAC : Control signal (PCH, BCCH, SCCH)
E : Collision control bits

Fig. 4.1.4.3-1 : Signal format for control physical channels

4.1.4.3.2 Traffic physical channel

The signal format (bit assignment) for the traffic channel (280 bits) is given in Fig. 4.1.4.3-2.

(1) Uplink

R 4	P 2	TCH (FACCH) 112	SW 20	CC 8	SF 1	SACCH/ RCH 15	TCH (FACCH) 112	G 6

(2) Downlink

R 4	P 2	TCH (FACCH) 112	SW 20	CC 8	SF 1	SACCH/ RCH 21	TCH (FACCH) 112

G : Guard time
R : Burst transient response guard time
P : Preamble
SW : Synchronization word
CC : Color code
SACCH : Slow ACCH
FACCH : Fast ACCH
RCH : Housekeeping bits
SF : Steal flag

Fig. 4.1.4.3-2 : Signaling format for traffic physical channels

4.1.4.3.3 Packet physical channel

The signal format (bit assignment) for a packet physical channel (280 bits) shall be as shown in Fig. 4.1.4.3-3.

(1) Uplink

1st unit

R	P	CAC	SW	CC	CAC	G
4	48	66	20	8	116	18

2nd unit and subsequent units

R	P	CAC	SW	CC	CAC	G
4	2	112	20	8	116	18

(2) Downlink

R	P	CAC	SW	CC	CAC	E
4	2	112	20	8	112	22

G : Guard time
R : Burst transient response guard time
P : Preamble
SW : Synchronization word
CC : Color code
CAC : Control signal (UPCH)*
E : Collision control bits

Fig. 4.1.4.3-3 : Signal format for packet physical channels

* Should be : CAC : Control signal/user data (UPCH)
(change proposal will be issued)

4.1.4.3.4 Synchronization burst

A synchronization burst of 280 bits is a signal which is sent to establish synchronization either when setting up the traffic channel or switching channels. The signal format (bit assignment) for the synchronization burst is given in Fig. 4.1.4.3-3 below.

(1) Uplink

G	R	P	SW	#1	#2	#3	Q	G
54	4	48	32	21	21	21	1	78

CC	B	TA	SSC
8	1	4	8

(2) Downlink

R	P	SW	#1	#2	#3	Q	Post
4	102	32	21	21	21	1	78

CC	B	TA	SSC
8	1	4	8

G : Guard time
R : Burst transient response guard time
P : Preamble
Post : Postamble
SW : Synchronization word
TA : Time alignment
B : Burst identification bit
SSC : Superframe sync counter
Q : Tail bit (must always be set to "1")

Note 1 : #1 to #3 have the same content and perform majority-decision processing for each bit.
Note 2 : When B=0, TA and SSC are constantly "0"; when B=1, TA and SSC are used.

Fig. 4.1.4.3-4 : Synchronization burst signaling format

4.1.4.3.5 Guard time and burst transient response guard time

The guard time (bits) and the burst transient respones guard time (bits) for the control physical channel, the traffic physical channel, the packet physical channel and the synchronization bursts are listed in Table 4.1.4.3-1.

Table 4.1.4.3-1 : Guard time and burst transient response guard time

(1) Uplink

Channel type	Guard time	Burst transient response guard time
Control physical channel	18	4
Traffic physical channel	6	4
Packet physical channel	18	4
Synchronization burst	54/78(#)	4

(#) Before/after burst

(2) Downlink

Channel type	Guard time	Burst transient response guard time
Control physical channel	0	4
Traffic physical channel	0	4
Packet physical channel	0	4
Synchronization burst	0	4

4.1.4.3.6 Details of frame bits

Frame bits are structured as outlined below.

Preamble and postamble patterns are listed in Table 4.1.4.3-2, while the structure of the burst identification bit is given in Table 4.1.4.3-3. The postamble pattern for downlink sync burst is a repetition of its preamble pattern. The steal flag value is listed in Table 4.1.4.3-4. FACCH is divided into 2 slots (1st and 2nd slots) and transmitted as described in item 4.1.5.2.2. If the transmission data is on a FACCH, the steal flag in the 1st slot is set for “1.” The steal flag can be used as information for detecting the FACCH. The superframe sync counter (SSC) indicates the slot No. (superframe position corresponds to 0) for acquisition of superframe synchronization and is specified between 0 and 251 and assigned. The slot position in a frame can be detected by means of a SSC mod (the number of slots used in 1 superframe). (Refer to Fig. 4.1.4.3-5 and Item 4.1.11.2.)

For details on time alignment, refer to item 4.1.12.

Table 4.1.4.3-2 : Preamble/postamble pattern

Channel type	Pre-/postamble pattern
Control physical channel (uplink 1st unit) Packet physical channel (uplink 1st unit) uplink sync burst	10011001 • •1001
Downlink sync burst	10011001 • • • 100110
Control physical channel (downlink, uplink 2nd unit); traffic physical channel Packet physical channel (dowulink, uplink 2nd unit)	10
Traffic physical channel (during VOX non-speech state) — Refer to Fig. 4.1.19-1	100110

Table 4.1.4.3-3 : Structure of burst identification bits

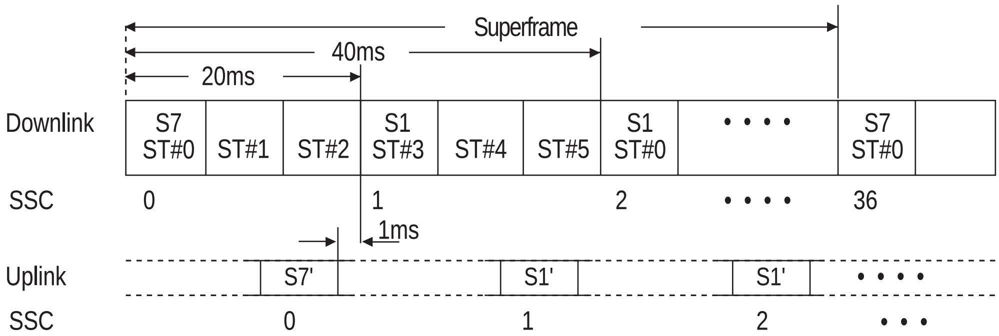
Burst type	B
Initial synchronization burst (SB1, SB2) *1	0
Completion sync burst (SB3, SB4) *2	1

*1: Used for frame synchronization

*2: Time alignment adjustment, superframe synchronization

Transmission signal type	SF
TCH transmission	0
FACCH transmission	1

The relationship between SSC bit and uplink/downlink transmission timing is shown in Fig. 4.1.4.3-5.

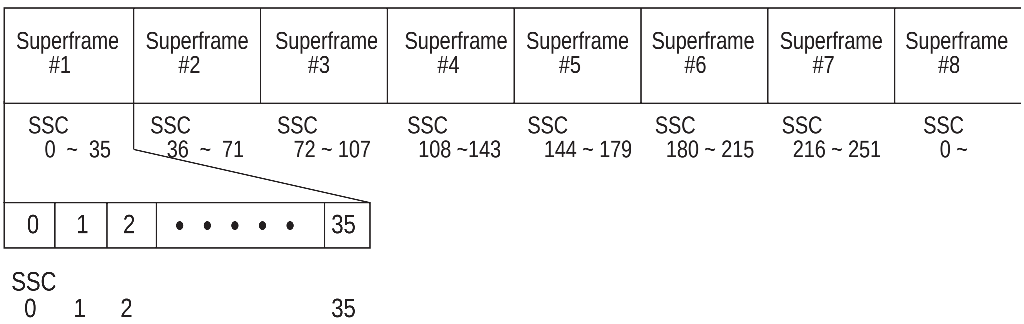


When using slots ST#0 and ST#3 at full rate :

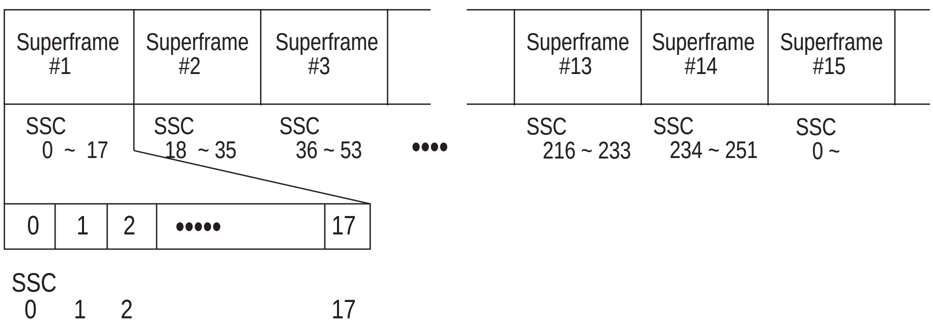
S7 is the ST#0 superframe sync word
S1 is the ST#0 frame sync word

Note also that S7' and S1' represent the inverted bit pattern for S7 and S1, respectively.

Fig. 4.1.4.3-5 : SSC timing (Full rate)



(1) Method of using SSC at Full rate



(2) Method of using SSC at Half rate

Fig. 4.1.4.3-6 : SSC spread over multiple superframes

4.1.4.3.7 Synchronization word pattern

Synchronization words are structured as follow.
20-bit synchronization words are used for the control channels, traffic physical channels and packet physical channels, while 32-bit synchronization words are used for the synchronization bursts. Six of the 12 types for 20-bit sync word patterns are used for superframe synchronization for control physical

channels and traffic physical channels at the head of a superframe, and also for superframe and hyperframe synchronization for packet physical channels at the head of superframes and hyperframes. The superframe or the hyperframe synchronization word for each slot for 2- or 3-slot packet channels is assigned within a subframe as shown in Fig. 4.1.4.3-8.

32-bit sync words ignore superframes. The 20-bit sync word patterns and 32-bit sync word patterns for downlink signals indicated in hexadecimal are listed in Fig. 4.1.4.3-7. Sync words for uplink signals have the inverted bit pattern of the sync words used for downlink signals.

The method of assigning 20-bit sync word patterns on the control physical channel, traffic physical channel or packet physical channel in relation to the number of TDMA channels is listed in Table 4.1.4.3-5; the method of assigning the 32-bit sync word patterns is listed in Table 4.1.4.3-6. Numbers 3 to 8 in the tables show the sync word allocation for channels mixing half rate and full rate.

(1) 20-bit synchronization word pattern

S1	:	87A4B	S2	:	9D236
S3	:	81D75	S4	:	A94EA
S5	:	5164C	S6	:	4D9DE
S7	:	31BAF	S8	:	1E56F
S9	:	E712C	S10	:	FBC1F
S11	:	8279E	S12	:	98908

(2) 32-bit synchronization word pattern

SS1	:	2F94D06B	SS2	:	1D4EE2B1
SS3	:	70168FE9	SS4	:	83527CAD
SS5	:	3678C987	SS6	:	48D8B727

Fig. 4.1.4.3-7: Synchronization word patterns

Table 4.1.4.3-5 : 20-bit sync word assignment

Method	ST#0	ST#1	ST#2	ST#3	ST#4	ST#5
1 (half rate)	S1/S7	S2/S8	S3/S9	S4/S10	S5/S11	S6/S12
2 (full rate)	S1/S7	S2/S8	S3/S9	S1/S7	S2/S8	S3/S9
3	S1/S7	S2/S8	S3/S9	S1/S7	S5/S11	S6/S12
4	S1/S7	S2/S8	S3/S9	S4/S10	S2/S8	S6/S12
5	S1/S7	S2/S8	S3/S9	S4/S10	S5/S11	S3/S9
6	S1/S7	S2/S8	S3/S9	S1/S7	S2/S8	S6/S12
7	S1/S7	S2/S8	S3/S9	S1/S7	S5/S11	S3/S9
8	S1/S7	S2/S8	S3/S9	S4/S10	S2/S8	S3/S9

Note 1 : Method 1 is applied if all slots are half rate, and method 2 is applied if all slots are full rate

Note 2 : (S1/S7) indicates that if the used slot is at the head of a superframe, S7 is used, otherwise S1 is used.

Table 4.1.4.3-6 : 32-bit sync word assignment

Method	ST#0	ST#1	ST#2	ST#3	ST#4	ST#5
1 (half rate)	SS1	SS2	SS3	SS4	SS5	SS6
2 (full rate)	SS1	SS2	SS3	SS1	SS2	SS3
3	SS1	SS2	SS3	SS1	SS5	SS6
4	SS1	SS2	SS3	SS4	SS2	SS6
5	SS1	SS2	SS3	SS4	SS5	SS3
6	SS1	SS2	SS3	SS1	SS2	SS6
7	SS1	SS2	SS3	SS1	SS5	SS3
8	SS1	SS2	SS3	SS4	SS2	SS3

Note 1 : Method 1 is applied if all slots are half rate, and method 2 is applied if all slots are full rate.

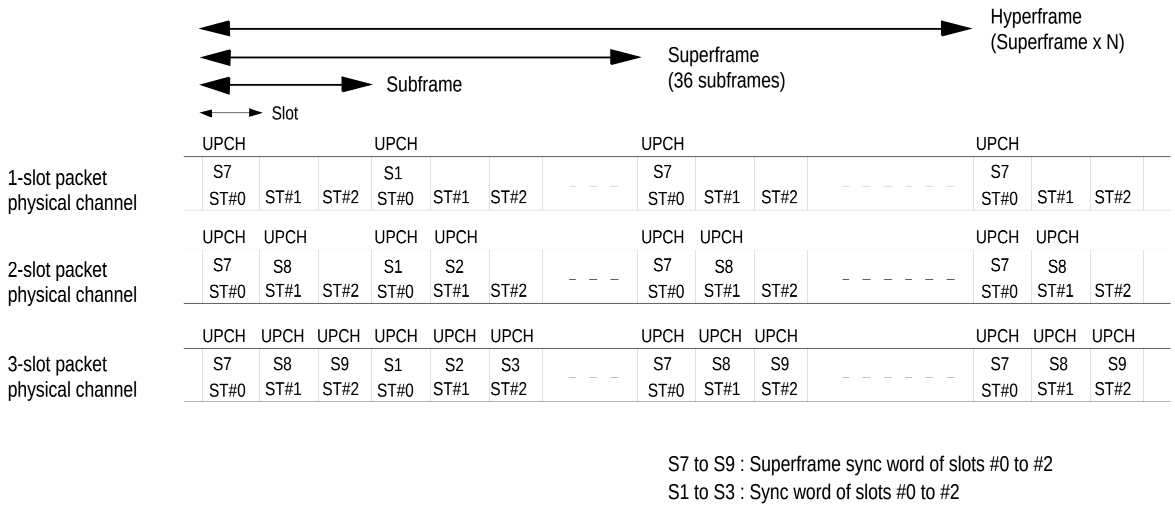


Fig. 4.1.4.3-8 : Example of synchronization word assignment for the packet physical channel

4.1.4.4 Structure of housekeeping bits

The information bits of the housekeeping bit (RCH) are composed of 14 bits and 22 bits for the uplink and downlink respectively, and are made up of the identification code and parameters. Refer to section 4.1.5.2.3.2 for the signal assembly/disassembly between the information bits and RCH bits.

Housekeeping bits are used to designate the following :

(1) State report (See Item 4.1.14 of this section.)
(2) Transmission output control (See Item 4.1.19 of this section)
(3) Time alignment designation (See Item 4.1.12 of this section)

The signaling structures of the information bits are shown in Fig. 4.1.4.4-1 (see Table 4.1.5.2-4). The POW-D value is used for compensating the home zone reception level included in the layer 3 RT signals "Condition Report 1" and "Condition Report 2" (see 4.1.19).
The compensation period is from the superframe where a POW-D value is received until the superframe

at which the next assigned value is received. The mobile station always uses the latest POW-D received in the superframe. If no POW-D report is received, no compensation is performed.

MSB ... LSB

Signal name	1 2	3 4 5 6 7	8 1 2	3 4 5 6
Idle	0 0	Spare		
Condition report	0 1	RSSI	ERR	POW-U
Operator specific signal	1 0	Operator option		
Spare	Other			

RSSI : Reception level
ERR : Error detection information (BER value)
POW-U : Mobile station transmission power value (the newest value of the mobile station's transmission power is set)

(a) Uplink RCH information bit structure

MSB ... LSB

Signal name	1 2 3 4	5 6 7 8	1 2 3 4 5 6 7 8	1 2 3 4 5 6
Idle	0 0 0 0	Spare	Spare	
Power control	0 0 0 1	POW	Spare	
Time alignment designation	0 0 1 0	TA	Spare	
Downlink power setting report	0 0 1 1	POW-D	Spare	
Operator specific signal	0 1 0 0	Operator option		
Spare	Other			

POW : Mobile station transmission output value (absolute value)
TA : Time alignment (absolute value)
POW-D : Base station transmission output regulated value (relative value)

(b) Downlink RCH information bit structure

Fig. 4.1.4.4-1 : RCH information bit structure

4.1.5 Channel coding

4.1.5.1 Control channel signals (BCCH, PCH, SCCH)

(1) Error correction codes

Uplink 2nd unit and following units	:	3-bit shortened BCH (12, 8) of BCH (15, 11)
Uplink 1st unit, downlink	:	1-bit shortened BCH (14, 10) of BCH (15, 11)
The generator polynomial is	:	$1 + X + X^4$
Generator matrix	:	Generator matrix G is shown in Fig. 4.1.5.1-1. I_{11} represents the 11 x 11 identity matrix.
No. of bits that can be corrected	:	1 bit
Shortening method	:	Adding "0" before the information bits.

(2) Error detection code

16-bit CRC

The generator polynomial is	:	$1 + X^5 + X^{12} + X^{16}$

(3) Interleaving

a) Interleaving is not performed between slots.

b) The depth of Interleaving shall be the number of BCH (12, 8) blocks or BCH (14,10) blocks within a slot (N_{BCH}).

Table 4.1.5.1-1 indicates the relationship between the number of information bits (X) for CAC and the depth of the Interleaving (N_{BCH}).

(4) Coding procedure

The coding procedure is given in Fig. 4.1.5.1-2.

(5) Relationship between error correction, detection coding and bit Interleaving.

The relationship between error correction, detection coding and bit Interleaving for the downlink is shown in Fig. 4.1.5.1-3, and for the uplink 1st and 2rd units are shown in Fig. 4.1.5.1-4.

(6) Layer 2 information in the 1st uplink unit for the SCCH is 104 bits and two "0"s are added for the remaining 2 bits.

Table 4.1.5.1-1 : Relationship between information bits and interleaving

Channel type			X (bit)	N_{BCH}
CAC	Downlink		136	16
	Uplink	1st unit	104	13
		2nd unit and subsequent units	128	19

$$G = \left[\begin{array}{cc} I_{11} & \begin{array}{cccc} 1 & 0 & 0 & 1 \\ 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 \end{array} \end{array} \right]$$

Fig.4.1.5.1-1 : Generator matrix for BCH (15, 11)

Fig. 4.1.5.1-2 : Coding procedure

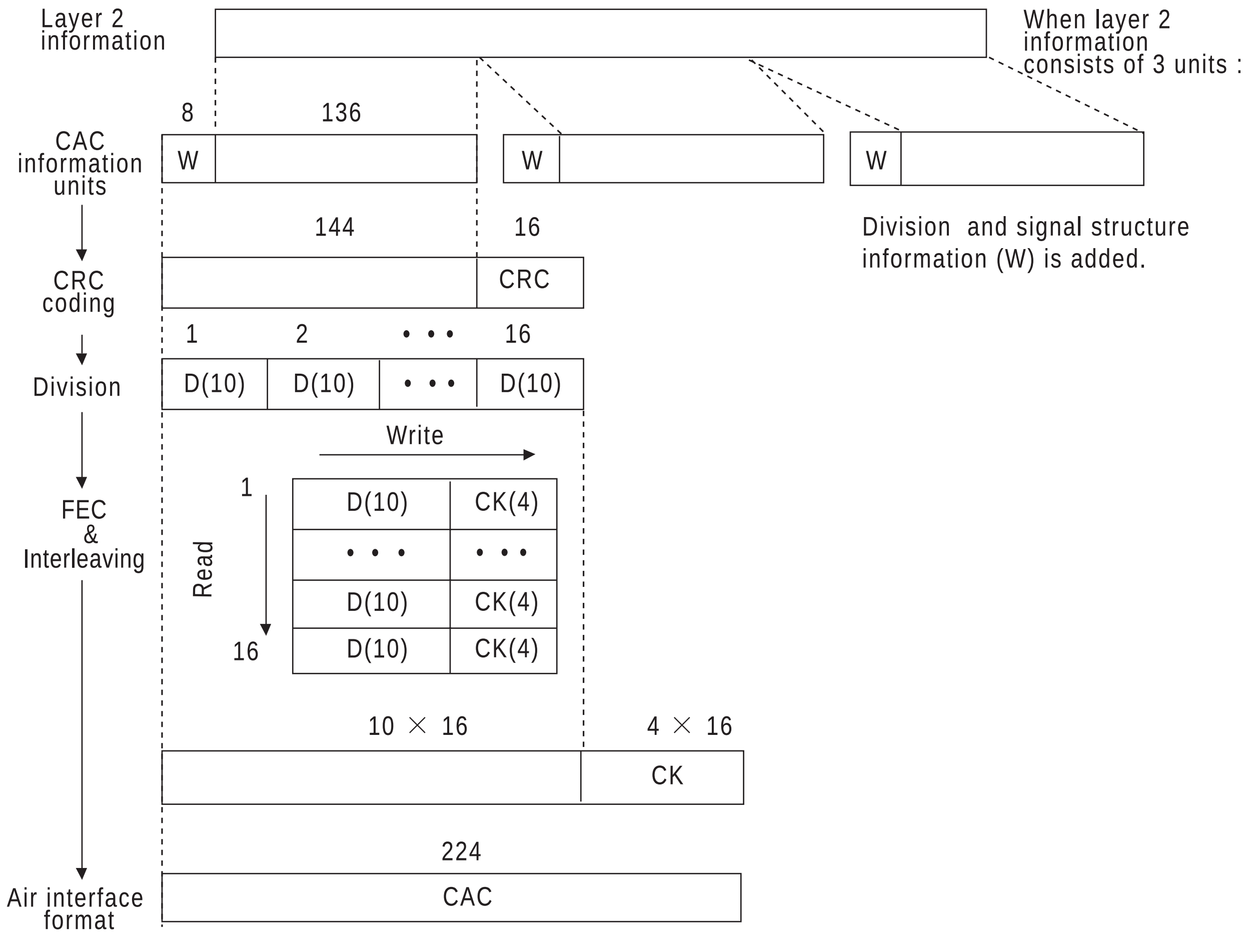


Fig. 4.1.5.1-3 : Downlink control signals (BCCH, PCH, SCCH)

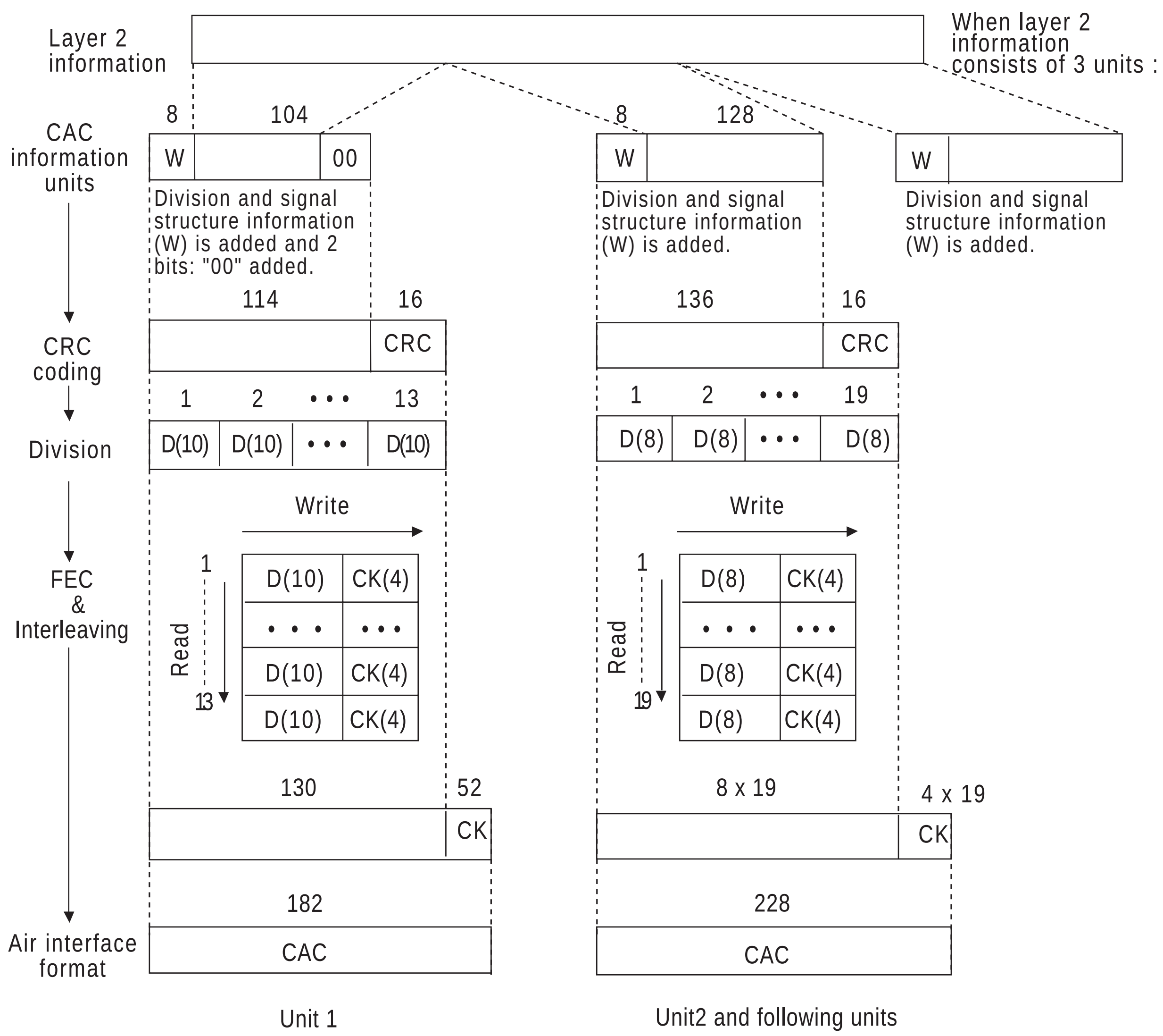


Fig. 4.1.5.1-4 : Uplink control signals (SCCH)

4.1.5.2 Traffic channel signal

4.1.5.2.1 TCH signal assembly/disassembly

The TCH performs signal assembly/disassembly for transmission service.

4.1.5.2.1.1 Speech

Refer to Chapter 5 for signal assembly and disassembly for the speech signal (11.2/5.6 kb/s digital signal).

4.1.5.2.1.2 Other bearer service

Under investigation

4.1.5.2.2 FACCH signal assembly/disassembly

(1) Error correction code

1-bit extended BCH (8,4) for BCH (7,4)

The generator polynomial is : $1 + X + X^3$

Generator matrix : The generator matrix G is shown in Fig. 4.1.5.2-1.
I_4 represents the 4x4 identity matrix.

No. of bits that can be corrected : 1 bit

(2) Error detection code

16-bit CRC

The generator polynomial is : $1 + X^5 + X^{12} + X^{16}$

(3) Interleaving

a) Interleaving is carried out for 2 slots.

b) The No. of information bits X for FACCH must be 88; the depth of interleaving N_{BCH} must be 28.

(4) Coding procedure

The coding procedure is given in Fig. 4.1.5.2-2.

(5) Relationship between error correction/detection coding and bit interleaving/bit insertion and removal is given in Fig. 4.1.5.2-3.

(6) Method of inserting and removing bits

The allocation of FACCH bits to the radio zone format is the same as that for bit allocation to the physical channel under the voice codec method (full rate; refer to 5.1.2.5, half rate; refer to 5.2.2.5). The information portion of the FACCH is placed in the first slot, while the detection bits are placed in the second slot. If the FACCH spans over multiple units, the FACCH shall be allocated consecutively. Fig. 4.1.5.2-4 shows the allocation of signals when the FACCH is transmitted for 1 unit and when it is transmitted consecutively for 2 units. Details of the bits used in the respective cases in full rate mode are shown in Tables 4.1.5.2-1 and 4.1.5.2-2. Details of the bits used in the respective cases in half rate mode are shown in Tables 4.1.5.2-3 and 4.1.5.2-4. (Refer to section 4.1.6 of this chapter for bit names.)

$$G = \left[\begin{array}{c|cccc} & 1 & 0 & 1 & 1 \\ I_4 & 1 & 1 & 1 & 0 \\ & 1 & 1 & 0 & 1 \\ & 0 & 1 & 1 & 1 \end{array}\right]$$

Fig. 4.1.5.2-1 : Generator matrix G

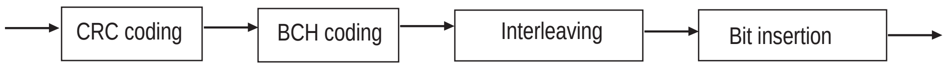


Fig. 4.1.5.2-2 : Coding procedure

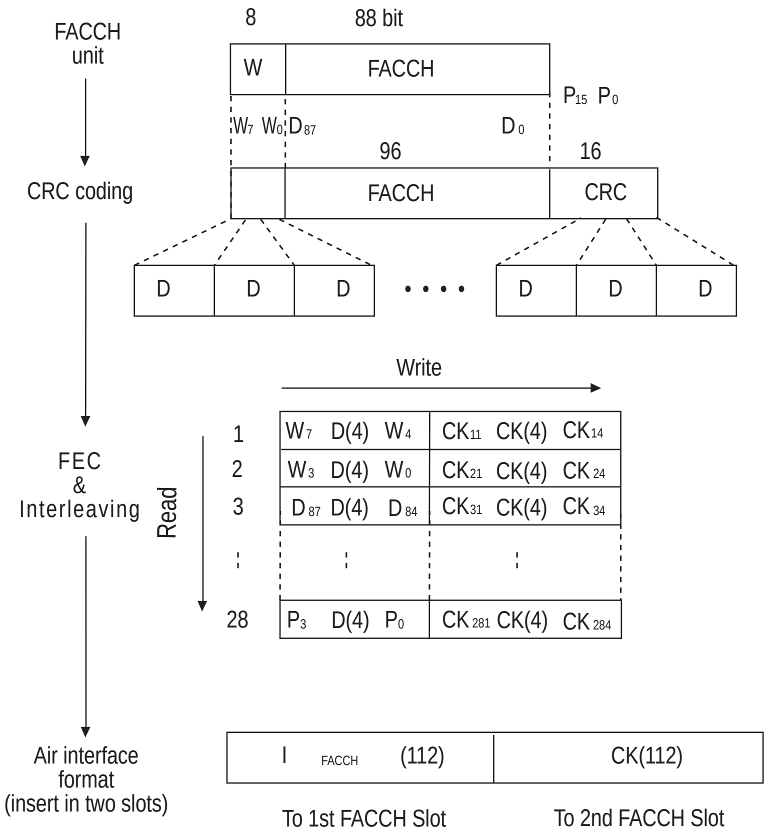
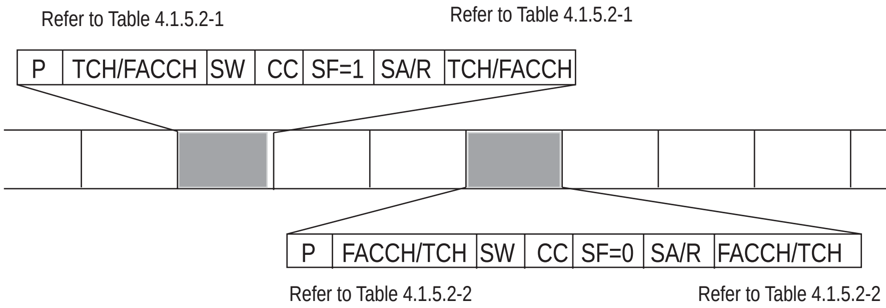
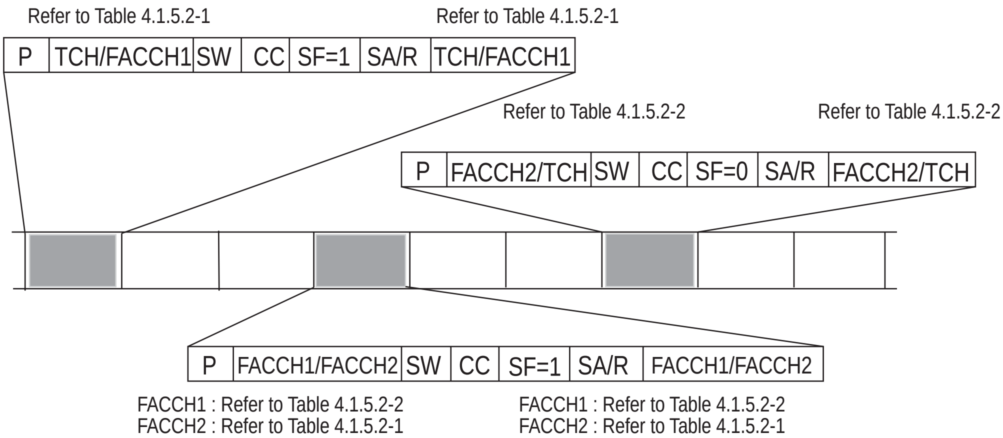


Fig. 4.1.5.2-3 : Relationship between error correction/detection coding and bit interleaving for the FACCH.



(1) When FACCH is transmitted for 1 unit:



(2) When FACCH is transmitted for 2 units:

Fig. 4.1.5.2-4 : Relationship between allocation of FACCH signals and steal flags

Table 4.1.5.2-1 : FACCH data bit assignment for the 1st slot in full rate mode

Order	Trans. bit	Order	Trans. bit	Order	Trans. bit	Order	Trans. bit	Order	Trans. bit
0	TCH	45	P_{15}	90	D_{26}	135	D_{45}	180	TCH
1	W_{7}	46	P_{11}	91	TCH	136	TCH	181	D_{68}
2	TCH	47	TCH	92	D_{22}	137	D_{41}	182	TCH
3	W_{3}	48	P_{7}	93	TCH	138	TCH	183	D_{64}
4	D_{87}	49	TCH	94	D_{18}	139	D_{37}	184	TCH
5	TCH	50	P_{3}	95	TCH	140	TCH	185	D_{60}
6	D_{83}	51	TCH	96	TCH	141	D_{33}	186	TCH
7	TCH	52	W_{6}	97	D_{14}	142	TCH	187	TCH
8	D_{79}	53	TCH	98	TCH	143	D_{29}	188	D_{56}
9	D_{75}	54	TCH	99	D_{10}	144	TCH	189	TCH
10	TCH	55	W_{2}	100	TCH	145	TCH	190	D_{52}
11	D_{71}	56	TCH	101	D_{6}	146	D_{25}	191	D_{48}
12	TCH	57	D_{86}	102	D_{2}	147	TCH	192	D_{44}
13	D_{67}	58	TCH	103	TCH	148	D_{21}	193	D_{40}
14	TCH	59	D_{82}	104	P_{14}	149	TCH	194	TCH
15	D_{63}	60	D_{78}	105	TCH	150	D_{17}	195	D_{36}
16	TCH	61	TCH	106	P_{10}	151	TCH	196	TCH
17	D_{59}	62	D_{74}	107	P_{6}	152	TCH	197	D_{32}
18	D_{55}	63	TCH	108	TCH	153	D_{13}	198	TCH
19	TCH	64	D_{70}	109	P_{2}	154	TCH	199	D_{28}
20	D_{51}	65	D_{66}	110	TCH	155	D_{9}	200	D_{24}
21	TCH	66	TCH	111	W_{5}	156	TCH	201	TCH
22	D_{47}	67	TCH	112	TCH	157	D_{5}	202	D_{20}
23	D_{43}	68	TCH	113	W_{1}	158	D_{1}	203	TCH
24	TCH	69	D_{62}	114	TCH	159	TCH	204	D_{16}
25	D_{39}	70	TCH	115	D_{85}	160	P_{13}	205	TCH
26	TCH	71	D_{58}	116	TCH	161	TCH	206	D_{12}
27	D_{35}	72	TCH	117	TCH	162	P_{9}	207	TCH
28	TCH	73	D_{54}	118	D_{81}	163	TCH	208	TCH
29	D_{31}	74	TCH	119	TCH	164	P_{5}	209	D_{8}
30	TCH	75	TCH	120	D_{77}	165	TCH	210	TCH
31	D_{27}	76	D_{50}	121	D_{73}	166	TCH	211	D_{4}
32	D_{23}	77	TCH	122	D_{69}	167	P_{1}	212	TCH
33	TCH	78	D_{46}	123	TCH	168	TCH	213	D_{0}
34	D_{19}	79	D_{42}	124	TCH	169	W_{4}	214	TCH
35	TCH	80	TCH	125	D_{65}	170	TCH	215	TCH
36	D_{15}	81	TCH	126	TCH	171	W_{0}	216	P_{12}
37	TCH	82	TCH	127	D_{61}	172	TCH	217	TCH
38	TCH	83	D_{38}	128	TCH	173	TCH	218	P_{8}
39	D_{11}	84	TCH	129	D_{57}	174	D_{84}	219	TCH
40	TCH	85	D_{34}	130	TCH	175	TCH	220	TCH
41	D_{7}	86	TCH	131	TCH	176	D_{80}	221	P_{4}
42	TCH	87	D_{30}	132	D_{53}	177	TCH	222	TCH
43	D_{3}	88	TCH	133	TCH	178	D_{76}	223	P_{0}
44	TCH	89	TCH	134	D_{49}	179	D_{72}		

Table 4.1.5.2-2 : FACCH data bit assignment for the 2nd slot in full rate mode

Order	Trans. bit	Order	Trans. bit	Order	Trans. bit	Order	Trans. bit	Order	Trans. bit
0	CK_{11}	45	TCH	90	TCH	135	TCH	180	CK_{74}
1	TCH	46	TCH	91	CK_{182}	136	CK_{123}	181	TCH
2	CK_{21}	47	CK_{221}	92	TCH	137	TCH	182	CK_{84}
3	TCH	48	TCH	93	CK_{192}	138	CK_{133}	183	TCH
4	TCH	49	CK_{231}	94	TCH	139	TCH	184	CK_{94}
5	CK_{31}	50	TCH	95	CK_{202}	140	CK_{143}	185	TCH
6	CH	51	CK_{241}	96	CK_{212}	141	TCH	186	CK_{104}
7	CK_{41}	52	TCH	97	TCH	142	CK_{153}	187	CK_{114}
8	TCH	53	CK_{251}	98	CK_{222}	143	TCH	188	TCH
9	TCH	54	CK_{261}	99	TCH	144	CK_{163}	189	CK_{124}
10	CK_{51}	55	TCH	100	CK_{232}	145	CK_{173}	190	TCH
11	TCH	56	CK_{271}	101	TCH	146	TCH	191	TCH
12	CK_{61}	57	TCH	102	TCH	147	CK_{183}	192	TCH
13	TCH	58	CK_{281}	103	CK_{242}	148	TCH	193	TCH
14	CK_{71}	59	TCH	104	TCH	149	CK_{193}	194	CK_{134}
15	TCH	60	TCH	105	CK_{252}	150	TCH	195	TCH
16	CK_{81}	61	CK_{12}	106	TCH	151	CK_{203}	196	CK_{144}
17	TCH	62	TCH	107	TCH	152	CK_{213}	197	TCH
18	TCH	63	CK_{22}	108	CK_{262}	153	TCH	198	CK_{154}
19	CK_{91}	64	TCH	109	TCH	154	CK_{223}	199	TCH
20	TCH	65	TCH	110	CK_{272}	155	TCH	200	TCH
21	CK_{101}	66	CK_{32}	111	TCH	156	CK_{233}	201	CK_{164}
22	TCH	67	CK_{42}	112	CK_{282}	157	TCH	202	TCH
23	TCH	68	CK_{52}	113	TCH	158	TCH	203	CK_{174}
24	CK_{111}	69	TCH	114	CK_{13}	159	CK_{243}	204	TCH
25	TCH	70	CK_{62}	115	TCH	160	TCH	205	CK_{184}
26	CK_{121}	71	TCH	116	CK_{23}	161	CK_{253}	206	TCH
27	TCH	72	CK_{72}	117	CK_{33}	162	TCH	207	CK_{194}
28	CK_{131}	73	TCH	118	TCH	163	CK_{263}	208	CK_{204}
29	TCH	74	CK_{82}	119	CK_{43}	164	TCH	209	TCH
30	CK_{141}	75	CK_{92}	120	TCH	165	CK_{273}	210	CK_{214}
31	TCH	76	TCH	121	TCH	166	CK_{283}	211	TCH
32	TCH	77	CK_{102}	122	TCH	167	TCH	212	CK_{224}
33	CK_{151}	78	TCH	123	CK_{53}	168	CK_{14}	213	TCH
34	TCH	79	TCH	124	CK_{63}	169	TCH	214	CK_{234}
35	CK_{161}	80	CK_{112}	125	TCH	170	CK_{24}	215	CK_{244}
36	TCH	81	CK_{122}	126	CK_{73}	171	TCH	216	TCH
37	CK_{171}	82	CK_{132}	127	TCH	172	CK_{34}	217	CK_{254}
38	CK_{181}	83	TCH	128	CK_{83}	173	CK_{44}	218	TCH
39	TCH	84	CK_{142}	129	TCH	174	TCH	219	CK_{264}
40	CK_{191}	85	TCH	130	CK_{93}	175	CK_{54}	220	CK_{274}
41	TCH	86	CK_{152}	131	CK_{103}	176	TCH	221	TCH
42	CK_{201}	87	TCH	132	TCH	177	CK_{64}	222	CK_{284}
43	TCH	88	CK_{162}	133	CK_{113}	178	TCH	223	TCH
44	CK_{211}	89	CK_{172}	134	TCH	179	TCH		

Table 4.1.5.2-3 : FACCH data bit assignment for the 1st slot in half rate mode

Order	Trans. bit	Order	Trans. bit	Order	Trans. bit	Order	Trans. bit	Order	Trans. bit
0	W_7	45	TCH	90	D_{26}	135	TCH	180	D_{68}
1	TCH	46	D_3	91	TCH	136	D_{45}	181	TCH
2	W_3	47	TCH	92	D_{22}	137	TCH	182	D_{64}
3	TCH	48	P_{15}	93	TCH	138	D_{41}	183	TCH
4	D_{87}	49	TCH	94	D_{18}	139	TCH	184	D_{60}
5	TCH	50	P_{11}	95	TCH	140	D_{37}	185	TCH
6	D_{83}	51	TCH	96	D_{14}	141	TCH	186	D_{56}
7	TCH	52	P_7	97	TCH	142	D_{33}	187	TCH
8	D_{79}	53	TCH	98	D_{10}	143	TCH	188	D_{52}
9	TCH	54	P_3	99	TCH	144	D_{29}	189	TCH
10	D_{75}	55	TCH	100	D_6	145	TCH	190	D_{48}
11	TCH	56	W_6	101	TCH	146	D_{25}	191	TCH
12	D_{71}	57	TCH	102	D_2	147	TCH	192	D_{44}
13	TCH	58	W_2	103	TCH	148	D_{21}	193	TCH
14	D_{67}	59	TCH	104	P_{14}	149	TCH	194	D_{40}
15	TCH	60	D_{86}	105	TCH	150	D_{17}	195	TCH
16	D_{63}	61	TCH	106	P_{10}	151	TCH	196	D_{36}
17	TCH	62	D_{82}	107	TCH	152	D_{13}	197	TCH
18	D_{59}	63	TCH	108	P_6	153	TCH	198	D_{32}
19	TCH	64	D_{78}	109	TCH	154	D_9	199	TCH
20	D_{55}	65	TCH	110	P_2	155	TCH	200	D_{28}
21	TCH	66	D_{74}	111	TCH	156	D_5	201	TCH
22	D_{51}	67	TCH	112	W_5	157	TCH	202	D_{24}
23	TCH	68	D_{70}	113	TCH	158	D_1	203	TCH
24	D_{47}	69	TCH	114	W_1	159	TCH	204	D_{20}
25	TCH	70	D_{66}	115	TCH	160	P_{13}	205	TCH
26	D_{43}	71	TCH	116	D_{85}	161	TCH	206	D_{16}
27	TCH	72	D_{62}	117	TCH	162	P_9	207	TCH
28	D_{39}	73	TCH	118	D_{81}	163	TCH	208	D_{12}
29	TCH	74	D_{58}	119	TCH	164	P_5	209	TCH
30	D_{35}	75	TCH	120	D_{77}	165	TCH	210	D_8
31	TCH	76	D_{54}	121	TCH	166	P_1	211	TCH
32	D_{31}	77	TCH	122	D_{73}	167	TCH	212	D_4
33	TCH	78	D_{50}	123	TCH	168	W_4	213	TCH
34	D_{27}	79	TCH	124	D_{69}	169	TCH	214	D_0
35	TCH	80	D_{46}	125	TCH	170	W_0	215	TCH
36	D_{23}	81	TCH	126	D_{65}	171	TCH	216	P_{12}
37	TCH	82	D_{42}	127	TCH	172	D_{84}	217	TCH
38	D_{19}	83	TCH	128	D_{61}	173	TCH	218	P_8
39	TCH	84	D_{38}	129	TCH	174	D_{80}	219	TCH
40	D_{15}	85	TCH	130	D_{57}	175	TCH	220	P_4
41	TCH	86	D_{34}	131	TCH	176	D_{76}	221	TCH
42	D_{11}	87	TCH	132	D_{53}	177	TCH	222	P_0
43	TCH	88	D_{30}	133	TCH	178	D_{72}	223	TCH
44	D_7	89	TCH	134	D_{49}	179	TCH		

Table 4.1.5.2-4 : FACCH data bit assignment for the 2nd slot in half rate mode

Order	Trans. bit	Order	Trans. bit	Order	Trans. bit	Order	Trans. bit	Order	Trans. bit
0	TCH	45	CK_{231}	90	TCH	135	CK_{123}	180	TCH
1	CK_{11}	46	TCH	91	CK_{182}	136	TCH	181	CK_{74}
2	TCH	47	CK_{241}	92	TCH	137	CK_{133}	182	TCH
3	CK_{21}	48	TCH	93	CK_{192}	138	TCH	183	CK_{84}
4	TCH	49	CK_{251}	94	TCH	139	CK_{143}	184	TCH
5	CK_{31}	50	TCH	95	CK_{202}	140	TCH	185	CK_{94}
6	TCH	51	CK_{261}	96	TCH	141	CK_{153}	186	TCH
7	CK_{41}	52	TCH	97	CK_{212}	142	TCH	187	CK_{104}
8	TCH	53	CK_{271}	98	TCH	143	CK_{163}	188	TCH
9	CK_{51}	54	TCH	99	CK_{222}	144	TCH	189	CK_{114}
10	TCH	55	CK_{281}	100	TCH	145	CK_{173}	190	TCH
11	CK_{61}	56	TCH	101	CK_{232}	146	TCH	191	CK_{124}
12	TCH	57	CK_{12}	102	TCH	147	CK_{183}	192	TCH
13	CK_{71}	58	TCH	103	CK_{242}	148	TCH	193	CK_{134}
14	TCH	59	CK_{22}	104	TCH	149	CK_{193}	194	TCH
15	CK_{81}	60	TCH	105	CK_{252}	150	TCH	195	CK_{144}
16	TCH	61	CK_{32}	106	TCH	151	CK_{203}	196	TCH
17	CK_{91}	62	TCH	107	CK_{262}	152	TCH	197	CK_{154}
18	TCH	63	CK_{42}	108	TCH	153	CK_{213}	198	TCH
19	CK_{101}	64	TCH	109	CK_{272}	154	TCH	199	CK_{164}
20	TCH	65	CK_{52}	110	TCH	155	CK_{223}	200	TCH
21	CK_{111}	66	TCH	111	CK_{282}	156	TCH	201	CK_{174}
22	TCH	67	CK_{62}	112	TCH	157	CK_{233}	202	TCH
23	CK_{121}	68	TCH	113	CK_{13}	158	TCH	203	CK_{184}
24	TCH	69	CK_{72}	114	TCH	159	CK_{243}	204	TCH
25	CK_{131}	70	TCH	115	CK_{23}	160	TCH	205	CK_{194}
26	TCH	71	CK_{82}	116	TCH	161	CK_{253}	206	TCH
27	CK_{141}	72	TCH	117	CK_{33}	162	TCH	207	CK_{204}
28	TCH	73	CK_{92}	118	TCH	163	CK_{263}	208	TCH
29	CK_{151}	74	TCH	119	CK_{43}	164	TCH	209	CK_{214}
30	TCH	75	CK_{102}	120	TCH	165	CK_{273}	210	TCH
31	CK_{161}	76	TCH	121	CK_{53}	166	TCH	211	CK_{224}
32	TCH	77	CK_{112}	122	TCH	167	CK_{283}	212	TCH
33	CK_{171}	78	TCH	123	CK_{63}	168	TCH	213	CK_{234}
34	TCH	79	CK_{122}	124	TCH	169	CK_{14}	214	TCH
35	CK_{181}	80	TCH	125	CK_{73}	170	TCH	215	CK_{244}
36	TCH	81	CK_{132}	126	TCH	171	CK_{24}	216	TCH
37	CK_{191}	82	TCH	127	CK_{83}	172	TCH	217	CK_{254}
38	TCH	83	CK_{142}	128	TCH	173	CK_{34}	218	TCH
39	CK_{201}	84	TCH	129	CK_{93}	174	TCH	219	CK_{264}
40	TCH	85	CK_{152}	130	TCH	175	CK_{44}	220	TCH
41	CK_{211}	86	TCH	131	CK_{103}	176	TCH	221	CK_{274}
42	TCH	87	CK_{162}	132	TCH	177	CK_{54}	222	TCH
43	CK_{221}	88	TCH	133	CK_{113}	178	TCH	223	CK_{284}
44	TCH	89	CK_{172}	134	TCH	179	CK_{64}		

4.1.5.2.3 SACCH signal assembly/disassembly

4.1.5.2.3.1 SACCH signal assembly/disassembly

(1) Error correction code

Uplink	:	BCH (15, 11)
Downlink	:	1-bit shortened BCH (14, 10) of BCH (15,11)
The generator polynomial is	:	$1 + X + X^4$
Generator matrix	:	Generator matrix G is shown in Fig. 4.1.5.2-5. I_{11} represents the 11x11 identity matrix.
No. of bits that can be corrected	:	1 bit
Shortening method	:	Adding "0" before the information bits

(2) Error detection code

16-bit CRC

The generator polynomial is : $1 + X^5 + X^{12} + X^{16}$

(3) Interleaving

a) Interleaving is carried out for 8 slots.

b) The relationship between the number of information bits for SACCH (X) and the depth of interleaving (N_{BCH}) is shown in Table 4.1.5.2-5.

(4) Structure of SACCH units

The structure of SACCH units is outlined in Fig. 4.1.5.2-6.

(5) Coding procedure

The coding procedure is outlined in Fig. 4.1.5.2-7.

(6) Relationship between error correction/detection coding and bit interleaving.

The relationship between error correction/detection coding and bit interleave for the downlink and uplink SACCH is shown in Fig. 4.1.5.2-8 and Fig.4.1.5.2-9. (The interleaving method is specified in Section 4.1.6)

Table 4.1.5.2-5 : Relationship between the information bits and interleaving

Channel type	X(bit)	N_{BCH}
Downlink	96	12
Uplink	64	8

$$
G = \left[\begin{array}{c|cccc}
 & 1 & 0 & 0 & 1 \\
 & 1 & 1 & 0 & 1 \\
 & 1 & 1 & 1 & 1 \\
 & 1 & 1 & 1 & 0 \\
 & 0 & 1 & 1 & 1 \\
I_{11} & 1 & 0 & 1 & 0 \\
 & 0 & 1 & 0 & 1 \\
 & 1 & 0 & 1 & 1 \\
 & 1 & 1 & 0 & 0 \\
 & 0 & 1 & 1 & 0 \\
 & 0 & 0 & 1 & 1
\end{array} \right]
$$

Fig. 4.1.5.2-5 : Generator matrix G for BCH (15, 11)

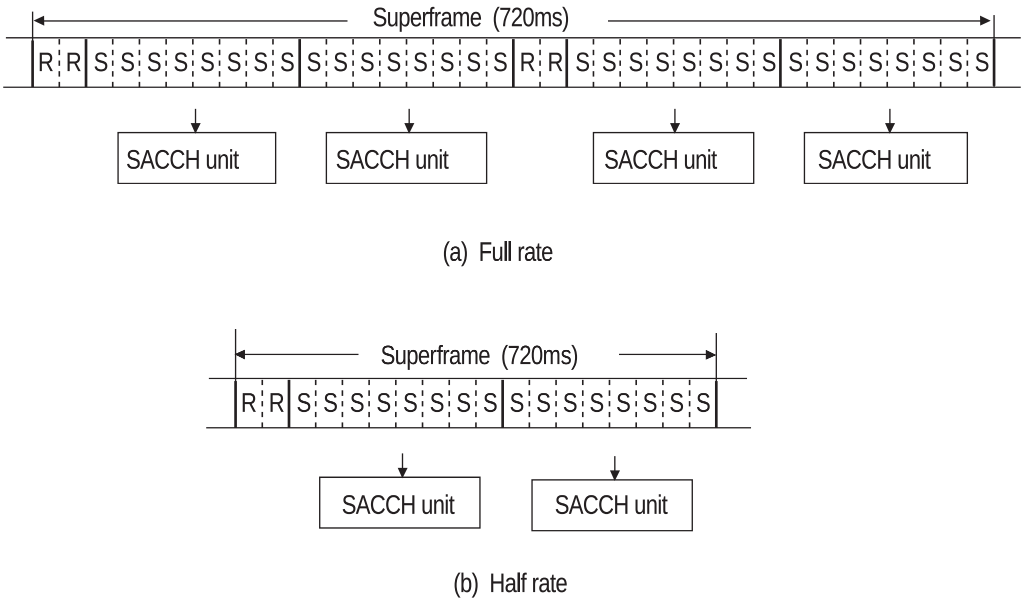


Fig. 4.1.5.2-6 : Structure of SACCH units

Fig. 4.1.5.2-7 : Coding procedure

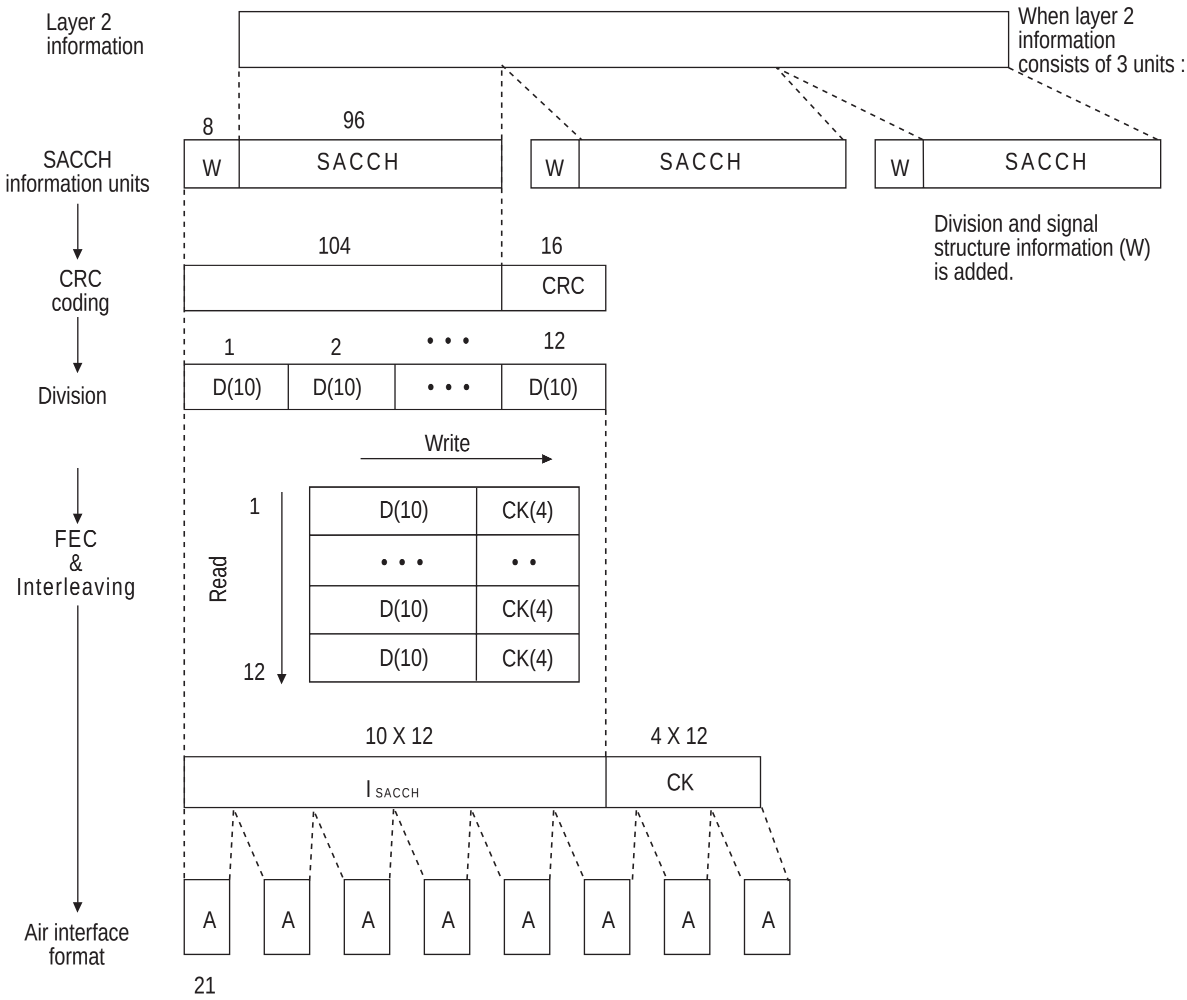


Fig. 4.1.5.2-8 : Downlink SACCH

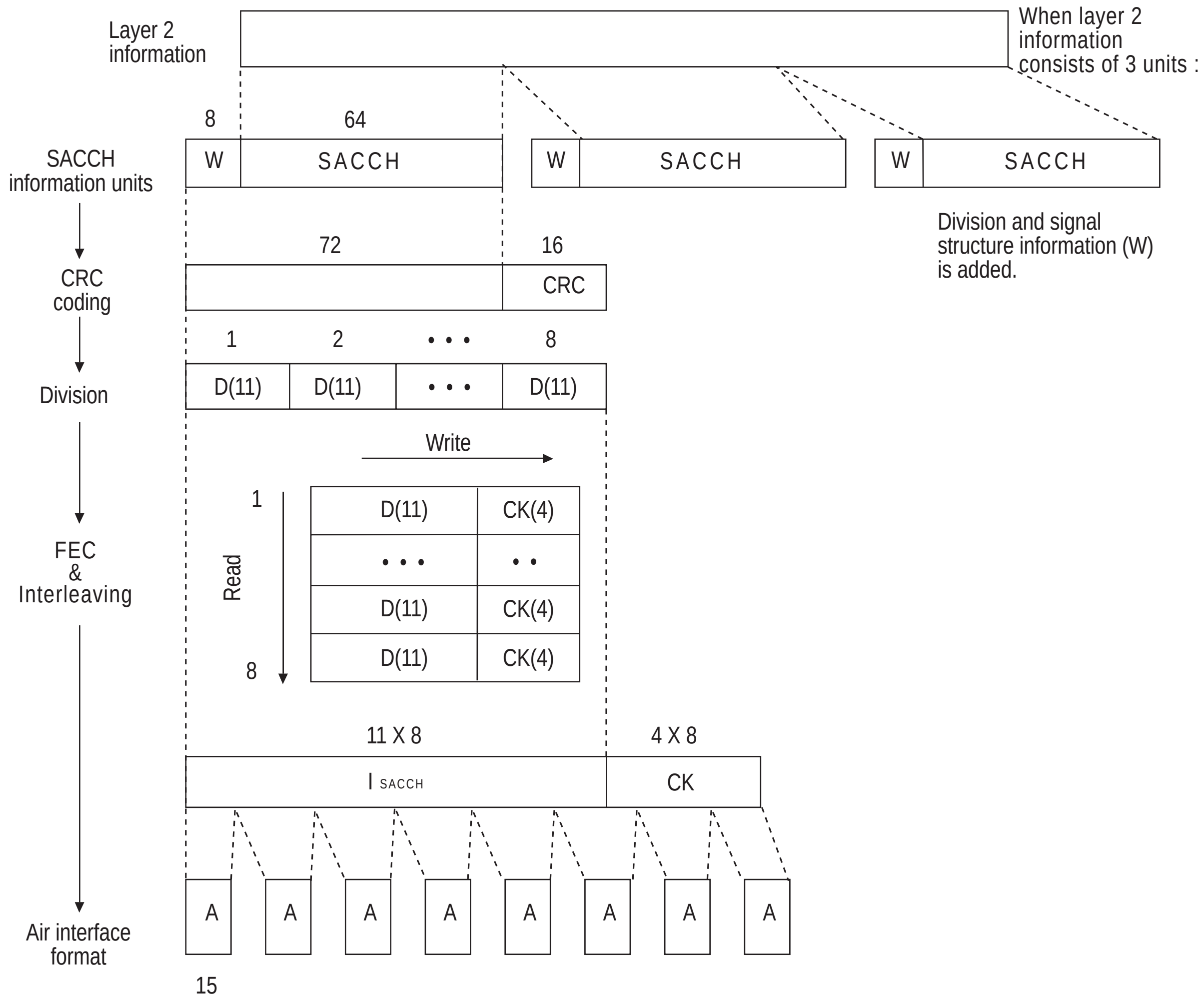


Fig. 4.1.5.2-9 : Uplink SACCH

4.1.5.2.3.2 RCH signal assembly/disassembly

(1) Error correction code

Uplink	:	BCH (15, 11)
Downlink	:	1-bit shortened BCH (14, 10) of BCH (15, 11)
The generator polynomial is	:	$1 + X + X^4$
Generator matrix	:	Generator matrix G is shown in Fig. 4.1.5.2-10. I_{11} represents the 11x11 identity matrix.
No. of error correctable bits	:	1 bit
Shortening method	:	Adding "0" before the information bits

(2) Error detection code : 8-bit CRC

The generator polynomial is : $1 + X + X^3 + X^4 + X^7 + X^8$

(3) Interleaving

a) Interleaving is performed at 2 slots.

b) The relationship between the number of information bits for RCH (X) and the depth of interleaving (N_{BCH}) is given in Table 4.1.5.2-6.

(4) Structure of RCH units

The structure of RCH units is outlined in Fig. 4.1.5.2-11.

(5) Coding procedure

The coding procedure is outlined in Fig. 4.1.5.2-12.

(6) Relationship between error correction/detection coding/ bit interleaving

The relationship between error correction/detection coding and bit interleaving for uplink and downlink RCH is outlined in Fig. 4.1.5.2-13 through 4.1.5.2-14.

The shift register for error detection code shall be set to all "1".

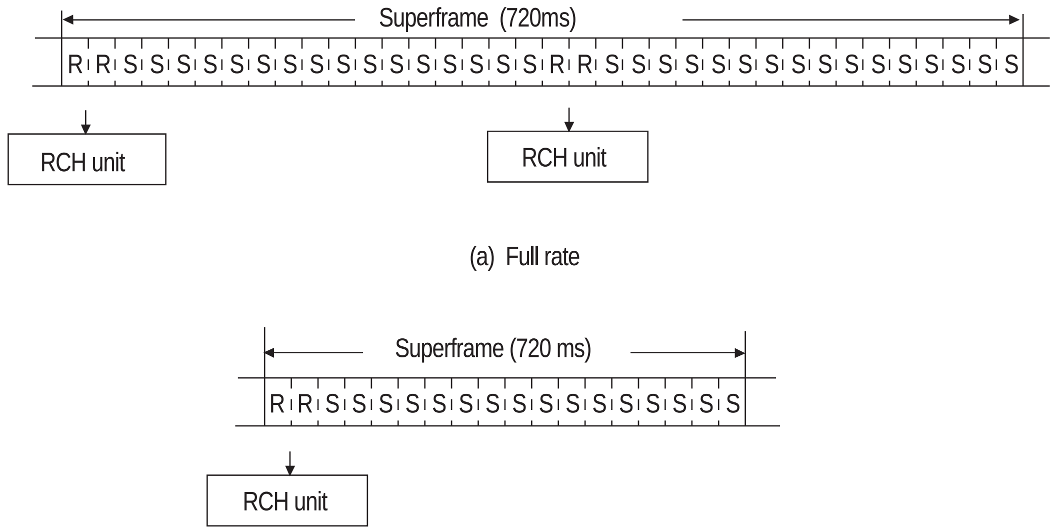
Refer to section 4.1.6 for the interleaving method.

Table 4.1.5.2-6 : Relationship between information bits and interleaving

Channel type	X(bit)	N_{BCH}
Downlink	22	3
Uplink	14	2

$$G = \left[\begin{array}{cc} & \begin{matrix} 1 & 0 & 0 & 1 \\ 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 1 \\ I_{11} \quad & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 \end{matrix} \end{array} \right]$$

Fig. 4.1.5.2-10 : Generator matrix G for BCH (15, 11)



(a) Full rate

(b) Half rate

Fig. 4.1.5.2-11 : Structure of RCH units

Fig. 4.1.5.2-12 : Coding procedure

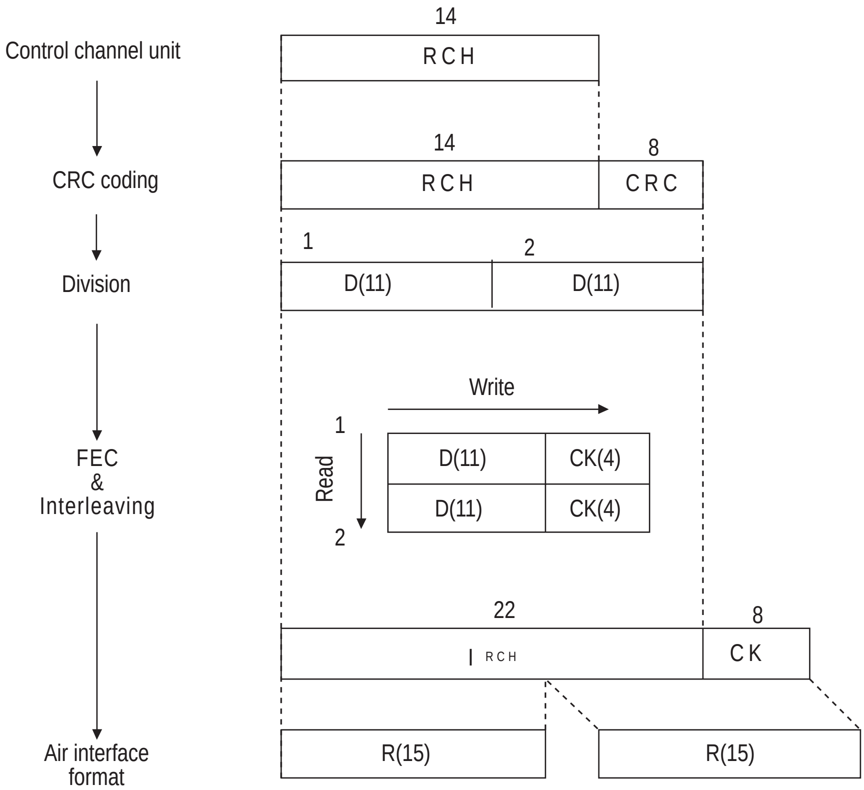


Fig. 4.1.5.2-13 : Uplink RCH

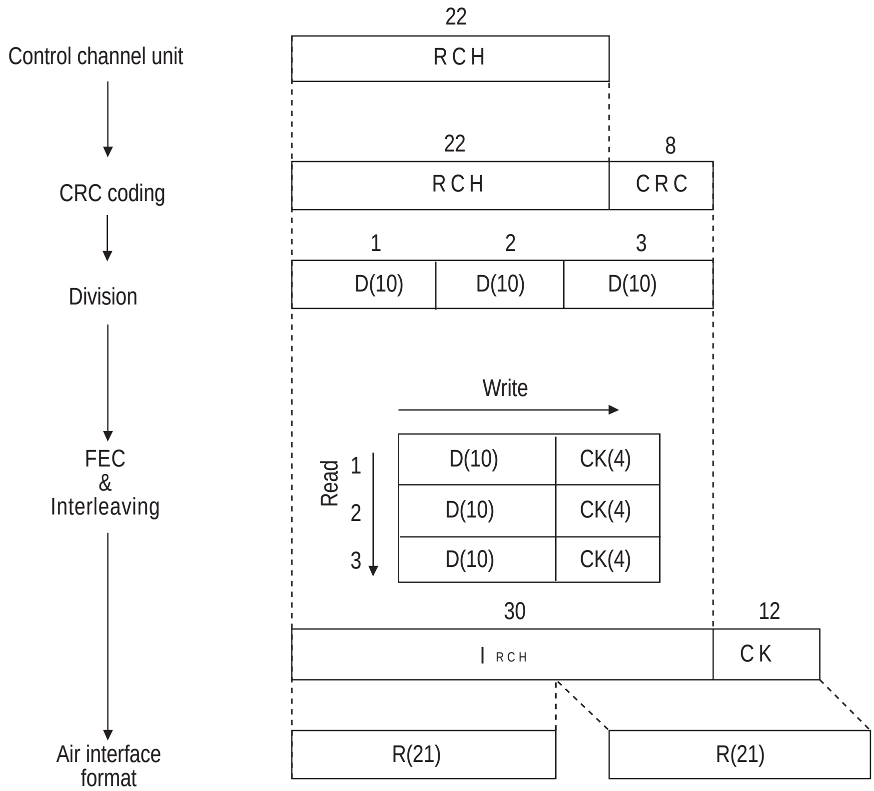


Fig. 4.1.5.2-14 : Downlink RCH

4.1.5.3 User packet channel signals (UPCH)

4.1.5.3.1 When error correction codes are added

(1) Error correction code

Uplink 2nd and subsequent units	:	3-bit shortened BCH (12, 8) of BCH (15, 11)
Uplink 1st unit/downlink	:	1-bit shortened BCH (14, 10) of BCH (15, 11)
Generator polynomial is		$1 + X + X^4$
Generator matrix	:	Generator matrix G is shown in Fig. 4.1.5.3-1. I_{11} represents the 11x11 identity matrix.
No. of bits that can be corrected	:	1 bit
Shortening method	:	Adding “0” before the information bits

(2) Error detection bit

16 bit CRC
The generator polynomial is : $1 + X^5 + X^{12} + X^{16}$

(3) Interleaving

a. Interleave is not performed between slots.
b. The depth of interleaving shall be the number of BCH (12, 8) blocks or BCH (14, 10) blocks within a slot (N_{BCH}). Table 4.1.5.3-1 indicates the relation between the number of information bits (X) for CAC and the depth of the interleaving (N_{BCH}).

(4) Coding procedure

The coding procedure is given in Fig. 4.1.5.3-2.

(5) Relationship between error correction, detection coding and bit interleaving

The relationship between error correction, detection coding and bit interleaving for the downlink is shown in Fig. 4.1.5.3-3 and for the uplink1st, 2nd and subsequent units is shown in Fig. 4.1.5.3-4.

(6) Layer 2 information in the UPCH uplink 1st unit is composed of 104 bits and two "0"s are added for the remaining 2 bits.

Table 4.1.5.3-1 : Relationship between information bits and interleaving

Channel type			X (bit)	N_{BCH}
CAC	Downlink		136	16
	Uplink	1st unit	104	13
		2nd and subsequent units	128	19

$$
G = \left[\begin{array}{cccc}
 & 1 & 0 & 0 & 1 \\
 & 1 & 1 & 0 & 1 \\
 & 1 & 1 & 1 & 1 \\
 & 1 & 1 & 1 & 0 \\
 & 0 & 1 & 1 & 1 \\
I_{11} & 1 & 0 & 1 & 0 \\
 & 0 & 1 & 0 & 1 \\
 & 1 & 0 & 1 & 1 \\
 & 1 & 1 & 0 & 0 \\
 & 0 & 1 & 1 & 0 \\
 & 0 & 0 & 1 & 1
\end{array} \right]
$$

Fig. 4.1.5.3-1 : Generator matrix for BCH (15, 11)

Fig. 4.1.5.3-2 : Coding procedure

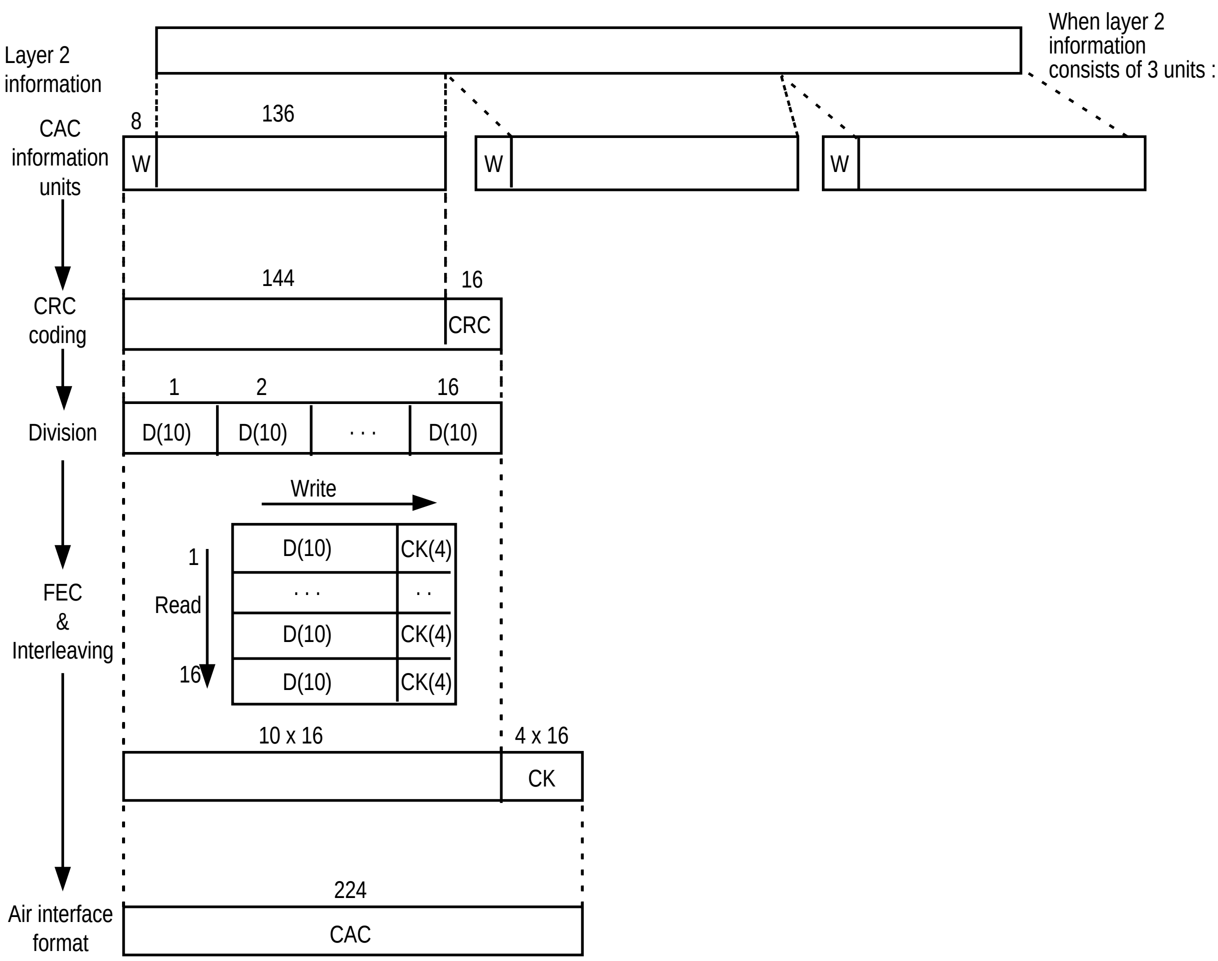


Fig. 4.1.5.3-3 : Downlink UPCH

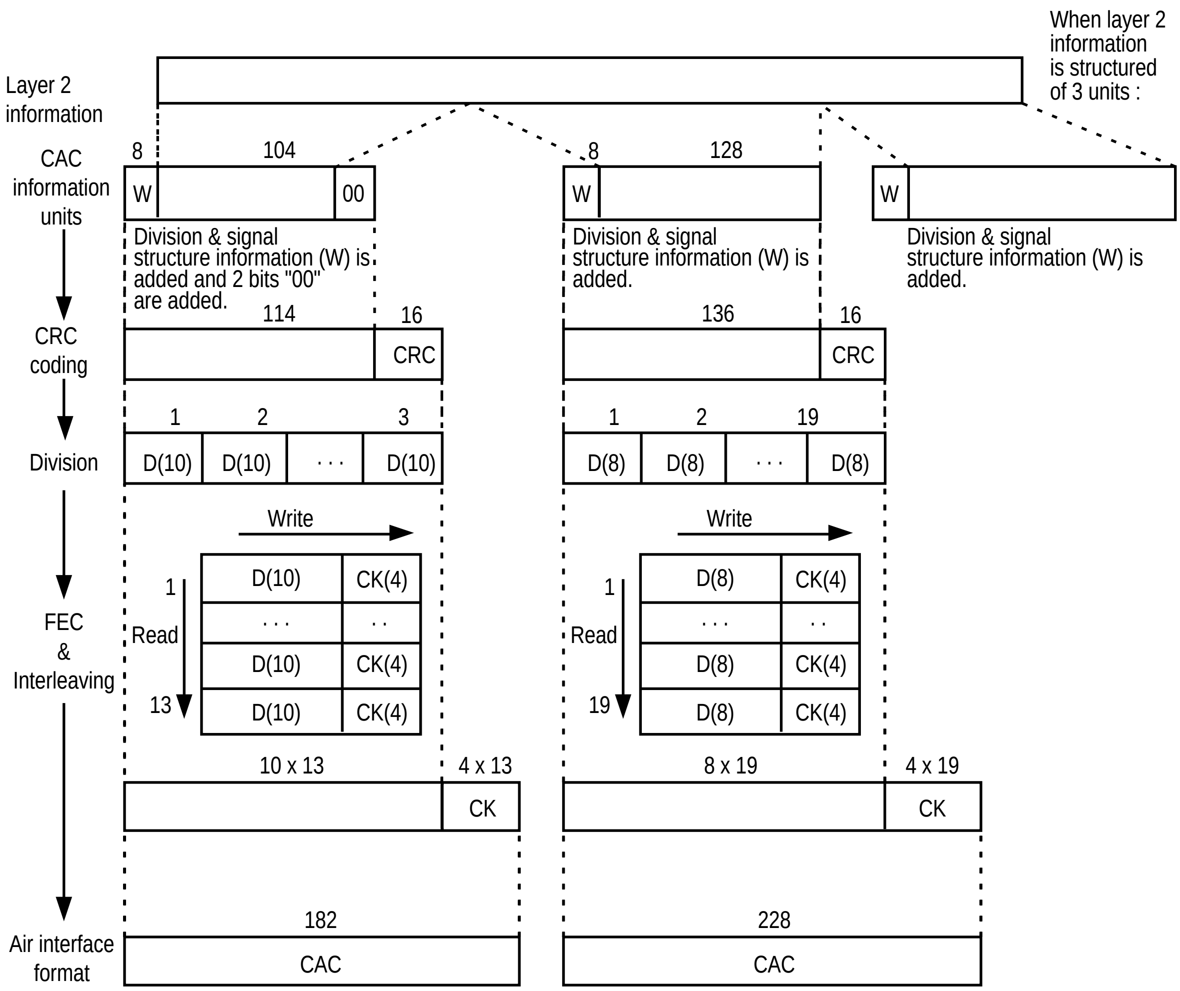


Fig. 4.1.5.3-4 : Uplink UPCH

4.1.5.3.2 When error correction codes are not added

(1) Error detection code

16 bit CRC
The generator polynomial is : $1 + X^5 + X^{12} + X^{16}$

(2) Coding procedure

The coding procedure is given in Fig. 4.1.5.3-5

(3) Error detection coding

The error detection coding for the downlink 1st unit is shown in Fig. 4.1.5.3-6 and for the uplink 1st and 2nd units is as shown in Fig. 4.1.5.3-7.

(4)The information after CRC coding for the UPCH uplink 1st unit is composed of 176 bits and “0”s are added for the remaining 6 bits. Also, the information after CRC coding for the uplink 2nd unit is composed of 224 bits and “0” s are added for the remaining 4 bits.

Fig. 4.1.5.3-5 : Coding procedure

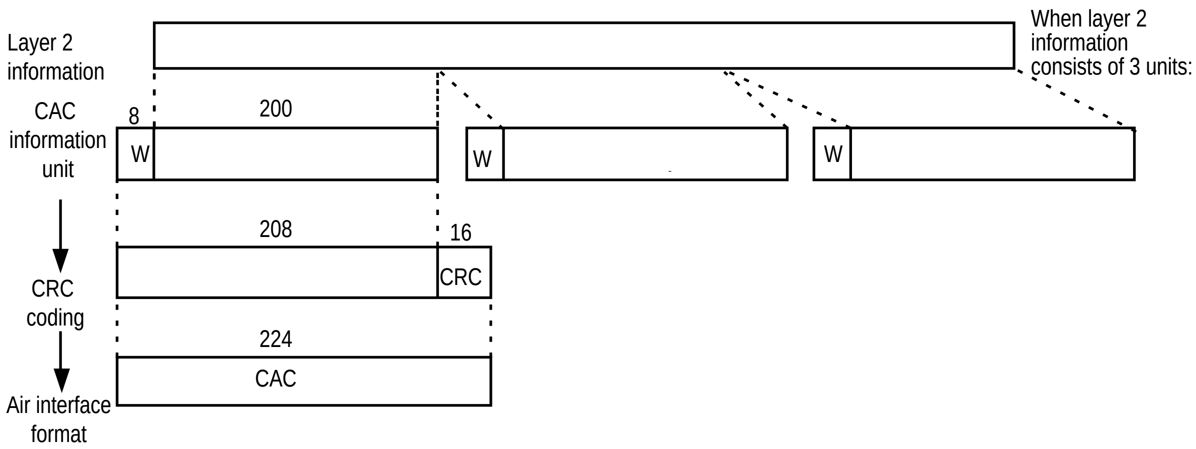


Fig. 4.1.5.3-6 : Downlink UPCH

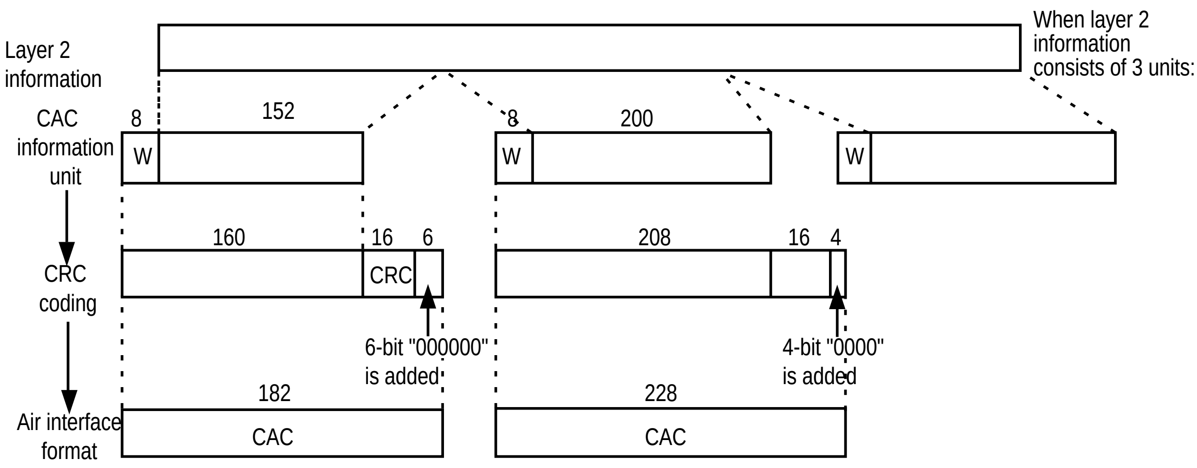


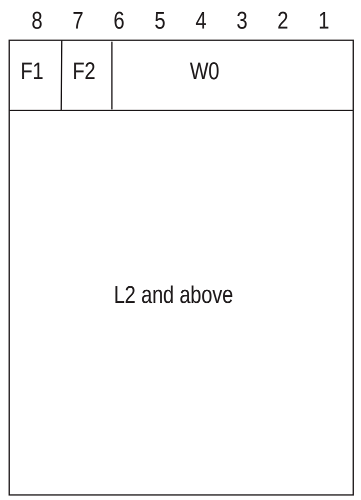
Fig. 4.1.5.3-7 : Uplink (UPCH)

4.1.5.4 Signal message assembly/disassembly

Signal message assembly/disassembly is carried out as follows.

The minimum unit for structuring a message consists of the signal structure information W, and the information of L2 and above. "W" includes the top and the end flags, and the number of units remaining in the message or the number of valid bytes within the end unit, and is used for message assembly and disassembly. In layer 2 and above, the parts from layer 2 and above layers contained in the units given by W are connected to form 1 message.

Fig. 4.1.5.4-1 gives the detailed format of a unit for BCCH, SCCH, PCH, SACCH and FACCH, examples of which are shown in Fig. 4.1.5.4-2. Fig. 4.1.5.4-3 gives detailed format of a unit for UPCH, and Fig. 4.1.5.4-4 gives examples. The relationship between a disassembled signal, error correction, detection code and interleave is given in Fig. 4.1.5.4-5.



W: Signal structure information

F1 : 0 •• Non-head unit
1 •• Head unit
F 2 : 0 •• Non-end unit
1 •• End unit
W0 : When F2 = 1, Number of valid bytes represented by L;
When F2 = 0, Number of remaining units represented by Wr.

Note, when the number of units exceeds 64, the setting is : 1 1 1 1 1 1

Fig. 4.1.5.4-1 : Detailed format of a unit (BCCH, SCCH, PCH, SACCH, FACCH)

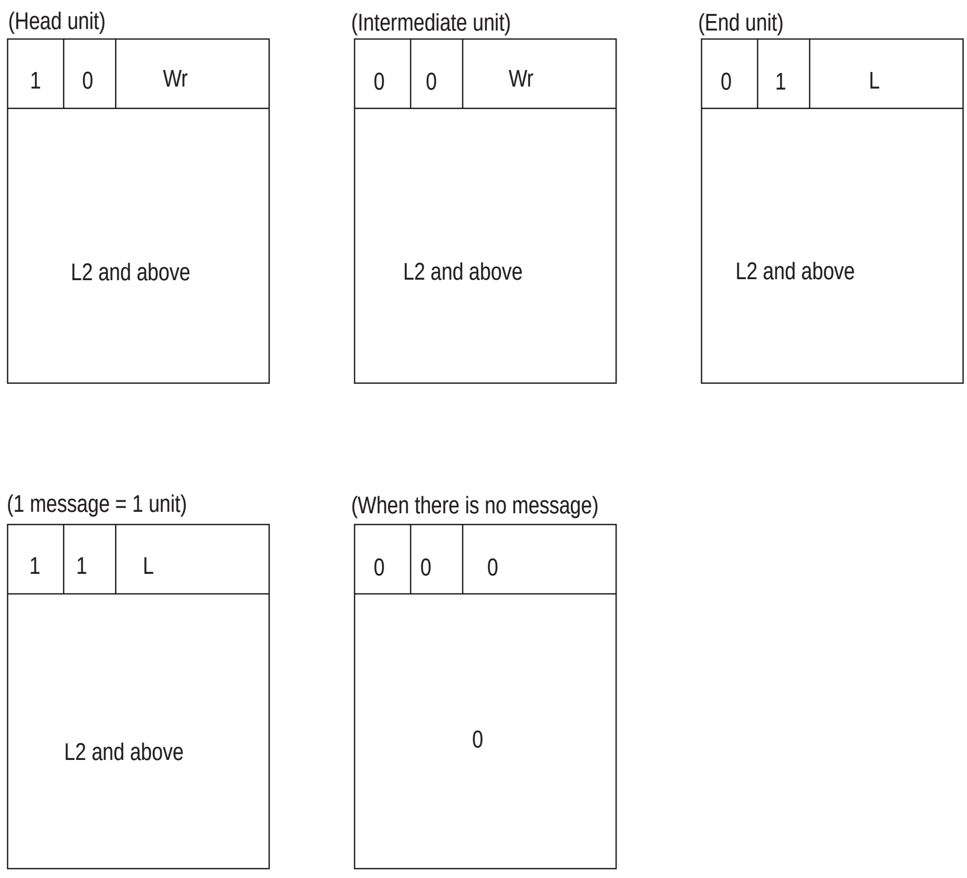


Fig. 4.1.5.4-2 : Examples of the unit and the format (BCCH, SCCH, PCH, SACCH, FACCH)

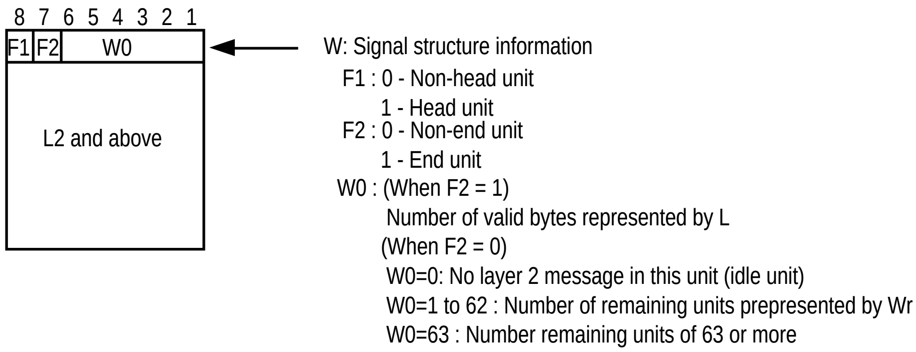
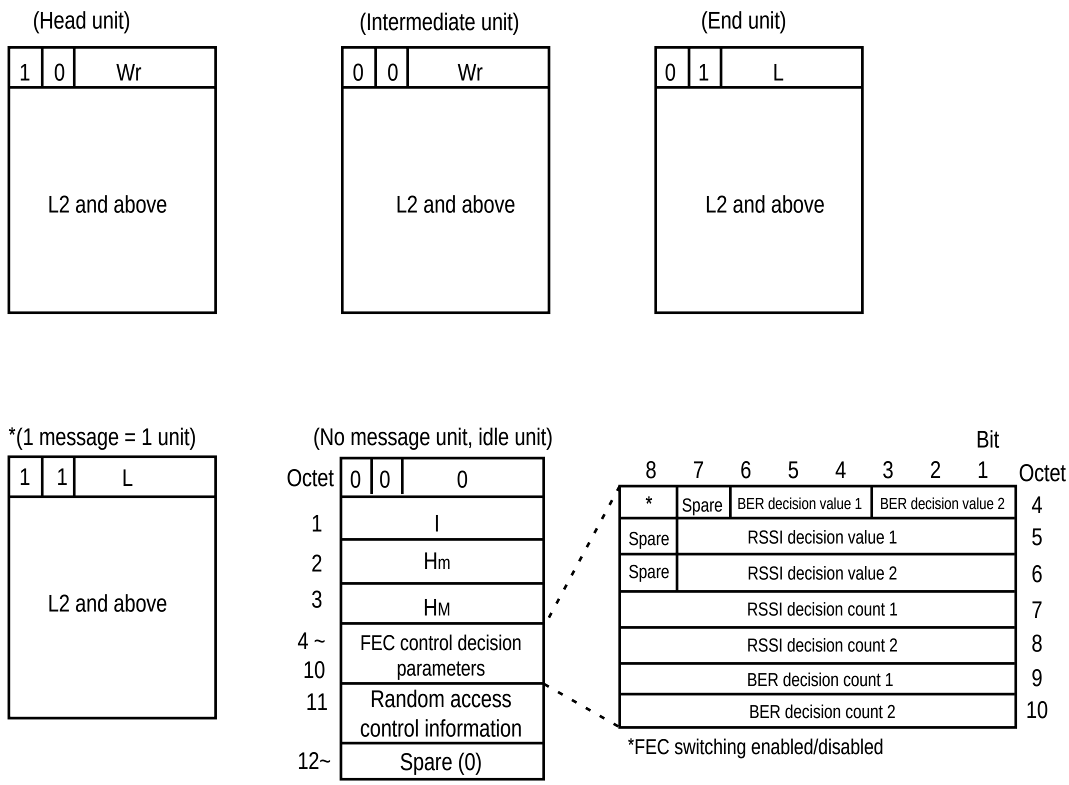


Fig. 4.1.5.4-3 : Detailed format of a unit (UPCH)



(1) I (Octet 1)

The number of consecutive idle unit(s) within the slot in binary (0 to 2).

(2) H_m (Octet 2)

Specifies the superframe number (0 to H_M) in a hyperframe in binary, which is formed in the packet physical channel through which the pertinent idle unit was transmitted.

(3) H_M (Octet 3)

Specifies the maximum superframe number (0 to 255) in the hyperframe, which is formed in the packet physical channel through which the pertinent idle unit was transmitted, i.e. the number of superframes - 1.

(4) FEC control decision parameters

(4-1) FEC switching enable/disable (Octet 4)

Bit 8		FEC switching enabled/disabled
0	:	FEC switching disabled
1	:	FEC switching enabled

(4-2) BER decision value 1 (Octet 4)

Bit 6	5	4		BER decision value 1
0	1	1	:	BER 3% or higher
0	1	0	:	BER 1% to 3%
0	0	1	:	BER 0.3% to 1%
0	0	0	:	BER 0.3% or lower

(4-3) BER decision value 2 (Octet 4)

Bit 6	5	4		BER decision value 2
0	1	1	:	BER 3% or higher
0	1	0	:	BER 1% to 3%
0	0	1	:	BER 0.3% to 1%
0	0	0	:	BER 0.3% or lower

(4-4) RSSI decision value 1 (Octet 5)

The home zone level for determining whether FEC is used or not is specified by binary (the same expression as 4.3.5.3.3.6 “Reception level” shall be used).

(4-5) RSSI decision value 2 (Octet 6)

The home zone level for determining whether FEC is used or not is specified by binary (the same expression as 4.3.5.3.3.6 “Reception level” shall be used).

(4-6) RSSI decision counter 1 (Octet 7)

The counter value for deciding the home zone level for controlling whether or not FEC is used is specified by binary (1 to 255).

(4-7) RSSI decision counter 2 (Octet 8)

The counter value for deciding the home zone level for controlling whether or not FEC is used is specified by binary (1 to 255).

(4-8) BER decision counter 1 (Octet 9)

The counter value for deciding the bit error rate for the home zone for controlling whether or not FEC is used is specified by binary (1 to 255).

(4-9) BER decision counter 2 (Octet 10)

The counter value for deciding the bit error rate for the home zone for controlling whether or not FEC is used is specified by binary (1 to 255).

(5) Random access control information (Octet 11)

(5-1) Bit 8 shall be spare.

(5-2) Continuous transmission standby required/not required (Octet 11)

Bit 7		Contiunous transmission standby required/not required
0	:	Not required
1	:	Required

(5-3) Maximum number of times for standby (Octet 1)

Bit 6	5	4	3	2	1		Maximum number of times for standby (Note 1)
0	0	0	0	0	0	:	Infimite
0	0	0	0	0	1	:	Once
			:				
1	1	1	1	1	1	:	63 times

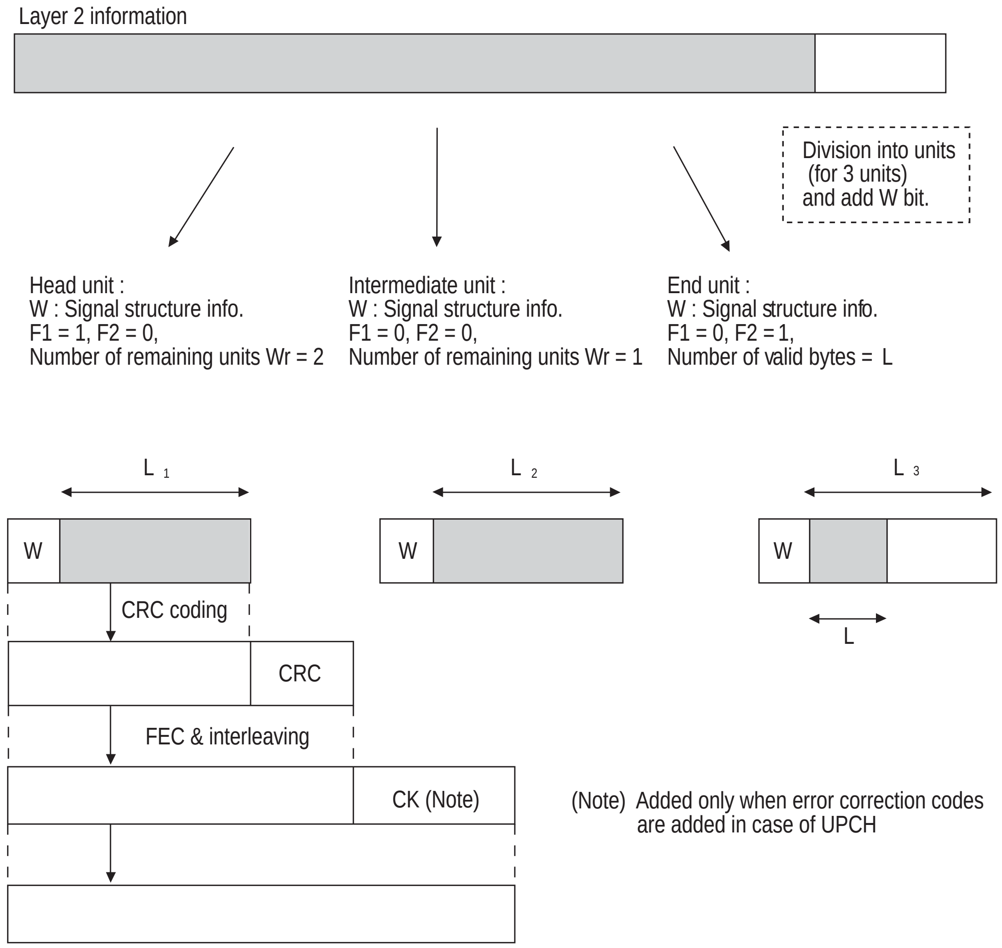
Note 1 : This is valid only when the continuous transmission required/not required is set for "required". When the continurous transmission required/not required is set for "not required", this shall be ignored at the MS side.

Note 2 : After packet physical channel activation, the operation "not required" shall be performed for "continuous transmission standby required/not required" described in Section 4.1.13.1.2(2) until an idle unit is received.

(6) Other : Spare (0)

Note : Idle units must always be transmitted by the channel coding with error correction.

Fig. 4.1.5.4-4 : Unit examples with format (UPCH)



	L_n size (bit) Downlink	Uplink
CAC (BCCH, PCH, SCCH, UPCH with error correction codes) :	136	104 (Second and succeeding units : 128)
CAC (UPCH without error correction codes) :	200	152 (Second and succeeding units : 200)
SACCH :	96	64
FACCH :	88	88

Fig. 4.1.5.4-5 : Method of dividing a message into units (example of dividing to 3 units)

4.1.6 Signal transmission order

This section describes the signal transmission order of downlink control channel. The CRC method differs for the RCH.

Fig. 4.1.6-1 shows the information D_{135} ~ D_0 which occurs above layer 2 (D_{135} corresponds to Bit 8 of the 1st octet for the information above Layer 2) with the signal assembly/disassembly bits W_7 ~ W_0 [W_7:F1, W_6 : F2, W_5 ~ W_0 : W0] added. The data read-out sequence for the state shown in Fig. 4.1.6-1 is "from the lowest numbered octet to the highest numbered octet starting from the MSB". The data series occurring before the BCH coding (with CRC bits P_{15} ~ P_0 added) is shown in Fig. 4.1.6-2. The CRC coding method is shown in Fig. 4.1.6-3. The defaults for shift registers S_{15} to S_0 are all "1". When reading W_7 to D_0 with the encoder shown in Fig. 4.1.6-3, T_1 should be flipped down and T_2 closed. Following this, when outputting the 16 test bits, flip up T_1 and open T_2.

As to the BCH coding, W_7 to P_0 in Fig. 4.1.6-2 are divided into 10 bit blocks, and "0" is inserted before the top bit of each block. Following this, it is multiplied by generator matrix G shown in Fig. 4.1.5.1-1. Each block which underwent BCH coding is assumed to be arranged as shown in Fig. 4.1.6-4, then bit interleaving is performed. The bit interleaving method that is used is to read the data "from the lowest block number row at a time (excluding rows made up of "0"s), starting with the MSB". The signal data series (CAC data) as it appears following interleaving is shown in Fig. 4.1.6-5; the signal format for the air interface is shown in Fig. 4.1.6-6. In this instance, 87A4Bh (which corresponds to the previously transmitted sync word pattern) is used for sync words SW_{19} to SW_0.

	MSB 8		LSB 1
Octet 1	W_7	• • • •	W_0
•	D_{135}	• • • •	D_{128}
•	•		•
•	•		•
•	•		•
•	•		•
•	•		•
•	•		•
18	D_7	• • • • •	D_0

W_7 :F1

W_6 :F2

W_5 ~ W_0 :W0

Fig. 4.1.6-1 : Configuration of layer 1 information bits

W_7 • • • • W_0	D_{135}• • • • • • • • D_0	P_{15} • • • • P_0

Fig. 4.1.6-2 : Data series before BCH coding

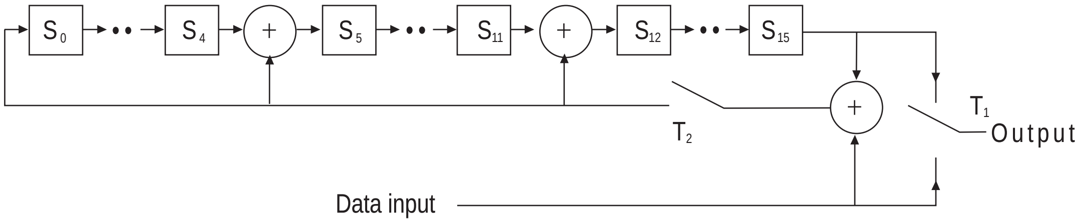


Fig. 4.1.6-3 : CRC encoder

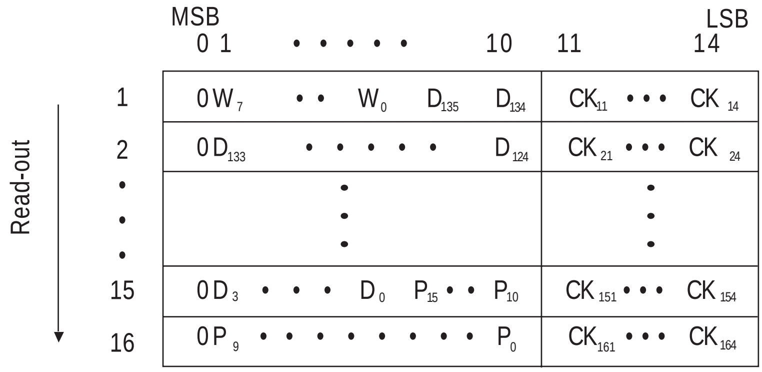


Fig. 4.1.6-4 : FEC and interleaving method

W_7 D_{133} • • D_3 P_9 W_6 • • • • • D_{134} • • P_0 CK_{11} • • CK_{161} • • CK_{14} • • CK_{164}

Fig. 4.1.6-5 : Signal series after interleaving

R	P	CAC	SW_{19} • • SW_0	C_7 • • C_0	CAC	E

Fig. 4.1.6-6 : Signal format for air interface

4.1.7 Scrambling system

(1) Scrambling pattern

a. Base stations

The scrambling pattern for the base station must be determined when the system is started up.

b. Mobile stations

With the control physical channel, the scrambling pattern corresponds to the color code on a one-to-one basis. Correspondence between color codes (C_0......C_7) and the scrambling shall be (S_0....S_8) = (C_0C_0 ....C_7) for the initial values (S_0.....S_8) for the scrambling pattern generator register. For channels other than the control physical channels, the scrambling patterns are specified by the base station using the BCCH, SCCH, SACCH/FACCH or UPCH and do not correspond to the color codes on a one-to-one basis.

(2) Scrambling method

The scrambling pattern is the output of the PN(9,5) structure as shown in fig. 4.1.7-1, and the initial values of the registers have a one-to-one correspondence with the pattern numbers. The methods of scrambling and descrambling are shown in fig. 4.1.7-2 and 4.1.7-3 respectively. For scrambling, starting at the head of the pertinent segment of the slot, each data bit is taken EXOR with the scrambling bit sequence $S_0S_1S_2S_3$... For each new slot the scrambling pattern starts from S_0 and runs through $S_1S_2S_3$....

(3) Effective scrambling range

Scrambling of data is effective for all three of the control, traffic and packet physical channels (excluding burst transient responses (R), preambles (P), frame synchronization words (SW) and color codes (CC)). Output of the scramble data stream for the SW and CC sections is paused temporarily. Scrambling is not performed for the synchronization burst. The effective scrambling range for bursts and the individual slots is given in Fig. 4.1.7-4.

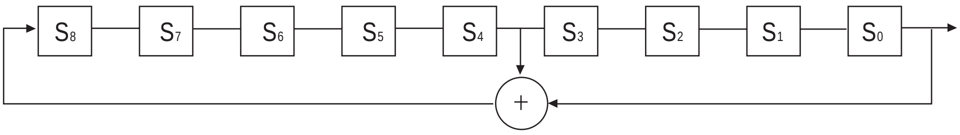


Fig. 4.1.7-1 : Structure of PN (9,5)

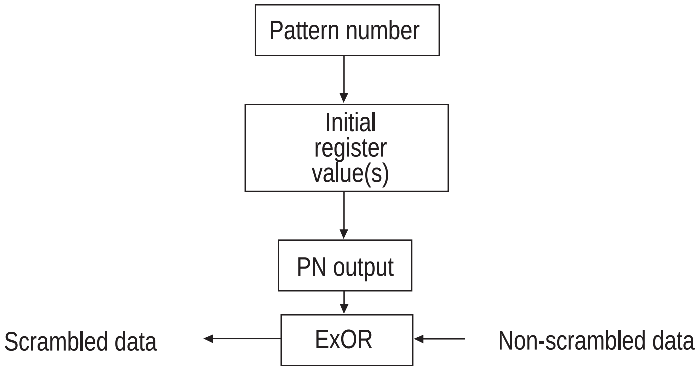


Fig. 4.1.7-2 : Scrambling method

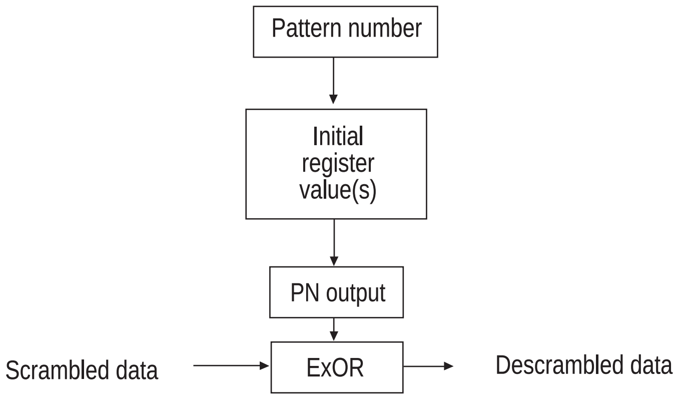
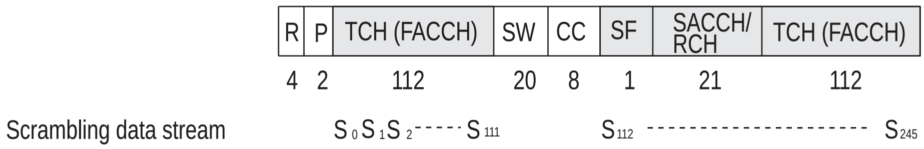
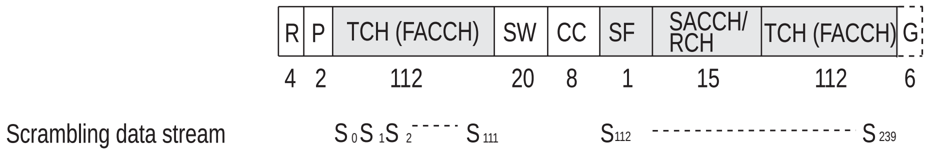


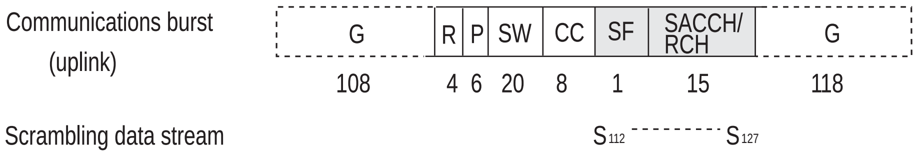
Fig. 4.1.7-3 : Descrambling method



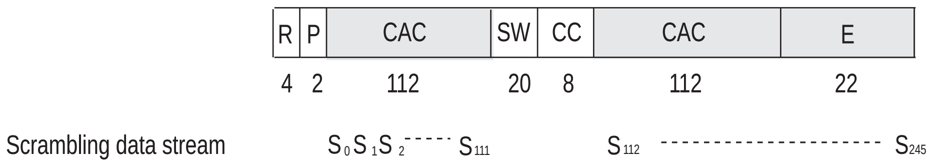
(a) Downlink traffic physical channel



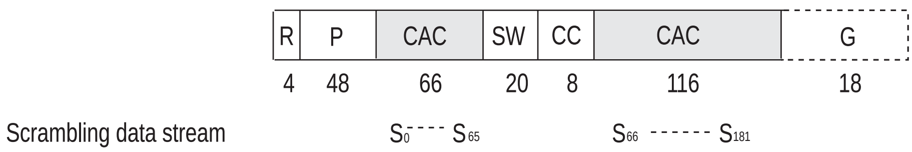
(b) Uplink traffic physical channel



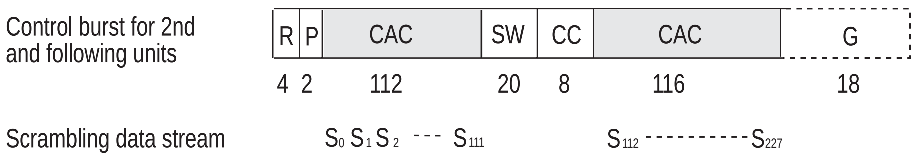
(c) Uplink traffic physical channel (when voice is absent during VOX)



(d) Downlink control physical channel



(e) Uplink control physical channel (for 1st unit)



(f) Uplink control physical channel (for 2nd and following units)

R	P	CAC	SW	CC	CAC	E
4	2	112	20	8	112	22

Scrambling data stream $S_0 S_1 S_2$ ----- S_{111} S_{112} -------------------- S_{245}

(g) Downlink packet physical channel

R	P	CAC	SW	CC	CAC	G
4	48	66	20	8	116	18

Scrambling data stream S_0 --- S_{65} S_{66} ------ S_{181}

(h) Uplink packet physical channel (1st unit)

R	P	CAC	SW	CC	CAC	G
4	2	112	20	8	116	18

Scrambling data stream $S_0 S_1 S_2$ --- S_{111} S_{112} ---------- S_{227}

(i) Uplink packet physical channel (2nd unit and after)

Fig. 4.1.7-4 : Effective scrambling range

4.1.8 Color codes used as interference countermeasures

Color codes are codes that are assigned to individual clusters (i.e., frequency re-use pattern units) in order to distinguish the signals from the interfering station. An 8- bit color code is assigned for each burst. Up to 255 combinations can be used as color codes (except "00") and the same codes are used both for uplink and downlink channels. Error correction is not performed for color codes.

Detection of color codes during selection of the standby channel (refer to Appendix B.2) is performed by referring to the color code section after synchronization has been attained. To detect the color code, receive the 8-bit color code section in consecutive 7 sub-frames. If the same bit pattern is received more than 4 times, it is determined as the detected color code value. After the correct color code is detected, color codes will correspond to the scramble patterns on a one-to-one basis, so that the control data can be descrambled correctly. For channels other than control channels, color codes are specified by the SCCH from the base station.

4.1.9 Time slot structure

This section describes the timing for the physical channels.

4.1.9.1 Standard transmission timing for the mobile station

Fig. 4.1.9.1-1 shows the transmission data in symbol units.

R_1 R_2	P_1	D_1 • • • • D_{56}	S_1 • • • S_{10}	C_1 • • •	D_{57} • • • • • D_{114}	G	

(a) Control and packet physical channel (2nd unit)

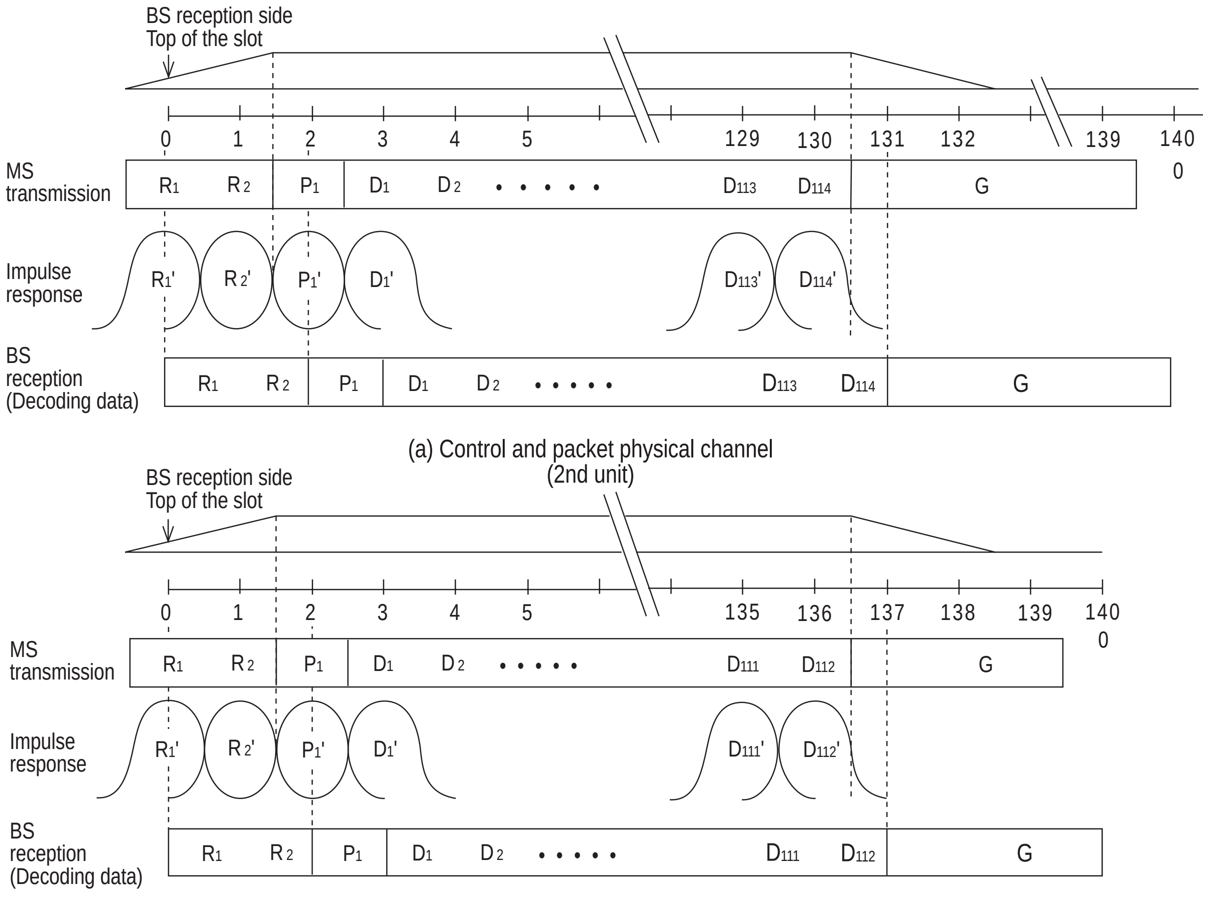
R_1 R_2	P_1	D_1 • • • • D_{56}	S_1 • • • S_{10}	C_1 • • •	S/R	D_{57} • • • • • • D_{112}	G

(b) Traffic physical channel

R_i (i = 1,2) : Ramp bit P_1 : Preamble S_i (i = 1, • • •, 10) : Sync word
C_i (i = 1,• • •, 4) : Color code   S/R : SACCH or RCH   G: Guard time
D_i (i = 1,• • •, 112 or 114) : CAC or TCH

Fig. 4.1.9.1-1 : Transmission data

Fig. 4.1.9.1-2 shows the valid data segment. P_1', D_1', D_2'.... are symbol data series that are the differential coded segments P_1, D_1, D_2.... in Fig. 4.1.9.1-1. Points 0 to 139 in the Fig. represent the maximum values of the impulse response of the base band filter with the transmission symbol at the mobile station and serve as symbol rating points for the data received by the base station.



(b) Traffic physical channel

Fig. 4.1.9.1-2 : Valid data segment

Fig. 4.1.9.1-3 shows the relationship between the reception and transmission at the mobile station (standard transmission timing at the mobile station). The timing shown in the Fig. is the timing in effect when time alignment (TA) control is not performed (in this instance, the time alignment designated value = "000".)

The mobile station starts transmitting the R_1 after 191 symbols (the 259th symbol) from the point where the sync word detection point for the downlink signal switches to the top symbol of the color code (the 69th symbol). However, the transmission timing may be changed by time alignment control during call in progress.

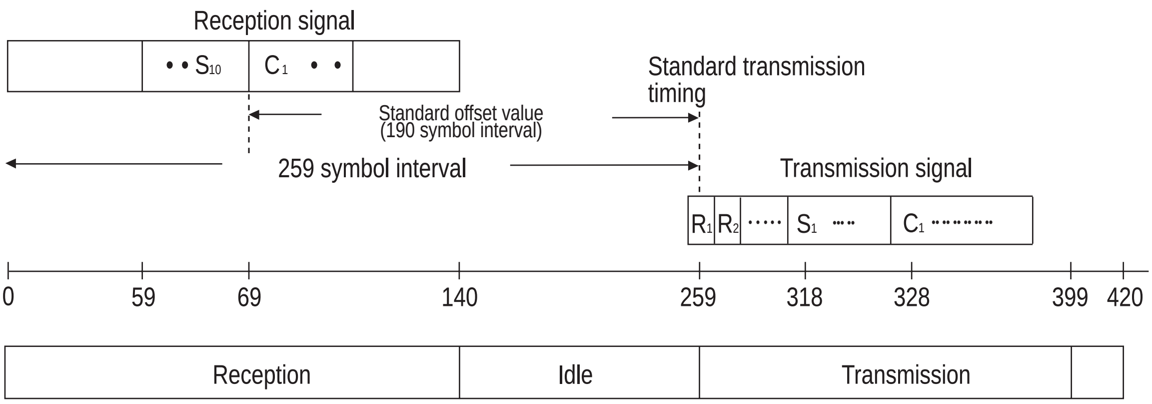


Fig. 4.1.9.1-3 : MS standard transmission timing

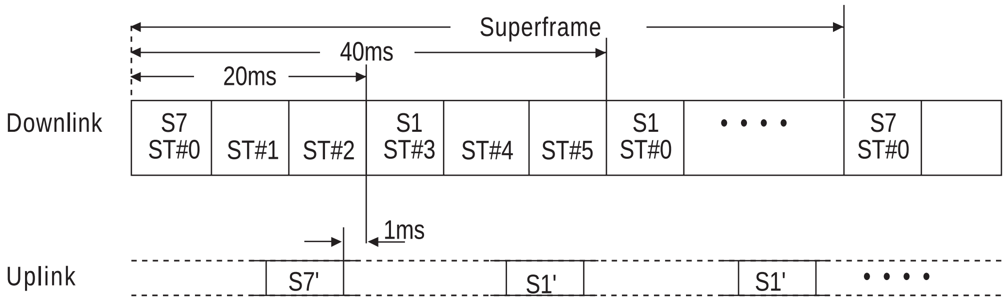
The transmission timing precision for the mobile station in relation to the reference transmission timing is as below :

Precision : +0 to +1 symbol ("+1 symbol" means that transmission which is delayed a maximum 1 symbol from the reference transmission timing is possible.)

Condition : The mobile station must be establishing synchronization. i.e., when the downlink signal is received correctly and synchronization is established or when the downlink signal has not been received but it is within the synchronization protection time which is specified by the timer value for TR103, 104, 105, etc., and the out-of-sync detection time for N3 and N4.

Transmission timing changes for the mobile station between consecutive bursts shall not exceed 1/8 symbol, regardless of the condition of the downlink RF section. Transmission timing changes should be executed when the mobile station is not transmitting.

Fig. 4.1.9.1-4 shows the relationship between downlink and uplink superframe timing at full rate. It also applies to the timings at half rate. However, the start point of the superframe at each channel is not specified.



(Slots ST#0, ST#3 are used at full rate.)
S7 : Superframe sync word of ST#0
S1 : Frame sync word of ST#0

Note that S7' and S1' are bit inverted patterns of S7 and S1.

Fig. 4.1.9.1-4 Superframe timing (Full rate)

4.1.9.2 Time alignment

Time alignment control is performed in order to prevent burst signals from colliding due to transmission delays in the RF section. By means of time alignment control, the transmission timing for the mobile station is adjusted in symbol units when a new traffic channel is activated, or while call in progress are taking place on the traffic channel. (Refer to items 4.1.11.2.1 and 4.1.12 for details on time alignment.)

The timing adjustment range in relation to the reference transmission timing is as follows :

0 to -6 symbols : {-6 symbols means that the transmission rate is 6 symbols ahead of the reference timing}

Note : Time alignment for mobile stations is not performed outside the above range.

4.1.10 Structure of common access channel

4.1.10.1 Frequency assignment

(1) The common access channel shall exist on individual carrier (Freq.) on zone basis or sector basis. The conditions for frequency repetition are determined on the basis of transmission reliability. The common control channels assigned to each zone shall include at least one "perch" channel.

(2) Mobile stations shall memorize the frequency used as the perch channel for the system in the ROM as fixed information. The control channels other than the perch channel are reported by the BCCH and the mobile station memorizes them in the RAM.

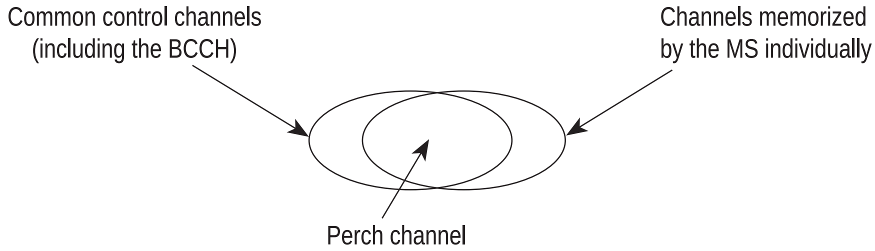
Also, when either network specifies the perch channel used for the peripheral zone surveillance to the mobile station, shortened codes are used.

(3) Definition of perch channels

a. A "perch" channel shall be assigned to slot 2 and 5 of the individual carriers in each zone. The perch channel is a sub-set of the common control channels including the BCCH.

b. The mobile station independently memorizes multiple channels. However, independently memorized multiple channels are not always the perch channels and some may be used as traffic channels and so forth.

c. The relationship between the common control channels including the BCCH, perch channels and the individual channels which are memorized by the MS is shown in figure below.



d. The operating procedure after the power for the mobile station is turned ON is outlined below.

i) When the power for the mobile station is turned on, the mobile station first scans the carrier in individually memorized channel at the mobile station and then creates a carrier table by level in order to obtain the perch channel in the zone where the mobile station is located.

ii) The carriers are synchronized with slot 2 and slot 5 (ranking in the order of higher level carriers to lower), the channel is checked to see whether it is a common control channel or not, then the BCCH is received. If the mobile station is ready for standby, it changes to the standby state.

4.1.10.2 Functional channel assignments on radio channels

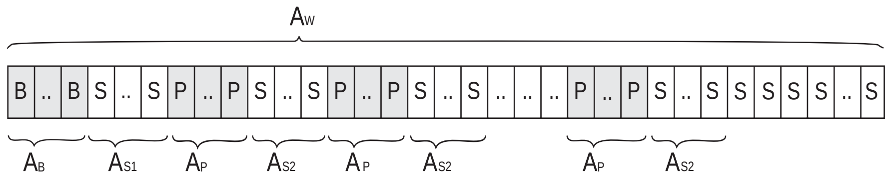
4.1.10.2.1 Control physical channel

The structure for common access channels shall be variable for the individual cells. The basic structure for the BCCH, PCH and SCCH on a single radio channel shall be shown in Fig. 4.1.10.2-1 below.

The BCCH message shall always start from the top slot of the superframe. Also, the operator shall determine the number of BCCH slots (A_B)so that transmission of the message signal divided into multiple units is completed within one superframe. Fig. 4.1.10.2-2 shows the BCCH channel structure when the BCCH message (A_B = 7) is composed of 4 units.
SCCH messages or PCH messages in the same group can be started and ended in any slot regardless of superframes.

Normally, the control channel in a cell is made up of multiple radio channels. The PCH is structured in groups for intermittent reception of mobile stations. Fig. 4.1.10.2-3 shows an example of the structure of a control channel within a cell consisting of 3 channels and 9 groups.
Control channels within the same cell have the same color codes.

Control channels within the same cell have the same color codes.



A_W : No. of slots in each repetition unit (36 slots)
A_B : No. of BCCH slots
A_{S1} : No. of SCCH slots following the BCCH
A_P : No. of PCH slots per group
A_{S2} : No. of SCCH slots following the PCH

Fig. 4.1.10.2-1 : Basic structure of the radio channel

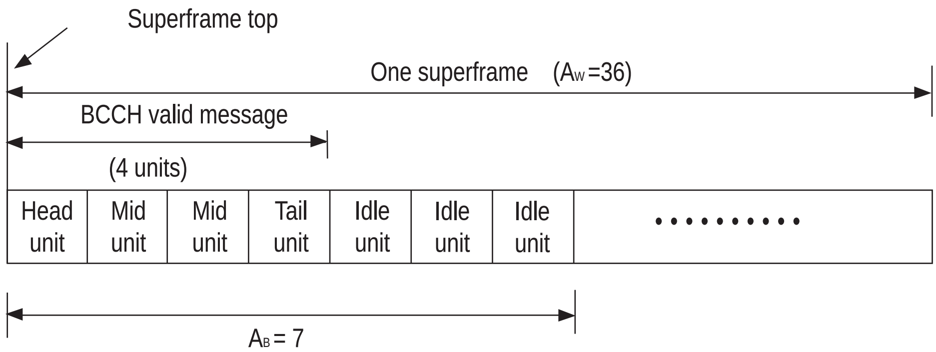
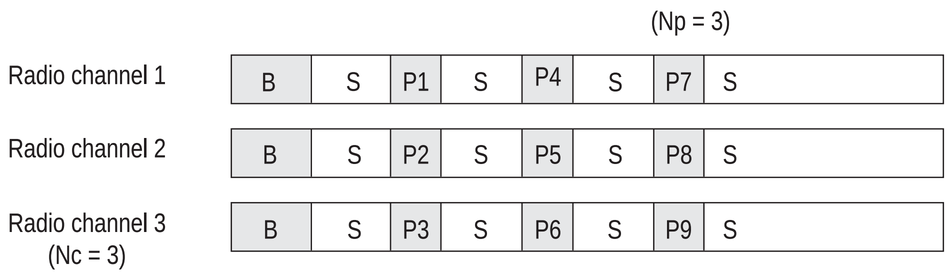


Fig. 4.1.10.2-2 : BCCH channel structure



N_C : No. of radio channels used for control within a cell
N_P : No. of groups composing the PCH within one superframe

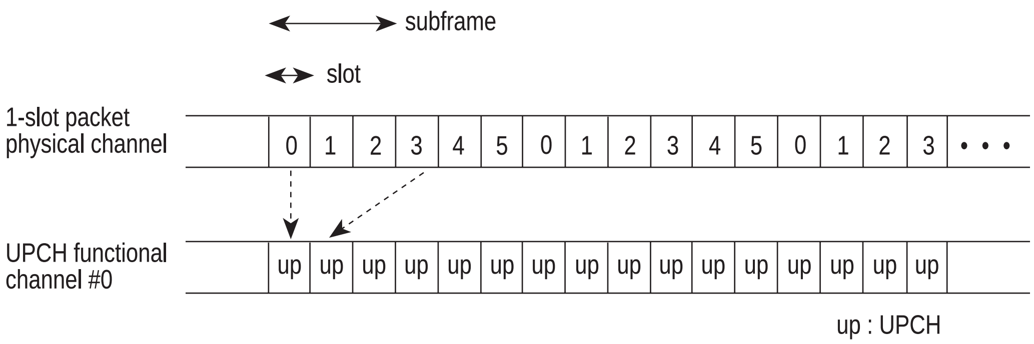
Fig. 4.1.10.2-3 : Example of control channel structure within a cell

4.1.10.2.2 Packet physical channel

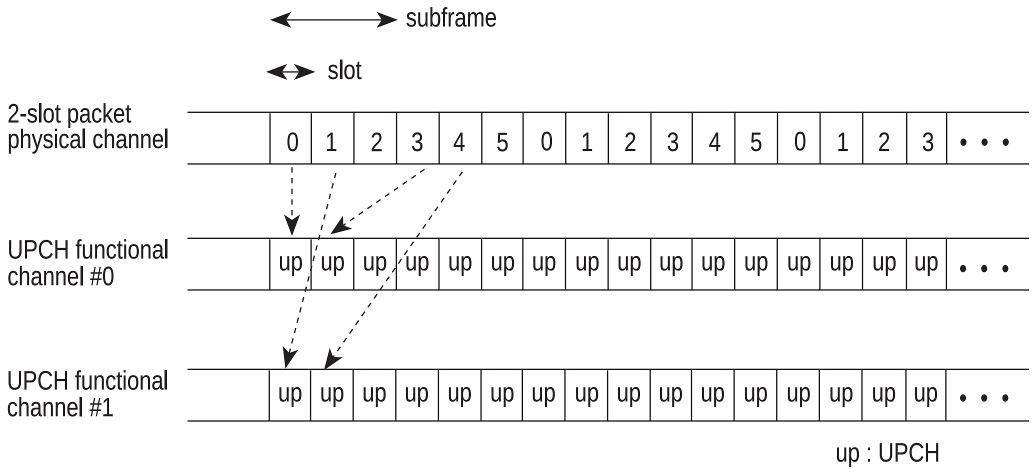
4.1.10.2.2.1 Structure

A packet physical channel forms superframes which consist of 36 subframes, and hyperframes which consist of multiple superframes. The number of superframes making up a hyperframe less one (H_M) and the superframe number (Hm) which indicates the position of the superframe in the hyperframe are notified by an idle unit (refer to 4.1.5.4). The mobile station decides the hyperframe structure by receiving an idle unit.

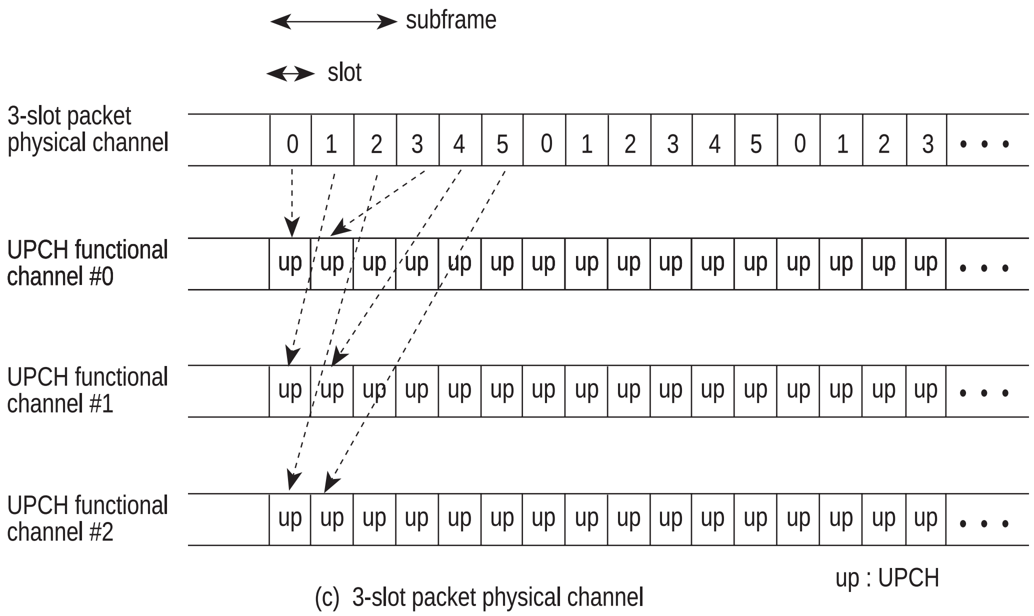
A UPCH functional channel for both uplink and downlink is assigned to all subframes for each slot which forms the packet physical channel. In other words, a 1-slot packet physical channel consists of one UPCH functional channel, a 2-slot packet physical channel consists of two UPCH functional channels and 3-slot packet physical channel consists of three UPCH functional channels. The relationship between the packet physical channel and the UPCH functional channel(s) is shown in Fig. 4.1.10.2-4



(a) Example of 1-slot packet physical channel composed of slot #0 and #3



(b) Example of 2-slot packet physical channel composed of slots #0 + #3, and slots #1 + #4



(c) 3-slot packet physical channel

Fig. 4.1.10.2-4

Both the mobile station and the base station transmit a series of units into which a layer 2 frame is divided through a UPCH functional channel. The transmission is defined as low-speed transmission when multiple layer 2 frames are transmitted in order using one UPCH functional channel, and as high-speed transmission when multiple layer 2 frames are transmitted in parallel using two or three UPCH functional channels out of UPCH functional channel(s) which compose the packet physical channel. Refer to 4.1.10.2.2.2 and 4.1.10.2.2.3 for the detailed method of transmission. Refer also to 4.1.10.4.2 for determining the UPCH functional channel used for low-speed and high-speed transmission.
The layer 2 information in the uplink UPCH functional channel can begin and end with any subframe regardless of the boundary of the hyperframe or the superframe.

The layer 2 information in the downlink UPCH functional channel begins with the transmission start timing defined below according to the usage of the layer 2 information.

(1) Continuous signal transmission start timing

This is the timing to start layer 2 information transmission to the mobile station which receives all 36 subframes composing a superframe continuously.

This timing can be allocated to all subframes composing a superframe.

When the layer 2 information exists to be transmitted to the mobile station which watches this timing, the base station starts transmitting the signals using the next empty subframe of this timing.

(2) Intermittent signal transmission start timing

This is the timing to start the layer 2 information transmission to the mobile station which intermittently receives some of the 36 subframes which compose a superframe in order to save the battery consumption.

This timing is allocated to N_{GR} subframes periodically at the cycle of (36/N_{GR}) subframes which compose an "intermittent reception group". Furthermore multiple intermittent reception groups are allocated at the cycle corresponding to the subframes indicated by I_{GR} (a divisor of 36/N_{GR}) for the purpose of scattering signal transmissions. Fig. 4.1.10.2-6 shows detailed examples of intermittent reception groups. N_{GR} and I_{GR} are notified by the base station to the mobile station using layer 3 information.

When the layer 2 information exists to be transmitted to the mobile station which watches this timing, the base station starts transmitting the signals using the next empty subframe of this timing.

(3) Common signal transmission start timing

This is the timing at which the transmission of common layer 2 information to be transmitted to all mobile stations which are using the UPCH functional channel is started.

This timing is allocated at the (36/N_{GC}) subframe cycle. N_{GC} is notified by the base station to the mobile station using layer 3 information.

When the common layer 2 information exists to be transmitted, the base station starts transmission simultaneously at this timing of all UPCH functional channels. When neccssay, the mobile station receives at this timing at least 1 channel of all UPCH functional channels used.

(4) Paging signal transmission start timing

This is the timing to start the layer 2 information transmission to the mobile station which intermittently receives only one subframe among those composing a superframe or a hyperframe in order to reduce battery consumption.

This timing is allocated to N_{GP} subframes at the (N_{WP}/N_{GP}) subframe cycle starting with subframe G_{PO}. Each group of these subframes is called a "paging notification group" . The mobile station receives one paging report in the specified superframe or hyperframe. G_{PO}, N_{WP} and N_{GP} are notified from the base station to the mobile station.

When the layer 2 information exists to be transmitted to the mobile station which watches this timing, the base station starts transmitting the signals using the next empty subframe of this timing.

These signal transmission start timings are allocated in a superframe, and repeated at the superframe cycle. This structure is variable for each cell and is notified by the base station to the mobile station using layer 3 information (refer to 4.1.10.3.2 and 4.1.10.4.2). Examples of this structure are shown in Fig 4.1.10.2-5.

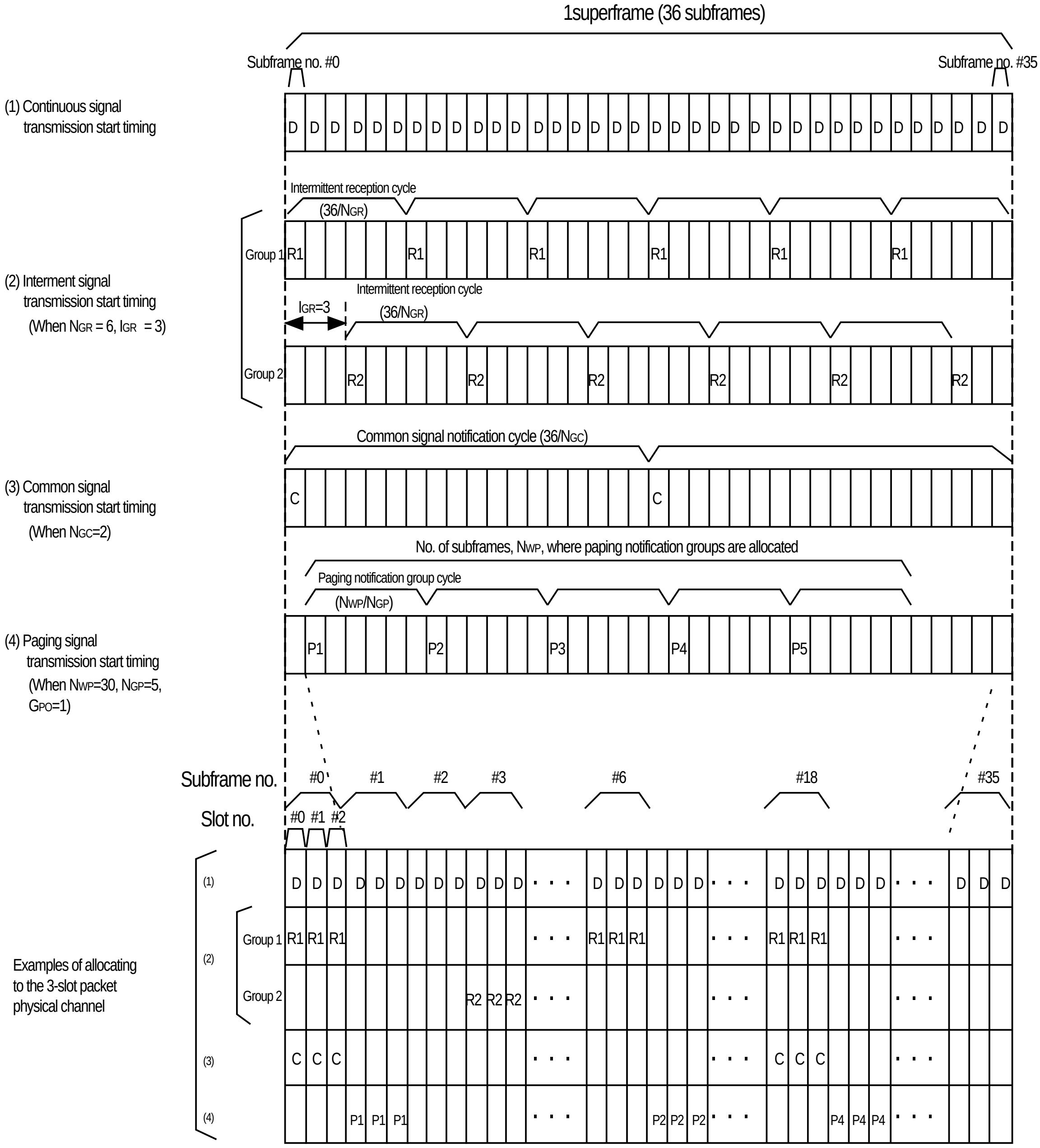


Fig. 4.1.10.2-5 : Examples of packet physical channel structure

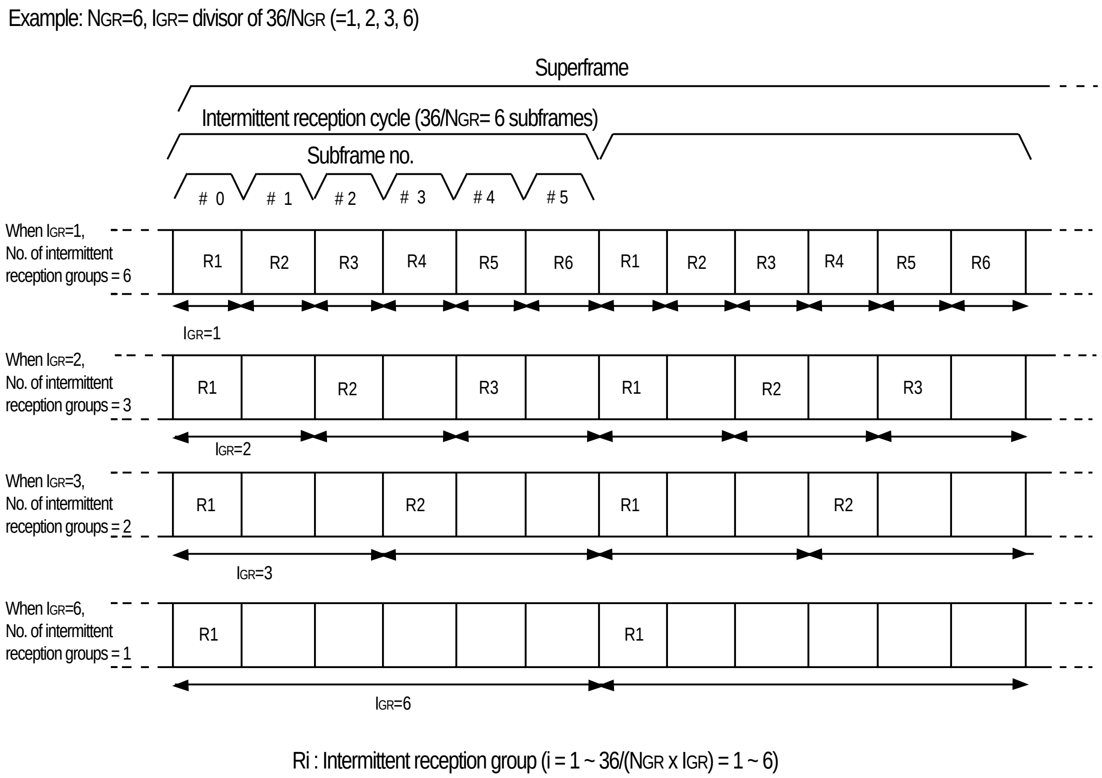


Fig. 4.1.10.2-6 : Detailed examples of intermittent reception groups

4.1.10.2.2.2 Transmission and reception method for the mobile station
4.1.10.2.2.2.1 Low-speed transmission

(1) Transmission method

When there is information to be transmitted, the mobile station starts transmission through the specified UPCH functional channel after random access control (see 4.1.13.1.2) from any subframe available. Fig. 4.1.10.2-7 is an operation example.

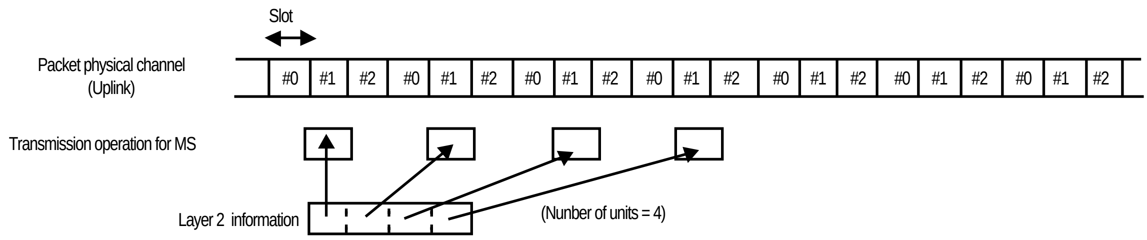


Fig. 4.1.10.2-7 Low-speed transmission operation

(2) Reception method

The mobile station performs reception from the specified UPCH functional channel as defined below.

i) Continuous reception
This is the type of reception by which the mobile station receives all subframes (refer to Fig. 4.1.10.2-8).

ii) Intermittent reception
This is the type of reception by which the mobile station receives the subframes at a timing of one of the intermittent signal transmission start timings and receives at the common signal transmission start timing (Refer to Fig. 4.1.10.2-9)

iii) Superframe intermittent reception
This is the type of reception by which the mobile station receives the designated paging notification group out of the paging signal transmission start timings for each superframe. Also, the mobile station receives at the common signal transmission start timing when so instructed by the base station (refer to Fig. 4.1.10.2-10).

iv) Hyperframe intermittent reception
This is the type of reception by which the mobile station receives the designated paging notification group out of the paging signal transmission start timings of the designated superframe in the hyper frame. Also the mobile station receives at the common signal transmission start timing when so instructed by the base station (refer to Fig. 4.1.10.2-11).

The mobile station performs continuous reception when activating the packet physical channel or changing the reception methods.

When a mobile station which is set for intermittent reception, superframe intermittent reception or hyperframe intermittent reception receives a head unit in the subframe to be received, the mobile station analyzes the address field of the LAPDM frame contained in the unit. If the mobile station's MSI, SMSI or Group MSI is set in the address field, the mobile station performs continuous reception until receiving the end unit. If the address field spans two units, the mobile station needs to analyze also the subsequent unit.

The mobile station cannot perform hyperframe intermittent reception unless it has received at least one idle unit after frame synchronization. However, the mobile station can perform superframe intermittent reception without receiving an idle unit.

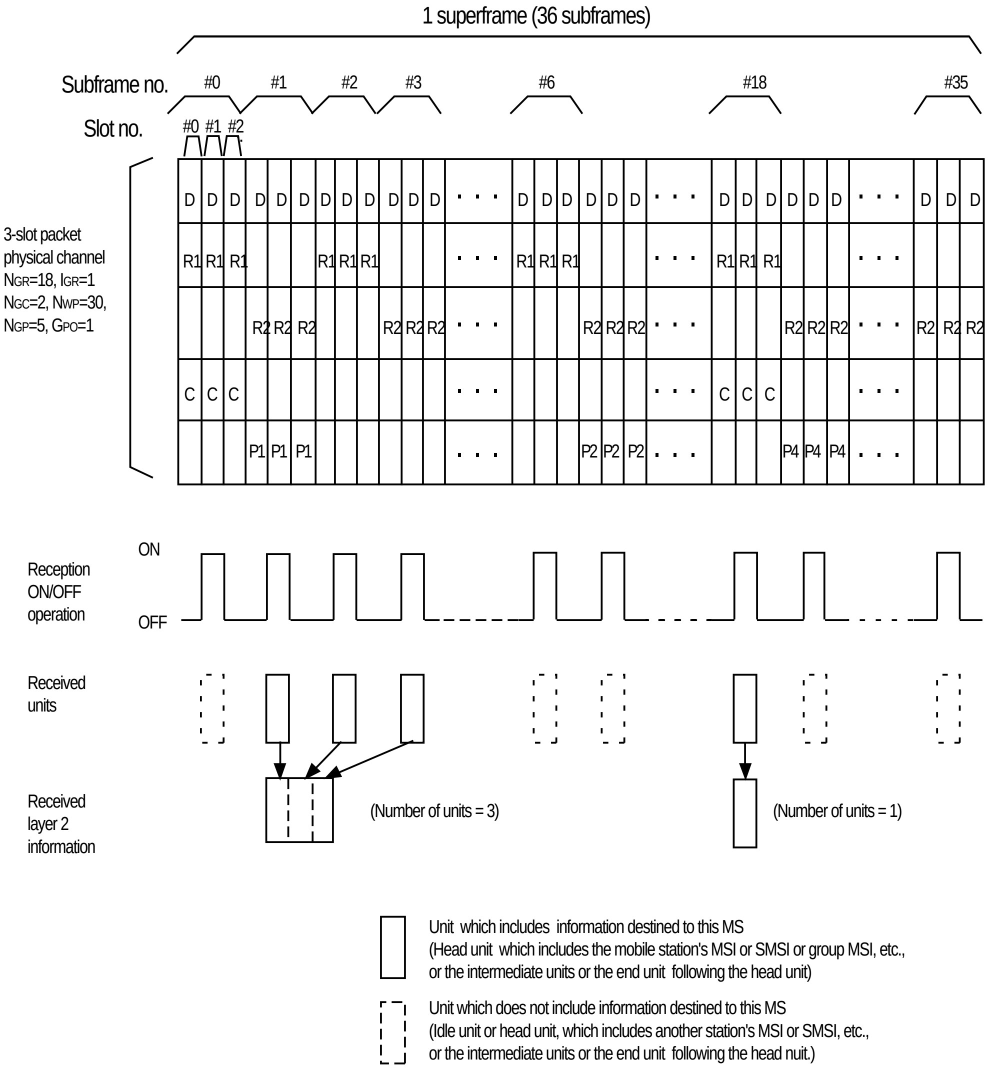
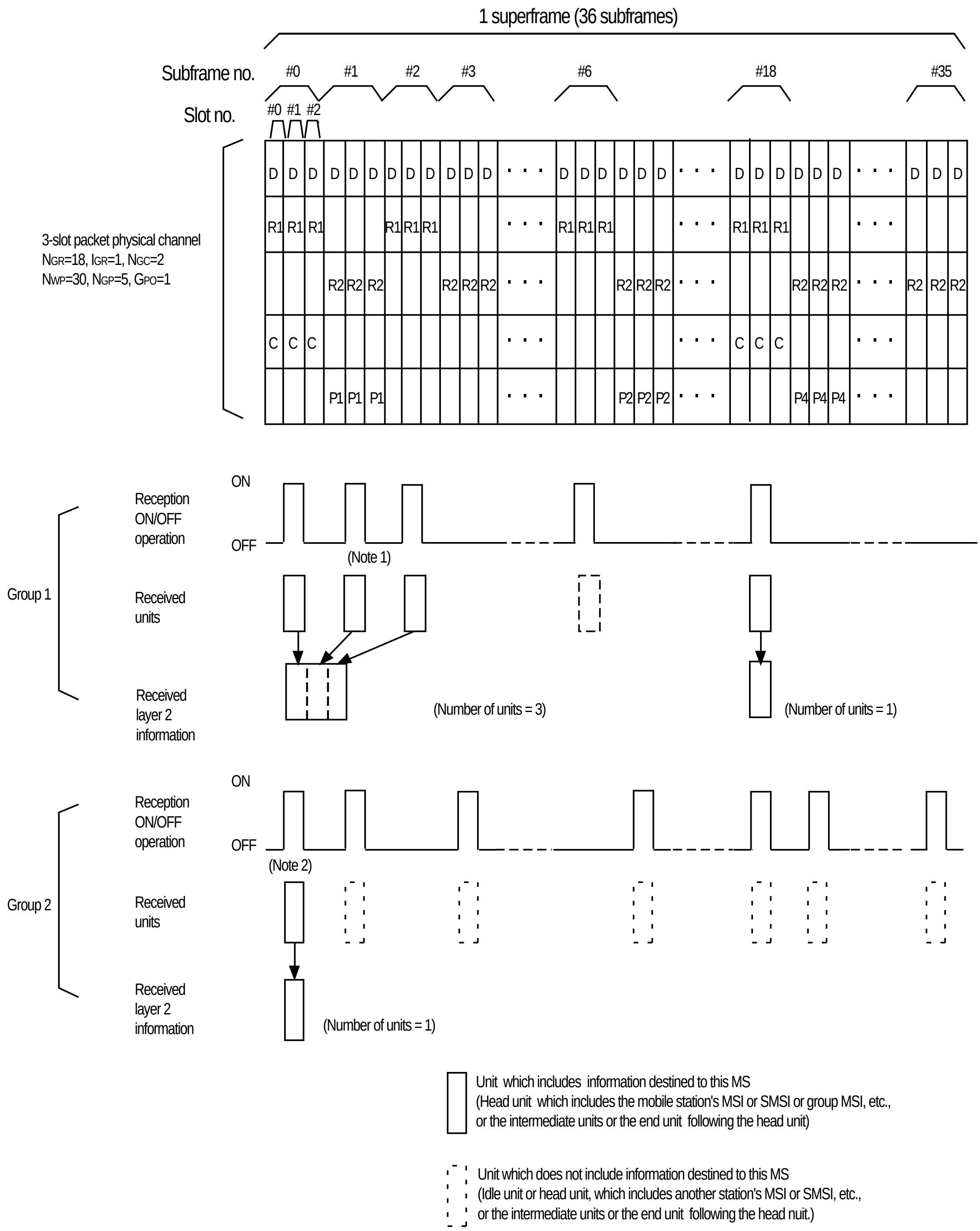


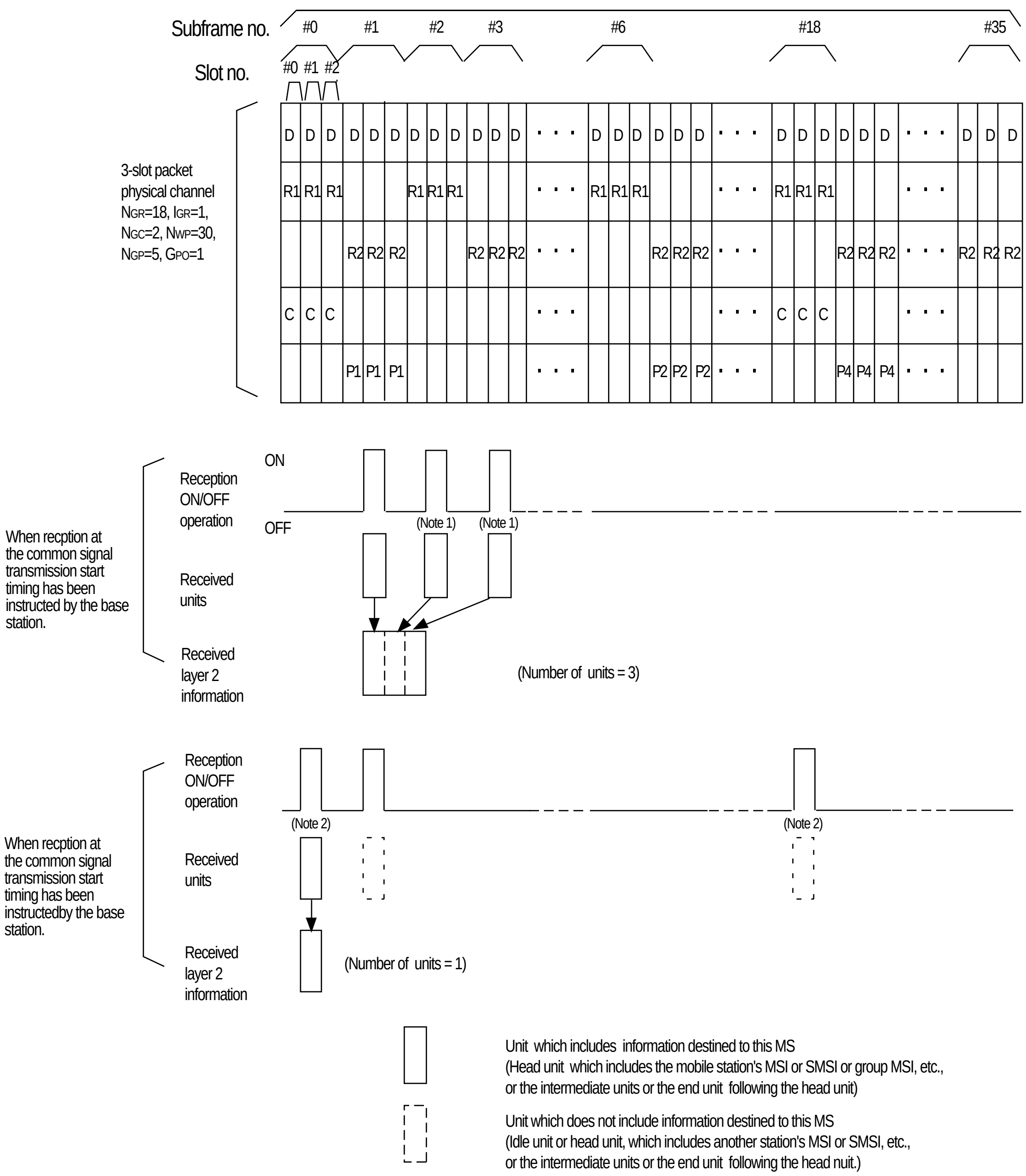
Fig. 4.1.10.2-8 : Example of continuous reception during low-speed transmission (reception of slot #1)



Note 1 : When the mobile station receives the head unit which includes information destined to the own mobile station by the intermittent reception group, the mobile station performs continuous reception until it receives the end unit.

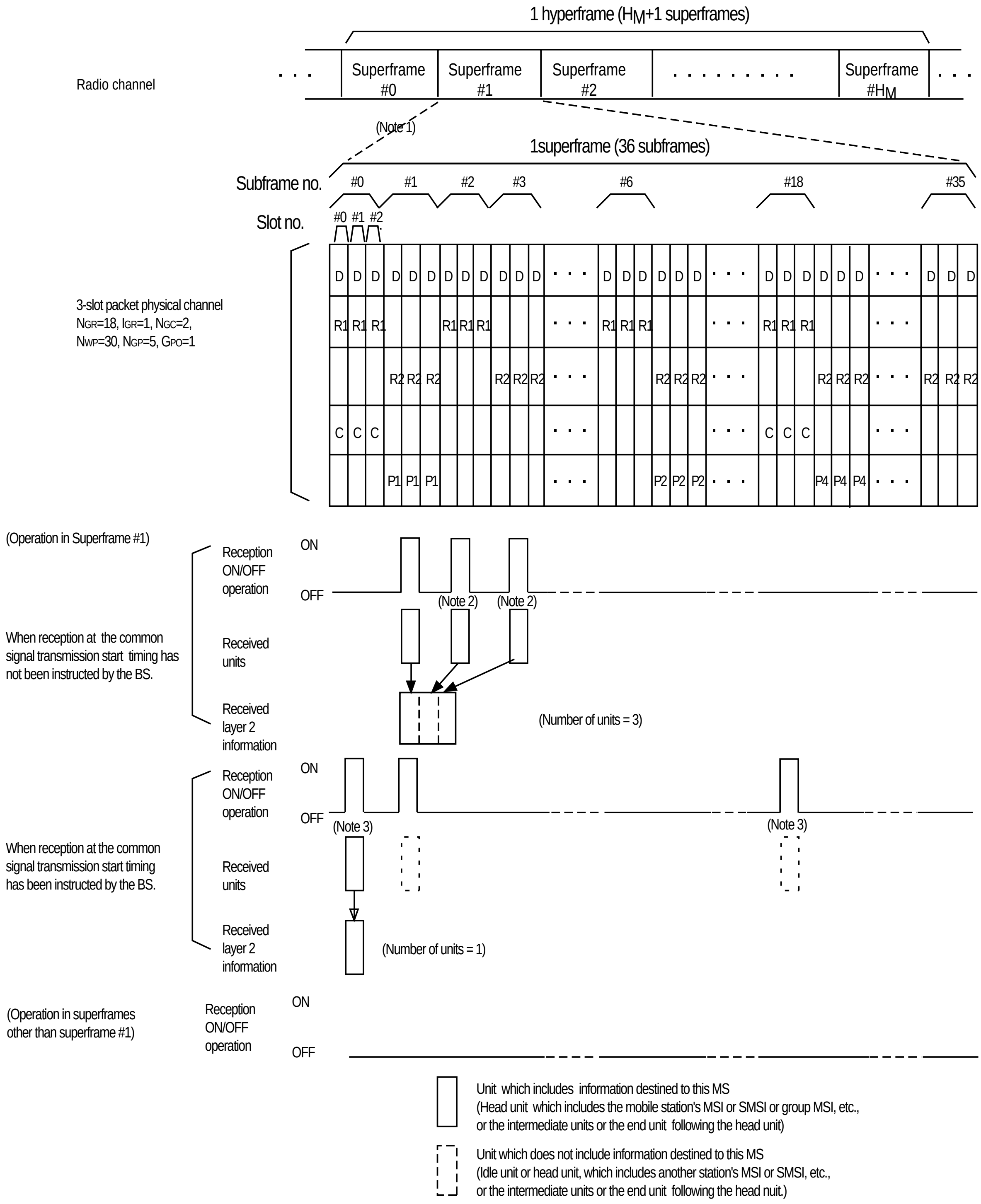
Note 2 : The mobile station receives at the common signal transmission timing along with the intermittent reception group.

Fig. 4.1.10.2-9 : Example of intermittent reception during low-speed transmission (reception of slot #1)



Note 1 : When the mobile station receives the head unit which includes information destined to the own mobile station by the intermittent reception group, the mobile station performs for continuous reception until it receives the end unit.
Note 2 : The mobile station receives at the common signal transmission timing along with the intermittent reception group.

Fig. 4.1.10.2-10 : Example of superframe intermittent reception during low-speed transmission (reception of slot #1)



Note 1 : The structure of superframes is identical.

Note 2 : When the mobile station receives the head unit which includes the information destined to the own mobile station by the intermittent reception group, the mobile station performs continuous reception untill it receives the end unit.

Note 3 : The mobile station receives at the common signal transmission timing along with intermittent reception groups.

Fig. 4.1.10.2-11 : Example of hyperframe intermittent reception during low-speed transmission (reception of slot #1 and superframe #1)

4.1.10.2.2.2.2 High-speed transmission

(1) Transmission method

When there is information to be transmitted, the mobile station starts transmission after random access control (see 4.1.13.1.2) from any subframe available. Fig. 4.1.10.2-12 is an operation example.

The mobile station transmits the layer 2 information in parallel through at maximum the number of UPCH functional channels which compose the packet physical channel.

The mobile station layer 1, in order to ensure the signal order of the transmitted layer 2 information, starts transmission of the subsequent layer 2 information after the random access of the layer 2 information to be first sent has succeeded and transmission of the head unit has started.

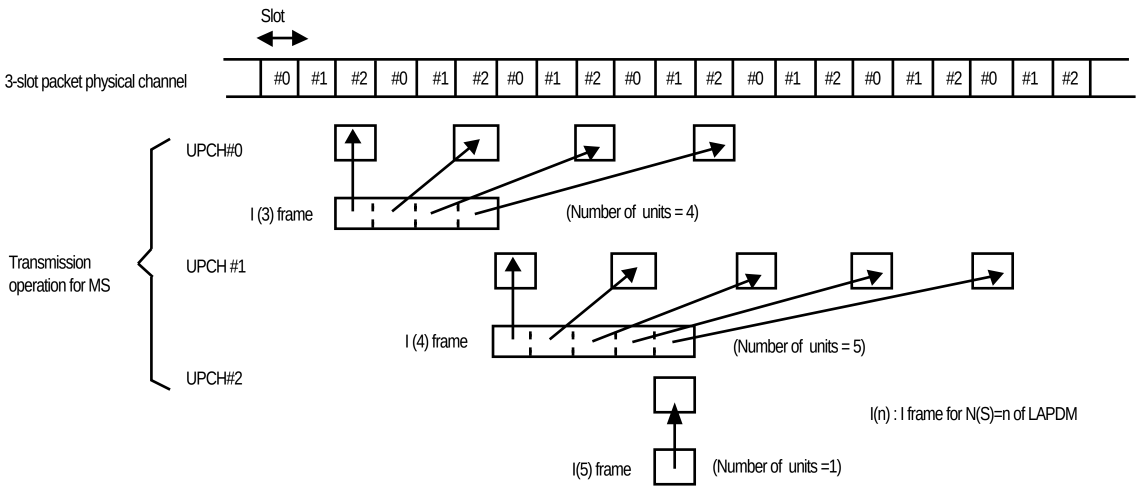


Fig. 4.1.10.2-12 : Operation of the MS during high-speed transmission

(2) Reception method

The reception methods when the mobile station performs reception from all of UPCH functional channels are defined as follows.

i) Continuous reception

This is the type of reception by which the mobile station receives all subframes (continuous signal transmission timing) (refer to Fig. 4.1.10.2-13).

ii) Intermittent reception

This is the type of reception by which the mobile station receives the subframes at a timing of one of the intermittent reception groups at the intermittent signal transmission start timings and at the common signal transmission start timing (refer to Fig. 4.1.10.2-14).

Also, the reception methods when the mobile station performs reception from the specified UPCH functional channel, are defined as follows.

iii) Superframe intermittent reception

This is the type of reception by which the mobile station receives the designated paging nofication group out of the paging signal transmission start timings for each superframe. At the same time, the mobile station receives at the common signal transmission start timing when so instructed by the base station (refer to Fig. 4.1.10.2-15).

iv) Hyperframe intermittent reception

This is the type of reception by which the mobile station receives the designated paging notification group out of the paging signal transmission start timings of the designated superframe in a hyperframe. At the same time the mobile station receives at the common signal transmission start timing when so instructed by the base station (refer to Fig. 4.1.10.2-16).

The mobile station performs continuous reception when activating the packet physical channel or when changing the reception methods.

When a mobile station which is set for intermittent reception, superframe intermittent reception or hyperframe intermittent reception receives a head unit in the subframes to be received, the mobile station analyzes the address field of the LAPDM frame contained in the unit. If the mobile station's MSI, SMSI or Group MSI is set in the address field, the mobile station performs continuous reception until receiving the end unit. If the address field spans two units, the mobile station needs to analyze also the subsequent unit.

The mobile station receives the layer 2 information in parallel from at maximum the number of UPCH functional channels which compose the packet physical channel. In order to ensure the signal order of the layer 2 information frames received, the layer 1 buffers the succeeding layer 2 information, the reception of which has been started after but completed before the preceding layer 2 information so that the layer 2 information frames are sent to the layer 2 in the order of the starting of reception. Fig. 4.1.10.2-17 shows an example of the reception operation.

The mobile station cannot perform hyperframe intermittent reception unless it has received at least one idle unit after frame synchronization. However, the mobile station can perform superframe intermittent reception without receiving an idle unit.

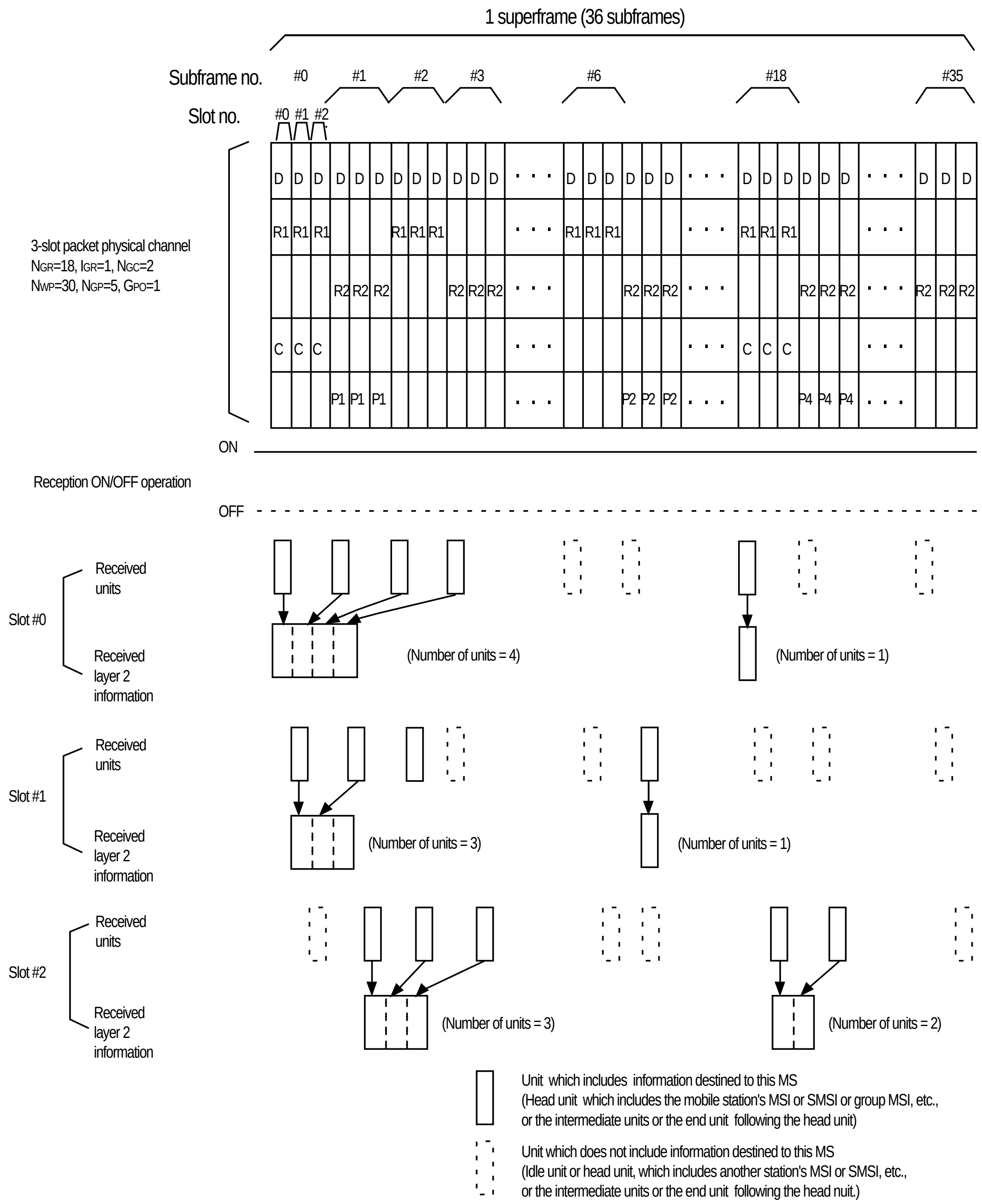
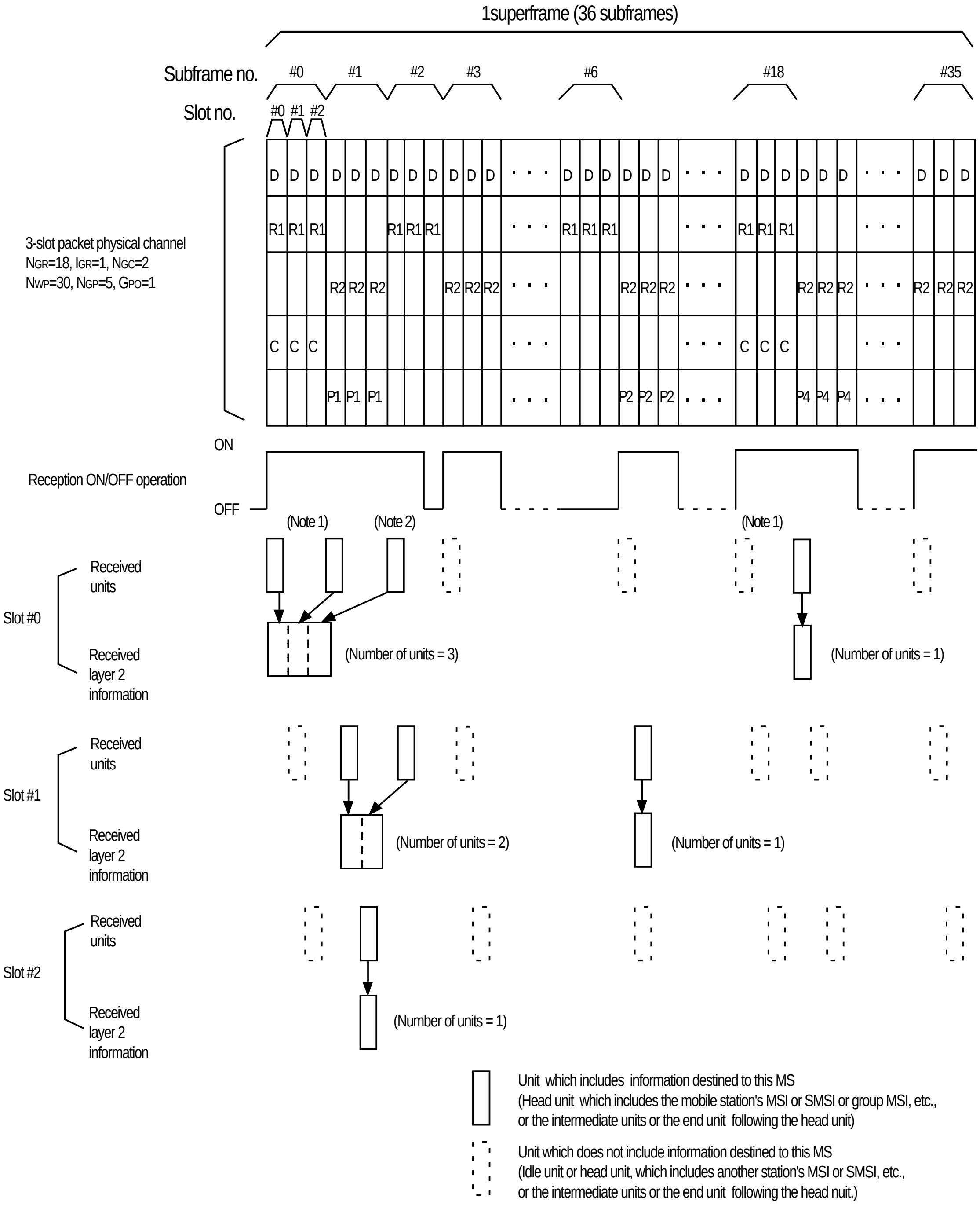


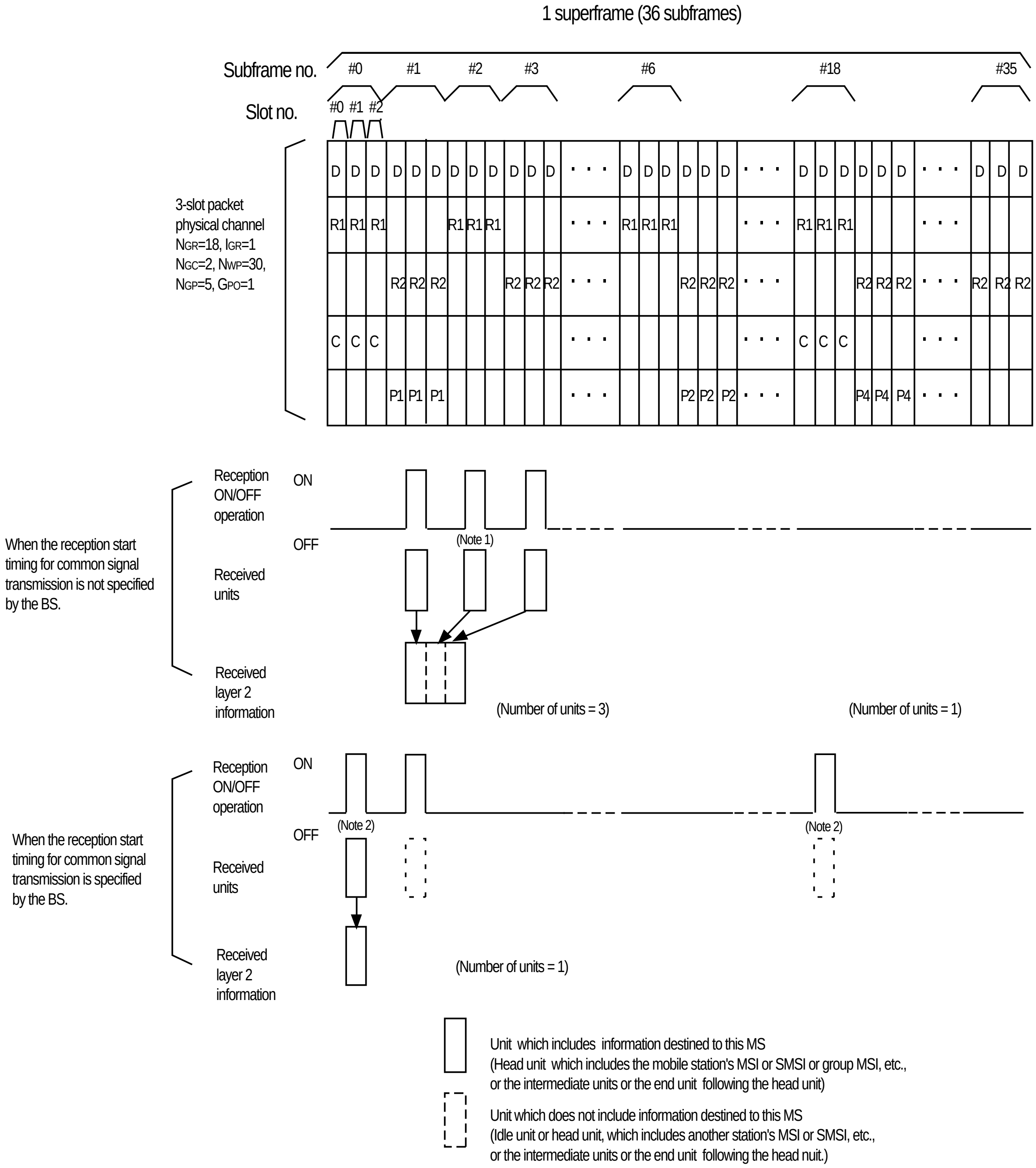
Fig. 4.1.10.2-13 : Example of continuous reception during high-speed transmission



Note 1 : The mobile station receives at the common signal transmission timing along with the intermittent reception group.

Note 2 : When the mobile station receives the head unit which includes information destined to the own mobile station by the intermittent reception group, the mobile station performs continuous reception until it receives the end unit.

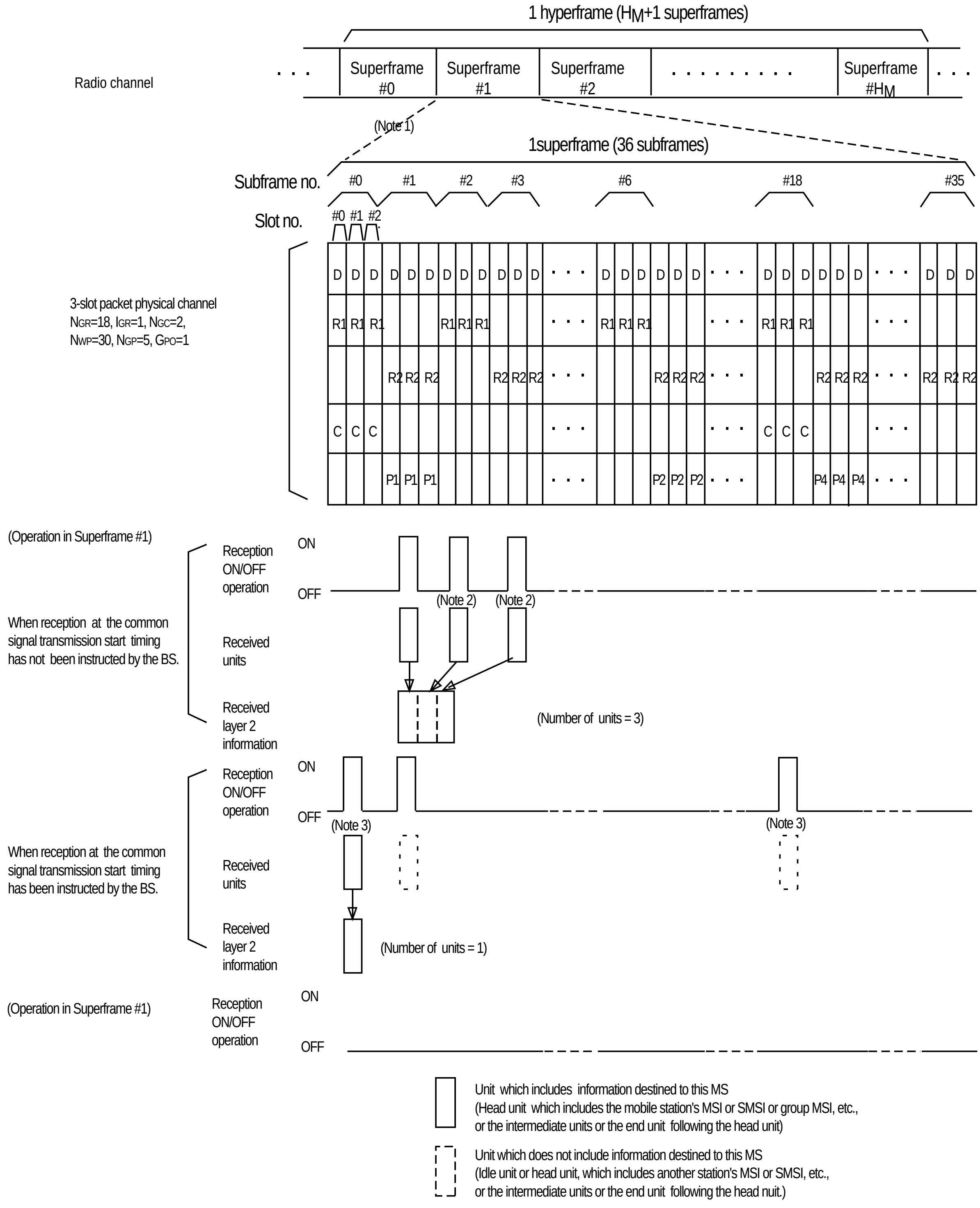
Fig. 4.1.10.2-14 : Example of intermittent reception during high-speed transmission (reception of 2nd intermittent reception group)



Note 1 : When the mobile station receives the head unit which includes information destined to the own mobile station by the intermittent reception group, the mobile station performs continuous reception until it receives the end unit.

Note 2 : The mobile station receives at the common signal transmission timing along with the intermittent reception group.

Fig. 4.1.10.2-15 : Example of intermittent reception of superframes during high-speed transmission (reception of slot #1)



Note 1 : The structure of superframes is identical.
Note 2 : When the mobile station receives the head unit which includes the information destined to the own mobile station by the intermittent reception group, the mobile station performs continuous reception untill it receives the end unit.
Note 3 : The mobile station receives at the common signal transmission timing along with intermittent reception groups.

Fig. 4.1.10.2-16 : Example of intermittent reception of hyperframes during high-speed transmission (reception of slot #1 and superframe #1)

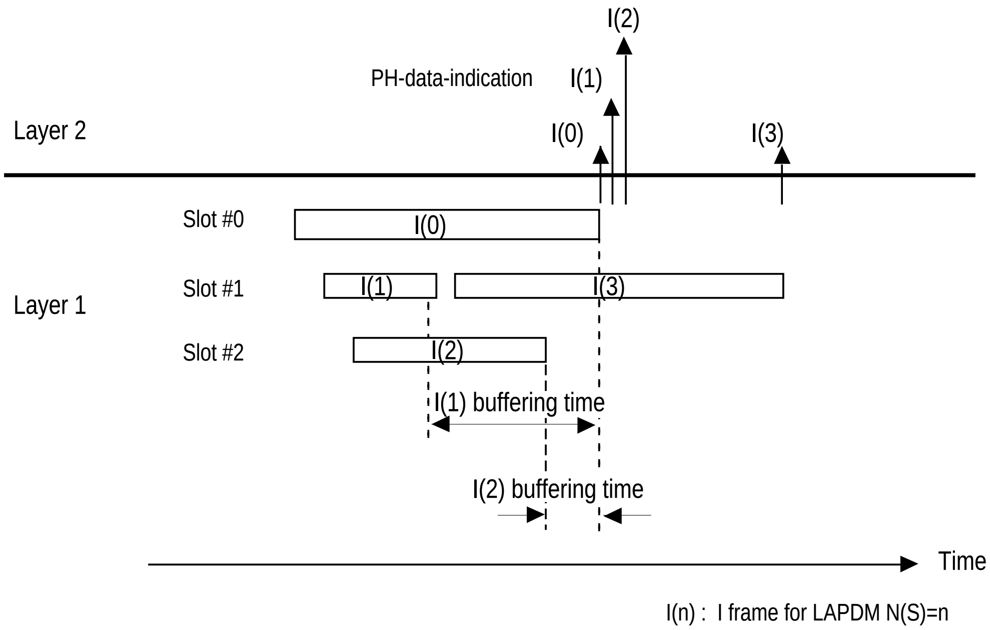


Fig. 4.1.10.2-17 : Example of reception for the multiple slot packet physical channel (3-slot)

4.1.10.2.2.3 Transmission and reception method for the base station

(1) Transmission method

The base station transmits the layer 2 information according to the reception method for each mobile station, which has been decided by the negotiation of transmission / reception methods described in 4.1.10.2.2.4.

The base station transmits the layer 2 information in parallel through at maximum the number of UPCH functional channels which compose the packet physical channel. In order to ensure the signal order of the layer 2 information to be transmitted, the layer 1 of the base station starts transmitting the succeeding layer 2 information after having started the transmission of the head unit of the preceding layer 2 information. If there is no information to be transmitted, the base station transmits idle units through the slots which compose the packet physical channel. Fig. 4.1.10.2-18 shows an example of the transmission operation.

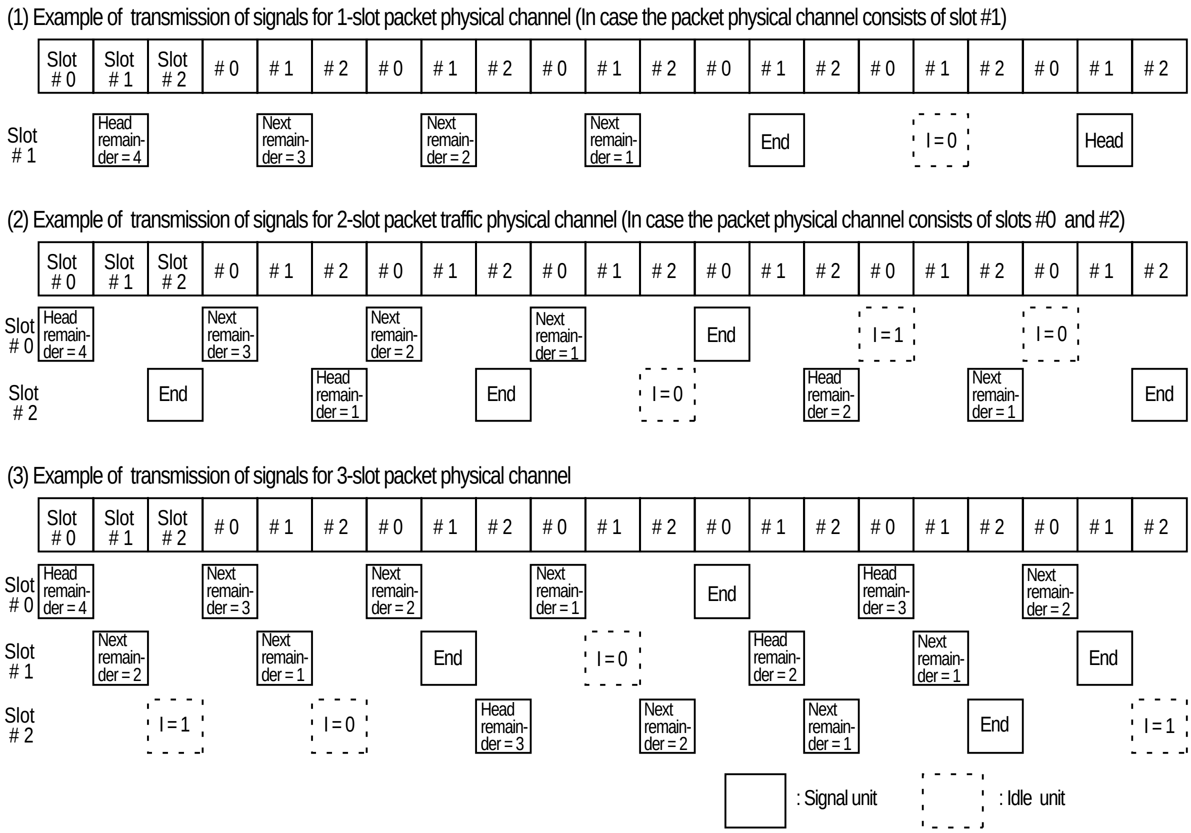


Fig. 4.1.10.2-18 : Example of signal transmission

(2) Reception method

The base station receives all UPCH functional channels composing the packet physical channel. The base station receives the layer 2 information in parallel from at maximum the number of UPCH functional channels which compose the packet physical channel. In order to ensure the sequence order of the layer 2 information frames, the layer 1 buffers the succeeding layer 2 information, the reception of which has been started after but completed before the preceding layer 2 information so that the layer 2 information frames shall be sent to the layer 2 in the order that reception has started. Fig.4.1.10.2-19 shows an example of the reception operation.

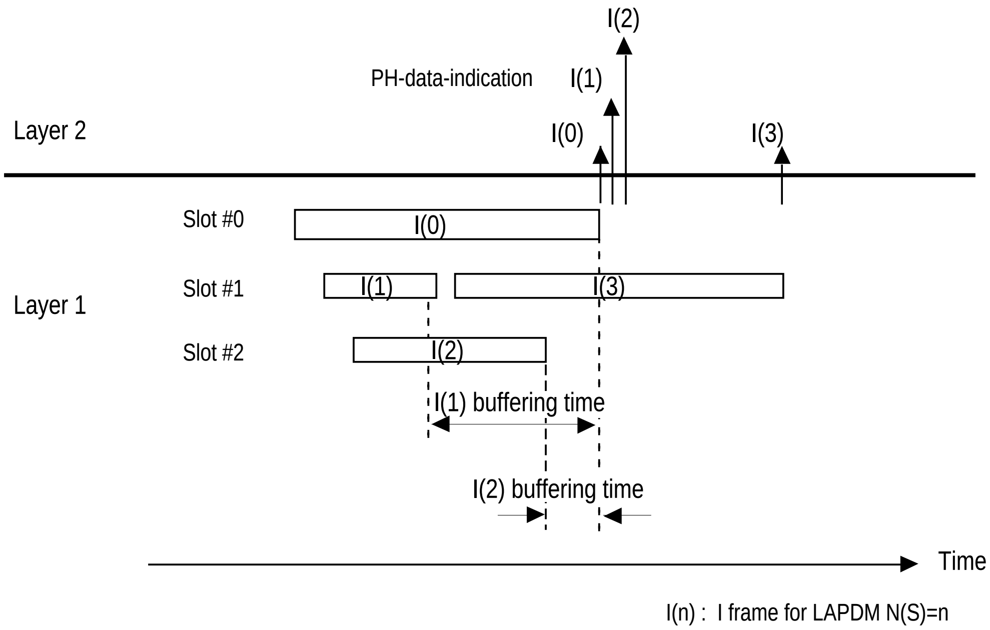


Fig. 4.1.10.2-19 Reception operation for a multiple-slot packet physical channel (3-slot)

4.1.10.2.2.4 Negotiation of transmission/reception methods

The mobile station and the base station perform negotiation of transmission/reception methods using the layer 3 procedure.

The mobile station transmits the layer 3 message "Packet Communication Registration Request" or "Packet Channel Registration Request" to the base station to request the desired transmission/reception method after activating the packet physical channel or when changing the reception methods. When the base station accepts the reguest of the mobile station, the base station transmits the layer 3 message "Packet Communication Registration Response" or "Packet Channel Registration Response" to acknowledge the mobile station that the requested transmission/ reception method is accepted. When the base station rejects the request of the mobile station, it transmits the layer 3 message "Packet Communication Registration Reject" or "Packet Channel Registration Reject" to the mobile station to respond that the respond was rejected.

During negotiation, described above the mobile station transmits / receives the layer 2 information using low-speed continuous reception as the transmission/reception methods. And the base station determines that the mobile station uses the UPCH functional channel, through which the base station has received the layer 3 massage "Packet Communication Registration Reguest" or "Packet channel Registration Reguest" and is in low-speed continuous reception, and the base station transmits/receives the layer 2 information for negotiating of the transmission/reception methods using the UPCH functional channel.

4.1.10.3 Channel structure designation

4.1.10.3.1 Control physical channel

The BCCH shall broadcast information on control physical channel structure to mobile stations in the cell. The mobile stations determine the control physical channel structure based on this information and information which has been stored in the mobile station.

The information broadcast on the BCCH and information stored in the mobile station consists of the following:

(1) Broadcast information

A_B	:	Number of BCCH slots
A_{S1}	:	Number of SCCH slots following the BCCH
A_P	:	Number of PCH slots per group
A_{S2}	:	Number of SCCH slots following the PCH
N_p	:	Number of PCH groups divided within one superframe
N_c	:	Number of radio channels used for control within a cell
F_1, ..., F_{NC}	:	Physical channel codes for control

(2) Information stored in the mobile station (*)

n : The lower 2 octets of mobile station identifier (MSI) in decimal expression.

Tables for correspondence between the abbreviated codes and physical channels numbers (frequencies and slots).

* : The information stored in a mobile station shall also be memorized in the network side.

4.1.10.3.2 Packet physical channel

Information on the packet physical channel structure is notified to the mobile station by the BCCH of the control physical channel in the same cell, the idle unit in the UPCH of the packet physical channel or the layer 3 signal. The mobile station determines the packet physical channel structure based on this information and information which has been stored in the mobile station.

The information notified by the base station and the information stored in the mobile station consist of the following:

(1) Information on the packet physical channel configuration given by the Broadcast Information, Zone Information Notification, Packet System Information Notification or Packet Channel Handover Request.

N_{PC} :	Number of packet physical channels in the cell (0-9) (the sum of packet physical channels in all radio channels in the cell)
N_{GR} :	Number of intermittent signal transmission start timings of one intermittent reception group ($N_{GR} \geqq 1$)
I_{GR} :	Subframe interval with which intermittent reception groups are separated (divisor of $36/N_{GR}$)
N_{WP} :	Number of subframes for allocating paging notification groups in one superframe (multiple of N_{GP})

N_{GP} : Number of paging notification groups in N_{WP} ($N_{GP} \geqq 1$)
G_{PO} : Top subframe number of the 1st paging notification group
N_{GC} : Number of common information notification transmission start timings in one superframe ($N_{GC} \geqq 1$)
F_1 ... F_{NPC} : Alignment of the information elements for packet physical channel (frequency code, slot number, color code, scramble code and channels restriction information) obtained from the Broadcast Information, Zone Information Notification, Packet System Information Notification or Packet Channel Handover Request is specified by F_1, F_2.....F_{NPC}, in this order from the beginning. However, if packet physical channels are indicated by including "Number of extended channels" in the "Zone Information Notification" or "Packet Channel Handover Request" message, the "Number of extended channels" is defined as Npc and only the channels indicated by the "Number of extended channels" are numbered sequentially F_1, F_2.....F_{NPC} from the beginning to apply the algorithm defined in this section. In the case where channel selection failed, the Npc included in the "Packet Channel Structure Information" is specified as Npc and only the packet physical channels indicated by Npc are numbered sequentially F_1, F_2.....F_{NPC} from the beginning to apply the algorithm defined in this section .
N_{PS} : Number of UPCH functional channels on a packet physical channel (calculated based on the slot number assigned to the packet physical channel for each F_1.....F_{NPC}.)

(2) Information stored in the mobile station (*)

n : The value of the lower 2 octets of the mobile station identitfier (MSI) expressed in decimal.
A table listing the correspondence between shortened codes and physical channel numbers (frequency, slot)

* The information stored in the mobile station shall also be stored on the network.

(3) Information obtained from the idle unit of the UPCH in the packet physical channel

H_M : Maximum value of the superframe number of the received radio channel
H_m : Number of superframes in which the received idle unit exists.

(4) N_{AV1} - N_{AV3} : Number of usable packet physical channels in a cell ($\leqq N_{PC}$)

Usable packet physical channels are defined as channels notified from the base station, excluding those which cannot be selected due to any restriction and those which are judged by the mobile station to be incapable of communication for other reasons (detection of radiowave cut-off, etc.). The mobile station selects a channel for communication from the usable packet physical channels.That is, in the flow charts in Fig. 4.1.10.4-1 and Fig. 4.1.10.4-2, the MS selects a channel from N_{AV} channels which exclude channels in 100% restriction to the MS group in which the MS belongs, then if the selected channel can not be used due to insufficient radio condition, due to less than 100% restriction or due to non-supporting frequency band, the MS reselects a channel from N_{AV} channels excluding those channels.

$N_{AV\,1}$ is defined as the number of usable channels from among the 1-slot packet physical channels, $N_{AV\,2}$ is defined as the number of usable channels from among the 2-slot packet physical channels, and $N_{AV\,3}$ is defined as the number of usable channels from among the 3-slot packet physical channels. Examples are shown in Fig. 4.1.10.3-1

(5) N_{AVF} : Number of usable UPCH functional channels within the cell

Usable UPCH functional channels are defined as functional channels notified by the base station, excluding those which cannot be selected due to some restrictions and those which belong to the packet physical channels which are judged by the mobile station to be incapable of communication for other reasons (i.e., detection of radio wave cutoff,etc.,). In addition, N_{AVF} shall be the sum of the function channels which can be used.

(6) PF_1, PF_2. • • • PF_{NAVF}

From among channels F_1 to F_{NPC} excluding packet communication physical channels which cannot be used, packet physical channels are arranged from the top as PF_1, PF_2 • • • PF_{NAVF} in the order of the notified packet physical channels array for each UPCH functional channel. Note that for packet cammunication physical channels consisting of multiple UPCH functional channels, the packet physical channels shall be numbered in ascending slot number order.

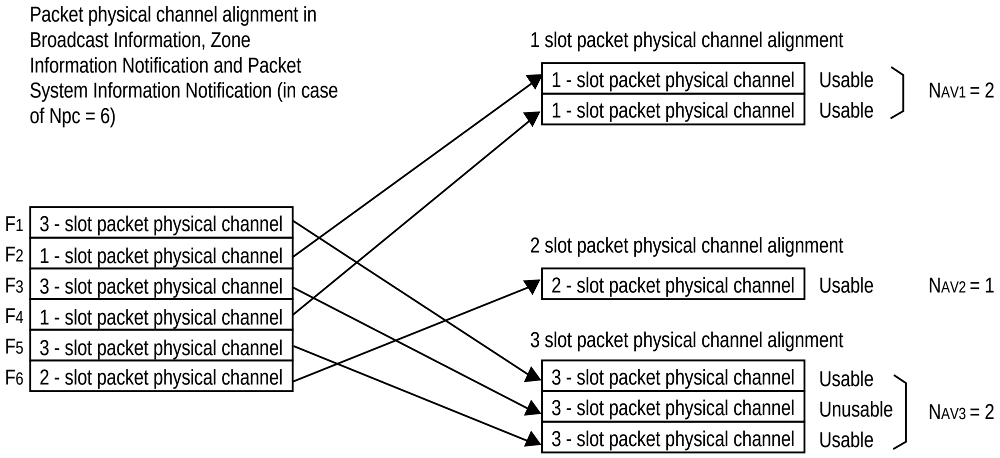


Fig. 4.1.10.3-1 Example for N_{AV1}~N_{AV3}

4.1.10.4 Channel structure determination method

4.1.10.4 1 Control physical channel

[STEP1] Determining termination groups

With BCCH reception of the Perch Channel, the radio channel position number IF, and the PCH group number I_p, used are calculated as follows:

$n' = (n - 1) \bmod (N_p \times N_c) + 1$
$I_F = (n' - 1) \bmod N_c + 1$
$I_p = [(n' - 1)/N_c] + 1$

Note 1 : $n-1 = 2^{16} - 1$ shall be set, if $n = 0$.
Note 2 : [X] represents the maximum integer which does not exceed X.

The mobile station switches to the control radio channel represented by code F_{IF} (which includes the PCH groups of itself) and enters the standby state.

[STEP2] Determining slots for individual channels

Slots on the radio channel F_{IF} are assigned as below.

BCCH : Slots 1 to A_B

PCH : Slots P_{IT} + 1 to $P_{IT} + A_p$
In this instance $P_{IT} = A_B + A_{S1} + (I_P - 1)(A_P + A_{S2})$

SCCH :
- Slots A_B + 1 to $A_B + A_{SI}$
- Slots $P_X + A_P + 1$ to $P_X + A_P + A_{S2}$
  In this instance $P_X = A_B + A_{S1} + (X-1)(A_P+A_{S2})$
  $X=1,2....,N_p$
- $A_B + A_{S1} + (A_P + A_{S2}) N_P + 1$ to A_W slot

4.1.10.4.2 Packet physical channel

Packet physical channels, UPCH functional channels, intermittent reception groups, paging notification groups, common signal transmission start timings and superframes to be used are determined by the following procedures depending on the transmission/reception methods.

I_{PF}: Packet physical channel number counted from the head of the alignment, when F_1 to F_{Npc} are grouped for each number of slots, N_{AV1} to N_{AV3}.
S_R: UPCH functional channel number counted from the smallest slot number assigned to the UPCH functional channel.
G_{R0}: Intermittent reception group number
G_{Ri}: Reception subframe number corresponding to the intermittent reception group number
H_R: Superframe number
P_i: Paging notification group number
G_P: Subframe number of the paging notification group
G_{ci}: Subframe number of common signal transmission start timing
I_{PFF}: Number of packet physical channels when counting $F_1 \cdots F_{NPC}$ from the head of the array.
I_{FC}: UPCH functional channel number when counting $PF_1, PF_2 \cdots PF_{NAVF}$ from the head position.

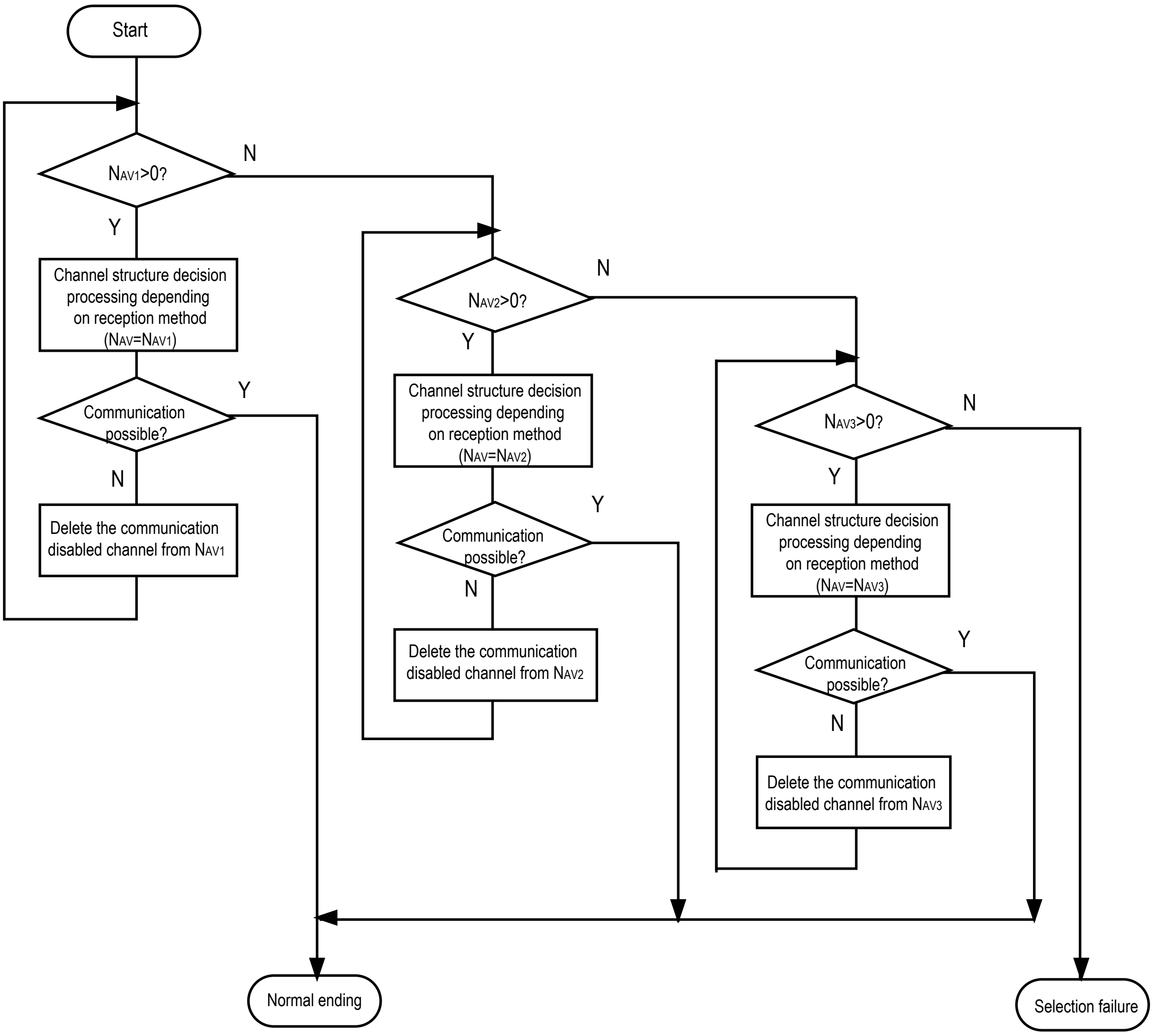
After the MS has decided the reception channel, the group and the timing, the MS decides either "low-speed" or "high-speed" at the end according to the transmission speed negotiated during the active mode registration.
The MS complying with version G or a subsequent version must support both selection algorithm A and B. The MS must perform the selection algorithm B in the network supporting the algorithm B and perform the selection algorithm A in the network which dose not support B.

(1) Low-speed transmission

For low-speed transmission, depending on the contents of the Broadcast Information message, the packet physical channel and functional channel is determined by selecting one of the algorithms listed below.

[Channel selection algorithm 1]
The packet physical channel shall be determined by assigning priority in the order of 1-slot packet physical channels, 2-slot packet physical channels and 3-slot packet physical channel according to Fig. 4.1.10.4-1-1. In addition, the UPCH functional channel, intermittent reception group, paging notification group and common signal transmission start timing shall be determined according to the reception method.

[Channel selection algorithm 2]
After 1-slot packet physical channels, 2-slot packet physical channels and 3-slot packet physical channels are divided into functional channels, the UPCH functional channel and packet physical channel are decided according to Fig. 4.1.10.4-1-2. In addition, the intermittent reception group, paging notification group and the common signal transmission start timing shall be determined according to the reception method.



Note : The conditions of communication possible are
・The pertinent channel is not restricted.
・The pertinent channel is in the usable frequency band.

Fig. 4.1.10.4-1-1 : Packet physical channel selection method during low-speed transmission

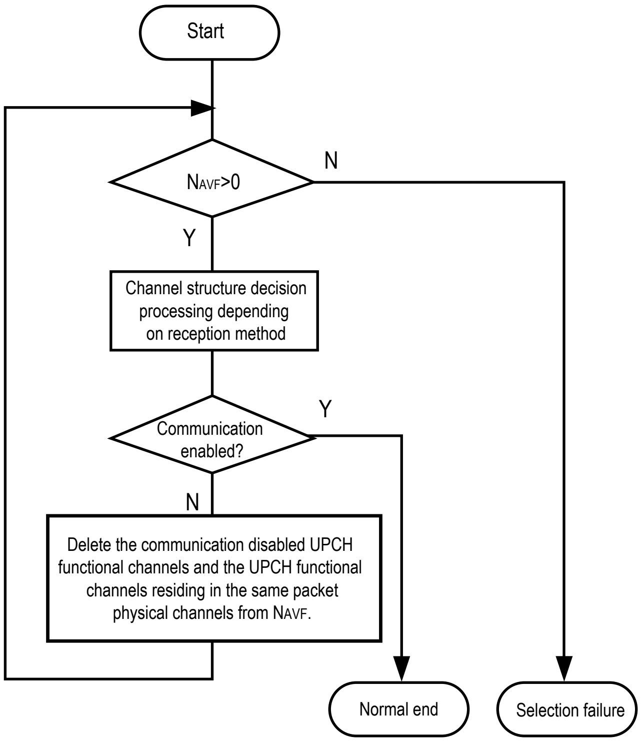


Fig.4.1.10.4-1-2

(a) Channel selection algorithm 1

[Reception group selection algorithm A]

1) Continuous reception

I_{PF} and S_R to be used for the continuous reception are obtained by the following calculations:
$I_{PF} = (n \bmod N_{AV}) + 1$
$S_R = n \bmod N_{PS}$

2) Intermittent reception

I_{PF}, S_R, G_{RO}, G_{Ri}, and G_{Ci} to be used for the intermittent reception are obtained by the following calculations:
$I_{PF} = (n \bmod N_{AV}) + 1$
$S_R = n \bmod N_{PS}$
$G_{RO} = (n \bmod (36/(N_{GR} \times I_{GR}))) \times I_{GR}$
$G_{Ri} = G_{RO} + (36/N_{GR}) \times i$ (i = integer from 0 to (N_{GR}-1))
$G_{Ci} = (36/N_{GC}) \times i$ (i = integer from 0 to (N_{GC}-1))

3) Superframe intermittent reception

I_{PF}, S_R, P_i, G_P, and G_{Ci} to be used for the superframe intermittent reception are obtained by the following calculations:
$I_{PF} = (n \bmod N_{AV}) + 1$
$S_R = n \bmod N_{PS}$
$P_i = (n \bmod N_{GP}) + 1$

$G_P = G_{PO} + (P_i - 1) \times N_{WP}/N_{GP}$
$G_{Ci} = (36/N_{GC}) \times i$ (i = integer from 0 to (N_{GC}-1))

4) Hyperframe intermittent reception

I_{PF}, S_R, H_R, Pi, G_P, and G_{Ci} to be used for the hyperframe intermittent reception are obtained by the following calculations.

$I_{PF} = (n \bmod N_{AV}) + 1$
$S_R = n \bmod N_{PS}$
$H_R = n \bmod (H_M + 1)$
$P_i = (n \bmod N_{GP}) + 1$
$G_P = G_{PO} + (P_i - 1) \times N_{WP}/N_{GP}$
$G_G = (36/N_{GC}) \times i$ (i = integer from 0 to (N_{GC}-1))

[Reception group selection algorithm B]

1) Continuous reception

I_{PF} and S_R to be used for the continuous reception are obtained by the following calculations:
$I_{PF} = (n \bmod N_{AV}) + 1$
$n' = n \text{ div } N_{AV}$
$S_R = n' \bmod N_{PS}$

2) Intermittent reception

I_{PF}, S_R, G_{RO}, G_{Ri}, and G_{Ci} to be used for the Intermittent reception are obtained by the following calculations:
$I_{PF} = (n \bmod N_{AV}) + 1$
$n' = n \text{ div } N_{AV}$
$S_R = n' \bmod N_{PS}$
$n'' = n' \text{ div } N_{PS}$
$G_{RO} = (n'' \bmod (36/(N_{GR} \times I_{GR}))) \times I_{GR}$
$G_{Ri} = G_{RO} + (36/N_{GR}) \times i$ (i = integer from 0 to (N_{GR}-1))
$G_{Ci} = (36/N_{GC}) \times i$ (i = integer from 0 to (N_{GC}-1))

3) Superframe intermittent reception

I_{PF}, S_R, P_i, G_P, and G_{Ci} to be used for the superframe intermittent reception are obtained by the following calculations :
$I_{PF} = (n \bmod N_{AV}) + 1$
$n' = n \text{ div } N_{AV}$
$S_R = n' \bmod N_{PS}$
$n'' = n' \text{ div } N_{PS}$
$P_i = (n'' \bmod N_{GP}) + 1$
$G_P = G_{PO} + (P_i - 1) \times N_{WP}/N_{GP}$
$G_{Ci} = (36/N_{GC}) \times i$ (i = integer from 0 to (N_{GC}-1))

4) Hyperframe intermittent reception

I_{PF}, S_R, H_R, P_i, G_P, and G_{Ci} to be used for the hyperframe intermittent reception are obtained by the following calculations:

I_{PF} = (n mod N_{AV}) + 1
n' = n div N_{AV}
S_R = n' mod N_{PS}
n" = n' div N_{PS}
Pi = (n" mod N_{GP}) + 1
G_P = G_{PO} + (P_i - 1) x N_{WP}/N_{GP}
G_{ci} = (36/N_{GC}) x i   (i = integer from 0 to (N_{GC}-1))
n"' = n" div N_{GP}
H_R = n"' mod (H_M+1)

(b) Channel selection algorithm 2

1) Continuous reception
I_{PFF} and S_R are used for continuous reception and are obtaind by the following calculations:
I_{FC} = (n mod N_{AVF})+1
I_{PFF} : Packet physical channel to which I_{FC} belongs
S_R : Slot number of I_{FC}

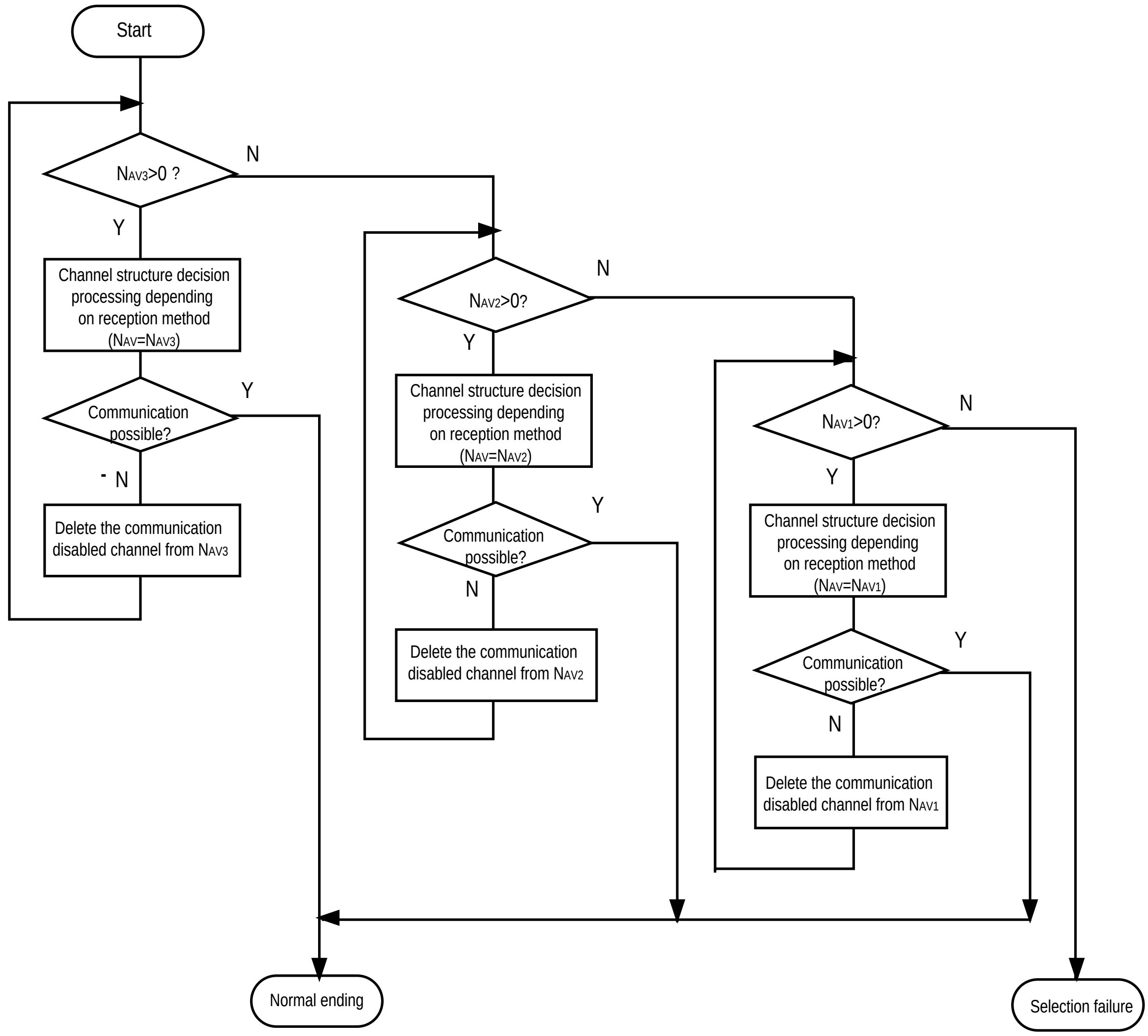
2) Intermittent reception
I_{PFF}, S_R, G_{RO}, G_{Ri} and G_{Ci} are used for intermittent reception and are obtained by the following calculations:
I_{FC} = (n mod N_{AVF}) +1
I_{PFF}: Packet physical channel to which I_{FC} belongs
S_R : Slot number of I_{FC}
n" = n' div N_{AVF}
G_{RO} = (n" mod (36/(N_{GR} x I_{GR}))) x I_{GR}
G_{Ri} = G_{RO} + (36/N_{GR}) x i (i = integer from 0 to (N_{GR} - 1))
G_{Ci} = (36/N_{GC}) x 1   (i = integer from 0 to (N_{GC} -1))

3) Superframe intermittent reception
I_{PFF}, S_R, P_i, G_P, and G_{Ci} are used for the superframe intermittent reception and are obtained by the following calculations:
I_{FC} = (n mod N_{AVF}) +1
I_{PFF} = Packet physical channel to which I_{FC} belongs
S_R : Slot number of I_{FC}
n" = n div N_{AVF}
P_i = (n" mod N_{GP}) +1
G_P = G_{PO} + (P_i - 1) x N_{WP}/N_{GP}
G_{Ci} = (36/N_{GC}) x i   (i = integer from 0 to (N_{GC} -1))

4) Hyperframe intermittent reception
I_{PFF}, S_R, H_R, P_i, G_P, and G_{Ci} are used for the hyperframe intermittent reception and are obtained by the following calculations:
I_{FC} = (n mod N_{AVF}) +1
I_{PFF} = Packet physical channel to which I_{FC} belongs
S_R : Slot number of I_{FC}
n" = n div N_{AVF}
Pi = (n" mod N_{GP}) +1
G_P = G_{PO} + (P_i - 1) x N_{WP}/N_{GP}
G_{Ci} = (36/N_{GC}) x i   (i = integer from 0 to N_{GC} -1)
n"' = n" div N_{GP}
H_R = n"' mod (H_M +1)

(2) High speed transmission

For the high-speed transmission, a priority is given to the type of packet physical channel in the order of 3-slot, 2-slot and 1-slot. Moreover, the UPCH functional channel, intermittent reception group, paging notification group or common signal transmission start timing is determined, depending on the reception method. (Refer to Fig. 4.1.10.4-2.)



Note : The conditions of communication possible are
• The pertinent channel is not restricted
• The pertinent channel is in the usable frequency band

Fig. 4.1.10.4-2 : Packet physical channel selection method during high-speed transmission

[Reception group selection algorithm A]

1) Continuous reception

I_{PF} to be used for the continuous reception is obtained by the following calculation :
$I_{PF} = (n \bmod N_{AV}) + 1$

2) Intermittent reception

I_{PF}, G_{RO}, G_{Ri}, and G_{Ci} to be used for the intermittent reception are obtained by the following calculations:
$I_{PF} = (n \bmod N_{AV}) + 1$
$G_{RO} = (n \bmod (36/(N_{GR} \times I_{GR}))) \times I_{GR}$
$G_{Ri} = G_{RO} + (36/N_{GR}) \times i$ (i = integer from 0 to (N_{GR}-1))
$G_{Ci} = (36/N_{GC}) \times i$ (i = integer from 0 to (N_{GC}-1))

3) Superframe intermittent reception

I_{PF}, S_R, P_i, G_P, and G_{Ci} to be used for the superframe intermittent reception are obtained by the following calculations :
$I_{PF} = (n \bmod N_{AV}) + 1$
$S_R = n \bmod N_{PS}$
$P_i = (n \bmod N_{GP}) + 1$
$G_P = G_{PO} + (P_i - 1) \times N_{WP}/N_{CP}$
$G_{Ci} = (36/N_{GC}) \times i$ (i = integer from 0 to (N_{GC}-1))

4) Hyperframe intermittent reception

I_{PF}, S_R, H_R, P_i, G_P, and G_{Ci} to be used for the hyperframe intermittent reception are obtained by the following calculations :
$I_{PF} = (n \bmod N_{AV}) + 1$
$S_R = n \bmod N_{PS}$
$H_R = n \bmod (H_M + 1)$
$P_i = (n \bmod N_{GP}) + 1$
$G_P = G_{PO} + (P_i - 1) \times N_{WP}/N_{CP}$
$G_{Ci} = (36/N_{GC}) \times i$ (i = integer from 0 to (N_{GC}-1))

[Reception group selection algorithm B]

1) Continuous reception

I_{PF} to be used for the continuous reception is obtained by the following calculations:
$I_{PF} = (n \bmod N_{AV}) + 1$

2) Intermittent reception

I_{PF}, G_{RO}, G_{Ri} , and G_{Ci} to be used for the Intermittent reception are obtained by the following calculations:
$I_{PF} = (n \bmod N_{AV}) + 1$
$n' = n \operatorname{div} N_{AV}$
$n'' = n' \operatorname{div} N_{PS}$
$G_{RO} = (n'' \bmod (36/(N_{GR} \times I_{GR}))) \times I_{GR}$

$G_{Ri} = G_{RO} + (36/N_{GR}) \times i$ (i = integer from 0 to (N_{GR}-1))
$G_{Ci} = (36/N_{GC}) \times i$ (i = integer from 0 to (N_{GC}-1))

3) Superframe intermittent reception

I_{PF}, S_R, P_i, G_P, and G_{Ci} to be used for the superframe intermittent reception are obtained by the following calculations :
$I_{PF} = (n \bmod N_{AV}) + 1$
$n' = n \text{ div } N_{AV}$
$S_R = n' \bmod N_{PS}$
$n'' = n' \text{ div } N_{PS}$
$P_i = (n'' \bmod N_{GP}) + 1$
$G_P = G_{PO} + (P_i - 1) \times N_{WP}/N_{CP}$
$G_{Ci} = (36/N_{GC}) \times i$ (i = integer from 0 to (N_{GC}-1))

4) Hyperframe intermittent reception

I_{PF}, S_R, H_R, P_i, G_P, and G_{Ci} to be used for the hyperframe intermittent reception are obtained by the following calculations:
$I_{PF} = (n \bmod N_{AV}) + 1$
$n' = n \text{ div } N_{AV}$
$S_R = n' \bmod N_{PS}$
$n'' = n' \text{ div } N_{PS}$
$P_i = (n \bmod N_{GP}) + 1$
$G_P = G_{PO} + (P_i - 1) \times N_{WP}/N_{CP}$
$G_{Ci} = (36/N_{GC}) \times i$ (i = integer from 0 to (N_{GC}-1))
$n''' = n'' \text{ div } N_{GP}$
$H_R = n''' \bmod (H_M + 1)$

4.1.11 Procedure for channel Activation/Deactivation

4.1.11.1 Control channels

Layer 1 incorporates a procedure for establishing and releasing the frame synchronization for the common access channel in order to gather the information of the common access channel by the upper layer and to enable the transmission of control information through the common access channel.

4.1.11.1.1 Procedure for activating the common access channel

As the uplink control channel is a common access channel, a fixed link is not set up between the mobile station and the base stations. For this reason, the control channel is constantly maintained in the initializing state.

Base station activates the common access channel in accordance with the procedure in Fig. 4.1.11.1-1

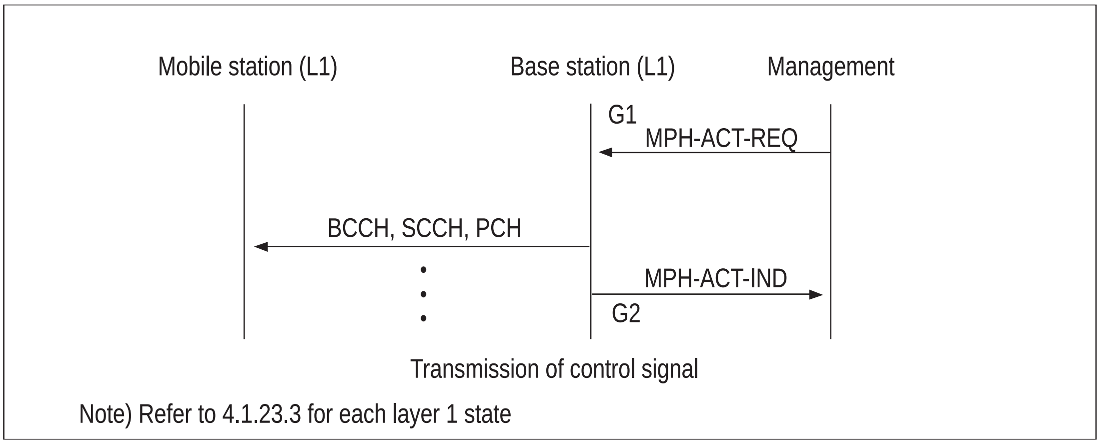


Fig. 4.1.11.1-1 : Procedure for activating the common control channel (at the base station)

When the power is turned on or the station moves into another zone in the standby state or after call terminated, mobile station shall activate the control channel using the procedure shown in Fig. 4.1.11.1-2.

The mobile station first determine the zone which it is in by scanning the memorized perch channel. Following this, the color code is detected and superframe synchronization is attained on the pertinent channel.

In layer 1, the scrambling code is determined from the detected color code and the BCCH is received autonomously. Following this, at Layer 3, the BCCH information is used to identify the channel structure and the group number within the zone, and then the standby state is set on the pertinent channel.

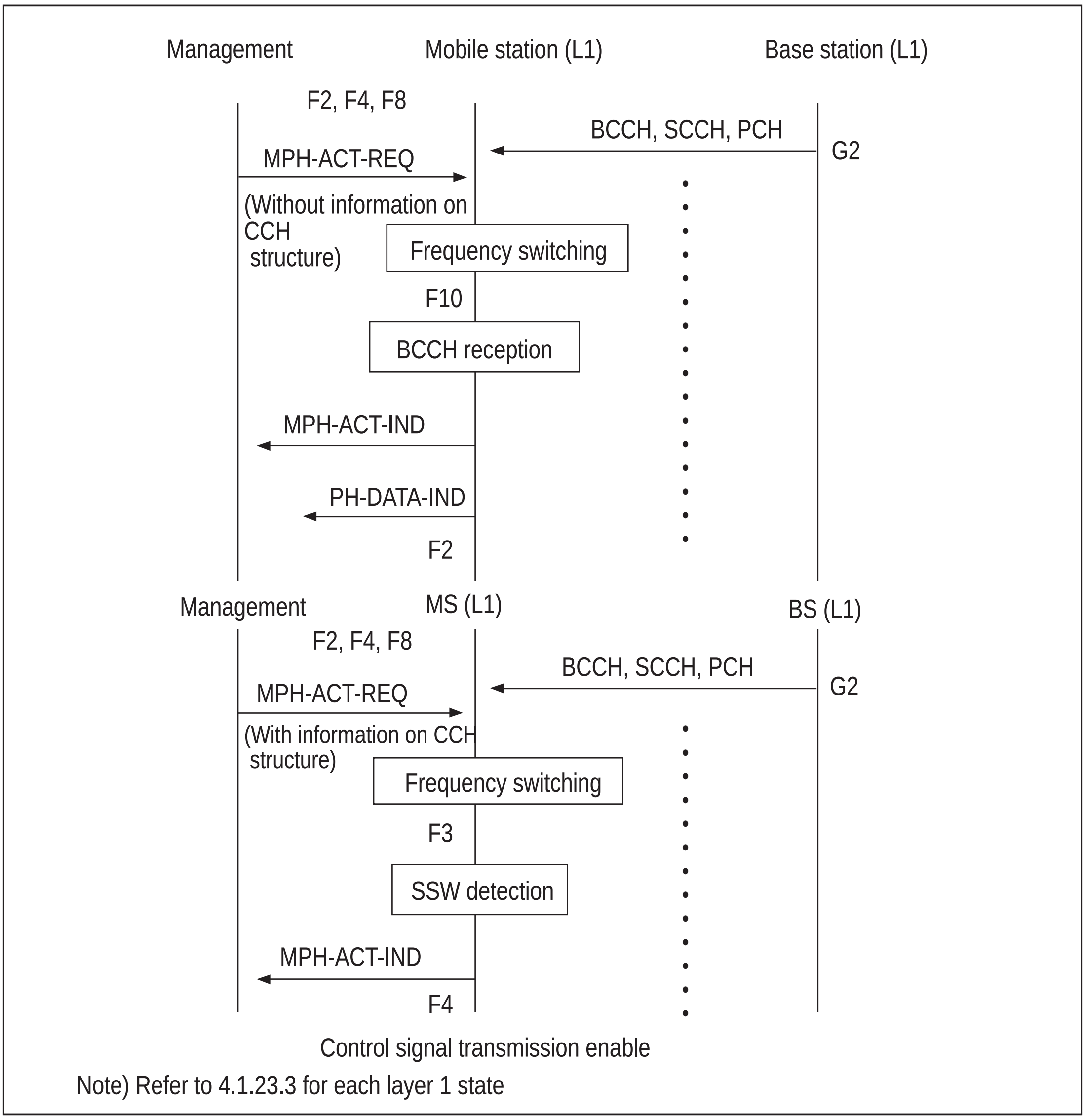


Fig. 4.1.11.1-2 : Procedure for activating the common control channel (at the mobile station)

4.1.11.1.2 Procedure for deactivating the common access channel

For mobile stations, a set procedure is not specified for deactivating the common access channel since it is automatically deactivated when the power is turned off or when a new channel is activated. At the base station, the common access channel is not deactivated normally. However, if it needs to be deactivated to change frequencies and so forth, the procedure shown in Fig. 4.1.11.1-3 is used.

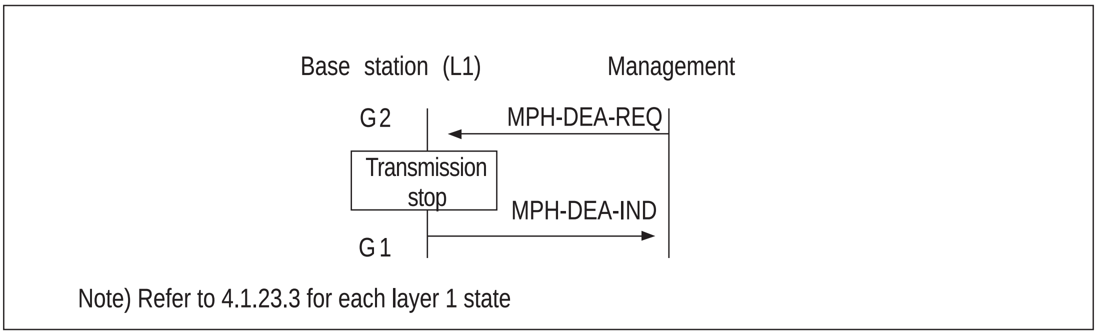


Fig. 4.1.11.1-3 : Procedure for deactivating the common access channel (at the base station)

4.1.11.1.3 Procedure for activating the user packet channel

As the downlink user packet channel is a common access channel, any fixed link is not set up between the mobile station and the base station. Instead, the user packet channel is constantly maintained in the activating state.

The base station activates a user packet channel by the procedure shown in Fig. 4.1.11.1-4 below.

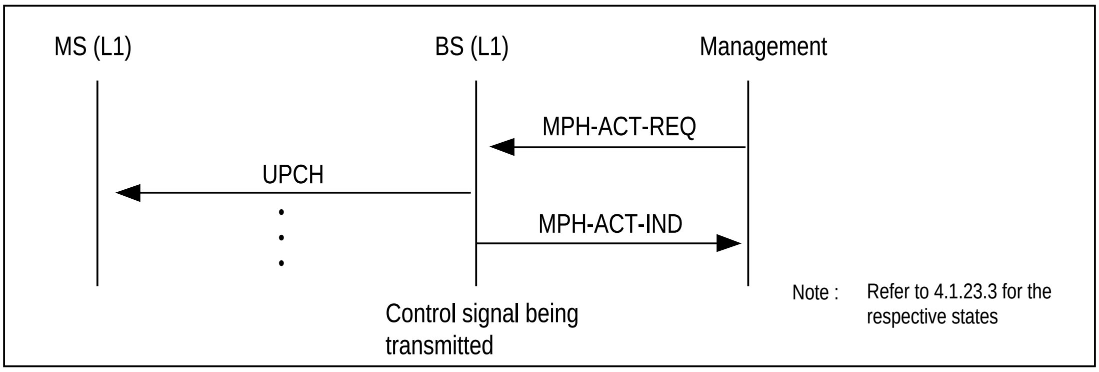


Fig. 4.1.11.1-4 : Procedure for activating the user packet channel (at base station)

The mobile station activates a user packet channel by the procedure shown in Fig. 4.1.11.1-5.
In the layer 1, the color coding/the scramble coding designated by the BCCH are conducted. In the layer 3, it enters the standby state.

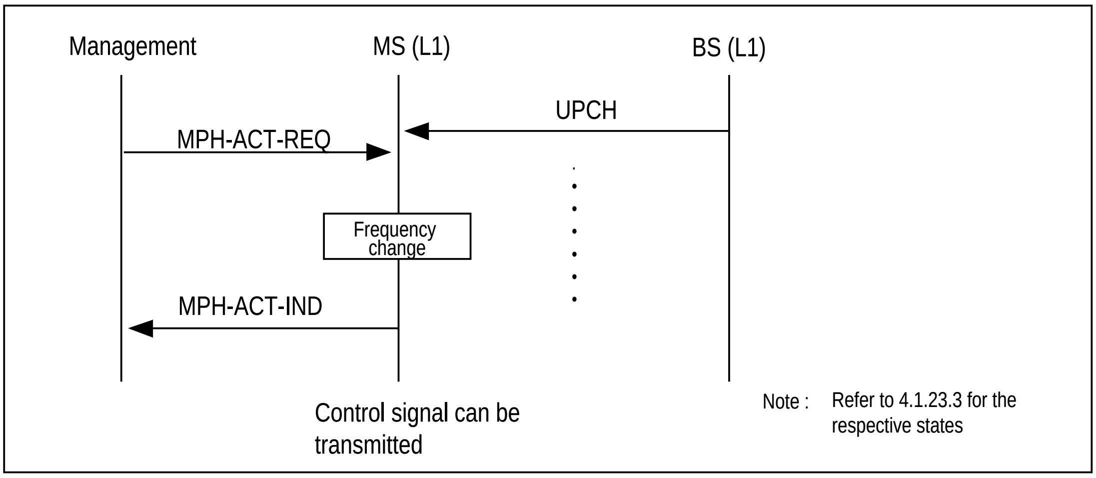


Fig. 4.1.11.1-5 Procedure for activating the user packet channel (at the mobile station)

4.1.11.1.4 Procedure for deactivating the user packet channel

As the user packet channel is automatically deactivated when a new channel is activated by the mobile station or the power is turned OFF, the deactivating procedure is not specified.

At the base station, however, the user packet channel is not usually deactivated. If the user packet channel needs to be deactivated due to frequency change, etc., it should be deactivated by the procedure shown in Fig. 4.1.11.1-6.

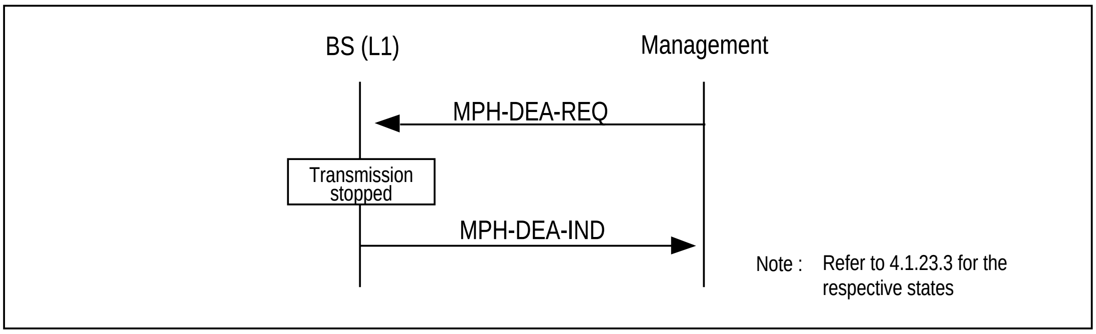


Fig. 4.1.11.1-6 Procedure for deactivating the user packet channel (at the base station)

4.1.11.2 Traffic channel (TCH)

Layer 1 incorporates a function that activate and deactivate the traffic channel and the frame synchronization so as to permit data transmission through the traffic channel and it's auxiliary ACCH.

4.1.11.2.1 Procedure for activating the traffic channel

The traffic channel is activated by designating the color code and the scrambling code from the management entity. In addition, synchronization burst is used for superframe synchronization and time alignment designation. (Refer to 4.1.12)
The traffic channel is activated by the procedure shown in Fig. 4.1.11.2-1.

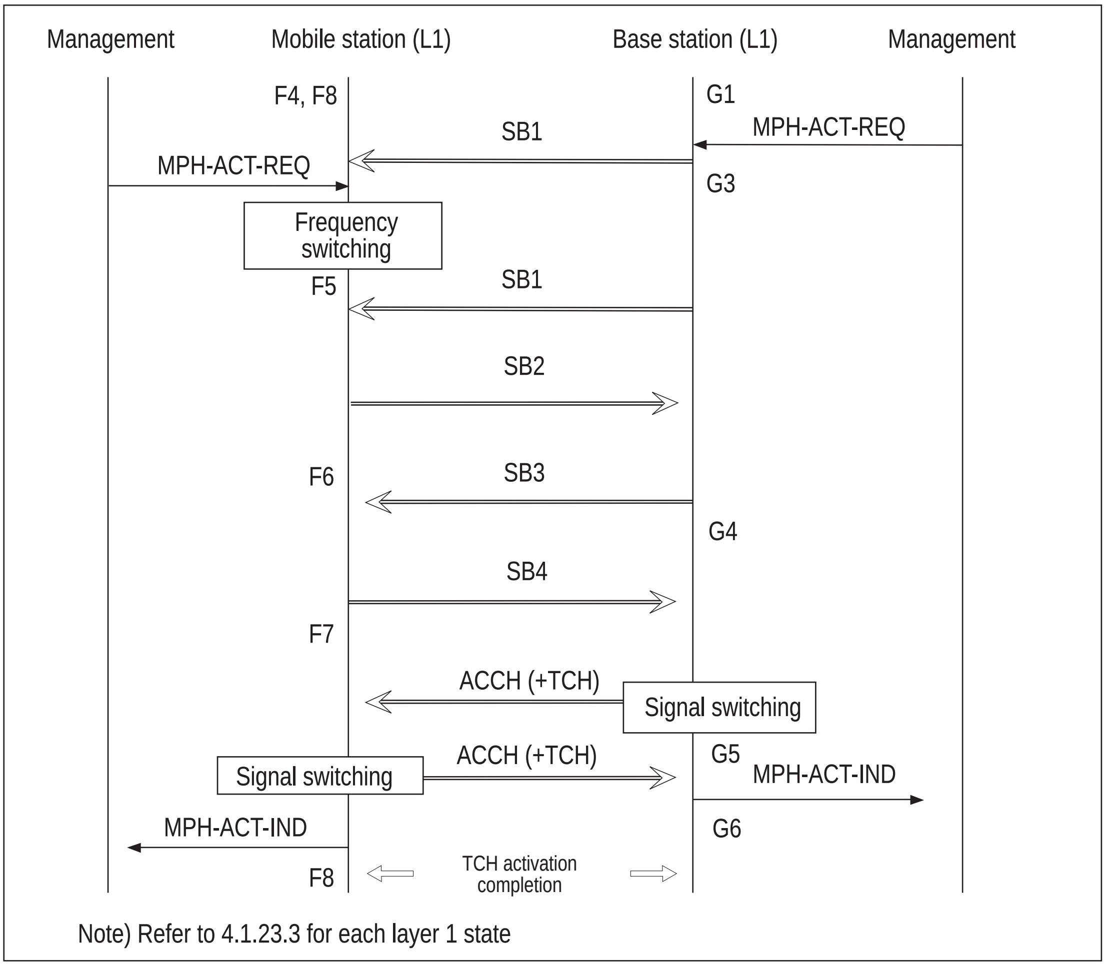


Fig. 4.1.11.2-1 : Procedure for activating the traffic channel.

<Restoring of synchronization burst data>

The transmission side sends out data that repeats the color code and the burst identifier bits (including the time alignment value and the superframe sync counter in case of SB3 and SB4) three times for one synchronization burst.

When detecting a 32-bit SW on the reception side, the data which was repeated three times is selected by majority decision at each bit and restored.

- SB2 transmission condition

  Following this, if the color code of the restored data matches with the one specified by the management entity and the burst identifier bit indicates SB1, the mobile station shall start transmission for SB2.

- SB1 stop/SB3 transmission condition

  At base station, if the color code of the restored data matches with the one specified by the management entity and the burst identification bit indicates SB2, the base station shall stop transmission of SB1 and start transmitting SB3. At this time, it shall designate timing alignment value and the superframe synchronization counter value.

  Here, the designated SB3 superframe counter value immediately after SB1 stops shall be within the range from 0 to 35.

- SB2 stop/SB4 transmission condition

  At mobile station, if the color code of the restored data matches with the one designated by the management entity and the burst identification bit indicates SB3, the mobile station shall stop the SB2 transmission and start the SB4 transmission. At this time, it shall start to count the superframe synchronization and transmit the designated time alignment value and the superframe synchronization counter value. If SB3 cannot be received, the value of (the superframe counter + 1) and the latest designated time alignment value are set on the SB4. However, the timing shall not be changed even if the time alignment is designated.

- SB3 stop/signal switching condition

  If the color code of the restored data matches with the one designated by the management and the burst identification bit indicates SB4, in addition the time alignment value matches with the amount designated and the superframe synchronization count being correctly increased, the base station stops the SB3 transmission and switches to the traffic physical channel for communication.

- SB4 stop/signal switching condition

  When a 20-bit SW is detected at the mobile station, the mobile station stops transmission of SB4 and switches to the traffic physical channel at the timing in accordance with the time alignment procedure.

4.1.11.2.2 Procedure for re-activating the traffic channel

When TCH activation fails or when the frame synchronization goes out-of-sync during call in progress, superframe synchronization shall be reestablished by exchanging synchronization burst signals.

At this time, the quality supervision information (Refer to 4.1.14) already memorized shall be reset, also, the SB2 transmission level at MS shall be set to the latest designated value.

When the BS detects frame out-of-sync, the BS shall reactivate the traffic channel using the procedure shown in Fig. 4.1.11.2-2.

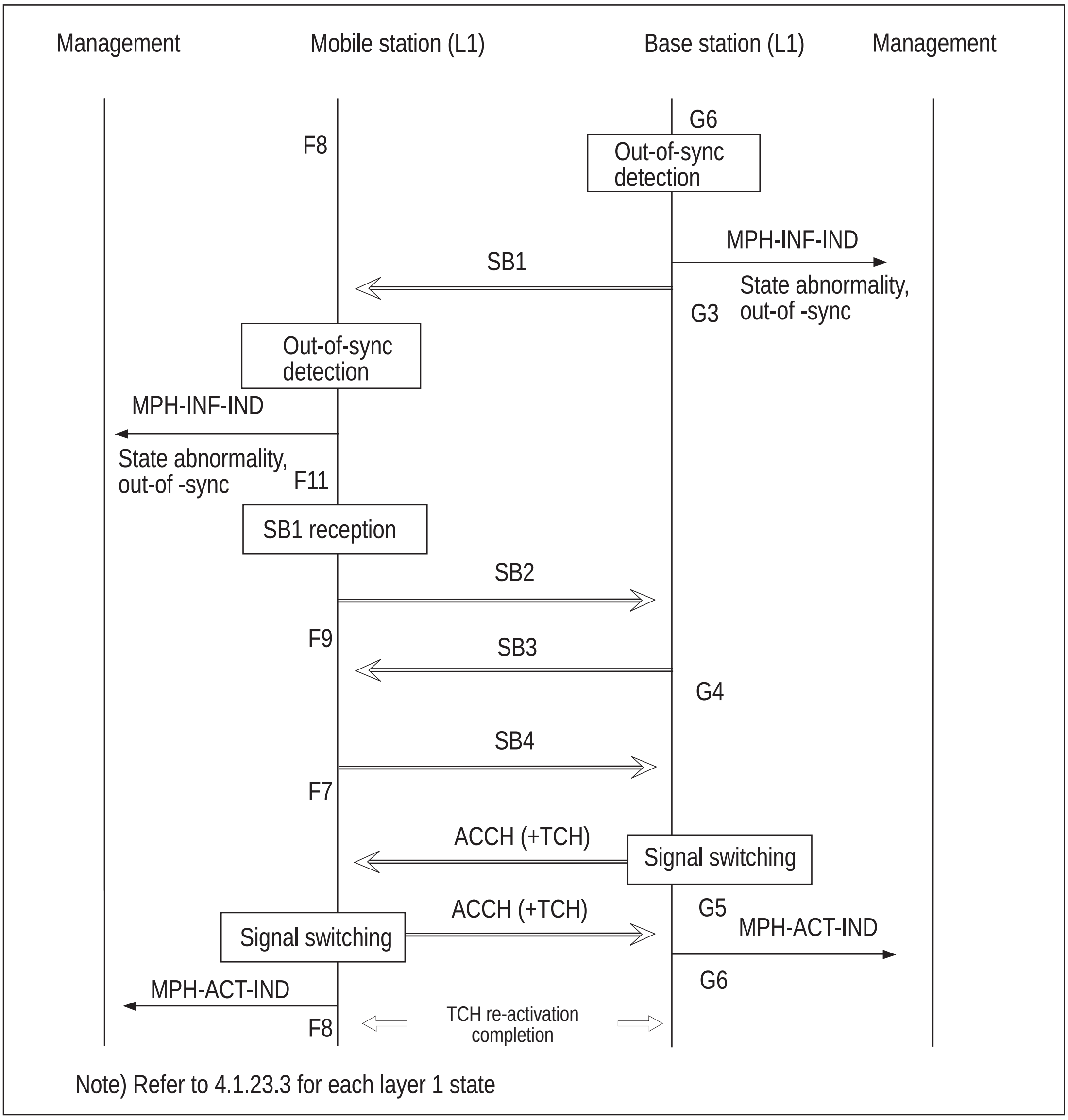


Fig. 4.1.11.2-2 : Procedure for re-activating the traffic channel (when frame out-of-sync condition is detected at the base station)

When the mobile station detects frame out-of sync, the traffic channel shall be reactivated by the procedure shown in Fig. 4.1.11.2-3.

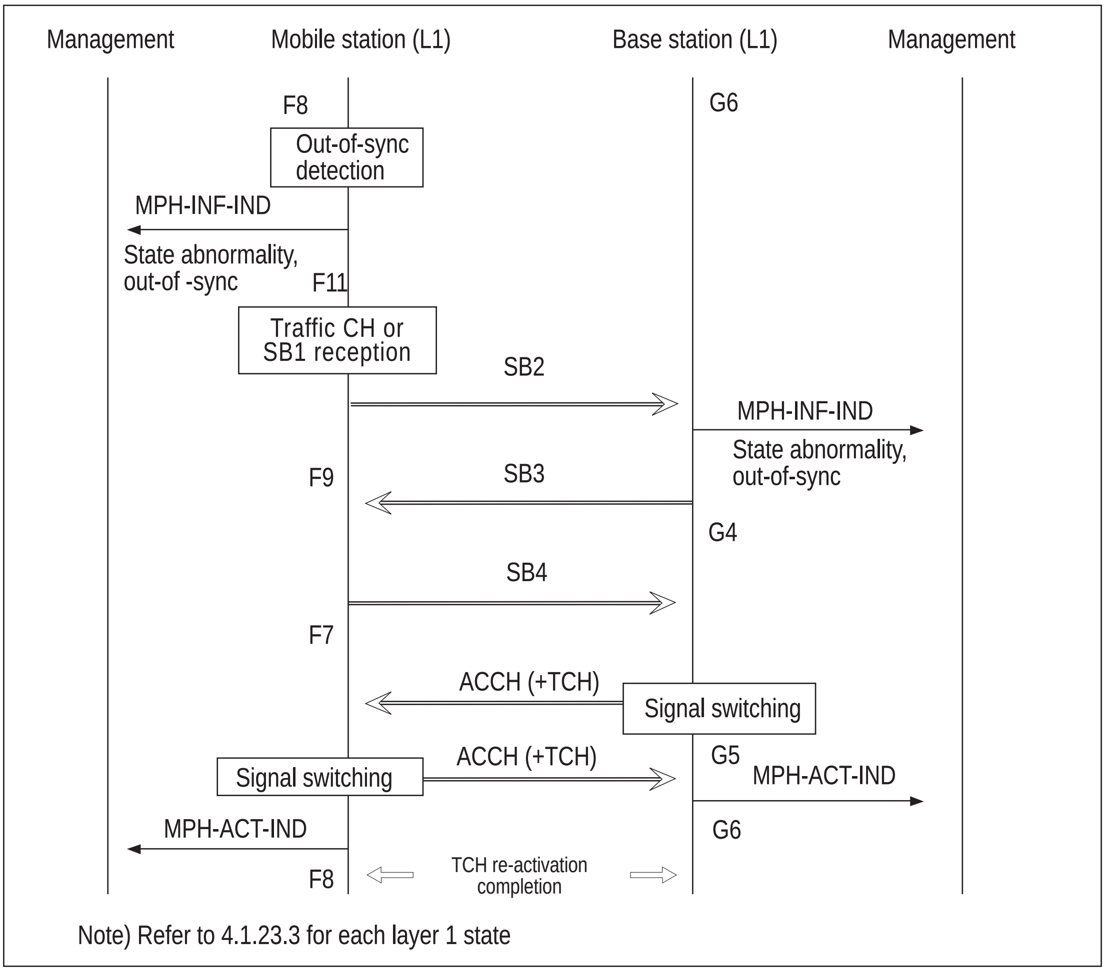


Fig. 4.1.11.2-3 : Procedure for re-activating the traffic channel (when frame out-of-sync condition is detected at the mobile station)

When a TCH activation fails, the traffic channel shall be reactivated using the procedure shown in Fig. 4.1.11.2-4 below.

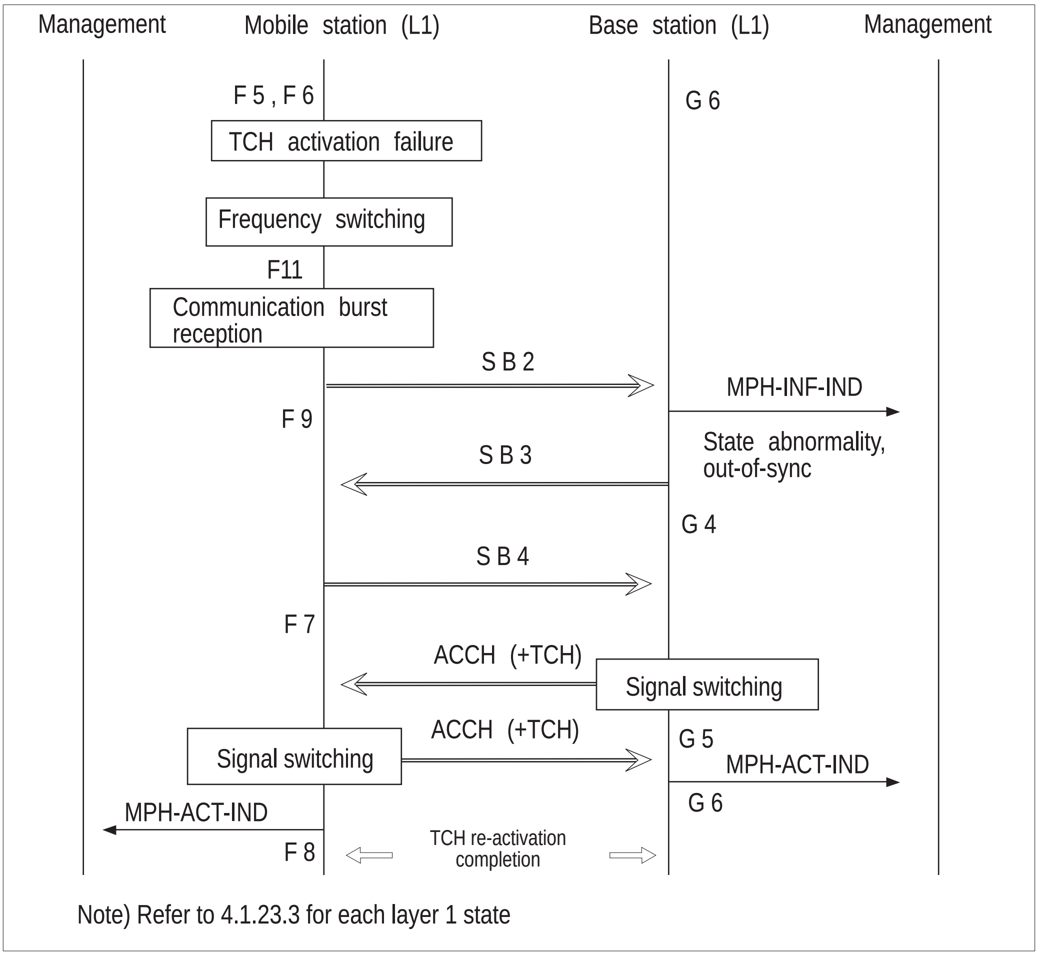


Fig. 4.1.11.2-4 : Procedure for re-activating the traffic channel (when TCH activation fails)

4.1.11.2.3 Procedure for deactivating the traffic channel

In the mobile station, a deactivating procedure of the traffic channel is not specified, since it is automatically deactivated only when the power is turned off or when a new channel is activated.

In the base station, the traffic channel shall be deactivated by the procedure shown in Fig. 4.1.11.2-5. However, the carrier transmission including the channel used for zone recognition shall not be stopped.

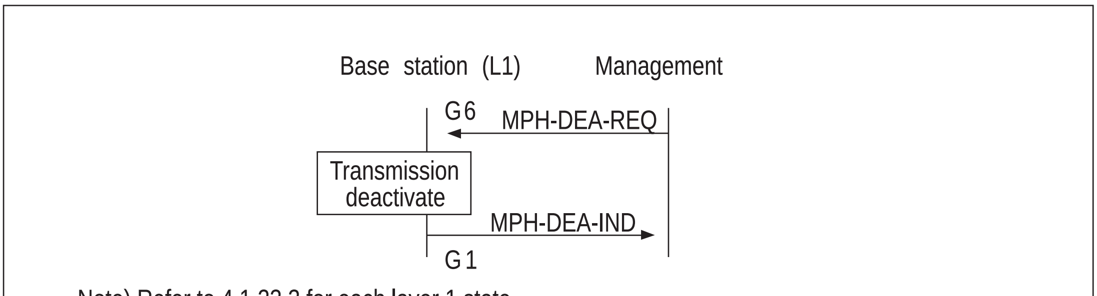


Fig. 4.1.11.2-5: Procedure for deactivating the traffic channel (at base station)

4.1.12 Time alignment control

4.1.12.1 Measurement

At base station, the phase difference between the reference timing (i.e., the base station burst signal reception timing) and the reception burst signal shall be measured for the individual slots. Measurement of timing is shown in Fig. 4.1.12.1-1.

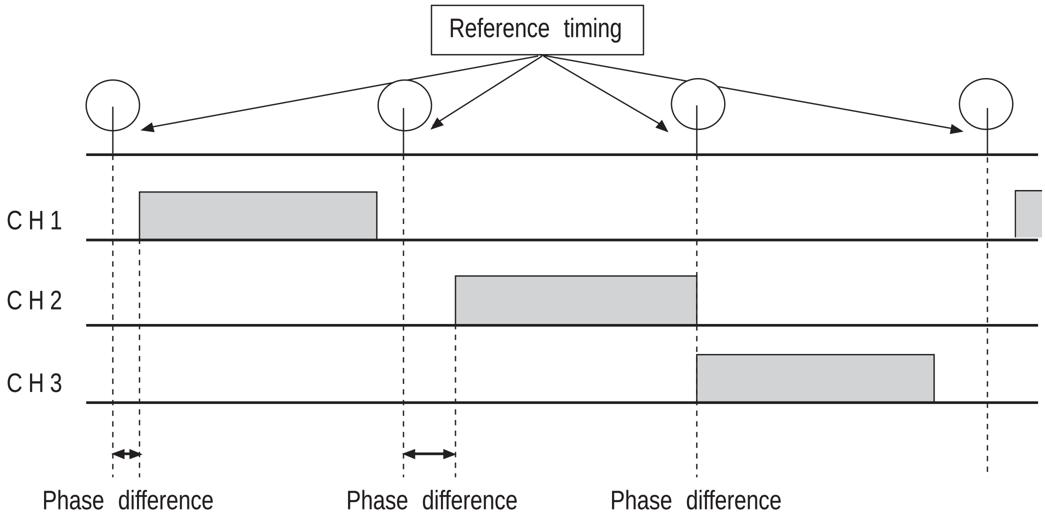


Fig. 4.1.12.1-1 : Measurement of timing

4.1.12.2 Timing selection/adjustment timing

When the timing control of mobile station needs to be adjusted after making phase difference measurements, base station shall designate the absolute value of the transmission timing to the mobile station using the procedure shown in Table 4.1.12.2-1. At the mobile station, the previously set time alignment shall be remained in effect until a new time alignment is set. The time alignment control range during call in progress shall be within ± 1 symbol relatively. If the latest time alignment value designated during call in progress exceeds ± 1 symbol compared to the previous value, the mobile station shall neglect the new designation. The adjustment of the transmission timing during call in progress is shown in Fig. 4.1.12.2-1. The transmission timing of SB2 shall accord with the latest value before new value is designated.

Table 4.1.12.2-1 : Notification method of the time alignment value

	Notification method	Adjustment timing
With TCH activation	SB3 (Refer to section 4.1.11.2.)	From 1st signal after switching to TCH
During call in progress	RCH (Refer to section 4.1.4.4.)	From the next RCH transmission timing (Refer to Fig. 4.1.12.2-1.)

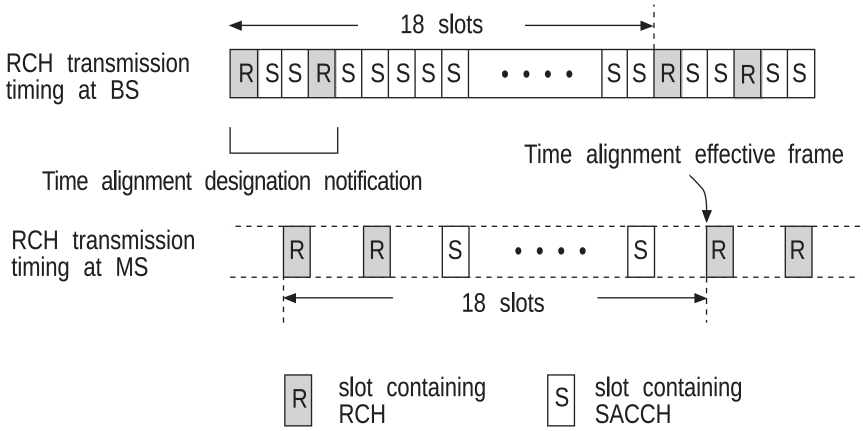


Fig. 4.1.12.2-1 : Time alignment adjustment timing during call in progress

4.1.12.3 Time alignment value

The time alignment value shall be specified with four-bit units as shown in Table 4.1.12.3-1. The specified value shall be based on the reference timing of transmission at the mobile station. (Refer to section 4.1.9.1.)

Table 4.1.12.3-1 : Specifying bits to set the degree of time alignment

Time alignment	Operation
* 1 1 1	Transmits at the currently set timing
* 1 1 0	Accelerate 6 symbols
* 1 0 1	Accelerate 5 symbols
* 1 0 0	Accelerate 4 symbols
* 0 1 1	Accelerate 3 symbols
* 0 1 0	Accelerate 2 symbols
* 0 0 1	Accelerate 1 symbol
* 0 0 0	Transmits at the reference timing

MSB LSB

Note : Items marked "*" are spare bits, and set "0" and ignored.

4.1.12.4 Time alignment designation at TCH activation and during call in progress

Time alignment designation at TCH activation, out-of-sync condition during call in progress or channel switching is shown in Fig. 4.1.12.4-1 to 4.1.12.4-4. Note that parameters in parentheses (SB1(•) to SB4 (•) ; TCH (•) , etc.) represent the used frequencies.

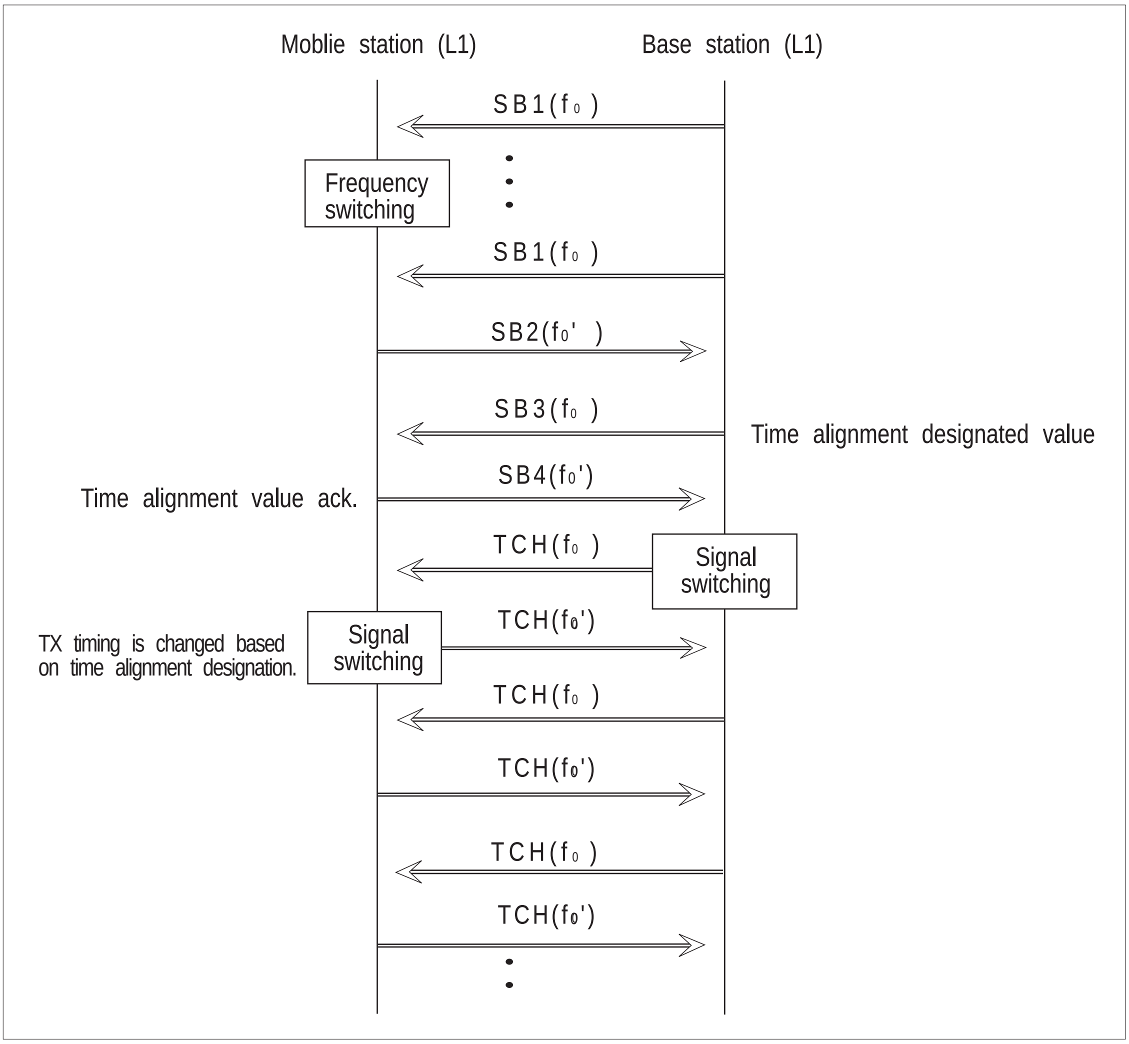


Fig. 4.1.12 .4-1 Time alignment during initial synchronization (when synchronization is established normally)

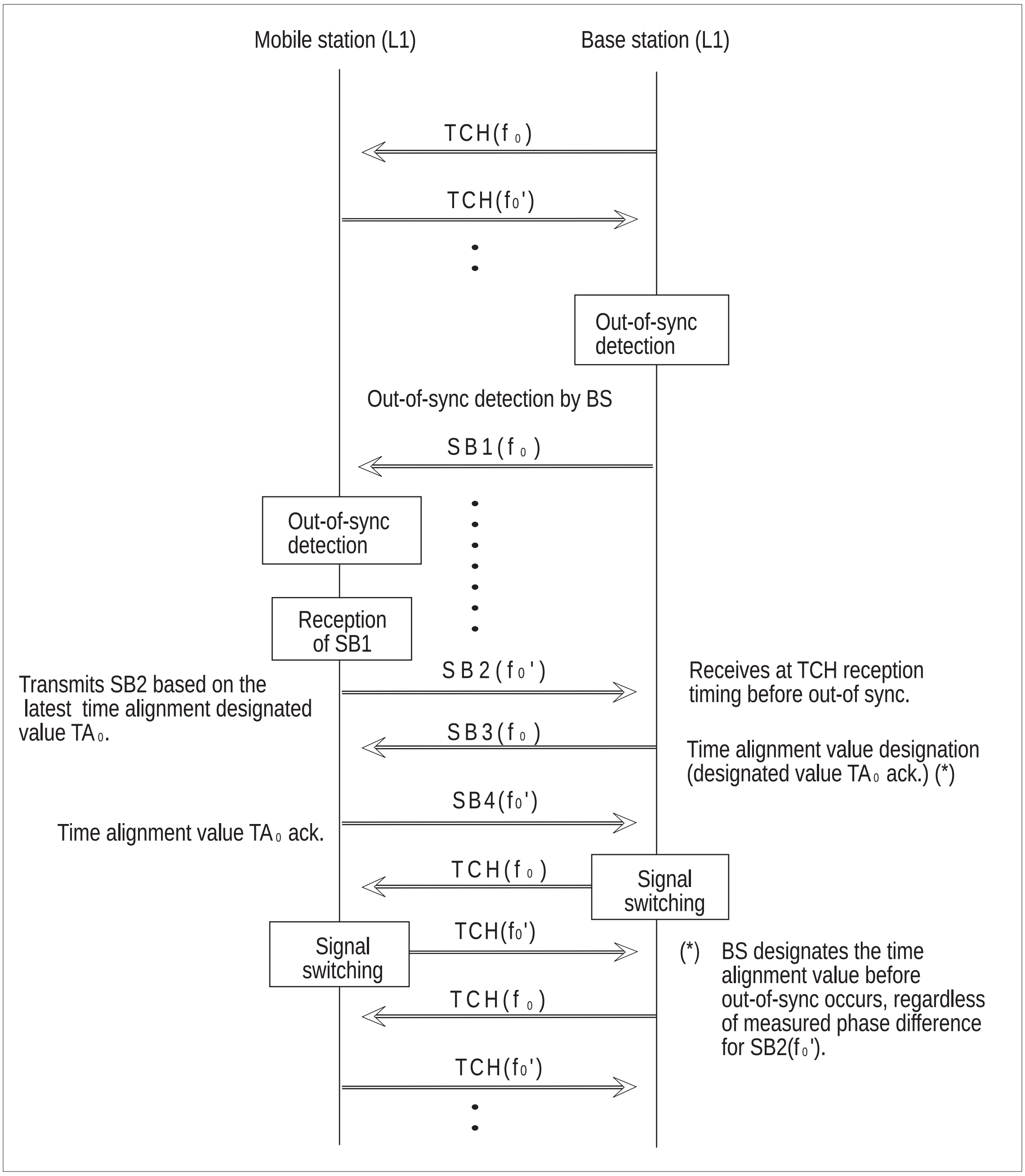


Fig. 4.1.12.4-2 Time alignment when an out-of-sync condition occurs during call in progress

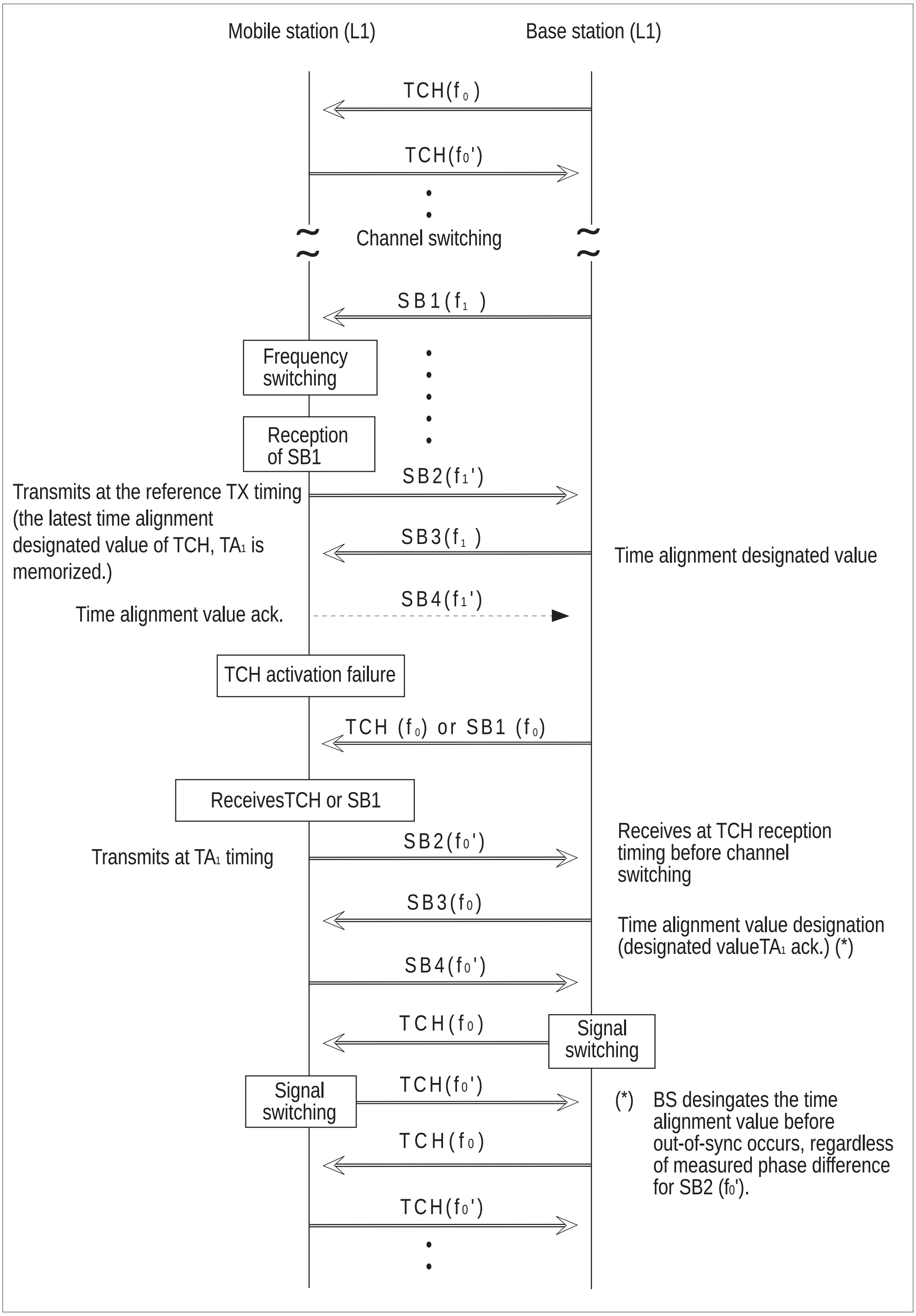


Fig.4.1.12.4-3 Time alignment when channel switching fails

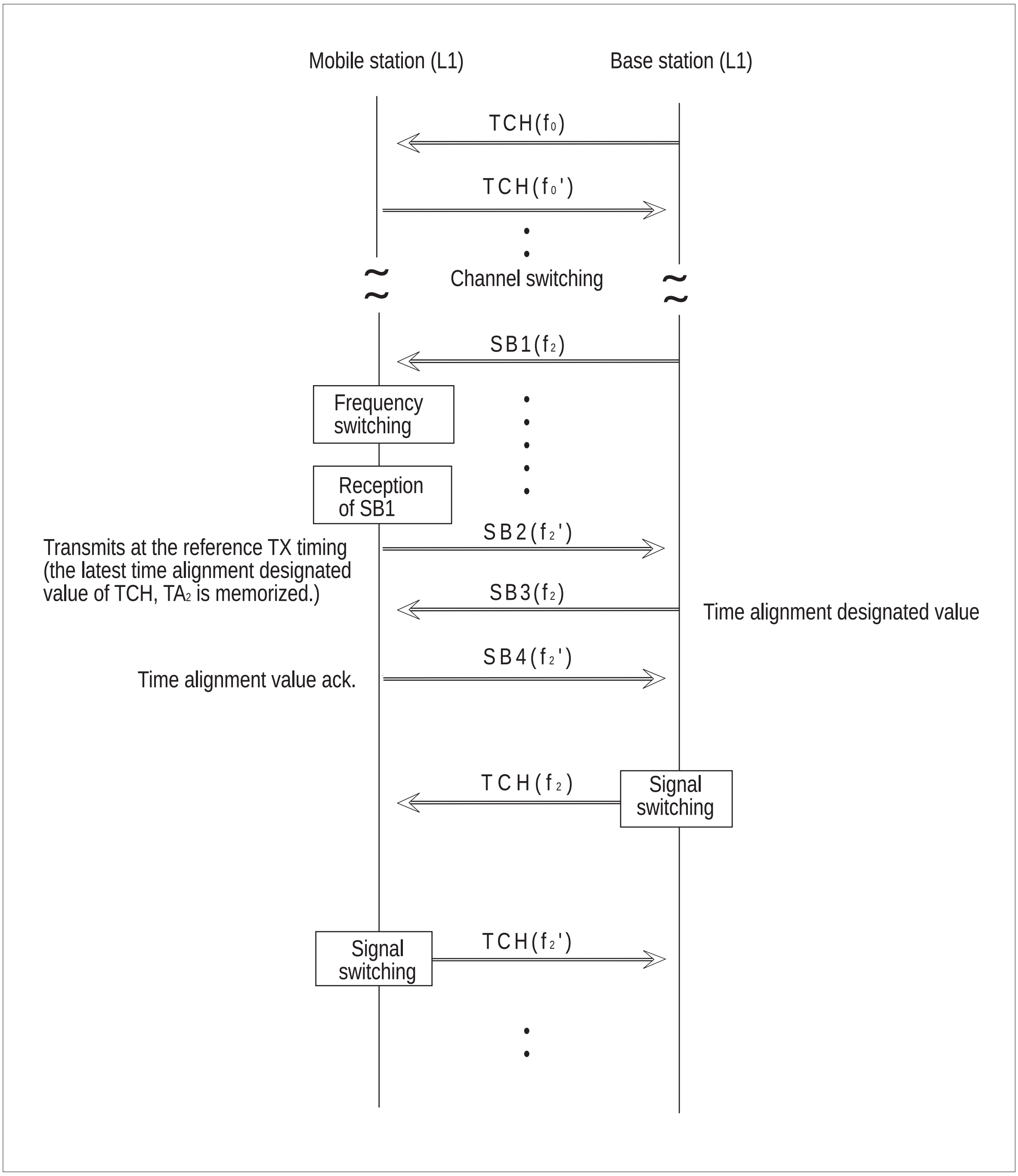


Fig.4.1.12.4-4 Time alignment when channel switching succeeds

4.1.13 Random access control

The common access channels for uplink (SCCH, UPCH) transmit signals using the open channel control random access method with partial echo (ICMA - PE).

4.1.13.1 Basic operation

4.1.13.1.1 Basic operation on SCCH

The operation flow of the base station and the mobile station is shown in Figs. 4.1.13.1-1 and 4.1.13.1-2. An example of an operation is shown in Fig. 4.1.13.1-3.

The first example of Fig. 4.1.13.1-3 shows the collision of the bursts of mobiles 2 and 4 with the burst of mobile 1 and an instance in which the latter is not received at the base station. In this case, when mobile station 1 is not transmitting, mobile station 3 is transmitting on the open slots.

The second example of Fig. 4.1.13.1-3 shows the case where the burst of mobile 1 collides with the burst of mobile station 2, so the burst of mobile station 1 is not received at the base station. In this case, mobile stations 1 and 2 both transmit 2 bursts each.

(1) Operation of base station

a. Transmission timing is set by slots.

b. The following are broadcast in the collision control bits on the downlink signaling format.

   (a) Transmission enable/disable at the next slot. (I/B)

   (b) Signal reception/non-reception (R/N)

   (c) Partial echo (PE)

   (Bit structures for individual items will be described later.)

c. When the base station receives the signal from the mobile station, "R" shall be set for R/N, and the result of a certain processing performed on the reception data shall be set for the PE.

d. I/B for the next slot shall be set according to the message structure information (message length information) "W" (i.e., if the reception data is the last unit, "I" is set; if reception data continues to be transmitted, "B" is set).

e. I/B, R/N and PE are transmitted as collision control bits.

(2) Operation of mobile station

a. Transmission timing is set by slots.

b. If there is existing data to be transmitted, transmission begins immediately after the mobile station receives a slot of which I/B is "I" (transmission enable).

c. If R/N for the collision control bit for the next downlink slot is "R", and if the PE of the reception signal is a bit series with 1-bit error tolerance for the CRC check bits transmitted by the self station, the 1st unit is assumed as transmitted successfully. If the message continues, transmission shall be continued. If the message consists of only one unit, transmission shall be completed.

d. If the 1st unit does not match with the conditions given in (c) above and recycling is required, the operations described in (b) and after (b) shall be performed after random delay. In the event of recycling over, a transmission failure results.

e. When transmitting a message consisting of 2 units or more, if the collision control bit (R/N) for the downlink slot for the 2nd or following units is set to "N", transmission shall be stopped at that time and fails.

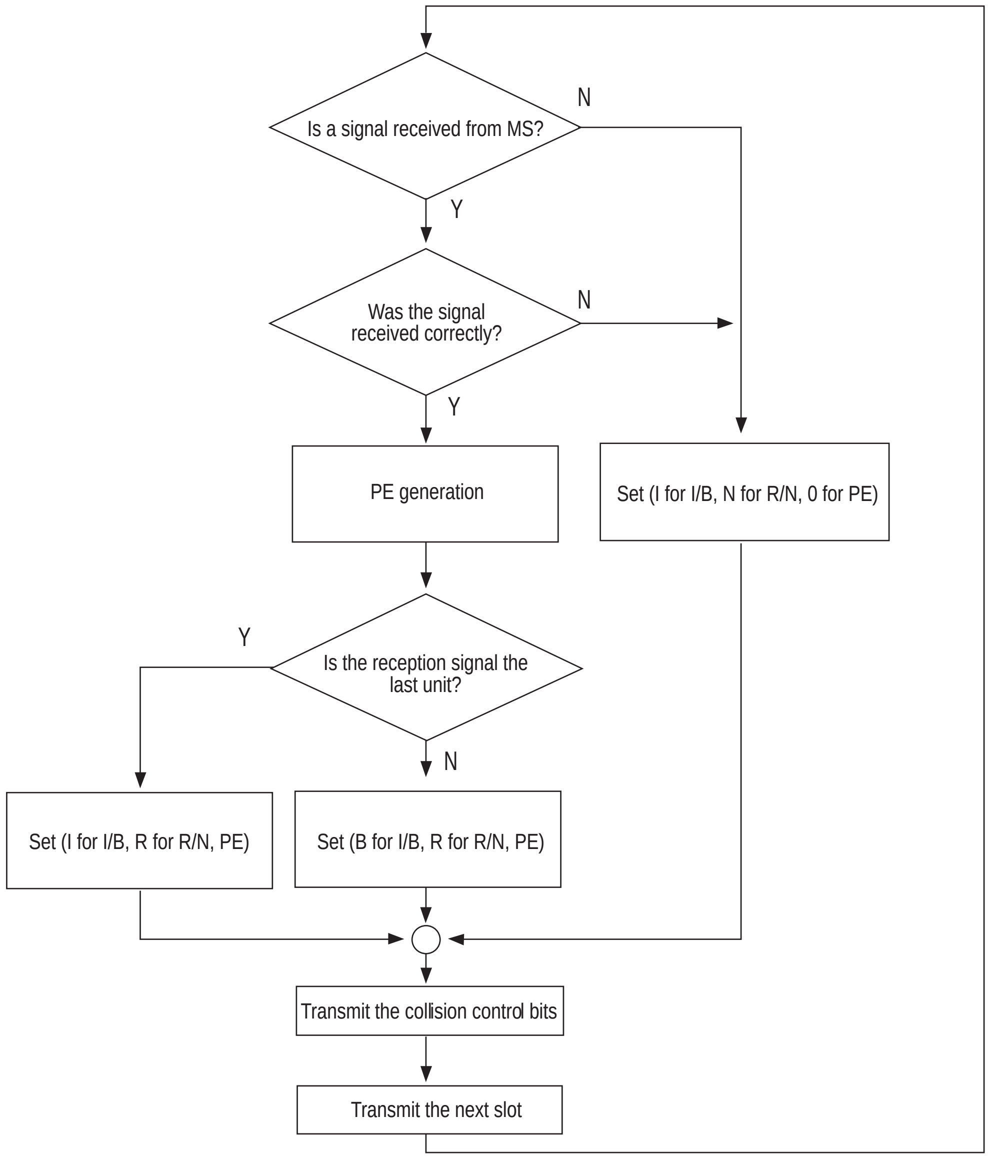


Fig. 4.1.13.1-1 : Transmission flow at base station

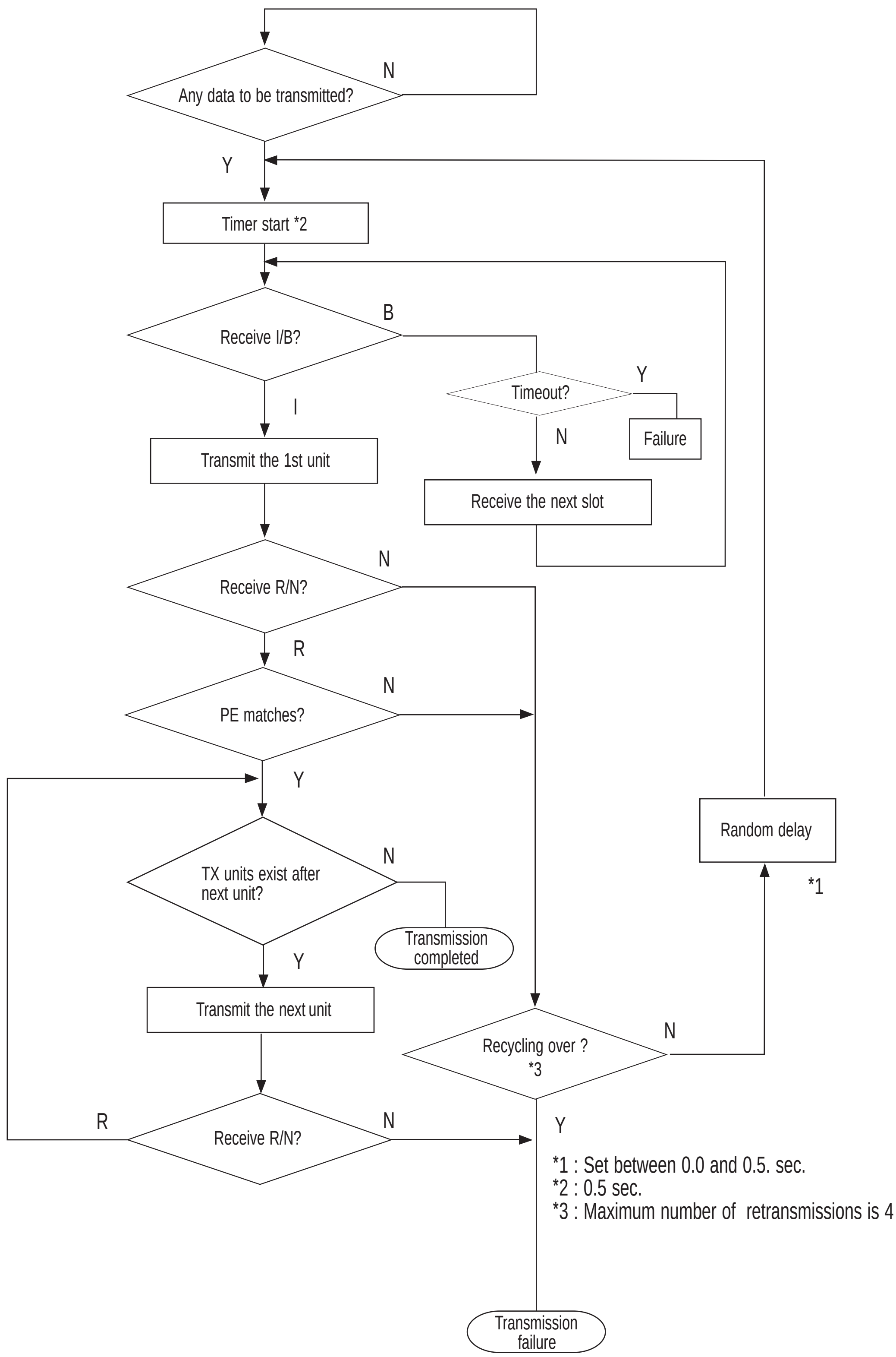
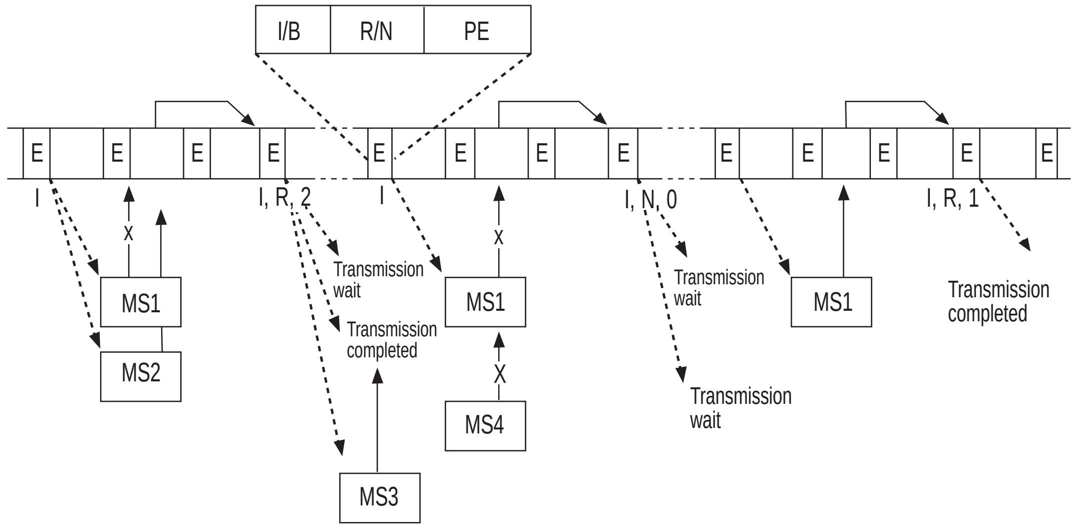
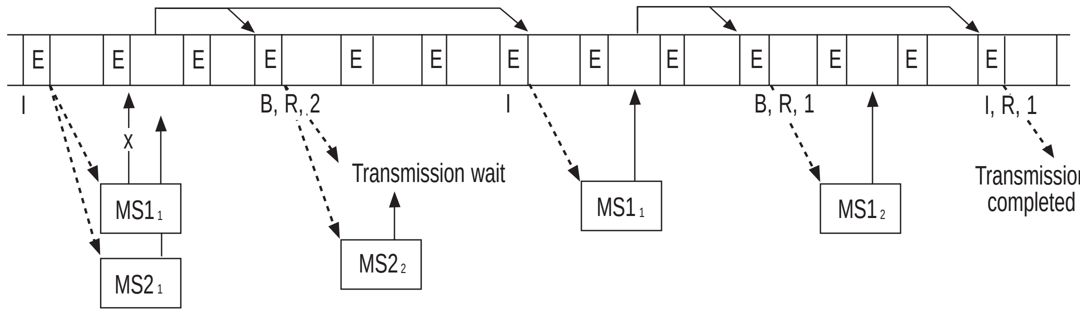


Fig. 4.1.13.1-2 : Transmission flow at mobile station



(1) In case of transmission data consisting of 1 burst



(2) In case of transmission data consisting of 2 bursts

Fig.4.1.13.1-3 : Example of operation

4.1.13.1.2 Basic operation on UPCH

The transmission flows of the base station and the mobile station are shown in Figs. 4.1.13.1-4 and 4.1.13.1-5, and examples of the operation are shown in Fig. 4.1.13.1-6.

(1) Operation of base station

a. Transmission timing is set by slots.

b. The following are broadcast by the collision control bits on the downlink signaling format:

(a) Transmission enable/disable at the next slot. (I/B)

(b) Signal reception/non-reception (R/N)

(c) Partial echo (PE)

(Bit structure for each item is described later.)

c. When the base station receives the signal from the mobile station, "R" shall be set for R/N, and the result of the designated processing performed on the reception data shall be set for the PE.

d. I/B for the next slot shall be set depending on the message structure information (message length information) "W" (i.e., if the reception data is the end unit, "I" is set; if reception data continues to be transmitted, "B" is set).

e. I/B, R/N and PE are transmitted as the collision control bits.

(2) Operation of the mobile station

1) In case of low-speed transmission

a. Transmission timing is set by slots

b. If there is data to be transmitted, the mobile station receives the collision control bits for the currently using UPCH functional channel from among the packet physical channels. If the I/B of the received collision control bits is set to "I" (transmission enable), the mobile station starts transmission with the slot which immediately follows the current slot.

c. If the R/N of the collision control bits for the next downlink slot is set to "R", and if the PE for the received signal is the bit series with 1-bit error tolerance for the CRC check bits transmitted by the mobile station, the 1st unit is considered to be transmitted successfully. If the message continues, the transmission shall be continued. Even if the R/N of the collision control bits which are received during the continuing transmission is "N", the mobile station continues transmission until the last unit. If the message consists of only one unit, the transmission shall be completed.

d. If the 1st unit does not satisfy the condition given in the c) above and recycling is performed, the operations described in the b) and after b) shall be performed after some random delay. In the event of recycling over, a transmission failure results.

e. If the "continuous transmission standby required/not required" parameter in the idle unit in Section 4.1.5.4 is set to "required" and there are data to be transmitted continuously after the current transmission is completed, the MS suspends transmission until it receives the I/B of the collision control bit set to "I" (transmission enable) for at least two times consecutively. However, when the mobile station receives the "I" (transmission enable) only once and fails to receive it the second time and sets for standby, and repeats this operation continuously for the number of times indicated by the maximum number of times for standby in the idle unit, the data which has been suspended from transmission can be transmitted when the mobile station receives the "I" (transmission enable) only once at the subsequent timing.

2) In case of high-speed transmission

a. Transmission timing is set by slots

b. If there is data to be transmitted, the mobile station discriminates the collision control bits for the UPCH functional channel which have not yet been transmitted from the mobile station, from among all UPCH functional channels composing a packet physical channel. If the I/B of the received collision control bits is set to "I" (transmission enable), the mobile station starts transmission with the slot which immediately follows the current slot. If there are multiple data to be transmitted, the data shall be transmitted in the order it is generated.

c. If the R/N for the collision control bits for the next downlink slot is set to "R" and if the PE for the received signal is the bit series with 1-bit error tolerance for the CRC check bits transmitted by the mobile station, the 1st unit is considered to be transmitted successfully. If the message continues, the transmission shall be continued. Even if the R/N of the collision control bits which are received during the continuing transmission is "N", the mobile station continues transmission until the last unit. If the message consists of only one unit, the transmission shall be completed.

d. If the 1st unit does not satisfy the condition given in the c) above and recycling is performed, the operations described in the b) after b) shall be performed after some random delay. In the even of recycling over, a transmission failure results.

e. When continuously transmitting data by the same UPCH functional channel after the current transmission is completed and if the "continuous transmission standby required/not required" parameter in the idle unit in Section 4.1.5.4 is set for "required", the mobile station suspends transmission on the UPCH functional channel until it receives the I/B of the collision control bit set to "I" (transmission enable) at least two times consecutively on the pertinent UPCH functional channel. However, when the mobile station receives the "I" (transmission enable) only once on the pertinent UPCH functional channel and fails to receive it the second time and sets to standby, and repeats this operation continuously for the number of times indicated by the maximum standby times in the idle unit, transmission is enabled on the pertinent UPCH functional channel only when the "I" (transmission enable) is received only once at the subsequent timing.

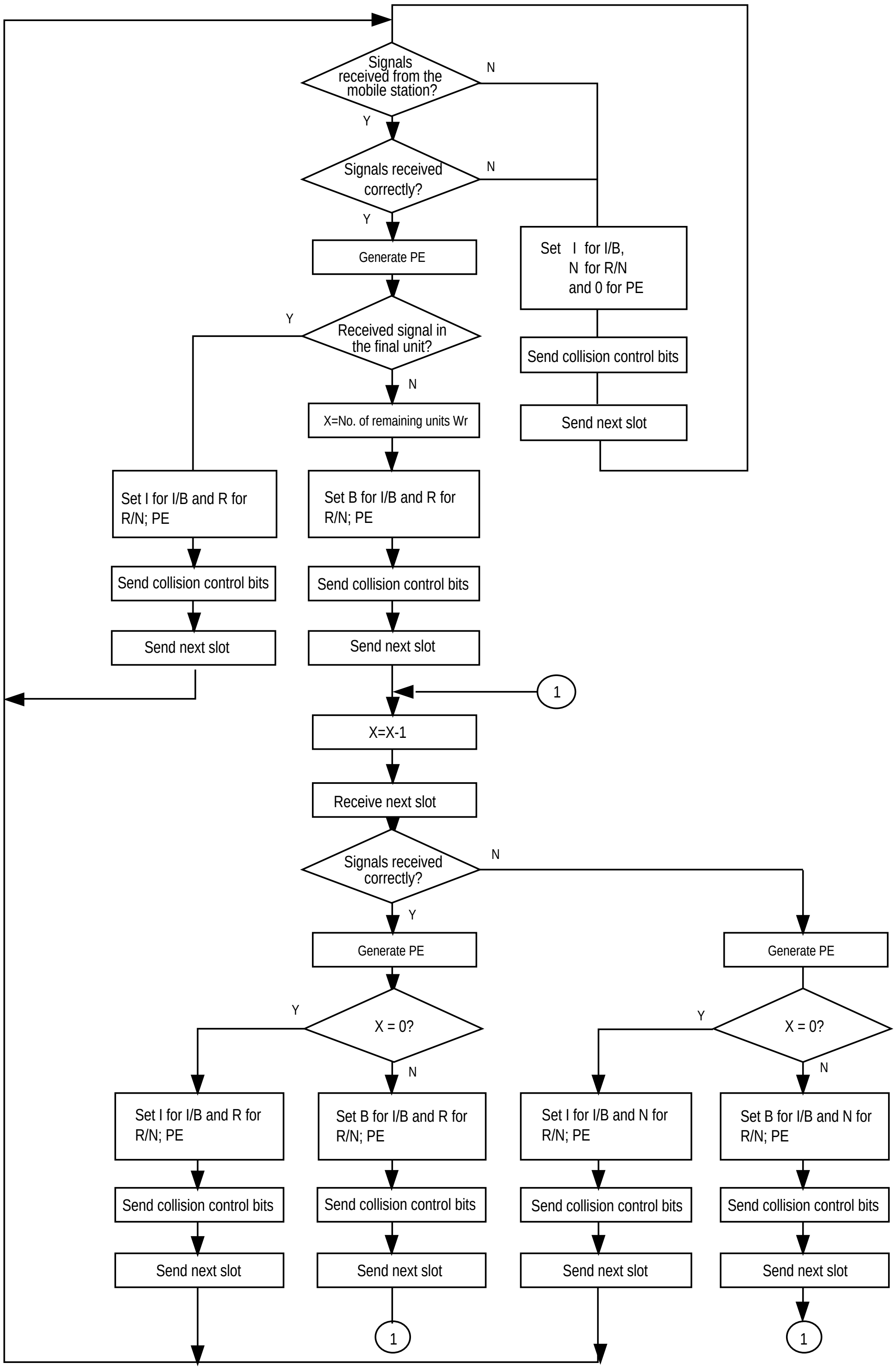


Fig. 4.1.13.1-4 Transmission flow at base station

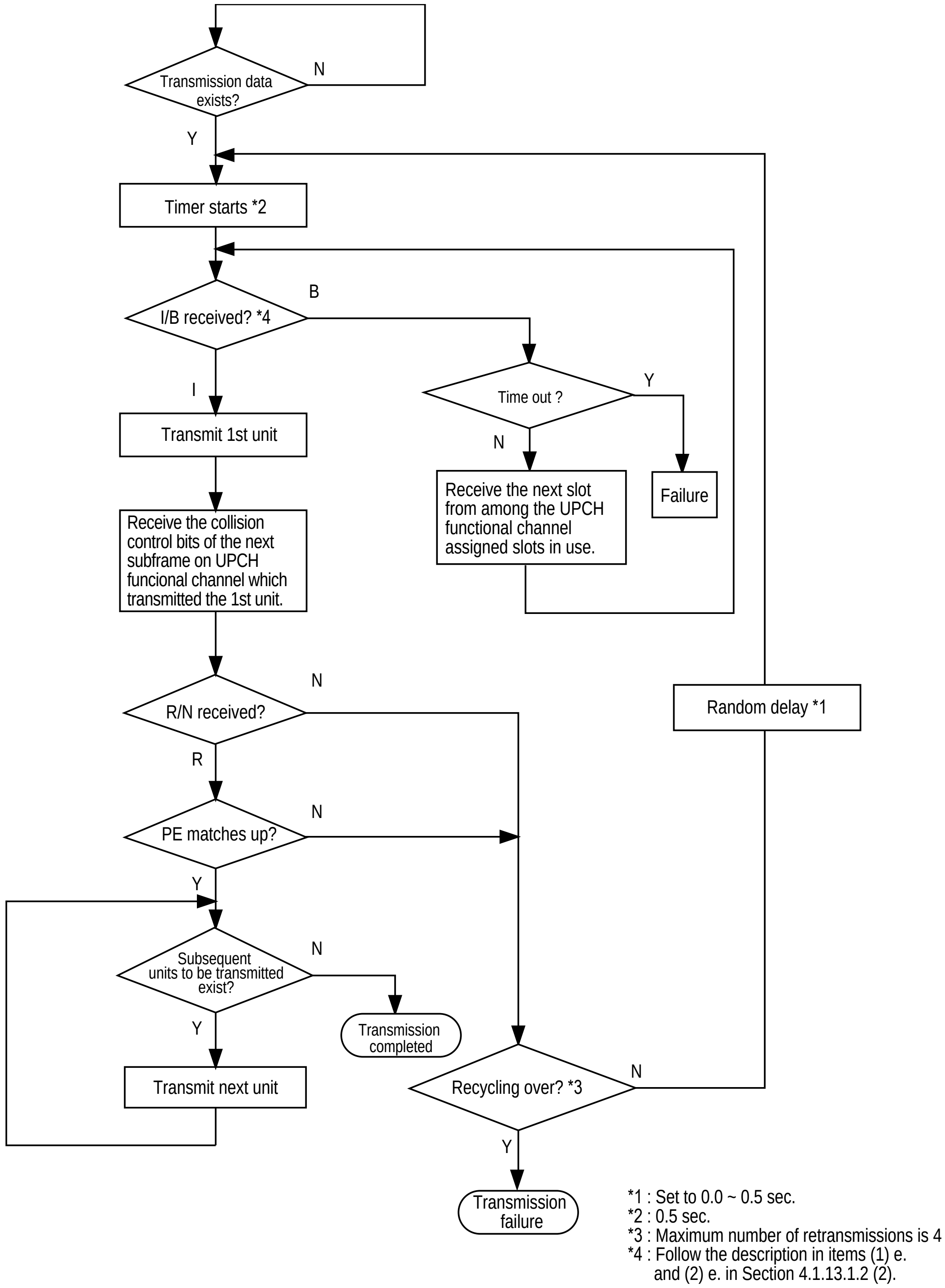
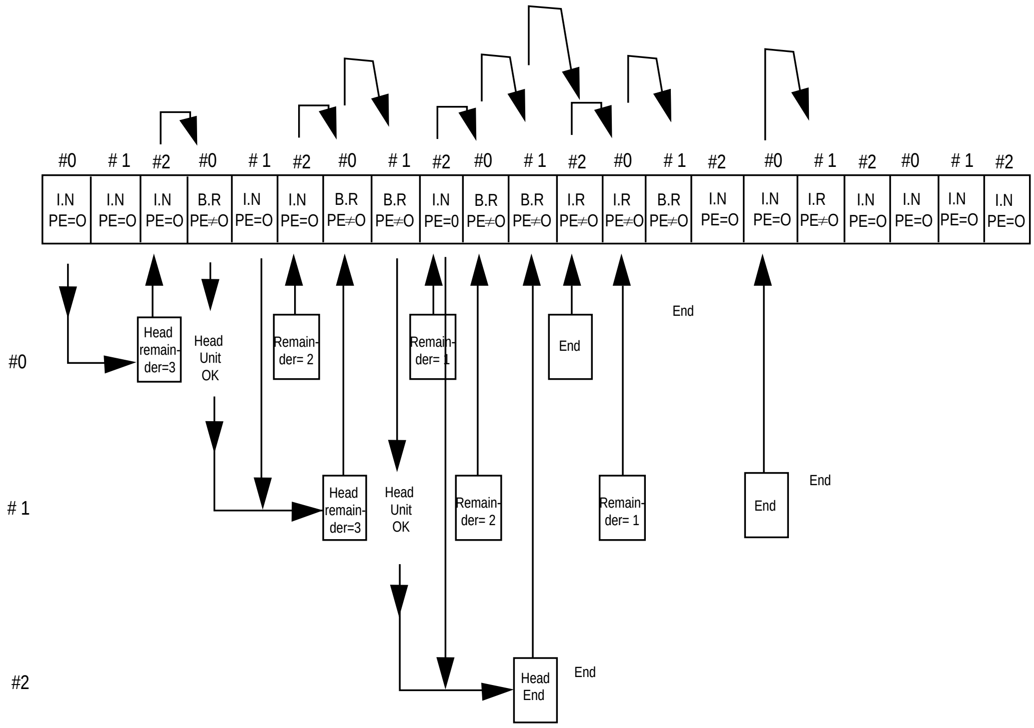
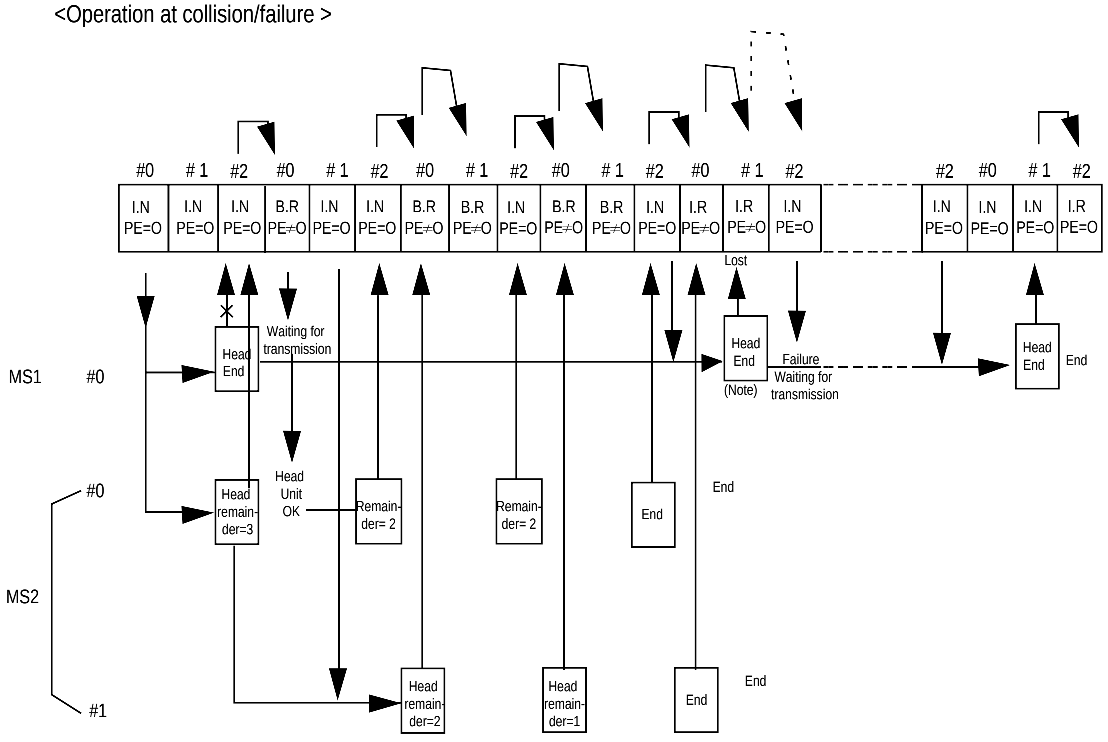


Fig. 4.1.13.1-5 : Transmission flow at mobile station

<Basic operation>



<Operation at collision/failure >



Note : Transmission is performed over any slot after random delay
(In this instance, transmission is over slot#2.)

Fig. 4.1.13.1-6 : Examples of operation

4.1.13.2 Collision control processing

4.1.13.2.1 Structure of the collision control bits

The structure of the collision control bits is shown in the following Fig. 4.1.13.2-1.

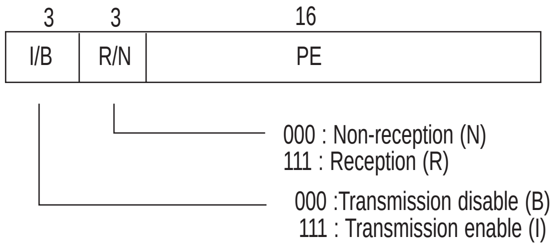


Fig. 4.1.13.2-1 : Structure of collision control bit

4.1.13.2.2 Reception processing for collision control bits at the mobile station

I/B : When transmitting the 1st slot, only "111" specifies transmission enable, while other settings specify transmission disable.

R/N : Majority decision set by 3 bits (0: Non-reception, 1: Reception)

PE : 1-bit error tolerance

4.1.13.2.3 Partial echo (PE) generation processing

The base station shall transmit the 16-bit CRC as the PE after CAC error correction.

4.1.14 Quality supervision

4.1.14.1 Quality supervision at mobile station

4.1.14.1.1 TCH

The mobile station reports the reception level and the error rate of the reception wave, through the uplink RCH during call in progress to the base station. Base station uses these information for transmission output control and channel switching (handover).

Reception level and error rate are transmitted by the 1st RCH in the superframe as the state report signal. If there is no other signal to be transmitted, then the 2nd RCH is an idle signal. Fig. 4.1.14.1-1 shows the reporting timing.
Incidentally, the top RCHs in the superframe on the traffic channel immediately after activation, reactivation or channel switching, shall be the idle signals.

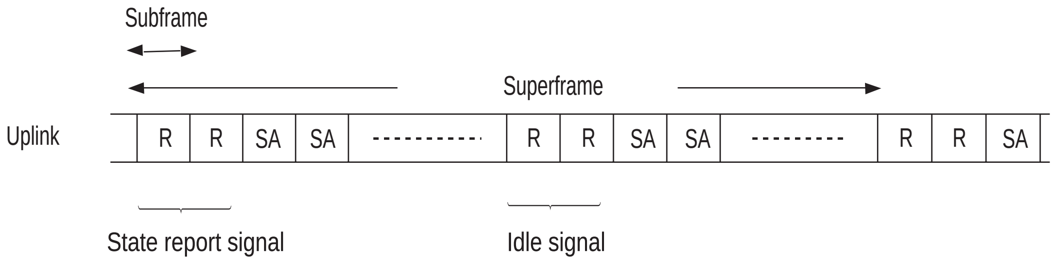


Fig. 4.1.14.1-1 : RCH report timing

4.1.14.1.1.1 Reception level detection

(1) Obtain 1 or more samples of RSSI value (dB) for individual reception slot to acquire the average RSSI-AVE value for the superframe period as shown in Fig. 4.1.14.1-2. After this, the average value is sent at the next RCH transmission timing, and these operations shall be repeated for each superframe that follow.

(2) The transmission timing for RSSI-AVE value and RCH is as shown in Fig. 4.1.14.1-3.

(3) The relationship between the RSSI value and bit pattern is shown in Table 4.1.14.1-1 below.

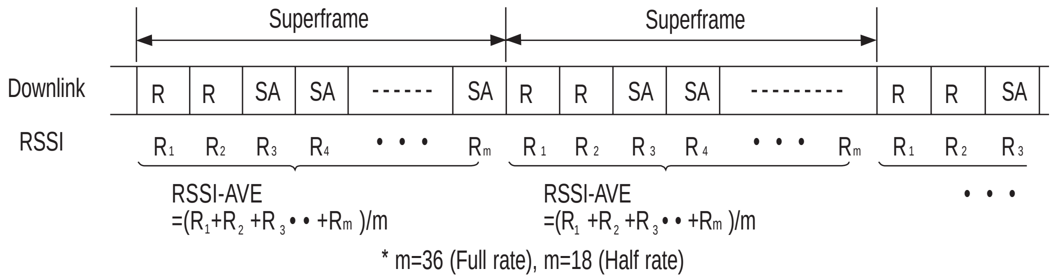


Fig. 4.1.14.1-2 : Reception level calculation period and method

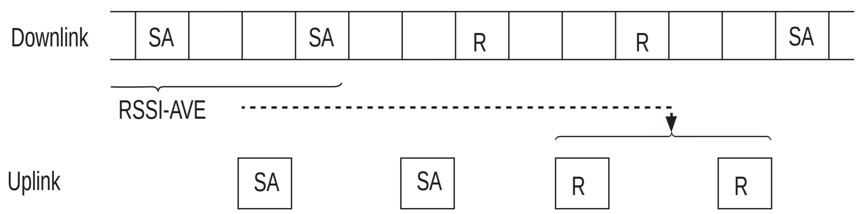


Fig. 4.1.14.1-3 : Reception level transmission timing (Full rate)

Table 4.1.14.1-1 : Relationship between RSSI value and bit pattern

Bit pattern	RSSI
1 1 1 1 1	60dBμ or more
1 1 1 1 0	58dBμ or more ~ less than 60dBμ
1 1 1 0 1	56dBμ or more ~ less than 58dBμ
:	:
0 0 0 0 1	0dBμ or more ~ less than 2dBμ
0 0 0 0 0	Less than 0dBμ

4.1.14.1.1.2 Error rate detection

(1) The estimated bit error rate (BER) for the superframe period is transmitted at the next RCH transmission timing as shown in Fig. 4.1.14.1-4. This operation is repeated for each superframe that follows.

(2) The transmission timing for the BER and RCH is shown in Fig. 4.1.14.1-5.

(3) The relationship between the BER and bit pattern is shown in Table 4.1.14.1-2.

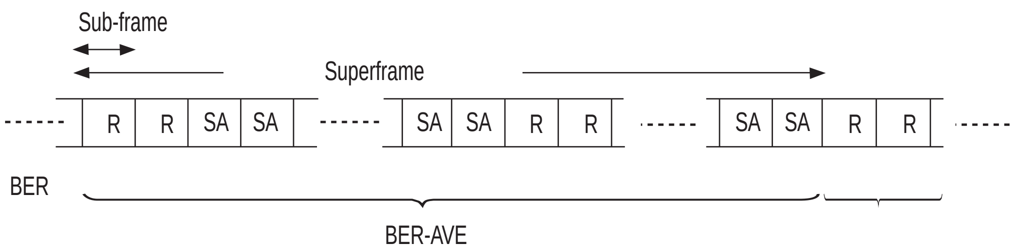


Fig. 4.1.14.1-4: BER calculation period (Full rate)

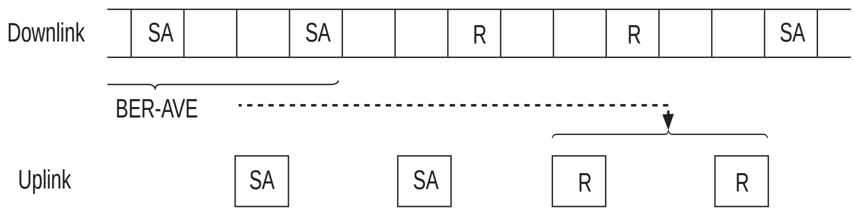


Fig. 4.1.14.1-5 : BER reporting timing (Full rate)

Table 4.1.14.1-2 : Relationship between BER and bit pattern

Bit pattern	BER
0 1 1	3% or more
0 1 0	1% or more but less than 3%
0 0 1	0.3% or more but less than 1%
0 0 0	Less than 0.3%

4.1.14.1.2 UPCH

4.1.14.1.2.1 Reception level detection

Reception level is detected by obtaining the RSSI sample values (dB) at the slot timing of the user packet channel (UPCH), then obtain the arithmetical average RSSI-AVE for the sampled segment (Refer to Fig. 4.1.14.1-6). Measurement accuracy with standard deviation of 2.5dB or less shall be assumed under the condition of Rayleigh fading with 5Hz fading pitch.

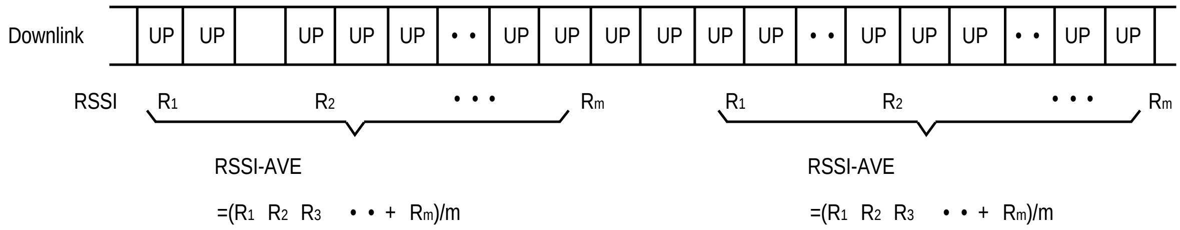


Fig. 4.1.14.1-6 : Reception level calculation segment and the calculation method

4.1.14.1.2.2 Error rate detection

Each slot is sampled at the slot timing for the user packet channel (UPCH) and obtain the estimated bit error rate (BER) for the sampled 36 subframes. (Refer to Fig. 4.1.14.1-7).

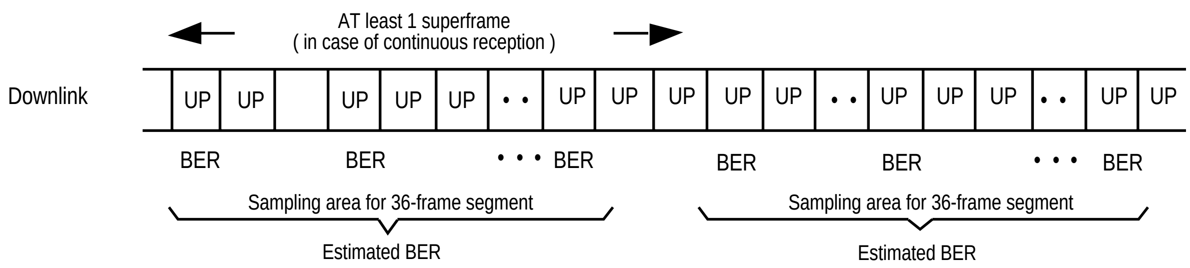


Fig. 4.1.14.1-7 : BER calculation segment

4.1.14.2 Quality supervision at base station

4.1.14.2.1 Reception level detection

Not specified.

4.1.14.2.2 Error rate detection

Not specified.

4.1.15 Detection of the reception levels of the peripheral zone supervisory carriers

The reception level of the peripheral zone supervisory carriers designated by the "Condition Report Information" signal during voice communication is detected by using empty slots.

(1) Assume F1, F2,...., Fn as the designated carriers, and m as the measurement count.

(2) Measure the carrier reception level (with 1 or more samples (dB)) of the empty slot of 1 TDMA subframe (20 ms), in the order of F1 to Fn. And repeat it m times.

(3) Assume m sampled values are represented by :

F1(1),....F1(m) for F1
F2(1),....F2(m) for F2
:
Fn(1),....Fn(m) for Fn,

then the initial averages F1(ave1), F2(ave1),.... Fn(ave1)for F1, F2, and Fn are calculated as :

F1(ave1) = (F1(1) + ...+ F1(m))/m
F2(ave1) = (F2(1) + ...+ F2(m))/m
:
Fn(ave1) = (Fn(1) + ...+ Fn(m))/m

(4) When the sampled value of (m+1)-th time is obtained, calculate the following average values.

F1(ave2) = F1(ave1) + (F1(m+1) - F1(ave1))/m
F2(ave2) = F2(ave1) + (F2(m+1) - F2(ave1))/m
:
Fn(ave2) = Fn(ave1) + (Fn(m+1) - Fn(ave1))/m

(5) The same processing as (4) above shall be performed for the (m+2)-th time and after that.

Level measurement for the peripheral zone supervisory carriers specified by the layer 3 signals during packet communication shall be performed with idle slots or at slot timings which are not necessary to receive signal.

(1) Assume F1, F2, ...Fn as the designated carriers, and m as the measurement count.

(2) If there are empty slots (1 slot or 2 slots are continuously used in the subframe unit), measure the carrier reception level (of 1 or more samples (dB)) in the empty slot of 1 TDMA subframe (20ms), in the order of F1 to Fn. And repeat it m times. If there are not empty slot (3 slots are continuously used in subframe unit), measure the carrier reception level (of 1 or more samples (dB)) in the idle slot (s) in the order of F1 to Fn and repeat it m times.

(3) Assume that the sampled values are represented by :

F1(1), ...F1(m) for F1
F2(1), ...F2(m) for F2
:
Fn(1), ...Fn(m) for Fn,

then, the initial averages F1 (ave1), F2(ave1), ...Fn(ave1) for F1, F2, and Fn respectively are calculated as follows:

F1(ave1) = (F1(1) + ...+ F1(m))/m
F2(ave1) = (F2(1) + ...+ F2(m))/m
:
Fn(ave1) = (Fn(1) + ...+ Fn(m))/m

(4) Once the sampled value of the (m+1)-th time is obtained, calculate the following average values :

$$
\begin{aligned}
&F1(ave1) = F1(ave1) + (F1(m+1) - F1(ave1))/m \\
&F2(ave1) = F2(ave1) + (F2(m+1) - F2(ave1))/m \\
&\qquad\qquad\vdots \\
&Fn(ave1) = Fn(ave1) + (Fn(m+1) - Fn(ave1))/m
\end{aligned}
$$

(5) The same processing as (4) above shall be performed for the (m+2)-th time and after that.

Note: Other algorithm than above may be used, but it shall meet three conditions below.

- Above procedures from (1) through (3) shall be the same.
- Procedures (4) and (5) can be replaced by other algorithm, but average value shall be calculated at each of (m+1)-th time, (m+2)-th time, ...
- Level detection accuracy shall be superior to the above algorithm.

An example of the other algorithm is as follows, which is called a complete moving average.

(4)' When the sampled value of the (m+1)-th time is obtained, calculate the following average value.

$$
\begin{aligned}
&F1\ (ave2)=F1\ (ave1)+(\ F1\ (m+1) - F1\ (1)\ )/m \\
&F2\ (ave2)=F2\ (ave1)+(\ F2\ (m+1) - F2\ (1)\ )/m \\
&: \\
&: \\
&Fn\ (ave2)=Fn\ (ave1)+(\ Fn\ (m+1) - Fn\ (1)\ )/m
\end{aligned}
$$

(5)' The same processing as (4)' above shall be performed for the (m+2)-th time and after that.

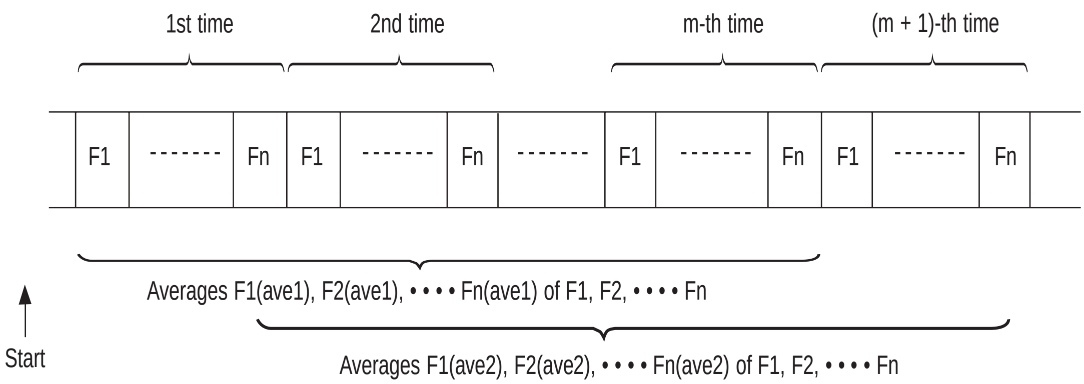


Fig. 4.1.15-1 : Averaging of the detected reception level

4.1.16 Radiowave cut off detection

4.1.16.1 Radiowave cut off detection at the mobile station

Perform radiowave cut off detection as follows by comparing the color code designated by the base station with the color code on the carrier which the mobile station is presently receiving.

(1) Radiowave cut off timer start condition :

When the designated color code does not match with the received color code for N_1 consecutive comparisons.

(2) Radiowave cut off timer stop condition :

When the designated color code matches with the received color code for N_2 consecutive comparisons.

(3) Radiowave cut off condition :

When the radiowave cut off timer indicates T seconds.

Above parameters are shown in Table. 4.1.16-1

Table 4.1.16-1 : Standard values for parameters

Parameter	Standard
N_1	6 times
N_2	3 times
T	5 sec.

The radiowave cut-off detection of the packet physical channel differs depending on the reception types. Radiowave cut-off detection is performed for each subframe in case of the continuous reception, while it is performed for each subframe received in case of the intermittent reception, superframe intermittent reception and hyperframe intermittent reception. When the radiowave cut-off detection start conditions are met during the intermittent reception, superframe intermittent reception or hyperframe intermittent reception operation, the mobile station immediately switches to the continuous reception operation, and when the radiowave cut-off detection stop condition is met, the mobile station returns to intermittent reception operation.

4.1.16.2 Radiowave cut off detection at the base station

Not specified.

4.1.17 Frame synchronization

4.1.17.1 Detection of out-of-sync

Both the mobile and base stations shall have the function of the out-of- sync detection procedure. However, the out-of-sync detection method for base station is not specified here, while this section is applied only to mobile stations.

When the following conditions are met, the out-of-sync condition is established.

(1) Frame out-of-sync condition : Sync words (SW) are not detected for N_3 consecutive times.

(2) Superframe out-of-sync condition : Superframe sync words (SSW) are not detected for N_4 consecutive times.

(Note) It is desirable that even in the standby state, in which mobile station receives only PCH as described in Appendices B and G, superframe out-of-sync condition can be detected.

(3) Sync burst out-of-sync condition : Out-of-sync detection is not performed.

(4) Hyperframe out-of-sync condition : Superframe number H_M or H_m does not match up consecutive N5 times on reception of idle units.

Parameters shall accord with Table 4.1.17-1.

Table 4.1.17-1 Parameter standard values

Parameter	Standard
N_3	10 times (2 bit error tolerance)
N_4	10 times (2 bit error tolerance)
N_5	Once

The out-of-sync detection of the packet physical channel differs depending on the reception types. In case of the low-speed transmission, out-of-sync is detected in the slots which are currently used for communication from among all slots composing the packet physical channel. In case of the high-speed transmission, sync word detection is performed independently for each slot composing the packet physical channel. If the out-of-sync condition arises in any of the slots, it is declared as out-of-sync. During the continuous reception, out-of-sync detection is performed by receiving all subframes. During the intermittent reception, superframe intermittent reception or hyperframe intermittent reception, the sync word detection is performed for each subframe received, and if no sync word is detected, the mobile station immediately switches to the continuous reception and the out-of-sync detection is performed.

Out-of-sync detection in hyperframes of the packet physical channel is performed by comparing the superframe no. H_M and H_m received from the idle unit to the values when synchronization was established. When a hyperframe out-of-sync condition is detected, the mobile station performs the continuous reception until a hyperframe sync is established again by receiving the idle unit.

4.1.17.2 Synchronization establishment condition

When the mobile station meets the following conditions, it is assumed that synchronization is established. However establishment conditions at base stations are not specified in this standard.

(1) Frame synchronization establishment condition:

Sync words are received for two consecutive times with 1 bit error tolerance (control physical channel). One sync word is received with 1 bit error tolerance; in addition, the color code matches (when frame out-of-sync has been detected for the control physical channel, or when switching back to the control physical channel after activation of a packet physical channel or a TCH has failed).

(2) Superframe synchronization establishment condition:

One sync word is received with 2 bit error tolerance on the frame synchronization condition.
(This indicates the superframe synchronization condition on the control physical channel or the packet physical channel. TCH establishes this synchronization by using the superframe sync counter for sync burst.)

(3) Sync establishment condition for sync burst :

One sync burst is received with 4 bit error tolerance; in addition, the color code matches.

(4) Transition condition from sync burst to communication burst:

One TCH sync word is received with 2 bit error tolerance.

(5) Hyperframe synchronization establishment condition :

One idle unit is received.

4.1.18 Handover time (synchronization establishing time)

"Handover time" is defined as the period from when the mobile station switches the TCH until synchronization with the newly assigned TCH is established. The handover time is specified in Table 4.1.18-1. Detailed definition for handover time is given in Chapter 6, Item 6.2.10.

Table 4.1.18-1

RF level of the 2nd signal generator (dBm)	Model automobile speed (Km/h)	Handover time (msec)
-90	8 and 100	200

Note : The specifications in the above table is the minimum requirement to maintain availability between the base station and the mobile station. Improvement of synchronization time to reduce service down time is left to individual manufacturers.

Also note that synchronization for base stations is not specified in this Standard.

4.1.19 Transmission output control

(1) Transmission output control of mobile station

The transmitting mobile station shall control the transmission output according to the command set from the base station.

(2) Transmission output control of base station

Application of the transmission output control of the base station shall be left to individual operators. However, the transmission output control of the base station shall accord with stipulation in Item 3.4.2.2, (2).

The transmission output for an unused slot shall accord with the stipulation in Item 3.4.2.2, (2). However, transmission output control of the perch channel carrier shall not be performed for all slots, and the content of the unused slot excluding SW and CC shall be left to individual operators and shall be transmitted with scrambling (with scramble pattern other than $S_0=S_1=...=S_8=0$) as specified in Item 4.1.7.

4.1.19.1 Transmission output control algorithm

Control algorithm is not specified. The correspondence of the bit pattern and the base station transmission output regulated value (POW-D) is shown in Table 4.1.19.1-1. POW-D is reported via RCH (Refer to 4.1.4.4).

Table 4.1.19.1-1 Correspondence between POW-D and bit pattern

Bit pattern	Transmission output regulated value
1 1 1	0dB
* 1 1 0	-4dB
* 1 0 1	-8dB

MSB LSB * Spare bits

4.1.19.2 Operation of mobile station

(1) Transmission output power of the mobile station is designated by downlink RCH and shall be changed in accordance with the designated value. The correspondence between bit patterns and the mobile station transmission output value (POW) is listed in Table 4.1.19.2-1. The "o" in the table indicates that the transmission output power of the mobile station is set to the specified value and "X" indicates that the transmission output power is set to the maximum transmission power of the mobile station.

(2) Transmission output power of mobile station shall be changed by the first transmission timing passed 20 m sec after reception of the power change command from the base station. However, transmission output power shall not be changed during the slot.

(3) Transmission timing of the mobile station transmission power value (POW-U) shall be set to the uplink RCH passed 18 frames (18 subframes for full rate) after reception of the downlink RCH, as shown in Fig. 4.1.19.2-1.

(Here, the latest RSSI, ERR and POW-U shall be transmitted.)

Table 4.1.19.2-1 : Relationship between the mobile station transmission output value and bit pattern

Bit pattern	Mobile station transmission output value	Mobile station type			
		I	II	III	IV
∗ 0 0 0	3.0W	o	x	x	x
∗ 1 1 1	3.0W - 4dB/2.0W	o	o	x	x
∗ 1 1 0	3.0W - 8dB/2.0W - 4dB	o	o	o	x
∗ 1 0 1	3.0W -12dB/2.0W - 8dB	o	o	o	o
∗ 1 0 0	3.0W -16dB/2.0W -12dB	o	o	o	o
∗ 0 1 1	3.0W -20dB/2.0W -16dB	o	o	o	o
∗ 0 1 0	3.0W -24dB/2.0W -20dB	o	o	o	o
∗ 0 0 1	3.0W -28dB/2.0W -24dB	o	o	o	o

MSB LSB

Note : "∗" indicates spare bits.
"o" indicates transmission output value can be used.
"x" indicates transmission output value cannot be used.

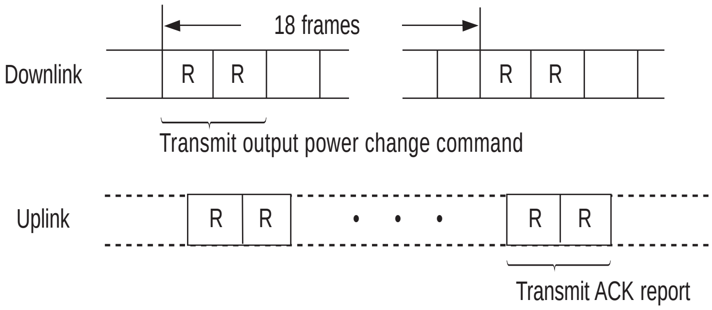


Fig. 4.1.19.2-1 : Transmission timing of the mobile station transmission power value (POW-U) (Half rate)

4.1.19.3 Autonomous transmission power control function of mobile station

When the reception level which the mobile station detected in the standby state and in any packet communication state is higher than the threshold of "40 dBμV", the mobile station shall be able to control transmission power autonomously. In addition, the degree of transmission power control shall accord with the Fig. below. Note that the control should be performed within the control range specified for each mobile station type, based on the maximum transmission output power for the zone (i.e., the max. transmission power in the zone which is broadcast by the BCCH). Moreover transmission power should not be changed during the slot.

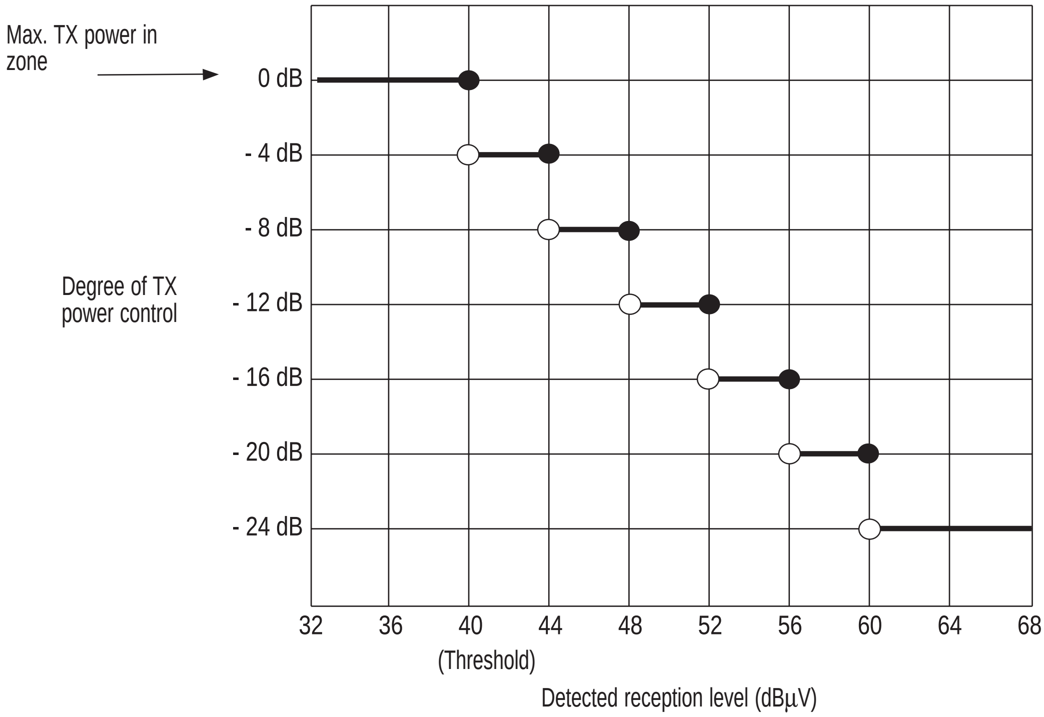


Fig. 4.1.19.3-1 : Autonomous transmission power control

4.1.20 VOX control

Mobile station with VOX control capability must operate as follows :

(1) Mobile station shall have VOX function which enables to turn the TCH transmission output ON and OFF according to the presence or absence of the voice input during call in progress. When voice input is not present, the mobile station constantly transmits the information burst shown in Fig. 4.1.20-1.

(2) When the mobile station detects the voice absence during voice present state, it sends out a postamble signal (POST) to indicate transmission output OFF state of the TCH. Conversely, when the MS detects the voice presence during voice absent state, it sends out a preamble signal (PRE) to indicate the transmission output ON state of the TCH.

Both PRE and POST signals consist of the same 224-bit frame structure specified in Chapter 5 "Voice Coding System" and the same bit interleaving shall be performed.

The POST signal includes background noise information of the mobile station which enables the base station to generate background noise during voice absence period.

The PRE signal is a 224-bit unique word, while the POST signal is a 448-bit word (224-bit unique word (PST0), plus 224-bit information for generating background noise (PST1)). However, because the coded data is interleaved for every two slots, the PRE signal spans over two slots, and the POST spans over three slots.

The POST signal information for generating background noise shall be;

- when the VSELP, PSI-CELP, ACELP speech codecs are used, the signal obtained from mobile station background noise encoded in accordance with the codec standards. The mobile station transmits the POST signal periodically (maximum period: once per second) during voice absent state, so that the base station can update the background noise generation. The transmission timings of PRE and POST signals, when the VSELP, PSI-CELP speech codecs are used, are shown in Fig. 4.1-20-2. For the transmission timings of PRE and POST signals when the ACELP speech codec is used, refer to Section 5.4 "ACELP speech codec".

- when the CS-ACELP speech codec is used, refer to Section 5.3 "CS-ACELP speech codec."

(3) The unique word pattern for the respective preamble and postamble signals is shown in Fig. 4.1.20-3. This figure shows the bit assignment with the respective PSTO and PRE are set for slots 1 and 2.

(4) The mobile station shall stop the VOX control, but transmit TCH continuously, regardless of the voice existence in the following periods.

i) The duration from when communications activate until the first voice present frame is detected.

ii) During channel switching (the duration from when the frequency set command is received until the new traffic channel detects the first voice present frame (or until the previous channel detects the first voice present frame on switching back to the previous channel)).

iii) The duration from when a VOX disable command is received from the base station until a VOX enable command is received or the call is terminated.

(5) The mobile station shall be able to transmit FACCH immediately during VOX operation regardless of its condition.
In this case, PRE and POST signals are not added to FACCH itself.

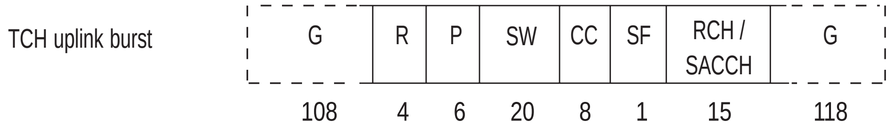


Fig. 4.1.20-1 : Transmission signal during VOX

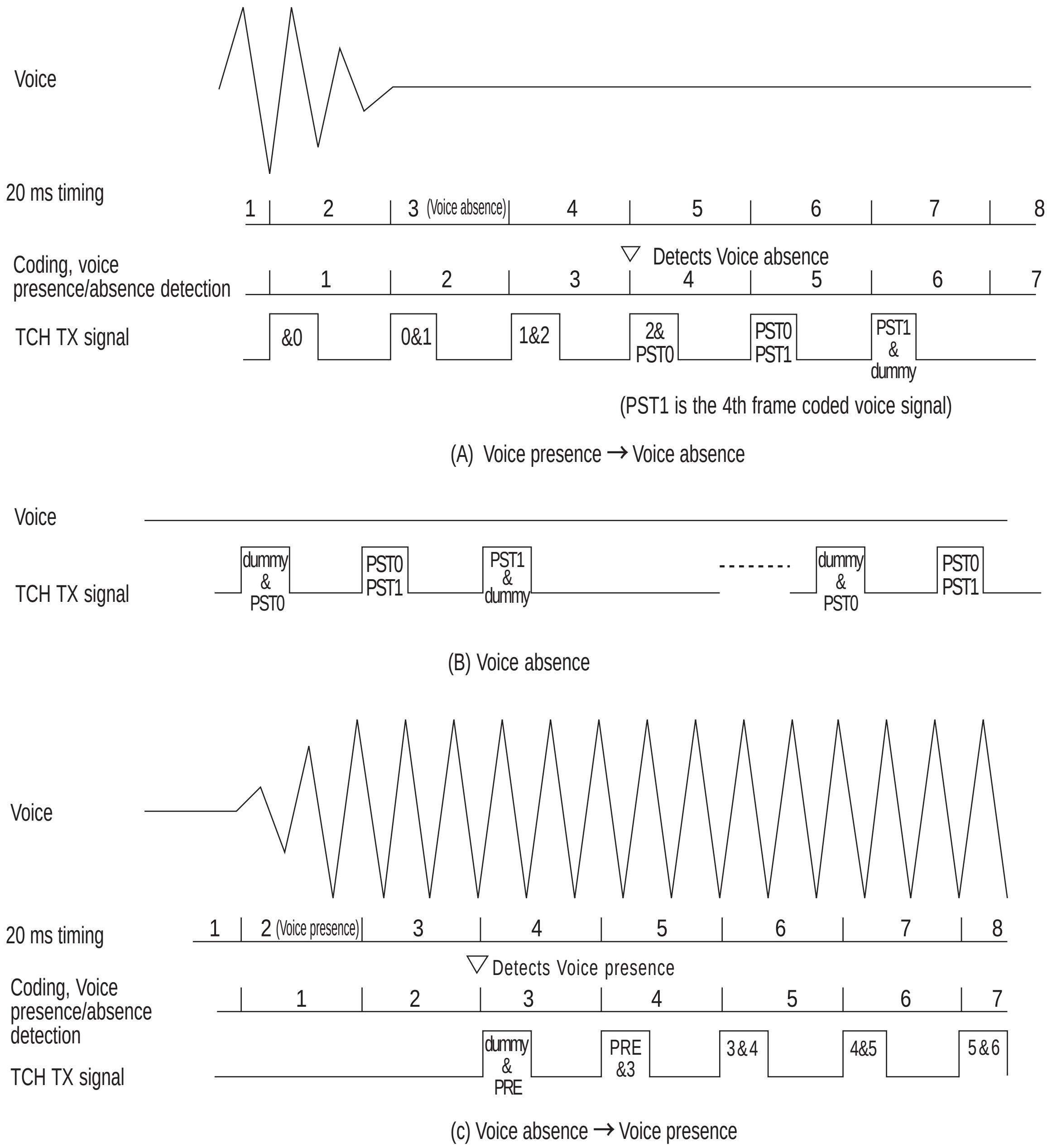


Fig. 4.1.20-2 : Transmission timing for preamble, postamble

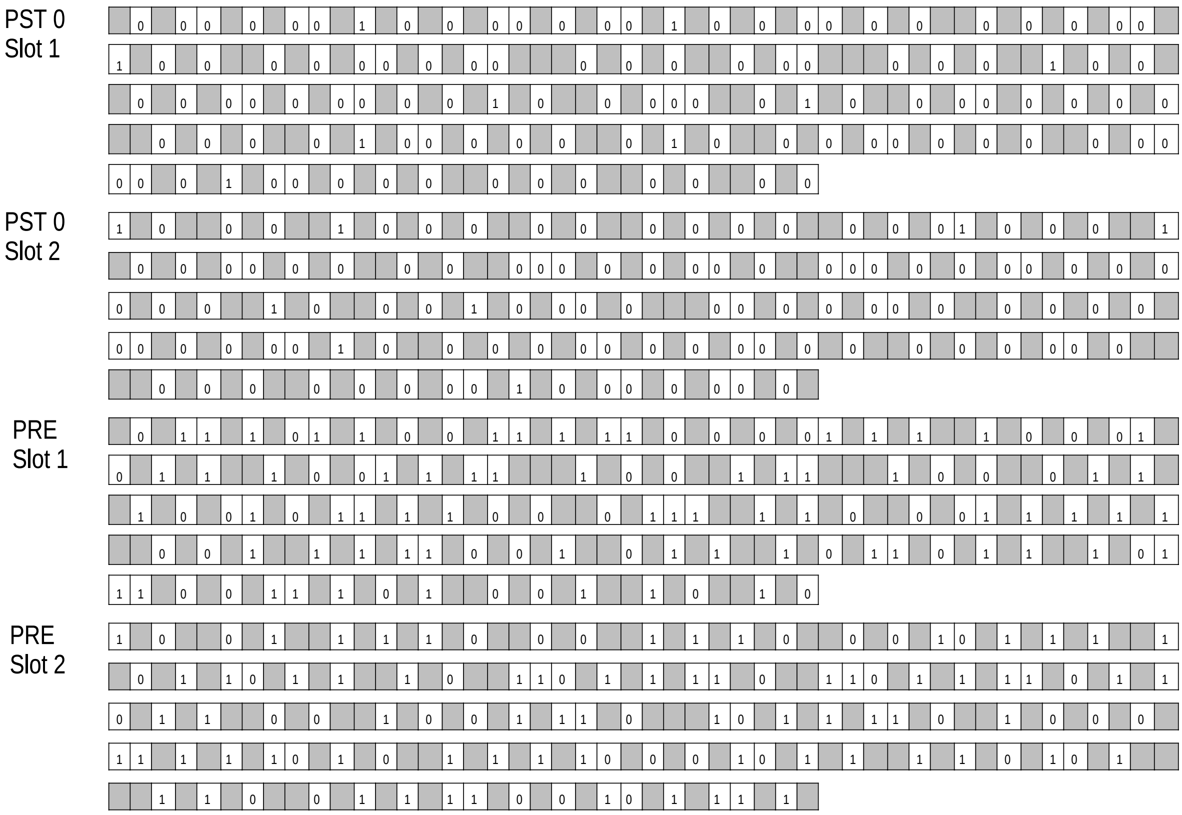


Fig. 4.1.20-3 (a) Unique word patterns for preamble and postamble signals (VSELP, ACELP (full-rate))

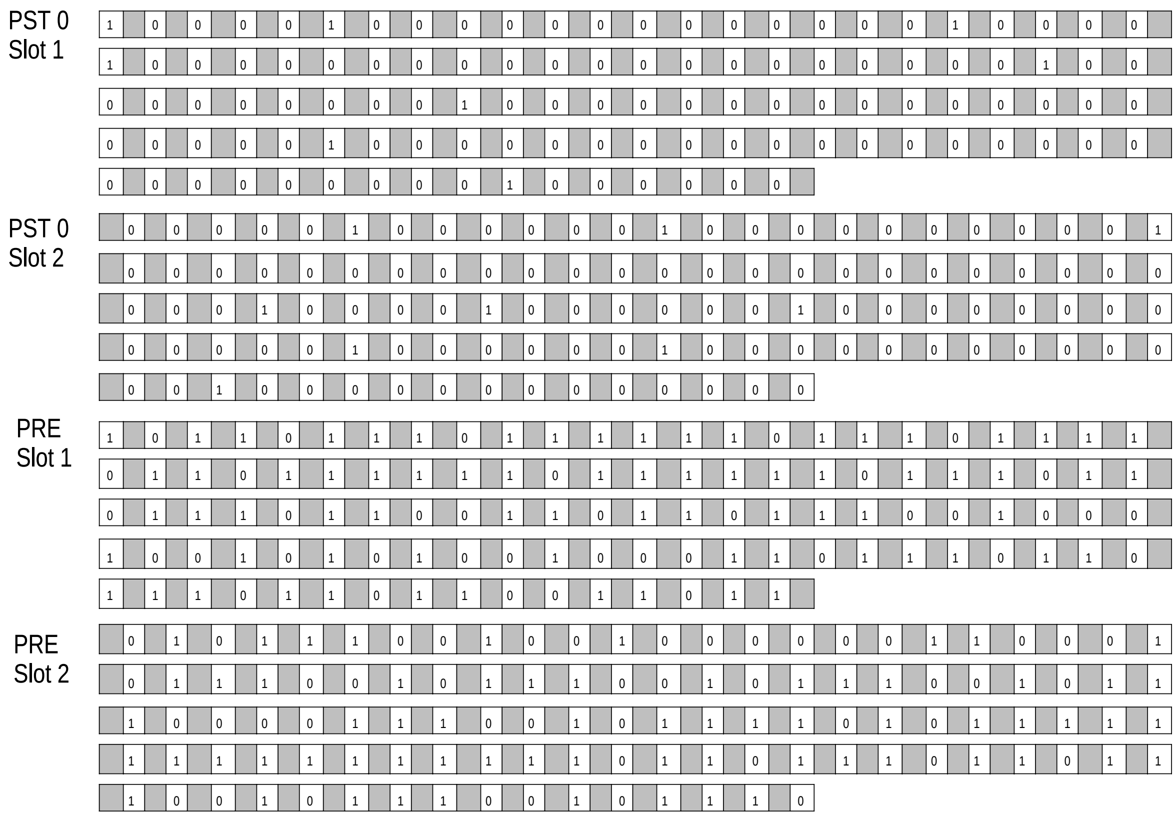


Fig. 4.1.20-3 (b) Unique word patterns for preamble and postamble signals (PSI-CELP (half-rate))

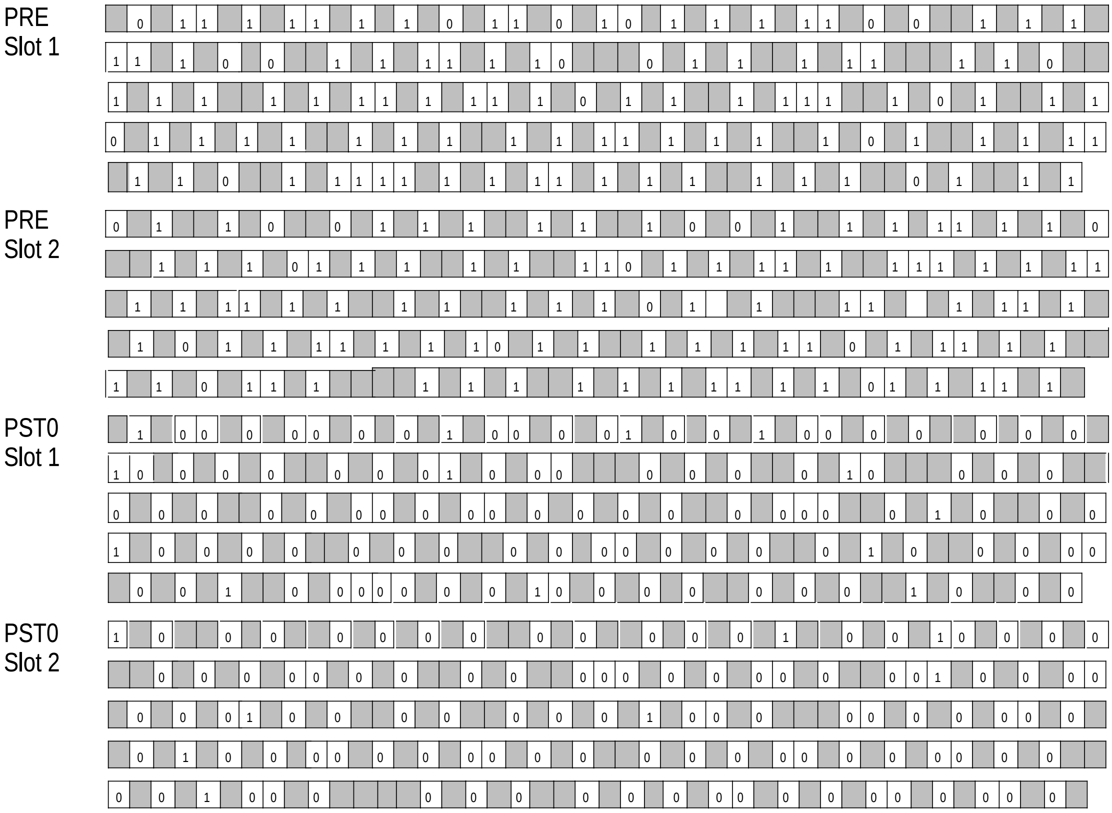


Fig. 4.1.20-3 (c) Preamble/Postamble signal unique word patterns (CS-ACELP (full-rate))

4.1.21 UPCH channel coding switching control

There is a case where error correction codes are added (hereinafter referred to as "with FEC") and a case where error correction codes are not added (hereinafter referred to as "without FEC") as the channel coding. Switching between these cases is controlled according to the channel quality.

4.1.21.1 Basic operation

(1) When a new packet physical channel is selected, the mobile station receives from the base station a notification of the channel quality condition information (downlink BER and RSSI) which permits "without FEC". The condition information to be nortified is listed in Table 4.1.21.1-1. The FEC control decision parameters are nortified through the UPCH idle unit.

(2) The mobile station measures the BER and RSSI level and if a certain condition is met, the mobile station transmits signals without FEC, and if the condition is not met, the mobile station transmits signals with FEC.

Table 4.1.21.1-1 FEC control determination parameters

FEC switching enable/disabled	Enabled/disabled
BER decision value 1	BER value
BER decision count 1	1-255
BER decision value 2	BER value
BER decision count 2	1-255
RSSI decision value 1	RSSI value
RSSI decision count 1	1-255
RSSI decision value 2	RSSI value
RSSI decision count 2	1-255

4.1.21.2 FEC switching control of mobile station

4.1.21.2.1 During signal transmission

(1) A frame which contains the Protocol discriminator set for "Protocol for mobile packet communication", or a frame which contains the Protocol discriminator set for "Protocol for switched virtual circuit connection packet communication "and at the same time contains a User Information message, is coded and divided into units with FEC or without FEC for each frame according to Fig.4.1.21.2-1. Immediately after channel activation, coding with FEC shall be performed until an idle unit is received and BER and RSSI values are obtained. And also, immediately after channel selection, coding with FEC shall be performed until BER and RSSI values are obtained.

(2) A frame which includes RT or MM message(s), and a layer 2 supervisory frame are always coded with FEC and set into units.

(3) An I’ frame to be transmitted by reception of an SREJ’, is set into units according to the FEC setting (with FEC or without FEC) at the transmission of the corresponding I frame.

(4) At time out of timer T200 or on reception of an SREJ, the corresponding frame shall be coded with FEC, set into units and retransmitted.

(5) Immediately after switching from Packet standby state into Active state, coding with FEC shall be performed, and the FEC switching control shall begin from the initial state.

(Note) Items (2), (3) and (4) apply to the network side operation as well.

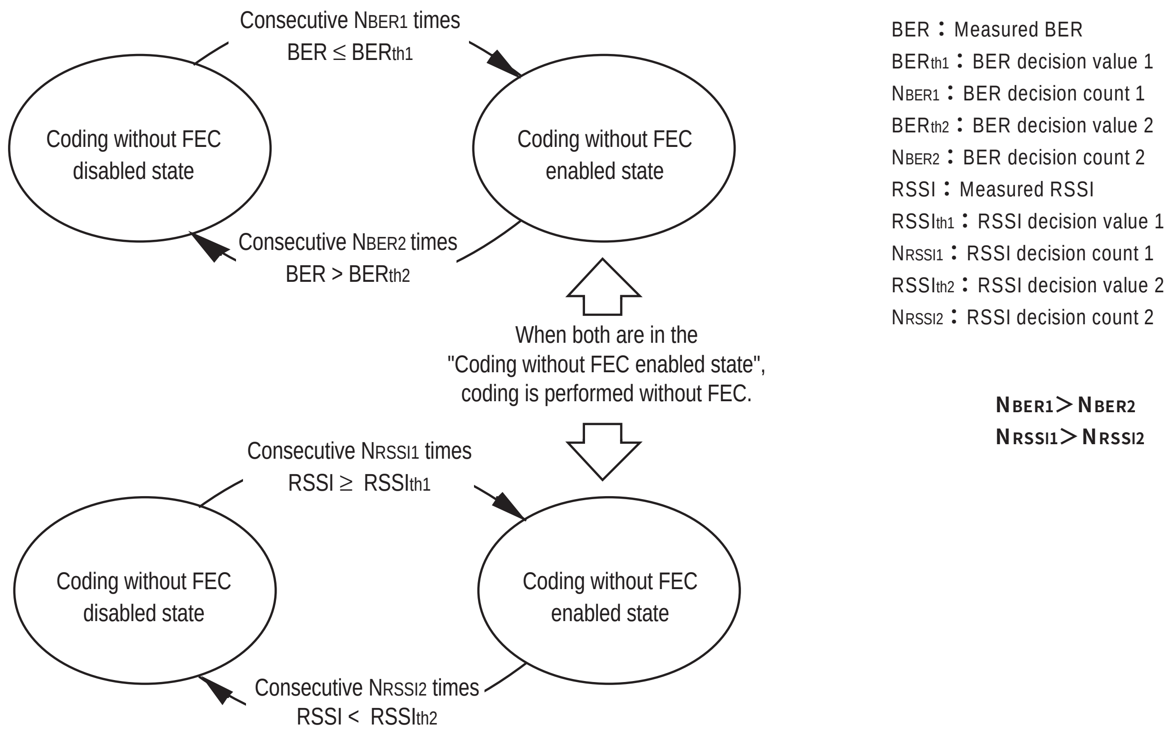


Fig. 4.1.21.2-1 Transmission operation of mobile station

4.1.21.2.2 During signal reception

The mobile station shall perform the operation shown in Fig. 4.1.21.2-2 below.

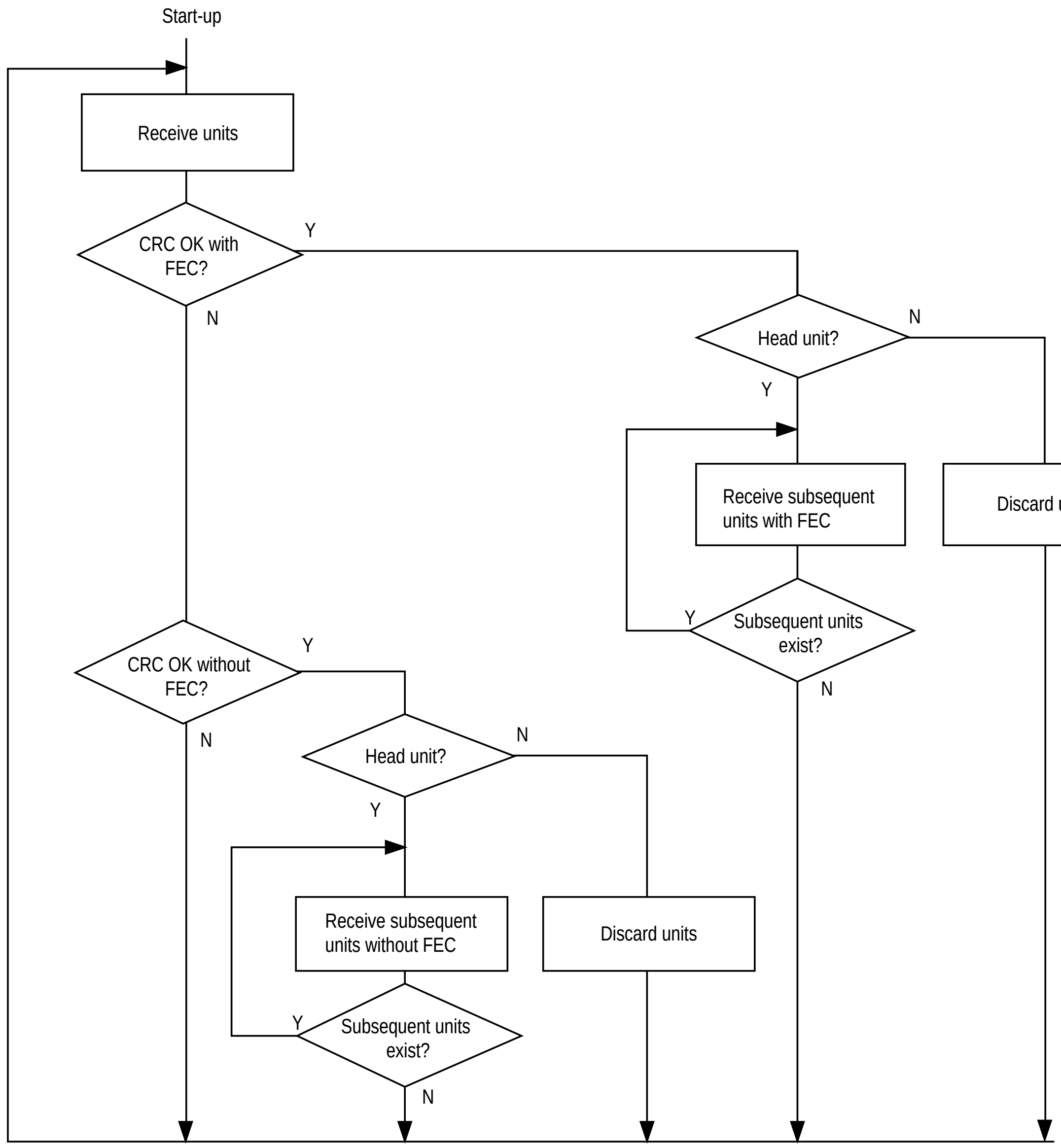


Fig. 4.1.21.2-2 Reception operation of mobile station

4.1.22 Malfunction detection for mobile stations

(1) Malfunction detection timer

The mobile station shall be equipped with a malfunction detection timer which is independent on other functions. This timer operates normally when the mobile station is power on. If the mobile station is controlled by software, a reset command should be inserted into the control software so that the timer does not end while the sequence is being executed. The same operation shall be performed by also the mobile station hardware design. The maximum timer value shall be 10 seconds.

(2) Fault transmission

To minimize the possibility of the fault transmission caused by malfunction of the parts in the mobile station, the mobile station shall have the detection function and prevention function for fault transmission.

4.1.23 Communications between layers

4.1.23.1 Interface for the physical layer (Layer 1)

The physical layer (layer 1) is interfaced with the data link layer (layer 2) and the management entity by means of primitives. The interface for the Layer 1 is shown in Fig. 4.1.22.1-11.

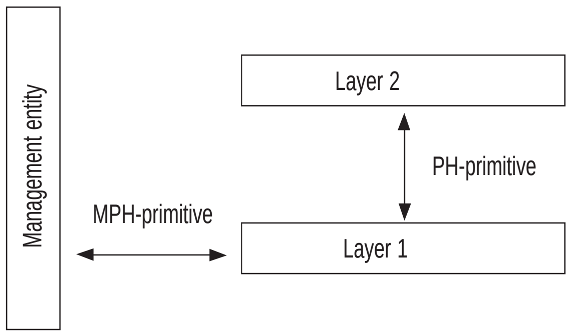


Fig. 4.1.22.1-1 : Interface for layer1

4.1.23.1.1 Interface with the data link layer (Layer 2)

The PH-primitive is exchanged between the physical layer and the data link layer in order to transmit and receive the layer 2 frame.

4.1.23.1.2 Interface with the management entity

The MPH-primitive is exchanged between the physical layer and the management entity in order to transmit and receive information on assigning radio channels, information on physical layers and so forth.

4.1.23.2 Primitives for the physical layer (Layer 1)

Definitions of primitives (and their related parameters) which are exchanged between Layer 1 and Layer 2, or between Layer 1 and the management entity, are given in Fig. 4.1.22.2-1(Layer 1 primitive), 4.1.22.2-2 (primitive parameter) below.

General name	Type				Content of message unit
	REQ	IND	RES	CON	
Between Layer 1 and Layer 2					
PH-DATA	O	O	-	-	
PH-INFO	-	O	-	-	
Between Layer 1 and Management Entity					
MPH-ACTIVATE	O	O	-	-	
MPH-DEACTIVATE	O	O	-	-	
MPH-INFO	O	O	-	-	

REQ : Request O : Exists - : Doesn't exist
IND : Indicate
RES : Respond
CON : Confirm

Fig. 4.1.23.2-1 : Primitives for the physical layer (Layer 1)

Note: Channel activate/deactivate

The layer 3 RT information such as frequency codes, slot number is necessary for activating or deactivating channel. However, because such information does not relate to layer 2 information, channel activation or deactivation is performed by the management entity issuing MPH-ACTIVATE or DEACTIVATE primitive which includes channel information.

Parameter	Type	Symbol	Entity	*1	*2	*3	*4	*5	*6	*7	*8	*9	*11
PH-DATA	REQ	PH-DATA-REQ	BS/MS		O								
	IND	PH-DATA-IND	BS/MS		O			O	O				
PH-INFO	IND	PH-INF-IND	BS/MS										O
MPH-ACTIVATE	REQ	MPH-ACT-REQ	BS/MS	O		O	O			O			
	IND	MPH-ACT-IND	BS/MS			O							
MPH-DEACTIVATE	REQ	MPH-DEA-REQ	BS										
	IND	MPH-DEA-IND	BS										
MPH-INFO	REQ	MPH-INF-REQ	BS/MS										
	IND	MPH-INF-IND	BS/MS										

Symbol	Info. type	*1	*2	*3	*4	*5	*6	*7	*8	*9	*10
MPH-INF-REQ	Quality request			O					O		
MPH-INF-IND	Quality indication			O					O		
MPH-INF-IND	State indication								O		
MPH-INF-IND	State abnormality									O	
MPH-INF-REQ	VOX control										O

Note 2 BS : Base Station, MS : Mobile Station

*1 : Physical channel type (CCH/TCH)
*2 : Functional channel type

*3 : Frequency/slot information
*4 : Code information (scrambling code, color code)
*5 : Partial re-transmission/non-reception unit number
*6 : Number of bits per unit
*7 : Layer 1 structural information
*8 : Measurement data (measuring conditions, measurement results)
*9 : Cause indication
*10 : Enable/disable
*11 : Transmission result (Success/Failure)

Fig. 4.1.23.2-2 : Parameters for primitives

4.1.23.3 Layer 1 procedure

State indications which are given for mobile and base stations are listed in Figs. 4.1.22.3-1 and 4.1.23.3-2 below, respectively.

State of mobile station

	State	Description of the state
F1	Non-active	Power for the mobile station is OFF
F2	Channel deactivated	Channel is deactivated
F3	Activating control channel	Detecting the SW of the control channel
F4	Control channel activated	Frame synchronization of the control channel is established
F5	Synchronizing traffic channel	Waiting for SB1
F6	Traffic channel synchronization	Transmitting SB2 and waiting for SB3
F7	Activating traffic channel	Transmitting SB4 and waiting for the base station to switch signal
F8	Traffic channel activated	Call in progress on the traffic channel
F9	Re-activating traffic channel	Re-activating traffic channel and transmitting SB2
F10	Activating perch channel	Waiting for reception of BCCH on the perch channel
F11	Re-synchronizing traffic channel	Establishing re-synchronization on the traffic channel
F12	Activating packet channel	Detecting the SW of the packet channel
F13	Packet channel activated	Frame synchronization of the packet channel is established

Fig. 4.1.23.3-1 : State of mobile station

State of base station

	State	Description of the state
G1	Channel deactivated	Channel is not being used
G2	Activating control channel	Detecting the SW of the control channel
G3	Synchronizing traffic channel	Transmitting SB1 and waiting for SB2
G4	Traffic channel synchronization	Transmitting SB3 and waiting for SB4
G5	Activating traffic channel	Signal switched by the base station and waiting for the mobile station to switch signal
G6	Traffic channel activated	Call in progress on the traffic channel
G7	Activating packet channel	Detecting the SW of the packet channel

(Note) SW : Synchronization word (refer to section 4.1.4.3.6)
SB1 to SB4 : Refer to section 4.1.11.2

Fig. 4.1.23.3-2 : State of base station

4.1.23.4 Layer 1 protocol header

Layer 1 incorporates a function for direct exchanging control information (such as time alignment data, transmission power control data and quality supervision data) with opposing physical channel. It also assigns bits on the information physical channel. (Refer to Section 4.1.4.4 "Structure of housekeeping bits".)

4.2 Layer 2 standards

4.2.1 Overview of layer 2 standards

4.2.1.1 Overview

Layer 2 defines the LAPDM (Link Access Procedure for Digital Mobile Channels) used for data transmission between nodes using the bit transmission functions of layer 1 (layer 2 is called the data link layer). The purpose of LAPDM is to convey information between the layer 3 entities across the RF section interface for the digital mobile telephone system using the CCH.

The following standards and terminology are used to regulate and define LAPDM usage.

(1) ITU-T Recommendation X.200 [2] and X.210 [3]
The reference model and layer services conventions for Open systems Interconnection (OSI).

(2) TTC Standards JT-X25 [4]
— X.25 "Packet Mode Terminal Interface."

(3) ISO3309 [5] and ISO4335 [6]
"High-level Data Link Control (HDLC) Standards for frame structure and elements of procedure.

LAPDM is a protocol which operates at the data link layer of the OSI architecture. The relationship between the data link layer and other protocol layers is defined in the ITU-T Recommendations I.320, [7].

The LAPB operation is not permitted on LAPDM.

LAPDM is independent of transmission bit rate. It requires a duplex, bit transparent CCH.
A description of the remaining item headings in this section is given below.

Item heading		Description
4.2.1.2	:	The basic structure employed by this digital cellular standards and by the layer 2 standards.
4.2.1.3	:	Overview description of LAPDM functions and procedures.
4.2.1.4	:	Summary of the services that the data link layer provides to layer 3 and the services that the data link layer requires from the physical layer.
4.2.1.5	:	Overview of the data link layer structure.
4.2.1.6	:	Special requirements.

4.2.1.2 Concepts and terminology

The basic structuring technique in the OSI model is layering. According to this technique, communications among application processes is viewed as being logically partitioned into an ordered set of layers represented in a vertical sequence as shown below in Fig. 4.2.1.2-1.

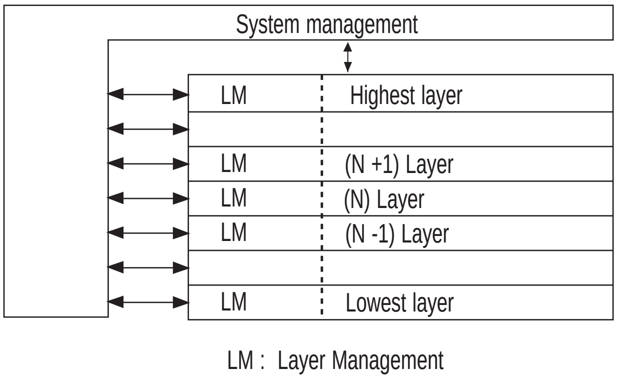


Fig 4.2.1.2-1 : Layer structure of the OSI

A data link layer Service Access Point (SAP) is the point at which the data link layer provides services to layer 3. Each data link layer SAP associates with one or more data link connection endpoints as shown in Fig. 4.2.1.2-2. A data link connection endpoint is identified by a data link connection endpoint identifier as seen from layer 3 and by a Data Link Connection Identifier (DLCI) as seen from the data link layer.

Entities exist in each layer. “Entity” is a concept used to refer to the modeling of the functional module required by each layer in order to exchange data between different systems. Entities in the same layer, but in different systems, which must exchange information to achieve a common objective are called “peer entities.” The services provided by the data link layers are the combination of the services and functions provided by both the data link layer and the physical layer.

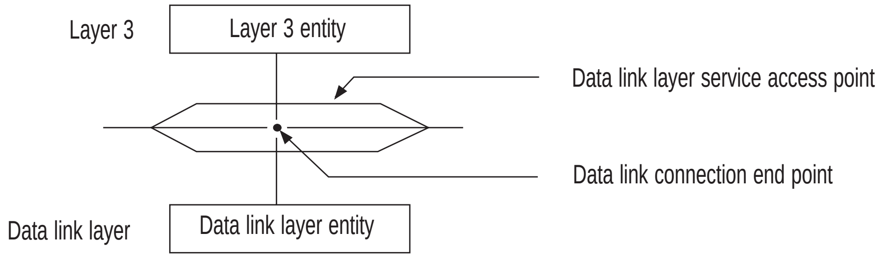


Fig. 4.2.1.2-2 : Entities, service access points and end points

Cooperation between data link layer entities is governed by a peer-to-peer protocol specific to the layer. In order for information to be exchanged between two or more layer 3 entities, an association must be established between the layer 3 entities in the data link layer using a data link layer protocol. The peer-to-peer relationship is shown in Fig. 4.2.1.2-3. This association is called a “data link connection.” Data link connections are provided by the data link layer between two or more SAPs.

Data link message units are conveyed between data link layer entities by means of a physical connection.

Layer 3 requests services from the data link layer via service primitives.

The same applies to the interaction between the data link layer and the physical layer. The primitives represent, in an abstract way, the logical exchange of information and control between the data link layer and adjacent layers. They do not specify or constrain usage.

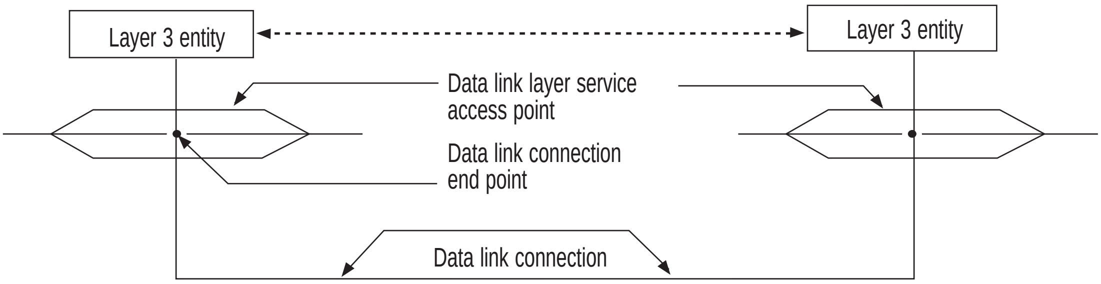


Fig. 4.2.1.2-3 : Peer-to-peer relationship

The four types of primitives shown in Fig. 4.2.1.2-4 below are exchanged between the data link layer and adjacent layers.

(1) REQUEST (REQ)
(2) INDICATION (IND)
(3) RESPONSE (RSP)
(4) CONFIRM (CON)

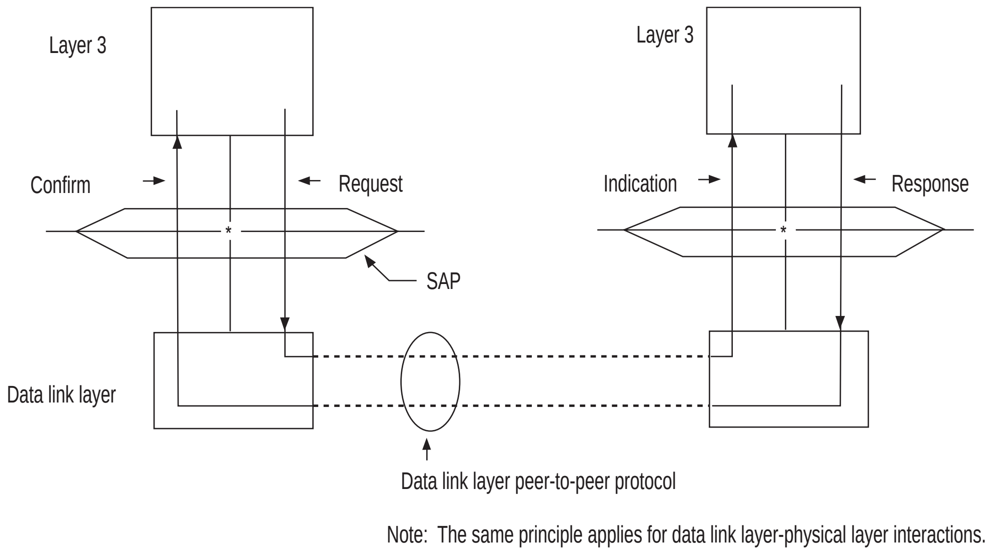


Fig.4.2.1.2-4 : Primitive action sequence

The REQUEST (REQ) primitive is used by higher layers to request service from the next lower layer.

The INDICATION (IND) primitive is used by a layer providing a service to notify the next higher layer of any specific activity which is service related.

The IND primitive may also be the result of an activity of a lower layer related to the REQ primitive at the peer entity.

The RESPONSE (RSP) primitive is used by a layer to acknowledge reception of an IND primitive from a lower layer.

The CONFIRM(CON) primitive is used by the layer providing the requested service to confirm that the function of the primitives have been fully completed.

Refer to "Section 4.2.2 Layer 2 Specifications" for regulations pertaining to layer-to-layer interaction.

Information is transferred via various types of message units, between peer entities and between entities in adjacent layers that are attached to a specific SAP. The following two main types of message units are used.

(1) Message units of peer-to-peer protocol.
(2) Message units that contain layer-to-layer information concerning state and specialized service requests.

Message units of the layer 3 peer-to-peer protocol are carried by the data link connection. Note that message units containing layer-to-layer information concerning state and specialized service requests are never conveyed over a data link connection or a physical connection.

Fig. 4.2.1.2-5 below shows a reference model for the data link layer.

Layer 2 specifications cover the following points:

(1) The peer-to-peer protocols for the transfer of information and control between any specified pair of data link layer service access points.

(2) The interaction between the data link layer and layer 3, and between the data link layer and the physical layer.

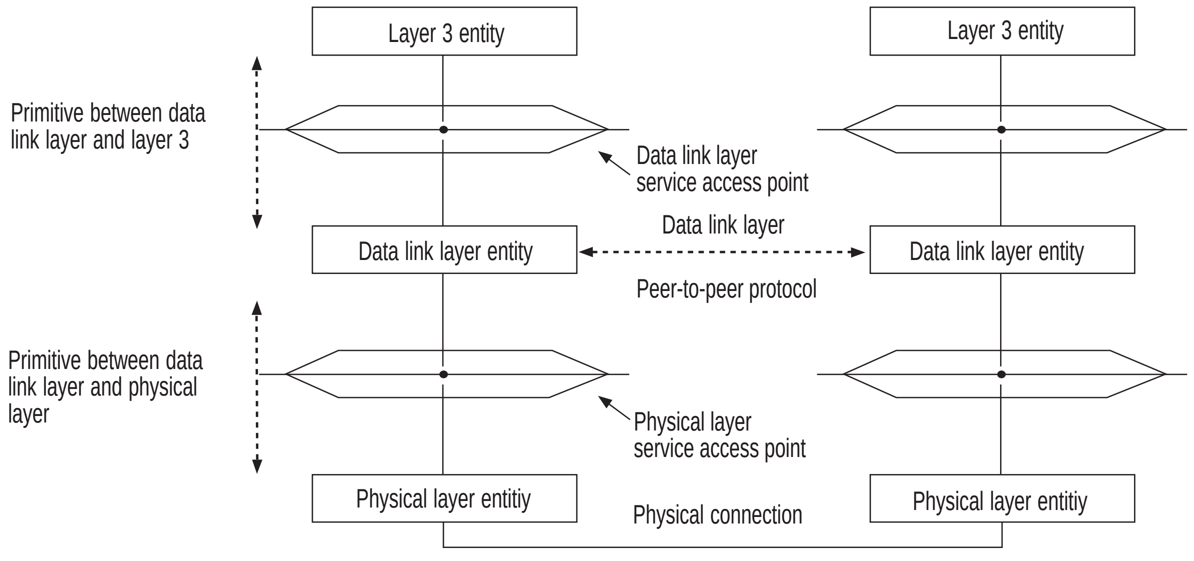


Fig. 4.2.1.2-5 Data link layer reference model

4.2.1.3 LAPDM function and overview

4.2.1.3.1 General

(1) The major functions of the LAPDM is as follows :

i) Connections between several mobile stations on the user-network interface.

ii) Multiple layer 3 entities

iii) Information transfer by the broadcast channel (BCCH)

iv) Information transfer by the paging channel (PCH)

v) Information transfer by the signalling control channel (SCCH).

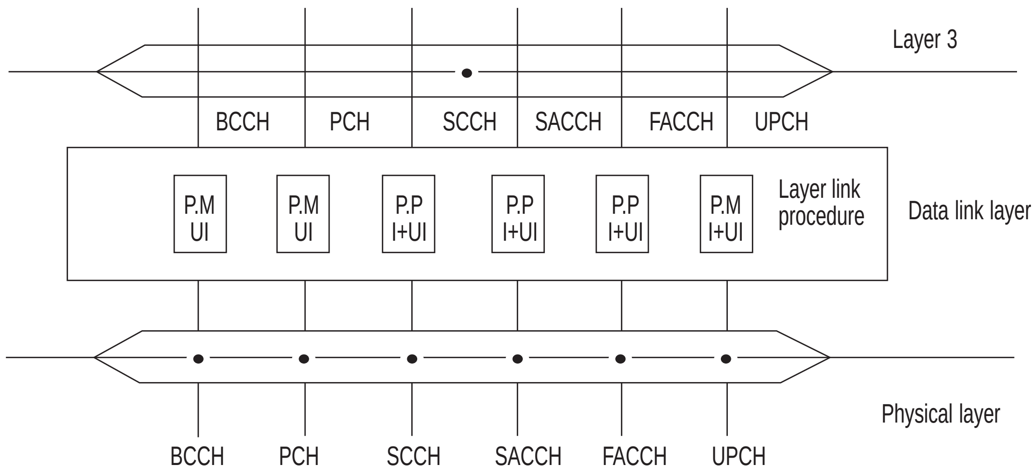
vi) Information transfer by the slow associated control channel (SACCH)

vii) Information transfer by the fast associated control channel (FACCH)

viii) Information transfer on the user packet channel (UPCH)

The above function channels are configured as shown in Fig. 4.2.1.3-1 below.
The layer 3 entity conveys information using multiple function channels on one data link connection. The respective physical connections are provided to layer 2 for each function channel.

Each function channel on the data link connection contains state parameters and system parameters for information transfer, and transfers information performs state transitions independently.



PM : Point-to-multipoint
PP : Point-to-point
I : Acknowledged information transfer
UI : Unacknowledged information transfer

Fig.4.2.1.3-1 : Functional diagram of layer 2

(2) The following layer 2 functions are common for the function channels:

i) Providing of one or more data link connections on the CCH. Discrimination between the data link connections is by means of a Data Link Connection Identifier (DLCI) contained in each frame.

ii) Frame delimiting, alignment and transparency, allowing recognition of a sequence of bits transmitted over the CCH as a frame.

iii) Sequence control, to maintain the sequential order of frames across the data link connection.

iv) Detection of transmission, format and operation errors on a data link connection.

v) Recovery from detected transmission, format and operational errors.

vi) Notification to the management entity of unrecoverable errors.

vii) Flow control

The data link layer functions provide the means for information transfer between multiple combinations of data link connection endpoints. The Information transfer may be via point-to-point data link connections, whereby a frame is directed from one endpoint to another endpoint.

Fig. 4.2.1.3-2 shows three different examples of point-to-point information transfer; Fig. 4.2.1.3-3 shows an example of broadcast information transfer.

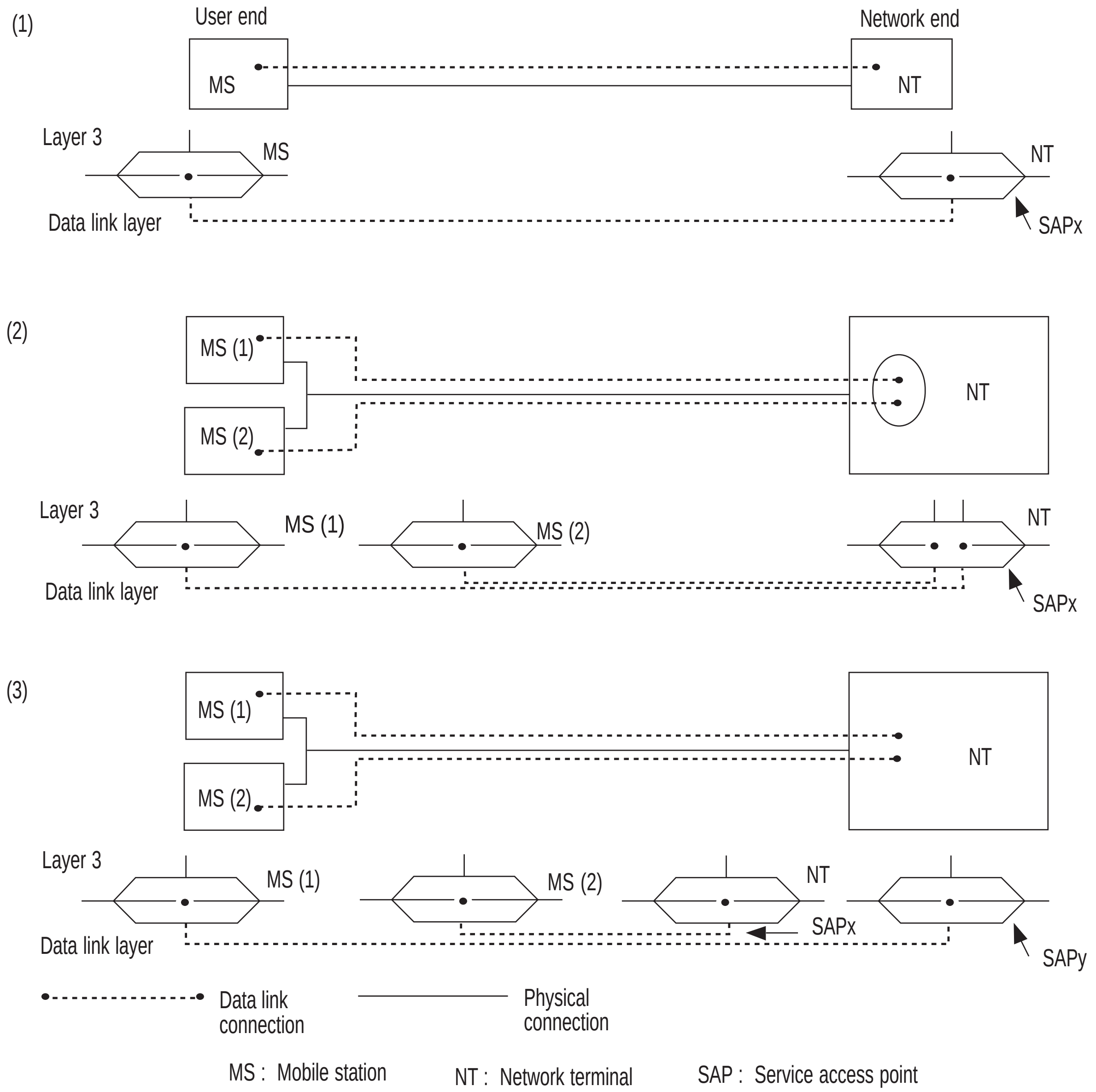


Fig.4.2.1.3-2 : Point-to-point data link connections

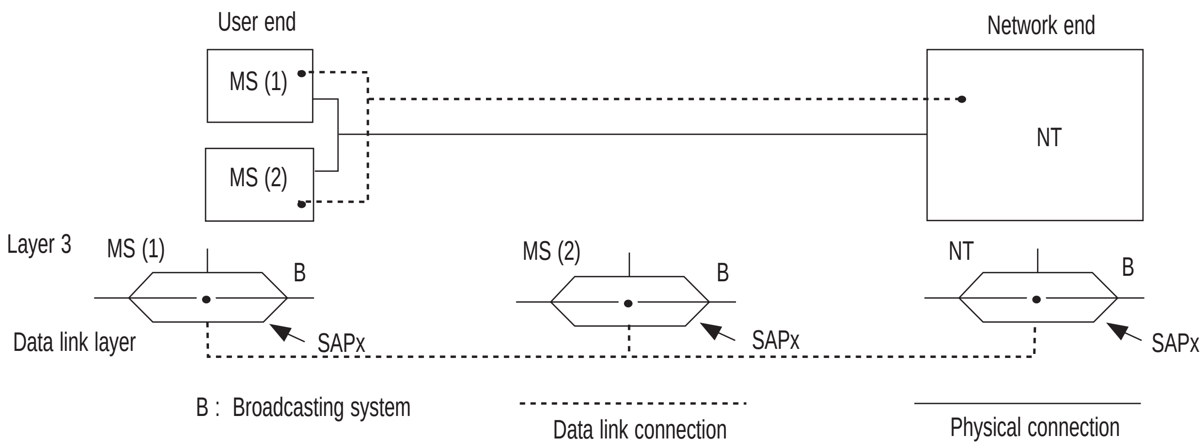


Fig.4.2. 1.3-3 : Broadcasting system data link connections

Two types of operations of the data link layer, acknowledged and unacknowledged information transfer, are defined for layer 3 information transfer. Both information transfer methods may coexist on a single CCH.

The BCCH and PCH support only the unacknowledged operating processes, while the SCCH, SACCH, FACCH and UPCH support both the acknowledged and unacknowledged types.

4.2.1.3.2 Unacknowledged operation

With this type of operation, layer 3 information is transmitted via Unnumbered Information (UI) frames. Reception of the UI frame is not acknowledged in the data link layer. Even when transmission or format errors are detected, the error recovery function is not set in the data link layer. In addition, flow control procedures are not specified.

Unacknowledged operation is applicable to both point-to-point and broadcast information transfer. With this method, the UI frame may be sent either to a specific endpoint or broadcast to multiple endpoints associated with specific Service Access Point Identifiers (SAPI).

4.2.1.3.3 Acknowledged operation

With this type of operation, layer 3 information is transmitted via frames that are acknowledged in the data link layer.

Error recovery procedures based on retransmission of unacknowledged frames are specified. In case of event errors which cannot be corrected in the data link layer, a report is sent to the management entity. In addition, flow control procedures are specified.

Acknowledged operation is applicable to point-to-point information transfer.

Acknowledged operation is defined only for multiple frame transmission (refer to 4.2.2.5.5). Multiple frame operation is initiated by a multiple frame establishment procedure using the SAMBE (Set Asynchronous Balanced Mode Extended) or SAMBEI (Set Asynchronous Balanced Mode Extended with Information) commands.

The retransmission procedures for the acknowledged operation are classified into the following two types : basic retransmission and partial retransmission control.

4.2.1.3.3.1 Basic retransmission control

With this retransmission procedure, one layer 3 information is transmitted in a single I frame. Errors are recovered by retransmitting unacknowledged frames.

Layer 3 information is sent using numbered Information (I) frames. Note that a number of I frames may be in outstanding state at the same time (i.e., in a state in which transmission has not yet been acknowledged).

4.2.1.3.3.2 Partial retransmission control

With this retransmission procedure, layer 3 information is transmitted in a single I’ frame. Partial units are created by dividing the frame used for the basic retransmission control. Errors in the frame are recovered by retransmitting unacknowledged units.

Layer 3 information is sent using numbered Information (I') frames. Note that a number of I' frames cannot be in outstanding state at the same time.

4.2.1.3.3.3 Selective partial retransmission control

With this retransmission procedure, layer 3 information is transmitted in a single frame. Partial retransmission units are created by dividing the frame used for the basic retransmission control. Errors in the frame are recovered by retransmitting unacknowledged units.

Layer 3 information is sent using numbered Information (I’) frames. Note that a number of I’ frames can be in the outstanding state at the same time.

4.2.1.3.4 Information transfer by function channels

Refer to Section 2.4.3 for a general description of channel types and the information transfer functions used in this section. (4.2).

4.2.1.3.5 Data link connection identification

4.2.1.3.5.1 Data link connection structure

A data link connection is identified by a Data Link Connection Identifier (DLCI) carried in the address field of each frame.

The data link connection identifier is associated with a connection endpoint identifier at the two ends of the data link connection.

The connection endpoint identifier is used to identify message units that pass between the data link layer and layer 3. It consists of the SAPI and the Connection Endpoint Suffix (CES).

The DLCI consists of two elements : a SAPI and a Mobile Station Identifier (MSI). The mobile station identifier is the same number as the mobile station number (refer to 2.6).

The SAPI is used to identify the service access point, either on the network side or the user side of the user-network interface.

The MSI is used to identify a specific connection endpoint within a service access point.

The MSI is preassigned to each mobile station. In addition, in this Standard, a Shortened Mobile Station Identifier (SMSI) can also be assigned to a mobile station. The MSI must be coded and stored in an anti-copying device to prevent the MS from being duplicated.

The DLCI is a pure data link layer concept, therefore, it is used internally by the data link layer entity and is not known by the layer 3 entity or management entity. In the layer 3 entity or in management entity, the concept of a Connection Endpoint Identifier (CEI) is used instead.

The CEI is composed of SAPI information and CES. The CES value is selected by the layer 3 or management entity to address the data link layer entity. When either the layer 3 entity or management entity recognizes the relevant MSI, it will internally associate the DLCI with the CEI, and commence to form a peer-to-peer association for the data link layer. The layer 3 and management entities use this CEI to address its peer entity.

DLCI (Data Link Connection Identifiers) = SAPI + MSI (or SMSI)
CEI (Connection Endpoint Identifiers) = SAPI + CES

4.2.1.3.5.2 Data link states

One point-to-point data link can be in either of the following two basic states :

(1) Multiple frame unestablished state

This state is set initially at power on, or by a multiple frame ending procedure. In this state, only the unacknowledged information transfer is possible.

(2) Multiple frame established state

This state is set by the multiple frame set-up procedure. Both acknowledged and unacknowledged information transfer are possible.

A broadcasting type data link entity is always in an information transfer state, in which only the unacknowledged information transfer is possible.

4.2.1.3.5.3 SMSI management

The SMSI assignment procedure is used by the data link entity to provide SMSI value to the mobile station used for the following communication over the data link connection.

The SMSI value is a common standard for all SAPs at the mobile station. This procedure occurs in the management entity.

When an SMSI value is assigned to a mobile station, the mobile station creates an association between SMSI, MSI and CES at the individual SAP. When a network receives the 1st frame including the assigned SMSI, or as soon as the SMSI is assigned, the network creates an association between the SMSI, MSI and CES.

When the management entity recognizes that the SMSI value is no longer valid, the association between the SMSI, MSI and CES is removed by an SMSI removal requested by the management entity.

The network activates the SMSI check procedure to check the state of the SMSI (e. g. to see if multiplex assignment of the SMSI has been made or not) either in the multiple frame-unestablished state or in the multiple frame established state.

Shortened Mobile Station Identifier (SMSI) management procedures are described in section 4.2.2.5.3 below.

4.2.1.4 Service characteristics

4.2.1.4.1 General

The data link layer provides services to layer 3 and to the layer 2 management entity and utilizes the services provided by the physical layer and layer management. A detailed description of the data link layer services provided to layer 3 and layer management is given in 4.2.1.4.2 and 4.2.1.4.3 below.

The physical layer service and the layer management service provided for the data link layers are

described in 4.2.1.4.4 and 4.2.1.4.5.
Communications between the layer 3 management entity and the layer 2 management entity are made via the system management. Communications between the system management and the layer 2 management entity become necessary in the following cases.

(1) For establishing and canceling a relationship between MSI and CES.

(2) For establishing and canceling a relationship between SMSI, MSI and CES.

(3) For reporting and responding to errors in the data link layer.

This Standard does not specify the services between the system management and layer 2 management entity.

Note: Communication between different layers in the OSI reference model makes use of primitives which are passed across the layer boundaries. The data link layer primitives defined in this Standard represent, in an abstract way, the logical exchange of information and control between the data link layer and adjacent layers. They do not specify nor constrain implementations.

4.2.1.4.2 Services provided to layer 3

4.2.1.4.2.1 General

Specification of the interaction (of primitives) with layer 3, provides a description of the services that the data link layers and the physical layers offer to layer 3 as viewed from layer 3.

Two forms of information transfer services are associated with layer 3. The first service is based on unacknowledged information transfer at the data link layer, while the second service is based on acknowledged information transfer at the data link layer.

Different information transfer services can co-exist on the same data link. The information transfer services that can be used are limited by the data link according to the channel to be used. (refer to Section 4.2.1.3)

4.2.1.4.2.2 Priority

Layer 3 message units are handled according to their respective layer 2 priority.

On frame transmission, the data link procedure provides frame contention resolution according to the following priorities :

(1) When the SAPI values of the frames being transmitted are the same, the transmission of frames are handled on an ordinary FIFO (First-in-first-out) basis.

    Between UI and I frames, higher priority is given to UI frames. Also, if there are I frames or I' frames to be returnsmitted, and there are I frames which have not even once been transmitted, the latter shall be transmitted after the former.

(2) When the SAPI values of the frames to be transmitted are different, the transmission of frames are handled according to the priority of the data links.

The priority order among data links accords with the SAPI values given below.

Priority order		
High	:	SAPI = 0, 1
Low	:	SAPI = other than 0 and 1

4.2.1.4.2.3 Unacknowledged information transfer service

With this type of information transfer, information is not acknowledged at the data link layer. Acknowledged procedures may be provided at higher layers. Information transfer is via broadcast or point-to-point data link connections.

The characteristics of the unacknowledged information transfer service are summarized as follows :

(1) Provision of a data link connection between layer 3 entities for unacknowledged information transfer of layer 3 message units.

(2) Identification of data link connection endpoints.

(3) No verification of message arrival within the peer data link layer entity.

The primitives associated with the unacknowledged information transfer services are:

DL-UNIT DATA-REQ/IND

The DL-UNIT DATA-REQ primitive is used to request that a message unit be sent using the procedures for the unacknowledged information transfer service.

The DL-UNIT DATA-IND primitive indicates the arrival of a message unit received by means of an unacknowledged information transfer service.

4.2.1.4.2.4 Acknowledged information transfer service

Multiple frame operation is used for this service. The characteristics of the acknowledged information transfer service can be summarized as follows.

(1) Provision of a data link connection between layer 3 entities for acknowledged information transfer of layer 3 message units.

(2) Identification of the data link connection endpoint.

(3) To maintain sequence integrity of data link layer message units in the absence of malfunctions.

(4) Notifying the peer entity in the event of errors (for example, loss of sequence).

(5) Notifying the management entity of unrecoverable errors detected by the data link layer.

(6) Flow control.

(7) Frame transmission according to the priority given by SAPI.

(8) Provision of services without loosing the message while switching from the previously set channel to a new channel (when SAPI = 0, 1)

(9) Provision of error correction procedures for correcting errors on the frame level using a partial retransmission control system.

The primitives associated with the acknowledged information transfer services are :

(1) Data transfer

DL-DATA-REQ/IND/CON

The DL-DATA-REQ primitive is used to request that message units be sent using the procedures for the acknowledgment information transfer service. The DL-DATA-IND primitive indicates the arrival of the message units received by means of the acknowledged information transfer service. The DL-DATA-CON primitive is used to confirm that the I frame has been transmitted to the remote entity correctly by the acknowledged information transfer procedure.

(2) Settings for multiple frame operation

DL-ESTABLISH-REQ/IND/CON.

These primitives are used respectively, to request, indicate and confirm the establishment of multiple frame operation between two service access points.

(3) Termination of multiple frame operation

DL-RELEASE-REQ/IND/CON.

These primitives are used respectively, to request, indicate and confirm an attempt to terminate multiple frame operation between two service access points.

4.2.1.4.3 Services provided to the layer management

Only the unacknowledged information transfer service is provided to the layer management in order that the data link layer management can communicate with its peer layer management. In this case, information transfer is not acknowledged at the data link layer. Acknowledgment procedures may be provided by the layer management.

Information transfer is via point-to-point connections.

The characteristics of the unacknowledged information transfer service are summarized as follows:

(1) Provision of a data link connection between layer management entities for unacknowledged information transfer of data units.

(2) Identification of data link connection endpoints.

(3) No verification of message arrival within the peer data link layer entity.

The following primitives are associated with the unacknowledged information transfer service provided for layer management :

MDL-UNIT DATA-REQ/IND

The MDL-UNIT DATA-REQ primitive is used to request that a message unit be sent using unacknowledged information transfer service procedure for layer management. The MDL-UNIT DATA-IND primitive indicates the arrival of a message unit received by means of the unacknowledged information transfer service to layer management.

4.2.1.4.4 Services required from the physical layer

The following services are provided by the physical layer.

(1) Physical layer connection for the transparent transmission of bits in the same order in which they are submitted to the physical layer.

(2) Transmission of data link layer message units according to their respective data link layer priority.

(3) Indicating the physical state of the CCH.

Services (1) and (2) above are provided in the physical layer entity on the mobile station or the network side, and service (3) above is provided in the management entity.

These services are described using the following service primitives which pass between the data link layer and the physical layer.

(4) PH-DATA-REQ/IND

These primitives are used to request that a message unit be sent and to indicate the arrival of a message unit.

(5) PH-INFO-IND

This primitive is used to report that the information which was received by layer 1 by means of a PH-DATA-REQ primitive has been transmitted.

4.2.1.4.5 Management functions

4.2.1.4.5.1 Outline

Assignment, check and removal of SMSI

The services related to assignment, removal and check for the Mobile Station Identifier (MSI) and the Shortened Mobile Station Identifier (SMSI) are provided by the layer management on the network. These management functions are described by the following service primitives.

4.2.1.4.5.2 Definition of primitives for management functions

The following primitives are used for the respective management functions :

(1) Reporting MSI and assignment of SMSI

MDL-ASSIGN-REQ/IND primitive
The MDL-ASSIGN-IND primitive is used to indicate to the layer management whether or not MSI or SMSI are required. The MDL-ASSIGN-REQ primitive is used by the layer management to pass the MSI or the SMSI from the layer management to the data link layer so that the data link layer entities for the mobile station can commence communication with the network data link layer entities.

(2) Removal of SMSI

MDL-REMOVE-REQ primitive

This primitive is used to convey layer management requests for removal of an SMSI assigned by the MDL-ASSIGN primitive.

(3) SMSI check

MDL-UNIT DATA-REQ/IND primitives

These primitives are used for checking the validity of SMSI assigned by the layer management using the MDL-ASSIGN primitive.

(4) Error reports

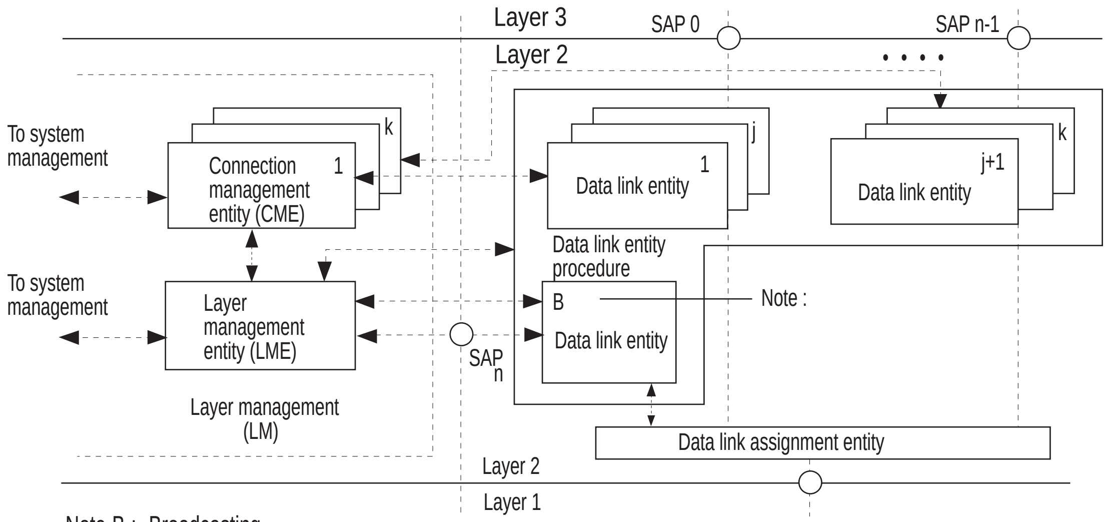
MDL-ERROR-IND/RPS primitives

These primitives report error situations between layer management and data link layer entities.

4.2.1.5 Outline of data link layers and management entities

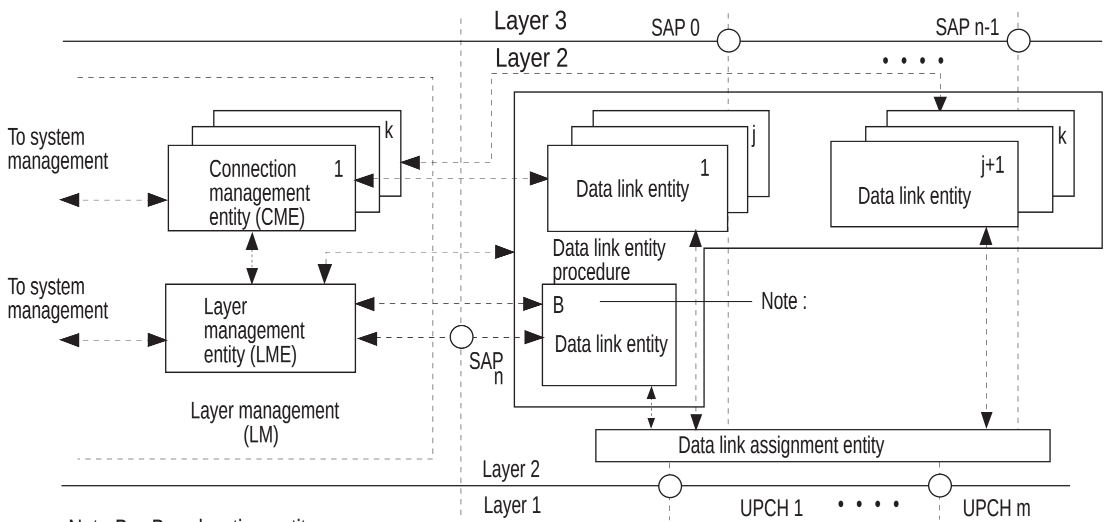
4.2.1.5.1 Functional configuration

A functional model of the data link layer is shown in Fig. 4.2.1.5-1. This figure is a functional model used for illustrative purposes only and is not intended to restrict implementation.



Note B : Broadcasting entity

Fig. 4.2.1.5-1 : Functional model of data link layer management (1/2)



Note B : Broadcasting entity

Fig. 4.2.1.5-1 : Functional model of data link layer management (2/2)

4.2.1.5.2 Identification of data link connection endpoints

Data link connection end points are identified by the Data Link Connection Identifier (DLCI).

The DLCI is composed of the following two elements :

– The Service Access Point identifier (SAPI)

– The Mobile Station Identifiers (MSI) or Shortened Mobile Station Identifier (SMSI)

4.2.1.5.3 Data link entity

Fig. 4.2.1.5-1 above illustrates the manner in which data link entities exist in the physical layer for individual SAPI. The data link entity analyzes the content of the control field for the received frame, and provides appropriate responses, such as peer-to-peer communications and layer-to-layer indications. Also, it analyzes the data link layer service primitives and transfers peer-to-peer commands and responses according to the data link layer primitives.

4.2.1.5.4 Data link assignment entity

Data link assignment entity is required when two or more SAPI exist on one functional channel or when a DLCI is provided by multiple physical channels.

This entity analyzes the address field of a received frame and the functional channel type which contains the reception primitives sent from the physical layer. If the frame is correct, it assigns the frame to the appropriate data link entity based on the DLCI.

This entity transfers the frame to be transmitted to the appropriate physical channel based on the DLCI and provides services to control competition among various data link entities on an identical function channel. Competition control is performed based on SAPI values, with priority given to SAPI=0 information.

4.2.1.5.5 Management structure

The Layer Management Entity (LME) provides for the management of resources that have a layer-wide influence. The LME for layer 2 provides the following functions using MDL-ASSIGN, MDL-REMOVE and MDL-UNIT DATA primitives :

(1) Reports MSI
(2) Assigns SMSI
(3) Cancels SMSI
(4) Checks SMSI

The Connection Management Entity (CME) provides management of resources which have an influence on the individual connections. The CME for layer 2 provides the following functions using the MDL-ERROR primitive :

(1) Error processing.

(2) Support for connection flow control.

4.2.1.6 Special requirements

4.2.1.6.1 Operating types and applicable SAPI

The individual function channels support the following SAPI and operating types (I : Acknowledged operation, UI : Unacknowledged operation)

SAPI = 0 : Call control procedures
SAPI = 1 : Call control procedures (high quality)
SAPI = 6 : Layer 2 management procedures (high quality)
SAPI = 7 : Layer 2 management procedures

4.2.1.6.2 Acknowledged operation

4.2.1.6.2.1 Outstanding number "k"

The outstanding number for "k" when SAPI = 0 must be as follows :

Function channel	BCCH	PCH	SCCH	SACCH	FACCH	UPCH
k	1	1	1	1	1	-

The outstanding number for "k" when SAPI = 1 must be as follows :

Function channel	BCCH	PCH	SCCH	SACCH	FACCH	UPCH
k	-	-	-	-	-	15

4.2.1.6.2.2 Processing capacity

Mobile and base stations must have sufficient processing capabilities in order to prevent the data link layer entities from going over to the receiver busy condition.
When the mobile station transmits a response to a command in the received layer 2 frame, the layer 2 processing time shall be 0.2 sec. or less.

4.2.2 Layer 2 specification

4.2.2.1 General

This section specifies the details of frame structure, elements of procedure, format of field and procedures of the LAPDM (Link Access Procedure for the Digital Mobile channel). The concepts, terminology, overview description of LAPDM functions and procedures, and the relationship with other Standards (ITU-T Recommendation) are described in section 4.2.1 "Layer 2 Standards".

Note 1 : As stated in section 4.2.1 "Layer 2 Standards", the term "data link layer" is used in the main text of this Standard. However, mainly in figures and tables, the term "layer 2" and "L2" are used as abbreviations. Furthermore, in accordance with the reference model for Open Systems Interconnection, the term "layer 3" is used to indicate the layer above the data link layer.

Note 2 : "Layer management entity" and/or "connection management entity" within this document refer to those entities in the data link layer.

4.2.2.2 Frame structure for peer-to-peer communication

4.2.2.2.1 General

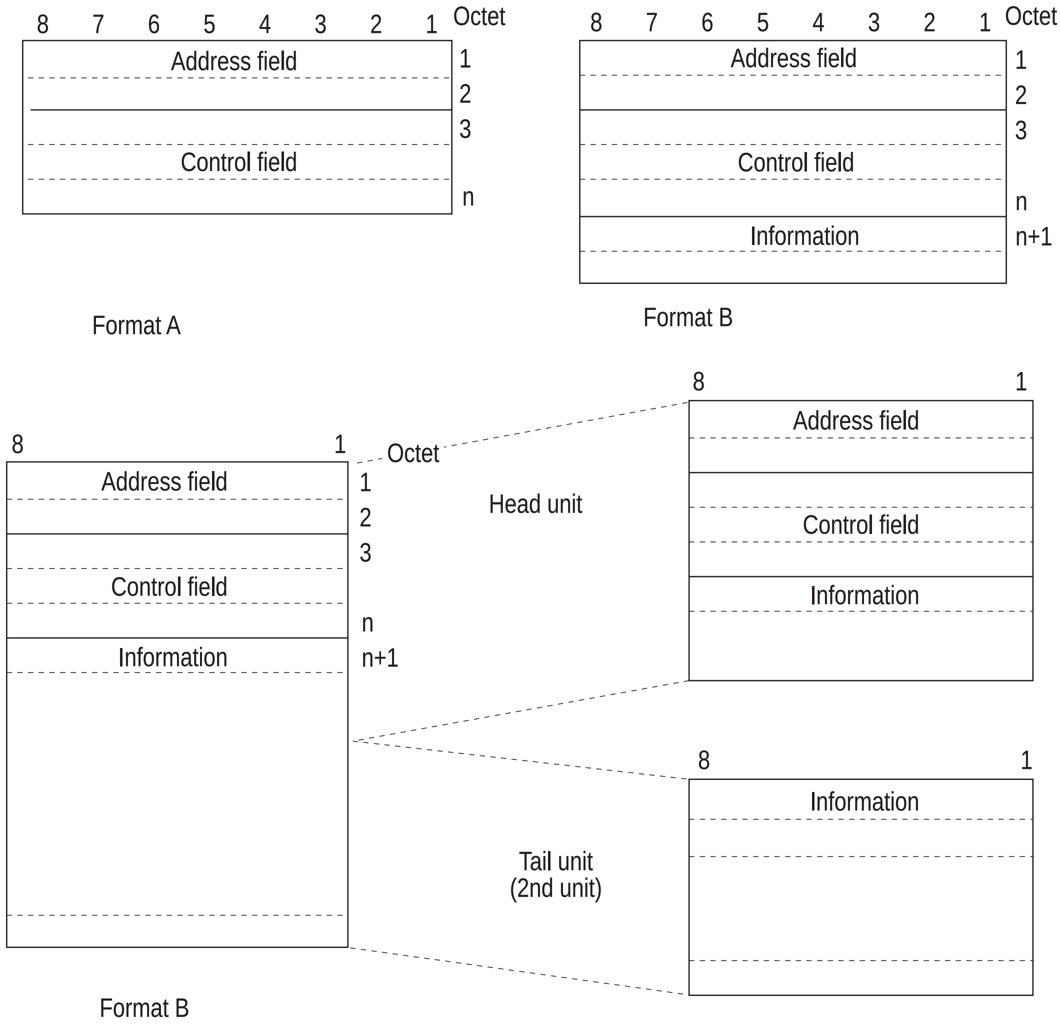
All data link layer peer-to-peer procedures are carried out using one of the two frame formatting methods outlined in Fig. 4.2.2.2-1. Of the two formats, format A does not have an information field, while format B does. With the LAPDM, a frame which exceeds the specified length is divided into several units so that errors can be corrected by retransmission control in each unit. The unit length is specified by Layer 1. Note that an address field or control field may span over multiple units.

4.2.2.2.2 Address field

The address fields shall consist of an integer number of octets as shown in Fig. 4.2.2.2-1. The address field indicates the mobile station identifier and service access point identifier. The format of the address field is defined in section 4.2.2.3.2 below.

4.2.2.2.3 Control field

The control fields shall consist of an integer number of octets as shown in Fig. 4.2.2.2-1. Both frame formats A and B shall have control field. The format of the control field is defined in section 4.2.2.3.4 below.



(When format B is divided into several units)

Fig.4.2.2.2-1 : Frame format

4.2.2.2.4 Information field

The information field of a frame, when present, follows the control field (refer to Section 4.2.2.3.4). The information field shall consist of an integer number of octets.

The maximum number of octets (N201) in the information field is defined in Section 4.2.2.5.10.3 below.

4.2.2.2.5 Transparency

Bit transparency is fully ensured by layer 1.

4.2.2.2.6 Valid bit area of the frame

The valid bit area of the frame is fully ensured by layer 1.

4.2.2.2.7 Format convention

4.2.2.2.7.1 Numbering convention

The basic numbering convention used in this Standard is illustrated in Fig. 4.2.2.2-2. The bits of an octet are shown horizontally and are numbered from 1 to 8. Multiple octets are shown vertically and are numbered from 1 to n.

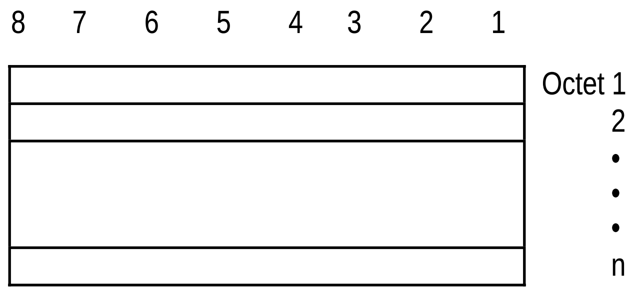


Fig. 4.2.2.2-2 : Format convention

4.2.2.2.7.2 Field mapping convention

When a field is contained within a single octet, the lowest bit number of the field represents the least significant bit.

When a field spans more than one octet, the significance of bit within each octet progressively decreases as the octet number increases. The lowest bit number associated with the field represents the least significant bit.

For example, a bit number can be identified as a couple (o,b) where "o" is the octet number and "b" is the relative bit number within the octet. Fig. 4.2.2.2-3 illustrates a field that spans from bit (1,3) to bit (2,7). The most significant bit of the field is mapped on bit (1,3) and the least significant bit is mapped on bit (2,7).

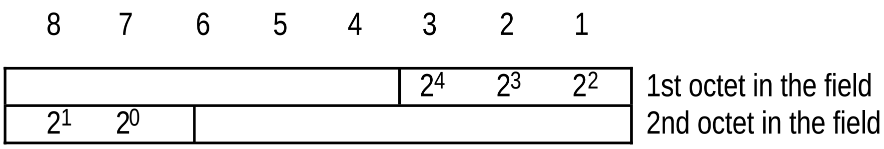


Fig. 4.2.2.2-3 : Field mapping convention

4.2.2.2.8 Invalid frames

An invalid frame is a frame which :

(1) has fewer than three octets that contain sequence numbers and fewer than two octets that do not contain sequence numbers, or

(2) does not consist of an integral number of octets, or

(3) contains a service access point identifier which is not supported by the receiver (refer to Section 4.2.2.3.3.2), or

(4) contains ID control (refer to Section 4.2.2.3.3.3) and ID indication (refer to Section 4.2.2.3.3.4) except for allowed combinations of ID control and ID indication (refer to Table 4.2.2.2-1).

(5) has on error in at least one unit containing address or control fields in the case of I', REJ' or SREJ' frames spanning over several units.

Invalid frames shall be discarded without notification to the sender. No action is taken as the result of that frame. The allowed combinations of ID control and ID indication are shown in Table 4.2.2.2-1.

Table 4.2.2.2-1 : Allowed combinations of ID control and ID indication

ID control	ID indication
0 0	0 0, 0 1, 1 0, 1 1
0 1	1 1
1 0	1 0
1 1	1 0

4.2.2.3 Elements of procedures and formats of fields for data link layer peer-to-peer communications

4.2.2.3.1 General

The elements of procedures define the commands and responses that are used on the data link connections carried on the CCH.

Procedures are derived from these elements of procedures and are described in section 4.2.2.5 this section.

4.2.2.3.2 Address field formats

4.2.2.3.2.1 Address field formats for BCCH, PCH, SCCH SACCH and FACCH

SAPI, MSI and SMSI are indicated in the address field format. MSI fields have a variable length. An EA (Extended Address field bit) is used to indicate last octet in the field.

The address field format shown in Fig. 4.2.2.3-1.1 contains address field extension bits, command/response field bits, and subfields for the data link layer SAPI and MSI.

Other than MSI, SMSI is also used as temporary identifiers. SMSI possess a fixed length of 1 octet as shown in Fig. 4.2.2.3-1 below. Each format is identified by the ID indication (AI).

8 7	6 5	4 3	2 1
AC	AI =11	SAPI	C/R
SMSI			
			EA = 0
MSI			EA = 0
			EA = 1

8 7	6 5	4 3	2 1
AC	AI =01	SAPI	C/R
			EA = 0
MSI			EA = 0
			EA = 1

8 7	6 5	4 3	2 1
AC	AI =10	SAPI	C/R
SMSI			

8 7	6 5	4 3	2 1
AC	AI = 00	SAPI	C/R

C/R = Command/response field bit
SAPI = Service access point identifier
AC = ID control
AI = ID indication
EA = Address field extension bit
SMSI = Shortened mobile station identifier
MSI = Mobile station identifier

Fig. 4.2.2.3-1.1 Example of address field formats (BCCH, PCH, SCCH, SACCH, FACCH)

4.2.2.3.2.2 Address field format for UPCH

SAPI, MSI and SMSI are indicated in the address field format. MSI and SMSI fields have a variable length. An EA (Extended Address field bit) is used to indicate the last octet in the field.

The address field format shown in Fig. 4.2.2.3-1.2 contains address field extension bits, command/response field bits, and subfields for the data link layer SAPI and MSI.

Other than MSI, SMSI is also used as temporary identifiers. Each format is identified by the ID indication (AI). SMSI has a maximum variable length of 64 bits.

8 7	6 5	4 3	2 1
AC	AI =11	SAPI	C/R
			EA = 0
SMSI			EA = 0
			EA = 1
			EA = 0
MSI			EA = 0
			EA = 1

8 7	6 5	4 3	2 1
AC	AI =01	SAPI	C/R
			EA = 0
MSI			EA = 0
			EA = 1

8 7	6 5	4 3	2 1
AC	AI =10	SAPI	C/R
			EA = 0
SMSI			EA = 0
			EA = 1

8 7	6 5	4 3	2 1
AC	AI = 00	SAPI	C/R

C/R = Command/response field bit
SAPI = Service access point identifier
AC = ID control
AI = ID indication
EA = Address field extension bit
SMSI = Shortened mobile station identifier
MSI = Mobile station identifier

Fig. 4.2.2.3-1.2 Example of address field formats (UPCH)

4.2.2.3.3 Address field variables

4.2.2.3.3.1 Command/response field bit (C/R)

The C/R bit identifies whether a frame is a command or response frame. The mobile station side sends out commands to the network with the C/R bit set to "0" and responses with the C/R bit set to "1." Conversely, the network sends commands to the user with the C/R bit set to "1," and responses with the C/R bit set to "0." The direction in which commands and responses are sent by the mobile station and network respectively and the corresponding bit settings are outlined in Table 4.2.2.3-1 below.

Table 4.2.2.3-1 : C/R field bit usage

Command/Response	Direction	C/R value
Command	Network side –> mobile station side	1
	Mobile station side –> network side	0
Response	Network side –> mobile station side	0
	Mobile station side –> network side	1

In conformance with HDLC rules, commands use the address of the peer data link layer entity, while responses use the address of their own data link layer entity. According to these rules, both peer entities on a point-to-point data link connection use the same Data Link Connection Identifier (DLCI) composed of a SAPI-MSI.

4.2.2.3.3.2 Service access point identifier (SAPI)

The SAPI identifies a point at which data link layer services are provided by a data link layer entity to a layer 3 or management entity. Consequently, the SAPI specifies a data link layer entity that should process a data link layer frame and also a layer 3 or management entity which is to receive information carried by the data link layer frame. The SAPI allows 8 service access points to be specified, wherein bit 2 of the address field octet containing the SAPI is the least significant bit and bit 4 is the most significant. The SAPI values are allocated as shown in Table 4.2.2.3-2.

Table 4.2.2.3-2 : SAPI Value

SAPI Value	Related layer 3 or management entity
0	Call control procedures
1	Call control procedures (high quality)
6	Layer 2 management procedure (high quality)
7	Layer 2 management procedure
Others	Reserved for future standardization

4.2.2.3.3.3 ID control field (AC)

The ID control field is used by the network for assigning and canceling Shortened Mobile Station Identifiers (SMSI) for mobile stations. The bit assignments in the ID control field are listed in Table 4.2.2.3-3 below (refer to Section 4.2.2.5.3).

Table 4.2.2.3-3 : ID control field usage

ID control	0 0	0 1	1 0	1 1
Usage	No control	SMSI assignment	SMSI removal	MSI+SMSI request

4.2.2.3.3.4 ID indication field (AI)

ID indication field is used to identify MSI or SMSI contained in the address field. ID indication field bits are allocated as shown in Table 4.2.2.3-4.

Table 4.2.2.3-4 : ID indication field usage

ID indication	SMSI	MSI
00	Not used	Not used
01	Not used	Used
10	Used	Not used
11	Used	Used

4.2.2.3.3.5 Address field extension bit (EA)

The MSI field and the SMSI field on the UPCH have a variable length and it is extended by setting the first bit sent out in the MSI field octet or the SMSI field octet on the UPCH to indicate the final octet of the MSI field or the SMSI field on the UPCH. The presence of 1 in the first bit of the MSI field octet or the SMSI field on the UPCH indicates that this is the final octet of the MSI field or the SMSI field on the UPCH.

For example, a 2-octet MSI field shall have bit 1 of the first octet set to "0" and bit 1 of the second octet set to "1."

When the length of the MSI bits or the SMSI bits on the UPCH is not a multiple of 7, "0" is attached to the most significant bit position of the MSI or the SMSI on the UPCH. After extending the number to a multiple of 7, this data is stored in the MSI field or the SMSI field on the UPCH. An example of extending a 24-bit length MSI to 28 bits and storing it is indicated in Fig. 4.2.2.3-2. The extended part is from (1,8) to (1,5).

8	7	6	5	4	3	2	1	
0	0	0	0	2^{23}	2^{22}	2^{21}	EA=0	1st octet in MSI field
2^{20}	2^{19}	2^{18}	2^{17}	2^{16}	2^{15}	2^{14}	EA=0	2nd octet in MSI field
2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2^{7}	EA=0	3rd octet in MSI field
2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	EA=1	4th octet in MSI field

Fig. 4.2.2.3-2 : Example of extension and storing of the MSI

4.2.2.3.3.6 Mobile Station Identifier (MSI) and Shortened Mobile Station Identifier (SMSI)

The MSI and SMSI used in point-to-point data link connections correspond to one mobile station (MS) only. The MSI used for broadcast type data link connections, however, apply to all data link entities which have the same SAPI on the user end. The MSI is an binary expression with a maximum length of 64 bits and has the same value as the mobile station number in Section 2.6.(i.e.,2^{23} to 2^{0} excluding EA bits in the example in Fig.4.2.2.3-2 above.)

4.2.2.3.3.6.1 Broadcast data link connection

Of the MSI subfield bit patterns that are structured by one octet, the bit pattern "1111111" (127) is defined as the group MSI. The group MSI is assigned to the broadcast data link connection associated with the addressed Service Access Point (SAP).

Assignment of MSI 127 is prohibited as its use is reserved for broadcasting layer 2.

This group MSI is used, for example, for broadcast type unacknowledged information transfer using the BCCH.

4.2.2.3.3.6.2 Point-to-point data link connection

The remaining address values other than group addresses are used for the point-to-point data link connections associated with the addressed SAPI.

The MSI is a fixed address that is exclusively assigned for each mobile station. SMSI are selected by the network, and the network end is responsible for their allocation.

4.2.2.3.3.7 Relationship with channel types

SMSI is used only for SCCH and UPCH. The SCCH and UPCH utilize the address field format AI = 01 (MSI only) when an SMSI is not assigned.
When an SMSI is assigned, the SCCH and UPCH utilize the address field format AI = 10 (SMSI only).

The SACCH and FACCH shall always use the address field format AI = 00 (neither MSI nor SMSI included).

During SMSI check procedure other address combinations can occur (refer to the detailed description in Section 4.2.2.5.3.4).

4.2.2.3.4 Control field formats

The control field is used for identifying the frame types for commands or responses. Sequence numbers are included in the control field when necessary. In case errors occur with units within a frame and it is required that partial retransmission control be performed, the partial retransmission control field format (described in Section 4.2.2.3.6 below) must be used. This field format is the extended form of the original field format.

The following three types of formats are used for the control field:

(1) I format : For numbered information transfer
(2) S format : For supervisory functions
(3) U format : For unnumbered information transfer and control functions

The control field format is shown in Fig. 4.2.2.3-3.

Modulo 64 is used for all three formats. (refer to Section 4.2.2.3.5.3.1.) S1, S2: Supervisory function bit

Control field bits	8	7	6	5	4	3	2	1
I format	N (S)						0	0
	N (R)						P	EC
S format	X	X	X	X	S1	S2	0	1
	N (R)						P/F	EC
U format	M	M	M	P/F	M	M	1	M

S1	S2	Function
0	0	RR
0	1	RNR
1	0	REJ

X : Spare bit
M : Modifier function bit (refer to Table 4.2.2.3-5)
EC : Control field extension bit
N(S) : Originator's transmission sequence number
N(R) : Originator's reception sequence number
P/F : "P" indicates poll bit when transmission is a command
"F" indicates final bit when transmission is a response

Fig. 4.2.2.3-3 : Control field format

4.2.2.3.4.1 Information transfer (I) format

The I format shall be used to perform an information transfer between layer 3 entities. The functions of N(S), N(R) and P (defined in Section 4.2.2.3.5) are independent; that is, each I frame has an N(S) sequence number, an N(R) sequence number which is used for acknowledgment of I frames received by the data link layer entity, and a P bit that may be set to "0" or "1". The use of N(S), N(R), and P is defined in Section 4.2.2.5.

4.2.2.3.4.2 Supervisory (S) format

The S format shall be used to perform link supervisory control functions such as : acknowledge I frames, request retransmission of I frames, and request a temporary suspension of transmission of I frames.
The functions of N(R) and P/F are independent, that is, each supervisory frame has an N(R) sequence number which is used for acknowledgment of I frames received by the data link layer entity, and a P/F bit that may be set to "0" or "1".

4.2.2.3.4.3 Unnumbered (U) format

The U format shall be used to provide additional link control functions and unnumbered information transfers for unacknowledged information transfer. This format does not contain sequence numbers. It does include a P/F bit that may be set to "0" or "1." The functions provided by this format are identified by M bits.

4.2.2.3.5 Control field parameters and associated state variables

The various parameters associated with the control field formats are described in this section.

The coding of the bits within these parameters is such that the lowest numbered bit within the parameter field is the least significant bit.

4.2.2.3.5.1 Poll/Final bit (P/F)

All frames contain the Poll/Final (P/F) bit. The P/F bit serves a function in both command frames and response frames. In command frames, the P/F bit is referred to as the P bit. In response frames it is referred to as the "F" bit. The P bit set to "1" is used to solicit (poll) a response frame from the peer data link layer entity. The F bit set to "1" is used to indicate the response frame transmitted as a result of a soliciting (poll) command. The use of the P/F bit is described in Item 4.2.2.5.

4.2.2.3.5.2 Control field extension bit (EC)

Control fields can be extended by indicating the last octet of the control field octets with the bit which is transmitted at the top of the control field octet. When the first bit of the octet in the control field is set to "1", this octet is indicated as the last octet of the control field.

Partial retransmission unit number n(S) and partial retransmission request unit number n(R) (described in Section 4.2.2.3.6) are entered in the extended control field.

4.2.2.3.5.3 Multiple frame operation-variables and sequence numbers

4.2.2.3.5.3.1 Modulo n

Each I frame is sequentially numbered and may have the value 0 through n-1, where n is the modulus for the sequence number. The modulus equals 64 in this Standard and the sequence numbers cycle through the entire range, 0 through 63.

Note : All arithmetic operations on state variables and sequence numbers contained in this Standard are affected by the modulus operation.

4.2.2.3.5.3.2 Send state variable V(S)

Each point-to-point data link connection endpoint shall have an associated V(S) when using I frame commands. V(S) denotes the sequence number of the next I frame to be transmitted. The V(S) can take on the value 0 through n-1. The value of V(S) shall be incremented by 1 with each successive I frame transmission, and shall not exceed the V(A), that is defined in next section, by more than K, the maximum number of outstanding I frames. The value of k (outstanding value, refer to Section 4.2.1.6.2.1) is in the range of $1 \leq k \leq 63$.

4.2.2.3.5.3.3 Acknowledgment state variable V(A)

Each point-to-point data link connection endpoint shall have an associated V(A) when using I frame commands and supervisory frame commands/responses. V(A) identifies the last frame that has been acknowledged by its peer. V(A)-1 equals the N(S) of the last acknowledged I frame. V(A) can take on the value 0 through n minus 1. The value of V(A) shall be updated by the valid N(R) values received from its peer (refer to Section 4.2.2.3.5.3.6). V(A) valid N(R) is in the range : $V(A) \leq N(R) \leq V(S)$.

4.2.2.3.5.3.4 Send sequence number N(S)

Only I frames have the send sequence number of a transmitted frame. At the time that a serial numbered I frame is designated for transmission, the value of N(S) is set equal to V(S).

4.2.2.3.5.3.5 Receive state variable V(R)

Each point-to-point data link connection endpoint shall have an associated V(R) when using I frame commands and S frame commands/responses. V(R) denotes the sequence number of the next sequertial I frame expected to be received. V(R) can take on the value 0 through n minus 1. The value of V(R) shall be incremented by one on receipt of an error-free, in-sequence I frame whose N(S) equals V(R).

4.2.2.3.5.3.6 Receive sequence number N(R)

All I frames and supervisory frames have N(R), the expected receive sequence number for the next received I frame. At the time that an I or S frame is designated for transmission, the value of N(R) is set equal to V(R). N(R) indicates that the data link layer entity transmitting the N(R) has correctly received all I frames numbered up to and including N(R)-1. Note, however, that the N(R) contained in the SREJ or SREJ' frame is used for requesting retransmission of the I or I' frame indicated by the N(R), and thus does not indicate confirmation of any I frames.

4.2.2.3.5.4 Unacknowledged operation variables and parameters

No variables are defined for unacknowledged type operation. The maximum octet length for the information field is the only parameter defined. (refer to 4.2.2.5.10)

4.2.2.3.6 Partial retransmission control field format

The partial re-transmission control field is used for identifying the type of frame which will be either a command or response. The partial retransmission control field contains the unit sequence numbers.

Two types of partial retransmission control field formats are specified : the information transfer format and supervisory function format. In this Standard, the information transfer function which has partial retransmission fields is referred to as I' and the supervisory function which has applicable fields is referred to as S'.
The field formats for respective I' and S' fields are given in Fig. 4.2.2.3-4. The unit numbers used for partial retransmission control are added to the sequence numbers in the layer 2 control field for the standard HDLC, as both numbering methods are used for control.

There may be some cases wherein the address field and control field cannot be contained in the top single unit due to extension of the partial retransmission control filed, and thus will spread over multiple units. In such instances, the partial retransmission unit specified for the partial retransmission control field shall be allocated from the unit succeeding the unit where the control field ends. (Refer to Appendix Q.)

Unit numbers are assigned to each unit (divided from the I frame) sequentially starting from "0." The tail unit gets the unit number (equal to the number of divided units minus 1.)

Control field bit	8	7	6	5	4	3	2	1
I' format (partial retransmission)	N (S)						0	0
	N (R)						P	EC=0
	n1 (S)							EC=0
	:							:
	ni (S)							EC=1

EC : Control field extension bit
ni(S) : Partial retransmission unit number

Fig. 4.2.2.3-4 : Partial retransmission control field format (1/2)

Control field bit	8	7	6	5	4	3	2	1
S' format (partial retransmission)	Spare				S1	S2	0	0
	N (R)						P/F	EC=0
	n1 (R)							EC=0
	:							:
	ni (R)							EC=1

S1	S2	Function
1	0	REJ'
1	1	SREJ'

EC : Control field extension bit
ni(R) : Partial retransmission request number
S1, S2 : Supervisory bits

Fig. 4.2.2.3-4 : Partial retransmission control field format (2/2)

4.2.2.3.6.1 Information transfer (I') format

The partial retransmission I' format shall be used to perform information transfer between layer 3 entities. The functions of n(S), N(S), N(R) and P are independent, that is, each I' frame has an n(S) partial unit sequence number, an N(S) sequence number, an N(R) sequence number which may or may not acknowledge additional I frames received by the data link layer entity, and a P bit that may be set to "0" or "1". The use of N(S), N(R), and P is defined in section 4.2.2.3.5.

4.2.2.3.6.2 Supervisory (S') format

The partial retransmission S' format shall be used to perform data link supervisory control functions, such as acknowledgment of I and I' frames, and to request partial retransmission of I' frames. The functions of n(R), N(R) and P/F are independent, that is, each supervisory frame has an N(R) sequence number which may or may not acknowledge additional I frames received by the data link entity, and a P/F bit that may be set to "0" or "1", and n(R) partial retransmission rrequest unit number.

4.2.2.3.7 Partial retransmission control field parameters and associated state variables

The various parameters associated with the partial retransmission control field formats are described in this section.

The coding of the bits within these parameters are such that the lowest numbered bit within the parameter field is the least significant bit.

P/F bits and EC bits are defined in Section 4.2.2.3.5 above.

4.2.2.3.7.1 Multiple frame operation variables and sequence numbers

4.2.2.3.7.1.1 Divided send state variable v(S)

Individual point-to-point data link connection endpoints have a v(S) (divided send state variable) associated with the respective V(S) when using the (I') frame command.
v(S) is a group of unit sequence numbers represented by v(S) = {v1(S), v2(S).....vi(S)}. The v(S) indicates the divided unit sequence number for the (I') frame to be transmitted next.

Individual elements for v1(S),.....vi(S) are lined up sequentially and can be a value from “0” to the number of divided units minus1. The value of v(S) is updated by the value of n(R) sent from the other party (refer to Section 4.2.2.3.5.3.6).

4.2.2.3.7.1.2 Send divided sequence number n(S)

Only (I') frames have a send divided unit sequence number n(S) for the transmitted frames. The n(S) indicates the unit sequence number for each unit contained in the message field in the I' frame. The n(S) is a group of unit sequence numbers represented by n(S) = {n1(S), n2(S)....., ni(S)}. Prior to transmission of (I') frames, the n(S) value is made equivalent to the v(S) value.

Individual elements n1(S),....,ni(S) are lined up sequentially and can be a value “0” to the number of divided units minus 1.

When specifying all of the unit sequence numbers which follow K to include in the message field, the unit sequence number should be set n1(S)=K, n2(S)=0.

4.2.2.3.7.1.3 Divided receive state variable v(R)

Individual point-to-point data link connection endpoints have a v(R) (divided receive state variable) associated with to V(R) when using an S' frame command. The v(R) is a group of unit sequence numbers represented by v(R) = {v1(R), v2(R),......vi(R)}. The v(R) indicates the divided unit sequence number for the I' frame to be received next. Individual elements for v(R) v1(R)......vi(R) are lined up sequentially can be a value from “0” to the maximum number of divided units minus 1.

The v(R) value is updated by the correct value of n(S) when it is sent by the other party. (refer to Section 4.2.2.3.5.3.6.) The correct value of n(S) is a value that is within v(R). Incorrect n(S) values are ignored.

4.2.2.3.7.1.4 Receive divided unit sequence number n(R)

Only S' frames have the receive divided unit sequence number to be received following each N(R). The n(R) is a group of unit sequence numbers represented by n(R) = {n1(R), n2(R),.....,ni(R)}. Prior to transmission of S' frames, the value of n(R) is set equivalent to the v(R) value. Individual elements n1(R),....ni(R) for n(R) are lined up sequentially and can take on values from 0 to the maximum number of divided units minus 1. The n(R) indicates that the data link entity which transmitted the current n(R) has received all the divided units with numbers other than n(R) correctly.

When the unit sequence number is n1(R)=K, n2(R)=0, it indicates that all the divided units with numbers smaller than K been received correctly. The reception side gives notification of the numbers of the units which have not been received on the transmission side in order to request transmission of those units.

4.2.2.3.8 Commands and responses

Commands and responses which are used by the data link layer entities for both the user and the network are listed in Table 4.2.2.3-5.

In line with LAPDM procedures for command and response usage, the frame types which are not listed in Table 4.2.2.3-5 are classified as undefined command and response control fields.

The commands and responses listed in Table 4.2.2.3-5 are described in 4.2.2.3.8.1 through 4.2.2.3.8.14 below.

4.2.2.3.8.1 Information I command

The function of the I command is to enter information provided by Layer 3 in the information field in frames and to number them sequentially for transmission over the data link connection. This command is used in line with multiple frame operations for point-to-point data link connections.

4.2.2.3.8.2 Set Asynchronous Balanced Mode Extended (SABME) command

The unnumbered SABME command is used for setting the specified mobile station or the network for modulo 64 acknowledgment type multiple frame operation.

A data link entity which receives an SABME command transmits a UA response at the first opportunity for acknowledging that the SABME command was accepted. When the data link entity accepts an SABME command, V(S), V(A) and V(R) in the data link layer entity are set to "0". Before the data link layer entity transmits a SABME command, all the error conditions are cleared. The SABME command cannot have an information field.

Previously transmitted I and I' frames for which an acknowledgment or a response was not given when the SABME command was processed are discarded without any acknowledgment or response given. In such instances, the data in the aborted I and I' frames may be lost. Recovery of such data is a function of higher layers such as Layer 3 or the management entity.

4.2.2.3.8.3 Set Asynchronous Balanced Mode Extended with information (SABMEI) command

An unnumbered SABMEI command is a SABME command that incorporates an information transmission function. SABMEI commands make the specified user or the network info the modulo 64 acknowledgment type multiple frame operation. At the same time, information provided by Layer 3 is inserted into frame information fields for transmission through the data link connection by the SABMEI commands.

The data link entity which received the SABMEI command transfers the information in the information field to Layer 3, then transmits a UA response at the first opportunity to acknowledge that the SABMEI command was received. (UA response for SABMEI applies both to setting of the acknowledged multiframe operation and acknowledgment of layer 3 information reception.) After the data link entity receives the SABMEI command, the V(S), V(A) and V(R) of the data link layer entity are set to "0", and when the SABMEI command is transmitted all errors are cleared.

Previously transmitted I and I' frames that are unacknowledged when this command is processed, remain unacknowledged and are discarded. As data in these I and I' frames may be lost, recovery of this lost data must be performed by a higher layer (for example, Layer 3) or by the management entity.

SABMEI commands are not used when SAPI =1

4.2.2.3.8.4 Disconnect (DISC) command

The DISC unnumbered command is used to terminate the multiple frame operation.

The data link layer entiy receiving the DISC command confirms the acceptance of a DISC command by the transmission of a UA response. The data link layer entiy which sent the DISC command terminates the multiple frame operation when it receives the acknowledging UA or DM response. No information field is permitted with the DISC command.

Previously transmitted I and I' frames that are unacknowledged when this command is processed remain unacknowledged and are discarded. As data in these I and I' frames may be lost, recovery of this lost data must be performed by a higher layer (for example, Layer 3) or by the management entity.

4.2.2.3.8.5 Unnumbered information (UI) command

When a Layer 3 or management entity requests unacknowledged information transfer, the UI unnumbered command is used to send information to its peer without affecting data link layer variables. UI command frames do not carry a sequence number and therefore, the UI frame may be lost without notification.

4.2.2.3.8.6 Receive ready (RR) command/response

The RR supervisory frame is used for the following purposes :

(1) indicate it is ready to receive I and I' frames;

(2) acknowledge previously received I and I' frames numbered up to and including N(R)-1 (refer to Section 4.2.2.5); and

(3) clear a busy condition that was indicated by the earlier transmission of an RNR frame by that same data link layer entity.

4.2.2.3.8.7 Reject (REJ) command/response

The REJ supervisory frame is used by a data link layer entity to request retransmission of I frames starting with the frame numbered N(R). The value of N(R) in the REJ frame acknowledges I and I' frames numbered up to and including N(R)-1.

Only one REJ error state for a given direction of information transfer is established. The REJ error state is cleared (reset) upon the receipt of an I and I' frames with an N(S) equal to the N(R) of the REJ frame.

The transmission of a REJ frame shall also indicate the clearance of any busy condition within the sending data link layer entity that was reported by the earlier transmission of an RNR frame by that same data link layer entity.

In addition to indicating the state of a data link layer entity, the REJ command with P bit set to "1" may be used to ask for the state of its peer data link layer entity.

REJ frames are not used when SAPI =1.

4.2.2.3.8.8 Receive not ready (RNR) command/response

The RNR supervisory frame is used by a data link layer entity to indicate a busy condition; that is, a temporary inability to accept additional incoming I and I' frames. The value of N(R) in the RNR frame acknowledges I and I' frames numbered up to and including N(R)-1.

As described in section 4.2.1.6.2.2, when the data link layer is normal, the home receiver busy condition should not occur and, RNR command/response are not used. However, in cases when the home receiver busy condition occurs due to hardware problems, etc., RNR command/responses are used.

In addition to indicating the state of a data link layer entity, the RNR command with P bit set to "1" may be used to ask for the state of its peer data link layer entity.

4.2.2.3.8.9 Unnumbered acknowledgment (UA) response

The UA unnumbered response is used by a data link layer entity to acknowledge the receipt and acceptance of the mode-setting commands (SABME, SABMEI, or DISC). Received mode-setting commands are not processed until the UA response is transmitted. The transmission of the UA response indicates the clearance of any busy condition that was reported by the earlier transmission of an RNR frame by that same data link layer entity. No information field is permitted with the UA response.

4.2.2.3.8.10 Disconnected mode (DM) response

The DM unnumbered response is used by a data link layer entity to report to its peer that the data link layer is in a state wherein multiple frame operation cannot be performed. No information field is permitted with the DM response.

4.2.2.3.8.11 Frame reject (FRMR) response

The FRMR unnumbered response may be received as a report of an error condition unrecoverable by retransmission of the identical frame, (i.e., at least one of the following error conditions resulting from the receipt of a valid frame) :

(1) the receipt of a command or response control field that is undefined or not implemented;

(2) the receipt of a supervisory or unnumbered frame with incorrect length;

(3) the receipt of an invalid N(R); or

(4) the receipt of a frame with an information field which exceeds the maximum established length.

An undefined control field is any of the control field encodings that are not identified in section 4.2.2.3-5 above.

A valid N(R) value is one that is in the range of $V(A) \leq N(R) \leq V(S)$.
The cause for frame reject is contained in the FRMR response information field. The format used for this information field is shown in Fig. 4.2.2.3-5 below.

8	7	6	5	4	3	2	1	
Control field for								Octet 1
rejected frame								2
V(S)							0	3
V(R)							C/R	4
0	0	0	0	Z	Y	X	W	5

Fig. 4.2.2.3-5 : FRMR information field format

(1) The rejected frame control field is the control field of the received frame which caused the frame reject. When the rejected frame is an unnumbered frame, the control field of the rejected frame is positioned in octet 1, with octet 2 set to "0000 0000".

(2) V(S) is the current send state variable value on the user or network side reporting the rejection condition.

(3) C/R is set to "1" if the frame rejected was a response and to "0" if the frame rejected was a command.

(4) V(R) is the current receive state variable value on the user or network side reporting the rejection condition.

(5) W set to "1" indicates that the control field received and returned in octets 1 and 2 was undefined or not implemented.

(6) X set to "1" indicates that the control field received and returned in octets 1 and 2 was considered invalid because the frame contained an information field which is not permitted with this frame, or is a supervisory or unnumbered frame with incorrect length. When X set is to "1", W must be set to "1".

(7) Y set to "1" indicates that the information field received exceeded the maximum established information field length (N201) for the user or network side reporting the rejection condition.

(8) Z set to "1" indicates that the control field received and returned in octets 1 and 2 contained an invalid N(R).

(9) Octet 3, bit 1 and octet 5, bits 5 through 8, shall be set to "0".

4.2.2.3.8.12 Exchange identification information (XID) command/response

The XID frame may have an information field in which the identification information is conveyed. The exchange of XID frames must be made by connection management.
No sequence numbers are included in the control field.

The maximum length of the information field must conform to the value N201.
Sending or receiving an XID frame shall have no effect on the operational mode or associated state variables associated with the data link layer entities.

These standards do not regulate the procedures used between the connection management sections using the XID frames, thus, when the connection management receives XID frames, they are aborted without notification given to the transmitting party.

4.2.2.3.8.13 Partial re-transmission control information (I') command

The function of the partial re-transmission control (I') command is to enter the information with N(S) numbers furnished by layer 3 into the information field of the frame and to transmit units with the n(S) numbers through the data link connection. This command is used in multiple frame operation for the point-to- point data link connections.

4.2.2.3.8.14 Partial re-transmission control reject (REJ') command/response

Partial re-transmission control REJ' supervisory frames are used by the data link layer entity for requesting re-transmission of units with n(R) numbers in I frames with the N(R) number. Reception of units with numbers other than n(R) is acknowledged by the n(R) value in the REJ' frame.

Reception of the I and I' frames numbered up to and including N(R)-1 can be acknowledged by the value of N(R) in the REJ' frame.

Only one REJ' error state can be set in one information transfer direction.

The REJ' error state is cleared when I or I' frame which contains the n(R) for the REJ' frame is received.

REJ’ frames are not used when SAPI=1.

4.2.2.3.8.15 Selective reject (SREJ) command/response

The SREJ supervisory is frame used for requesting retransmission of the I frame indicated by N(R). The P/F bit for the SREJ frame is constantly set to "0". In this instance, the N(R) included in the SREJ does not mean acknowledgment of any I frames.

At this point, one more SREJ error states may be set in the direction of information transfer. The SREJ error state is cleared when the I frame which has an N(S) equivalent to the N(R) for the SREJ frame is received.

On reception of retransmitted I frames or I' frames which do not accord with the sequence in the SREJ error state, it is determined that the SREJ frame has been lost. Accordingly, a new SREJ error state is set and the SREJ frame is retransmitted.

SREJ frames are used only when SAPI = 1.

4.2.2.3.8.16 Selective partial retransmission control reject (SREJ') command/response

The SREJ' supervisory frame is used for requesting retransmission of the I' frame indicated by N(R). The P/F bit for the SREJ' frame is constantly set to “0”. In this instance, the N(R) included in the SREJ' does not mean acknowledgment of any I frames.

At this point, one or more SREJ' error states maybe set in the direction of information transfer. The SREJ' error state is cleared when I' frame which has an N(S) equivalent to the N(R) for the SREJ' frame is received.

On reception of retransmitted I frames or I' frames which do not accord with the sequence in the SREJ' error state, it is determined that the SREJ' frame has been lost. Accordingly, a new SREJ' error state is set and the SREJ' frame is retransmitted.

SREJ' frames are used only when SAPI = 1.

Table 4.2.2.3-5 : Commands and responses (Basic retransmission control) Part 1

Application	Format	Command	Response	Coding 8	7	6	5	4	3	2	1	Octet (note)
Unacknow-ledged	I Info. transfer	I (information)		N(S)						0	0	1
				N(R)						P	1	2
& multiple frame acknow-ledged information transfer	S Super-visory	RR (receive ready)	RR (receive ready)	0	0	0	0	0	0	0	1	1
				N(R)						P/F	1	2
		RR1 (conditional receive ready)	RR1 (conditional receive ready)	0	0	0	1	0	0	0	1	1
				N(R)						P/F	1	2
		RNR (receive not ready)	RNR (receive not ready)	Spare				0	1	0	1	1
*w/o partial				N(R)						P/F	1	2
retrans-mission control		REJ (reject)	REJ (reject)	Spare				1	0	0	1	1
				N(R)						P/F	1	2
		SREJ (selective reject)		Spare				1	1	0	1	1
				N(R)						P/F	1	2
	U Un-numbered	SABME (Set asynchronous balanced mode extended)		0	1	1	P	1	1	1	1	1
		SABMEI (Set asynchronous balanced mode extended (w/info.)		0	1	1	P	1	1	1	0	1
			DM(discon-nect mode)	0	0	0	F	1	1	1	1	1
		UI (unnumbered information)		0	0	0	P	0	0	1	1	1
		DISC (disconnect)		0	1	0	P	0	0	1	1	1
			UA (Unnumbered acknowledge-ment)	0	1	1	F	0	0	1	1	1
			FRMR (frame reject)	1	0	0	F	0	1	1	1	1
Connection manage-ment		XID (exchange identification)	XID (exchange identification))	1	0	1	P/F	1	1	1	1	1

Note1 : Transmission and reception of XID frames does not influence operations and variables in the data link layer and received XID frames are aborted.

Note2 : RR1 (conditional receive ready) is used in Half-duplex packet communication specified in Annex 5.

Table 4.2.2.3-5 : Commands and responses (Partial re-transmission control) Part 2

Form of application	Format	Command	Response	Coding 8	7	6	5	4	3	2	1	Octet
Multiple frame acknow-ledged information transfer with partial retransmis-sion control	I' info. transfer	I' (info).		N(S)						0	0	1
				N(R)						P	0	2
				n1(S)							0	3
				:							0	:
				ni(S)							1	2 + i
	S' supervisory	REJ' (reject)	REJ' (reject)	Spare				1	0	0	1	1
				N(R)						P/F	0	2
				n1(R)							0	3
				:								:
				ni(R)							1	2 + i
		SREJ' (selective reject)	SREJ' (selective reject)	Spare				1	1	0	1	1
				N(R)						P/F	0	2
				n1(R)							0	3
				:							0	:
				ni(R)							1	2 + i

Note : Octet values in the above table are relatives values assuming that the last octet in the address field is “0.”

4.2.2.4. Elements for layer-to-layer communications

4.2.2.4.1 General

This standard requires that communications between layers and, between the data link layer and the layer management are performed by primitives.

Primitives represent, in an abstract way, the logical exchange of information and control between the data link and adjacent layers. They do not specify or restrict implementation.

Primitives consist of commands and their respective responses associated with services requested for lower layers. The general syntax of a primitive is listed below.

XX-Generic name-Type : Parameter

XX designates the interface across which the primitive flows. In this standard, XX can be used to represent the following.

(1) DL for communication between layer 3 and the datalink layer
(2) PH for communication between the data link layer and the physical layer
(3) MDL for communication between the layer management and the data link layer
(4) MPH for communication between the management entity and the physical layer.

4.2.2.4.1.1 Generic names

The generic name specifies the activity that should be performed. The primitives defined in these standards are listed in Table 4.2.2.4-1. Note that not all primitives have associated parameters.

The primitive generic names that are defined in this Standard are listed below.

Note that DL-STOP, DL-RESTART, DL-RECONNECT primitives are used on the mobile station side and not used by the network side.

4.2.2.4.1.1.1 DL-ESTABLISH primitive

The DL-ESTABLISH primitive is used to request the procedures for establishing a multiple frame operation, or for indicating or confirming the result of the request.

4.2.2.4.1.1.2 DL-RELEASE primitive

The DL-RELEASE primitive is used to request the procedures for terminating a currently established multiple frame operation or confirm the results of the request. It is also used to indicate that a previously established multiple frame operation is terminated, or to report an unsuccessful establishment attempt.

4.2.2.4.1.1.3 DL-DATA primitive

The DL-DATA primitive is used to request and indicate layer 3 messages which are to be transmitted, or which have been received by the data link layer using the acknowledged information transfer service. This primitive is also used to confirm that the I frame has been transmitted to the remote entity correctly by the acknowledged information transfer procedure.

4.2.2.4.1.1.4 DL-UNIT DATA primitive

The DL-UNIT DATA primitives are used to request and indicate layer 3 messages which are to be transmitted, or have been received by the data link layer using the unacknowledged information transfer service.

4.2.2.4.1.1.5 DL-STOP primitive

The DL-STOP primitive is used to request the procedure to temporarily halt the multiple frame operation established at channel handover or to confirm the results of this request.

4.2.2.4.1.1.6 DL-RESTART primitive

The DL-RESTART primitive is used to request the procedure to restart multiple frame operation which is halted after channel handover to a new channel, or to confirm the results of this request.

4.2.2.4.1.1.7 DL-RECONNECT primitive

The DL-RECONNECT primitive is used to request the procedure to restart the multiple frame operation which is stopped after the channel handover fails and return to the previous channel, or to confirm the results of this request.

4.2.2.4.1.1.8 MDL-ASSIGN primitive

The MDL-ASSIGN primitive is used by the layer management entity to request that the data link layer associate the MSI value or SMSI value contained within the message unit of the primitive with the specified Connection Endpoint Suffix (CES) across all SAPIs. The MDL-ASSIGN primitive is also used by the data link layer to indicate to the layer management entity the need for the MSI value or SMSI value to be associated with the CES specified in the primitive message unit.

4.2.2.4.1.1.9 MDL-REMOVE primitive

The MDL-REMOVE primitive is used by the layer management entity to request that the data link layer remove the association of the specified MSI, SMSI value with the specified CES across all SAPIs. The MSI, SMSI and CES are specified by the MDL-REMOVE primitive message unit.

4.2.2.4.1.1.10 MDL-ERROR primitive

The MDL-ERROR primitive is used to indicate to the connection management entity that an error has occurred associated with a previous management function request or detected as a result of communication with the data link layer peer entity. The layer management entity may respond with an MDL-ERROR primitive if the layer management entity cannot obtain the specified value.

4.2.2.4.1.1.11 MDL-UNIT DATA primitive

The MDL-UNIT DATA primitive is used to request transmission, or to indicate that layer management entity messages which are to be transmitted, or have been received by the data link layer using the unacknowledged information transfer service.

4.2.2.4.1.1.12 MDL-XID primitive

The MDL-XID primitive is used by the connection management entity to request, indicate, respond to and confirm the actions for use of XID procedures.

Note : Transmission and reception of XID frames have no influence on the operations and parameters of the data link layer. The received XID frames shall be discarded.

4.2.2.4.1.1.13 MDL-INFORMATION primitive

The MDL-INFORMATION primitive is used by the data link entities to request reporting the state of layers 1 and 3 and indicate the state of layers 1 and 3.

4.2.2.4.1.1.14 PH-DATA primitive

The PH-DATA primitive is used to request and indicate message units containing frames used for data link layer peer-to-peer communications passed to and from the physical layer. Also, the message unit contains the unit sequence number for the unit which has not been received, the number of bits in the unit and frame ID number.

4.2.2.4.1.1.15 PH-INFORMATION primitive

The PH-INFORMATION primitive reports that the information received by layer 1 by means of the PH-DATA-REQ primitive has been transmitted. Also, the message unit contains the frame ID number and the results of whether the transmission of signals succeeded or not.

4.2.2.4.1.1.16 MPH-ACTIVATE primitive

The MPH-ACTIVATE primitive is used to indicate that the physical layer connection has been activated.

4.2.2.4.1.1.17 MPH-DEACTIVATE primitive

The MPH-DEACTIVATE primitive is used to request deactivation of the physical layer connection or to indicate that the physical layer connection has been deactivated. The REQ primitive is used by the network side system management entity.

4.2.2.4.1.1.18 MPH-INFORMATION primitive

The MPH-INFORMATION primitive is used by the user side management entity to indicate that the physical is either at the following states :

(1) physical channel is connected.
(2) physical channel is disconnected.

When the system management has obtained the information on the physical channel by the MPH-INFORMATION primitive, the system management reports this information to the layer 2 management.

4.2.2.4.1.1.19 DL-RESUME

The DL-RESUME primitive is used for requesting resumption of a multiple frame operation which has been halted after the mobile station hands over to a new channel or to confirm the result of such requests.

4.2.2.4.1.2 Primitive types

The primitive types defined in these standards are as follows;

4.2.2.4.1.2.1 REQUEST (REQ) primitives

The REQUEST primitive type is used when a higher layer or layer management is requesting a service from the lower layer.

4.2.2.4.1.2.2 INDICATION (IND) primitives

The INDICATION primitive type is used by a layer providing a service to inform the higher layer or layer management.

4.2.2.4.1.2.3 RESPONSE (RSP) primitives

The RESPONSE primitive type is used by layer management as a consequence of the INDICATION primitive type.

4.2.2.4.1.2.4 CONFIRM (CON) primitives

CONFIRM primitive type is used by the layer providing the requested service to confirm that an activity has been completed.

Fig.4.2.2.4-1 illustrates the relationship of the primitive types to layer 3 and the data link layer.

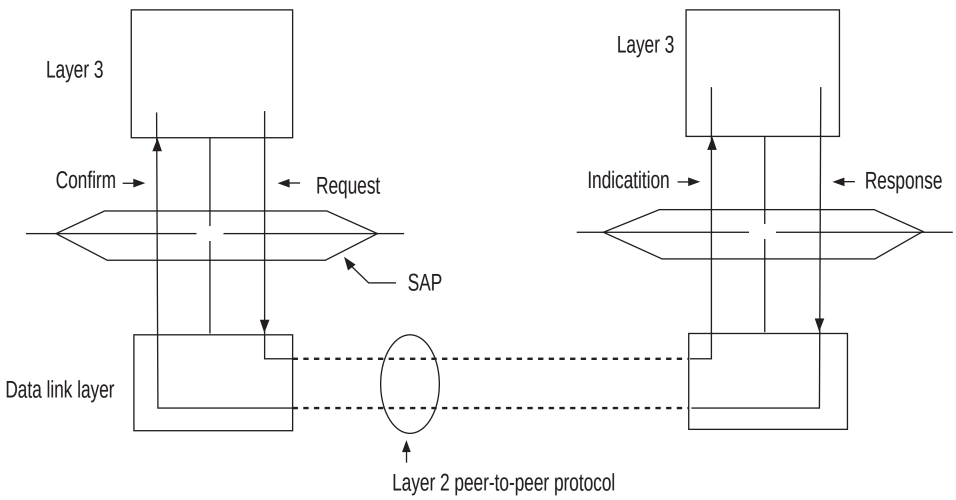


Fig.4.2.2.4-1 : Relationship of the primitive types to layer 3 and the data link layer

4.2.2.4.1.3 Parameter definition

4.2.2.4.1.3.1 Priority indicator

Since layer 1 as covered in this standard does not perform controls using the priority order, this parameter is not used.

4.2.2.4.1.3.2 Channel type

With LAPDM, messages are transferred over multiple function channels. This parameter is used to identify the function channel which transfers a message unit that was transmitted by one SAP. (refer to 4.2.2.2.3)

4.2.2.4.1.3.3 ID control

ID control is used to identify if the frame transmitted is to be used for assignment or removal of the SMSI. Value of SMSI, MSI and CES which are required for assignment and removal are transmitted across the system management by the layer management to layer 3.

4.2.2.4.1.3.4 Message units

Message units contain additional layer-to-layer information concerning actions and results associated with requests. In the case of DATA primitives, the message unit contains the peer-to-peer messages for the requesting layer. For example, the DL-DATA message unit contains layer 3 information. A list of message units is given in Table 4.2.2.4-1.

Note : Operations across the data link layer/layer 3 boundary shall be such that the layer sending the DL-DATA or DL-UNIT DATA primitive can assume a temporal order of the bits within the message unit, and that the layer receiving the primitive can reconstruct the message with its assumed temporal order.

Table 4.2.2.4-1 : Message units

General name	Type				Parameter			Content of message unit
	REQ	IND	RSP	CON	CH type	ID control	Message unit	
L3 <--> L2								
DL-ESTABLISH	o	o	-	o	o	-	o	Layer 3 peer-to-peer message
DL-RELEASE	o	o	-	o	o	-	-	
DL-DATA	o	o	-	o	o	o	o	Layer 3 peer-to-peer message
DL-UNIT DATA	o	o	-	-	o	o	o	Layer 3 peer-to-peer message
DL-STOP	o	-	-	o	o	-	o	State of I-queue *1
DL-RESTART	o	-	-	o	o	-	-	
DL-RECONNECT	o	-	-	o	o	-	-	
DL-RESUME	o	-	-	o	o	-	-	
M <--> L2								
MDL-ASSIGN	o	o	-	-	-	-	o	MSI, SMSI values, CES
MDL-REMOVE	o	-	-	-	-	-	o	MSI, SMSI values, CES
MDL-ERROR	-	o	o	-	o	-	o	Cause of error message
MDL-UNIT DATA	o	o	-	-	o	-	o	Management function peer-to-peer message
MDL-XID *5	o	o	o	o	o	-	o	Connection management information
MDL-INFO	o	o	-	-	-	-	o	States of layers 1 and 3 *4
L2 <--> L1								
PH-DATA	o	o	-	-	o	-	o	Data link layer peer-to-peer message
PH-INFO	-	o	-	-	-	-	-	ID number for frame, transmission result *3
M <--> L1								
MPH-ACTIVE	o	o	-	-	-	-	-	
MPH-DEACTIVE	o	o	-	-	-	-	-	
MPH-INFO	o	o	-	-	-	-	o	State of physical layer *6

L3 <--> L2 : Layer 3/data link layer boundary
M <--> L2 : Management entity/data link layer boundary
L2 <--> L1 : Data link layer/physical layer boundary
M <--> L1 : Management entity/physical layer boundary

o : Exists
- : Does not exist

*1 : The state of the I-queue indicates whether or not an (I) frame exists in the I-queue.

*2 : PH-DATA has the frame ID number, the number of bits in the unit and the unit sequence number for unreceived units.

*3 : The frame ID number is used to identify the layer 2 frame which has been already transmitted.

*4 : The states of layers 1 and 3 are the following :

Layer 1 : (start/stop)
Network layer 3 : (idle/TCH start)
Mobile station layer 3 : (stop/standby/TCH active)

*5 : Transmission and reception of XID frames do not affect the operation and variables of data link layer, and the received XID frames are discarded.

*6 : Refer to Fig. 4.1.22.2-2 for the state of physical layer.

4.2.2.4.2 Primitive procedures

4.2.2.4.2.1 General

Primitive procedures define the interactions between adjacent layers to specify and provide a service. The service primitives represent the elements of the procedures.

In the scope of this standard the interactions between layer 3 and the data link layer are specified.

4.2.2.4.2.2 Layer 3 - Data link layer interactions

The state for a data link connection endpoint may be derived from the internal states of the data link layer entity supporting this type of a data link connection.

The data link connection endpoint states are defined as follows:

(1) Broadcast data link connection endpoint
(Information transfer state)

(2) Point-to-point data link connection endpoints

i) Link connection release state
ii) Awaiting establish state
iii) Awaiting release state
iv) Link connection established state

The primitives provide the procedural means to specify conceptually how a data link service user can invoke a service.

This section defines the constraints on the sequences in which the primitives may occur. The sequences are related to the states at one point-to-point data link connection endpoint.

The possible overall sequences of primitives at a point- to-point data link connection endpoint are defined in the state transition diagram, Fig.4.2.2.4-2. The link connection released and link connection established states are stable states, while the awaiting establish and awaiting release states are transition states.

The model illustrates the behavior of layer 2 as seen by layer 3. This model assumes that the primitives passed between layers is implemented by a first-in-first-out queue.

As described in the notes in Fig.4.2.2.4-2, in this model, "collisions" of REQUEST and INDICATION primitives can occur, thereby illustrating actions that seem to be in conflict with the actual layer 2 protocol description. In some implementations, these collisions could occur. In such instances, follow the guidelines given in Fig.4.2.2.4-2.

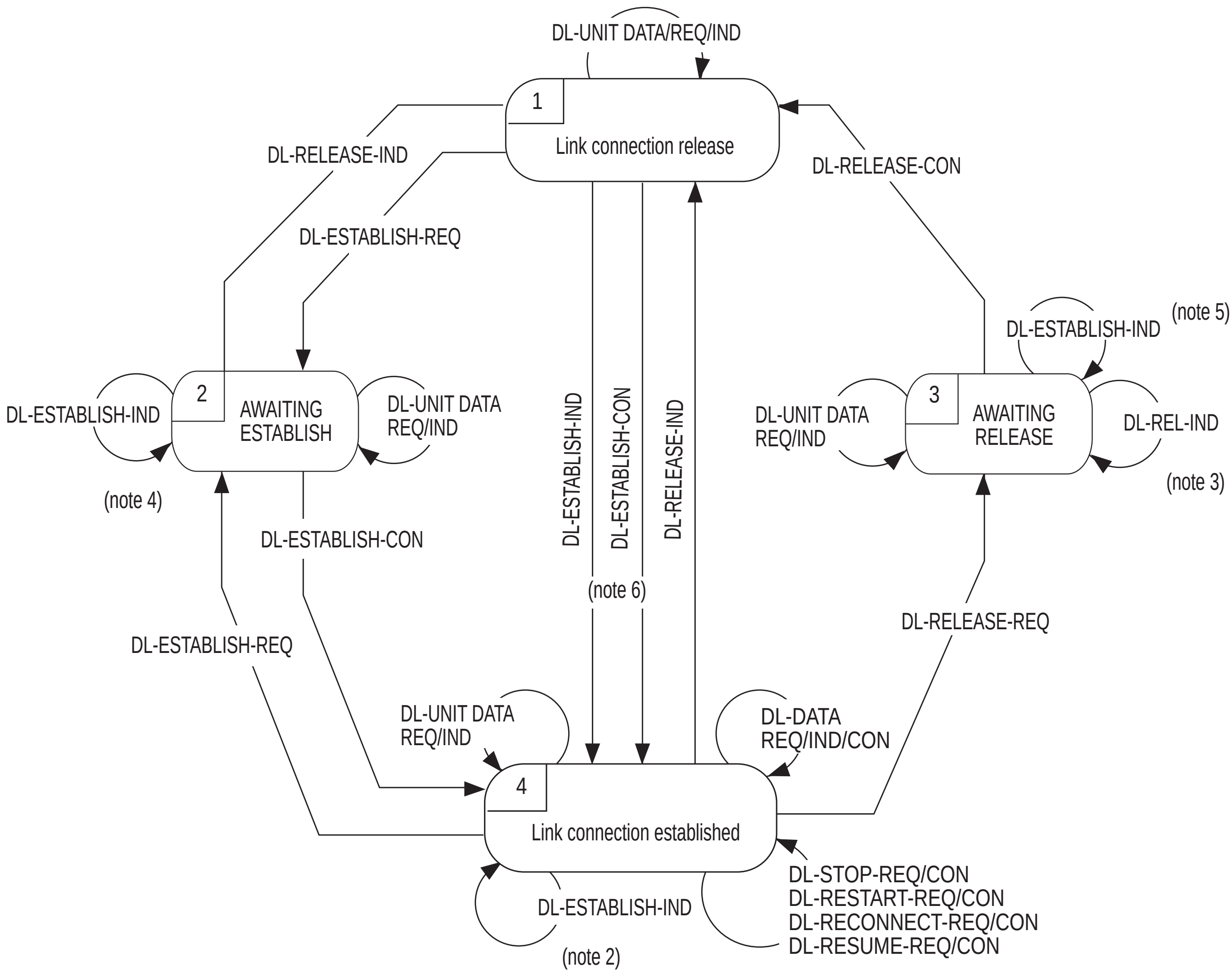


Fig. 4.2.2.4-2 : State transition diagram for sequences of primitives at a point-to-point data link connection endopoint as seen by layer 3 (note 1)

Notes on Fig.4.2.2.4-2 :

Note 1 : If the data link layer entity issues a DL-ESTABLISH-IND (in case of data link layer initiated or peer system initiated re-establishment), DL-RELEASE-CON or DL-RELEASE-IND, this indicates the discarding of all the data link service data units represented by DL-DATA-REQ.

Note 2 : This primitive notifies layer 3 of link re-establishment.

Note 3 : This primitive will occur if a DL-RELEASE-REQ collides with a DL-RELEASE-IND.

Note 4 : This primitive will occur if a DL-ESTABLISH-REQ collides with a DL-ESTABLISH-IND.

Note 5 : This primitive will occur if a DL-RELEASE-REQ collides with a DL-ESTABLISH-IND.

Note 6 : This primitive will occur if a DL-ESTABLISH-REQ (in the case of layer 3 initiated re-establishment) collides with a DL-RELEASE-IND. Since this DL-RELEASE-IND is not related to the DL-ESTABLISH-REQ, the data link layer will establish the link and issue a DL-ESTABLISH-CON.

4.2.2.5 Definition of the peer-to-peer procedures of the data link layer

The procedures for use by the data link layer are specified in the following sections.

The elements of procedure (frame types) are applied as follows.

(1) Unacknowledged information transfer, refer to Item 4.2.2.5.2 in this section below.

UI command

(2) Multiple frame acknowledged information transfer, refer to Items 4.2.2.5.5 through 4.2.2.5.8 in this section below.

SABME command
SABMEI command
UA response
DM response
DISC command
RR command/response
RNR command/response
REJ command/response
I command
FRMR response
REJ' command/response
I' command
SREJ command/response
SREJ' command/response

(3) Connection management entity information transfer

XID command/response

Note : Transmission and reception of XID frames do not affect the operation or variables of data link layer and the received XID frames are discarded.

4.2.2.5.1 Procedure for the use of the P/F bit

4.2.2.5.1.1 Unacknowledged information transfer

P/F bits are not used for unacknowledged information transfer and must be set to "0".

4.2.2.5.1.2 Acknowledged multiple frame information transfer

A data link layer entity receiving a SABME, SABMEI, DISC, RR, RNR, REJ, REJ', I or I' frame, with the P bit set to "1", shall set the F bit to "1" in the next response frame it transmits, as defined in Table 4.2.2.5-1.

Table 4.2.2.5-1 : Immediate response operation of P/F bits

Command received with P bit = 1	Response transmitted at F bit = 1
SAMBE, SAMBEI, DISC	UA, DM
I, RR, RNR, REJ, I', REJ'	RR, RNR, REJ, REJ'

4.2.2.5.2 Procedure for unacknowledged information transfer

4.2.2.5.2.1 Outline

The procedures which apply to the transmission of information in unacknowledged operation are defined below.

The data link layer error recovery procedure is not defined in the unacknowledged operation.

4.2.2.5.2.2 Transmission of unacknowledged information

Note : "UI frame transmission" means that the data link layer transmits UI frames to the physical layer.

Unacknowledged information is transferred from layer 3 or from the management entity to the data link layer either by the DL-UNIT DATA-REQ primitive or MDL-UNIT DATA-REQ primitive.

Layer 3 or management message units must be transmitted by UI command frames.

MSI to be used must accord with section 4.2.2.3.3.6.

The P bit shall be set to "0".

When Layer 1 operation halts continuously without resuming, this state is reported by layer 1 to the data link layer (by means of the MDL-INFO-REQ primitive). When the data link layer receives this message, the entire UI transmission queue is emptied.

Note : The procedure for halting operation of the system management for the network must ensure that operation of layer 1 is not halted until all the UI data is transmitted.

4.2.2.5.2.3 Receipt of unacknowledged information

When the data link layer receives a UI command frame containing SAPI, MSI or SMSI that are supported by the receiving end, the data in the information field must be transferred from the data link layer to layer 3 using a DL-UNIT DATA-ID primitive sent from the data link layer to layer 3, or else it must be transferred to the management entity using a MDL-UNIT DATA-ID primitive sent from the data link layer to the management. otherwise, the UI command frames are discarded, and thus no data transferred to layer 3 or the management entity.

4.2.2.5.3 Shortened mobile station identifier (SMSI) management procedure

4.2.2.5.3.1 Overview

SMSI can be used for the SCCH and UPCH. SMSIs are assigned to the individual mobiles by the layer management entity at network end (referred to as ASP: assignment source point).

The mobile station must use an assigned SMSI until it is removed.

The SMSI management must accord with the following procedures:

(1) SMSI assignment procedure (refer to Section 4.2.2.5.3.2)
(2) SMSI removal procedure (refer to Section 4.2.2.5.3.3)
(3) SMSI check procedure (refer to Section 4.2.2.5.3.4)

The assignment and removal are activated by operating the AC field for any SAPI=0 or SAPI=1 message.
The check procedure uses UI (unacknowledged information) transfer at SAPI=6 or SAPI=7.

The mobile station must maintain the relationship between SMSI and SAPI so that it uses only one SMSI for all SAPIs at a time.

The SMSI assignment procedure is activated by ASP, if the network has not assigned SMSI to the MS in any of following situations:

(1) When a DL-ESTABLISH-REQ is received from layer 3
(2) When a DL-UNIT DATA-REQ is received from layer 3
(3) When a SABME or SABMEI command is received from the MS
(4) When a UI command is received from the MS

The data link layer entity in the mobile station reports to the layer management entity by the MDL-ASSIGN-IND primitive that SMSI assignment has been performed.

The network can use the check procedure for checking:

1) Whether or not a specified SMSI is used.
2) If SMSI overlapping assignment has been made or not.

The layer management entity of a mobile must issue MDL-REMOVE-REQ primitive to order the data link entity to remove the SMSI locally e.g. at loss of the SCCH connection.

The layer management entity messages which use SAPI=6 or SAPI=7 in the SMSI management procedure are transmitted to the data link layer entity using the MDL-UNIT DATA-REQ primitive. They are received using the MDL-UNIT DATA-IND primitive.

The data link layer entity transmits the layer management entity message using UI command frames.

4.2.2.5.3.2 SMSI assignment procedure

The SMSI value must be selected by the ASP when this procedure is activated. To do this, the ASP must maintain a list of assigned SMSI values, free SMSI values and SMSI values in removal process. Then the ASP issues an MDL-ASSIGN-REQ primitive which causes the data link layer entity to include the following elements in the next message sent to the mobile station:

(1) ID control (AC) = SMSI assignment (01)
(2) ID indication (AI) = MSI + SMSI (11)
(3) Fixed address (MSI)
(4) Shortened address (SMSI)

The network continues SMSI assignment control and sends an SMSI assignment control frame when transmitting the next frame, until the network receives the frame with ID indication='01' (SMSI only) from the mobile station.

When a mobile station receives a frame with control ID='01', the layer management entity for the mobile station initiates the following operation, regardless whether or not the SMSI value in the message has been assigned to the layer management entity.

(1) When the MSI matches up, the layer management entity assumes that the SMSI value in the address is assigned to the mobile station and reports this to the data link entity of the mobile station using the MDL-ASSIGN-REQ primitive. Then the mobile station transmits the following frame containing the SMSI assigned to the network when there is data to be transmitted.

i) Control ID=no control (00)
ii) ID indication=SMSI (10)
iii) Shortened address (SMSI)

(2) After the mobile station has transmitted the above frame it uses only the SMSI, except when it receives the message containing AC=11. In this case, it transmits the next message containing both MSI and SMSI for this one transmission only.

4.2.2.5.3.3 SMSI removal procedure

When the layer management entity on the network determines that the allotted SMSI needs to be removed (refer to Section 4.2.2.5.3.3.2), the ASP must issue the MDL-REMOVE-REQ primitive. Then the data link layer entity will include the following elements in the next message to the mobile station.

(1) ID control=SMSI removal (10)
(2) The SMSI value to be removed.

When the layer management entity of the mobile station determines that the SMSI needs to be removed (refer to Section 4.2.2.5.3.3.2), it must issue a MDL-REMOVE-REQ primitive, and the data link layer entity removes the SMSI.

4.2.2.5.3.3.1 Operations performed by the data link layer entity on reception of the MDL-REMOVE-REQ primitive:

The data link layer entity in the mobile station removes the SMSI when it receives the MDL-REMOVE-REQ primitive.

4.2.2.5.3.3.2 Conditions for removing the SMSI

When an SMSI value is assigned to the user equipment under the following conditions, the SMSI should be removed.

(1) When an ID control='10' frame sent by the ASP is received:

(2) When a frame which is received from the ASP is comprised of ID control='01' and it contains an SMSI that matches up but an MSI that doesn't. (In such instances, the data link layer entity assumes that the SMSI is assigned to another user equipment unit and removes the SMSI.)

(3) When a radio channel set has been successfully completed, i.e. a TCH burst has been received on the TCH-channel. (If the mobile station fails to successfully establish layer 1 on the TCH-channel and returns to the SCCH, then an assigned SMSI shall still be valid.)

(4) When the mobile station enters the standby state.

(5) When the mobile station moves to a new terminal registration area during packet communication, the SMSI assigned for the previous terminal registration area is canceled.

(Note : In case of (3) and (4) and (5) above, the mobile station locally removes the SMSI, i.e. without any message is exchanged over the radio interface.)

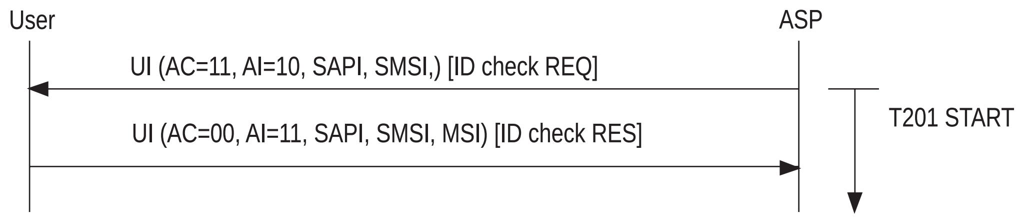
4.2.2.5.3.4 SMSI check procedure

4.2.2.5.3.4.1 Usage of the SMSI check procedure

The layer management entity on the network side can perform either of the following operations using the SMSI check procedure:
- Check if a specified SMSI is in use or not.
- Check if SMSI multiple assignment has been made.

4.2.2.5.3.4.2 Operation of SMSI check procedure

The SMSI check procedure is outlined in Fig. 4.2.2.5-1 below.



MSI : Mobile Station Identifier
SMSI : Shortened Mobile Station Identifier
SAPI : 7
ID check REQ : Identity check request
ID check RES : Identity check response
( ) : Content of address field of data link layer command
[ ] : Content of information field of data link layer command

Fig.4.2.2.5-1 : SMSI check procedure

(1) The ASP shall transmit a message containing the following elements:

i) ID control value = MSI + SMSI request value (11)
ii) ID indication value = SMSI request value (10)
iii) SMSI value which is to be checked
iv) Message type = ID check request

(2) Timer T201 shall be started.

If any mobile station has been assigned the SMSI value specified in the MSI + SMSI ID check request message, it shall respond by transmitting a message containing the following elements :

i) ID control value = no control value (00);
ii) ID indication value = MSI + SMSI request value (11);
iii) Mobile Station Identity (MSI);
iv) Shortened Mobile Station Identity (SMSI);
v) Message type = ID check response.

When the SMSI check procedure is used to verify multiple SMSI assignment :

(1) if more than one ID check response is received within the N202 times SMSI check procedure (refer to Section 4.2.2.5.10.4), multiple SMSI assignment shall be considered present;

(2) if no ID check response is received within the N202 times SMSI check procedure, the SMSI value shall be assumed to be free and available for (re) assignment;

(3) if same ID check response is received within the N202 times SMSI check procedure, the SMSI value shall be assumed to be in use.

When the SMSI check procedure is used to test whether an SMSI value is in use, it is completed upon the receipt of the SMSI ID check response message, and the SMSI value shall be assumed to be in use. Otherwise :

(1) When an ID check response is not received during T201, an ID check request it repeated once more to restart timer T201.

(2) If the ID check response is not received while the ID check request is being repeated N202 times, it is assumed that the pertinent SMSI value is not in use and it can be reassigned.

4.2.2.5.3.5 Formats and coding

4.2.2.5.3.5.1 Outline

All the messages used in the SMSI check procedure are sent in the information field of a UI command frame which is set at SAPI = 6 or SAPI = 7. Each of the messages is structured as shown in Fig. 4.2.2.5-2 below.

8 7 6 5 4 3 2 1	
Management entity identifier	Octet 1
Message type	2

Fig. 4.2.2.5-2 : Structure of messages used in SMSI check procedure

4.2.2.5.3.5.2 Layer management entity identifier

The octets for the layer management entity identifier in the SMSI check procedure must be '0000 1111'. Values other than this are reserved for future use. The fields for various messages are coded as listed in Table 4.2.2.5-2.

4.2.2.5.3.5.3 Message type

Octet 2 is used for the message type. The purpose of message type is to identify the message being transmitted. Table 4.2.2.5-2 shows the message coding in the SMSI check procedure.

Message	Management entity identifier	Message type
ID check REQ	0000 1111	0000 0100
ID check RES	0000 1111	0000 0101

ID : identity

Table 4.2.2.5-2 : Message coding in the SMSI Check procedure

4.2.2.5.4 Automatic negotiation of data link layer parameters

This procedure is not covered in these standards.

4.2.2.5.5 Establishment and release procedures for multiple frame operation

4.2.2.5.5.1 Establishment procedures for multiple frame operation

A detailed explanation on multiple frame operation is given in this section. The module is 64.

4.2.2.5.5.1.1 Outline

These procedures are used for establishing multiple frame operation between the network and a specific user entity. Layer 3 requests that multiple frame operation be set using the DL-ESTABLISH-REQ primitive. Resetting of this operation is initiated by the data link layer procedure dealt with in 4.2.2.5.8 below. All the frames received during the establishment procedure, except those in the unnumbered (U) frame format, are ignored.

4.2.2.5.5.1.2 Establishment procedure

The data link layer entity activates a request for establishing multiple frame operation by transmitting a SABME command (Set Asynchronous Balanced Mode Extended) or a SABMEI command (Set Asynchronous Balanced Mode Extended with Information). This clears all the errors, and when the re-transmission counter is reset, timer T200 is started simultaneously. (Refer to Section 4.2.2.5.10.1 in this section below for timer T200.) All the mode set commands must be transmitted with the "P" bit set to "1".

When the establishment procedure is initiated on by layer 3, all the DL-DATA-REQ primitives in the outstanding state and (I) frames in the waiting queue are aborted.

If the message unit for the DL-ESTABLISH-REQ primitive is empty, the data link layer entity transmits an SABME command. If the message unit is not empty, it transmits the SABMEI command.

If the data link layer entity which receives the SABME or SABMEI command is ready to enter the multiple frame established state, it performs the following processing.;

(1) Responds with an unnumbered acknowledgment (UA) response with the "F" bit set to the same binary number as the "P" bit for the SABME or SABMEI command that was received.

(2) Sets all the transmission state variable V(S), the reception state variable V(R), the acknowledgment state variable V(A), the divided transmission state variable v(S) and the divided reception state variable v(R) to "0".

(3) Switches to the multiple frame established state and reports that the multiple frame established state has been set for layer 3 using the DL-ESTABLISH-IND primitive. When the data link layer entity receives an SABMEI command, it transfers the information field to layer 3 at the same time it reports that the multiple frame established state using the DL-ESTABLISH-IND primitive.

(4) Clears any receiver busy conditions on the receiving end.

(5) Starts timer T202. (refer to Section 4.2.2.5.10.7.)

If the data link layer entity cannot switch to the multiple frame established state, it responds to a SABME or SABMEI command using a DM response with the "F" bit set to the same binary number as the "P" bit in the SABME or SABMEI command received by the data link layer entity.

When the party which transmitted an SABME or SABMEI command receives a UA response with the "F" bit set to "1", the pertinent party performs following processing.

(1) Resets the T200 timer.

(2) Start timer T202.

(3) Sets all transmission state variable V(S), reception state variable V(R), acknowledgment state variable V(A), divided transmission state variable v(S) and divided reception state variable v(R) to "0."

(4) Switches to the multiple frame established state and reports the state to layer 3 using the DL-ESTABLISH-CON primitive.

When the party that transmitted a SABME or SABMEI command receives a DM response with the "F" bit set to "1", the pertinent party reports the reception to layer 3 using the DL-REL-IND primitive and resets timer T200. Following this, the data link layer switches to the multiple frame unestablished state. In this instance, DM responses with their "F" bits set to "0" are ignored.

In instances when the data link layer receives a DL-REL-REQ primitive while the data link layer is re-establishing, this primitive is processed after establishment of the mode setting operation.

4.2.2.5.5.1.3 Procedure for timer T200 expiry

If timer T200 expires state before the data link layer entity receives UA or DM responses with the "F" bit set to "1", the data link layer entity performs the following procedures.

(1) Re-transmits the SABME or SABMEI command.
(2) Restarts timer T200.
(3) Updates the re-transmission counter "+1".

After the data link layer entity re-transmits the SABME or SABMEI commands N200 times and timer T200 expires, the data link layer entity reports the state to layer 3 and the connection management entity using a DL-REL- IND and MDL-ERROR-IND primitives respectively. Next, the data link layer entity aborts all the DL-DATA-REQ primitives in the outstanding state and the (I) frames in the waiting queue, then switches to the multiple frame unestablished state.

The value of N200 is defined in 4.2.2.5.10.2 below.

4.2.2.5.5.2 Halting, restarting, reconnection and resumption of multiple frame operation

4.2.2.5.5.2.1 General

The halting, restarting and reconnecting procedures for multiple frame operation are used by the layer 2 entity at the mobile station side for halting the multiple frame operation of SAPI=0 during channel handover and restarting the multiple frame operation with the new channel after handover. The halting and resumption procedures for multiple frame operation are used for halting the multiple frame operation of SAPI =1 during channel handover and resumption the multiple frame operation with the new channel after handover. The purpose of these procedures is preventing the message from being lost during channel handover.

These procedures may delay channel handover, thus they are used only for layer 3 messages of SAPI=0,1. The recovery procedure for lost of messages of other than SAPI=0 or duplicated transmission is performed by a higher layer than Layer 2.

Channel handover of SAPI=0 is initiated by the layer 3 entity at the network side. After having issued the channel handover command, the layer 3 entity halts transmission of layer 3 messages. Then it restarts transmission of messages after the channel handover is completed and the data link connection is established. These message transmission or transmission halting procedures are performed by layer 3 entity and the layer 2 at the network side has no function to prevent loss of the message or duplicated transmission.

Channel handover of SAPI=1 is initiated by the Layer 3 entity on the mobile station side. After having issued the channel handover command, the layer 3 entity halts transmission of layer 3 messages. Then it restarts transmission of messages after the channel handover has been completed and the packet channel registration process has been completed.

The operation of the layer 2 on the mobile station side is described below by assuming a conceptual I-queue. To simplify explanation, all the messages transferred from layer 3 to layer 2 by DL-DATA-REQ and DL-UNIT DATA-REQ primitives are first accumulated in an I or UI queue. Layer 2 entity retrieves layer 3 messages from the I or UI queue on a first-in-first-out basis and transfers these messages to layer 1.

4.2.2.5.5.2.2 Halting

Layer 3 entity requests halting of the multiple frame operation using the DL-STOP-REQ primitive. When layer 2 entity receives this primitive, it performs the following operation.

(1) halts retrieving layer 3 messages from I or UI queue in case of SAPI = 0 or 7.
halts retrieving layer 3 messages from I queue in case of SAPI = 1 or 6.
(2) stops the pertinent (timers) if T200 or T202 is active.
(3) transmits a DL-STOP-CON primitive to layer 3.

4.2.2.5.5.2.3 Restarting

After successful handover to a new channel with SAPI=0, the layer 3 entity requests restarting the multiple frame operation using a DL-RESTART-REQ primitive. When layer 2 entity receives this primitive, it performs the following operation.

Note : The I frames in the middle of partial retransmission are handled as I frames for which transmission has not been acknowledged.

When there are I frames for which transmission has not been acknowledged:

i) traces back in the I queue up to the message next to the message for which transmission has been acknowledged.
ii) clears all the error states and resets the retransmission counter.
iii) transmits an SABMEI command.
iv) transmits a DL-RESTART-CON primitive to layer 3.

When layer 2 entity receives a UA response, it performs the following operation:

i) resets T200 and activates T202.
ii) sets transmission state variable V(S), reception state variable V(R), acknowledgment state variable
iii) V(A), divided transmission state variable v(S) and divided reception state variable v(R) to "0". switches to the multiple frame established state.
iv) transmits a DL-ESTABLISH-CON primitive to layer 3.

When there is no I frame for which transmission has not been acknowledged:

i) clears all the error states and resets the retransmission counter.
ii) Resets T200 and T202.
iii) switches to the multiple frame unestablished state
iv) transmits a DL-RESTART-CON primitive to layer 3.

Following this, the layer 2 continues normal operation.

4.2.2.5.5.2.4 Reconnecting

When channel handover fails for some reason and a return is made to the previous channel, with SAPI =0 the layer 3 entity requests reconnection of multiple frame operation using a DL-RECONNECT-REQ primitive. The layer 2 entity performs the following operation on reception of this primitive.

(1) Switches to multiple frame operation.
(2) Activates the timer stopped by a DL-STOP-REQ primitive.
(3) Transmits a DL-RECONNECT-CON primitive to layer 3.

Following this, layer 2 continues normal operations.

4.2.2.5.5.2.5 Resumption

When channel is restarting with SAPI=1, layer 3 entity requests resumption of the multiple frame operation using DL-RESUME-REQ primitive. When layer 2 entity receives this primitive, it resumes transmission of frames during the same state as before the multiple frame operation was halted.

4.2.2.5.5.3 Information transfer

After the pertinent data link layer entity transmits the UA response to a received SABME or SABMEI command, or after the pertinent data link layer entity receives the UA response to a transmitted SABME or SABMEI, the data link layer entity transmits or receives I and S frames or I' and S' frames according to the procedures described in section 4.2.2.5.6 and section 4.2.2.5.7, respectively.

When the data link layer entity receives a SABME or SABMEI command while in the multiple frame established state, the data link layer entity performs the re-establishment procedure described in section 4.2.2.5.8. On receiving a UI command, the data link layer entity carries out the procedures described in section 4.2.2.5.2 above.

4.2.2.5.5.4 Termination of multiple frame operation

4.2.2.5.5.4.1 General

The following procedures are used to terminate the multiple frame operation between the network and the mobile station entity. Layer 3 requests termination of the multiple frame operation using the DL-REL-REQ primitive. All frames other than U frames received during the release procedures are ignored. Also, DL-DATA-REQ primitives in the outstanding state and the I and I' frames in the transmission and reception waiting queues are all discarded.

When operation of layer 1 is halted continuously, the data link layer entity aborts all the I frames and I' queues. It delivers a DL-REL-CON primitive to layer 3 if a DL-REL-REQ primitive is outstanding. It delivers a DL-REL-CON primitive to layer 3 if a DL-REL-REQ primitive has already been received and the release processing has been completed. It delivers a DL-REL-IND primitive to layer 3, if layer 3 has not sent a DL-REL-REQ primitive. However, the time required to decide that layer 1 stops continuously has to be longer than the time required for the MS to return to the previous channel in the case of channel handover failure. (refer to Appendix L.)

4.2.2.5.5.4.2 Release procedure

The data link layer entity initiates a request for release of multiple frame operation by transmitting a disconnect (DISC) command with the P bit set to "1". Following this Timer T200 is activated and the re-transmission counter is reset.

A data link layer entity which receives a DISC command in the multiple frame established state or timer recovery state (refer to Section 4.2.2.5.9.3 below) transmits a UA response with the F bit set to the same binary value as the P bit in the received DISC command. The data link layer entity then passes a DL-REL-IND primitive to layer 3 and switches to the multiple frame unestablished state.

When the data link layer entity which transmitted the DISC command receives either of the following, it switches to the multiple frame unestablished state and resets timer T200.

(1) UA response with the F bit set to "1", or

(2) DM response with the F bit set to "1", this indicating that the peer data link layer entity has already been set to the multiple frame unestablished state.

The data link layer entity which issued the DISC command switches to the multiple frame unestablished state and reports this to layer 3 using a DL-REL-CON primitive. (The conditions relating to this state are defined in section 4.2.2.5.5.4.)

4.2.2.5.5.4.3 Procedure on expiry of timer T200

If timer T200 expires before a UA or DM response with the F bit set to "1" is received, the originator of the DISC command shall:

(1) retransmit the DISC command as defined in section 4.2.2.5.5.4.2 above,

(2) restart timer T200, and

(3) increment the retransmission counter by 1.

If the data link layer entity has not received the correct response as defined in section 4.2.2.5.5.4.2 above, after N200 attempts to recover, the data link layer entity shall indicate this to the connection management entity by means of the MDL-ERROR-IND primitive, then enter the multiple frame unestablished state and notify layer 3 by means of the DL-REL-CON primitive.

4.2.2.5.5.5 Multiple frame unestablished state

The following processing is performed in the multiple frame unestablished state.

(1) When the data link layer entity receives a DISC command it transmits a DM response with the F bit set to the same value as the P bit of the received DISC command.

(2) When the data link layer entity receives a SABME or SABMEI command, it performs the procedures in section 4.2.2.5.5.1 above.

(3) When the data link layer entity receives an unexpected DM response with the F bit set to "0", it, if it is able to, transmits a SABME or SABMEI command to initiate the establishment procedures. Otherwise, DM responses are ignored. (refer to Section 4.2.2.5.5.1.2)

(4) When the data link layer entity receives UI commands, the procedures defined in section 4.2.2.5.2 above are performed.

(5) When the data link layer entity receives an unexpected UA response, an MDL-ERROR-IND program is issued to indicate a possible double assignment of an SMSI value.

(6) All other frame types are discarded.

4.2.2.5.5.6 Collision of unnumbered commands and responses

4.2.2.5.5.6.1 Identical transmitted and received commands

If the transmitted and received U commands (SABME, SABMEI or DISC) are the same, the data link layer entity transmits the UA response as soon as possible. It then switches to the specified state (multiple frame established state or multiple frame unestablished state) after receiving the UA response and reports this state to layer 3 using the appropriate CON primitive.

4.2.2.5.5.6.2 Different transmitted and received commands

If the transmitted and received U commands (SABME, SABMEI or DISC) are different, the data link layer entity transmits the DM response as soon as possible. It switches to the multiple frame unestablished state when it receives a DM response with the F bit set to "1" and reports this state to layer 3 using the appropriate primitive. The entity which received the DISC command issues a DL-REL-IND primitive while the entity which transmitted the DISC command issues a DL REL-CON primitive.

4.2.2.5.5.6.3 Unsolicited DM response and SABME/SABMEI/DISC command

If the data link layer entity receives a DM response with the F bit set to "0", a collision between a transmitted SABME, SABMEI or DISC commands and the unsolicited DM response may have occurred. Such collisions may happen if a user equipment applies protocol procedure given in ITU-T Recommendations X.25LAPB to ask for a mode-setting command.

In order to prevent misinterpretation of the DM response received, the data link layer entity shall always transmit its SABME, SABMEI or DISC command with the P bit set to "1".

When a SABME, SABMEI or DISC command collide with a DM response with the F bit set to "0", the DM response is ignored.

4.2.2.5.6 Information transfer procedures during multiple frame operation

The procedures which apply to the transmission of I frames are defined below.

Note : The term "transmission of an I frame" refers to the delivery of an I frame by the data link layer entity to the physical layer.

4.2.2.5.6.1 Transmitting I frames

Information received by the data link layer entity from layer 3 by means of a DL-DATA-REQ primitive shall be transmitted in an I frame. The control field parameters N(S) and N(R) shall be assigned the values of send state variable V(S) and receive state variable, V(R), respectively. V(S) shall be incremented by 1 at the end of the transmission of the I frame.

If timer T200 is not running at the time of transmission of an I frame, it shall be started. If timer T200 expires, the procedures defined in section 4.2.2.5.6.7 below shall be followed.

If V(S) is equal to V (A) plus k (where k is the maximum number of outstanding I frames - refer to Section 4.2.2.5.10.5), the data link layer entity shall not transmit any new I frames, but may retransmit an I frame as a result of the error recovery procedures described in sections 4.2.2.5.6.4 and 4.2.2.5.6.7.

When the network side or mobile station side is in the own receive busy condition, it may still transmit I frames, provided that a peer receiver busy condition does not exist.

Note : Any DL-DATA-REQ primitives received while in the timer recovery condition shall be queued.

4.2.2.5.6.2 Receiving I frames

Independent of a timer recovery condition, when a data link layer entity is not in the own receiver busy condition and receives a valid I frame whose N(S) is equal to the current V(R), the data link layer entity shall :

(1) pass the information field of this frame to layer 3 using the DL-DATA-IND primitive;
(2) increment by 1 its V(R) and act as indicated below.

However, when units for which reception failed exist in a valid I frame, the procedures defined in section 4.2.2.5.7.2 shall be followed.

4.2.2.5.6.2.1 P bit set to "1"

If the P bit of the received I frame was set to "1", the data link layer entity shall respond to its peer in one of the following ways :

(1) if the data link layer entity receiving the I frame is still not in the own receiver busy condition, it shall send an RR response with the F bit set to "1";

(2) if the data link layer entity receiving the I frame enters the own receiver busy condition upon receipt of the I frame, it shall send an RNR response with the F bit set to "1".

4.2.2.5.6.2.2 P bit set to "0"

If the P bit of the received I frame was set to "0" and :

(1) if the data link layer entity is still not in an own receiver busy condition :

i) if no I frame is available for transmission, or if an I frame is available for transmission but a peer receiver busy condition exists, the data link layer entity shall transmit an RR response with the F bit set to "0"; or

ii) if an I frame is available for transmission and no peer receiver busy condition exists, the data link layer entity shall transmit an I frame with the value of N(R) set to the current value of V(R) as defined in section 4.2.2.5.6.1 above; or

(2) if, on receipt of this I frame, the data link layer entity is now in the own receiver busy condition, it shall transmit an RNR response with the F bit set to "0".

When the data link layer entity is in the own receiver busy condition, it shall process any received I frames according to section 4.2.2.5.6.6.

4.2.2.5.6.3 Sending and receiving acknowledgements

4.2.2.5.6.3.1 Sending acknowledgements

When the data link layer entity transmits I frames or supervision (S) frames, (RR, RNR or REJ), the N(R) value must always be set equivalent to the V(R) value.

4.2.2.5.6.3.2 Receiving acknowledgements

When the data link layer entity receives valid I frames or RR, RNR or REJ supervisory (S) frames, regardless of whether or not the home-receiver busy condition or the timer recovery state is set, it assumes that all transmitted I frames up to N(R)-1 are acknowledged through the use of N(R) included in the received frame. The V(A) acknowledgement state variable value is set to the N(R) value. When the data link layer entity receives a valid I or (S) frame with an N(R) value larger than the V(A) value (actually after several I frames have been acknowledged) or receives REJ frames with an N(R) value equivalent to the V(A) value, it stops timer T200.

Note 1 : If an S frame with the "P" bit set to "1" has already been transmitted, but has not yet been acknowledged, timer T200 is not reset.

Note 2 : If the peer receiver busy is in condition when the data link layer entity receives a valid I frame, timer T200 is not reset.

When timer T200 is reset by reception of RR, RNR or I frames and an outstanding I frame has not been acknowledged, the data link layer entity reactivates timer T 200. Following this, if the timer sets to the time out state, the data link layer entity carries out the recovery procedure described in section 4.2.2.5.6.7 below for the I frame which has not been acknowledged yet.

When timer T200 is reset on reception of a REJ frame, the data link layer entity performs the retransmission procedure outlined in section 4.2.2.5.6.4 below.

4.2.2.5.6.3.3 Acknowledge pending

Acknowledge pending occurs when the data link layer entity on the receiving side receives an I frame having an N(S) equivalent to the V(R). At this point, the receiving side data link layer entity updates the V(R) and activates timer T203. Acknowledgement pending is then performed using the following procedure:

(1) The data link layer entity on the receiving side updates the V(R) when it receives an I frame having an N(S) equivalent to the V(R) while timer T203 is active.

(2) When timer T203 sets to time out, the data link layer entity transmits an RR response.

(3) When I frames or I' frames to be transmitted are generated, the data link layer entity stops timer T203 and transmits the I frames or I' frames.

(4) When the data link layer entity has to transmit supervisory frames for some reason, it stops timer T203 and transmits the supervisory frames.

4.2.2.5.6.4 REJ frame reception

When the data link layer receives a valid REJ frame, the entity performs operation outlined below.

(1) When the data link layer entity is not set for the timer recovery state:

i) Clear an existing peer receiver busy condition.

ii) Sets V(S) and V(A) of the entity equivalent to the value of the N(R) contained in the control field in the REJ frame.

iii) Stops timer T200.

iv) Starts timer T202.

v) However if the frame is a REJ command frame with the P bit set to "1", the appropriate supervisory response frame with the F bit set to "1" is transmitted. (refer to Note 2, in Section 4.2.2.5.6.5.)

vi) I frames must be transmitted as quickly as possible as defined in Section 4.2.2.5.6.1 below based on a) through c) below and the paragraphs which follow.

vii) If the data link layer entity receives a REJ response frame with the F bit set to "1", illegal protocol is reported to the connection management entity by the MDL-ERROR-IND primitive.

(2) When the data link layer entity is set for the timer recovery state and receives a REJ response frame with the F bit set to "1":

i) Clears the peer receiver busy condition.

ii) Sets V(S) and V(A) of the entity equivalent to the value of N(R) contained in the control field in the REJ frame.

iii) Stops timer T200.

iv) Starts timer T202.

v) Switches to the multiple frame established state.

vi) I frames must be transmitted as quickly as possible as defined in Section 4.2.2.5.6.1 based on a) through c) below and the paragraphs which follow.

(3) When the data link layer entity is set for the timer recovery state and receives REJ frames other than REJ response frames with the F bit set to `"1":

i) Clears the peer receiver busy condition.

ii) Sets V(A) of the entity to a value equivalent to the value of the N(R) contained in the control field in the REJ frame.

iii) If the frame received by the data link layer entity is a REJ command frame with the P bit set to "1", the entity must transmit the appropriate supervisory response frame with the F bit set to "1". (refer to Note 2, in 4.2.2.5.6.5.)

I frame transmission must be performed based on the following :

a. When the data link layer entity receives a REJ frame during transmission of an S frame, it ends transmission of supervision frames before transmitting the requested I frame.

b. When the data link layer entity receives a REJ frame during transmission of SABME, SABMEI, DISC commands or UA or DM response, it ignores retransmission requests.

c. When the data link layer entity receives a REJ frame during non-transmission state, it immediately starts transmitting the requested I frame.

Once transmission of the I frame indicated by the received REJ frame has started, all other unacknowledged I frames in the outstanding state are transmitted. Following retransmission of the I frames, other I frames which have not yet been transmitted can be transmitted.

4.2.2.5.6.5 RNR frame reception

The peer receiver busy condition is set as long as data link layer entity is not executing the mode set operation when the entity receives a valid RNR command or response.

Then the entity performs the following :

(1) When the received frame is an RNR command with the "P" bit set to "1," the data link layer entity sends an RR response with the "F" bit set to "1" when the entity is not set in the own receiver busy state. The entity returns an RNR response with the "F" bit set to "1" when the entity is set in the own receiver busy state.

(2) If the data link layer entity receives an RNR response frame with the "F" bit set to "1", the data link layer entity clears the timer recovery state and the N(R) in the RNR response frame received is used for updating V(S).

If the data link layer entity acknowledges the receiving party receiver busy condition, the entity does not transmit any I frames to the party indicating the busy state.

Note 1 : The value of N(R) in all RR or RNR commands is not used for updating V(S) regardless of the value set to the "P" bit .

Next, the data link layer entity performs the following:

(3) RNR frame is used for acknowledging the reception of all the I frames (re)transmitted with N(S) value. Then V(A) is set to the value equivalent to the N(R) contained in the RNR frame.

(4) When the data link layer entity is not awaiting reception of supervisory response frames with the "F" bit set to "1", timer T200 is reactivated.

If timer T200 expires, the data link layer entity performs the following:

(5) If the data link layer entity is not yet set for the timer recovery state, it switches to the timer recovery state and resets the re-transmission count variable.

(6) If the entity is already set to the timer recovery state, the re-transmission recovery variable increments by "1".

Next, the data link layer entity performs the following:

(7) If the re-transmission count variable is smaller than N200:

i) Transmits the appropriate supervisory command with the "P" bit set to "1". (refer to Note 2.)

ii) Restarts timer T200.

(8) If the re-transmission count variable is equivalent to N200, the resetting procedure defined in 4.2.2.5.8 below is started, and the entity reports this to the connection management entity using a MDL-ERROR-IND primitive.

The data link layer entity which receives a supervisory frame with the "P" bit set to "1" responds with the appropriate supervisory response frame with the "F" bit set to "1" (refer to Note 2) as quickly as possible to indicate whether or not the own receiver busy condition is continued or not.

When the data link layer entity receives the supervisory response with the "F" bit set to "1", the entity stops timer T200 and performs the following:

(9) If the response received by the data link layer entity is an RR or REJ response, the entity clears the peer receiver busy condition and transmits new I frames or re-transmits the I frame as outlined in 4.2.2.5.6.1 or 4.2.2.5.6.4 respectively.

(10) If the response received by the data link layer entity is an RNR response, the entity operates according to the procedure specified in the 1st paragraph of 4.2.2.5.6.5 above.

If the data link layer entity receives a supervisory command (RR, RNR, REJ) with the "P" bit set to "0" or "1", or a supervisory response frame (RR, RNR, REJ) with the "F" bit set to "0" during inquiry processing, the data link layer entity performs the following:

(11) If the supervisory frame received is an RR or REJ command frame, or an RR or REJ response frame with the "F" bit set to "0", the entity clears the peer receiver busy condition. If the supervisory frame received is a command with the "P" bit set to "1", the entity transmits the appropriate supervisory response frame with the "F" bit set to "1" (refer to Note 2).

However, transmission or re-transmission of I frames is not performed until the entity receives the appropriate supervisory response frame with the "F" bit set to "1" or timer T200 sets to the time-out state.

(12) If the supervisory frame received is an RNR command frame, or RNR response frame with the "F" bit set to "0", the entity remains in the receiving party receiver busy condition. If the supervisory frame received is an RNR command with the "P" bit set to "1", the entity transmits the appropriate supervisory response frame with the "F" bit set to "1" (refer to Note 2).

If the data link layer entity receives an SABME or SABMEI command, the entity clears the peer receiver busy condition.

Note 2 : If the data link layer entity is in the reject error state but not in the own receiver busy condition (i.e., the entity receives an N(S) sequence error and after transmitting an REJ frame, the requested I frame has not been returned), the appropriate supervisory frame to transmit is an RR frame.

If the data link layer entity is set in the N(S) sequence error state but not in the own receiver busy condition (i.e., the entity receives N(S) sequence error but REJ frame has not been transmitted), the appropriate supervisory frame to transmit is an REJ frame.

The appropriate supervisory frame to transmit when the data link layer entity is set in the own-receiver busy condition is an RNR frame.

In other instances, the appropriate supervisory frame to transmit is an RR frame.

4.2.2.5.6.6 Own receiver busy condition of the data link layer entity

When the data link layer entity has been set in the own receiver busy condition, the entity transmits an RNR frame as quickly as possible.

The RNR frame can be one of the following.

(1) RNR response with the "F" bit set to "0"

(2) RNR response with the "F" bit set to "1" if the own receiver busy condition is set after reception of a command frame with the "P" bit set to "1".

(3) RNR command with the "P" bit set to "1" if the own receiver busy condition is set after time-out of timer T200.

All the I frames received with the "P" bit set to "0" are aborted after updating the V(A).

All the supervisory frames received with the P/F bits set to "0" are processed including updating of the V(A).

All the I frames received with the "P" bit set to "1" are aborted after updating V(A). However, an RNR response frame with the "F" bit set to "1" is transmitted. All the supervisory frames received with the "P" bit set to "1" are processed including updating of V(A), then RNR response frame with the "F" bit set to "1" is transmitted.

In order to report removal of the home-receiver busy condition to the peer data link layer entity, the data link layer entity transmits an RR frame or transmits a REJ frame with the N(R) set to the present value of V(R) if the previously detected sequence error has not yet been reported.

The data link layer entity can report removal of home- receiver busy condition to the peer data link layer entity by transmitting an SABME or SABMEI command or a UA response (response to SABME command).

4.2.2.5.6.7 Waiting for acknowledgement

The data link layer entity controls the internal transmission count variables. If timer T200 sets to the time out state, the data link layer entity performs the following:

(1) If the data link layer entity has not been set for the timer recovery state, the entity switches to the timer recovery state, then resets the re-transmission variable.

(2) If the data link layer entity is already set for the timer recovery state, "1" is added to the re-transmission count variable.

Next, the data link layer entity performs the following:

(3) When the re-transmission count variable is smaller than N200:

i) Restarts timer T200.

ii) Then, sets the "P" bit of the last transmitted I frame or I' frame (V(s)-1) to "1" and re-transmits. However, when SAPI=1, the "P" bit for the RR frames is set for "1" and transmitted.

(4) When the re-transmission count variable is equivalent to N200, the entity turns on the resetting procedure defined in 4.2.2.5.8 below and reports this to the connection management entity using a MDL-ERROR-IND primitive.

The timer recovery state is cleared when the data link layer entity receives a valid supervisory frame response with the "F" bit set to "1". If the N(R) in the supervisory frame received is within the range of the present V(A) to V(S), the V(S) is set to the value of the N(R) received.

Timer T200 is halted if the supervisory frame response received is an RR or REJ response. Following this, the data link layer entity transmits or re-transmits I and I' frames as required. If the supervisory frame response received is an RNR response, timer T200 is stopped to execute an inquiry as described in 4.2.2.5.6.5 above and then is restarted.

4.2.2.5.6.8 SREJ frame reception

When the data link layer entity receives valid SREJ frames, it retransmits the I frame which includes an N(S) equivalent to the N(R) in the SREJ frame. I frames which have already been transmitted following I frames specified by the SREJ frame should not be retransmitted on reception of the SREJ frame. I frames to be transmitted for the first time can be transmitted after I frames specified by the SREJ frame are retransmitted.

Transmission of I frames is performed using the following procedures:

(1) When the data link layer entity receives an SREJ frame during transmission of an S frame, the data link layer entity must complete this transmission before starting transmission of the requested I frames.

(2) When the data link layer entity receives an SREJ frame during transmission of SABME, DISC commands or UA or DM response, it ignores retransmission requests.

(3) If the data link layer entity is not transmitting frames when it receives the SREJ frame, it immediately starts transmission of the requested I frame.

4.2.2.5.7 Information transfer procedure for partial retransmission control operation

The procedure for I' frame transmission is described below.

Note : The term "I' frame transmission" means transferring I' frames by the data link layer entity to the physical layer.

4.2.2.5.7.1 I' frame transmission

The information requested of the data link layer entity by REJ' or SREJ' is transmitted by I' frames. The values of transmission state variable V(S) and reception state variable V(R) are assigned to parameters N(S) and N(R) of the control field respectively. Also the value of divided transmission state variable v(S) is assigned to n(S).

If n(S) is a group of unit sequence numbers ranging from K to the number of divided units -1, (0<K<the number of divided units-1), the I' command with "K" set for n1(S) and "0" for n2(S) is transmitted. (refer to 4.2.2.3.7.1.)

If timer T200 has not been started when I' frames are transmitted, it shall be started. If timer T200 expires, the procedure described in item 4.2.2.5.6.7 above is performed.
When the network or the user side is in the own-receiver busy condition, I' frames can be transmitted as long as the peer is not set for the receiver busy condition.

4.2.2.5.7.2 I' frame reception

When the data link layer entity is not in the own receiver busy condition (regardless of the timer recovery state) and it receives an I' frame, the data link entity carries out the following operation. But, if the received I' frame is n2(S)=0, the divided transmission unit sequence number n(S) is assumed as a group of unit numbers from n1(S) to the number of divided units -1 and the following processing is performed.

(1) When the data link layer entity receives a valid I' frame having a transmission sequence number N(S) equivalent to the present reception state variable V(R) and a transmission divided unit sequence number n(S) corresponding with the present divided reception state variable v(R), the data link entity carries out the following processing :

i) Builds up the information field for the frame using the information for the pertinent frame and the I' frame with the N(S) sequence number which the entity received previously and transfers the information field to layer 3 using a DL-DATA-IND primitive.

ii) Adds 1 to the value of reception state variable V(R) and performs the following operation:

- The operation described in 4.2.2.5.7.2.1 below when the "P" bit of I' frame is set to "1".

- The operation described in 4.2.2.5.7.2.2 below when the "P" bit of I' frame is set to "0".

(2) If the data link layer entity receives a valid I' frame having a transmission sequence number N(S) equivalent to the present reception state variable V(R), and a transmission divided unit sequence number n(S) that is contained in the v(R) but which does not match up with the present divided reception state variable v(R), then the data link layer entity carries out the following processing.

i) Builds up the N(S) information field for the frame using the information of the pertinent frame and the I' frame with the N(S) sequence number which the entity received previously.

ii) Updates the divided reception state variable v(R) using the transmission divided unit sequence number n(S).

iii) In case of SAPI = 0, transmits a REJ' response having a transmission divided unit sequence number n(R) which matches with the divided reception state variable v(R). If n(R) is a group of consecutive unit sequence numbers from K to the number of divided units -1 (0<K<the number of divided units - 1), a REJ' response with n1(R) set for "K" and with n2(R) set for "0" is transmitted. (refer to 4.2.2.3.7.1)

In case of SAPI = 1, transmits an SREJ' response having a transmission divided unit sequence number n(R) which matches with the divided reception state variable v(R). If n(R) is a group of consecutive unit sequence numbers from K to the number of divided units -1 (0<K<the number of divided units - 1), an SREJ' response with n1(R) set for "K" and with n2(R) set for "0" is transmitted. (refer to 4.2.2.3.7.1)

If busy, an RNR response with F bit set for “0” is sent.

(3) If the data link layer entity receives a valid I' frame that has a transmission sequence number N(S) equivalent to the present reception state variable V(R) and divided unit sequence number n(S) which is either contained or not contained in the present divided reception state variable v(R), then it carries out the following processing.

i) Abandons the portion corresponding to the n(S) which is not contained in the v(R) of the information field

ii) Compares the v(R) and the n(S) which is contained in the v(R) and performs the following:

- When the v(R) matches up with the n(S), performs (1) above.

- When the v(R) does not match up with the n(S), performs (2) above.

The data link layer entity processes all the I' frames received during the own receiver busy condition as specified in 4.2.2.5.6.6 above.

4.2.2.5.7.2.1 When the "P" bit is set to "1":

If the "P" bit for the I' frame received by the data link layer entity is set to "1", the data link layer entity responds to the other party by one of the following procedures.

(1) If the data link layer entity receiving the I' frames is not yet set to the own receiver busy condition, the entity transmits an RR response with the "F" bit set to "1".

(2) If the data link layer entity receiving I' frames switches to the own receiver busy condition on reception of a I' frame, the entity transmits an RNR response with the "F" bit set to "1".

4.2.2.5.7.2.2 When the "P" bit is set to "0":

If the "P" bit of the I' frame received is set to "0", the following is performed.

(1) In case that the data link layer entity is not set in the own receiver busy condition:

i) If there are no I frames to be transmitted or if there are I frames to be transmitted but the receiving party is set in the busy state, the data link layer entity transmits an RR response with the "F" bit set to "0".

Or,

ii) If there are I frames to be transmitted and the peer receiver is not set in the busy state, the data link layer entity transmits I frames with the N(R) set to the present value of V(R) as described in 4.2.2.5.6.1 above.

(2) In cases when the data link layer entity is set in the own-receiver busy condition when receiving I' frames, it transmits an RNR response with the "F" bit set to "0".

When the data link layer entity is set in the own-receiver busy condition, the entity processes any I' frame it receives as described in 4.2.2.5.6.6 above.

4.2.2.5.7.3 REJ' frame reception

When the data link layer receives a valid REJ' frame, the data link layer entity operates as outlined below.

If n2(R) of the received REJ' frame is "0", the transmission divided unit sequence number n(R) is assumed to contain the unit numbers n1(R) up to (the number of divided units - 1) and the following processing is performed.

(1) If the data link layer entity is not in the timer recovery state:

i) Clears the peer receiver busy condition.

ii) Sets the V(S) and V(A) of the entity to the value of N(R) contained in the control field of the REJ frame.

iii) Sets the v(S) of the entity to the value of n(R) contained in the control field in the REJ' frame.

iv) Stops timer T200.

v) Starts timer T202.

vi) If the frame is a REJ command frame with its P bit set to "1", an appropriate supervisory response frame with its F bit set to "1" is transmitted. (refer to Note 2 in Section 4.2.2.5.6.5.)

vii) If the data link layer entity receives a REJ response frame with its F bit set to "1", it reports an illegal protocol to the connection management entity using an MDL-ERROR-IND primitive.

viii) Corresponding I' frames must be transmitted as quickly as possible as defined in Section 4.2.2.5.6.1 above in consideration of a) thru c) on the following page and the paragraph following them.

(2) When the data link layer entity is set in the timer recovery state and receives an REJ' response frame with the F bit set to "1":

i) Clears the peer receiver busy condition.

ii) Sets V(S) and V(A) of the entity to the value of N(R) contained in the control field of the REJ frame.

iii) Sets v(S) of the entity to the value of n(R) contained in the control field in the REJ' frame.

iv) Stops timer T200.

v) Starts timer T202.

vi) Switches to the multiple frame established state.

(3) If the data link layer entity is in the timer recovery state and receives REJ' frames other than a REJ' response frame with its F bit set to "1", the following operation is performed:

i) The entity clears the peer receiver busy condition.

ii) Set V(S) and V(A) of the entity to the value of N(R) contained in the control field in the REJ frame.

iii) Set v(S) of the entity to the value of n(R) contained in the control field in the REJ' frame.

iv) If the reception frame is a REJ' command frame with the "P" bit set to "1", the entity transmits the appropriate supervisory response frame with the "F" bit set to "1". (refer to Note 2 in Section 4.2.2.5.6.5.)

I' frame transmission must be performed based on the following:

a. When the data link layer entity receives a REJ' frame during transmission of supervisory frames, the transmission of supervisory frames must be completed before starting transmission of the requested I' frames.

b. When the data link layer entity receives a REJ' frame during transmission of SABME, SABMEI or DISC commands or UA or DM responses, re-transmission requests are ignored.

c. When the data link layer entity receives a REJ' frame when the entity is not transmitting, transmission of the requested I' frame begins immediately.

4.2.2.5.7.4 SREJ’ frame reception

When the data link layer entity receives valid SREJ' frames, it retransfers the I' frame which includes N(S) and n (S) equivalent to the N(R) and n (R) in the SREJ' frame. I frames which have already been transmitted following I' frames specified by the SREJ' frame should not be retransmitted on reception of the SREJ' frame. I frames to be transmitted for the first time can be transmitted after I' frame specified by the SREJ' frame is retransferred.

Transmission of I' frame is performed using the following procedures:

(1) When the data link layer entity receives an SREJ' frame during transmission of an S frame, the data link layer entity must complete this transmission before starting transmission of the requested I' frames.

(2) When the data link layer entity receives an SREJ' frame during transmission of SABME, DISC commands or UA or DM response, it ignores retransmission requests.

(3) If the data link layer entity is not transmitting frames when it receives the SREJ' frame, it immediately starts transmission of the requested I' frame.

4.2.2.5.8 Re-establishment of multiple frame operation

4.2.2.5.8.1 Standards for re-establishing

The standards for re-establishing the multiple frame operation mode are defined by the items in this section under the following conditions.

(1) When the data link layer entity receives SABME or SABMEI commands during the multiple frame operation mode.

(2) When the entity receives a DL-ESTABLISH-REQ primitive from layer 3. (refer to Section 4.2.2.5.5.1.1.)

(3) When a retransmission error occurs N200 times during the timer recovery state. (refer to Section 4.2.2.5.6.7.)

(4) When the frame reject state described in Section 4.2.2.5.9.5 is set.

(5) When the entity receives a FRMR response frame during the multiple frame operation mode. (refer to Section 4.2.2.5.9.6.)

(6) When the entity receives an unsolicited DM response with the "F" bit set to "0" during the multiple frame operation mode. (refer to Section 4.2.2.5.9.7.)

(7) When the entity receives a DM response with the "F" bit set to "1" during the timer recovery state.

(8) When the function channel type for layer 1 is changed by channel switching. (E.g. from the SCCH to TCH or from one TCH to another TCH.)

Note : The multiple frame operation on the UPCH is not reestablished when channel handover is performed within the same terminal registration area.

4.2.2.5.8.2 Procedure

The data link layer entity performs the procedures defined in Section 4.2.2.5.5.1 under all resetting conditions. The entity transmits SABME or SABMEI commands under all resetting conditions which occur at the pertinent station.

When the resetting procedure is activated by the data link layer entity or the other party, the data link entity performs the following :

(1) Transmits the MDL-ERROR-IND primitive to the connection management entity.

(2) Transmits the DL-ESTABLISH-IND primitive to layer 3 to abort all the I queues if V(S)>V(A) before resetting.

If the resetting procedure is activated by layer 3 or if a DL-ESTABLISH-REQUEST primitive is generated during resetting, the entity transmits a DL-ESTABLISH-CON primitive.

4.2.2.5.9 Error reports and recovery

Error states occur as a result of physical layer errors or procedure errors in the data link layer entity. The items in this section cover effective error recovery procedures performed for correcting errors after detecting error states in the data link layer entity.

4.2.2.5.9.1 N(S) sequence error

N(S) sequence error state occurs in the receiving entity when the receiving entity receives valid I frames having a N(S) value that is not equivalent to the V(R) of the receiving entity. When SAPI = 0, 7, such I frame is aborted. When SAPI = 1, 6 the information field for I frames having an N(S) value within a range of V(R)<N (S)<V (R)+k is stored on the reception side and the information field for all I frames having an N(S) value outside of this range is aborted and causes a re-establishment of multiple frame operation.

The receiving entity does not acknowledge the I frame which causes the sequence error or the I frames which follow it until the entity receives an I frame with the correct N(S) value. (In this instance, V(R) is not updated.)

When a data link layer entity receives one or more I frames containing sequence errors (but no other type of errors) or receives successive RR, RNR or REJ supervisory frames, this data link layer entity uses the control field information contained in the N(R) field and P/F bits in order to perform the data link control function.

For example, the entity receives an acknowledgement for the previously transmitted I frame and responds to the "P" bit set to "1". Therefore, new N(R) and "P" bit values which differ from those contained in the I frame which were transmitted initially can be set for the re-transmitted information frame.

When SAPI=0, 7, the REJ frame is used by the data link layer entity on the receiving end to activate the error recovery state for re- transmission following the detection of the N(S) sequence error. Only one REJ error state is set for information transfer in one direction.

When SAPI=0, 7, the data link layer entity which receives a REJ command or response, starts transmitting or re-transmitting consecutive I frames starting from the I frame indicated by the N(R) in a REJ frame.

In case of SAPI=0, 7, the REJ error state is cleared when the entity receives the requested I or I' frame having the N(S) equivalent to the requested N(R) or receives an SABME or DISC command.

When SAPI=1, 6, the SREJ frame is used by the data link entity on the receiving end to activate the error recovery state for retransmission following the detection of the N(S) sequence error. One or more SREJ error states are set in the direction of information transfer.

When SAPI = 1, 6, the data link entity which receives the SREJ frame, starts re-transmitting the I frame indicated by the N(R) in the SREJ frame.

In case of SAPI = 1, 6, the SREJ error state is cleared when the entity receives the requested I frame having the N(S) equivalent to the requested N(R) or receives an SABME or DISC command.

4.2.2.5.9.2 N(R) sequence error

The N(R) sequence error state occurs for the transmitting entity when the entity receives a valid supervisory frame or an I frame having an invalid N(R). Valid N(R) values must be within $V(A) \leq N(R) \leq V(S)$.

The information field contained in I frames with correct sequence and format can be transferred to layer 3 using a DL-DATA-IND primitive.

The data link layer entity reports this error state to the connection management entity using a MDL-ERROR-IND primitive and starts resetting as described in Section 4.2.2.5.8.2.

4.2.2.5.9.3 Timer recovery state

When the data link layer entity cannot receive an I frame or the last I frame in a series of I frames due to a transmission error, an out-of-sequence error state is not detected, and consequently a REJ frame is not transmitted.

The data link layer entity which transmitted an I frame that has not been acknowledged performs the recovery procedure defined in Section 4.2.2.5.6.7 above to decide the I frame from which to begin retransmission when timer T200 is set to time-out.

4.2.2.5.9.4 Invalid frame state

When the data link layer entity receives an invalid frame (refer to Section 4.2.2.2.8), the entity aborts the frame and processing is not carried out for that frame.

4.2.2.5.9.5 Frame reject conditions

A frame reject condition occurs under one of the conditions described in (1), (2), (3) or (4) of Section 4.2.2.3.8.11.

When a frame reject conditions occur in the multiple frame operation, the data link layer entity performs the following.

(1) Transmits a MDL-ERROR-IND primitive.

(2) It then begins re-establishing. (refer to Section 4.2.2.5.8.2.)

If the frame rejection condition occurs during establishing or release from multiple frame operation or when the data link is not set, the data link layer entity performs the following:

(3) Transmits the MDL-ERROR-IND primitive.

(4) Aborts the frame.

Note 1 : In order for operations to be carried out adequately, the receiving entity must be able to distinguish the invalid frames defined in Section 4.2.2.2.8 of this section from frames having an information field that exceeds the maximum set value (refer to Section 4.2.2.3.8.11 (4)) .

4.2.2.5.9.6 FRMR response frame reception

When the data link layer entity receives a FRMR response frame during multiple frame operation, the data link layer entity performs the following.

(1) Transmits the MDL-ERROR-IND primitive

(2) Then, starts resetting. (refer to Section 4.2.2.5.8.2.)

4.2.2.5.9.7 Unsolicited response frame

The procedures to take during reception of unsolicited response frames are summarized in Table 4.2.2.5-4.

When the data link layer entity receives an unsolicited UA response, SMSI multiple assignment is possible for the entity. This state is reported to the layer management.

4.2.2.5.9.8 SMSI multiple assignment

The data link layer entity interprets the following conditions as an SMSI multiple assignment and starts recovery.

(1) When the data link layer entity receives a UA response frame during the multiple frame established state.

(2) When the entity receives a UA response frame with the timer recovery state set.

(3) When the entity receives a UA response frame with the SMSI assignment state set.

When the data link layer entity interprets an SMSI multiple assignment condition, the entity reports this state to the connection management entity using the MDL-ERROR-IND primitive.

4.2.2.5.9.9 n(S) sequence error

An n(S) sequence error occurs for the receiving entity when the entity receives a valid I frame which has an N(S) equivalent to the V(R) on the receiving entity and contains the units which have not been received, or a Valid I' frame which has an n(S) that does not contain at least one v(R) on the reception end. In this instance, the information fields for I' frames which correspond to the n(S) which is not contained in v(R) are aborted.
The receiving entity does not acknowledge the I or I' frame which caused the sequence error and all succeeding I or I' frames until it receives an I frame having the correct N(S) or I' frame having the correct N(S) and n(S).

A data link layer entity which receives an I' frame having a sequence error (but does not contain any other errors) or which receives a successive supervisory frame (REJ'), utilizes the control field information contained in the n(R) field and P/F bit in order to carry out the data link control function.

For example, the entity which receives the previously transmitted I frame acknowledges and responds to a "P" bit set to "1". Therefore, new n(R) and "P" bit values which differ from those contained in an I frame that is transmitted initially can be set for re-transmitted information frames.

When SAPI = 0, 7, the REJ' frame is used by the receiving data link layer entity for activating the error state recovery for re-transmission following the detection of the n(S) sequence error. Only one REJ' error state is set for information transfer in each direction of transmission.

When SAPI = 0, 7, the data link entity receives a REJ' command or response, the entity starts transmitting or re-transmitting I' frames indicated by the n(R) in a REJ' frame.

In case of SAPI = 0, 7, the REJ' error state is canceled when the entity receives an I' frame which contained the requested n(R) or SABME, SABMEI or DISC commands.

When SAPI = 1, 6, the SREJ' frame is used by the data link entity on the receiving end to activate the error recovery state for re-transmission following the detection of the unit error. One or more SREJ' error states are set in the direction of information transfer.

When SAPI = 1, 6, the data link entity which receives the SREJ' frame, starts re-transmitting the I' frame indicated by the N(R) and n(R) in a SREJ' frame .

In case of SAPI =1, 6, the SREJ' error state is cleared when the entity receives the requested I' frame having the N(S) and n(S) equivalent to the requested N(R) and n(R) or receives an SABME or DISC command.

4.2.2.5.10 System parameter list

The following system parameter list gives the default settings used for each individual SAP.

"Default" means to use the initially defined value when no other value is assigned and negotiation is not performed.

4.2.2.5.10.1 Timer T200

The default values for timer T200 which is started at the end of frame transmission sets timers T200A and T200B according to the procedure in 4.2.2.5.6. The default values by channel type are given in Table 4.2.2.5-3.

In these standards, the operation for "starting T200" is defined as below:

(1) Start the timer set as T200B.

(2) Stop T200B on reception of the PH-INFO primitive regardless of the result of transmission contained in the message unit, and re-starts the timer T200A..

Time up of the above T200A and T200B is all processed as time up for T200.

Note 1 : To ensure that the procedure is carried out properly, the setting for timer T200 must be greater than the maximum interval between command frame transmission and the reception of response frame corresponding to the command.

Note 2 : If a satellite connection exists in the transfer route and the user end consists of several terminals, the value for T200 may need to be set to a value greater than the default settings listed in Table 4.2.2.5-3.

4.2.2.5.10.2 Maximum number of re-transmissions (N200)

The maximum number of frame re-transmissions (N200) is set as a system parameter.

The defaults for N200 are given in Table 4.2.2.5-3.

4.2.2.5.10.3 Maximum octet length for information fields (N201)

The maximum octet length (N201) for information fields is set as a system parameter.

The defaults for N201 are given in Table 4.2.2.5-3.

4.2.2.5.10.4 Maximum number of re-transmissions for the SMSI check procedure (N202)

The maximum number of re-transmissions (N202) in the SMSI check procedure is set as a system parameter.

The defaults for N202 are given in Table 4.2.2.5-3.

4.2.2.5.10.5 Maximum number of outstanding I frames "k"

The maximum number "k" for I frames numbered sequentially which can be maintained as outstanding (i.e. unacknowledged) in a given period of time is a system parameter which does not exceed 63 for extended operation in modulo 64.

The defaults for "k" are given in Table 4.2.2.5-3.

4.2.2.5.10.6 Timer 201

The minimum re-transmission interval (T201) for a SMSI identity check message is set as a system parameter.

The defaults for T201 are given in Table 4.2.2.5-3.

4.2.2.5.10.7 Timer T202

The value of timer T202 represents the maximum interval during which frames are not exchanged.

The defaults for timer T202 are given in Table 4.2.2.5-3 below.

4.2.2.5.10.8 Timer T203

The value of timer T203 represents the acknowledgment hold time.
The defaults for timer T203 are given in Table 4.2.2.5-3 below.

Table 4.2.2.5-3 : Default for each parameter (SAPI =0,7) (user side)

CH type	BCCH	PCH	SCCH	SACCH	FACCH	UPCH
T200A	-	-	1 s.	1 s.	1 s.	-
T200B	-	-	10 s.	10 s.	10 s.	-
N200	-	-	4 times	4 times	4 times	-
N201 *	260 octets	260 octets	260 octets	260 octets	260 octets	-
N202	-	-	5 times	5 times	5 times	-
K *	-	-	1	1	1	-
T201	-	-	10 s.	10 s.	10 s.	-
T202	-	-	20 s.	20 s.	20 s.	-
T203	-	-	-	-	-	-

* : Mandatory default even for the network.

Table 4.2.2.5-3 : Default for each parameter (SAPI =1,6) (user side)

CH type	BCCH	PCH	SCCH	SACCH	FACCH	UPCH
T200A	-	-	-	-	-	2 s.
T200B	-	-	-	-	-	10 s.
N200	-	-	-	-	-	4 times
N201 *	-	-	-	-	-	260 octets
N202	-	-	-	-	-	5 times
k *	-	-	-	-	-	15
T201	-	-	-	-	-	10 s.
T202	-	-	-	-	-	20s. (note)
T203	-	-	-	-	-	400msec.

* : Mandatory default even for the network.

Note : The user shall use the timer when it received an RNR response with F = 1 and $V(A) \leq N(R) \leq V(S)$ in Timer recovery state.

4.2.2.5.11 Monitoring functions of the data link layer

4.2.2.5.11.1 General

Supervision of data link layer resources is carried out by the procedure elements described in 4.2.2.5 of this section. The items below in this section describe the procedures which are used to carry out supervisory functions. Use of this function is optional.

4.2.2.5.11.2 Data link layer supervision in the multiframe established state

Use of the procedures outlined in the HDLC procedural class is being considered for the problem solving procedures dealt with below.

The term "checking the connection" means to report the connection condition to data link layer 3. Also note that when this problem solving procedure is used together with normal information transfer, it can be more effective than the procedure included in layer 3.

This procedure is based on the supervision command frames (RR, RNR commands) and timer T202. Operation in the multiple frame establish state is as follows. If there are no frames to be exchange on the data link connection (i.e., if there are no new I frames or no I frames in the outstanding state, or if there are no supervisory frames with their "P" bits set to "1"), there would be no method to detect data link connection errors or disconnected plugs for the user equipment.

When timer T202 expires, supervision commands with the "P" bit set to "1" are transmitted. These procedures are not affected by transmission errors which occur under normal procedure using timer T200 which counts the number of re-transmissions and performs up to N200 attempts.

4.2.2.5.11.3 Connection checking procedures

4.2.2.5.11.3.1 Start timer T202

Timer T202 is started under the following conditions.

(1) When the multiple frame established state is set.

(2) When timer T200 stops in the multiple frame established state. (refer to the note in Section 4.2.2.5.11.3.2.)

If timer T200 is not started either on reception of I frames or supervision frames, timer T202 is restarted.

4.2.2.5.11.3.2 Stop timer T202

Timer T202 is stopped under the following conditions.

(1) When timer T200 is started during the multiple frame established state (refer to note).

(2) When the multiple frame established state is canceled.

Note : These two conditions mean that timer T202 starts only after T200 has stopped and is not reactivated.

4.2.2.5.11.3.3 Expiry of timer T202

When a timer T202 expires, the data link layer entity performs the following. (In this instance, note that T200 is not activated or has not expired.)

(1) The re-transmission counter variable sets to "0".

(2) The timer recovery state is set.

(3) Transmits either of the following supervisory commands with the "P" bit set to "1."

1) Transmits an RR command if the receiver busy condition is not set (home-reception non-busy state).

2) Transmits RNR command if the receiver busy condition is set (home-receiver busy condition).

(4) Start timer T200.

(5) Transmits an MDL-ERROR-IND primitive to the connection management after N200 re-transmissions.

Table 4.2.2.5-4 : Processing for reception of unsolicited response frames

Unsolicited response frame	SMSI-ASSIGN	When link is set	When link is released	Multiple frame operation mode	
				Set mode	Timer recovery state
UA response F=1	MDL-ERROR-IND	Solicited	Solicited	MDL-ERROR-IND	MDL-ERROR-IND
UA response F=0	MDL-ERROR-IND	MDL-ERROR-IND	MDL-ERROR-IND	MDL-ERROR-IND	MDL-ERROR-IND
DM response F=1	Ignore	Solicited	Solicited	MDL-ERROR-IND	Solicited
DM response F=0	Set	Ignore	Ignore	Reset MDL-ERROR-IND	Reset MDL-ERROR-IND
Supervisory response F=1	Ignore	Ignore	Ignore	MDL-ERROR-IND	Solicited
Supervisory response F=0	Ignore	Ignore	Ignore	Solicited	Solicited

Reference Materials :

[1] TTC Standard JT-Q920 "ISDN User/Network Interface Layer 2 standards."

[2] TTC Standard JT-Q921 “ISDN User/Network Interface Layer 2 Specifications.”

[3] ITU-T Recommendation X.200, "Reference Model of Open Systems Interconnection for ITU-T Applications."

[4] ITU-T Recommendation X.210 OSI "Layer Service Conventions."

[5] TTC Standard JT-X25 X.25 "Packet Mode Terminal Interface."

[6] ISO 3309 "Data Communication High-Level Data Link Control."

[7] ISO 4335 "Data Communication High-Level Data Link Control Procedures; Consolidation of Elements of Procedures"

[8] ITU-T Recommendation I.320 "ISDN Protocol Reference Model."

[9] TTC Standard JT-I430 "ISDN Basic User/Network Interface Layer 1 Specifications."

[10] TTC Standard JT-I431 "ISDN 1st Group User/Network Interface Layer 1 Specifications."

[11] TTC Standard JT-Q930 "ISDN User/Network Interface Layer 3 standards."

[12] TTC Standard JT-Q931 "ISDN User/Network Interface Layer 3 Specifications."

[13] TTC Standard JT-I411 "ISDN User/Network Interface Regulations and Interface Structure."

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4.3 Layer 3 Standards

4.3.1 Overview

This standard regulates connection settings, maintenance, handovers and disconnection recovery on networks utilizing the radio section for digital mobile telephone systems.

They also serve to regulate location registration and authentication procedures for mobile stations utilized with such networks, and prescribe the framework for messages exchanged between digital mobile communications RF section control channels (CCH).

The main purpose of the standards is to outline and regulate the various characteristics, procedures and messages required for RF transmission management, mobility management and call control for CCH.

4.3.1.1 Scope of application

The present scope of application of these standards covers the circuit switching connection control and packet switching control.

4.3.1.2 Application for the interface structure

The layer 3 procedures utilize the functions and services provided by layer 2 and are used to request the services provided by layer 2 using the primitives defined in the Layer 2 Standards and to receive information from layer 2. These primitives are used for indicating the communications between the protocol layers and do not regulate implementation.

4.3.2 Definition of layer 3 functions

4.3.2.1 Radio frequency transmission management (RT)

The radio frequency transmission management entity RT features functions which relate to management of radiowave resources. These functions include the RF section selection, radio circuit setting, maintenance, switching and disconnection functions.

4.3.2.2 Mobility management (MM)

The mobility management (MM) entity features functions that support the mobility of user terminals. These include location registration and authentication functions.

4.3.2.3 Call control (CC)

The call control (CC) entity features functions related to circuit call connection control. These functions include call establishing (setup), maintenance and release functions. In addition, the call control entity features functions related to packet transmission control, including functions for packet segmentation.

4.3.3 Outline of signaling system

4.3.3.1 Common platform for layer 3

The common platform for layer 3 refers to the mechanism by which the individual RT, MM and CC signals are first transmitted by multiplexed transmissions via the RF section interface in order to facilitate smooth transmission and then separated again into the individual RT, MM and CC signals when received. In addition, encryption processing for the RT, MM and CC signals is performed on the user packet channel (UPCH). Layer 3 entities for respective RT, MM and CC signals provide communications with the data link layer entity via the common platform.

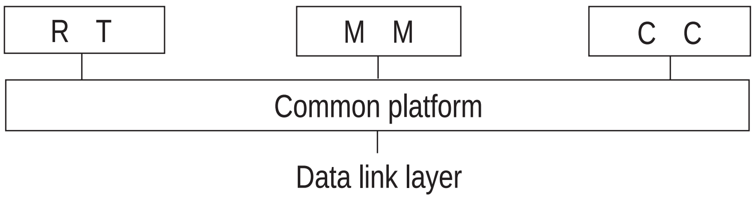


Fig. 4.3.3.1-1 : Layer 3 structure

4.3.3.2 Signaling format

All the layer 3 signals are structured in the signaling format given in Fig. 4.3.3.2-1 below.

Common platform indication field	RT message	MM message	CC message

Fig. 4.3.3.2-1 : Layer 3 signaling format

The common platform indication field provides the information required by the signal reception party in order to separate the RT, MM and CC signals. Each signal field in layer 3 is arrayed in the fixed order of RT-->MM--> CC. When signals do not follow the above structure, the fields are packed together and transmitted by one layer 2 frame. The common platform enables transmission of the respective RT, MM and CC on one layer 2 frame. However, no more than one signal for the same layer 3 function can be transmitted in the same layer 2 frame (which means, for example, that two RT signals cannot be transmitted in one frame.)

Mandatory and the only permissible combinations which can be transmitted by the platform function are as follows: (Refer to Item 4.3.8.)

(1) Originating Condition Report (RT) and SETUP (CC) in the origination sequence.

(2) MS Release (RT) and REL COMP (CC) (semi-normal signal) in the origination sequence.

(3) Authentication Request (MM) and SETUP (CC) in the termination sequence (only when authentication for the called party is performed).

Not mandatory but the permissible combinations which can be transmitted by the platform function are as follows:

(1) packet origination sequence/ packet termination sequence/ packet communication registration state inquiry sequence:
Packet Channel Handover Request (RT) and Packet Communication Registration Response (MM)

(2) packet channel registration sequence/ packet system information notification sequence/ packet paging sequence:
Packet Channel Handover Request (RT) and Packet Channel Registration Response (MM)

4.3.3.2.1 Common platform indication field

The common platform indication field provides information as to whether or not the respective RT, MM and CC signals exist, plus information on the signal lengths required to separate the signals and information on encryption. Fig. 4.3.3.2-2 gives the field format for the common platform indication.

<table>
<tr><td>Bit</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td></tr>
<tr><td></td><td>*4</td><td colspan="4">Spare</td><td>*1</td><td>*2</td><td>*3</td></tr>
<tr><td></td><td colspan="8">No. of RT/MM octets (note 1)</td></tr>
<tr><td></td><td colspan="8">No. of MM octets (note 2)</td></tr>
<tr><td></td><td>*5</td><td>Spare</td><td colspan="6">Operator specific information element length</td></tr>
<tr><td></td><td colspan="8">Operator specific information element</td></tr>
</table>

*1	0:	without RT signal
	1:	with RT signal
*2	0:	without MM signal
	1:	with MM signal
*3	0:	without CC signal
	1:	with CC signal
*4	0 :	without ciphering information (Note 3)
	1 :	with ciphering information
*5	0 :	without MSI ciphering (Note 4)
	1 :	with MSI ciphering

Note 1 : Appears when two or more signals are transmitted by the platform function. This indicates the length of the RT when RT signal is included or MM signal when the RT signal is not included and MM signal is included.

Note 2 : Appears only when three signals are transmitted by the platform function. Represents the length of the MM signal.

Note 3 : "without ciphering information" is used for function channels except UPCH.

Note 4 : Only when *4 indicates "with ciphering information," are the subsequent information elements included in the common platform indication filed.

Fig. 4.3.3.2-2 : Common platform indication field format

Octets 2 and 3 specify the signal length required for separating signals when signals are multiplexed.

Example 1 : Without containing multiplexed signals (Note 5).

Only octet 1.

Example 2 : Containing multiplex RT and CC signals (Note 5).

*4	Spare	1 0 1
No. of RT octets		

Example 3 : Containing MM and CC signals (Note 5).

*4	Spare	0 1 1
No. of MM octets		

Example 4 : Containing RT, MM and CC signals (Note 5).

*4	Spare	1 1 1
No. of RT octets		
No. of MM octets		

Note 5 : Examples 1 to 4 above are of cases when *4 indicates "without ciphering". When *4 indicates "with ciphering", *5 and subsequent information shown in Fig. 4.3.3.2-2 are assigned to the subsequent octets.

4.3.3.3 Specifications for expansion of RT and MM messages

(1) The expansion for RT and MM messages shall accord with the following rules:

When adding new information elements to the existing messages, new information elements shall be added at the end of the existing message.

(2) Processing on reception of expanded RT and MM messages shall be as below:

When the network or the user receives a message containing unrecognized information elements, the network or the user reads the message up to the end of the recognizable information elements and ignores the rest of the information elements. However the message itself is not discarded.

4.3.4 Common platform

The common platform has functions for multiplexing information from the higher RT, MM and CC entities and for separating layer 3 information from the opposing side into higher RT, MM and CC entities.

4.3.5 Radio frequency transmission management (RT management)

4.3.5.1 RT state definitions

4.3.5.1.1 RT states on the user side of the interface

This section regulates the basic RT states for the user side of the interface. The codes in parenthesis indicate the state of individual items.

i) Stop (URT0)

State wherein the RT is stopped.

ii) Control channel activation (URT1)

State wherein layer 1 is requested to activate a control channel.

iii) Standby (URT2)

Standby state for the user.

iv) Origination (URT3)

State wherein the user has sent an origination request to the network.

v) Reception-level measurement during origination (URT4)

State wherein the level for the channel specified by the network is being measured while originating a call.

vi) Termination (URT5)

State wherein the user has received paging from the network.

vii) Reception-level measurement during termination (URT6)

State wherein the level for the channel specified by the network is being measured on reception of a call on the network.

viii) Radio channel set (URT7)

State wherein the network has specified a radio channel (Radio-channel Set) for the user.

ix) Control channel reactivation (URT8)

State wherein layer 1 is requested to reactivate the control channel in order to receive a Radio-channel Set to be retransmitted.

x) Radio channel reset (URT9)

State wherein the user is waiting for a radio channel to be re-specified.

xi) TCH active (URT12)

State wherein the user has set a TCH.

xii) Condition report (URT13)

State wherein the user has reported the radio condition to the network on detection of strong electromagnetic field but has not yet received the acknowledgement from the network.

xiii) Handover radio-channel set (URT17)

State wherein the network has specified a radio channel for the user during communications (handover channel set).

xiv) TCH reactivation (URT18)

State wherein the user is waiting for the TCH to be activated on layer 1 on detection of an out-of-sync condition on layer 1.

xv) UPCH activation request (Continuous/intermittent reception) (URT 19)

State wherein Layer 1 is requested to activate a UPCH (continuous or intermittent reception).

xvi) UPCH activation request (Superframe intermittent reception) (URT 20)

State wherein Layer 1 is requested to activate a UPCH (Superframe intermittent reception).

xvii) UPCH active (Continuous or intermittent reception) (URT 21)

State wherein the user has set a UPCH (Continuous or intermittent reception).

xviii) UPCH active (Superframe intermittent reception) (URT 22)

State wherein the user has set a UPCH (Superframe intermittent reception).

xix) Zone information request (URT 23)

State wherein the user requests zone information from the network.

xx) Stop during UPCH switching (URT 24)

State wherein the RT is on hold during UPCH switching.

xxi) Control channel activation during UPCH switching (URT 25)

State wherein Layer 1 is requested to activate a control channel during UPCH switching.

xxii) Broadcast information reception during UPCH switching (URT 26)

State wherein the user is waiting for reception of the broadcast information during UPCH switching.

xxiii) Stop during UPCH voice paging (URT 27)

State wherein the RT is on hold while responding to UPCH voice paging.

xxiv) Control channel activation during UPCH voice paging (URT 28)

State wherein Layer 1 is requested to activate a control cannel while responding to UPCH voice paging.

xxv) Broadcast information reception during UPCH voice paging (URT 29)

State wherein the user is waiting for reception of the broadcast information while responding to UPCH voice paging.

xxvi) UPCH paging 2 (URT 30)

State wherein the user has not acknowledged, responded or requested connection in relation to a UPCH Voice Paging 2 from the network.

xxvii) UPCH paging 2 response hold (URT 31)

State wherein the user has acknowledged but not responded or requested a connection in relation to a UPCH Voice Paging 2 from the network.

xxviii) UPCH paging 2 response (URT 32)

State wherein the user has responded and is waiting for the response acknowledgement in relation to a UPCH Voice Paging 2 from the network.

xxix) UPCH paging 2 connection (URT 33)

State wherein the user has requested connection in relation to a UPCH Voice Paging 2 from the network.

xxx) Reception-level measurement during UPCH paging (URT 34)

State wherein the level for the channel specified by the network is being measured on terminating call connection during packet communications.

xxxi) Radio channel assignment during UPCH paging (URT 35)

State wherein the user has specified a radio channel by the network on terminating call connection during packet communications.

xxxii) UPCH reactivation (URT 36)

State wherein the user is waiting for the packet physical channel to be activated on layer 1 on detection of an out-of-sync condition in layer 1.

xxxiii) Radio channel re-assignment during UPCH paging (URT 37)

State wherein the user is waiting for a radio channel to be re-assigned on terminating call connection during packet communications.

4.3.5.1.2 RT states on the network side of the interface

This section regulates basic RT states for the network side of the interface. The codes in parenthesis indicate the state of individual items.

i) NULL (NRT0)

Idle state for the network.

ii) Termination (NRT2)

State wherein the network has reported an incoming call to the user but has not yet received a response from the user.

iii) Channel selection (NRT3)

State wherein the network is selecting a channel.

iv) Reception-level measurement request (NRT4)

State wherein the network has requested the user for reception level measurement.

v) Radio-channel set (NRT5)

State wherein the network has specified a radio channel for the user.

vi) TCH active (NRT6)

State wherein the network has set a traffic channel (TCH).

vii) Radio-channel disconnect (NRT7)

State wherein the network has requested the user to disconnect the radio channel.

viii) Reception-level measurement during communication (NRT8)

State wherein the network has requested the MS for level measurement during communication.

ix) Handover radio-channel set (NRT9)

State wherein the network has specified a handover radio channel during communications.

x) System information (NRT11)

State wherein the network has reported system information to the user.

xi) Condition inquiry (NRT12)

State wherein the network has requested the user for the radio condition.

xii) Condition report information (NRT13)

State wherein the network has reported condition-report information to the user.

xiii) Condition report state (NRT14)

State wherein the network has reported the condition report state to the user.

xiv) VOX control (NRT15)

State wherein the network has reported the VOX control to the user.

xv) TCH reactivation (NRT 16)

State wherein the network is waiting for activation of the traffic channel on layer 1 after an out-of-sync condition is detected on layer 1.

xvi) Termination (Packet) (NRT 17)

State wherein the network has notified an incoming call to the user, but has not yet received a response from the user.

xvii) UPCH active (Continuous or intermittent reception) (NRT 18)

State wherein the user has set the packet channel (Continuous or intermittent reception).

xviii) UPCH active (Superframe intermittent reception) (NRT 19)

State wherein the user has set the packet channel (Superframe intermittent reception).

xix) Packet paging (NRT 20)

State wherein the network has sent packet paging to the user, but has not yet received a response from the user.

xx) UPCH voice paging (NRT 21)

State wherein the network has notified a UPCH voice in coming call, but has not yet received a response from the user.

xxi) UPCH voice paging 2 (NRT 22)

State wherein the network has transmitted UPCH Voice Paging 2 to the user but has not received any response from the user.

xxii) UPCH paging hold (NRT 23)

State wherein the network has received an acknowledgement for the UPCH Voice Paging 2 from the user and has placed the terminating call on hold.

xxiii) Channel selection during UPCH paging (NRT 24)

State wherein the network is selecting the channel on terminating call connection during packet communications.

xxiv) Reception-level measurement during UPCH paging (NRT 25)

State wherein the network has requested to the user for reception-level measurement on terminating call connection during packet communications.

xxv) Radio channel assignment during UPCH paging (NRT 26)

State wherein the network has designated the channel for the user on terminating call connection during packet communications.

xxvi) UPCH paging stop (NRT 27)

State wherein the network has reported that voice paging has stopped, but has not received an acknowledgement.

xxvii) Paging during UPCH paging hold (NRT 28)

State wherein a paging has been transmitted during UPCH reception hold.

xxviii) UPCH paging stop during paging (NRT 29)

State wherein the network has reported that voice paging has stopped during a paging transmission.

xxix) Packet channel handover (NRT30)

State wherein the network has requested packet channel handover and is waiting for activation of the packet physical channel.

4.3.5.2 Definition and content of message functions

Table 4.3.5.2-1 lists the messages required for radio frequency transmission management. This section regulates the details of each message.

The regulations in this section include the following:

(1) Brief explanation of message transfer direction, channel type, and usage of each message.

The RT signals are defined only in the radio access section of either originating or terminating side, that is RT signals are local signals which do go through the network.

(2) A table which lists up the information elements in the order they appear in the message.
For each information element, the tables include the following.

a. Item number which regulates the information element covered in these specifications.

b. Direction in which the information element can be transferred.

From user to network (uplink)
From network to user (downlink) or both directions (uplink/downlink)

c. Mandatory (M) or optional (O).

Regarding the optional information element, the environment in which that information element is included is indicated as notes.

d. Information length

Table 4.3.5.2-1 : Messages used for the radio frequency transmission management

Messages for call establishing	Ref.	Messages for call disconnect recovery	Ref.
Originating Condition Report	4.3.5.2.1	Mobile Station Release	4.3.5.2.20
Paging	4.3.5.2.2	Radio-channel Disconnect	4.3.5.2.21
Terminating Condition Report	4.3.5.2.3	Radio-channel Disconnect Acknowledgement	4.3.5.2.22
Reception-level Measurement Request	4.3.5.2.4		
Reception-level Measurement Response	4.3.5.2.5		
Radio-channel Set	4.3.5.2.6		
Ciphering Mode Alternation Request	4.3.5.2.24		
Ciphering Mode Alternation Acknowledgement	4.3.5.2.25		
Messages during call in progress	**Ref.**	**Other messages**	**Ref.**
Handover Radio-channel Set	4.3.5.2.7	Broadcast Information	4.3.5.2.23
System Information	4.3.5.2.8	Operator Specific Information	4.3.5.2.26
System Information Acknowledgement	4.3.5.2.9		
Condition Inquiry	4.3.5.2.10		
Condition Report 1	4.3.5.2.11	**Messages during packet communication**	**Ref.**
Condition Report 2	4.3.5.2.12		
Condition Report Acknowledgement	4.3.5.2.13	Zone Information Request	4.3.5.2.27
Condition Report Information	4.3.5.2.14	Zone Information Notification	4.3.5.2.28
Condition Report Information Acknowledgement	4.3.5.2.15	Packet Paging	4.3.5.2.29
Condition Report State	4.3.5.2.16	Packet System Information Notification	4.3.5.2.30
Condition Report State Acknowledgement	4.3.5.2.17	UPCH Voice Paging Notification	4.3.5.2.31
VOX Control	4.3.5.2.18	UPCH Voice Paging Response	4.3.5.2.32
VOX Control Acknowledgement	4.3.5.2.19	UPCH Voice Paging 2	4.3.5.2.33
		UPCH Voice Paging 2 Inquiry	4.3.5.2.34
		UPCH Voice Paging 2 Acknowledgement	4.3.5.2.35
		UPCH Voice Paging 2 Response	4.3.5.2.36
		UPCH Voice Paging 2 Response Acknowledgement	4.3.5.2.37
		UPCH Paging Condition Report	4.3.5.2.38
		UPCH Radio Channel Assignment	4.3.5.2.39
		UPCH Voice Paging Stop	4.3.5.2.40
		UPCH Voice Paging Stop Acknowledgement	4.3.5.2.41
		Packet Channel Handover Request	4.3.5.2.42

4.3.5.2.1 Originating Condition Report

This message is transmitted by the user to the network to report information on radiowave conditions, including the MS home zone reception level, the peripheral zone reception level etc. Settings are shown in Table 4.3.5.2-2 below.

Table 4.3.5.2-2 : Contents of the Originating Condition Report message

Message type : Originating Condition Report
Direction : User --> Network (SCCH)

Information element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Uplink	M	1	
Mobile station type	4.3.5.3.3.3	Uplink	M	3	
Reception level	4.3.5.3.3.6	Uplink	M	1	Home zone reception level
Number of selected zones (N)	4.3.5.3.3.13	Uplink	M	1	0 - 20
Perch channel number	4.3.5.3.3.16	Uplink	O	1	No. 1 max. RX level peripheral zone
Reception level	4.3.5.3.3.6	Uplink	O	1	
Perch channel number	4.3.5.3.3.16	Uplink	O	1	No. 2 max. reception level peripheral zone
Reception level	4.3.5.3.3.6	Uplink	O	1	
~	~	~	~	~	~
Perch channel number	4.3.5.3.3.16	Uplink	O	1	No. N max. reception level peripheral zone
Reception level	4.3.5.3.3.6	Uplink	O	1	
Frequency band	4.3.5.3.3.30	Uplink	O (Note1)	2	Max.16 bands
Speech coding method capability notification	4.3.5.3.3.55	Uplink	O (Note3)	Variable length	
Operator specific information	4.3.5.3.3.54	Uplink	O (Note4)	1-128	

M: Mandatory O: Optional

Note 1 : This information element is mandatory for an MS complying with RCR STD-27E or a subsequent version.
Note 2 : Mobile station number (MSI) is included in the Layer 2 section.
Note 3 : This information element is mandatory for an MS complying with RCR STD-27H or a subsequent version.

Note 4 : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.2 Paging

This message is sent from the network to the user to perform paging for the mobile station. Settings are shown in Table 4.3.5.2-3 below.

Table 4.3.5.2-3 : Contents of the Paging message

Message type : Paging
Direction : Network --> User(PCH)

Information element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Downlink	M	1	
BCCH reception period	4.3.5.3.3.26	Downlink	M	1	
Number of paging MSs (N)	4.3.5.3.3.27	Downlink	M	1	0 - 15
Mobile station number [voice]	Note 1	Downlink	O	Variable length	For No.1 paging MS
Paging identification number	4.3.5.3.3.2	Downlink	O	1	
~	~	~	~	~	~
Mobile station number [voice]	Note 1	Downlink	O	Variable length	For No. N paging MS
Paging identification number	4.3.5.3.3.2	Downlink	O	1	
Number of packet paging MSs (N)	4.3.5.3.3.43	Downlink	O (Note 3)	1	
Mobile station number [packet]	(Note 1)	Downlink	O (Note 3)	Variable length	For No. 1 packet paging MS
~	~	~	~	~	~
Mobile station number [packet]	(Note 1)	Downlink	O (Note 3)	Variable length	For No. N paging MS
Operator specific information	4.3.5.3.3.54	Downlink	O (Note4)	1-128	

M : Mandatory O : Optional

Note 1 : The same coding as MSI for layer 2 is used. Refer to "Layer 2 standards" for details.*

Note 2 : The address of this signal in layer 2 is a group MSI.

Note 3 : When voice paging is performed, this information element is not included in the paging message.

Note 4 : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

* "Refer to Layer 2 standards" for details. "will be changed to "Refer to Section 4.2.2.3.3.6 for details." in a coming change proposal.

4.3.5.2.3 Terminating Condition Report

This message is sent from the user to the network as a response to Paging (see 4.3.5.2.2 above) along with RF condition information, including the MS's home zone reception-level peripheral zone reception-level etc. Settings are shown in Table 4.3.5.2-4 below.

Table 4.3.5.2-4 : Contents of the Terminating Condition Report message

Message type : Terminating Condition Report
Direction : User --> Network (SCCH)

Information element	Ref.	Direction	Class	Info. length (bytes)	Remarks
Message type	4.3.5.3.2	Uplink	M	1	
Paging identification number	4.3.5.3.3.2	Uplink	M	1	
Mobile station type	4.3.5.3.3.3	Uplink	M	3	
Reception level	4.3.5.3.3.6	Uplink	M	1	Home zone reception level
Number of selected zones (N)	4.3.5.3.3.13	Uplink	M	1	0 - 20
Perch channel number	4.3.5.3.3.16	Uplink	O	1	No. 1 max. reception level peripheral zone
Reception level	4.3.5.3.3.6	Uplink	O	1	
Perch channel number	4.3.5.3.3.16	Uplink	O	1	No. 2 max. reception level peripheral zone
Reception level	4.3.5.3.3.6	Uplink	O	1	
~	~	~	~	~	~
Perch channel number	4.3.5.3.3.16	Uplink	O	1	No. N max. reception level peripheral zone
Reception level	4.3.5.3.3.6	Uplink	O	1	
Frequency band	4.3.5.3.3.30	Uplink	O (Note1)	2	Max.16 band
Speech coding method capabibity notification	4.3.5.3.3.55	Uplink	O (Note3)	Variable length	
Operator specific information	4.3.5.3.3.54	Uplink	O (Note4)	1-128	

M : Mandatory O : Optional

Note 1 : This information element is mandatory for an MS complying with RCR STD-27E or a subsequent version.
Note 2 : Mobile station number (MSI) is included in the Layer 2 section.
Note 3 : This information element is mandatory for an MS complying with RCR STD-27H or a subsequent version.
Note 4 : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.4 Reception-level Measurement Request

This message is sent from the network to the user to inquire the interference level of the radio channel to be assigned. Settings are shown in Table 4.3.5.2-5 below.

Table 4.3.5.2-5 : Contents of the Reception-level Measurement Request message

Message type : Reception-level Measurement Request
Direction : Network --> User (SCCH/SACCH/FACCH/UPCH)

Information element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Downlink	M	1	
Frequency code	4.3.5.3.3.8	Downlink	M	2	
Slot number	4.3.5.3.3.18	Downlink	M	1	Note 2
Number of measurement	4.3.5.3.3.9	Downlink	M	1	No. of times measured
Operator specific information	4.3.5.3.3.54	Downlink	O (Note3)	1-128	

M : Mandatory O : Optional

Note 1 : Mobile station number (MSI) is included in the Layer 2 section (for SCCH/UPCH).
Note 2 : "Slot not specified" is used. Support of "slot 0" to "slot 5" has not been decided yet.
Note 3 : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.5 Reception-level Measurement Response

This message is sent from the user to the network in response to the Reception-level Measurement Request (4.3.5.2.4.) Settings are shown in Table 4.3.5.2-6 below.

The channel which received a Reception-level Measurement Request is used.

Table 4.3.5.2-6 : Contents of the Reception-level Measurement Response message

Message type : Reception-level Measurement Response
Direction : User --> Network (SCCH/SACCH/FACCH/UPCH)

Information element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Uplink	M	1	
Reception level	4.3.5.3.3.6	Uplink	M	1	Interference level
Operator specific information	4.3.5.3.3.54	Uplink	O (Note2)	1-128	

M : Mandatory O : Optional

Note 1 : Mobile station number (MSI) is included in the Layer 2 section. (for SCCH/UPCH)
Note 2 : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.6 Radio-channel Set

This message is sent from the network to the user to specify the radio channel for communications. The user begins switching to the specified channel after receiving this message. Settings are shown in Table 4.3.5.2-7 below.

Table 4.3.5.2-7 : Contents of the Radio-channel Set message

Message type : Radio-channel Set
Direction : Network --> User (SCCH)

Information element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Downlink	M	1	
Frequency code	4.3.5.3.3.8	Downlink	M	2	
Slot number	4.3.5.3.3.18	Downlink	M	1	
Color code	4.3.5.3.3.7	Downlink	M	1	For TCH
Scramble code	4.3.5.3.3.11	Downlink	M	1	" "
MS TX power assignment	4.3.5.3.3.19	Downlink	M	1	" "
Channel information	4.3.5.3.3.20	Downlink	M	1	" "
Speech coding method assignment	4.3.5.3.3.56	Downlink	O (Note2)	1	
Operator specific information	4.3.5.3.3.54	Downlink	O (Note3)	1-128	

M : Mandatory O : Optional

Note 1 : Mobile station number (MSI) is included in the Layer 2 section.
Note 2 : If MS complying with RCR STD-27H or a later version receives the message without this information element, MS sets VSELP or PSI-CELP according to the channel information rate in Channel information information element for full-rate or half-rate, respectively.
Note 3 : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.7 Handover Radio-channel Set

This message is sent from the network to the user to specify the radio channel to be switched over to. The user starts switching to the specified channel soon after receiving this message. This message is used for switching the channel during communications. Settings are shown in Table 4.3.5.2-8 below.

Table 4.3.5.2-8 : Contents of the Handover Radio-channel Set message

Message type : Handover Radio-channel Set
Direction : Network --> User (SACCH/FACCH)

Information element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Downlink	M	1	
Frequency code	4.3.5.3.3.8	Downlink	M	2	
Slot number	4.3.5.3.3.18	Downlink	M	1	
Color code	4.3.5.3.3.7	Downlink	M	1	For handover TCH
Scramble code	4.3.5.3.3.11	Downlink	M	1	" "
MS TX power assignment	4.3.5.3.3.19	Downlink	M	1	" "
Channel information	4.3.5.3.3.20	Downlink	M	1	" "
Speech coding method assignment	4.3.5.3.3.56	Downlink	O (Note1)	1	
Operator specific information	4.3.5.3.3.54	Downlink	O (Note2)	1-128	

M : Mandatory O : Optional

Note 1 : If an MS complying with RCR STD-27H or a subsequent version receives the message without this information element, the MS sets VSELP or PSI-CELP according to the channel information rate in Channel information information element for full-rate or half-rate, respectively.

Note 2 : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.8 System Information

This message is sent from the network to the user to report the system information to the user. Settings are shown in Table 4.3.5.2-9 below. After the user receives this message, when communication is over, the user can reset to the control channel without scanning the perch channel.

Table 4.3.5.2-9 : Contents of the System Information message

Message type : System Information
Direction : Network --> User (SACCH/FACCH)

Information element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Downlink	M	1	
Control channel structure information	4.3.5.3.3.12	Downlink	M	6 - 33	
Perch channel number	4.3.5.3.3.16	Downlink	M	1	Perch CH in home zone
Color code	4.3.5.3.3.7	Downlink	M	1	For perch CH
Restriction information	4.3.5.3.3.5	Downlink	M	3	
MS TX power assignment	4.3.5.3.3.19	Downlink	M	1	For control CH
Operator specific information	4.3.5.3.3.54	Downlink	O (Note)	1-128	

M : Mandatory O : Optional

Note : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.9 System Information Acknowledgement

This message is sent from the user to the network as acknowledgement for the System Information (in 4.3.5.2.8). Settings are shown in Table 4.3.5.2-10 below.

The channel which received the System Information is used.

Table 4.3.5.2-10 : Contents of the System Information Acknowledgement message

Message type : System Information Acknowledgement
Direction : User --> Network (SACCH/FACCH)

Information element	Ref.	Direction	Class	Info.length (octets)	Remarks
Message type	4.3.5.3.2	Uplink	M	1	
Operator specific information	4.3.5.3.3.54	Uplink	O (Note)	1-128	

M : Mandatory O : Optional

Note : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.10 Condition Inquiry

This message is sent from the network to the user to inquire about the MS's home zone and the peripheral zone reception level. Settings are shown in Table 4.3.5.2-11 below.

Table 4.3.5.2.11 : Contents of the Condition Inquiry message

Message type : Condition Inquiry
Direction : Network --> User (SACCH)

Information element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Downlink	M	1	
Operator specific information	4.3.5.3.3.54	Downlink	O (Note)	1-128	

M : Mandatory O : Optional

Note : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.11 Condition Report 1

This message is sent from the user to the network as a response to the Condition Inquiry message (in 4.3.5.2.10) and as an automatic report. Settings are shown in Table 4.3.5.2-12 below.

Refer to Appendix C for details.

Table 4.3.5.2-12 : Contents of Condition Report 1 message

Message type : Condition Report 1
Direction : User --> Network (SACCH)

Information element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Uplink	M	1	
Reception level	4.3.5.3.3.6	Uplink	M	1	Reception level of home zone (note1)
Number of selected zones (N)	4.3.5.3.3.13	Uplink	M	1	0 ~ 20
Perch channel number	4.3.5.3.3.16	Uplink	O	1	No. 1 max. reception level peripheral zone
Reception level	4.3.5.3.3.6	Uplink	O	1	
Perch channel number	4.3.5.3.3.16	Uplink	O	1	No. 2 max. reception level peripheral zone
Reception level	4.3.5.3.3.6	Uplink	O	1	
~	~	~	~	~	~
Perch channel number	4.3.5.3.3.16	Uplink	O	1	No. N max. reception level peripheral zone
Reception level	4.3.5.3.3.6	Uplink	O	1	
Operator specific information	4.3.5.3.3.54	Uplink	O (Note2)	1-128	

M : Mandatory O : Optional

Note 1 : The home zone reception level is compensated to the value which is obtained when the transmission output control of the base station by the POW-D information on the layer 1 RCH is not performed.

Note 2 : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.12 Condition Report 2

This message is sent from the user to the network as a condition report with acknowledgement requested. The mobile station repeatedly retransmits this message until it receives an acknowledgement signal from the network. Settings are shown in Table 4.3.5.2-13 below.

Refer to Appendix C for details.

Table 4.3.5.2-13 : Contents of the Condition Report 2 message

Message type : Condition Report 2
Direction : User --> Network (SACCH)

Information element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Uplink	M	1	
Reception level	4.3.5.3.3.6	Uplink	M	1	Reception level of home zone (note1)
Number of selected zones (N)	4.3.5.3.3.13	Uplink	M	1	0 ~ 20
Perch channel number	4.3.5.3.3.16	Uplink	O	1	No. 1 max. reception level peripheral zone
Reception level	4.3.5.3.3.6	Uplink	O	1	
Perch channel number	4.3.5.3.3.16	Uplink	O	1	No.2 max. reception level peripheral zone
Reception level	4.3.5.3.3.6	Uplink	O	1	
~	~	~	~	~	~
Perch channel number	4.3.5.3.3.16	Uplink	O	1	No.N max. reception level peripheral zone
Reception level	4.3.5.3.3.6	Uplink	O	1	
Operator specific information	4.3.5.3.3.54	Uplink	O (Note2)	1-128	

M : Mandatory O : Optional

Note 1 : The home zone reception level is compensated to the value which is obtained when the transmission output control of the base station by the POW-D information on the layer 1 RCH is not performed.

Note 2 : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.13 Condition Report Acknowledgement

This message is sent from the network to the user as acknowledgement for the reception of a Condition Report 2 message (4.3.5.2.12). Settings are shown in Table 4.3.5.2-14 below.

Table 4.3.5.2-14 : Contents of the Condition Report Acknowledgement message

Message type : Condition Report Acknowledgement
Direction : Network --> User (SACCH)

Information element	Ref.	Direction	Class	Info.length (octets)	Remarks
Message type	4.3.5.3.2	Downlink	M	1	
Operator specific information	4.3.5.3.3.54	Downlink	O (Note)	1-128	

M : Mandatory O : Optional

Note : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.14 Condition Report Information

This message is sent from the network to the user to report the conditions required for the reception level report, and the perch channel numbers of the peripheral zones/sectors where the reception level is detected. Settings are shown in Table 4.3.5.2-15 below.

Table 4.3.5.2-15 : Contents of the Condition Report Information message

Message type : Condition Report Information
Direction : Network --> User (SACCH/FACCH)

Information element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Downlink	M	1	
Report condition	4.3.5.3.3.15	Downlink	M	5	
Maximum numbers of reporting channels	4.3.5.3.3.21	Downlink	M	1	0 ~ N
No. of perch channels (N)	4.3.5.3.3.14	Downlink	O	1	0 ~ 20
Perch channel number	4.3.5.3.3.16	Downlink	O	1	1st
~	~	~	~	~	~
Perch channel number	4.3.5.3.3.16	Downlink	O	1	Nth
Operator specific information	4.3.5.3.3.54	Downlink	O (Note)	1-128	

M : Mandatory O : Optional

Note : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.15 Condition Report Information Acknowledgement

This message is sent from the user to the network as acknowledgement for the Condition Report Information message (in 4.3.5.2.14). Settings are shown in Table 4.3.5.2-16 below.
The channel which received Condition Report Information is used.

Table 4.3.5.2-16 : Contents of the Condition Report Information Acknowledgement message

Message type : Condition Report Information Acknowledgement
Direction : User --> Network (SACCH/FACCH)

Information element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Uplink	M	1	
Operator specific information	4.3.5.3.3.54	Uplink	O (Note)	1-128	

M : Mandatory O : Optional

Note : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.16 Condition Report State

This message is sent from the network to the user to report the conditions required for the reception level report. Settings are shown in Table 4.3.5.2-17 below.

Table 4.3.5.2-17 : Contents of the Condition Report State message

Message type : Condition Report State
Direction : Network --> User (SACCH/FACCH)

Information element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Downlink	M	1	
Report condition	4.3.5.3.3.15	Downlink	M	5	
Operator specific information	4.3.5.3.3.54	Downlink	O (Note)	1-128	

M : Mandatory O : Optional

Note : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.17 Condition Report State Acknowledgement

This message is sent from the user to the network as an acknowledgement for the Condition Report State message (in 4.3.5.2.16). Settings are shown in Table 4.3.5.2-18 below.
The channel which received Condition Report State is used.

Table 4.3.5.2-18 : Contents of the Condition Report State Acknowledgement message

Message type : Condition Report State Acknowledgement
Direction : User --> Network (SACCH/FACCH)

Information element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Uplink	M	1	
Operator specific information	4.3.5.3.3.54	Uplink	O (Note)	1-128	

M : Mandatory O : Optional

Note : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.18 VOX Control

This message is sent from the network to the user to enable or disable the VOX (Voice Operated Transmitter) function. Setting are shown in Table 4.3.5.2-19 below. Refer to Appendix H for details.

Table 4.3.5.2-19 : Contents of the VOX Control message

Message type : VOX Control
Direction : Network --> User (SACCH/FACCH)

Information element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Downlink	M	1	
VOX control information	4.3.5.3.3.28	Downlink	M	1	
Operator specific information	4.3.5.3.3.54	Downlink	O (Note)	1-128	

M : Mandatory O : Optional

Note : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.19 VOX Control Acknowledgement

This message is sent from the user to the network as an acknowledgement for the VOX Control message (in 4.3.5.2.18). Setting are shown in Table 4.3.5.2-20 below. The channel which received VOX Control message is used. Refer to Appendix H for details.

Table 4.3.5.2-20 : Contents of the VOX Control Acknowledgement message

Message type : VOX Control Acknowledgement
Direction : User --> Network (SACCH/FACCH)

Information element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Uplink	M	1	
VOX control information	4.3.5.3.3.28	Uplink	M	1	
Operator specific information	4.3.5.3.3.54	Uplink	O (Note)	1-128	

M : Mandatory O : Optional

Note : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.20 Mobile Station Release

This message is sent from the network to the user to request the mobile station to release the present state.

Settings are shown in Table 4.3.5.2-21 below.

Table 4.3.5.2-21 : Contents of the Mobile Station Release message

Message type : Mobile Station Release
Direction : Network --> User (SCCH)

Information element	Ref.	Direction	Class	Info.length (octets)	Remarks
Message type	4.3.5.3.2	Downlink	M	1	
Cause	4.3.5.3.3.10	Downlink	M	1	
Operator specific information	4.3.5.3.3.54	Downlink	O (Note2)	1-128	

M : Mandatory O : Optional

Note 1 : Mobile station number is included in the layer 2 section.
Note 2 : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.21 Radio-channel Disconnect

This message is sent from the network to the user to release the radio channel for communications. Settings are shown in Table 4.3.5.2-22 below.

Table 4.3.5.2-22 : Contents of the Radio-channel Disconnect message

Message type : Radio-channel Disconnect
Direction : Network --> User (FACCH)

Information element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Downlink	M	1	
Cause	4.3.5.3.3.10	Downlink	M	1	
Operator specific information	4.3.5.3.3.54	Downlink	O (Note)	1-128	

M : Mandatory O : Optional

Note : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.22 Radio-channel Disconnect Acknowledgement

This message is sent from the user to the network as an acknowledgement to the Radio-channel Disconnect (in 4.3.5.2.21). The user switches to the Standby state after transmitting this message. Settings are shown in Table 4.3.5.2-23 below.

Table 4.3.5.2-23 : Contents of the Radio-CH Disconnect Acknowledgement message

Message type : Radio-channel Disconnect Acknowledgement
Direction : User --> Network(FACCH)

Information element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Uplink	M	1	
Operator specific information	4.3.5.3.3.54	Uplink	O (Note)	1-128	

M : Mandatory O : Optional

Note : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.23 Broadcast Information

This message is sent from the network to the user to report the control channel structure information, information regarding decision for the standby channel, restriction information, etc. Settings are shown in Table 4.3.5.2-24 below.

Table 4.3.5.2-24 : Contents of the Broadcast Information message

Message type : Broadcast Information
Direction : Network --> User (BCCH)

Information element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Downlink	M	1	
Network identity	4.3.5.3.3.25	Downlink	M	2	
Restriction information	4.3.5.3.3.5	Downlink	M	3	
Control channel structure information	4.3.5.3.3.12	Downlink	M	6 - 33	
MS TX power assignment	4.3.5.3.3.19	Downlink	M	1	For control CH
Communication level	4.3.5.3.3.22	Downlink	M	1	
Communication deteriorated level	4.3.5.3.3.23	Downlink	M	1	
Number of location registration areas (N)	4.3.5.3.3.17	Downlink	M	1	1,2,4,8 or 16
Location identity	4.3.5.3.3.4	Downlink	M	1	1st
~	~	~	~	~	~
Location identity	4.3.5.3.3.4	Downlink	M	1	Nth
Maximum numbers of reporting channels	4.3.5.3.3.21	Downlink	M	1	0 - M
Number of perch channels (M)	4.3.5.3.3.14	Downlink	M	1	0 - 20
Perch channel number	4.3.5.3.3.16	Downlink	O	1	1st
~	~	~	~	~	~
Perch channel number	4.3.5.3.3.16	Downlink	O	1	Mth
Location registration timer	4.3.5.3.3.29	Downlink	M	1	

Table 4.3.5.2-24 : Contents of the Broadcast Information message (Cont'd)

Information element	Ref.	Direction	Class	Info. length (octets)	Remarks
Extension information size (K)	4.3.5.3.3.24	Downlink	M	1	0 - 127
Operator specific information No. 1	-	Downlink	O	0 - 5	For operator option, Note 1
Extension standard information size (J)	4.3.5.3.3.45	Downlink	O	1	0 - 121, Note 2
Packet channel structure information	4.3.5.3.3.39	Downlink	O	5	Extension standard information element, Note 3
Frequency code (1)	4.3.5.3.3.8	Downlink	O	2	Extension standard information element
Slot number (1)	4.3.5.3.3.18	Downlink	O	1	Extension standard information element
Color code (1)	4.3.5.3.3.7	Downlink	O	1	Extension standard information element
Scramble code (1)	4.3.5.3.3.11	Downlink	O	1	Extension standard information element
Channel restriction information (1)	4.3.5.3.3.31	Downlink	O	1	Extension standard information element
~	~	~	~	~	~
Frequency code (Npc)	4.3.5.3.3.8	Downlink	O	2	Extension standard information element
Slot number (Npc)	4.3.5.3.3.18	Downlink	O	1	Extension standard information element
Color code (Npc)	4.3.5.3.3.7	Downlink	O	1	Extension standard information element
Scramble code (Npc)	4.3.5.3.3.11	Downlink	O	1	Extension standard information element
Channel restriction information (Npc)	4.3.5.3.3.31	Downlink	O	1	Extension standard information element
Terminal registration area code	4.3.5.3.3.32	Downlink	O	1	Extension standard information element, Note 3
Packet paging area code multiplex number	4.3.5.3.3.37	Downlink	O	1	Extension standard information element, Note 3
Packet paging area code	4.3.5.3.3.38	Downlink	O	1	Extension standard information element, Note 3
~	~	~	~	~	~
Packet paging area code	4.3.5.3.3.38	Downlink	O	1	Extension standard information element, Note 3
Zone service information	4.3.5.3.3.33	Downlink	O	3	Extension standard information element, Note 3
Packet standby permitted level difference	4.3.5.3.3.46	Downlink	O	1	Extension standard information element, Note 3
Packet user registration timer	4.3.5.3.3.34	Downlink	O	1	Extension standard information element, Note 3
Operator specific information No. 2	-	Downlink	O	0- (K-J-6)	For operator option

M : Mandatory O : Optional

Note 1 : The operator specific information No. 1 information element is mandatory if the extension standard information element or the operator specific information No. 2 is set. In this case information length is fixed as 5 bytes.

Note 2 : The extension standard information size information element is mandatory if the extension standard information element or the operator specific information No.2 is set.

Note 3 : Mandatory if the extension standard information element is set.

4.3.5.2.24 Ciphering Mode Alternation Request

This message is sent from the network to the user to report that the ciphering mode is changed during call in progress. (See Table 4.3.5.2-25 below.)

Table 4.3.5.2-25 : Content of the Ciphering Mode Alteration Request message

Message type : Ciphering Mode Alternation Request
Direction : Network --> User (FACCH)

Information element	Ref.	Direction	Type	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Downlink	M	1	
Operator specific information	4.3.5.3.3.54	Downlink	O (Note)	1-128	

M : Mandatory O : Optional

Note : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.25 Ciphering Mode Alternation Acknowledgement

This message is sent from the user to the network as an acknowledgement for the reception of a Ciphering Mode Alteration Request message. (See Table 4.3.5.2-26 below.)

Table 4.3.5.2-26 : Content of the Ciphering Mode Alternation Acknowledgement message

Message type : Ciphering Mode Alternation Acknowledgement
Direction : User --> Network (FACCH)

Information element	Ref.	Direction	Type	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Uplink	M	1	
Operator specific information	4.3.5.3.3.54	Uplink	O (Note)	1-128	

M : Mandatory O : Optional

Note : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.26 Operator Specific Information

This message is sent from the network to the user or from the user to the network for exchanging information for providing operator specific service between the network of a specific telecommunication operator and users registered on that network. (See Table 4.3.5.2-27 below.)

Table 4.3.5.2-27 : Content of the Operator Specific Information message

Message type : Operator Specific Information
Direction : Bi-directional

Information element	Ref.	Direction	Type	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Bi-dir.	M	1	
Network identity	4.3.5.3.3.25	Bi-dir.	M	2	
Operator specific information	- - - - -	Bi-dir.	O	Variable length	Defined by each telecommunication operator

M : Mandatory O : Optional

4.3.5.2.27 Zone Information Request

This message is sent from the user to the network to request zone information. (Refer to Table 4.3.5.2-28 below.)

Table 4.3.5.2-28 : Content of the Zone Information Request message

Message type : Zone Information Request
Direction : User --> Network (UPCH)

Information element	Ref.	Direction	Type	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Uplink	M	1	
Number of zones for which information is requested	4.3.5.3.3.41	Uplink	M	1	1 - 12
Perch channel number	4.3.5.3.3.16	Uplink	O	1	
~	~	~	~	~	~
Perch channel number	4.3.5.3.3.16	Uplink	O	1	
Operator specific information	4.3.5.3.3.54	Uplink	O (Note)	1-128	

M : Mandatory O : Optional

Note : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.28 Zone Information Notification

This message is sent from the network to the user to report the zone information.
(See Table 4.3.5.2-29 below.)

Table 4.3.5.2-29 : Content of the Zone Information Notification message

Message type : Zone Information Notification
Direction : Network -->User (UPCH)

Information element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.7	Downlink	M	1	
Number of reported zones (N)	4.3.5.3.3.42	Downlink	M	1	0 - 12
Perch channel number	4.3.5.3.3.16	Downlink	O	1	For 1st zone
Number of perch channels	4.3.5.3.3.14	Downlink	O	1	For 1st zone
Perch channel number	4.3.5.3.3.16	Downlink	O	1	For 1st zone
~	~	~	~	~	~
Perch channel number	4.3.5.3.3.16	Downlink	O	1	For 1st zone
Packet channel structure information	4.3.5.3.3.39	Downlink	O	5	For 1st zone
Frequency code (1)	4.3.5.3.3.8	Downlink	O	2	For 1st zone
Slot number (1)	4.3.5.3.3.18	Downlink	O	1	For 1st zone
Color code (1)	4.3.5.3.3.7	Downlink	O	1	For 1st zone
Scramble code (1)	4.3.5.3.3.11	Downlink	O	1	For 1st zone
Channel restriction information (1)	4.3.5.3.3.31	Downlink	O	1	For 1st zone
~	~	~	~	~	~
Frequency code (N_{PC})	4.3.5.3.3.8	Downlink	O	2	For 1st zone
Slot number (N_{PC})	4.3.5.3.3.18	Downlink	O	1	For 1st zone
Color code (N_{PC})	4.3.5.3.3.7	Downlink	O	1	For 1st zone
Scramble code (N_{PC})	4.3.5.3.3.11	Downlink	O	1	For 1st zone
Channel restriction information (N_{PC})	4.3.5.3.3.31	Downlink	O	1	For 1st zone
Terminal registration area code	4.3.5.3.3.32	Downlink	O	1	For 1st zone
Packet paging area code multiplex number	4.3.5.3.3.37	Downlink	O	1	For 1st zone
Packet paging area code	4.3.5.3.3.38	Downlink	O	1	For 1st zone
~	~	~	~	~	~ ~
Packet paging area code	4.3.5.3.3.38	Downlink	O	1	For 1st zone
Zone service information	4.3.5.3.3.33	Downlink	O	3	For 1st zone
Packet system timer	4.3.5.3.3.44	Downlink	O	1	For 1st zone
~	~	~	~	~	~
Perch channel number ~ Packet system timer		Downlink	O		For 1st zone
UPCH maximum transmission power	4.3.5.3.3.57	Downlink	O	1~6	(Note 4)
Maximum number of reporting channels (1)	4.3.5.3.3.21	Downlink	O	1	For 1st zone (Note 5)
~	~	~	~	~	~
Maximum number of reporting channels (N)	4.3.5.3.3.21	Downlink	O	1	For Nth zone (Note 5)
Number of extended channels	4.3.5.3.3.58	Downlink	O	1~6	(Note 5)

Frequency code (1)	4.3.5.3.3.8	Downlink	O	2	For 1st zone (Note 6)
Slot number (1)	4.3.5.3.3.18	Downlink	O	1	For 1st zone (Note 6)
Color code (1)	4.3.5.3.3.7	Downlink	O	1	For 1st zone (Note 6)
Scramble code (1)	4.3.5.3.3.11	Downlink	O	1	For 1st zone (Note 6)
Standby condition (1)	4.3.5.3.3.59	Downlink	O	1	For 1st zone (Note 6)
~	~	~	~	~	~
Frequency code (n)	4.3.5.3.3.8	Downlink	O	2	For 1st zone (Note 6)
Slot number (n)	4.3.5.3.3.18	Downlink	O	1	For 1st zone (Note 6)
Color code (n)	4.3.5.3.3.7	Downlink	O	1	For 1st zone (Note 6)
Scramble code (n)	4.3.5.3.3.11	Downlink	O	1	For 1st zone (Note 6)
Standby condition (n)	4.3.5.3.3.59	Downlink	O	1	For 1st zone (Note 6)
~	~	~	~	~	~
Frequency code ~ Standby condition		Downlink	O		For Nth zone (Note 6)
Operator specific information	4.3.5.3.3.54	Downlink	O	1-128	Note 7

M : Mandatory O : Optional

Note 1 : Perch channel number, number of perch channels, packet channel structure information, terminal registration area code, packet paging area code multiplex number, packet paging area code, zone service information and packet system timer information elements are not mandatory when the number of reported zones is set to "0", but these are mandatory when the number of reported zones is set to another value.

Note 2 : The value set for the Number of reported zones information element must not exceed the value of the Number of zones for which information is requested information element included in the Zone Information Request message. In addition, this message must not exceed the value specified in N 201 if information of each zone is set.

Note 3 : N_{PC} : Number of packet physical channels in the cell (Refer to Section 4.1.10.3.2)

Note 4 : If the value of the Number of reported zones information element is set to "0", this information element is not included in the message. If the value is set to greater or equal to "1", this information element has a variable length according to the coding for this information element. If the value of the Number of reported zones information element is set to greater or equal to "1" and subsequent information element (include this information element) does not exist, the mobile station adopts the maximum transmission power of the zone in which it received this message as the UPCH maximum transmission power after zone switching. Note that when the Number of reported zones information element is set to “1” or greater and one or more subsequent information elements are present following the Maximum number of reporting channels, this information element can not be omitted.

Note 5 : When the Number of reported zone information element is set to “0”, this information element is not included in the signal. When this information element is set to “1” or greater and the Maximum number of reporting channels information element is present, the Number of extended channels information element is not omitted regardless of the number of extended channels set. When the Number of extended channels information element is present, the Maximum number of reporting channels information element is not omitted. When the Number of reported zones information element is set to “1” or greater and neither the Maximum number of reporting channels nor Number of extended channels information element is present, the mobile station performs the same operation as when the Maximum number of reporting channels is set to “0” and the Number of extended channels is set to “0”. Note that the Maximum number of reporting channels and Number of extended channels information elements are mandatory when the Number of reported zones information element is set to “1” or greater and one or more information elements are present subsequent to the Standby condition of the nth extended channel in the Nth zone.

Note 6 : These information elements are arrayed sequentially from the 1st extended channel of the 1st zone according to the setting for the Number of extended channels. The information elements of the zones having no extended channel are not included in the array.

Note 7 : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (Information length = 0), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.29 Packet Paging

This message is sent from the network to the user in the Packet standby mode for packet paging (See Table 4.3.5.2-30 below.)

Table 4.3.5.2-30 : Content of the Packet Paging message

Message type : Packet Paging
Direction : Network --> User (UPCH)

Information element	Ref.	Direction	Type	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Downlink	M	1	
Common information reception segment length	4.3.5.3.3.40	Downlink	M	1	
Number of packet paging mobile stations	4.3.5.3.3.43	Downlink	M	1	0 - 15
Mobile station number	Note 1	Downlink	O	Variable length	For 1st packet paging MS
~	~	~	~	~	~
Mobile station number	Note 1	Downlink	O	Variable length	For Nth packet paging MS
Operator specific information	4.3.5.3.3.54	Downlink	O (Note3)	1-128	

M : Mandatory O : Optional

Note 1 : The same coding as MSI for Layer 2 is used. Refer to "Layer 2 standards" for details.
Note 2 : The address of this signal in Layer 2 is a group MSI.

Note 3 : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.30 Packet System Information Notification

This message is sent from the network to the user to notify the mobile station of the latest system information when the system information on packets has been modified. (Refer to Table 4.3.5.2-31 below.)

Table 4.3.5.2-31 : Content of the Packet System Information Notification message

Message type : Packet System Information Notification
Direction : Network -->User (UPCH)

Information element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Downlink	M	1	
Retransmission identifier	4.3.5.3.3.36	Downlink	M	1	
Operation probability	4.3.5.3.3.35	Downlink	M	1	
Packet channel structure information	4.3.5.3.3.39	Downlink	M	5	
Frequency code (1)	4.3.5.3.3.8	Downlink	O	2	
Slot number (1)	4.3.5.3.3.18	Downlink	O	1	
Color code (1)	4.3.5.3.3.7	Downlink	O	1	
Scramble code (1)	4.3.5.3.3.11	Downlink	O	1	
Channel restriction information (1)	4.3.5.3.3.31	Downlink	O	1	
~	~	~	~	~	~
Frequency code (N_{PC})	4.3.5.3.3.8	Downlink	O	2	
Slot number (N_{PC})	4.3.5.3.3.18	Downlink	O	1	
Color code (N_{PC})	4.3.5.3.3.7	Downlink	O	1	
Scramble code (N_{PC})	4.3.5.3.3.11	Downlink	O	1	
Channel restriction information (N_{PC})	4.3.5.3.3.31	Downlink	O	1	
Terminal registration area code	4.3.5.3.3.32	Downlink	M	1	
Packet paging area code multiplex number	4.3.5.3.3.37	Downlink	M	1	
Packet paging area code	4.3.5.3.3.38	Downlink	O	1	
~	~	~	~	~	~
Packet paging area code	4.3.5.3.3.38	Downlink	O	1	

Zone service information	4.3.5.3.3.33	Downlink	M	3	
Packet system timer	4.3.5.3.3.44	Downlink	M	1	
Operator specific information	4.3.5.3.3.54	Downlink	O (Note2)	1-128	

M : Mandatory O : Optional

Note 1 : N_{PC} : Number of packet physical channels in the cell (Refer to Section 4.1.10.3.2)

Note 2 : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.31 UPCH Voice Paging

This message is sent from the network to the user to notify the user, which is in Active mode or Packet standby mode on user packet channel, of voice paging.

Table 4.3.5.2-32 : UPCH Voice Paging message

Message type : UPCH Voice Paging
Direction : Network -->User (UPCH)

Information element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Downlink	M	1	
Common information reception segment length	4.3.5.3.3.40	Downlink	M	1	
System information indication	4.3.5.3.3.47	Downlink	M	1	
Control channel structure information	4.3.5.3.3.12	Downlink	O	6 - 33	Note 3
Perch channel number	4.3.5.3.3.16	Downlink	O	1	Perch CH in home zone, Note 3
Color code	4.3.5.3.3.7	Downlink	O	1	For perch CH, Note 3
Restriction information	4.3.5.3.3.5	Downlink	O	3	For control CH, Note 3
MS TX power assignment	4.3.5.3.3.19	Downlink	O	1	Note 3
Number of paging MSs (N)	4.3.5.3.3.27	Downlink	M	1	0 ~ 15
Mobile station number	Note 1	Downlink	O	Variable length	For No. 1 paging MS
Paging identification number	4.3.5.3.3.2	Downlink	O	1	

~	~	~	~	~	~
Mobile station number	Note 1	Downlink	O	Variable length	For No. N paging MS
Paging identification number	4.3.5.3.3.2	Downlink	O	1	
Operator specific information	4.3.5.3.3.54	Downlink	O (Note4)	1-128	

M : Mandatory O : Optional

Note 1 : The same coding as MSI for Layer 2 is used. Refer to Layer 2 specification for details.
Note 2 : The address of this signal in Layer 2 is group MSI.
Note 3 : This information element is included in the signal only if system information exists in the System information indication and is not included otherwise.
Note 4 : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.32 UPCH Voice Paging Response

This message is sent from the user to the network to report voice paging condition in Active mode or Packet standby mode, in response to the UPCH voice paging.

Table 4.3.5.2-33 : UPCH Voice Paging Response message

Message type : UPCH Voice Paging Response
Direction : User -->Network (UPCH)

Information element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Uplink	M	1	
Voice paging condition	4.3.5.3.3.48	Uplink	M	1	
Operator specific information	4.3.5.3.3.54	Uplink	O (Note2)	1-128	

M : Mandatory O : Optional

Note 1 : A mobile station number is included in the layer 2 section.
Note 2 : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.33 UPCH Voice Paging 2

This message is sent from the network to the user to report that a voice connection request has been generated by the Voice Terminating Method 2 to a mobile station during packet communication. (See Table 4.3.5.2-34 below.)

Table 4.3.5.2-34 : Contents of the UPCH Voice Paging 2 message

Message type : UPCH Voice Paging 2
Direction : Network $\rightarrow$ User (UPCH)

Information Element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Downlink	M	1	
UPCH paging connection timer	4.3.5.3.3.49	Downlink	M	1	
Maximum number of reporting channels	4.3.5.3.3.21	Downlink	M	1	
Calling party number	4.3.5.3.3.50	Downlink	M	1 - 16	
Operator specific information	4.3.5.3.3.54	Downlink	O (Note2)	1-128	

M : Mandatory O : Optional

Note 1 : Mobile station number is included in the Layer 2 section.
Note 2 : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.34 UPCH Voice Paging 2 Inquiry

This message is sent from the network to the user to report that a voice connection request has been generated by the Voice Terminating Method 2 to a mobile station during Packet standby.
(See Table 4.3.5.2-35 below.)

Table 4.3.5.2-35 : Contents of the UPCH Voice Paging 2 Inquiry message

Message type : UPCH Voice Paging 2 Inquiry
Direction : Network → User (UPCH)

Information Element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Downlink	M	1	
UPCH paging connection timer	4.3.5.3.3.49	Downlink	M	1	
Maximum numbers of reporting channels	4.3.5.3.3.21	Downlink	M	1	
Number of paging MSs (N)	4.3.5.3.3.27	Downlink	M	1	
Mobile station number	Note 1	Downlink	M	Variable length	For No.1 paging MS
Calling party number	4.3.5.3.3.50	Downlink	M	1 - 16	For No.1 paging MS
~	~	~	~	~	~
Mobile station number	Note 1	Downlink	M	Variable length	For No.N paging MS
Calling party number	4.3.5.3.3.50	Downlink	M	1 - 16	For No.N paging MS
Operator specific information	4.3.5.3.3.54	Downlink	O (Note3)	1-128	

M : Mandatory O : Optional

Note 1 : The same coding as the MSI in layer 2 is used; refer to the Layer 2 specification for details.
Note 2 : The Layer 2 address of this signal is the Group MSI.
Note 3 : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.35 UPCH Voice Paging 2 Acknowledgement

This message is sent from the user to the network as acknowledgement for the UPCH Voice Paging 2 (in 4.3.5.2.33) or UPCH Voice Paging 2 Inquiry (in 4.3.5.2.34) for the user. This message is not sent when UPCH Voice Paging 2 response or UPCH Paging Condition Report message can be sent within the timer value defined in Section 4.3.5.4. (See Table 4.3.5.2-36 below.)

Table 4.3.5.2-36 : Contents of the UPCH Voice Paging 2 Acknowledgement message

Message type : UPCH Voice Paging 2 Acknowledgement
Direction : User $\rightarrow$ Network (UPCH)

Information Element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Uplink	M	1	
Operator specific information	4.3.5.3.3.54	Uplink	O (Note2)	1-128	

M : Mandatory O : Optional

Note 1 : Mobile station number (MSI) is included in the Layer 2 section.
Note 2 : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.36 UPCH Voice Paging 2 Response

This message is sent from the user to the network in response to UPCH Voice Paging 2(in 4.3.5.2.33) or UPCH Radio Channel Assignment (in 4.3.5.2.39) for the user. (See Table 4.3.5.2-37 below.)

Table 4.3.5.2-37 : Contents of the UPCH Voice Paging 2 Response message

Message type : UPCH Voice Paging 2 Response
Direction : User $\rightarrow$ Network (UPCH)

Information Element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Uplink	M	1	
Termination response information	4.3.5.3.3.51	Uplink	M	1	
Operator specific information	4.3.5.3.3.54	Uplink	O (Note2)	1-128	

M : Mandatory O : Optional

Note 1 : Mobile station number (MSI) is included in the Layer 2 section.
Note 2 : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.37 UPCH Voice Paging 2 Response Acknowledgement

This message is sent from the network to the user as acknowledgement for UPCH Voice Paging 2 Response (in 4.3.5.2.33) for the user. (See Table 4.3.5.2-38 below.)

Table 4.3.5.2-38 : Contents of the UPCH Voice Paging 2 Response Acknowledgement message

Message type : UPCH Voice Paging 2 Response Acknowledgement
Direction : Network →User (UPCH)

Information Element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Downlink	M	1	
Termination response acknowledgement information	4.3.5.3.3.52	Downlink	M	1	
Cause	4.3.5.3.3.10	Downlink	M	1	
Operator specific information	4.3.5.3.3.54	Downlink	O (Note2)	1-128	

M : Mandatory O : Optional

Note 1 : Mobile station number (MSI) is included in the Layer 2 section.
Note 2 : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.38 UPCH Paging Condition Report

This message is sent from the user to the network to request UPCH Voice Paging 2 (in 4.3.5.2.33) or UPCH Voice Paging 2 Inquiry (in 4.3.5.2.34) for the user to switch to the traffic channel (See Table 4.3.5.2-39 below.)

Table 4.3.5.2-39 : Contents of the UPCH Paging Condition Report message

Message type : UPCH Paging Condition Report
Direction : User →Network (UPCH)

Information Element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Uplink	M	1	
Mobile station type	4.3.5.3.3.3	Uplink	M	3	
Reception level	4.3.5.3.3.6	Uplink	M	1	Home zone reception level
Number of selected zones (N)	4.3.5.3.3.13	Uplink	M	1	0 – 20
Perch channel number	4.3.5.3.3.16	Uplink	O	1	No.1 max. reception level peripheral zone
Reception level	4.3.5.3.3.6	Uplink	O	1	
Perch channel number	4.3.5.3.3.16	Uplink	O	1	No.2 max. reception level peripheral zone
Reception level	4.3.5.3.6	Uplink	O	1	
Perch channel number	4.3.5.3.3.16	Uplink	O	1	No.N max. reception level peripheral level
Reception level	4.3.5.3.3.6	Uplink	O	1	
Frequency band	4.3.5.3.3.30	Uplink	M	2	Maximum 16 bands
Speech coding method capability notification	4.3.5.3.3.55	Uplink	O (Note2)	variable length	
Operator specific information	4.3.5.3.3.54	Uplink	O (Note3)	1-128	

M : Mandatory O : Optional

Note 1 : Mobile station number (MSI) is included in the Layer 2 section.
Note 2 : This information element is mandatory for an MS complying with RCR STD-27H or a subsequent version.
Note 3 : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.39 UPCH Radio Channel Assignment

This message is sent from the network to the user to assign the radio channel for communication on UPCH. The user immediately starts switching to assigned channel from packet radio channel upon receipt of this message. (See Table 4.3.5.2-40 below.)

Table 4.3.5.2-40 : Contents of the UPCH Radio Channel Assignment message

Message type : UPCH Radio Channel Assignment
Direction : Network →User (UPCH)

Information Element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Downlink	M	1	
Frequency code	4.3.5.3.3.8	Downlink	M	2	
Slot number	4.3.5.3.3.18	Downlink	M	1	
Color code	4.3.5.3.3.7	Downlink	M	1	For traffic channel
Scramble code	4.3.5.3.3.11	Downlink	M	1	"
MS transmission power assignment	4.3.5.3.3.19	Downlink	M	1	"
Channel information	4.3.5.3.3.20	Downlink	M	1	"
Traffic channel connection information	4.3.5.3.3.53	Downlink	M	1 - 9	
Operator Specific Information	4.3.5.3.3.54	Downlink	M	1 - 128	
Speech coding method assignment	4.3.5.3.3.56	Downlink	O (Note2)	1	

M : Mandatory O : Optional

Note 1: Mobile station number (MSI) is included in the Layer 2 section.
Note 2: If MS complying with RCR STD-27H or a later version receives the message without this information element, MS sets VSELP or PSI-CELP according to the channel information rate in Channel information information element for full-rate or half-rate, respectively.

4.3.5.2.40 UPCH Voice Paging Stop

This message is sent from the network to the user to report the Voice Paging stop on UPCH. (See Table 4.3.5.2-41 below.)

Table 4.3.5.2-41 : Contents of the UPCH Voice Paging Stop message

Message type : UPCH Voice Paging Stop
Direction : Network $\rightarrow$ User (UPCH)

Information Element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Downlink	M	1	
Cause	4.3.5.3.3.10	Downlink	M	1	
Operator specific information	4.3.5.3.3.54	Downlink	O (Note)	1-128	

M : Mandatory O : Optional

Note : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.41 UPCH Voice Paging Stop Acknowledgement

This message is sent from the user to the network to acknowledge that the Voice Paging has stopped on UPCH. (See Table 4.3.5.2-42 below.)

Table 4.3.5.2-42 : Contents of the UPCH Voice Paging Acknowledgement Message

Message type : UPCH Voice Paging Stop Acknowledgement
Direction : User $\rightarrow$Network (UPCH)

Information Element	Ref.	Direction	Class	Info. length (octets)	Remarks
Message type	4.3.5.3.2	Uplink	M	1	
Operator specific information	4.3.5.3.3.54	Uplink	O (Note)	1-128	

M : Mandatory O : Optional

Note : In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (information length = 0 is set), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.2.42 Packet Channel Handover Request

This message is sent from the network to the user to specify the handover packet channel for the mobile station in the Active or Packet standby state. (See Table 4.3.5.2-43)

Table 4.3.5.2-43 Content of Packet Channel Handover Request message

Message type: Packet Channel Handover Request
Direction: Network --> User (UPCH)

Information element	Ref.	Direction	Type	Info. length (oct)	Remarks
Message type	4.3.5.3.2	Downlink	M	1	
Channel handover mobile station assignment	4.3.5.3.3.60	Downlink	M	1	0-64 (Note 1)
Mobile station number	Note 2	Downlink	O	Variable	For 1st handover mobile station
~	~	~	~	~	~
Mobile station number	Note 2	Downlink	O	Variable	For Nth handover mobile station
Channel handover information	4.3.5.3.3.61	Downlink	M	1	Note 3
Frequency code (1)	4.3.5.3.3.8	Downlink	O	2	For home zone
Slot number (1)	4.3.5.3.3.18	Downlink	O	1	For home zone
Color code (1)	4.3.5.3.3.7	Downlink	O	1	For home zone
Scramble code (1)	4.3.5.3.3.11	Downlink	O	1	For home zone
Standby condition (1)	4.3.5.3.3.59	Downlink	O	1	For home zone
~	~	~	~	~	For home zone
Frequency code (n)	4.3.5.3.3.8	Downlink	O	2	For home zone
Slot number (n)	4.3.5.3.3.18	Downlink	O	1	For home zone
Color code (n)	4.3.5.3.3.7	Downlink	O	1	For home zone
Scramble code (n)	4.3.5.3.3.11	Downlink	O	1	For home zone
Standby condition (n)	4.3.5.3.3.59	Downlink	O	1	For home zone
Number of reported zones (N)	4.3.5.3.3.42	Downlink	M	1	0~12 (Note 4)
Perch channel number	4.3.5.3.3.16	Downlink	O	1	For 1st zone
Number of perch channels	4.3.5.3.3.14	Downlink	O	1	For 1st zone
Perch channel number	4.3.5.3.3.16	Downlink	O	1	For 1st zone
~	~	~	~	~	~
Perch channel number	4.3.5.3.3.16	Downlink	O	1	For 1st zone
Packet channel structure information	4.3.5.3.3.39	Downlink	O	5	For 1st zone
Frequency code (1)	4.3.5.3.3.8	Downlink	O	2	For 1st zone
Slot number (1)	4.3.5.3.3.18	Downlink	O	1	For 1st zone
Color code (1)	4.3.5.3.3.7	Downlink	O	1	For 1st zone
Scramble code (1)	4.3.5.3.3.11	Downlink	O	1	For 1st zone

Channel restriction information (1)	4.3.5.3.3.31	Downlink	O	1	For 1st zone
~	~	~	~	~	~
Frequency code (Npc)	4.3.5.3.3.8	Downlink	O	2	For 1st zone
Slot number (Npc)	4.3.5.3.3.18	Downlink	O	1	For 1st zone
Color code (Npc)	4.3.5.3.3.7	Downlink	O	1	For 1st zone
Scramble code (Npc)	4.3.5.3.3.11	Downlink	O	1	For 1st zone
Channel restriction information (Npc)	4.3.5.3.3.31	Downlink	O	1	For 1st zone
Terminal registration area code	4.3.5.3.3.32	Downlink	O	1	For 1st zone
Packet paging area code multiplex number	4.3.5.3.3.37	Downlink	O	1	For 1st zone
Packet paging area code	4.3.5.3.3.38	Downlink	O	1	For 1st zone
~	~	~	~	~	~
Packet paging area code	4.3.5.3.3.38	Downlink	O	1	For 1st zone
Zone service information	4.3.5.3.3.34	Downlink	O	3	For 1st zone
Packet system timer	4.3.5.3.3.44	Downlink	O	1	For 1st zone
~	~	~	~	~	~
Perch channel number~ Packet system timer		Downlink	O		For Nth zone
UPCH maximum transmission power	4.3.5.3.3.57	Downlink	O	1~6	
Number of maximum reporting channels (1)	4.3.5.3.3.21	Downlink	O	1	For 1st zone (Note 5)
~	~	~	~	~	~
Number of maximum reporting channels (N)	4.3.5.3.3.21	Downlink	O	1	For Nth zone
Number of extended channels	4.3.5.3.3.58	Downlink	O	1~6	
Frequency code (1)	4.3.5.3.3.8	Downlink	O	2	For 1st zone (Note 5)
Slot number (1)	4.3.5.3.3.18	Downlink	O	1	For 1st zone (Note 5)
Color code (1)	4.3.5.3.3.7	Downlink	O	1	For 1st zone (Note 5)
Scramble code (1)	4.3.5.3.3.11	Downlink	O	1	For 1st zone (Note 5)
Standby condition (1)	4.3.5.3.3.59	Downlink	O	1	For 1st zone (Note 5)
~	~	~	~	~	~
Frequency code (n)	4.3.5.3.3.8	Downlink	O	2	For 1st zone (Note 5)
Slot number (n)	4.3.5.3.3.18	Downlink	O	1	For 1st zone (Note 5)
Color code (n)	4.3.5.3.3.7	Downlink	O	1	For 1st zone (Note 5)
Scramble code (n)	4.3.5.3.3.11	Downlink	O	1	For 1st zone (Note 5)
Standby condition (n)	4.3.5.3.3.59	Downlink	O	1	For 1st zone (Note 5)
~	~	~	~	~	~
Frequency code~ Standby condition		Downlink	O		For Nth zone (Note 5)
Operator specific information	4.3.5.3.3.54	Downlink	O	1-128	Note 8

M : Mandatory O : Optional

Note 1: In case where the address of Layer 2 is a group MSI, all mobile stations which are specified by the Channel handover mobile station assignment or Mobile station number perform packet channel handover. In case where the address of Layer 2 is an SMSI or MSI, only the concerned mobile station performs packet channel handover.

Note 2: The same coding as MSI or SMSI for Layer 2. Refer to the Layer 2 specification for details. If the Number of channel handover mobile stations of the Channel handover mobile station assignment is set to “0”, this information element is not included.

Note 3: If the Number of extended channels included in the Channel handover information is set to “0”, the information elements Frequency code (1) through Standby condition (n), which follow this information element are not included in this message.

Note 4: If the Number of reported zones is set to “0”, the Perch channel number, Number of perch channels, Packet channel structure information, Terminal registration area code, Packet paging area code multiplex number, Packet paging area code, Zone service information, Packet system timer, UPCH maximum transmission power, Number of maximum reported channels, and Number of extended channels information elements are not included in this message. If the Number of reported zones is set to other than “0”, these information elements are mandatory.

Note 5: These information elements are arrayed sequentially from the 1st extended channel of the 1st zone according to the setting for the Number of extended channels. The information elements of zones having the Number of extended channels set to “0” are not included in this message.

Note 6: The value of the Number of reported zones information element shall be set so that the length of this message does not exceed the length specified by N201 after setting the information of each zone.

Note 7: Npc: Number of packet physical channels in the cell (Refer to Section 4.1.10.3.2.)

Note 8: In case where this information element includes only the information length (Information length = 0) and there are no subsequent information elements following this information element, this information element itself is omitted. If the message is transmitted between the MS and the network which does not support the operator specific function equipped in the MS, this information element includes only the information length (Information length = 0), and when there are no subsequent information elements to be transmitted following this information element, this information element itself is omitted.

4.3.5.3 Message format and information element coding

This section regulates the contents of messages. Bits in an octet are transmitted sequentially in the order of "bit 1, 2, 3..." and octets in the order of "octet 1, 2, 3..."

4.3.5.3.1 Outline

Each of the messages in this protocol is made up of the following elements.

a) Message type
b) Other information elements

Element a) is common to all the messages and must be contained in all of them. Element b) is regulated depending on individual message types. The structure of each message is shown in Fig. 4.3.5.3-1.

Bit	8	7	6	5	4	3	2	1	
	Message type								Octet 1
	Information element group field								•
	~							~	
									•

Fig. 4.3.5.3-1 : Message format structure

Information elements contained in individual messages have a fixed length. However if the number of information elements in a message cannot be specified when indicating the same information more than once, a variable number of information elements can be used by specifying the information for the number of information elements just above the pertinent information element. Fig. 4.3.5.3-2 is a structural example of this.

Bit 8 7 6 5 4 3 2 1	
(No. of information elements : N)	Octet 1
(Information element 1)	Octet 2
•	•
(Information element N)	Octet N + 1

Fig. 4.3.5.3-2 : Message format structure for a variable number of information elements.

If a field extends beyond 1 octet, higher-number octets contain the less significant bits, i.e. the least significant bit is the bit with the lowest bit number in the octet with the highest octet number.

4.3.5.3.2 Message type

The Message type information element is used for identifying the function of message being transferred. (Refer to Fig. 4.3.5.3-3.)

This information element is 1 octet in length.

Octet	Bit 8 7 6 5 4 3 2 1
1	Message type

Message type (Octet 1)

Bit	8	7	6	5	4	3	2	1		Message type
	0	0	0	-	-	-	-	-	:	Messages related to communications activation
				0	0	0	0	1	:	Originating Condition Report
				0	0	0	1	0	:	Paging
				0	0	0	1	1	:	Terminating Condition Report
				0	0	1	0	0	:	Packet paging
				0	0	1	0	1	:	UPCH Voice Paging Notification
				0	0	1	1	0	:	UPCH Voice Paging Response
				0	0	1	1	1	:	UPCH Voice Paging 2
				0	1	0	0	0	:	UPCH Voice Paging 2 Acknowledgement
				0	1	0	0	1	:	UPCH Voice Paging 2 Response
				0	1	0	1	0	:	UPCH Voice Paging 2 Response Acknowledgement
				0	1	0	1	1	:	UPCH Voice Paging Stop
				0	1	1	0	0	:	UPCH Voice Paging Stop Acknowledgement
				0	1	1	0	1	:	UPCH Paging Condition Report
				0	1	1	1	0	:	UPCH Voice Paging 2 Inquiry
	0	0	1	-	-	-	-	-	:	Messages related to call release
				0	0	0	0	1	:	Mobile Station Release
	0	1	0	-	-	-	-	-	:	Messages related to channel assignment
				0	0	0	0	1	:	Reception-level Measurement Request
				0	0	0	1	0	:	Reception-level Measurement Response
				0	0	0	1	1	:	Radio-Channel Set
				0	0	1	0	0	:	Ciphering Mode Alteration Request
				0	0	1	0	1	:	Ciphering Mode Alteration Acknowledgement
				0	0	1	1	0	:	UPCH Radio Channel Assignment
				0	0	1	1	1	:	Packet Channel Handover Request
	0	1	1	-	-	-	-	-	:	Messages during channel setting
				0	0	0	0	1	:	Handover channel Set
				0	0	0	1	0	:	System Information
				0	0	0	1	1	:	System Information Acknowledgement
				0	0	1	0	0	:	Condition Inquiry
				0	0	1	0	1	:	Condition Report 1
				0	0	1	1	0	:	Condition Report 2
				0	0	1	1	1	:	Condition Report Acknowledgement
				0	1	0	0	0	:	Condition Report Information
				0	1	0	0	1	:	Condition Report Information Acknowledgement
				0	1	0	1	0	:	Condition Report State
				0	1	0	1	1	:	Condition Report State Acknowledgement
				0	1	1	0	0	:	VOX Control
				0	1	1	0	1	:	VOX Control Acknowledgement
	1	0	0	-	-	-	-	-	:	Messages related to channel release
				0	0	0	0	1	:	Radio-channel Disconnect
				0	0	0	1	0	:	Radio-channel Disconnect Acknowledgement
	1	0	1	0	0	0	0	1	:	Broadcast Information
	1	1	0	-	-	-	-	-	:	Messages related to packet communication channel setting
				0	0	0	0	0	:	Packet system information notification
				0	0	0	0	1		Zone information request
				0	0	0	1	0		Zone information notification
	1	1	1	1	1	1	1	1	:	Operator Specific Information
							Others		:	Reserved

Fig. 4.3.5.3-3 : Message type information elements

4.3.5.3.3 Other information elements

4.3.5.3.3.1 Coding standards

Coding for other information elements must accord with the coding standards described below. This standards have been designed to facilitate location of information elements that are necessary for processing by the respective message processing equipment.

(1) Individual information elements are regulated based on the fixed length, excluding some exceptions.

(2) Information elements contained in a message are arranged in the specified order. The respective information elements can be extracted by RX equipment in the order in which they appear in the message by making use of the sequence in which information elements appear based on the message type and fixed information length of respective information elements.

(3) If a variable length or a variable number of information elements is contained in a message, each information element can be extracted by ascertaining the information element that appears the top of the information elements or the information element which indicates the number of elements in the message.

4.3.5.3.3.2 Paging identification number

The Paging identification number information element shown in Fig. 4.3.5.3.3-1 below is a number assigned to individual calls by the network for temporary control of calls during wide area paging. It is deleted when a response is returned from the MS. This information element is 1 octet long. Refer to Appendix J for details.

	Bit							
Octet	8	7	6	5	4	3	2	1
1	Paging identification number							

Fig. 4.3.5.3.3-1 : Paging identification number information element

Paging identification number (Octet 1) :

A number indicated from 0 to 255 in binary numbers which is assigned temporarily to the incoming call during paging.

4.3.5.3.3.3 Mobile station type

The Mobile station type information element shown in Fig. 4.3.5.3.3-2 is used for identifying the type of mobile station.

This information element is 3 octets in length.

<table>
<tr><th>Octet</th><th>Bit 8</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th></tr>
<tr><td>1</td><td colspan="2">Mobile station class</td><td colspan="3">Max. transmission power</td><td colspan="3">RF zone transfer rate</td></tr>
<tr><td>2</td><td colspan="3">Mobile station Rev.</td><td>*1</td><td colspan="3">Standard ciphering version</td><td>Rev. extended</td></tr>
<tr><td>3</td><td colspan="2">Spare</td><td colspan="6">Operator specific area</td></tr>
</table>

*1 : VOX enable/prohibit indication

Fig. 4.3.5.3.3-2 : Mobile station type information element

The contents of this information element are as follows:

(1) RF zone transfer rate (Octet 1)

Bit 3	2	1	:	RF zone transfer rate
0	0	1	:	Full-rate
0	1	1		Full-rate + Half-rate
Others			:	Reserved

Note : In Case the (4) mobile station Rev. is "010" (RCR STD-27E) or that for a later version, the selection of "001" (full rate) is not allowed.

(2) Max. transmission power (Octet 1)

Bit 6	5	4	:	Max. transmission power
0	0	0	:	3.0W
1	1	1	:	2.0W
1	1	0	:	2.0W - 4dB
1	0	1	:	2.0W - 8dB
Others			:	Reserved

(3) Mobile station classification (Octet 1)

Bit 8	7	:	Mobile station class
0	0	:	General mobile station
0	1	:	Priority mobile station (for VIP, emergency, etc.)
1	1	:	Maintenance mobile station
Others		:	Reserved

(4) Mobile station Rev. (Octet 2)

Indicates the specifications revision for mobile stations.

Bit 8	7	6	:	Mobile station Rev.
0	0	0	:	In compliance with RCR STD-27B
0	0	1	:	In compliance with RCR STD-27C/RCR STD-27D
0	1	0	:	In compliance with RCR STD-27E
0	1	1	:	In compliance with RCR STD-27F
1	0	0	:	In compliance with RCR STD-27G
1	0	1	:	In compliance with RCR STD-27H
1	1	0	:	In compliance with RCR STD-27I/J
1	1	1	:	In compliance with RCR STD-27K or a subsequent revisin (Refer to Rev. extended)

(5) VOX capable/incapable indication (Octet 2)

Bit 5	:	VOX capable/incapable indication
0	:	VOX control not allowed for MS
1	:	VOX control allowed for MS (Refer to Appendix H for details)

(6) Standard ciphering version (Octet 2)*

Bit 4	3	:	Standard ciphering version
0	1	:	1
Others		:	Reserved

* When more than one version exists, only one version is reported to the MS and selection of the version is left up to individual MS.

(7) Operator specific area (Octet 3)

Area wherein the operator can define freely.

(Example: Identifying in-between mobile and carry-about types, telecommunications operator ciphering mode and version, hitless handover MS, etc.)

(8) Rev. extended (Octet 2)

Bit 2	1	:	Rev. extended
0	0	:	In compliance with RCR STD-27K
0	1	:	In compliance with RCR STD-27L
Others		:	Reserved

4.3.5.3.3.4 Location identity

The Location identity information element shown in Fig. 4.3.5.3.3-3 below is an identification number which indicates the location registration area in which the mobile station is located.
This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Location identity							

Fig. 4.3.5.3.3-3 : Location identity information element

Location identity (Octet 1) :

A binary number (0 to 255) which identifies the location registration area where the mobile station locates. (Refer to Appendix F for details.)

4.3.5.3.3.5 Restriction information

The Restriction information element shown in Fig. 4.3.5.3.3-4 below is used for reporting the restriction state of the network to the user.

This information element is 3 octets long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	MS operation information				Zone selection correction level			
2	Restriction information				Access cycle interval			
3	Restriction group set							

Fig. 4.3.5.3.3-4 : Restriction information information element

(1) Zone selection correction level (Octet 1)
This information is valid when bit 7 of MS origination information is set for "1".

Bit 4	3	2	1	:	Zone selection correction level (perch CH reception level difference)
0	0	0	0	:	0 dB
0	0	0	1	:	2 dB
	~				~
1	1	1	1	:	30 dB

(2) MS operation information (Octet 1)

Bit 5 — Home zone access restriction
- 0 : Off
- 1 : On

Bit 6 — Home zone access
- 0 : Enabled
- 1 : Disabled

Bit 7 — Zone selection correction level
- 0 : Absent
- 1 : Present

Bit 8 — Home zone selection
- 0 : Enabled
- 1 : Disabled

(3) Access cycle interval (Octet 2)

Specifies the cycle at which a general mobile station can access the SCCH. This information is valid when the MS operation information bit 5 is "1".

Bit	4	3	2	1	:	Valid regulation removal cycle
	0	0	0	0	:	No restriction
	0	0	0	1	:	720 x 4ms
		~				~
	1	1	1	1	:	720 x 60ms

(4) Restriction information (Octet 2)

Specifies the contents of restriction separately for general mobile stations and high priority mobile stations. This information is valid when MS operation information bit 5 is "1".

Bit	5		Priority MS location registration
	0	:	Enabled
	1	:	Disabled

Bit	6		Priority MS origination
	0	:	Enabled
	1	:	Disabled

Bit	7		General MS location registration restriction
	0	:	Off
	1	:	On

Bit	8		General MS origination restriction
	0	:	Off
	1	:	On

(5) Restriction group set (Octet 3)

Specifies the general mobile station group for which restriction is in effect. General mobile stations are classified into 8 groups in order to set restrictions.

Bit	8		Group set
	0	:	Group 1 restriction Off
	1	:	Group 1 restriction On

Bit	7		Group set
	0	:	Group 2 restriction Off
	1	:	Group 2 restriction On

Bit	6		Group set
	0	:	Group 3 restriction Off
	1	:	Group 3 restriction On

Bit	5		Group set
	0	:	Group 4 restriction Off
	1	:	Group 4 restriction On

Bit	4		Group set
	0	:	Group 5 restriction Off
	1	:	Group 5 restriction On
Bit	3		Group set
	0	:	Group 6 restriction Off
	1	:	Group 6 restriction On
Bit	2		Group set
	0	:	Group 7 restriction Off
	1	:	Group 7 restriction On
Bit	1		Group set
	0	:	Group 8 restriction Off
	1	:	Group 8 restriction On

Refer to Appendix E for details on this information element.

4.3.5.3.3.6 Reception level

The Reception level information element shown in Fig. 4.3.5.3.3- 5 below indicates the reception level for communications measured by the mobile station. This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare	Reception level						

(1) Reception level (Octet 1)

Reception level is expressed in binary numbers ranging from 38 to 109.

Bit 7	6	5	4	3	2	1	:	Reception level (-44 dBμ)
1	1	0	1	1	0	1	:	65 dBμ or more
			~					~
1	0	0	0	0	0	0	:	20 dBμ or more, less than 21 dBμ
			~					~
0	1	0	1	1	0	0	:	0 dBμ or more, less than 1 dBμ
			~					~
0	1	0	0	1	1	1	:	-5 dBμ or more, less than -4 dBμ
			~					~
0	1	0	0	1	1	0	:	less than -5 dBμ

Fig. 4.3.5.3.3-5 : Reception level information element

4.3.5.3.3.7 Color code

The Color code information element shown in Fig. 4.3.5.3.3-6 below is used to specify the color code which is assigned for a frequency repetition unit for radio control and communications channels and is provide in order to prevent errors in instances of transfer skipping over the repetition unit. This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Color code							

Color code (Octet 1) :

The Color code is specified from 1 to 255 in binary. (Refer to 4.2 Layer 1 Specifications for details.)

Fig. 4.3.5.3.3-6 : Color code information element

4.3.5.3.3.8 Frequency code

The Frequency code information element shown in Fig. 4.3.5.3.3-7 below is used to specify the code to indicate the frequency for the radio channel for communication. This information element is 2 octets long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Frequency band identifier				Frequency code			
2								

a. Frequency band identifier (Octet 1)

Bit 8 7 6 5		Offset value (Fo),		TX/RX separation (Fb),		No. of carriers (Nc)
0 0 0 0	:	810.00 MHz	,	130.000 MHz	,	721
0 0 0 1	:	843.00 MHz	,	55.000 MHz	,	1681
0 0 1 0	:	1477.00 MHz	,	-48.000 MHz	,	1561
0 0 1 1	:	830.00 MHz	,	55.000 MHz	,	521
Others				Reserved		

b. Frequency code (Octets 1, 2)

Binary numbers Fc ranging from 0 to 4095 which specify each carrier frequency in the frequency bands specified by the Frequency band identifier.

BS transmission frequency (downlink) = Fo + 0.025 x Fc [MHz]
MS transmission frequency (uplink) = Fo + 0.025 x Fc + Fb [MHz], Fc = 0 ~ Nc-1

Frequency band identifier	Link	Frequency -->	fc -->
Frequency band identifier [0] (800 MHz band No.1)	Downlink	810 – 828	0 – 720
	Uplink	940 – 958	0 – 720
Frequency band identifier [1] (800 MHz band No.2)	Downlink	870 – 885	1080 – 1680
	Uplink	925 – 940	1080 – 1680
Frequency band identifier [2] (1.5 GHz band)	Uplink	1429 – 1453	0 – 960
	Uplink	1465 – 1468	1440 – 1560
	Downlink	1477 – 1501	0 – 960
	Downlink	1513 – 1516	1440 – 1560
Frequency band identifier [3] (800 MHz band No.3)	Downlink	838 – 843	320 – 520
	Uplink	893 – 898	320 – 520

Fig. 4.3.5.3.3-7 : Frequency code information element

4.3.5.3.3.9 Number of measurements

The Number of measurements information element shown in Fig. 4.3.5.3.3-8 below is used to specify the number of frames to be measured by the reception level measurement function of the MS. This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Number of measurements							

Fig. 4.3.5.3.3-8 : Number of measurements information element

Number of measurements (Octet 1) :
Specifies the number of frames to be measured between1 to 255 in binary.

When no slot is specified, the MS switches to the specified frequency within the idle slot time and detects the idle slot level for the number of measurement frames specified by the Number of measurements information element and reports the average level in the Reception-level Measurement Response message.

4.3.5.3.3.10 Cause

The Cause information element shown in Fig. 4.3.5.3.3-9 below is used for indicating the cause for call disconnection. This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Source	Cause value						

Fig. 4.3.5.3.3-9 : Cause information element

(1) Source (Octet 1)

The source is an entity that detects errors

Bit 8		
0	:	User
1	:	Mobile network

(2) Cause value (Octet 1)

Bit 7	6	5	4	3	2	1		Cause value
0	0	1	-	-	-	-		[Normal class]
			0	0	0	0	:	Normal disconnection
			1	0	1	1	:	MS abnormal state (disconnection at authentication NG)
			1	0	0	0	:	Mobil station unregistered for roaming
			1	1	1	1	:	Other normal events
0	1	0	-	-	-	-		[Resource unusable class]
			0	0	1	0	:	No available channel
			0	1	1	0	:	Network failure
			1	0	0	1	:	Temporary failure (squelch disconnection)
			1	0	1	0	:	Device congestion
			1	1	0	0	:	Requested channel unusable
			1	1	1	1	:	Other resource unusable class
0	1	1	-	-	-	-	:	[Service unusable class]
			0	0	1	0	:	Requested facility has not been subscribed.
			1	1	1	1	:	Other service unusable class
1	0	0	-	-	-	-	:	[Service not-provided class]
			0	1	0	1	:	Facility not yet provided is requested.
			1	1	1	1	:	Other service or option not provided class
1	1	0	-	-	-	-		[Procedural error class]
			0	0	0	1	:	Message type undefined or not provided
			0	1	0	0	:	Information element content invalid
			0	1	0	1	:	Mismatch of call condition and message
			0	1	1	0	:	Recovery by time up
			1	1	1	1	:	Other procedural error class (platform function errors, CC abnormalities)
Others								Reserved

4.3.5.3.3.11 Scramble code

The Scramble code information element shown in Fig. 4.3.5.3.3-10 below is used to specify the pattern used for bit scrambling in the RF section.

This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Scramble code							

Fig. 4.3.5.3.3-10 : Scramble code information element

Scramble code (octet 1)

The values for bits 1 to 8 are set initial values for registers S1 to S8 on the scramble circuit. S0 and S1 are set to the same values. (Refer to 4.1 Layer 1 for details on scrambling)

4.3.5.3.3.12 Control channel structure information

The Control channel structure information information element shown in Fig. 4.3.5.3.3-11 below indicates the physical structure (frequency, slot, etc.) of the CCH used by each radio base station. The frequency and slots for the common control channel can be specified by both mobile and base stations by using a specially designated number, such as the Mobile station number.

This information element is 6 to 33 octets in length.

Bit	8 7 6 5	4 3 2 1
1	Np	Nc
2	Ab	Ap
3	As2	As1
4	F_1	
5		
6	S_1	
~	~	
3 x Nc + 1	F_{Nc}	
3 x Nc + 2		
3 x Nc + 3	S_{Nc}	

Fig. 4.3.5.3.3-11 : Control channel structure information element

1) Nc (Octet 1)

Specifies the number of control channels (1 to 10 including the perch channel) for the zone in binary.

2) Np (Octet 1)

Specifies the number of mobile station groups (1 to 15) for each control channel in binary.

3) Ap (Octet 2)

Specifies the number of PCH slots (1 to 15) in one group in binary.

4) Ab (Octet 2)

Specifies the number of BCCH slots (1 to 15) for one control channel in binary.

5) As1 (Octet 3)

Specifies the number of SCCH slots (0 to 15) following the BCCH in binary.

6) As2 (Octet 3)

Specifies the number of SCCH slots (0 to 15) following the PCH in binary.

7) F1, S1 to F_{Nc}, S_{Nc} (Octet 4 -)

These refer to the frequency code and slot numbers for the control channel (Refer to 4.3.5.3.3.8 "Frequency code" and 4.3.5.3.3.18 "Slot number"). Also refer to Appendix B for details

4.3.5.3.3.13 Number of selected zones

The Number of selected zones information element shown in Fig. 4.3.5.3.3-12 below indicates the number of peripheral zones selected as prospects for the circuit connection zone.

This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare			Number of selected zones				

The number of selected zones for Octet 1 is indicated from 0 to 20 in binary.

Fig. 4.3.5.3.3-12 : Number of selected zones information element

Refer to Appendices C and D for details.

4.3.5.3.3.14 Number of perch channels

The Number of perch channels information element shown in Fig. 4.3.5.3.3-13 below reports the number of perch channels supervised to recognize the home zone and sector to the MS during Standby state or communications.

This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare			Number of perch channels				

Number of perch channels (Octet 1) is indicated by 0 to 20 in binary.

Fig. 5.3.3-13 : Number of perch channels information element

4.3.5.3.3.15 Report condition

The Report condition information element shown in Fig. 4.3.5.3.3-14 below is used for specifying the conditions for reporting the peripheral zone/sector reception level detected by the mobile station to the base station. This information element is 5 octets long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Report threshold level criteria							
2	Threshold for amount of state change							
3	Level measurement time							
4	Time interval criteria							
5	Periodical report time interval							

Fig. 4.3.5.3.3-14 : Report condition information element

1) Report threshold level criteria (Octet 1)

Specifies the difference in reception level between the MS's home zone and the peripheral zone which is a condition for detecting a high electric field (in 2's complement binary format from -127 to 127 dB).

2) Threshold for the amount of state change (Octet 2)

Specifies the threshold used, from 0 to 255 dB, in binary, to determine if the reception level has changed from the previously reported level.

3) Level measurement time (Octet 3)

Specifies the number of reception level measurement frames per perch channel in binary (1 to 255).

4) Time interval criteria (Octet 4)

Specifies the time interval used for judging the strong electric field in binary in units of 100 ms (0 to 255 x 100 ms).

5) Periodical report time interval (Octet 5)

Specifies the periodical report time interval for the peripheral zone reception level in binary in units of 1 s (1 to 255 x 1 s).

Refer to Appendix C for peripheral zone supervision of mobile stations.

4.3.5.3.3.16 Perch channel number

The Perch channel number information element indicates the perch channel number of which level the mobile station supervises in the Standby state and when in communication for zone/sector decision. The mobile station has a matching table for the perch channel number and the frequency code number in permanent memory. This information element is shown in Fig. 4.3.5.3.3-15 and 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Perch channel number							

Perch channel number (Octet 1) is specified in binary (0 to 255).

Note : Refer to Section 4.1.10.1 (3) for a definition of a perch channel.

Fig. 4.3.5.3.3-15 : Perch channel number information element

4.3.5.3.3.17 Number of location registration areas

The Number of location registration areas information element shown in Fig. 4.3.5.3.3-16 below indicates the number of location registration areas which are multiplexed on the RF zone. This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Number of location registration groups				Number of multiplexed areas per group			

Number of location registration areas (Octet 1)

Bit 4	3	2	1		Number of multiplexed areas per group (N_1)
0	0	0	0	:	1
0	0	0	1	:	2
0	0	1	1	:	4
0	1	1	1	:	8
1	1	1	1	:	16

Bit 8	7	6	5		Number of location registration groups (N_2)
0	0	0	0	:	1
0	0	0	1	:	2
0	0	1	1	:	4
0	1	1	1	:	8
1	1	1	1	:	16

Number of location registration areas = N_1 x N_2 (1, 2, 4, 8, 16)

Fig. 4.3.5.3.3-16 : Number of location registration areas information element

Refer to Appendix F for details.

4.3.5.3.3.18 Slot number

The Slot number information element shown in Fig. 4.3.5.3.3-17 below represents the slot location for the radio channel.

This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare		Slot number					

Slot number (Octet 1)

Bit 6	5	4	3	2	1		Slot position		
0	0	0	0	0	1	:	Slot 0	Full rate	Half-rate
0	0	0	0	1	0	:	Slot 1	Full rate	Half-rate
0	0	0	1	0	0	:	Slot 2	Full rate	Half-rate
0	0	1	0	0	0	:	Slot 3		Half-rate
0	1	0	0	0	0	:	Slot 4		Half-rate
1	0	0	0	0	0	:	Slot 5		Half-rate
0	0	0	0	0	0	:	Slot (s) not specified		
0	0	0	0	1	1	:	Slots 0 and 1		
0	0	0	1	0	1	:	Slots 0 and 2		
0	0	0	1	1	0	:	Slots 1 and 2		
0	0	0	1	1	1	:	Slots 0, 1, and 2		

	Slot 0	Slot 1	Slot 2		• •		Slot 5	

Fig. 4.3.5.3.3-17 : Slot number information element

4.3.5.3.3.19 MS TX power assignment

The MS TX power assignment information element shown in Fig. 4.3.5.3.3-18 below represents the maximum transmission output and the initial transmission power for the mobile station in the pertinent RF zone during channel handover. This information element for the CCH specifies the maximum transmission output allowed for the MS in the Standby state on the pertinent RF zone (in this instance, the initial transmission power section is invalid). This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Initial transmission power				Maximum transmission power			

Maximum transmission power (Octet 1)

Indicates the maximum transmission power allowed for the MS. When the transmission power in excess of this setting is specified by the Power control for layer 1 during TCH connection, transmission power is automatically set to the value specified by this field.

Bit 4	3	2	1		Transmission power
*	0	0	0	:	3.0W
*	1	1	1	:	3.0W- 4dB/2.0W
*	1	1	0	:	3.0W- 8dB/2.0W- 4dB
*	1	0	1	:	3.0W-12dB/2.0W- 8dB
*	1	0	0	:	3.0W-16dB/2.0W-12dB
*	0	1	1	:	3.0W-20dB/2.0W-16dB
*	0	1	0	:	3.0W-24dB/2.0W-20dB
*	0	0	1	:	3.0W-28dB/2.0W -24dB

* Spare bit (0)

Initial transmission power (Octet 1)

Indicates the initial transmission power for the MS before it is changed by the transmission output control after TCH is set by Radio-channel Set or Handover Radio-channel Set message. The coding for bits is the same as that of the Maximum transmission power.

Fig. 4.3.5.3.3-18 : MS TX power assignment information element

4.3.5.3.3.20 Channel information

The Channel information information element shown in fig. 4.3.5.3.3-19 below is used for reporting the information on the channel when specifying the channel.

This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Telecommunications Operator defined area				Channel information			

Fig. 4.3.5.3.3-19 : Channel information information element

(1) Channel information (Octet 1)

Bit	1		
	0	:	Full-rate
	1	:	Half-rate

Bit	2		
	0	:	Normally uplink VOX control disabled
	1	:	Normally uplink VOX control enabled

Refer to Appendix H for details.

Bit	4	3		Ciphering type
	0	0	:	Telecommunications Operator defined ciphering
	0	1	:	Standard ciphering version 1
	Others		:	Reserved

(2) Telecommunications Operator defined area (Bits 8 - 5)

An area that can be defined freely and used by the Telecommunications operator. (Example: for the indication of hitless channel handover, operator defined ciphering type, version, etc.)

4.3.5.3.3.21 Maximum number of reporting channels

The maximum number of reporting channels information element shown in Fig. 4.3.5.3.3-20 below indicates the maximum number of channels reporting the reception level as a result of pertinent zone/peripheral zone supervision for the mobile station.

This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare			Maximum number of reporting channels				

Maximum number of reporting channels (Octet 1) is specified 0 to 20 in binary.

Refer to Appendixes C and D for details.

Figure 4.3.5.3.3-20 : Maximum number of reporting channels information element

4.3.5.3.3.22 Communication level

The Communication level information element shown in Fig. 4.3.5.3.3-21 below indicates the reception level for the zone where the MS can set for standby in each RF zone/sector.

This information element is 1 octet long.

Octet	Bit 8	7	6	5	4	3	2	1
1	Spare	Communication level						

Communication level (Octet 1) :

The same coding as "Reception level" in Section 4.3.5.3.3.6 is used.

Fig. 4.3.5.3.3-21 : Communication level information element

Refer to Appendix B for details.

4.3.5.3.3.23 Communication deteriorated level

The Communication deteriorated level information element shown in Fig. 4.3.5.3.3-22 below indicates the reception level at which a mobile station that has been set for the Standby state is judged to be deteriorated (out of zone).

This information element is 1 octet long.

Octet	Bit 8	7	6	5	4	3	2	1
1	Spare	Communication deteriorated level						

Communication deteriorated level (Octet 1) :

The same coding as "Reception level" in Section 4.3.5.3.3.6 is used.

Fig. 4.3.5.3.3-22 : Communication deteriorated level information element

Refer to Appendix B for details.

4.3.5.3.3.24 Extension information size

The Extension information size information element shown in Fig. 4.3.5.3.3-23 below represents the sum of the information length of such information elements as the operator specific information No. 1 and the operator specific information No. 2 added by the operator option and the extension standard information element to be added RCR STD-27 Revision F and later revision.

This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare	Extension information size						

Extension information size (Octet 1) : 0 - 127 in binary.

Fig. 4.3.5.3.3-23 : Extension information size information element

4.3.5.3.3.25 Network identity

The Network identity information element indicates the number which identifies the mobile telecommunications network provided by each telecommunication operator as indicated in Fig. 4.3.5.3.3-24.

The user can decide whether a particular operator option is valid or not, as well as whether roaming is permitted or not using this number. This information element is 2 octets long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare	Country number						
2	Operator group number				Network identity in group			

Fig. 4.3.5.3.3-24 : Network identity information element

The content of this information element is listed below.

(1) Country number (Octet 1) : Identifies country

Bit 7	6	5	4	3	2	1		Country
0	0	0	0	0	0	1	:	Japan
Others							:	Reserved

(2) Operator group number (Octet 2) : Binary numbers ranging from 0 to 15 which identify each operator group.

Bit 8	7	6	5		Operator group
0	0	1	0	:	NTT DoCoMo Group
0	1	0	1	:	IDO
0	1	1	1	:	Cellular Group
1	0	0	0	:	TU-KA Group
1	0	0	1	:	Digital Phone Group
1	0	1	0	:	Digital TU-KA Group
Others				:	Reserved

(3) Network identity in group (Octet 2) : Binary numbers ranging from 0 to 15 which identify the local network in the operator group.

4.3.5.3.3.26 BCCH reception period

The BCCH reception period information element shown in Fig. 4.3.5.3.3-25 below indicates the period during which the mobile station should receive the BCCH after the mobile station has received a message containing this information element.

This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare				BCCH reception period			

BCCH reception period (Octet 1) :

Indicates the number of superframes from 0 to 15 during which BCCH should be received.

Bit 4	3	2	1		
0	0	0	0	:	BCCH reception is unnecessary
0	0	0	1	:	Receives during 1-superframe length
	~				~
1	1	1	1	:	Receives during 15-superframe length

Fig. 4.3.5.3.3-25 : BCCH reception period information element

Refer to Appendix G for details.

4.3.5.3.3.27 Number of paging MSs

The Number of paging MSs information element shown in Fig. 4.3.5.3.3-26 below indicates the number of voice paging MSs included in one paging message in which this information element is contained.

This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare				Number of paging MSs			

Number of paging MSs (Octet 1) : 0 to 15 in binary.

Fig. 4.3.5.3.3-26 : Number of paging MSs information element

4.3.5.3.3.28 VOX control information

The VOX control information element in the VOX Control message sent from the network to the user is used to specify whether the VOX function is enabled or prohibited during call in progress. The VOX control information in the VOX Control Acknowledgment message is used for reporting acknowledgment for the setting of the VOX function specified by the VOX control message to the network and returns the network command as it is. The VOX Control information element is shown in Fig. 4.3.5.3.3-27 below.

This information element is 1 octet long.

Octet	Bit 8	7	6	5	4	3	2	1
1	Spare							VOX control information

VOX control information (Octet 1)

Bit 1		VOX control information
0	:	VOX prohibited
1	:	VOX enabled

Fig. 4.3.5.3.3-27 : VOX control information information element

Refer to Appendix H

4.3.5.3.3.29 Location registration timer

The Location registration timer information element shown in Fig. 5.3-28 below indicates initial timer value after the power for the mobile station is turned on until the mobile station performs its first periodical local registration on the network. It also indicates repeating cycle timer value for the mobile station to perform periodical, location registration. This information element is 1 octet long.

Octet	Bit 8	7	6	5	4	3	2	1
1	Repeating cycle timer value					Initial timer value		

Fig. 4.3.5.3.3-28 : Location registration timer information element

The content of this information element shall be as indicated below.

(1) Initial timer (Octet 1)

Specifies the time period from when the power for the MS is turned on until it performs the first periodical location registration.

Bit 3 2 1		Initial timer value
0 0 0	:	Timer does not start
0 0 1	:	1 min.
|	:	|
1 1 0	:	6 min.
1 1 1	:	Timer does not start. Location registration starts immediately.

(2) Repeating cycle timer (Octet 1)

Indicates the time interval by which the MS performs location registration periodically after the MS performs the first periodical location registration after the power for the MS is turned ON.

Bit 8 7 6 5 4		Repeating cycle timer
0 0 0 0 0	:	Timer does not start
0 0 0 0 1	:	10 min.
|		|
1 1 1 1 1	:	310 min.

4.3.5.3.3.30 Frequency band

The Frequency band information element specifies the frequency bands of the physical channels which the MS can support and is shown in Fig.4.3.5.3.3-29. This information element is 2 octets long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Frequency band							
2	Spare							*1

*1: Frequency band

The MS indicates that it is possible to communicate using the physical channels of the band corresponding to each bit which is set to "1". The MS which supports multiple frequency bands sets each bit corresponding to a supported band to "1".

Note that mobile stations which are capable of communication on the band corresponding to Bit 6 of octet 1 must also be capable of communication on the band corresponding to Bit 5 of octet 1.

Furthermore, mobile stations which are capable of communication on the band corresponding to Bit 7 of octet 1, Bit 8 of octet 1 and/or Bit 1 of octet 2 must also be capable of communication on the band corresponding to Bit 1 of octet 1 and/or Bit 2 of octet 1.

Octet 1

Bit 1
- 0 : Transmission band ; 940.0-956.0 MHz Reception band ; 810.0-826.0 MHz MS not supporting
- 1 : Transmission band ; 940.0-956.0 MHz Reception band ; 810.0-826.0 MHz MS supporting

Bit 2
- 0 : Transmission band ; 1429.0-1453.0 MHz
  Reception band ; 1477.0-1501.0 MHz MS not supporting
- 1 : Transmission band ; 1429.0-1453.0 MHz
  Reception band ; 1477.0-1501.0 MHz MS supporting

Bit 3
- 0 : Transmission band ; 925.0-940.0 MHz Reception band ; 870.0-885.0 MHz MS not supporting
- 1 : Transmission band ; 925.0-940.0 MHz Reception band ; 870.0-885.0 MHz MS supporting

Bit 4
- 0 : Transmission band ; 956.0-958.0 MHz Reception band ; 826.0-828.0 MHz MS not supporting
- 1 : Transmission band ; 956.0-958.0 MHz Reception band ; 826.0-828.0 MHz MS supporting

Bit 5
- 0 : Transmission band ; 893.0-895.0 MHz Reception band ; 838.0-840.0 MHz MS not supporting
- 1 : Transmission band ; 893.0-895.0 MHz Reception band ; 838.0-840.0 MHz MS supporting

Bit 6
0 : Transmission band ; 895.0-898.0 MHz Reception band ; 840.0-843.0 MHz MS not supporting
1 : Transmission band ; 895.0-898.0 MHz Reception band ; 840.0-843.0 MHz MS supporting

Bit 7
0 : Transmission band ; 1429.0-1439.0 MHz and 1465.0-1468.0 MHz Reception band ; 1477.0-01487.0 MHz and 1513.0-1516.0 MHz not supporting
1 : Transmission band ; 1429.0-1439.0 MHz and 1465.0-1468.0 MHz Reception band ; 1477.0-01487.0 MHz and 1513.0-1516.0 MHz supporting

Bit 8
0 : Transmission band ; 1439.0-1443.0 MHz and 1465.0-1468.0 MHz Reception band ; 1487.0-01491.0 MHz and 1513.0-1516.0 MHz not supporting
1 : Transmission band ; 1439.0-1443.0 MHz and 1465.0-1468.0 MHz Reception band ; 1487.0-01491.0 MHz and 1513.0-1516.0 MHz supporting

Octet 2
Bit 1
0 : Transmission band ; 1443.0-1453.0 MHz and 1465.0-1468.0 MHz Reception band ; 1491.0-1501.0 MHz and 1513.0-1516.0 MHz not supporting
1 : Transmission band ; 1443.0-1453.0 MHz and 1465.0-1468.0 MHz Reception band ; 1491.0-1501.0 MHz and 1513.0-1516.0 MHz supporting

Bit spare : Transmission band ; 887.0-889.0 MHz   Reception band ; 832.0-834.0 MHz
Bit spare : Transmission band ; 898.0-901.0 MHz   Reception band ; 843.0-846.0 MHz
Bit spare : Transmission band ; 915.0-925.0 MHz   Reception band ; 860.0-870.0 MHz

Fig. 4.3.5.3.3-29 : Frequency band information element

4.3.5.3.3.31 Channel restriction information

The channel restriction information information element is used for notifying the mobile station of the packet channel restriction information in the same RF zone and is coded as shown in Fig. 4.3.5.3.3-30 below. This information element is 1 octet in length.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Channel restriction information							

Channel restriction information (Octet 1) :

Bit 8	7	6	5	4	3	2	1	:	Channel restriction information Maintenance	Priority	General
0	0	0	0	0	0	0	0	:	No restriction	No restriction	No restriction
0	0	0	0	0	0	0	1	:	No restriction	No restriction	12.5%
0	0	0	0	0	0	1	1	:	No restriction	No restriction	25.0%
0	0	0	0	0	1	0	1	:	No restriction	No restriction	37.5%
0	0	0	0	0	1	1	1	:	No restriction	No restriction	50.0%
0	0	0	0	1	0	0	1	:	No restriction	No restriction	62.5%
0	0	0	0	1	0	1	1	:	No restriction	No restriction	75.0%
0	0	0	0	1	1	0	1	:	No restriction	No restriction	87.5%
0	0	0	0	1	1	1	1	:	No restriction	No restriction	100%
0	1	1	1	1	1	1	1	:	No restriction	100%	100%
1	1	1	1	1	1	1	1	:	100%	100%	100%

Fig. 4.3.5.3.3-30 : Channel restriction information

4.3.5.3.3.32 Terminal registration area code (packet communication registration number)

The terminal registration area code information element is used for notifying the mobile station of the terminal registration area to which the RF zone belongs and is coded as shown in Fig. 4.3.5.3.3.-31 below. This information element is 1 octet in length.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Terminal registration area code							

Terminal registration area code (Octet 1) : A binary number within the range from 0 to 255.

Fig. 4.3.5.3.3-31 : Terminal registration area code information element

4.3.5.3.3.33 Zone service information

The zone service information information element is used for notifying the mobile station of the service state in the current zone and peripheral zone. The peripheral zone information indicates whether or not a packet channel exists in the zone corresponding to the perch channel notified by the number of perch channels in the Broadcast Information message, while the PCH packet paging information indicates whether or not PCH packet paging is performed in the current zone. Also, virtual circuit connection enable/disable information indicates whether or not the network supports virtual circuit connection. This information element is coded as shown in Fig. 4.3.5.3.3.32 and is 3 octets in length.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Peripheral zone information (1 - 8)							
2	Peripheral zone information (9 -16)							
3	*1	*2	Spare		Peripheral zone information (17 - 20)			

*1 : PCH packet paging information
*2 : Virtual circuit connection enable/disable

(1) Peripheral zone information (Octets 1 - 3) :

Each Bit
0 : Not present
1 : Present

(2) PCH packet paging information (Octet 3) :

Bit 8	PCH packet paging information
0	No paging
1	Paging

(3) Virtual circuit connection enable/disable (Octet 3) :

Bit 7	Virtual circuit connection enable/disable
0	Virtual circuit connection disable
1	Virtual circuit connection enable

Note : Bit 1 of Octet 1 and Bit 4 of Octet 3 indicate the first and the 20th perch channel, respectively.

Fig. 4.3.5.3.3-32 : Zone service information element

4.3.5.3.3.34 Packet user registration timer value

The packet user registration timer value information element indicates the initial timer value for initial location registration on the network after the power for the mobile station is turned ON and the repeating cycle timer value for periodical location registration after the mobile station performs the initial location registration after the power for the mobile station is turned ON. This information element is coded as shown in Fig. 4.3.5.3.3-33 and is 1 octet in length.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Repeating cycle timer value					Initial timer value		

Fig. 4.3.5.3.3-33 : Packet user registration timer value information element

The contents of the information element is as listed below:

(1) Initial timer value (Octet 1) :

The initial timer value specifies the duration of time after the power for the mobile station is turned ON until it performs the initial location registration on the network.

Bit 3	2	1		Initial timer value
0	0	0	:	Timer does not start
0	0	1	:	1 min
	.			
1	1	0	:	6 min
1	1	1	:	Timer does not start; performs location registration immediately

(2) Repeating cycle timer value (Octet 1) :

The repeating cycle timer value specifies the interval at which periodical location registration is performed after the mobile station performs the initial location registration.

Bit 8	7	6	5	4		Repeating cycle timer value
0	0	0	0	0	:	Timer does not start
0	0	0	0	1	:	10 min
		.				
1	1	1	1	1	:	310 min

4.3.5.3.3.35 Operation probability

The operation probability information element indicates the probability for switching channels by the mobile station when a packet channel change is requested. This information element is coded as shown in Fig. 4.3.5.3.3-34 below and is 1 octet in length.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare	Operation Probability						

Operation probability (Octet 1) : A binary number (from 0 to 100%)

Fig. 4.3.5.3.3-34 : Operation probability information element

4.3.5.3.3.36 Retransmission identifier

The retransmission identifier information element is used to detect whether the signal received by the mobile station was retransmitted or not. In cases when the mobile station receives the "packet system information report" message and the contents of this message are identical to those of the previously received message and it also has the identical retransmission identifier, the mobile station does not perform the corresponding operation, even if it receives the signal. This information element is coded as shown in Fig. 4.3.5.3.3-35 below and is 1 octet in length.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Retransmission identifier							

Retransmission identifier (Octet 1) : A binary number (from 0 to 255)

Fig. 4.3.5.3.3-35 : Retransmission identifier information element

4.3.5.3.3.37 Packet paging area code multiplex number

The packet paging area code multiplex number information element indicates the number of location registration areas that are multiplexed in the RF zone. This information element is coded as shown in Fig. 4.3.5.3.3-36 below and is 1 octet in length.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Packet paging area grouping number				Multiplex number in group			

Packet paging area code multiplex number (Octet 1) :

Bit 4	3	2	1	:	Multiplex number in group
0	0	0	0	:	1
0	0	0	1	:	2
0	0	1	1	:	4
0	1	1	1	:	8
1	1	1	1	:	16

Bit 8	7	6	5	:	Packet paging area grouping number
0	0	0	0	:	1
0	0	0	1	:	2
0	0	1	1	:	4
0	1	1	1	:	8
1	1	1	1	:	16

Packet paging area code multiplex number = Multiplex number in group x Packet paging area grouping number, (1, 2, 4, 8 or 16)

Fig. 4.3.5.3.3-36 : Packet paging area code multiplex number information element

4.3.5.3.3.38 Packet paging area code

The packet paging area code information element is an identification number which identifies the packet paging area in the zone in which the mobile station is currently located. This information element is coded as shown in Fig. 4.3.5.3.3-37 below and is 1 octet in length.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Packet paging area code							

Packet paging area code (Octet 1) : A binary number within a range of 0 to 255 which identifies the packet paging area in which the mobile station is currently located.

Fig. 4.3.5.3.3-37 : Packet paging area code information element

4.3.5.3.3.39 Packet channel structure information

The packet channel structure information element is used for notifying the mobile station of the packet communication physical channel structure information. This information element is coded as shown in Fig. 4.3.5.3.3-38 below and is 5 octets in length.

Octet \ Bit	8	7	6	5	4	3	2	1
1	*1	*3	Spare	*2	‹— N_{PC} —›			
2	Spare		‹— G_{PO} —›					
3	Spare		‹— N_{GC} —›					
4	N_{WP}/N_{GP}							
5	N_{GR}				I_{GR} designation			

*1 : Reception group selection algorithm information
*2 : Functional channel selection algorithm assignment
*3 : Packet restriction condition

N_{PC} : Number of packet physical channels in the cell (0 to 9) (the sum of packet physical channels in all radio channels in the cell)
G_{PO} : Top subframe number of the 1st paging notification group (0 to 35)
N_{GC} : Number of common information notification transmission start timings in one superframe ($N_{GC} \geq 1$)
N_{WP} : Number of subframes for allocating paging notification groups in one superframe (multiple of N_{GP})
N_{GP} : Number of paging notification groups in N_{WP}
N_{GR} : Number of intermittent signal transmission start timings of one intermittent reception group ($N_{GR} \geq 1$)
I_{GR} : Subframe interval with which the intermittent reception groups are separated (divisor of $36/N_{GR}$)

(1) N_{GC} coding

Bit	6	5	4	3	2	1		N_{GC}
	0	0	0	0	0	1	:	1
	0	0	0	0	1	0	:	2
	0	0	0	0	1	1	:	3
	0	0	0	1	0	0	:	4
	0	0	0	1	1	0	:	6
	0	0	1	0	0	1	:	9
	0	0	1	1	0	0	:	12
	0	1	0	0	1	0	:	18
	1	0	0	1	0	0	:	36
	Others						:	Reserved

Bit	8	7	6	5	4	3	2	1		N_{GP}	N_{WP}
	0	0	0	0	0	0	0	0	:	1	-
	0	0	0	0	0	0	0	1	:	2	2
	0	0	0	0	0	0	1	0	:	2	4
					.					.	.
	0	0	0	1	0	0	1	0	:	2	36
	0	0	0	1	0	0	1	1	:	3	3
	0	0	0	1	0	1	0	0	:	3	6
					.						.
	0	0	0	1	1	1	1	0	:	3	36
	0	0	0	1	1	1	1	1	:	4	4
	0	0	1	0	0	0	0	0	:	4	8
					.					.	.
	0	0	1	0	0	1	1	1	:	4	36
	0	0	1	0	1	0	0	0	:	5	5
	0	0	1	0	1	0	0	1	:	5	10
					.					.	.
	0	0	1	0	1	1	1	0	:	5	35
	0	0	1	0	1	1	1	1	:	6	6
	0	0	1	1	0	0	0	0	:	6	12
					.					.	.
	0	0	1	1	0	1	0	0	:	6	36
	0	0	1	1	0	1	0	1	:	7	7
	0	0	1	1	0	1	1	0	:	7	14
					.					.	.
	0	0	1	1	1	0	0	1	:	7	35
	0	0	1	1	1	0	1	0	:	8	8
	0	0	1	1	1	0	1	1	:	8	16
					.					.	.
	0	0	1	1	1	1	0	1	:	8	32
	0	0	1	1	1	1	1	0	:	9	9
	0	0	1	1	1	1	1	1	:	9	18
					.					.	.
	0	1	0	0	0	0	0	1	:	9	36
	0	1	0	0	0	0	1	0	:	10	10
	0	1	0	0	0	0	1	1	:	10	20
	0	1	0	0	0	1	0	0	:	10	30
	0	1	0	0	0	1	0	1	:	11	11

0	1	0	0	0	1	1	0	:	11	22
0	1	0	0	0	1	1	1	:	11	33
0	1	0	0	1	0	0	0	:	12	12
0	1	0	0	1	0	0	1	:	12	24
0	1	0	0	1	0	1	0	:	12	36
0	1	0	0	1	0	1	1	:	13	13
0	1	0	0	1	1	0	0	:	13	26
0	1	0	0	1	1	0	1	:	14	14
0	1	0	0	1	1	1	0	:	14	28
0	1	0	0	1	1	1	1	:	15	15
0	1	0	1	0	0	0	0	:	15	30
0	1	0	1	0	0	0	1	:	16	16
0	1	0	1	0	0	1	0	:	16	32
0	1	0	1	0	0	1	1	:	17	17
0	1	0	1	0	1	0	0	:	17	34
0	1	0	1	0	1	0	1	:	18	18
0	1	0	1	0	1	1	0	:	18	36
0	1	0	1	0	1	1	1	:	19	19
0	1	0	1	1	0	0	0	:	20	20
				.					.	.
0	1	1	0	1	0	0	0	:	36	36
	Others							:	Reserved	

(3) NGR coding

Bit	8	7	6	5		NGR
	0	0	0	0	:	1
	0	0	0	1	:	2
	0	0	1	0	:	3
	0	0	1	1	:	4
	0	1	0	0	:	6
	0	1	0	1	:	9
	0	1	1	0	:	12
	0	1	1	1	:	18
	1	0	0	0	:	Active intermittent reception not provided
	Others				:	Reserved

(4) IGR designate coding

Bit	4	3	2	1		IGR designation
	0	0	0	0	:	Designation 1
	0	0	0	1	:	Designation 2
	0	0	1	0	:	Designation 3
	0	0	1	1	:	Designation 4
	0	1	0	0	:	Designation 5
	0	1	0	1	:	Designation 6
	0	1	1	0	:	Designation 7
	0	1	1	1	:	Designation 8
	1	0	0	0	:	Designation9
	Others				:	Reserved

I_{GR} is determined as below :

NGR / IGR designation	1	2	3	4	6	9	12	18
Designation 1	1	1	1	1	1	1	1	1
Designation 2	2	2	2	3	2	2	3 (Note 1)	2 (Note 1)
Designation 3	3	3	3	9 (Note 1)	3	4 (Note 1)	—	—
Designation 4	4	6	4	-	6 (Note 1)	-	-	-
Designation 5	6	9	6	-	-	-	-	-
Designation 6	9	18 (Note 1)	12 (Note 1)	-	-	-	-	-
Designation 7	12	-	-	-	-	-	-	-
Designation 8	18							
Designation 9	36 (Note 1)	-	-	-	-	-	-	-

Note 1 : Patterns which could occur in one intermittent reception group per superframe.

(5) Reception group selection algorithm information (Octet 1)

<u>Bit 8 Reception group selection algorithm information</u>
0 : Algorithm B not provided
1 : Algorithm B provided

(6) Functional channel selection algorithm assignment (Octet 1)

<u>Bit 5 Functional channel selection algorithm assignment</u>
0 : Algorithm 1 assigned
1 : Algorithm 2 assigned

(7) Packet data restriction condition(Octet 1)

<u>Bit 7 Packet restriction condition</u>
0 : Refer to the restriction condition.
1 : Not refer to the restriction condition.

Fig. 4.3.5.3.3-38 : Packet channel structure information information element

4.3.5.3.3.40 Common information reception segment length

The common information reception segment length information element indicates the segment in which the mobile station should receive common information after reception of the message containing this information element. It is coded as shown in Fig. 4.3.5.3.3-39 below and is 1 octet in length.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare				Common information reception segment length			

Common information reception segment length (Octet 1) : Indicates the number of superframes wherein common information is received.

Bit 4 3 2 1		Common information reception segment length
0 0 0 0	:	Reception of common information is unnecessary
0 0 0 1	:	Reception only in one superframe segment
.		
1 1 1 1	:	Reception in 15-superframe segments

Fig. 4.3.5.3.3-39 : Common information reception segment length information element

4.3.5.3.3.41 Number of zones for which information is requested

The Number of zones for which information is requested information element indicates the number of zones for which information is requested. This information element is coded as shown in Fig. 4.3.5.3.3-40 below and is 1 octet in length.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare			Number of zone information requests				

Number of zone information requests (Octet 1) : A binary number within the range from 1 to 12.

Note : By this information element, information on the current zone as well as on the peripheral zones can be requested.

Fig. 4.3.5.3.3-40 : Number of zone information requests information element

4.3.5.3.3.42 Number of reported zones

The Number of reported zones information element indicates the number of zone information reported. This information element is coded as shown in Fig. 4.3.5.3.3-41 below and is 1 octet in length.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare			Number of reported zones				

Number of reported zones (Octet 1) : A binary number within a range of 0 to 12.

Note : When no zone information is reported, "0" is set for this information element.

Fig. 4.3.5.3.3-41 : Number of reported zones information element

4.3.5.3.3.43 Number of packet paging mobile stations

The Number of packet paging mobile stations information element indicates the number of mobile stations to be paged which are included in a paging message containing this information element. This information element is coded as shown in Fig. 4.3.5.3.3-42 below and is 1 octet in length.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare				Number of packet paging mobile stations			

Number of packet paging mobile stations (Octet 1) : The number of mobile stations to be paged by packet paging is indicated by a binary number within a range of 0 to 15.

Fig. 4.3.5.3.3-42 : Number of packet paging mobile stations information element

4.3.5.3.3.44 Packet system timer

The Packet system timer information element includes the information on the timers used for packet communication. This information element is used by the network to designate the packet cycle registration timer, the packet channel registration response wait timer value, or the packet communication deregistration response wait timer value for executing the packet channel registration procedure for the user when signals are not transmitted/received for a fixed period of time. This information element is coded as shown in Fig. 4.3.5.3.3-43 below and is 1 octet in length.

Octet \ Bit	8	7	6	5	4	3	2	1
1	*2	*1	Spare	Packet cycle registration timer				

* 1: TM309 (Packet communication deregistration response wait timer value)
* 2: TM308 (Packet channel registration response wait timer value)

Fig. 4.3.5.3.3-43 : Packet system timer information element

(1) Packet cycle registration timer (Octet 1)

Bit 5	4	3	2	1		Packet cycle registration timer
0	0	0	0	0	:	Timer does not start
0	0	0	0	1	:	10 min
		.				
1	1	1	1	1	:	310 min

(2) Packet communication deregistration response wait timer value (Octet 1)

Bit 7		TM309
0	:	2 s
1	:	6 s

(3) Packet channel registration response wait timer (Octet 1)

Bit 7		TM308
0	:	2 s
1	:	6 s

4.3.5.3.3.45 Extension standard information size

The Extension standard information size information element shown in Fig. 4.3.5.3.3-44 below represents the sum of the information length of the extension standard information element added in RCR STD 27 Revision F and later revisions.
This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare	Extension standard information size						

Extension standard information size (Octet 1) : 0 – 121 in binary

Fig. 4.3.5.3.3-44 : Extension standard information size information element

4.3.5.3.3.46 Packet standby permitted level difference

The Packet standby permitted level difference information element shown in Fig. 4.3.5.3.3-45 below represents the reception level difference between the zone available for voice communication only and zones available for packet communication, by which the network may allow the user to select a zone to stand by for packet communication.
This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Packet standby permitted level difference							

Packet standby permitted level difference : two's complement (-127 – 127 dB)

Fig. 4.3.5.3.3-45 : Packet standby permitted level difference information element

4.3.5.3.3.47 System information indication

The System information indication information clement shown in Fig. 4.3.5.3.3.46 indicates whether or not system information is included in the UPCH voice paging message.
This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare							*1

*1 : System information existence

The content of this information element shall be as indicated below.

(1) System information existence

Bit 1		System information existence
0	:	System information does not exist
1	:	System information exists

Fig. 4.3.5.3.3-46 : System information indication information element

4.3.5.3.3.48 Voice paging condition

The Voice paging condition information element is used for notifying the network whether the user transfers from the mode on UPCH to voice paging procedure or the user rejects voice paging to continue the state on UPCH, if the network notifies the user, which is in packet communication mode or packet standby mode of voice paging.

This information element is coded as shown in Fig. 4.3.5.3.3.47 below and is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare							*1

*1 : Voice paging acceptance/rejection

The content of this information element shall be as indicated below.

(1) Voice paging acceptance/rejection

Bit 1		Voice paging acceptance/rejection
0	:	Voice paging rejection
1	:	Voice paging acceptance

Fig. 4.3.5.3.3-47 : Voice paging condition information element

4.3.5.3.3.49 UPCH paging connection timer

The UPCH paging connection timer information element is the information for the network to designate the timer value of TR334 on user side and the number of retransmissions when the voice paging connection is performed on UPCH through the Voice Terminating Method 2. The coding of this information element is indicated in Fig. 4.3.5.3.3-48. This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Number of retransmissions			Timer value				

(1) Number of retransmissions (Octet 1)

Bit 8	7	6		
0	0	0	:	No retransmission
0	0	1	:	1 time
0	1	0	:	2 times
	•		:	•
1	1	0	:	6 times
1	1	1	:	Reserved

(2) Timer value (Octet 1)

Bit 5	4	3	2	1		
0	0	0	0	0	:	Reception connection not provided
0	0	0	0	1	:	1 s
0	0	0	1	0	:	2 s
		•			•	
1	1	1	1	0	:	30 s
1	1	1	1	1	:	Reserved

Note: The mobile station must not send UPCH Paging Condition Report when this value is set.

Fig. 4.3.5.3.3-48 : UPCH Paging Connection Timer information element

4.3.5.3.3.50 Calling party number

The Calling party number information element is used to identify the originator of a call as indicated in Fig. 4.3.5.3.3-49. The maximum length of this information element is 15 octets.

<table>
<tr><th>Octet</th><th>Bit 8</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th></tr>
<tr><td>1</td><td colspan="8">Length of calling party number contents</td></tr>
<tr><td>2</td><td>1</td><td colspan="3">Type of number</td><td colspan="4">Numbering plan identifier</td></tr>
<tr><td></td><td>*1</td><td colspan="3">Cause of no presentation</td><td colspan="2">Presentation indicator</td><td colspan="2">Network Screening Indicator</td></tr>
<tr><td></td><td colspan="4">2nd digit</td><td colspan="4">1st digit</td></tr>
<tr><td></td><td colspan="8"></td></tr>
<tr><td>n-1</td><td colspan="4">(2n-8) th digit</td><td colspan="4">(2n-9) th digit</td></tr>
<tr><td>n</td><td colspan="4">Filler (in case of odd number)</td><td colspan="4">(2n-7) th digit</td></tr>
</table>

*1 odd/even number indication

Note: In case the presentation indicator has no number to present due to disability of presentation or interconnection conditions, "0" is set for odd/even number indication and numbering plan identifier and Octets 4 to n are omitted.

Fig. 4.3.5.3.3-49 : Calling Party Number information element

The content of the information elements is as follows.

(1) Type of number (Octet 2) (Note 1)

Bit	7	6	5		Type of number
	0	0	0	:	Unknown (Note 2)
	0	0	1	:	International number (Note 3)
	0	1	0	:	National number (Note 3)
	0	1	1	:	Network defined number (Note 4)
	1	0	0	:	Local number (Note 3)
	1	1	0	:	Abbreviated number
	Others			:	Reserved

Note 1: Refer to ITU-T Rec. I.330 for the definitions of international, national and local numbers.

Note 2: Number type "unknown" is used for the user or network for which the number type such as international numbers, national numbers, etc. cannot be recognized. In this instance, the number digit field is structured according to the dialing procedure for the network; e.g., prefix or escape digits might be present.

Note 3: Prefix or escape digits are not included.

Note 4: The number type "network defined number" is used to indicate administration numbers or service numbers defined by the network. E.g., this number type is used to access an operator.

(2) Numbering plan identifier (Octet 2)

Bit	4	3	2	1		Numbering plan identifier
	0	0	0	0	:	Unknown (Note)
	0	0	0	1	:	ISDN/telephone numbering plan (Rec. E.164/E.163)
	0	0	1	1	:	Data numbering plan (Rec. X.121)
	0	1	0	0	:	Telex numbering plan (Rec. F.69)
	1	0	0	0	:	National numbering plan
	1	0	0	1	:	Private network numbering plan
	Others					Reserved

Note: The numbering plan identifier "unknown" is used when the user or network cannot recognize the numbering plan. In this instance, the number digit field is structured according to the dialing procedure on the network; e.g., prefix or escape digits might be present.

(3) Presentation indicator (Octet 3)

Bit	4	3		Presentation indicator
	0	0	:	Presentation allowed
	0	1	:	Presentation restricted
	1	0	:	No number displayed under interconnection conditions
	1	1	:	Reserved

Note: The presentation indicator is used to indicate whether the calling user wishes to display the calling party number to the called user over the originating user network interface. This may be required on a subscription basis.

(4) Network screening indicator (Octet 3)

Bit	2	1		Network Screening indicator
	0	0	:	User provided, not screened
	0	1	:	User provided, with network check, passed
	1	0	:	User provided, verified and failed
	1	1	:	Network provided

Note: The screening indicator indicates whether the calling party number is reported by the calling user or the network provides and reports the calling party number when the calling party number is presented to the called party.

(5) Odd/even indication (Octet 3)

Bit	8		Odd/even indication
	0	:	Even (when the number of digits is an even number)
	1	:	Odd (when the number of digits is an odd number)

(6) Cause of the calling party number not presented (Octet 3)

Bit	7	6	5		Cause of the calling party number not presented
	0	0	0	:	No cause of "non-presentation"
	0	0	1	:	Non-presentation due to user rejection
	0	1	0	:	Non-presentation due to conflict with other services
	0	1	1	:	Non-presentation due to origination from a public telephone
	1	0	0	:	Non-presentation due to unavailability of service
	Others				Reserved

(7) Numbering digits (Octet 4 - n)

Bit	4	3	2	1		(or 8 7 6 5)	4	3	2	1		(or 8 7 6 5)
	1	0	1	0	:	0	0	1	1	0	:	6
	0	0	0	1	:	1	0	1	1	1	:	7
	0	0	1	0	:	2	1	0	0	0	:	8
	0	0	1	1	:	3	1	0	0	1	:	9
	0	1	0	0	:	4	1	0	1	1	:	*
	0	1	0	1	:	5	1	1	0	0	:	#
							0	0	0	0	:	Filler
							Others					Reserved

4.3.5.3.3.51 Termination response information

The Termination response information information element is used when the user does not make the voice terminating connection and requests the network to make a deflection after receiving the voice paging report through Voice Terminating Method 2. The coding of this information element is as indicated in Fig. 4.3.5.3.3-50. This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare				Termination response information			

(1) Termination Response Information (Octet 1)

Bit	4	3	2	1		
	0	0	0	0	:	Other party disconnect
	0	0	0	1	:	Forwarded (without announcement)
	0	0	1	0	:	Forwarded (with announcement)
	0	0	1	1	:	Voice recording
	Others				:	Reserved

Fig. 4.3.5.3.3-50 Termination Response Information information element

4.3.5.3.3.52 Termination response acknowledgement information

The Termination response acknowledgement information information element is used to report to the user regarding the service provided by the network in relation to the service requested by the user through UPCH Voice Paging 2 response. The coding of this information element is indicated in Fig. 4.3.5.3.3-51. This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare				Termination response acknowledgement information			

(1) Termination Response Acknowledgement Information (Octet 1)

Bit	4	3	2	1		
	0	0	0	0	:	Other party disconnect
	0	0	0	1	:	Forwarded (without announcement)
	0	0	1	0	:	Forwarded (with announcement)
	0	0	1	1	:	Voice recording
	1	1	1	1	:	Re-response request
	Others				:	Reserved

Fig. 4.3.5.3.3-51 Termination Response Acknowledgement Information information element

4.3.5.3.3.53 Traffic channel connection information

The Traffic channel connection information information element is used to report the information on the TCH communication connection for users who wish to connect from the UPCH to the TCH by the Paging Method 2. The coding of this information element is as indicated in Fig. 4.3.5.3.3-52. This information element runs through Octets 1 - 9.

Bit	8	7	6	5	4	3	2	1
Octet 1	Spare							*1
Octet 2	Random pattern							
Octet 3								
Octet 4								
Octet 5								
Octet 6								
Octet 7								
Octet 8								
Octet 9	Random pattern							

Random pattern : present/not present

(1) Random pattern present/not present (Octet 1)

Bit 1
0 : Not present
1 : Present

(2) Random pattern (Octets 2 - 9)

The random pattern exists when Bit 1 of Octet 1 is "1". For details, refer to "Annex 1: Authentication, Ciphering and Subscriber Data Registration Standard for the Personal Digital Cellular Telecommunication System."

Fig. 4.3.5.3.3-52 Traffic channel connection information information element

4.3.5.3.3.54 Operator specific information

This information element indicates an area which can be defined by each operator freely and is coded as shown in Fig. 4.3.5.3.3-53 below. This information element has variable length.

Bit Octet	8	7	6	5	4	3	2	1
1	Operator specific information element length							
2 ~	Operator specific area							

Fig. 4.3.5.3.3-53 : Operator specific information information element

The contents of this information element are as follows:

(1) Operator specific information information element length (Octet 1)

Indicates the length of the information element for octet 2 and lower octets in binary (0 - 127).

4.3.5.3.3.55 Speech coding method capability notification

The Speech coding method capability notification is an information element used to notify the network of the speech coding method capability of the mobile station and is coded as shown in Fig.4.3.5.3.3-54. This information element has a variable length.

Octet	Bit 8	7	6	5	4	3	2	1
1	0/1 ext				*4	*3	*2	*1

*1 : VSELP codec capable/incapable
*2 : PSI-CELP codec capable/incapable
*3 : CS-ACELP codec capable/incapable
*4 : ACELP codec capable/incapable

The content of the information element is as follows.

(1) VSELP codec capable/incapable (Octet 1)

Bit 1	VSELP codec capable/incapable
0	: Reserved
1	: Capable

(2) PSI-CELP codec capable/incapable (Octet 1)

Bit 2	PSI-CELP codec capable/incapable
0	: Reserved
1	: Capable

(3) CS-ACELP codec capable/incapable (Octet 1)

Bit 3	CS-ACELP codec capable/incapable
0	: Incapable
1	: Capable

(4) ACELP codec capable/incapable (Octet 1)

Bit 4	ACELP codec capable/incapable
0	: Incapable
1	: Capable

Figure4.3.5.3.3-54 Speech coding method capability notification

4.3.5.3.3.56 Speech coding method assignment

The Speech coding method assignment is an information element used for assigning the speech coding method to the mobile station and is coded as shown in Fig. 4.3.5.3.3-55. This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Speech coding method assignment							

Speech coding method assignment (Octet1)

Bit 8	7	6	5	4	3	2	1		Speech coding method assignment
0	0	0	0	0	0	0	0	:	VSELP codec
0	0	0	0	0	0	0	1	:	PSI-CELP codec
0	0	0	0	0	0	1	0	:	CS-ACELP codec
0	0	0	0	0	0	1	1	:	ACELP codec
Others									Reserved

4.3.5.3.3.57 UPCH maximum transmission power

The UPCH maximum transmission power is used to notify the mobile station of the maximum transmission power permitted in the zone to which the mobile station in the packet communication state has switched without receiving Broadcast Information message. This information is coded as shown in Fig. 4.3.5.3.3-56. This information element has variable length.

Octet \ Bit	8	7	6	5	4	3	2	1
1	2nd zone				1st zone			
n	2n th zone				(2n-1) th zone			

Fig. 4.3.5.3.3-56 UPCH maximum transmission power information element

Bit 4 3 2 1 (or 8 7 6 5)		Transmission power
* 0 0 0	:	3.0W/filler (Note)
* 1 1 1	:	3.0W-4dB/2.0W
* 1 1 0	:	3.0W-8dB/2.0W-4dB
* 1 0 1	:	3.0W-12dB/2.0W-8dB
* 1 0 0	:	3.0W-16dB/2.0W-12dB
* 0 1 1	:	3.0W-20dB/2.0W-16dB
* 0 1 0	:	3.0W-24dB/2.0W-20dB
* 0 0 1	:	3.0W-28dB/2.0W-24dB

* : spare bit (0)

Note: If the number of notification zones is an odd number, a filler shall be set for bits 8 to 5 of the last octet.

4.3.5.3.3.58 Number of extended channels

The Number of extended channels means the packet physical channels notified to each mobile station when necessary. This information element indicates the number of extended channels in the current zone and is coded as shown in Fig.4.3.5.3.3-57 below. This information element has a variable length.

Octet \ Bit	8 7 6 5	4 3 2 1
1	Number of extended channels (2nd zone)	Number of extended channels (1st zone)
n	Number of extended channels (2nth zone)	Number of extended channels ((2n-1)th zone)

Number of extended channels: Specifies the number of extended channels in the zone in binary.
(0 to 15)

Fig. 4.3.5.3.3-57 Number of extended channels

4.3.5.3.3.59 Standby condition

The Standby condition information element indicates whether or not the mobile station can switch to the Packet standby state on the pertinent extended channel and is coded as shown in Fig. 4.3.5.3.3-58 below. This information element is 1 octet long.

Octet \ Bit	8 7 6 5 4 3 2	1
	Spare	* 1

*1 Standby allowed/ not allowed

(1) Standby allowed/not allowed

Bit 1	:	Standby allowed/ not allowed
0	:	Standby not allowed
1	:	Standby allowed

Fig. 4.3.5.3.3-58 Standby condition

4.3.5.3.3.60 Channel handover mobile station assignment

The Channel handover mobile station assignment information element indicates the type of mobile stations which perform channel handover and the number of channel handover mobile stations. This information element is coded as shown in Fig. 4.3.5.3.3-59 and has 1 octet length.

Octet	Bit 8	7	6	5	4	3	2	1
1	Number of channel handover mobile stations						Specified type	

(1) Specified type

Bit	2	1	:	Specified type
	0	0	:	MSI
	0	1	:	SMSI
	1	0	:	All mobile stations
	1	1	:	Reserved

(2) Number of channel handover mobile stations
Indicates the number of mobile stations which perform channel handover in binary (0 to 63). However, when the address of Layer 2 is an MSI or SMSI, this is set to “1”. When the address of Layer 2 is a group MSI and the Specified type is All mobile stations, this is set to “0”.

Fig. 4.3.5.3.3-59 Channel handover mobile station assignment

4.3.5.3.3.61 Channel handover information

The Channel handover information indicates the destination handover channel designated by the network and is coded as shown in Fig. 4.3.5.3.3-60. This information element is 1 octet long.

Octet	Bit 8	7	6	5	4	3	2	1
	*1	Spare			*2			

*1: Perch channel re-selection
*2: Number of extended channels

(1) Perch channel re-selection

Bit	1	:	Perch channel re-selection performed/not performed
	0	:	Not performed
	1	:	Performed

(2) Number of extended channels
Specifies the number of extended channels in the current zone in binary (0 to 15).

Fig. 4.3.5.3.3.60 Channel handover information

4.3.5.4 Timers and retransmission conditions

4.3.5.4.1 Timers and retransmission conditions in the user side of the interface

Conditions for the RT timers specified in the user side of the interface are listed in Tables 4.3.5.4.1-1 and 4.3.5.4.1-2 below.

Table 4.3.5.4.1-1 : Timers in the user side (RT) (1/3)

Timer No.	Default time-out value	State	Cause of start	Normal stop	At the first expiry	At the second and subsequent expiries
TR305	15 – 20 s	Origination	Originating Condition Report sent	Radio channel Set, or Mobile Station Release received	Enter Standby state	
TR306	15 – 20 s	Termination	Terminating Condition Report sent	Radio channel Set, or Mobile Station Release received	Enter Standby state	
TR311	2 s	Condition report	Condition Report 2 sent	Condition Report Acknowledgment, or Radio-channel Disconnect received	Retransmit Condition Report 2; Reset TR311	Retransmit Condition Report 2 three times, and then enter TCH active state
TR314	10 – 15 s	Radio channel set	MRT-ACT-REQ to L1 sent (1st time)	MRT-ACT-IND from L1, or Mobile Station Release reseived	Enter Standby state	
TR324	2 s	Zone Information request	Zone information Request sent	Zone Information Notification received	Retransmit Zone Information Request ; Reset TR324	Retransmit Zone Information Request three times, and then enter Packet communication state.
TR333	2 s	UPCH Paging 2 Response	" UPCH Voice Paging 2 Response" sent	"UPCH Voice Paging 2 Response Acknowledgement" received	"UPCH Voice Paging 2 Response" Reset TR333	Retransmit "UPCH Voice Paging 2 Response" three times, and then enter UPCH active state
TR334	See Note 2	UPCH Paging 2 Connect	"UPCH Paging Condition Report" sent	"UPCH Radio Channel Assignment" or "UPCH Voice Paging Stop" received	"UPCH Voice Paging Condition Report " Reset TR334	Retransmit "UPCH Condition Report" for the number of times specified by the network and then enter UPCH active state
TR336	15~ 20 s	Radio channel assignment during UPCH Paging	TCH Activation Request to Layer 1	"TCH Activation Acknowledgement" or "UPCH Voice Paging Stop" received from Layer 1	Switch to UPCH active state	

Table 4.3.5.4.1-1 : Timers in the user side (RT) (2/3)

Timer No.	Default time-out value	State	Conditions in the user side
TR315	0.5 s	Termination	Must return Terminating Condition Report within TR315 after receiving Paging.
TR316	$(0.5+\alpha)$ s	Reception-level measurement	Must return Reception-level Measurement Response within TR316 after receiving Reception-level Measurement Request.
	Note 3	Reception-level measurement during communication	Must return Reception-level Measurement Response within TR316 after receiving Reception-level Measurement Request.
TR317	0.5 s	Radio channel disconnect	Must return Radio-channel Disconnect Acknowledgment within TR317 after receiving Radio-channel Disconnect
TR318	0.5 s	System information	Must return System Information Acknowledgement within TR318 after receiving System Information.
TR319	0.5 s	Condition inquiry	Must return Condition Report 1 within TR319 after receiving Condition Inquiry.
TR320	0.5 s	Condition report information	Must return Condition Report Information Acknowledgement within TR320 after receiving Condition Report Information.
TR321	0.5 s	Condition report state	Must return Condition Report State Acknowledgement within TR321 after receiving Condition Report State.
TR322	0.5 s	VOX control	Must return VOX Control Acknowledgement within TR322 after receiving VOX Control

Table 4.3.5.4.1-1 : Timers in the user side (RT) (3/3)

Timer No.	Default time-out value	State	Conditions in the user side
TR323	5 s	UPCH activation request, Stop during UPCH switching, Control channel activation during UPCH switching, Broadcast information reception during UPCH switching	Must return Packet Communication Registration Request within TR323 after receiving Paging.
TR325	5 s	UPCH activation request, Stop during UPCH switching, Control channel activation during UPCH switching, Broadcast information reception during UPCH switching	Must return Packet Channel Registration Request within TR325 after receiving Packet Paging.
TR329	5 s	Stop during UPCH voice paging, Control channel activation during UPCH voice paging, Broadband information reception during UPCH voice paging	Must return Terminating Condition Report within TR329 after receiving Broadcast Information Reception during UPCH voice paging.
TR331	0.5 s	UPCH Paging 2	After receiving a "UPCH Voice Paging 2 Response" or a "UPCH Voice Paging 2 Inquiry," a "UPCH Voice Paging 2 Acknowledgement," a "UPCH Voice Paging 2 Response," or a "UPCH Paging Condition Report" must be transmitted within “TR331” seconds.
TR337	0.5 s	During packet communication or during packet standby	Must return UPCH Voice Paging Response within TR337 sec. after receiving UPCH Voice Paging.
TR339	5 s	UPCH activation request	Must return “Packet Channel Registration Request” or “Packet Communication Registration Request” within TR339 after reception of the “Packet Channel Handover Request”.

Note 1: The timers listed in the above table indicate the processing time from when the message reception by the MS is completed until the MS becomes ready to transmit the message.
Note 2: The value specified by UPCH Voice Paging 2
Note 3: a represents the time required for reception level detection.

4.3.5.4.2 Timer and retransmission conditions in the network side of the interface

The RT timer condition specified in the network side of the interface is listed in Tables 4.3.5.4.2-1 below.

Table 4.3.5.4.2-1 : Timers in the network side (RT) (1/2)

Timer No.	State	Cause of start	Normal stop	At the 1st to the (n-1) th expiries	At the nth and subsequent expiries
TR301	Termination	Paging sent	Terminating Condition Report received	Retransmit Paging; restart TR301	Enter Standby state
TR302	Reception-level measurement	Reception-Level Measurement Request sent	Reception-level Measurement Response received	Retransmit Reception-level Measurement Request; restart TR302	Transmit Mobile Station Release; enter Standby state
	Reception-level measurement during communication	Reception-Level Measurement Request sent	Reception-level Measurement Response received	Retransmit Reception-level Measurement Request; restart TR302	Enter TCH active state
TR303	Radio channel set	Radio-channel Set sent	TCH activation acknowledgement from L1 received	Retransmit Radio-channel Set; restart TR303	Enter Standby state
	Handover Radio-channel disconnect	Handover Radio-channel Set sent	TCH activation acknowledgement from L1 received	Retransmit Handover Radio-channel Set; restart TR303	Enter TCH active state
TR304	Radio-channel disconnect	Radio-channel Disconnect sent	Radio-channel Disconnect Acknowledgement received	Retransmit Radio-channel Disconnect; restart TR304	Enter Standby state
TR307	System information	System Information sent	System Information Acknowledgement received	Retransmit System Information; restart TR307	Enter TCH active state
TR308	Condition inquiry	Condition Inquiry sent	Condition Report 1 received	Retransmit Condition Inquiry; reset TR308	Enter TCH active state
TR309	Condition report information	Condition Report Information sent	Condition Report Information Acknowledgement received	Retransmit Condition Report Information; restart TR309	Enter TCH active state
TR310	Condition report state	Condition Report State sent	Condition Report State Acknowledgement received	Retransmit Condition Report State; restart TR310	Enter TCH active state
TR313	VOX control	VOX Control sent	VOX Control Acknowledgement received	Retransmit VOX Control; restart TR313	Enter TCH active state

Table 4.3.5.4.2-1 Timers on the network side (RT) (2/2)

Timer No.	State	Cause of start	Normal stop	At the 1st to the (n-1) th expiries	At the nth and subsequent expiries
TR326	Packet commu-nication registration	Paging sent	Packet communication Registration Request received	Retransmit Paging; Reset TR326	Switch to Null state
TR327	Packet paging	Packet Paging sent	Packet Channel Registration Request received	Retransmit Packet Paging; Reset TR327	Switch to the state before packet paging was sent (UPCH activation)
TR328	UPCH voice paging	UPCH voice paging report sent	UPCH voice paging response received	Retransmit UPCH voice paging; Reset TR328	Switch to the before UPCH voice paging was sent (UPCH activation)
TR330	UPCH Voice Paging 2	"UPCH Voice Paging 2" or "UPCH Voice Paging 2 Inquiry" sent	"UPCH Voice Paging 2 Acknowledgement," "UPCH Voice Paging 2 Response," or "UPCH Paging Condition Report" received	Retransmit "UPCH Voice Paging 2" or "UPCH Voice Paging 2 Inquiry" Reset TR330	Enter UPCH Paging Stop state
TR332	UPCH Paging Stop	"UPCH Voice Paging Stop" sent	"UPCH Voice Paging Stop Acknowledgement" received	Retransmit "UPCH Voice Paging Stop" Reset TR332	Enter UPCH Active state
TR335	Radio Channel Assignment during UPCH Paging	"UPCH Radio Channel Assignment" sent	"TCH activation Acknowledgement from Layer 1" received	Retransmit "UPCH Radio Channel Assignment" Reset TR335	Enter UPCH Paging Stop state
TR338	Packet channel handover	"Packet Channel Handover Request" sent	"Packet Channel Registration Request" or "Packet Communication Registration Request" received	Retransmit "Packet Channel Handover Request". Reset TR338.	Enter UPCH Active state.

Note : Timer values and numbers of retransmissions on the network side can be set by the operator.

4.3.6 Mobility management

4.3.6.1 Outline of mobility management (MM)

4.3.6.1.1 State of MM in the user side of the interface

This section regulates the basic MM states on the user side of the interface. Codes in parenthesis indicate the state of individual items.

i) Null (UMM0)

State wherein the MM function of the user is idle.

ii) Location registration (UMM1)

State wherein the user has requested the network for location registration.

iii) Authentication (UMM2)

State wherein the network has sent an Authentication Request message to the user but the user has not responded yet.

iv) Authentication during location registration (UMM3)

State wherein the user has received an Authentication Request message from the network, after requesting location registration, but has not yet responded.

v) User registration (UMM4)

State wherein the user has requested the network to perform user registration.

vi) Authentication during user registration (UMM5)

State wherein the user is requested to perform authentication by the network, after requesting user registration, but the user has not yet responded.

vii) User deregistration (UMM6)

State wherein the user has requested the network to perform user deregistration.

viii) Authentication during user deregistration (UMM7)

State wherein the user is requested to perform authentication by the network, after requesting user deregistration, but the user has not yet responded.

ix) Registration reset (UMM8)

State wherein the user has requested the network to perform registration reset.

x) Authentication during registration reset (UMM9)

State wherein the user is requested to perform authentication by the network, after requesting registration reset, but the user has not yet responded.

xi) Waiting for authentication during packet communication registration (active) (UMM10)

State wherein the user who has requested the network for packet communication registration (active) is waiting for packet authentication request.

xii) Waiting for authentication during packet communication registration (packet standby) (UMM11)

State wherein the user who has requested the network for packet communication registration (standby) is waiting for packet authentication request.

xiii) Authentication during packet communication registration (active) (UMM12)

State wherein the user who requested packet communication registration on the network was requested packet authentication by the network but the user has not responded yet.

xiv) Authentication during packet communication registration (packet standby) (UMM13)

State wherein the user who requested packet communication registration on the network was requested packet authentication by the network but the user has not responded yet.

xv) Packet communication registration (active) (UMM14)

State wherein the user who has sent packet authentication response to the network is waiting for packet communication registration response (active)

xvi) Packet communication registration (packet standby) (UMM15)

State wherein the user who has sent packet authentication response to the network is waiting for packet communication registration response (packet standby)

xvii) Packet communication (active) (UMM16)

State wherein the user is during packet communication (active)

xviii) Packet communication (packet standby) (UMM17)

State wherein the user is during packet communication (packet standby)

xix) Packet channel registration (active) (UMM18)

State wherein the user has requested the network for packet channel registration (active)

xx) Packet channel registration (packet standby) (UMM19)

State wherein the user has requested the network for packet channel registration (packet standby)

xxi) Authentication during packet channel registration (active) (UMM20)

State wherein the user who requested packet channel registration on the network was requested packet authentication by the network, but the user has not responded yet.

xxii) Authentication during packet channel registration (packet standby) (UMM21)

State wherein the user who requested packet channel registration on the network was requested packet authentication by the network, but the user has not responded yet.

xxiii) Packet communication deregistration (UMM22)

State wherein the user has requested the network for packet communication deregistration.

xxiv) Authentication during packet communication deregistration (UMM23)

State wherein the user who requested packet communication deregistration on the network was requested packet authentication by the network, but the user has not responded yet.

4.3.6.1.2 State of MM in the network side of the interface

This section regulates the basic MM states in the network side of the interface. Codes in parenthesis indicate the state of individual items.

i) Null (NMM0)

State wherein the MM function of the network is idle.

ii) Location registration (NMM1)

State wherein the network has received Location Registration Request from the user.

iii) Authentication (NMM2)

State wherein the network has sent Authentication Request to the user.

iv) Authentication during location registration (NMM3)

State wherein the network has requested the user to perform authentication, after being requested for location registration.

v) User registration (NMM4)

State wherein the network is requested by the user to perform user registration.

vi) Authentication during user registration (NMM5)

State wherein the network has requested the user to perform authentication, after being requested for location registration.

vii) User deregistration (NMM6)

State wherein the network is requested by the user for user deregistration.

viii) Authentication during user deregistration (NMM7)

State wherein the network has requested the user for authentication after being requested for user deregistration.

ix) Registration reset (NMM8)

State wherein the network is requested by the user for registration reset.

x) Authentication during registration reset (NMM9)

State wherein the network requested by the user for registration reset has requested the user for authentication.

xi) Waiting for authentication during packet communication registration (active) (NMM10)

State wherein the network has been requested by the user for packet communication registration (active)

xii) Waiting for authentication during packet communication registration (packet standby) (NMM 11)

State wherein the network has been requested by the user for packet communication registration (standby)

xiii) Authentication during packet communication registration (active) (NMM 12)

State wherein the network has requested the user for packet authentication, after being requested for packet communication registration (active).

xiv) Authentication during packet communication registration (packet standby) (NMM 13)

State wherein the network has requested the user for packet authentication, after being requested for packet communication registration (packet standby)

xv) Packet communication registration (active) (NMM 14)

State wherein packet authentication response has been sent from the user to the network.

xvi) Packet communication registration (packet standby) (NMM15)

State wherein packet authentication response has been sent from the user to the network.

xvii) Packet communication (active) (NMM16)

State wherein the network is during packet communication (active)

xviii) Packet communication (packet standby) (NMM17)

State wherein the network is during packet communication (packet standby)

xix) Packet channel registration (active) (NMM18)

State wherein the network has been requested by the user for packet channel registration (active)

xx) Packet channel registration (packet standby) (NMM19)

State wherein the network has been requested by the user for packet channel registration (standby)

xxi) Authentication during packet channel registration (active) (NMM20)

State wherein the network has requested the user for packet authentication, after being requested for packet channel registration (active).

xxii) Authentication during packet channel registration (packet standby) (NMM21)

State wherein the network has requested the user for packet authentication, after being requested for packet channel registration (packet standby).

xxiii) Packet communication deregistration (NMM22)

State wherein the network has been requested by the user for packet communication deregistration.

xxiv) Authentication during packet communication deregistration (NMM23)

State wherein the network has requested the user for packet authentication after being requested for packet communication deregistration.

xxv) Packet communication registration state inquiry (NMM24)

State wherein the network has requested the user for packet communication registration state inquiry.

xxvi) Packet communication disconnect (NMM25)

State wherein the network has requested the user for packet communication disconnect request.

4.3.6.2 Definitions and functions of messages

Table 4.3.6.2-1 lists the messages required for mobility management (MM). This section regulates the detail of each message.

The functions regulated in this section include the following:

(1) Brief explanation of message transfer direction, used channel and use of each message.

The MM signal is bi-directional, and SCCH or ACCH is used for it.

(2) Tables of information elements in the order they appear in the message.

These tables include the following:

a) The number of the section in this standard which specifies the information element.

b) Directions in which the information elements can be transferred.

- From user (MS) to network (uplink)
- From network to user (MS) (downlink)
- Bi-directional (uplink/downlink).

c) Mandatory (M) or optional (O).

With optional information elements, the condition that the pertinent information element is included is described in the notes beneath the table.

d) Information length

Table 4.3.6.2-1 : Messages for mobility management

Message	Ref.
Authentication Request	4.3.6.2.1
Authentication Response	4.3.6.2.2
Location Registration Request	4.3.6.2.3
Location Registration Acknowledgement	4.3.6.2.4
Location Registration Reject	4.3.6.2.5
User Registration Request	4.3.6.2.6
User Registration Response	4.3.6.2.7
User Registration Reject	4.3.6.2.8
User Deregistration Request	4.3.6.2.9
User Deregistration Response	4.3.6.2.10
User Deregistration Reject	4.3.6.2.11
Registration Reset Request	4.3.6.2.12
Registration Reset Response	4.3.6.2.13
Registration Reset Reject	4.3.6.2.14
Operator Specific Information	4.3.6.2.15
Packet Communication Registration Request	4.3.6.2.16
Packet Communication Registration Response	4.3.6.2.17
Packet Communication Registration Reject	4.3.6.2.18
Packet Channel Registration Request	4.3.6.2.19
Packet Channel Registration Response	4.3.6.2.20
Packet Channel Registration Reject	4.3.6.2.21
Packet Communication Deregistration Request	4.3.6.2.22
Packet Communication Deregistration Response	4.3.6.2.23
Packet Communication Deregistration Reject	4.3.6.2.24
Packet Communication Registration State Inquiry	4.3.6.2.25
Packet Communication Disconnect Request	4.3.6.2.26
Packet Communication Disconnect Acknowledgment	4.3.6.2.27
Packet Authentication Request	4.3.6.2.28
Packet Authentication Response	4.3.6.2.29

4.3.6.2.1 Authentication Request

This messages is sent from the network to the user and is used by the network to make an authentication check on the user. (Refer to Table 4.3.6.2-2.)

Table 4.3.6.2-2 : Contents of the Authentication Request message

Message type : Authentication Request
Direction : Network --> User (SCCH/SACCH/FACCH)

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Downlink	M	1	
Authentication random pattern	4.3.6.3.3.2	Downlink	M	8	
Ciphering mode	4.3.6.3.3.6	Downlink	O	1	Note 2

Note 1 : A mobile station number is included in layer 2 (for SCCH).

Note 2 : Network does not send the Ciphering mode information element to the user when the MS Rev. information in an Originating Condition Report or Terminating Condition Report message sent from the user is set for "RCR STD-27B".

4.3.6.2.2 Authentication Response

This message is sent from the user to the network to report response to Authentication Request message. (Refer to Table 4.3.6.2-3.)

The channel which received the Authentication Request message shall be used.

Table 4.3.6.2-3 : Contents of the Authentication Response message

Message type : Authentication Response
Direction : User --> Network (SCCH/SACCH/FACCH)

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Uplink	M	1	
Authentication ciphering pattern	4.3.6.3.3.3	Uplink	M	8	

Note : A mobile station number is included in layer 2 (for SCCH).

4.3.6.2.3 Location Registration Request

This message is sent from the user to the network to request registration of the new location when the user moves from one registration area to another. (Refer to Table 4.3.6.2-4)

Table 4.3.6.2-4 : Contents of the Location Registration Request message

Message type : Location Registration Request
Direction : User --> Network (SCCH)

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Uplink	M	1	
Mobile subscriber number	4.3.6.3.3.4	Uplink	M	1 - 14	Note 2
Terminating service registration type	4.3.6.3.3.14	Uplink	O	2 - 16	Note 3
Network registration type	4.3.6.3.3.40	Uplink	O	1	Note 4

Note 1 : Mobile station number (MSI) is included in Layer 2.

Note 2 : Mobile subscriber number is assigned to the mobile station when subscription to the network is signed.

Note 3 : This information element is mandatory for an MS complying with version F or a subsequent version.

Note 4 : This information element is mandatory in case of the MS which switches between the systems described in Appendix F.5, and it can be omitted otherwise.

4.3.6.2.4 Location Registration Acknowledgement

This message is sent from the network to the user as an acknowledgement for the reception and acceptance of the Location Registration Request. (refer to Table 4.3.6.2-5)

Table 4.3.6.2-5 : Contents of the Location Registration Acknowledgement message

Message type : Location Registration Acknowledgement
Direction : Network --> User (SCCH)

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Downlink	M	1	
Display	4.3.6.3.3.9	Downlink	O	Variable	Note 2

Note 1 : Mobile station number (MSI) is included in Layer 2.

Note 2 : The information provided by the network to the user is set by IA5 characters.

4.3.6.2.5 Location Registration Reject

This message is sent from the network to the user when location registration is not performed normally in response to a Location Registration Request message. When the user receives this message, the user performs operation depending on the Cause information element without updating the location identity memorized by the user. (Refer to Table 4.3.6.2-6.)

Table 4.3.6.2-6 : Contents of the Location Registration Reject message

Message type : Location Registration Reject
Direction : Network --> User (SCCH)

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Downlink	M	1	
Cause	4.3.6.3.3.5	Downlink	M	1	

Note : Mobile station number (MSI) is included in Layer 2.

4.3.6.2.6 User Registration Request

This message is sent from the user to the network to request registration of the user. (Refer to Table 4.3.6.2-7.)

Table 4.3.6.2-7 : Contents of the User Registration Request message

Message type : User Registration Request
Direction : User --> Network

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Uplink	M	1	
Mobile subscriber number	4.3.6.3.3.4	Uplink	M	1 - 14	
User registration type	4.3.6.3.3.7	Uplink	M	1	
User authentication type	4.3.6.3.3.8	Uplink	M	1	

Note : Mobile station number (MSI) is included in Layer 2.

4.3.6.2.7 User Registration Response

This message is sent from the network to the user to inform that the network accepted the User Registration Request. (Refer to Table 4.3.6.2-8.)

Table 4.3.6.2-8 : Contents of the User Registration Response message

Message type : User Registration Response
Direction : Network --> User

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Downlink	M	1	
Display	4.3.6.3.3.9	Downlink	M	Variable	Note 1

Note 1 : The information provided by the network to the user is set by IA5 characters.

4.3.6.2.8 User Registration Reject

This message is sent from the network to the user in response to the User Registration Request when user registration is not performed normally. (Refer to Table 4.3.6.2-9.)

Table 4.3.6.2-9 : Contents of the User Registration Reject message

Message type : User Registration Reject
Direction : Network --> User

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Downlink	M	1	
Cause	4.3.6.3.3.5	Downlink	M	1	

4.3.6.2.9 User Deregistration Request

This message is sent from the user to the network to request deregistration of the user. (Refer to Table 4.3.6.2-10.)

Table 4.3.6.2-10 : Contents of the User Deregistration Request message

Message type : User Deregistration Request
Direction : User --> Network

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Uplink	M	1	
Mobile subscriber number	4.3.6.3.3.4	Uplink	M	1 - 14	
User deregistration type	4.3.6.3.3.10	Uplink	M	1	

Note : Mobile station number (MSI) is included in Layer 2.

4.3.6.2.10 User Deregistration Response

This message is sent from the network to the user to report that the User Deregistration Request is accepted by the network. (Refer to Table 4.3.6.2-11.)

Table 4.3.6.2-11 : Contents of the User Deregistration Response message

Message type : User Deregistration Response
Direction : Network --> User

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Downlink	M	1	
Display	4.3.6.3.3.9	Downlink	M	Variable	Note 1

Note 1 : The information provided by the network to the user is set by IA5 characters.

4.3.6.2.11 User Deregistration Reject

This message is sent from the network to the user in response to the User Deregistration Request when user registration is not performed normally. (Refer to Table 4.3.6.2-12.)

Table 4.3.6.2-12 : Contents of the User Deregistration Reject message

Message type : User Deregistration Reject
Direction : Network --> User

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Downlink	M	1	
Cause	4.3.6.3.3.5	Downlink	M	1	

4.3.6.2.12 Registration Reset Request

This message is sent from the user (who owns the mobile station) to the network to reset the Mobile subscriber number which is registered on the mobile station. (Refer to Table 4.3.6.2-13.)

Table 4.3.6.2-13 : Contents of the Registration Reset Request message

Message type : Registration Reset Request
Direction : User --> Network

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Uplink	M	1	
Terminal identity code	4.3.6.3.3.11	Uplink	M	Variable	
Registration reset type	4.3.6.3.3.12	Uplink	M	1	

Note : Mobile station number (MSI) is included in Layer 2.

4.3.6.2.13 Registration Reset Response

This message is sent from the network to the user to report that the Registration Reset Request is accepted by the network. (refer to Table 4.3.6.2-14)

Table 4.3.6.2-14 : Contents of the Registration Reset Response message

Message type : Registration Reset Response
Direction : Network --> User

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Downlink	M	1	
Display	4.3.6.3.3.9	Downlink	M	Variable	Note 1

Note 1 : The information provided by the network to the user is set by IA5 characters.

4.3.6.2.14 Registration Reset Reject

This message is sent from the network to the user in response to the Registration Reset Request when user registration cannot be reset normally. (refer to Table 4.3.6.2-15)

Table 4.3.6.2-15 : Contents of the Registration Reset Reject message

Message type : Registration Reset Reject
Direction : Network --> User

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Downlink	M	1	
Cause	4.3.6.3.3.5	Downlink	M	1	

4.3.6.2.15 Operator Specific Information

This message is sent from the network to the user or from the user to the network for exchanging information for providing operator specific service between the network of a specific telecommunication operator and the users registered on that network. (See Table 4.3.6.2-16 below.)

Table 4.3.6.2-16 : Contents of the Operator Specific Information message

Message type : Operator Specific Information
Direction : Bi-directional

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Bi-directional	M	1	
Network identity	4.3.6.3.3.13	Bi-directional	M	2	
Operator specific information	———	Bi-directional	O	Variable	Defined by each telecommunication operator

4.3.6.2.16 Packet Communication Registration Request

This message is sent from the user to the network to request packet communication registration. (refer to Table 4.3.6.2-17)

Table 4.3.6.2-17 : Contents of the Packet Communication Registration Request

Message type : Packet Communication Registration Request
Direction : User --> Network (UPCH)

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Uplink	M	1	
Retransmission identifier	4.3.6.3.3.15	Uplink	M	2	
Mobile station type	4.3.6.3.3.16	Uplink	M	3	
Transmission speed	4.3.6.3.3.17	Uplink	M	1	
Communication state	4.3.6.3.3.18	Uplink	M	1 - 2	
Communication mode	4.3.6.3.3.19	Uplink	M	1 - 2	
Calling party number	4.3.6.3.3.20	Uplink	M	1 - 14	
Packed standby switching timer	4.3.6.3.3.21	Uplink	M	1	
Voice terminating method	4.3.6.3.3.22	Uplink	M	1	
Operator specific information	4.3.6.3.3.31	Uplink	M	1 - 128	
Packet connection method	4.3.6.3.3.32	Uplink	M	1	Note 2
Registration identifier	4.3.6.3.3.35	Uplink	O	1	Note 3
Reception level	4.3.6.3.3.36	Uplink	O	1	Current zone reception revel (Note 3)
Number of selected zones	4.3.6.3.3.37	Uplink	O	1	Note 3, Note 4
Perch channel number	4.3.6.3.3.38	Uplink	O	1	Note 3
Reception level	4.3.6.3.3.36	Uplink	O	1	Note 3
~					
Perch channel number	4.3.6.3.3.38	Uplink	O	1	Note 3
Reception level	4.3.6.3.3.36	Uplink	O	1	Note 3
Frequency band	4.3.6.3.3.39	Uplink	O	2	Note 3

Note 1 : Mobile station number (MSI) is included in Layer 2.
Note 2 : This information element is mandatory for an MS complying with Version G or a subsequent version.
Note 3 : This information element is mandatory for mobile stations of which the Extended channel selection capability in the Mobile station type is set to Capable.
Note 4 : The number of zones is set, the maximum number of which is the Maximum number of reporting channels of the pertinent zone which is notified by “Broadcast Information”, “Zone Information Notification” or “Packet Channel Handover Request” message.

4.3.6.2.17 Packet Communication Registration Response

This message is sent from the network to the user to report that the Packet Communication Registration Request sent by the user has been accepted by the network. (refer to Table 4.3.6.2-18)

Table 4.3.6.2-18 : Contents of the Packet Communication Registration Response

Message type : Packet Communication Registration Response
Direction : Network --> User (UPCH)

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Downlink	M	1	
Retransmission identifier	4.3.6.3.3.15	Downlink	M	2	
Transmission speed	4.3.6.3.3.17	Downlink	M	1	
Communication state	4.3.6.3.3.18	Downlink	M	1 - 2	
Communication mode	4.3.6.3.3.19	Downlink	M	1 - 2	
Packet system timer	4.3.6.3.3.23	Downlink	M	1	
Packet standby switching timer	4.3.6.3.3.21	Downlink	M	1	
Channel switching timer	4.3.6.3.3.24	Downlink	M	1	
Communication quality information	4.3.6.3.3.25	Downlink	M	5	
Connection zone decision information	4.3.6.3.3.26	Downlink	M	2	
Maximum number of reporting channels	4.3.6.3.3.27	Downlink	M	1	
Ciphering version	4.3.6.3.3.28	Downlink	M	1	
Voice terminating conditions	4.3.6.3.3.29	Downlink	M	1	
Packet communication environment	4.3.6.3.3.30	Downlink	M	1	
Operator specific information	4.3.6.3.3.31	Downlink	M	1 - 128	
Packet conection condition	4.3.6.3.3.33	Downlink	O	1	Note 2, 3
Maximum number of voice connection reporting channels	4.3.6.3.3.34	Downlink	O	1	Note 2, 3

Note 1 : Mobile station number (MSI) is included in Layer 2.

Note 2 : This information element is mandatory for an MS complying with Version G or a subsequent version.

Note 3 : An MS complying with Version G or a subsequent version will execute neither the virtual circuit connection procedure nor the voice connection procedure based on Voice Terminating Method 2 if it receives the signal without this information element.

4.3.6.2.18 Packet Communication Registration Reject

This message is sent from the network to the user as a response to the Packet Communication Registration Request by the user to report that packet communication registration has not been performed normally. (refer to Table 4.3.6.2-19)

Table 4.3.6.2-19 : Contents of the Packet Communication Registration Reject

Message type : Packet Communication Registration Reject
Direction : Network --> User (UPCH)

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Downlink	M	1	
Retransmission identifier	4.3.6.3.3.15	Downlink	M	2	
Cause	4.3.6.3.3.5	Downlink	M	1	

Note : Mobile station number (MSI) is included in Layer 2.

4.3.6.2.19 Packet Channel Registration Request

This message is sent from the user to the network to request packet channel registration. (refer to Table 4.3.6.2-20)

Table 4.3.6.2-20 : Contents of the Packet Channel Registration Request

Message type : Packet Channel Registration Request
Direction : User --> Network (UPCH)

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Uplink	M	1	
Retransmission identifier	4.3.6.3.3.15	Uplink	M	2	
Mobile station type	4.3.6.3.3.16	Uplink	M	3	
Transmission speed	4.3.6.3.3.17	Uplink	M	1	
Communication mode	4.3.6.3.3.19	Uplink	M	1 - 2	
Registration identifier	4.3.6.3.3.35	Uplink	O	1	Note 2
Reception level	4.3.6.3.3.36	Uplink	O	1	Home zone reception revel (Note 2)
Number of selected zones	4.3.6.3.3.37	Uplink	O	1	Note 2, Note 3
Perch channel number	4.3.6.3.3.38	Uplink	O	1	Note 2
Reception level	4.3.6.3.3.36	Uplink	O	1	Note 2
~					
Perch channel number	4.3.6.3.3.38	Uplink	O	1	Note 2
Reception level	4.3.6.3.3.36	Uplink	O	1	Note 2
Frequency band	4.3.6.3.3.39	Uplink	O	2	Note 2

Note 1 : Mobile station number (MSI) is included in Layer 2.

Note 2 : This information element is mandatory for mobile stations of which the Extended channel selection capability in the Mobile station type is set to Capable.

Note 3 : The number of zone is set, the maximum number of which is the Maximum number of reporting channels of the pertinent zone which is notified by "Broadcast Information", "Zone Information Notification" or "Packet Channel Handover Request" message.

4.3.6.2.20 Packet Channel Registration Response

This message is sent from the network to the user to report that the Packet Channel Registration Request sent by the user has been accepted by the network. (refer to Table 4.3.6.2-21)

Table 4.3.6.2-21 : Contents of the Packet Channel Registration Response

Message type : Packet Channel Registration Response
Direction : Network --> User (UPCH)

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Downlink	M	1	
Retransmission identifier	4.3.6.3.3.15	Downlink	M	2	
Transmission speed	4.3.6.3.3.17	Downlink	M	1	
Communication mode	4.3.6.3.3.19	Downlink	M	1 - 2	
Packet system timer	4.3.6.3.3.23	Downlink	M	1	
Channel switching timer	4.3.6.3.3.24	Downlink	M	1	
Communication quality information	4.3.6.3.3.25	Downlink	M	5	
Connection zone decision information	4.3.6.3.3.26	Downlink	M	2	
Maximum number of reporting channels	4.3.6.3.3.27	Downlink	M	1	
Maximum number of voice connection reporting channels	4.3.6.3.3.34	Downlink	O	1	Note 2

Note 1 : Mobile station number (MSI) is included in Layer 2.

Note 2 : An MS complying with Version G or a subsequent version will not execute the voice connection procedure based on Voice Terminating Method 2 if it receives the signal without this information element.

4.3.6.2.21 Packet Channel Registration Reject

This message is sent from the network to the user as a response to the Packet Channel Registration Request by the user to report that packet channel registration has not been performed normally. (refer to Table 4.3.6.2-22)

Table 4.3.6.2-22 : Contents of the Packet Channel Registration Reject

Message type : Packet Channel Registration Reject
Direction : Network --> User (UPCH)

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Downlink	M	1	
Retransmission identifier	4.3.6.3.3.15	Downlink	M	2	
Cause	4.3.6.3.3.5	Downlink	M	1	

Note : Mobile station number (MSI) is included in Layer 2.

4.3.6.2.22 Packet Communication Deregistration Request

This message is sent from the user to the network to request deregistration of packet communications. (refer to Table 4.3.6.2-23)

Table 4.3.6.2-23 : Contents of the Packet Communication Deregistration Request

Message type : Packet Communication Deregistration Request
Direction : User --> Network (UPCH)

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Uplink	M	1	
Retransmission identifier	4.3.6.3.3.15	Uplink	M	2	
Terminating service registration type	4.3.6.3.3.14	Uplink	M	2 - 16	

Note : Mobile station number (MSI) is included in Layer 2.

4.3.6.2.23 Packet Communication Deregistration Response

This message is sent from the network to the user to report that the Packet Communication Deregistration Request sent by the user has been accepted by the network. (refer to Table 4.3.6.2-24)

Table 4.3.6.2-24 : Contents of the Packet Communication Deregistration Response

Message type : Packet Communication Deregistration Response
Direction : Network --> User (UPCH)

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Downlink	M	1	
Retransmission identifier	4.3.6.3.3.15	Downlink	M	2	
Terminating service registration type	4.3.6.3.3.14	Downlink	M	2 - 16	

Note : Mobile station number (MSI) is included in Layer 2.

4.3.6.2.24 Packet Communication Deregistration Reject

This message is sent from the network to the user as a response to the Packet Communication Deregistration Request to report that packet communication deregistration has not been performed normally. (refer to Table 4.3.6.2-25)

Table 4.3.6.2-25 : Contents of the Packet Communication Deregistration Reject

Message type : Packet Communication Deregistration Reject
Direction : Network --> User (UPCH)

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Downlink	M	1	
Retransmission identifier	4.3.6.3.3.15	Downlink	M	2	
Cause	4.3.6.3.3.5	Downlink	M	1	

Note : Mobile station number (MSI) is included in Layer 2.

4.3.6.2.25 Packet Communication Registration State Inquiry

This message is sent from the network to the user to inquire the registration state for the user. (refer to Table 4.3.6.2-26)

Table 4.3.6.2-26 : Contents of the Packet Communication Registration State Inquiry

Message type : Packet Communication Registration State Inquiry
Direction : Network --> User (UPCH)

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Downlink	M	1	

Note : Mobile station number (MSI) is included in Layer 2.

4.3.6.2.26 Packet Communication Disconnect Request

This message is sent from the network to the user to release the UPCH. (refer to Table 4.3.6.2-27)

Table 4.3.6.2-27 : Contents of the Packet Communication Disconnect Request

Message type : Packet Communication Disconnect Request
Direction : Network --> User (UPCH)

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Downlink	M	1	
Cause	4.3.6.3.3.5	Downlink	M	1	

Note : Mobile station number (MSI) is included in Layer 2.

4.3.6.2.27 Packet Communication Disconnect Acknowledgment

This message is sent from the user to the network as an acknowledgment for the Packet Communication Disconnect Request from the network. (refer to Table 4.3.6.2-28)

Table 4.3.6.2-28 : Contents of the Packet Communication Disconnect Acknowledgment

Message type : Packet Communication Disconnect Acknowledgment
Direction : User --> Network (UPCH)

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Uplink	M	1	

Note : Mobile station number (MSI) is included in Layer 2.

4.3.6.2.28 Packet Authentication Request

This message is sent from the network to the user to verify that the user is a legal user on the network. (refer to Table 4.3.6.2-29)

Table 4.3.6.2-29 : Contents of the Packet Authentication Request

Message type : Packet Authentication Request
Direction : Network --> User (UPCH)

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Downlink	M	1	
Retransmission identifier	4.3.6.3.3.15	Downlink	M	2	
Authentication random pattern	4.3.6.3.3.2	Downlink	M	8	
Ciphering mode	4.3.6.3.3.6	Downlink	M	1	

Note : Mobile station number (MSI) is included in Layer 2.

4.3.6.2.29 Packet Authentication Response

This message is sent from the user to the network as a response to the Packet Authentication Request by the network. (refer to Table 4.3.6.2-30)

Table 4.3.6.2-30 : Contents of the Packet Authentication Response

Message type : Packet Authentication Response
Direction : User --> Network (UPCH)

Information element	Ref.	Direction	Class	Info. length	Remarks
Message type	4.3.6.3.2	Uplink	M	1	
Retransmission identifier	4.3.6.3.3.15	Uplink	M	2	
Authentication ciphering pattern	4.3.6.3.3.3	Uplink	M	8	

Note : Mobile station number (MSI) is included in Layer 2.

4.3.6.3 Structural format for messages and information element coding

This section regulates the content of messages. Bits are transmitted by octet running in numerical sequence from "bit 1, 2, 3, etc." Octets are also transmitted in ascending numerical order.

4.3.6.3.1 Outline

The respective messages utilized in the protocol are structured of the elements listed in the items below.

i) Message type

ii) Other information elements

Element i) is used commonly for all messages and must be contained in each one. Element ii) is regulated in relation to each message type. The structural format for the above is shown in Fig. 4.3.6.3-1 below.

Bit 8	7	6	5	4	3	2	1	
Message type								Octet 1
A set of information element field								•
~							~	•

Fig. 4.3.6.3-1 : Structural format for messages

In instances where the field for an element exceeds one octet, the significance of the bits becomes lower as the octet numbers increase. The least significant bit in the field corresponds to the lowest numbered bit in the field having the highest octet number.

4.3.6.3.2 Message type

The Message type information element shown in Fig. 4.3.6.3.2-1 below is used to indicate the type of message. This information element is 1 octet long.

Octet	Bit 8	7	6	5	4	3	2	1
1	Message type							

Message type (octet 1)

Bit 8	7	6	5	4	3	2	1		Message
0	0	0	-	-	-	-	-	:	Messages Related to Authentication
0	0	0	0	0	0	0	1	:	Authentication Request
0	0	0	0	0	0	1	0	:	Authentication Response
0	0	0	0	0	1	0	1	:	Packet Authentication Request
0	0	0	0	0	1	1	0	:	Packet Authentication Response
0	0	1	-	-	-	-	-	:	Messages Related to Location Registration
0	0	1	0	0	0	0	1	:	Location Registration Request
0	0	1	0	0	0	1	0	:	Location Registration Acknowledgement
0	0	1	0	0	0	1	1	:	Location Registration Reject
0	0	1	0	0	1	0	1	:	User Registration Request
0	0	1	0	0	1	1	0	:	User Registration Response
0	0	1	0	0	1	1	1	:	User Registration Reject
0	0	1	0	1	0	0	1	:	User Deregistration Request
0	0	1	0	1	0	1	0	:	User Deregistration Response
0	0	1	0	1	0	1	1	:	User Deregistration Reject
0	0	1	0	1	1	0	1	:	Registration Reset Request
0	0	1	0	1	1	1	0	:	Registration Reset Response
0	0	1	0	1	1	1	1	:	Registration Reset Reject
0	1	0	-	-	-	-	-	:	Messages related to packet communications
0	1	0	0	0	0	0	1	:	Packet Communication Registration Request
0	1	0	0	0	0	1	0	:	Packet Communication Registration Response
0	1	0	0	0	0	1	1	:	Packet Communication Registration Reject
0	1	0	0	0	1	0	1	:	Packet Channel Registration Request
0	1	0	0	0	1	1	0	:	Packet Channel Registration Response
0	1	0	0	0	1	1	1	:	Packet Channel Registration Reject
0	1	0	0	1	0	0	1	:	Packet Communication Registration State Inquiry
0	1	0	0	1	1	0	1	:	Packet Communication Deregistration Request
0	1	0	0	1	1	1	0	:	Packet Communication Deregistration Response
0	1	0	0	1	1	1	1	:	Packet Communication Deregistration Reject
0	1	0	1	0	0	0	1	:	Packet Communication Disconnect Request
0	1	0	1	0	0	1	0	:	Packet Communication Disconnect Acknowledgment
1	1	1	1	1	1	1	1	:	Operator Specific Information
						Others		:	Reserved

Fig. 4.3.6.3.2-1 : Message type information element

4.3.6.3.3 Other information elements

4.3.6.3.3.1 Coding specification

The coding used for other information elements must accord with the coding Specification described below. The coding specification are designed to aid the message-processing equipment in swiftly locating the information elements that are necessary for processing.

(1) Information elements, excluding Mobile subscriber number, Display and Terminal identity code, shall, in principle, be stipulated as being of a fixed length.

(2) The information elements contained within a message are arranged in the specified order and the pieces of information can be extracted in the order in which they appear in a message on the basis of the sequence in which the information elements appear in the message depending on the message type and the fixed length of the respective information element.

(3) The length of the Mobile subscriber number information element can be extracted according to the Mobile subscriber number content length specified in the 1st octet. This scheme is applied to the Display and Terminal identity code information elements.

4.3.6.3.3.2 Authentication random pattern

The Authentication random pattern information element shown in Fig. 4.3.6.3.3-1 below consists of random numbers used for authentication by the mobile station. This information element is 8 octets long.

	Bit							
Octet	8	7	6	5	4	3	2	1
1	Authentication random pattem							
2								
3								
4								
5								
6								
7								
8								

Authentication random pattern (Octets 1 to 8) : Random bit sequence according to the separately specified standards for authentication and ciphering.

Fig. 4.3.6.3.3-1 : Authentication random pattern information element

4.3.6.3.3.3 Authentication ciphering pattern

The Authentication ciphering pattern information element shown in Fig. 4.3.6.3.3-2 below is a ciphering pattern calculated by the mobile station from authentication random pattern. This information element is 8 octets long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Authentication ciphering pattern							
2								
3								
4								
5								
6								
7								
8								

Authentication ciphering pattern (octet 1 to 8) : Ciphered bit sequence.

Fig. 4.3.6.3.3-2 : Authentication ciphering pattern information element

4.3.6.3.3.4 Mobile subscriber number

The Mobile subscriber number information element shown in Fig. 4.3.6.3.3-3 below is used to specify the subscriber number assigned to identify the user. This information element is 1 - 14 octets in length.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Mobile subscriber number content length							
2	*1	Spare						
3	2nd digit				1st digit			
~	~				~			~
n - 1	(2n - 6) th digit				(2n - 7) th digit			
n	Filler (in case of odd number)				(2n - 5) th digit			

*1 Odd/Even indication

Fig. 4.3.6.3.3-3 : Mobile subscriber number information element

The contents of the information element are specified:

(1) Mobile subscriber number content length (Octet 1)

Indicates the information element length (number of octets) for the Octet 2 and the subsequent octets (0 to 13)

(2) Odd/Even indication (octet 2)

Bit 8		Odd/Even indication
0	:	Even (if the number of digits is an even number)
1	:	Odd (if the number of digits is an odd number)

(3) Number digits (octets 3 - n)

Bit 4	3	2	1		(or 8 7 6 5)
1	0	1	0	:	0
0	0	0	1	:	1
0	0	1	0	:	2
0	0	1	1	:	3
0	1	0	0	:	4
0	1	0	1	:	5

4	3	2	1		(or 8 7 6 5)
0	1	1	0	:	6
0	1	1	1	:	7
1	0	0	0	:	8
1	0	0	1	:	9
1	0	1	1	:	*
1	1	0	0	:	#
0	0	0	0	:	Filler
Others				:	Reserved

4.3.6.3.3.5 Cause value

This information element is used for indicating the cause when the MM request from the user is not performed normally. It is coded as shown in Fig.4.3.6.3.3-4. This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Cause value							

Fig. 4.3.6.3.3-4 : Cause information element

The coding for this information element is shown below.

(1) Cause value (Octet 1)

Bit 8	7	6	5	4	3	2	1		Cause
0	0	0	0	-	-	-	-	:	[Normal class]
				0	0	0	1	:	Location registration failure
				0	0	1	0	:	Roaming not allowed
				0	1	1	0	:	Channel unavailable
				1	0	1	1	:	Authentication failure
				1	1	0	0	:	Service not subscribed
				1	1	1	1	:	Other normal class
0	0	0	1	-	-	-	-	:	[Normal class]
				0	1	0	1	:	Communication reject
0	0	1	0	-	-	-	-	:	[Resource unavailable class]
				0	1	1	0	:	Network out of order
				1	0	0	1	:	Temporary failure
				1	0	1	0	:	Switch congestion
				1	1	0	0	:	Requested line/channel unavailable
				1	1	1	1	:	Other resource unavailable class
0	1	1	0	-	-	-	-	:	[Procedure error class]
				0	0	0	0	:	Mandatory information element is missing
				0	1	0	0	:	Invalid information element contents
				1	1	1	1	:	Other procedure error class
Others								:	Reserved

a) Location registration failure

Specified when location registration fails for the reasons of the network side. When the user receives this Cause value, the user remains in the zone, and should not reactivate the location registration procedure in the zone. When the user moves to another zone and if the memorized location identity is not contained in the broadcast location identity or if the memorized Network identity is different from the broadcast one, the location registration procedure is activated.

b) Roaming not allowed

Set for the user whose roaming is not allowed. When the user receives this Cause, value, the user remains in the zone, and should not reactivate the location registration procedure in the zone. When the user moves to another zone and if memorized network identity is different from the broadcast network identity, the location registration procedure is activated.

c) Channel unavailable

Set for users having communications temporarily suspended (Temporary suspension)

d) Authentication failure

Set when authentication is not performed normally.

e) Service not subscribed

Set for the user who does not subscribe to the service.

f) Other normal class

Set when user registration is not performed normally. e.g., when termination registration for the mobile station is rejected by the registration number restriction, registration prohibition or other reasons.

g) Communication reject

Set for the user to whom communications are not allowed.

h) Network out of order

Set when the processing cannot be performed normally due to failures in the network and the failure cannot be recovered within a short period of time.

i) Temporary failure

Set when the processing cannot be performed normally due to failures in the network and the failure can be recovered within a short period of time.

j) Switch congestion

Set when the switch is congested or under restriction.

k) Requested line/channel unavailable

Set when the requested channel is restricted or closed.

l) Other resource unavailable class

Set when any other resource unavailable errors than above occur.

m) Mandatory information element is missing

Set when some data in the information element is missing.

n) Invalid information element contents

Set when the data in the information element is not understandable.

o) Other procedure error class

Set when other procedure errors than above occur.

4.3.6.3.3.6 Ciphering mode

This information element is used by the network to specify the ciphering mode to the user and is coded as shown in Fig. 4.3.6.3.3-5 below. This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Ciphering mode							

Fig. 4.3.6.3.3-5 : Ciphering mode information element

The content of the information element is as follows:

(1) Ciphering mode (octet 1)

Bit 8	7	6	5	4	3	2	1		Ciphering mode
0	0	0	0	0	0	0	1	:	Ciphering mode 1
0	0	0	0	0	0	1	0	:	Ciphering mode 2
						Others		:	Reserved

4.3.6.3.3.7 User registration type

This information element is used by the user to specify the registration type that the user requests to the network and is coded as shown in Fig. 4.3.6.3.3-6 below. This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	User registration type							

Fig. 4.3.6.3.3-6 : User registration type information element

The contents of the information element is specified as follows:

(1) User registration type (octet 1)

Bit 8	7	6	5	4	3	2	1		User registration type
0	0	0	0	0	0	0	0	:	Reserved
0	0	0	0	0	0	0	1	:	Termination registration
						Others		:	Reserved

4.3.6.3.3.8 User authentication type

This information element is used by the termination registered user to specify the type of subscriber authentication on termination and is coded as shown in Fig. 4.3.6.3.3-7 below. This information element is 1 octet long.

Octet	Bit 8	7	6	5	4	3	2	1
1	Header	User authentication type						

Fig. 4.3.6.3.3-7 : User authentication type information element

The content of the information element is specified as follows:

(1) Header (octet 1)

Bit 8		Header
0	:	This information element valid
1	:	This information element invalid (bits 1 to 7 are ignored)

(2) User authentication type (octet 1)

Bit 7	6	5	4	3	2	1		User authentication type
0	0	0	0	0	0	0	:	Authentication not required
0	0	0	0	0	0	1	:	Authentication required
Others							:	Reserved

Note : "This information element invalid "means that the network does not update the user authentication type.

4.3.6.3.3.9 Display

This information element is used by the network to indicate the information related to MM to the user and is coded as shown in Fig. 4.3.6.3.3-8 below. This information element has a variable length. Note, however, that the maximum length is 33 octets.

Octet	Bit 8	7	6	5	4	3	2	1
1	Display data length							
:	Display (IA5 character)							
n	:							

Fig. 4.3.6.3.3-8 : Display information element

The contents of the information element specified is as follows:

(1) Display data length (octet 1)

Specifies the information element length (number of octets) for the octet 2 and the successive octets.

(2) Display (octet 2 - n)

Information related to MM is set by IA5 characters.

4.3.6.3.3.10 User deregistration type

This information element is used by the user to specify the type of the requested deregistration to the network and is coded as shown in Fig. 4.3.6.3.3-9 below. This information element has an 1 octet long.

Octet	Bit 8	7	6	5	4	3	2	1
1	User deregistration type							

Fig. 4.3.6.3.3-9 : User deregistration type information element

The contents of the information element is specified as follows:

(1) User deregistration type (octet 1)

Bit 8	7	6	5	4	3	2	1		User deregistration type
0	0	0	0	0	0	0	0	:	Reserved
0	0	0	0	0	0	0	1	:	Termination deregistration
Others								:	Reserved

4.3.6.3.3.11 Terminal identity code

This information element is used by the network to verify if the user is the owner of the mobile station in the procedure for accessing the mobile station data and is coded as shown in Fig. 4.3.6.3.3-10 below. This information element has a variable length. Note, however, that the maximum length is 18 octets.

Octet	Bit 8	7	6	5	4	3	2	1
1	Terminal identity code data length							
2	*1	Spare						
3	2 nd digit				1 st digit			
4	4 th digit				3 rd digit			
:	~				~			
n-1	(2n-6)-th digit				(2n-7)-th digit			
n	Filler (in case of odd number)				(2n-5)-th digit			

*1: Odd/Even indicator

Fig. 4.3.6.3.3-10 : Terminal identity code information element

The contents of the information element is as follows:

(1) Terminal identity code data length (octet 1)

Specifies the information element length (number of octets) for the octet 2 and the successive octets.

(2) Odd/Even indication (octet 2)

Indicates the number of digits composing the Terminal identity code is an odd number or an even number.

(3) Terminal identity code (octet 3 - n)

Bit 4	3	2	1		(or 8 7 6 5)	4	3	2	1		(or 8 7 6 5)
1	0	1	0	:	0	0	1	1	0	:	6
0	0	0	1	:	1	0	1	1	1	:	7
0	0	1	0	:	2	1	0	0	0	:	8
0	0	1	1	:	3	1	0	0	1	:	9
0	1	0	0	:	4	0	0	0	0	:	Filler
0	1	0	1	:	5		Others			:	Reserved

4.3.6.3.3.12 Registration reset type

This information element is used by the owner of the mobile station for indicating the type of registration reset when requesting the registration reset for the mobile station and is coded as shown in Fig. 4.3.6.3.3-11 below. This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Registration reset type							

Fig. 4.3.6.3.3-11 : Registration reset type information element

The contents of the information element is specified as follows:

(1) Registration reset type (octet 1)

Bit 8	7	6	5	4	3	2	1		Registration reset type
0	0	0	0	0	0	0	0	:	Reset all subscriber numbers registered
						Others		:	Reserved

4.3.6.3.3.13 Network identity

The Network identity information element is used for indicating the number for identifying the mobile communication networks provided by individual telecommunication operators and is coded as shown in Figure 4.3.6.3.3-12 below. This information element is 2 octets long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare	Country number						
2	Operator group number				Network identity in group			

Fig. 4.3.6.3.3-12 : Network identity information element

The contents of this information element is specified as follows:

(1) Country number (octet 1) : Binary numbers (from 0 to 127) which identify country.

Bit 7	6	5	4	3	2	1		Country
0	0	0	0	0	0	1	:	Japan
Others							:	Reserved

(2) Operator group number (octet 2) : Binary numbers (from 0 to 15) which identify operator group

Bit 8	7	6	5		Operator group
0	0	1	0	:	NTT DoCoMo group
0	1	0	1	:	IDO
0	1	1	1	:	Cellular group
1	0	0	0	:	TU-KA group
1	0	0	1	:	Digital-phone group
1	0	1	0	:	Digital TU-KA group
Others				:	Reserved

(3) Network identity in group (octet 2) : Binary numbers (from 0 to 15) which identify local network in the operator group.

4.3.6.3.3.14 Terminating service registration type

This information element is used for registering the communication service type by which the mobile station receives calls from the network and is coded as shown in Fig. 4.3.6.3.3-13 below. This information element is 2 to 16 octets long.

Octet	Bit 8	7	6	5	4	3	2	1
1	*1	Spare	Requested type		Service type information length			
2	Spare						*3	*2
3 - n	Spare							

*1 : Format Identification
*2 : Voice communication service
*3 : Packet communication service

Fig. 4.3.6.3.3-13 : Terminating service registration type information element

The contents of this information element is as follows:

(1) Service type information length (Octet 1)

Specifies the number of octets from octet 2 to n (1 – 15).

(2) Voice communication service (Octet 2)

Bit 1		Voice communication service
0	:	None
1		Provided

(3) Packet communication service (Octet 2)

Bit 2		Packet communication service
0	:	None
1	:	Provided

(4) Format identification (Octet 1)

Bit 1		Format identification
0	:	Requested type field invalid
1	:	Requested type field valid

This field is set to "1" for an MS complying with Version G or a subsequent version.

(5) Requested type (Octet 1)

Bit 6	5		Requested type
0	0	:	Location registration
1	0	:	Reserved
0	1	:	Packet deregistration
1	1	:	Packet deregistration and location registration

Note : When the Terminating service registration type information element is included in the Location Registration Request message, neither the voice communication service nor packet communication service can be set to "none."

4.3.6.3.3.15 Retransmission identifier

This information element is used for confirming whether the received signal is the signal to be received or not. If the retransmission identifier for the received signal differs from that for the requested signal, the mobile station does not perform the corresponding operation even if the mobile station receives the signal. This information element is coded as shown in Fig. 4.3.6.3.3-14 and is 2 octets long.

Octet \ Bit	8	7	6	5	4	3	2	1
1, 2	Retransmission identifier							

Fig. 4.3.6.3.3-14 : Retransmission identifier information element

4.3.6.3.3.16 Mobile station type

This information element is used for reporting the mobile station type and is coded as shown in Fig. 4.3.6.3.3-15 below. This information element is 3 octets long.

<table>
<tr><td></td><td colspan="8">Bit</td></tr>
<tr><td>Octet</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td></tr>
<tr><td>1</td><td colspan="2">Mobile station class</td><td>*1</td><td>*2</td><td colspan="3">Spare</td><td>*3</td></tr>
<tr><td>2</td><td colspan="3">Mobile station Rev.</td><td>Spare</td><td colspan="2">Standard ciphering version</td><td colspan="2">Rev. extended</td></tr>
<tr><td>3</td><td colspan="2">Spare</td><td colspan="6">Operator specific area</td></tr>
</table>

*1 : Reception group selection algorithm B capability
*2 : Functional channel selection algorithm 2 capability
*3 : Extended channel selection capability

Fig. 4.3.6.3.3-15 : Mobile station type information element

The contents of this information element are as follows:

(1) Mobile station class (Octet 1)

Bit 8	7		Mobile station class
0	0	:	General mobile station
0	1	:	Priority mobile station (VIP, emergency use)
1	1	:	Maintenance mobile station
Others		:	Reserved

(2) Reception group selection algorithm B capability (Octet 1)

Bit 6		Reception group selection algorithm capability (Note 1)
0	:	Not capable
1	:	Capable

Note 1 : For an MS complying with Version G or a subsequent version, it is mandatory to set to "Capable".

(3) Functional channel selection algorithm 2 capability (Octet 1)

Bit 5		Functional channel selection algorithm 2 capability (Note 2)
0	:	Not capable
1	:	Capable

Note 2 : For an MS complying with Version G or a subsequent version, it is mandatory to set to "Capable".

(4) Mobile station Rev. (Octet 2)

A code which indicates the specification revision number for mobile stations.

Bit	8	7	6		Mobile station Rev.
	0	1	1	:	In compliance with RCR STD-27F
	1	0	0	:	In compliance with RCR STD-27G
	1	0	1	:	In compliance with RCR STD-27H
	1	1	0	:	In compliance with RCR STD-27I/J
	1	1	1	:	In compliance with RCR STD-27K or a subsequent revision (Refer to Rev. extended)
	Others			:	Reserved

(5) Standard ciphering version (Octet 2)*

Bit	4	3		Standard ciphering version
	0	1	:	Ver. 1
	Others		:	Reserved

* If a mobile station supports several versions, it shall report only one version, but the choice of which is up to the mobile station.

(6) Operator specific area (Octet 3)

An area which can be freely defined by each operator.

(7) Extended channel selection capability (Octet 1)

Bit	1	:	Extended channel selection capability
	0	:	Not capable
	1	:	Capable

(8) Rev. extended (Octet 2)

Bit	2	1		Rev. extended
	0	0	:	In compliance with RCR STD-27K
	0	1	:	In compliance with RCR STD-27L
	Others		:	Reserved

4.3.6.3.3.17 Transmission speed

This information element is used for reporting the transmission speed for communication and capability of switching between the channel coding with FEC and the channel coding without FEC and is coded as shown in Fig. 4.3.6.3.3-16. If the entity is incapable of switching between FEC and non-FEC, the entity must use FEC. This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
	*1	T_IDLE				*2	Transmission speed	

*1 : Capability for switching between FEC channel coding and non-FEC channel coding.
*2 : Full-duplex/Half-duplex

Fig. 4.3.6.3.3-16 : Transmission speed information element

(1) Transmission speed (Octet 1)

Bit 2 1		Transmission speed
0 0	:	High speed
0 1	:	Low speed (Note)
Others	:	Reserved

Note : This value is always coded if Bit 3 is "1" (Half-duplex).

(2) Capability for switching between FEC channel coding and non-FEC channel coding (Octet 1)

Bit 8		FEC switching capability
0	:	FEC switching capable
1	:	FEC switching incapable

(3) Full-duplex/Half-duplex (Octet 1)

Bit 3		
0	:	Full-duplex
1	:	Half-duplex

(4) T_IDLE timer value (Octet 1) : 500 ms unit (0-7.5 s) in binary

Note : This value is valid when Bit 3 (octet 1) is "1" (Half-duplex) and the direction is from the network to the user, otherwise this value is set to all "0".

4.3.6.3.3.18 Communication state

This information element is used for reporting the communication state and is coded as shown in Fig. 4.3.6.3.3-17. This information element is 1 to 2 octets long.

Octet	Bit 8	7	6	5	4	3	2	1
1	Spare							*1
2	Terminal registration area code							

*1 : Communication state indication

Fig. 4.3.6.3.3-17 : Communication state information element

The contents of this information element are as follows:

(1) Communication state indication

Bit 1		Communication state indication
0	:	Communication initial state
1	:	Communication active state

(2) Terminal registration area code

If the communication state indication is set for "communication active state", the terminal registration area to which the mobile station belongs is indicated in binary. If the communication state indication is set for "communication initial state," this terminal registration area code is omitted.

4.3.6.3.3.19 Communication mode

This information element is used by the mobile station for requesting the communication state and reception method from the network or by the network for specifying them to the mobile station, and is coded as shown in Fig. 4.3.6.3.3-18. This information element is 1 to 2 octet long.

Octet	Bit 8	7	6	5	4	3	2	1
1	Mode							
2	Spare		Reception subframe					

Fig. 4.3.6.3.3-18 : Communication mode information element

The contents of this information element is as follows:

(1) Mode

Bit	8	7	6	5	4	3	2	1		Mode
	0	0	0	0	-	-	-	-	:	Active
					0	0	0	0	:	Continuous reception
					0	0	0	1	:	Intermittent reception
	0	0	0	1	-	-	-	-	:	Packet standby
					0	0	0	0	:	Superframe intermittent
							Others		:	Reserved

Note : Hyperframe intermittent reception is a subject for future study. When this is to be standardized, a corresponding code of this field shall be defined.

(2) Reception subframe (0 to 35)

Indicates the top subframe number to be received.

Reception subframe can be omitted depending on the value indicated in Mode as shown below:

	Active		Packet standby
	Continuous reception	Intermitted reception	Superframe intermittent
Reception subframe	Omitted	Indicated	Indicated

4.3.6.3.3.20 Calling party number

This information element represents the mobile subscriber number for packet communication. (The same coding as that for Section 4.6.3.3.4 "Mobile subscriber number" should be used.)

4.3.6.3.3.21 Packet standby switching timer

This information element indicates the information on switching to the packet standby state if the user data is not transmitted or received for a certain period of time when the communication mode is set for the active mode and is coded as shown in Fig. 4.3.6.3.3-19. This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
	Packet standby switching timer							

Fig. 4.3.6.3.3-19 : Packet standby switching timer information element

The contents of this information element is as follows:

(1) Packet standby switching timer (Octet 1)

Indicates the timer for switching to the packet standby state in minutes using binary (from 1 to 255) as minutes. However, if this information is set for "all zero", it should be assumed "not set."

4.3.6.3.3.22 Voice terminating method

This information element is used for reporting the voice terminating method on the UPCH for the mobile station to the network and is coded as shown in Fig. 4.3.6.3.3-20. This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare						*2	*1

* 1 : Voice terminating method 1 enable/disable
* 2 : Voice terminating method 2 enable/disable

Fig. 4.3.6.3.3-20 : Voice terminating method information element

The contents of this information element is as follows:

(1) Voice terminating method 1 enable/disable (Octet 1)

Bit 1		Voice Terminating Method 1 enable/disable
0	:	Disable
1	:	Enable

Bit 2		Voice Terminating Method 2 enable/disable
0	:	Disable
1	:	Enable

4.3.6.3.3.23 Packet system timer

The Packet system timer information element includes the information on the timers used for packet communication. This information element is used by the network to designate the packet periodical registration timer, the packet channel registration response wait timer value, or the packet communication deregistration response wait timer value for executing the packet channel registration procedure for the user when signals are not transmitted/received for a fixed period of time. This information element is coded as shown in Fig. 4.3.5.3.3-21 below and is 1 octet in length.

Octet	Bit 8	7	6	5	4	3	2	1
1	*2	*1	Spare	Packet periodical registration timer				

* 1 : TM309 (Packet communication deregistration response wait timer value)
* 2 : TM308 (Packet channel registration response wait timer value)

Fig. 4.3.6.3.3-21 : Packet system timer information element

The contents of this information element are as follows:

(1) Packet cycle registration timer (Octet 1)

Bit 5	4	3	2	1		Packet periodical registration timer
0	0	0	0	0	:	Timer not activated
0	0	0	0	1	:	10 min
		:				
1	1	1	1	1	:	310 min

(2) Packet communication deregistration response wait timer value (Octet 1)

Bit 7		TM309
0	:	2 s
1	:	6 s

(3) Packet channel registration response timer value (Octet 1)

Bit 8		TM308
0	:	2 s
1	:	6 s

4.3.6.3.3.24 Channel switching timer

This information element indicates the duration of time that the network ensures communications for the user when the user switches to another channel and is coded as shown in Fig. 4.3.6.3.3-22 below. This information element is 1 octet long.

Octet	Bit 8	7	6	5	4	3	2	1
1	Channel switching timer							

Fig. 4.3.6.3.3-22 : Channel switching timer information element

Channel switching timer (Octet 1) :

Bit	8	7	6	5	4	3	2	1		Channel switching timer
	0	0	0	0	0	0	0	0	:	0 s
	0	0	0	0	0	0	0	1	:	1 s
			:							
	1	1	1	1	1	1	1	0	:	254 s
	1	1	1	1	1	1	1	1	:	Value specified by the Packet periodical registration timer

4.3.6.3.3.25 Communication quality information

This information element is used by the network for specifying the condition for determining deterioration of the reception quality for the channel during packet communication in each RF zone for the user and is coded as shown in Fig. 4.3.6.3.3-23 below. This information element is 5 octets long.

Octet	Bit 8	7	6	5	4	3	2	1
1	Spare	Packet communication level						
2	Spare	Packet communication deteriorated level						
3	No. of times packet communication deteriorated level detected							
4	Spare					Deterioration bit error rate		
5	No. of times bit error rate deterioration detected							

Fig. 4.3.6.3.3-23 : Communication quality information information element

(1) Packet communication level (Octet 1)

Specifies the reception level in binary by which communications can continue on the current packet channel. (The same coding as "Reception level" in section 4.3.5.3.3.6 is used.)

(2) Packet communication deteriorated level (Octet 2)

Specifies the reception level in binary by which deterioration of the reception level is determined. (The same coding as "Reception level" in section 4.3.5.3.3.6.)

(3) Number of times level deterioration detected (Octet 3)

Specifies the number of times that reception level deterioration is detected in binary (from 1 to 255) by which communications are stopped.

(4) Deterioration bit error rate (Octet 4)

Specifies the bit error rate for the home zone, by which deterioration of the bit error rate is determined.

Bit 3	2	1		Deterioration bit error rate
0	1	1	:	BER 3% or more
0	1	0	:	BER 1% or more but less than 3%
0	0	1	:	BER 0.3% or more but less than 1%
0	0	0	:	BER less than 0.3%

(5) Number of times of bit error rate deterioration detection (Octet 5)

Specifies the number of times of detection of deterioration of the bit error rate in binary (from 1 to 255) for determining that communications cannot be continued on the current packet channel.

4.3.6.3.3.26 Connection zone decision information

This information element is used by the network for specifying the difference between the reception level of the candidate connection zone and that of the home zone for deciding the connection destination RF zone to the user when the packet channel is changed. This information element is coded as shown in Fig. 4.3.6.3.3-24 below and is 2 octets long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Connection permitted level difference							
2	Strong electric field decision level difference							

Fig. 4.3.6.3.3-24 : Connection zone decision information information element

(1) Connection permitted level difference (Octet 1)

Specifies the difference between the peripheral zone reception level and the reception level of the home zone by which connection is permitted in 2's complement binary format from -127 to 127 dB.

(2) Strong electric field decision level difference (Octet 2)

Specifies the difference between the peripheral zone reception level and the reception level of the home zone for a strong electric field detection in 2's complement binary format from -127 to 127 dB.

4.3.6.3.3.27 Maximum number of reporting channels

This information element is used by the network for reporting the maximum number of peripheral perch channels which can be assigned when requesting the current zone and the peripheral zone information from the user. This information element is coded as shown in Fig. 4.3.6.3.3-25 below and is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare			Maximum number of reporting channels				

Maximum number of reporting channels : Binary (from 0 to 12).

Fig. 4.3.6.3.3-25 : Maximum number of reporting channels information element

4.3.6.3.3.28 Ciphering version

This information element is used by the network for reporting the ciphering version used for communications to the user and is coded as shown in Fig. 4.3.6.3.3-26 below. This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Operator specific definition area				Ciphering type		Spare	

Fig. 4.3.6.3.3-26 : Ciphering version information element

The contents of this information element are as follows:

(1) Ciphering type (Octet 1)

Bit 4	3		Ciphering type
0	0	:	Operator specific ciphering
0	1	:	Standard ciphering version 1
Others		:	Reserved

(2) Operator specific definition area (Octet 1)

An area which can be defined freely by each operator.

4.3.6.3.3.29 Voice terminating condition

This information element is used by the network for reporting the voice terminating condition on the UPCH to the mobile station and is coded as shown in Fig. 4.3.6.3.3-27 below. This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare						*2	*1

*1 : Voice Terminating Method 1 availability
*2 : Voice Terminating Method 2 availability

Fig. 4.3.6.3.3-27 : Voice terminating condition information element

The contents of this information element are as follows:

(1) Voice terminating availability (Octet 1)

Bit 1 Voice Terminating Method 1 availability
0 : Not available
1 : Available

Bit 2 Voice Terminating Method 2 availability
0 : Not available
1 : Available

4.3.6.3.3.30 Packet communication environment

This information element is used for indicating the environment provided to the mobile station during packet communications and is coded as shown in Fig. 4.3.6.3.3-28 below. This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare							*1

*1 : Channel switching between terminal registration areas

Fig. 4.3.6.3.3-28 : Packet communication environment information element

The contents of this information element are as follows:

(1) Channel switching between terminal registration areas (Octet 1)

Bit 1 Channel switching between terminal registration areas
0 : Method 1 (DTE not notified)
1 : Method 2 (DTE notified)

4.3.6.3.3.31 Operator specific information

This information element indicates an area which can be defined by each operator freely and is coded as shown in Fig. 4.3.6.3.3-29 below. This information element has variable length.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Operator specific information element length							
2 ~	Operator specific area							

Fig. 4.3.6.3.3-29 : Operator specific information information element

The contents of this information element are as follows:

(1) Operator specific information information element length (Octet 1)

Indicates the length of the information element for octet 2 and lower octets in binary (0 – 127).

4.3.6.3.3.32 Packet connection method

The packet connection method information element is used by the user to notify the network of the packet connection method which can be communicated and is coded as shown in Fig. 4.3.6.3.3-4. This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Number of switched virtual circuits simultaneously connected			Spare			*2	*1

*1 : Protocol for mobile packet communications enable/disable
*2 : Protocol for Switched Virtual Circuit connection

Fig. 4.3.6.3.3-30 Packet communication method information element

The information element contents are as shown below.

(1) Protocol for mobile packet communications enable/disable (octet 1)

Bit 1		Protocol for mobile packet communication enable/disable (Note 1)
0	:	Disable
1	:	Enable

(2) Protocol for Switched Virtual Circuit connection enable/disable (Octet 1)

Bit 2		Protocol for Switched Virtual Circuit connection enable/disable (Note 1)
0	:	Disable
1	:	Enable

Note 1 : Either "Protocol for mobile packet communication" or "Protocol for Switched Virtual Circuit connection" must be "Enable". If both of these field are "Enable", then connection should be performed by using the communication protocol designated by Packet connection condition included in the Packet Communication Registration Response message.

(3) Number of simultaneous connections for Switched Virtual Circuit (Octet 1)

The number of simultaneous connections that the user permits for Switched Virtual Circuit is expressed in binary (0-7).

If Enable is set for Protocol for Switched Virtual Circuit connection enable/disable, (1-7) shall be set; if Disable is set, then (0) shall be set.

4.3.6.3.3.33 Packet connection condition

Packet connection condition is used by the network to notify the user of the packet connection condition. This information element is coded as shown in Fig. 4.3.6.3.3-8 and is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Number of Switched Virtual Circuits simultaneously connected			Spare			Packet connection condition	

Fig. 4.3.6.3.3-31 Packet connection condition information element

The contents of the information elements are as follows:

(1) Packet connection condition (Octet 1)

Bit 2	1		Packet connection condition
0	1	:	Use of protocol for mobile packet communication
1	0	:	Use of protocol for Switched Virtual Circuit connection
Others		:	Reserved

(2) Number of switched virtual circuits simultaneously connected (Octet 1)

This indicates the number of simultaneous Switched Virtual Civcuit connections that the network permits for virtual circuit. If "Use of protocol for Switched Virtual Circuit connection" is set for the Packet connection condition, (1-7) shall be set; if "Use of protocol for mobile packet communications" is set, then (0) shall be set.

4.3.6.3.3.34 Maximum number of voice connection reporting channels

The "Maximum number of voice connection reporting channels" represents the maximum number of channels which report recepting levels as a result of the supervision of peripheral zones of the mobile station. With Voice Terminating Method 2, this information element is used by the mobile station for performing voice connections after switching zones while voice termination is on hold as shown in Fig. 4.3.6.3.3-32. This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare			Maximum number of voice connection reporting channels				

Maximum number of voice connection reporting channels (Octet 1): binary numbers (0 ~ 20)

Fig. 4.3.6.3.3-32 Maximum number of voice connection reporting channels information element

4. 3. 6. 3.3.35 Registration identifier

The Registration identifier is used for identifying the state of the mobile station during packet communication registration or packet channel registration. This information element is coded as shown in Fig. 4.3.6.3.3.33 below and is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
	*1	Spare				Frequency switching count		

*1:Registration identifier

(1) Registration identifier

Bit	8	:	Registration identifier
	0	:	Initial registration
	1	:	Re-registration

(2) Frequency switching count

Specifies the number of times in binary (0 to 7) that the packet physical channel and control physical channel is activated due to zone switching, etc., until registration processing on the packet physical channel is completed. 7 or more times are expressed as 7.

Fig. 4.3.6.3.3.33 Registration identifier

4.3.6.3.3.36 Reception level

The Reception level information element indicates the reception level for communications measured by the mobile station and is coded as shown in Fig. 4.3.6.3.3-34 below. This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare	Reception level						

Reception level (Octet 1) : Specifies the reception levels in binary. (38 to 109)

Bit	7	6	5	4	3	2	1	:	Reception level
	1	1	0	1	1	0	1	:	65dBμ or higher
	1	0	0	0	0	0	0	:	20dBμ or higher, less than 21dBμ
	0	1	0	1	1	0	0	:	0dBμ or higher, less than 1dBμ
	0	1	0	0	1	1	1	:	-5dBμ or higher, less than -4dBμ
	0	1	0	0	1	1	0	:	less than -5dBμ

Fig. 4.3.6.3.3-34 Reception level information element

4.3.6.3.3.37 Number of selected zones

The Number of selected zones information element indicates the number of peripheral candidate zones which are selected for the circuit connection zone and is coded as shown in Fig. 4.3.6.3.3-35 below. This information element is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Spare			Number of selected zones				

Number of selected zones (Octet 1) : Specifies the Number of selected zones in binary (0 to 20).

Fig. 4.3.6.3.3-35 Number of selected zones information element

4.3.6.3.3.38 Perch channel number

The Perch channel number information element indicates the perch channel number of which level the mobile station supervises in the Standby state and when in communication for zone/sector decision. The mobile station has a matching table for the perch channel number and the frequency code number in permanent memory. This information element is shown in Fig. 4.3.6.3.3-36 and 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Perch channel number							

Perch channel number (Octet 1) is specified in binary (0 to 255).

Note : Refer to Section 4.1.10.1 (3) for a definition of a perch channel.

Fig. 4.3.6.3.3-36 Perch channel number information element

4.3.6.3.3.39 Frequency band

The Frequency band information element specifies the frequency bands of the physical channels which the MS can support and is shown in Fig. 4.3.6.3.3-37. This information element is 2 octets long.

Octet \ Bit	8	7	6	5	4	3	2	1
1	Frequency band							
2	Spare							*1

The MS indicates that it is possible to communicate using the physical channels of the band corresponding to each bit which is set to "1". The MS which supports multiple frequency bands sets each bit corresponding to a supported band to "1".

Note that mobile stations which are capable of communications on the band corresponding to Bit 6 of octet 1 must also be capable of communication on the band corresponding to Bit 5 of octet 1.

Furthermore, mobile stations which are capable of communication on the band corresponding to Bit 7 of octet 1, Bit 8 of octet 1 and/or Bit 1 of octet 2 must also be capable of communication on the band corresponding to Bit 1 of octet 1 and/or Bit 2 of octet 1.

Octet 1

Bit 1

0 : Transmission band ; 940.0-956.0 MHz Reception band ; 810.0-826.0 MHz MS not supporting

1 : Transmission band ; 940.0-956.0 MHz Reception band ; 810.0-826.0 MHz MS supporting

Bit 2

0 : Transmission band ; 1429.0-1453.0 MHz
Reception band ; 1477.0-1501.0 MHz MS not supporting

1 : Transmission band ; 1429.0-1453.0 MHz
Reception band ; 1477.0-1501.0 MHz MS supporting

Bit 3
0 : Transmission band ; 925.0-940.0 MHz Reception band ; 870.0-885.0 MHz MS not supporting
1 : Transmission band ; 925.0-940.0 MHz Reception band ; 870.0-885.0 MHz MS supporting

Bit 4
0 : Transmission band ; 956.0-958.0 MHz Reception band ; 826.0-828.0 MHz MS not supporting
1 : Transmission band ; 956.0-958.0 MHz Reception band ; 826.0-828.0 MHz MS supporting

Bit 5
0 : Transmission band ; 893.0-895.0 MHz Reception band ; 838.0-840.0 MHz MS not supporting
1 : Transmission band ; 893.0-895.0 MHz Reception band ; 838.0-840.0 MHz MS supporting

Bit 6
0 : Transmission band ; 895.0-898.0 MHz Reception band ; 840.0-843.0 MHz MS not supporting
1 : Transmission band ; 895.0-898.0 MHz Reception band ; 840.0-843.0 MHz MS supporting

Bit 7
0 : Transmission band ; 1429.0-1439.0 MHz and 1465.0-1468.0 MHz Reception band ; 1477.0-01487.0 MHz and 1513.0-1516.0 MHz not supporting
1 : Transmission band ; 1429.0-1439.0 MHz and 1465.0-1468.0 MHz Reception band ; 1477.0-01487.0 MHz and 1513.0-1516.0 MHz supporting

Bit 8
0 : Transmission band ; 1439.0-1443.0 MHz and 1465.0-1468.0 MHz Reception band ; 1487.0-01491.0 MHz and 1513.0-1516.0 MHz not supporting
1 : Transmission band ; 1439.0-1443.0 MHz and 1465.0-1468.0 MHz Reception band ; 1487.0-01491.0 MHz and 1513.0-1516.0 MHz supporting

Octet 2
Bit 1
0 : Transmission band ; 1443.0-1453.0 MHz and 1465.0-1468.0 MHz Reception band ; 1491.0-1501.0 MHz and 1513.0-1516.0 MHz not supporting
1 : Transmission band ; 1443.0-1453.0 MHz and 1465.0-1468.0 MHz Reception band ; 1491.0-1501.0 MHz and 1513.0-1516.0 MHz supporting

Bit spare : Transmission band ; 887.0-889.0 MHz Reception band ; 832.0-834.0 MHz

Bit spare : Transmission band ; 898.0-901.0 MHz Reception band ; 843.0-846.0 MHz

Bit spare : Transmission band ; 915.0-925.0 MHz Reception band ; 860.0-870.0 MHz

Fig. 4.3.6.3.3-37 Frequency band information element

4.3.6.3.3.40 Network registration type

The Network registration type information element is used for identifying whether the pertinent registration is for switching from a system other than PDC to the PDC system or for normal location registration. This information element is coded as shown in Fig. 4.3.6.3.3-38 below and is 1 octet long.

Octet \ Bit	8	7	6	5	4	3	2	1
	*1	Spare						*2

*1: System switching capability
*2: Network registration identifier

Fig. 4.3.6.3.3-38 Network registration type information element

System switching capability (Octet 1)

Bit 8	:	System switching capability
0	:	Switching incapable
1	:	Switching capable

Network registration identifier (Octet 1)

Bit 1	:	Network registration identifier
0	:	Normal location registration
1	:	System switching registration

4.3.6.4 Timer and retransmission conditions

4.3.6.4.1 Timer and retransmission conditions specified in the user side of the interface

Conditions for the MM timer and re-transmission specified in the user side of the interface are listed in Table 4.3.6.4-1.

Table 4.3.6.4-1 : Timer and retransmission conditions on the user side (MM) (1/2)

Timer No.	Default time-out	State	Cause of start	Normal stop	At the first expiry	At the second and subsequent expiries
TM301	6 s	Location registration	Location Registration Request sent	Location Registration Acknowledgement, or Location Registration Reject received	Retransmit Location Registration Request and restart TM301.	Retransmit Registration Request three times, and then enter Null state.
TM304	15 s	User registration	User Registration Request sent	User Registration Response, or User Registration Reject received	Retransmit User Registration Request and restart TM304.	Retransmit User Registration Request three times, and then enter Null state.
		User deregistration	User De-registration Request sent	User Deregistration Response, or User Deregistration Reject received	Retransmit User Deregistration Request and restart TM304.	Retransmit User Deregistration Request three times, and then enter Null state.
TM305	6 s	Registration reset	Registration Reset Request sent	Registration Reset Response, or Registration Reset Reject received	Retransmit Registration Reset Request and restart TM305.	Retransmit Registration Reset Request three times, and then enter Null state.
TM307	6 s	Packet communi-cation registration	Packet Communi-cation Registration Request sent	Packet Communication Registration Response, or Packet Communication Registration Reject received	Retransmit Packet Communication Registration Request and restart TM307	Retransmit Packet Communication Registration Request three times, and then enter Null state.
TM308	2 s or 6 s (note 1)	Packet channel registration	Packet Channel Registration Request sent	Packet Channel Registration Response, or Packet Channel Registration Reject received	Retransmit Packet Channel Registration Request and restart TM308	Retransmit Packet Channel Registration Request three times, and then enter Null state.
TM309	2 s or 6 s (note 1)	Packet communi-cation deregist-ration	Packet Communi-cation Deregistra-tion Request sent	Packet Communication Deregistration Response or Packet Communication Deregistration Reject received	Retransmit Packet Commu-nication Deregistration Request and restart TM309	Retransmit Packet Communication Deregistration Request three times, and then enter Null state.

Note 1: The timer values specified by the packet system timer information element included in the RT or MM messages must be used. The packet system timer information element are set in the Zone Information Report message, Packet System Information Report message, Packet Communication Registration Response message and the Packet Channel Registration Response message.

Table 4.3.6.4-1 : Timer and retransmission conditions on the user side (MM) (2/2)

Timer No.	Default time-out	State	Conditions on user side
TM303	0.5 s	Authentication	Must return Authentication Response within TM303, after receiving Authentication Request.
TM306	1.5 s	Authentication	Must return Authentication Response within TM306, after receiving Authentication Request.
TM312	0.5 s	Packet authentication	Must return Packet Authentication Response within TM312, after receiving Packet Authentication Request.
TM315	0.5 s	during packet communication or during packet stand by	Must return Packet Communication Registration Request within TM315 after receiving Packet Communication Registration State Inquiry.
TM316	0.5 s	during packet communication or during packet stand by	Must return Packet Communication Disconnect Acknowledgment within TM316, after receiving Packet Communication Disconnect Request.

Note 1 : Timer values and numbers of retransmission of the network side can be specified by the operator.

Note 2 : The above timers indicate the processing time from when reception of the message by the MS is completed until the MS is ready to transmit a message.

Note 3 : Timer TM306 is set during a call origination (a user registration and a user deregistration) performed by a user other than the owner of the MS.

4.3.6.4.2 Timer and retransmission conditions in the network side of the interface

Conditions for the MM timer and retransmission specified in the network side of the interface are listed in Table 4.3.6.4-2 below.

Table 4.3.6.4-2 : Timer and retransmission conditions in the network side (MM)

Timer No.	State	Cause of start	Normal stop	At the 1~(n-1) th expiry	At the nth and subsequent expiries
TM302	Authentication	Authentication Request sent	Authentication Response received	Retransmit Authentication Request and restart TM302	Enter Null state
TM310	Packet communication registration state inquiry	Packet Communication Registration State Inquiry sent	Any layer 3 signal received	Retransmit Packet Communication Registration State Inquiry and restart TM310	Enter Null state
TM313	Packet Communication Disconnect	Packet Communication Disconnect Request sent	Packet Communication Disconnect Acknowledgment received	Retransmit Packet Communication Disconnect Request and restart TM313	Enter Null state
TM314	Packet authentication	Packet Authentication Request sent	Packet Authentication Response received	Retransmit Packet Authentication Request and restart TM314	Enter Null state

Note : Timer values and numbers of retransmission of the network side can be specified by the operator freely.

4.3.7 Call control signal (CC)

The item headings below give the standards for the basic call control signals for circuit/packet switched calls.

4.3.7.1 Call conditions

4.3.7.1.1 Call conditions for the user end of the interface

The following call states apply to user end of the user- to-network interface. Codes in parenthesis indicate the state of each item.

i) Null (UCC0)

A state in which no calls exist.

ii) Call initiated (UCC1)

This state exists for an outgoing call when the user requests the network for call setup.

iii) Outgoing call proceeding (UCC3)

This state exists for an outgoing call when the user has received acknowledgment (CALL PROC) from the network for reception of all the information required to establish the call.

iv) Call delivered (UCC4)

This state exists for an outgoing call when the user has received a call initiating report (ALERT) from the called party.

v) Call present (UCC6)

This state exists for an incoming call when the user has received a call setup request but has not yet responded to it.

vi) Call received (UCC7)

This state exists for an incoming call when the user has indicated alerting the calling (ALERT) but has not answered yet.

vii) Connect request (UCC8)

This state exists for an incoming call when the user has answered the call and is waiting to be awarded the call.

viii) Active (UCC10)

This state exists for an incoming call when the user has received a response acknowledgment message (CONN ACK) from the network.
This state exists for an outgoing call when the user has received an indication that the remote user has answered the call.

ix) Disconnect request (UCC11)

This state exists when the user has requested the network to clear the end-to-end connection (if any) and is waiting for acknowledgment for this request from the network.

x) Disconnect indication (UCC12)

This state exists when the user has received an invitation to disconnect because the network has disconnected end-to-end connection (if any.)

xi) Release request (UCC19)

This state exists when the user has requested the network to release and is waiting for a response.

xii) Packet null (UCCP0)

A state in which the user is waiting for packet transfer.

xiii) Null (UCCS0)

State in which user is not carrying out switched virtual circuit connection.

xiv) Connection request (UCCS1)

State in which the user has sent a connection request to the network and is waiting for a response.

xv) Connection notification (UCCS2)

State in which the user has received a connection request from the network but has not made any response.

xvi) Connection (UCCS3)

State in which the user is connected to a switched virtual circuit.

xvii) Connection release request (UCCS4)

State in which the user has sent a connection release request to the network and is waiting for a response.

4.3.7.1.2 Call conditions on the network end of the interface

The following call states apply to the network end of the network-to-user interface. Codes in parenthesis indicate the state of each item.

i) Null (NCC0)

State in which no calls exist.

ii) Call initiated (NCC1)

This state exists for an outgoing call when the network has received a call establishment request but has not yet responded to it.

iii) Outgoing call proceeding (NCC3)

This state exists for an outgoing call when the network has transferred an acknowledgment (CALL PROC) for reception of all the information required for call establishment by the user.

iv) Call delivered (NCC4)

This state exists for an outgoing call when the network has indicated that remote user alerting has been initiated.

v) Call present (NCC6)

This state exists for an incoming call when the network has sent a call establishment request (SETUP) but has not yet received any response to it.

vi) Call received (NCC7)

This state exists for an incoming call when the network has received an indication that the user is alerting but has not yet received an answer.

vii) Connect request (NCC8)

This state exists for incoming call when the network has received an answer but has not yet awarded the call.

viii) Active (NCC10)

This state exists for an incoming call when the network has awarded the call to the called user.

This state exists for an outgoing call when the network has indicated that the remote user has answered the call.

ix) Disconnect request (NCC11)

This state exists when the network has received a request from user to clear the end-to-end connection (if any).

x) Disconnect indication (NCC12)

This state exists when the network has disconnected the end-to-end connection (if any) and has sent an indication to disconnect the user-network connection.

xi) Release request (NCC19)

This state exists when the network has requested the user to release the call and is waiting for acknowledgment from the user.

xii) Packet null (NCCP0)

State in which the network is waiting for packet transfer.

xiii) Null (NCCS0)

State in which the network is not carrying out Switched Virtual Circuit connection.

xiv) Connection request (NCCS1)

State in which the network has sent a connection request to the user and is waiting for a response.

xv) Connection notification (NCCS2)

State in which the network has received a connection request from the user but has not made any response.

xvi) Connection(NCCS3)

State in which the network is connected for a Switched Virtual Circuit.

xvii) Connection release request (NCCS4)

State in which the network has sent a connection release request to the user and is waiting for a response.

4.3.7.2 Definitions of functions and contents of CC messages

The items headings in the remainder of this section describe CC message structure in relation to the defined CC message functions and the contents of the CC message information.

Each definition includes:

(1) Brief description of the message direction, channel classification and the usage, including whether the message has:

a) Local significance, i.e. relevant only in the originating or terminating access;

b) Access significance, i.e. relevant in the originating and terminating access, but not in the network;

c) Dual significance, i.e. relevant in either the originating or terminating access and in the network;

d) Global significance, i.e. relevant in the originating and terminating access and in the network.

(2) Tables listing information elements in the order in which they appear in each message (common relative order for all message types). For each information element the table indicates;

a) section number which specifies the information element in this specifications;

b) the direction(s) in which information elements are transmitted; i.e.,

Uplink	:	From the user to the network,
Downlink	:	From the network to the user,
Bi-dir.	:	Bi-directional from network to user or user to network;

c) whether inclusion is mandatory (M) or optional (O), with a reference to notes explaining the circumstances under which the information element shall be included;

d) information length, including whether the information element is of a fixed length (F) or of a variable length, where ' * ' denotes an undefined maximum length, depending on network or service.

4.3.7.2.1 CC messages for circuit switched connection

Table 4.3.7.2-1 is the list of the CC messages used in circuit switched connection control.

Table 4.3.7.2-1 : CC messages used for circuit mode connection control.

Messages for call setup	Ref.
ALERTing	4.3.7.2.1.1
CALL PROCeeding	4.3.7.2.1.2
CONNect	4.3.7.2.1.3
CONNect ACKnowledge	4.3.7.2.1.4
PROGress	4.3.7.2.1.7
SETUP	4.3.7.2.1.10
Message during call in progress	**Ref.**
USER INFOrmation	4.3.7.2.1.11
Messages for call release	**Ref.**
DISConnect	4.3.7.2.1.5
RELease	4.3.7.2.1.8
RELease COMPlete	4.3.7.2.1.9
Other messages	**Ref.**
FACility	4.3.7.2.1.12
CONGestion CONtrol	4.3.7.2.1.13
INFOrmation	4.3.7.2.1.6
STATus	4.3.7.2.1.14

4.3.7.2.1.1 ALERTing

This message is sent from the called user to the network to indicate that the called user is being alerted. The message is then transferred to the calling user by the network to indicate that alerting is initiated. (Refer to Table 4.3.7.2-2.)

Table 4.3.7.2-2 : Contents of the ALERT message

Message type : ALERTing
Definition area : Global
Direction : Bi-directional (SACCH/FACCH)

Information element	Ref.	Direction	Class	Info. length		Remarks
				FV	(oct)	
Protocol discriminator	4.3.7.3.2	Bi-dir.	M	F	1	
Call reference/suppl. service identifier	4.3.7.3.3	Bi-dir.	M	F	1	
Message type	4.3.7.3.4	Bi-dir.	M	F	1	
Channel identification	4.3.7.3.5.9	Bi-dir.	O	V	2 - 3	
Facility	4.3.7.3.5.21	Bi-dir.	O (note 1)	V	2 - *	
Progress indicator	4.3.7.3.5.15	Bi-dir.	O (note 2)	F	3	
Display	4.3.7.3.5.10	Downlink	O (note 3)	V	(note 4)	
Signal	4.3.7.3.5.16	Downlink	O (note 5)	F	2	
Feature activation	4.3.7.3.5.11	Uplink	O (note 6)	V	2 - 4	
Feature indication	4.3.7.3.5.12	Downlink	O (note 6)	V	2 - 5	
User-user	4.3.7.3.5.22	Bi-dir.	O (note 7)	V	2 - 131	

Note 1 : This information element shall be included in the ALERT message in case of the service 2 start-up procedure for user-user information transfer (UUS) supplementary services.
Also, it is included in this message sent from the user to the network for the explicit service 1 activating procedure.
It is not included in this message for the service 1 except the above case.

Note 2 : When an interconnection is established or the network provides the in-band information/pattern to the user, this information element is included in the message.

Note 3 : This information element is included in this message when the network provides information that can be presented to the user.

Note 4 : The minimum length of the display information element is 2 octets and the maximum length is 34 octets.

Note 5 : This information element is included in this message when supplementary information is provided which indicates tone.

Note 6 : This information element may be used for stimulus operation of supplementary services.

Note 7 : This information element can be included as an evident or implicit activating procedure for service 1 of user-user information transfer (UUS) supplementary services.

4.3.7.2.1.2 CALL PROCeeding

This message is sent from the network to the calling user to indicate that no further call setup information will be accepted. (Refer to Table 4.3.7.2-3. below.)

Table 4.3.7.2-3 : Contents of the CALL PROC message

Message type : Call PROCeeding
Definition area : Local
Direction : Downlink(SCCH, SACCH/FACCH)

Information element	Ref.	Direction	Class	Info. length		Remarks
				FV	(oct)	
Protocol discriminator	4.3.7.3.2	Downlink	M	F	1	
Call reference/suppl. service identifier	4.3.7.3.3	Downlink	M	F	1	
Message type	4.3.7.3.4	Downlink	M	F	1	
Channel identification	4.3.7.3.5.9	Downlink	O	V	2 - 3	
Facility	4.3.7.3.5.21	Downlink	O (note 1)	V	2 - *	
Progress indicator	4.3.7.3.5.15	Downlink	O (note 2)	F	3	
Display	4.3.7.3.5.10	Downlink	O (note 3)	V	(note 4)	
Feature indication	4.3.7.3.5.12	Downlink	O (note 5)	V	2 - 5	
Locking shift (codeset 5)	4.3.7.3.5.2	Downlink	O	F	1	
Re-call indication	4.3.7.3.5.23	Downlink	O (note 6)	F	1	

Note 1 : This information element can be included in this message only when rejecting explicit requests for service 1, 2 or 3 of the UUS supplementary services.

Note 2 : When an interconnection is established or the in-band information/pattern is provided, this information element is included in this message.

Note 3 : This information element is included in this message when the network provides information that can be presented to the user.

Note 4 : The minimum length of the display information element is 2 octets. Maximum length is 34 octets.

Note 5 : This information element may be used for stimulus operation of supplementary services.

Note 6 : This information element may be used when the network re-calls the MS after the MS has been disconnected.

4.3.7.2.1.3 CONNect

This message is sent from the called user to the network or from the network to the calling user to indicate that the called user accepted the call. (Refer to Table 4.3.7.2-4.)

Table 4.3.7.2-4 : Contents of the CONN message

Message type : CONNect
Definition area : Global
Direction : Bi-directional (SACCH/FACCH)

Information element	Ref.	Direction	Class	Info. length		Remarks
				FV	(oct)	
Protocol discriminator	4.3.7.3.2	Bi-dir.	M	F	1	
Call reference/suppl. service identifier	4.3.7.3.3	Bi-dir.	M	F	1	
Message type	4.3.7.3.4	Bi-dir.	M	F	1	
Channel identification	4.3.7.3.5.9	Bi-dir.	O	V	2 - 3	
Facility	4.3.7.3.5.21	Bi-dir.	O (note 1)	V	2 - *	
Progress indicator	4.3.7.3.5.15	Bi-dir.	O (note 2)	F	3	
Display	4.3.7.3.5.10	Downlink	O (note 3)	V	(note 4)	
Signal	4.3.7.3.5.16	Downlink	O (note 5)	F	2	
Feature activation	4.3.7.3.5.11	Uplink	O (note 6)	V	2 - 4	
Feature indication	4.3.7.3.5.12	Downlink	O (note 6)	V	2 - 5	
User-user	4.3.7.3.5.22	Downlink	O (note 7)	V	2 - 131	

Note 1 : This information element shall be included in the CONN message in case of an explicit service 1 start-up procedure for the user-user information transfer (UUS) supplementary services and a service 3 start-up procedure at call establishment. Also it can be included in this message sent from the user to the network for the explicit service 1 activating procedure when it is not included in the ALERT message.

Note 2 : This information element is included in this message when an interconnection is established or in-band information/pattern is provided.

Note 3 : This information element is included in this message when the network provides the information that can be presented to the user.

Note 4 : The minimum length of the display information element is 2 octets and the maximum length is 34 octets.

Note 5 : This information element is included in this message when supplementary information is provided which indicates tone.

Note 6 : This information element may be used for stimulus operation of supplementary services.

Note 7 : This information element can be included in an evident or implicit activating procedure for service 1 of user-user information transfer (UUS) supplementary services.

4.3.7.2.1.4 CONNect ACKnowledge

This message is sent by the network to indicate that the called user has been awarded the call. It may also be sent by the calling user to the network to ensure symmetry in the protocol procedure. (Refer to table 4.3.7.2-5 below.)

Table 4.3.7.2-5 : Contents of the CONN ACK message

Message type : CONNect ACKnowledg
Definition area : Local
Direction : Bi-directional (SACCH/FACCH)

Information element	Ref.	Direction	Class	Info. length		Remarks
				FV	(oct)	
Protocol discriminator	4.3.7.3.2	Bi-dir.	M	F	1	
Call reference/suppl. service identifier	4.3.7.3.3	Bi-dir.	M	F	1	
Message type	4.3.7.3.4	Bi-dir.	M	F	1	
Channel identification	4.3.7.3.5.9	Downlink	O	V	2 - 3	
Display	4.3.7.3.5.10	Downlink	O (note 1)	V	(note 2)	
Signal	4.3.7.3.5.16	Downlink	O (note 3)	F	2	

Note 1 : This information element is included in this message when the network provides information that can be presented to the user.

Note 2 : The minimum length of the display information element is 2 octets and the maximum length is 34 octets.

Note 3 : This information element is included in this message when supplementary information is provided which indicates tone.

4.3.7.2.1.5 DISConnect

This message is sent by the user to request the network to clear an end-to-end connection or is sent by the network to indicate that the end-to-end connection is cleared. (Refer to Table 4.3.7.2-6.)

Table 4.3.7.2-6 : Content of the DISC messages

Message type : DISConnect
Definition area : Global
Direction : Bi-directional (SCCH, SACCH/FACCH)

Information element	Ref.	Direction	Class	Info. length		Remarks
				FV	(oct)	
Protocol discriminator	4.3.7.3.2	Bi-dir.	M	F	1	
Call reference/suppl. service identifier	4.3.7.3.3	Bi-dir.	M	F	1	
Message type	4.3.7.3.4	Bi-dir.	M	F	1	
Cause	4.3.7.3.5.8	Bi-dir.	M	V	2 - 5	
Facility	4.3.7.3.5.21	Bi-dir.	O (note 1)	V	2 - *	
Progress indicator	4.3.7.3.5.15	(note 2)	O (note 3)	F	3	
Display	4.3.7.3.5.10	Downlink	O (note 4)	V	(note 5)	
Signal	4.3.7.3.5.16	Downlink	O (note 6)	F	2	
Feature indication	4.3.7.3.5.12	Downlink	O (note 7)	V	2 - 5	
User-user	4.3.7.3.5.22	Bi-dir.	O (note 8)	V	2 - 131	
Locking shift (codeset 5)	4.3.7.3.5.2	Downlink	O	F	1	
Advice of charge	4.3.7.3.5.17	Downlink	O (note 9)	V	2 - 8	

Note 1 : This information element is included in the DISC message if it is the initial call clearing message for service 1 of the UUS supplementary services.

Note 2 : This information element is included in this message when the network provides the in-band information/pattern in the direction of the network to the user.

Note 3 : This information element is provided by the network when in-band information/pattern is provided. The user may provide the in-band information/pattern along with the progress identifier. In such cases, the network ignores this information element and does not transfer in-band information/pattern.

Note 4 : This information element is included in this message when the network provides information that can be presented to the user.

Note 5 : The minimum length of the display information element is 2 octets and the maximum length is 34 octets.

Note 6 : This information element is included in this message when supplementary information is provided which indicates tone.

Note 7 : This information element may be used for stimulus operation of supplementary services.

Note 8 : This information element can be included in this message to indicate that the evident service of the UUS supplementary services are accepted or services 1, 2 or 3 is rejected.

Note 9 : This information element can be included in this message in order to advise the call charges.

4.3.7.2.1.6 INFOrmation

This message is sent by the user or the network to transfer supplementary information. (Refer to Table 4.3.7.2-7.)

Table 4.3.7.2-7 : Contents of the INFO message

Message type : INFOrmation
Definition area : Local
Direction : Bi-directional (SCCH, SACCH/FACCH)

Information element	Ref.	Direction	Class	Info. length		Remarks
				FV	(oct)	
Protocol discriminator	4.3.7.3.2	Bi-dir.	M	F	1	
Call reference/suppl. service identifier	4.3.7.3.3	Bi-dir.	M	F	1	
Message type	4.3.7.3.4	Bi-dir.	M	F	1	
Cause	4.3.7.3.5.8	Downlink	O	V	2 - 5	
Display	4.3.7.3.5.10	Downlink	O (note 1)	V	(note 2)	
Keypad facility	4.3.7.3.5.14	Bi-dir.	O (notes3/5)	V	2 - 35	
Signal	4.3.7.3.5.16	Downlink	O (note 4)	F	2	
Feature activation	4.3.7.3.5.11	Uplink	O (note 5)	V	2 - 4	
Feature indication	4.3.7.3.5.12	Downlink	O (note 5)	V	2 - 5	
Locking shift (codeset 5)	4.3.7.3.5.2	Uplink	O (note 6)	F	1	
High-speed data transmission DCE function	4.3.7.3.5.24	Uplink	O (note 6)	V	2 - 8	

Note 1 : This information element is included in this message when the network provides information that can be presented to the user.

Note 2 : The minimum length of the display information element is 2 octets and the maximum length is 34 octets.

Note 3 : The keypad facility information element may be included in this message when the user requests the network to convey PB signal or conveys supplementary service information to the network.

Note 4 : This information element is included in this message when supplementary information is provided which indicates tone.

Note 5 : This information element may be used for stimulus operation of supplementary services.

Note 6 : This information element is used when performing high-speed data transmission.

4.3.7.2.1.7 PROGress

This message is sent by the network to the user to indicate the progress of a call when an interconnection is established or in- band information/pattern is provided. (Refer to Table 4.3.7.2-8.)

Table 4.3.7.2-8 : Contents of the PROG message

Message type : PROGress
Definition area : Global
Direction : Downlink (SCCH, SACCH/FACCH)

Information element	Ref.	Direction	Class	Info. length		Remarks
				FV	(oct)	
Protocol discriminator	4.3.7.3.2	Downlink	M	F	1	
Call reference/suppl. service identifier	4.3.7.3.3	Downlink	M	F	1	
Message type	4.3.7.3.4	Downlink	M	F	1	
Cause	4.3.7.3.5.8	Downlink	O	V	2 - 5	
Facility	4.3.7.3.5.21	Downlink	O (note 1)	V	2 - *	
Progress indicator	4.3.7.3.5.15	Downlink	M (note 2)	F	3	
Display	4.3.7.3.5.10	Downlink	O (note 3)	V	(note 4)	
User-user	4.3.7.3.5.22	Downlink	O (note 5)	V	2 - 131	

Note 1 : This information element can be included in this message only to indicate that explicit service 1, 2 or 3 request is rejected.

Note 2 : This information element is included in this message when the network provides supplementary information related to the in-band information/pattern.

Note 3 : This information element is included in this message when the network provides information that can be presented to the user.

Note 4 : The minimum length of the display information element is 2 octets and the maximum length is 34 octets.

Note 5 : This information element is included in this message for the UUS supplementary services (e.g. related to in-band tone and announcement) when the message is sent by the network to indicate that the call is disconnected by the called user before being in progress and therefore, that the user-user information element is included in the clearing message.

4.3.7.2.1.8 RELease

This message is sent by the user or the network to indicate that the equipment sending out this message has already disconnected from the information channel (if any) and to release the channel and call reference.

The receiving equipment releases the information channel and call reference after transmitting the REL COMP message. (Refer to Table 4.3.7.2-9.)

Table 4.3.7.2-9 : Contents of the REL message

Message type : RELease
Definition area : Local (note 1)
Direction : Bi-directional (SCCH, SACCH/FACCH)

Information element	Ref.	Direction	Class	Info. length		Remarks
				FV	(oct)	
Protocol discriminator	4.3.7.3.2	Bi-dir.	M	F	1	
Call reference/suppl. service identifier	4.3.7.3.3	Bi-dir.	M	F	1	
Message type	4.3.7.3.4	Bi-dir.	M	F	1	
Cause	4.3.7.3.5.8	Bi-dir.	O (note 2)	V	2 - 5	
Display	4.3.7.3.5.10	Downlink	O (note 3)	V	(note 4)	
Signal	4.3.7.3.5.16	Downlink	O (note 5)	F	2	
Feature indication	4.3.7.3.5.12	Downlink	O (note 6)	V	2 - 5	
User-user	4.3.7.3.5.22	Bi-dir.	O (note 7)	V	2 - 131	
Locking shift (codeset 5)	4.3.7.3.5.2	Downlink	O	F	1	
Advice of charge	4.3.7.3.5.17	Downlink	O (note 8)	V	2 - 8	

Note 1 : This message has local significance. When used as the initial call clearing message, it can transfer information of global significance.

Note 2 : This information element is mandatory when this message is used as the initial message to activate the clearing procedure. It is also included in this message when the REL message is transmitted as a result of an error handling condition.

Note 3 : This information element is included in this message when the network provides information that can be presented to the user.

Note 4 : The minimum length of the display information element is 2 octets and the maximum length is 34 octets.

Note 5 : This information element is included in this message when supplementary information is provided which indicates tone.

Note 6 : This information element may be used for stimulus operation of supplementary services.

Note 7 : This information element is included in this message when this message is sent as the first clearing message for UUS supplementary service 1.

Note 8 : This information element can be included in this message in order to order the call charges.

4.3.7.2.1.9 RELease COMPlete

This message is sent by the user or the network to indicate that the equipment sending the message has released the information channel and call reference. The released information channel is reusable and the equipment which received this message releases the call reference. (Refer to Table 4.3.7.2-10.)

Table 4.3.7.2-10 : Contents of the REL COMP message

Message type : RELease COMPlete
Definition area : Local (note 1)
Direction : Bi-directional (SCCH, SACCH/FACCH)

Information element	Ref.	Direction	Class	Info. length		Remarks
				FV	(oct)	
Protocol discriminator	4.3.7.3.2	Bi-dir.	M	F	1	
Call reference/suppl. service identifier	4.3.7.3.3	Bi-dir.	M	F	1	
Message type	4.3.7.3.4	Bi-dir.	M	F	1	
Cause	4.3.7.3.5.8	Bi-dir.	O (note 2)	V	2 - 5	
Display	4.3.7.3.5.10	Downlink	O (note 3)	V	(note 4)	
Signal	4.3.7.3.5.16	Downlink	O (note 5)	F	2	
Feature indication	4.3.7.3.5.12	Downlink	O (note 6)	V	2 - 5	
User-user	4.3.7.3.5.22	Uplink	O (note 7)	V	2 - 131	
Locking shift (codeset 5)	4.3.7.3.5.2	Downlink	O	F	1	
Advice of charge	4.3.7.3.5.17	Downlink	O (note 8)	V	2 - 8	

Note 1 : This message has local significance. When used as the initial call clearing message, it can transfer information of global significance.

Note 2 : This information element is mandatory when this message is used as the initial message to activate the clearing procedure. It is also included in this message when the REL COMP message is transmitted as a result of an error handling condition.

Note 3 : This information element is included in this message when the network provides information that can be presented to the user.

Note 4 : The minimum length of the display information element is 2 octets and the maximum length is 34 octets.

Note 5 : This information element is included in this message when supplementary information is provided which indicates tone.

Note 6 : This information element may be used for stimulus operation of supplementary services.

Note 7 : This information element is included in this message when the REL COMP message is sent from the user to reject the SETUP message on termination for UUS supplementary service 1.

Note 8 : This information element can be included in this message in order to advise the call charges.

4.3.7.2.1.10 SETUP

This message is transferred by the calling user to the network or by the network to the called user to initiate call establishment. (Refer to Table 4.3.7.2-11.)

Table 4.3.7.2-11 : Contents of the SETUP message

Message type : SETUP
Definition area : Global
Direction : Bi-directional (SCCH, SACCH/FACCH)

Information element	Ref.	Direction	Class	Info. length		Remarks
				FV	(oct)	
Protocol discriminator	4.3.7.3.2	Bi-dir.	M	F	1	
Call reference/suppl. service identifier	4.3.7.3.3	Bi-dir.	M	F	1	
Message type	4.3.7.3.4	Bi-dir.	M	F	1	
Bearer capability	4.3.7.3.5.3	Bi-dir.	M (note 1)	V	5 - 8	
Channel identification	4.3.7.3.5.9	Bi-dir.	O	V	2 - 3	
Facility	4.3.7.3.5.21	Bi-dir.	O (note 2)	V	2 - *	
Progress indicator	4.3.7.3.5.15	Bi-dir.	O (note 3)	F	3	
Display	4.3.7.3.5.10	Downlink	O (note 4)	V	(note 5)	
Keypad facility	4.3.7.3.5.14	Bi-dir.	O (note 6)	V	2 - 35	
Signal	4.3.7.3.5.16	Downlink	O (note 7)	F	2	
Feature activation	4.3.7.3.5.11	Uplink	O (note 8)	V	2 - 4	
Feature indication	4.3.7.3.5.12	Downlink	O (note 8)	V	2 - 5	
Calling party number	4.3.7.3.5.6	Bi-dir.	O (note 9)	V	2 - 16	
Calling party subaddress	4.3.7.3.5.7	Bi-dir.	O (note 10)	V	2 - 23	
Called party number	4.3.7.3.5.4	Bi-dir.	O (note 11)	V	5 - 15	
Called party subaddress	4.3.7.3.5.5	Bi-dir.	O (note 12)	V	2 - 23	
High layer compatibility	4.3.7.3.5.13	Bi-dir.	O (note 13)	F	3	
User-user	4.3.7.3.5.22	Bi-dir.	O (note 14)	V	2 - 131	
Locking shift (codeset 5)	4.3.7.3.5.2	Uplink	O (note 15)	F	1	
High-speed data transmission DCE function	4.3.7.3.5.24	Uplink	O (note 15)	F	6	

Note 1 : This information element is repeated in case the MS has multiple Bearer capability information elements. They are arranged according to the order of priority.

Note 2 : This information element shall be included in this message in case of the activating procedure for services 1, 2 and 3 during the call establishment state for the UUS supplementary services.

Note 3 : This information element is included in this message for interworking events or for connections to provide In-band information/pattern.

Note 4 : This information element is included in this message when the network provides information that can be presented to the user.

Note 5 : The minimum length of the display information element is 2 octets and the maximum length is 34 octets.

Note 6 : The keypad facility information element is included in this message for occasions when the user wants to transfer other call establishment information than the called party number to the network.

Note 7 : This information element is included in this message when supplementary information which indicates tone is provided to indicate the tone.

Note 8 : This information element may be used for stimulus operation of supplementary services procedure.

Note 9 : This information element is included in this message by the calling user or the network to identify the calling user. It is mandatory in the user-to-network direction.

Note 10 : When the calling user wishes to use the calling party subaddress indication, this information element is included in this message in the user-to-network direction. If the calling user inserts the calling party sub-address information element in the SETUP message, it is included in this message in the network-to-user direction.

Note 11 : The called party number information element is included in this message to transfer the called party number information from the user to the network.

Note 12 : When the calling user wishes to use the called party subaddress indication, this information element is included in the SETUP message in the user-to-network direction. If the calling user inserts the called party subaddress information element in the SETUP message, it will be included in this message in the network-to-user direction.

Note 13 : When the calling user wishes to transfer the high layer compatibility information to the called user, this information is included in this message in the user-to-network direction. If the calling user inserts a high layer compatibility information element in the SETUP message, it will be included in the SETUP message in the network-to-user direction.

Note 14 : This information element shall be included in the message in case of the implicit activating procedure for service 1 of UUS supplementary services. It is also included this message when an evident service 1 activating procedure is used.

Note 15 : This information element is used when performing high-speed data transmission.

4.3.7.2.1.11 USER INFOrmation

This message is sent from the user to the network to transfer information to a remote user. Also, this message is sent from the network to the user to transfer the information form the remote user.

Table 4.3.7.2-12 : Contents of the USER INFO message

Message type : USER INFOrmation
Definition area : Access
Direction : Bi-directional (SACCH/FACCH)

Information element	Ref.	Direction	Class	Info. length		Remarks
				FV	(oct)	
Protocol discriminator	4.3.7.3.2	Bi-dir.	M	F	1	
Call reference/suppl. service identifier	4.3.7.3.3	Bi-dir.	M	F	1	
Message type	4.3.7.3.4	Bi-dir.	M	F	1	
User-user	4.3.7.3.5.22	Bi-dir.	M	V	2 - 131	
More data	4.3.7.3.5.18	Bi-dir.	O (note 1)	F	1	

Note 1 : This information element is included in this message sent from the user in case of indicating that other USER INFO messages which belong to the same message block will continue to be sent.

4.3.7.2.1.12 FACility

This message is sent to request or check supplementary services. (Refer to Table 4.3.7.2-13 below.)

Table 4.3.7.2-13 : Contents of the FAC message

Message type : FACility
Definition area : Local (note 1)
Direction : Bi-directional (SACCH/FACCH)

Information element	Ref.	Direction	Class	Info. length		Remarks
				FV	(oct)	
Protocol discriminator	4.3.7.3.2	Bi-dir.	M	F	1	
Call reference/suppl. service identifier	4.3.7.3.3	Bi-dir.	M	F	1	
Message type	4.3.7.3.4	Bi-dir.	M	F	1	
Facility	4.3.7.3.5.21	Bi-dir.	M (note 2)	V	2-*	
Display	4.3.7.3.5.10	Bi-dir.	O (note 3)	V	(note 4)	

Note 1 : This message has local significance, however it can transfer information of global significance.

Note 2 : This information element is included in this message for the activating procedure for UUS supplementary service 3 during call in progress.

Note 3 : This information element is included in this message when the network provides information that can be presented to the user.

Note 4 : The minimum length of the display information element is 2 octets and the maximum length is 34 octets.

4.3.7.2.1.13 CONGestion CONtrol

This message is sent by the network or the user to indicate establishment or completion of flow control on transmission of the USER INFO message. (Refer to Table 4.3.7.2-14.)

Table 4.3.7.2-14 : Contents of the CONG CON message

Message type : CONGestion CONtrol
Definition area : Local (note 1)
Direction : Bi-directional (SACCH/FACCH)

Information element	Ref.	Direction	Class	Info. length		Remarks
				FV	(oct)	
Protocol discriminator	4.3.7.3.5.2	Bi-dir.	M	F	1	
Call reference/suppl. service identifier	4.3.7.3.5.3	Bi-dir.	M	F	1	
Message type	4.3.7.3.5.4	Bi-dir.	M	F	1	
Cause	4.3.7.3.5.8	Bi-dir	O (note 2)	V	2-5	
Display	4.3.7.3.5.10	Downlink	O (note 3)	V	(note 4)	
Congestion control level	4.3.7.3.5.19	Bi-dir.	M	F	1	

Note 1 : This message has local significance, however it can transfer information of global significance.

Note 2 : This information element is set when the user-user information is discarded as a result of congestion.

Note 3 : This information element is included in the message when the network provides information that can be presented to the user.

Note 4 : The minimum length of the display information element is 2 octets and the maximum length is 34 octets.

4.3.7.2.1.14 STATus

This message is sent by the user or the network to report an error state at the desired timing. (Refer to Table 4.3.7.2-15 below.)

Table 4.3.7.2-15 : Contents of the STAT message

Message type : STATus
Definition area : Local
Direction : Bi-directional (SCCH, SACCH/FACCH)

Information element	Ref.	Direction	Class	Info. length		Remarks
				FV	(oct)	
Protocol discriminator	4.3.7.3.2	Bi-dir.	M	F	1	
Call reference/suppl. service identifier	4.3.7.3.3	Bi-dir.	M	F	1	
Message type	4.3.7.3.4	Bi-dir.	M	F	1	
Cause	4.3.7.3.5.8	Bi-dir.	M	F	1	
Call state	4.3.7.3.5.20	Bi-dir.	M	F	3	
Display	4.3.7.3.5.10	Downlink	O (note 1)	V	(note 2)	

Note 1 : This information element is included in this message when the network provides information that can be presented to the user.

Note 2 : This minimum length of the display information element is 2 octets and the maximum length is 34 octets.

4.3.7.2.2 CC message for mobile packet communication

Table 4.3.7.2-16 shows be CC message for mobile packet communication.

Table 4.3.7.2-16 : CC message for mobile packet communication

Message for packet transfer	Ref.
Packet transfer	4.3.7.2.2.1

4.3.7.2.2.1 Packet Transfer

This message is sent by the user to the network during packet communications or from the network to the user during packet communications to transmit/receive packets for the user. (Refer to Table 4.3.7.2-17 below.)

Table 4.3.7.2-17 : Contents of the Packet Transfer message

Message type : Packet Transfer
Definition area : Local (Note1)
Direction : Bi-directional (UPCH)

Information element	Ref.	Direction	Class	Info. length		Remarks
				FV	(oct)	
Protocol discriminator	4.3.7.3.2	Bi-dir.	M	F	1	
Segmentation	4.3.7.3.6.1	Bi-dir.	M	F	3	
User packet data	4.3.7.3.6.2	Bi-dir.	M	V	2 - 254	

Note 1 : This message has local significance, however it can transfer information of global information.

4.3.7.2.3 CC messages for Switched Virtual Circuit connection packet communication.

Table 4.3.7.2-18 shows the CC messages for Switched Virtual Circuit connection packet communication.

Table 4.3.7.2-18 : CC messages for Switched Virtual Circuit connection packet communication.

Messages for virtual circuit setup	Ref.
Virtual Circuit Connection Request Virtual Circuit Connection Response Virtual Circuit Connection Reject	4.3.7.2.3.1 4.3.7.2.3.2 4.3.7.2.3.3
Message during communication	Ref.
User Information	4.3.7.2.3.4
Messages for virtual circuit release	Ref.
Virtual Circuit Connection Release Request Virtual Circuit Connection Release Response	4.3.7.2.3.5 4.3.7.2.3.6

4.3.7.2.3.1 Virtual Circuit Connection Request

This message is sent by the network or the user to request a Switched Virtual Circuit connection. (Table 4.3.7.2-19).

Table 4.3.7.2-19 : Contents of the Virtual Circuit Connection Request message

Message type : Virtual Circuit Connection Request
Definition area :
Direction : Bi-directional (UPCH)

Information Element	Ref.	Direction	Type	Info. length		Remarks
				FV	(oct)	
Protocol discriminator	4.3.7.3.2	Bi-dir.	M	F	1	
Logical number	4.3.7.3.7	Bi-dir.	M	F	1	
Message type	4.3.7.3.8	Bi-dir.	M	F	1	
Connection destination identification code	4.3.7.3.9.4	Bi-dir.	M	V	3 - 36	
Operator specific information	4.3.7.3.9.5	Bi-dir.	O	V	2 - 129	

4.3.7.2.3.2 Virtual Circuit Connection Response

This message is sent by the network or the user to respond to the switched virtual circuit connection request. (Table 4.3.7.2-20).

Table 4.3.7.2-20 : Contents of Virtual Circuit Connection Response Message.

Message type : Virtual Circuit Connection Response.
Definition area :
Direction : Bi-directional (UPCH)

Information Element	Ref.	Direction	Type	Info. length		Remarks
				FV	(oct)	
Protocol discriminator	4.3.7.3.2	Bi-dir.	M	F	1	
Logical number	4.3.7.3.7	Bi-dir.	M	F	1	
Message type	4.3.7.3.8	Bi-dir.	M	F	1	
Operator specific information	4.3.7.3.9.5	Bi-dir.	O	V	2 - 129	

4.3.7.2.3.3 Virtual Circuit Connection Reject

This message is sent by the network or the user to reject the switched virtual circuit connection request. (Table 4.3.7.2-21)

Table 4.3.7.2-21: Contents of Virtual Circuit Connection Reject message.

Message type : Virtual Circuit Connection Reject.
Definition area :
Direction : Bi-directional (UPCH)

Information Element	Ref.	Direction	Type	Info. length		Remarks
				FV	(oct)	
Protocol discriminator	4.3.7.3.2	Bi-dir.	M	F	1	
Logical number	4.3.7.3.7	Bi-dir.	M	F	1	
Message type	4.3.7.3.8	Bi-dir.	M	F	1	
Cause	4.3.7.3.9.3	Bi-dir.	M	V	2 - 5	

4.3.7.2.3.4 User Information

This message is sent from the user to the network during switched virtual circuit connection or from the network to the user during switched virtual circuit connection to send or receive packets. (Table 4.3.7.2-22)

Table 4.3.7.2-22: Contents of User Information message

Message type : User Information
Definition area :
Direction : Bi-directional (UPCH)

Information Element	Ref.	Direction	Type	Info. length		Remarks
				FV	(oct)	
Protocol discriminator	4.3.7.3.2	Bi-dir.	M	F	1	
Logical number	4.3.7.3.7	Bi-dir.	M	F	1	
Message type	4.3.7.3.8	Bi-dir.	M	F	1	
Segmentation	4.3.7.3.9.1	Bi-dir.	M	F	4	
User packet data	4.3.7.3.9.2	Bi-dir.	M	V	2 - 251	

4.3.7.2.3.5 Virtual Circuit Connection Release Request

This message is sent by the network or the user to request connection release of the switched virtual circuit (Table 4.3.7.2-23)

Table 4.3.7.2-23 Contents of Virtual Circuit Connection Release Request message.

Message type : Virtual Circuit Connection Release Request
Definition area :
Direction : Bi-directional (UPCH)

Information Element	Ref.	Direction	Type	Info. length		Remarks
				FV	(oct)	
Protocol discriminator	4.3.7.3.2	Bi-dir.	M	F	1	
Logical number	4.3.7.3.7	Bi-dir.	M	F	1	
Message type	4.3.7.3.8	Bi-dir.	M	F	1	
Cause	4.3.7.3.9.3	Bi-dir.	M	V	2 - 5	

4.3.7.2.3.6 Virtual Circuit Connection Release Response

This message is sent by the network or user to respond to a switched virtual circuit connection release request (Table 4.3.7.2-24)

Table 4.3.7.2-24 Contents of Virtual Circuit Connection Release Response message

Message type : Virtual Circuit Connection Release Response
Definition area :
Direction : Bi-directional (UPCH)

Information Element	Ref.	Direction	Type	Info. length		Remarks
				FV	(oct)	
Protocol discriminator	4.3.7.3.2	Bi-dir.	M	F	1	
Logical number	4.3.7.3.7	Bi-dir.	M	F	1	
Message type	4.3.7.3.8	Bi-dir.	M	F	1	
Cause	4.3.7.3.9.3	Bi-dir.	O (Note)*	V	2 - 5	

Note : This information element is included in the Virtual Circuit Connection Release message, if this message is sent as a result of an error processing condition.

*Note : This (Note) will be added in the coming Japanese version of the Standard.

4.3.7.3 Message format and information element coding

This section specifies the contents of the messages. The bit transmission sequence in each octet is in the order of Bit 1, Bit 2... to Bit 8. Similarly, octets in each message are transmitted in the sequence of Octet 1, Octet 2....

4.3.7.3.1 Outline

Each message is composed of the following elements in this protocol.

(1) When the protocol discriminator is Protocol for RCR standard mobile communication.

i) Protocol discriminator
ii) Call reference/supplementary service identifier
iii) Message type
iv) Information elements

Items i), ii) and iii) are common for all messages and must be included in all messages, while item iv) is specified depending on each message type. This structure is shown in Fig. 4.3.7.3-1 (a). Protocol discriminator is specified in Section 4.3.7.3.2. Call reference/supplementary service identifier is specified in Section 4.3.7.3.3. Message type is specified in Section 4.3.7.3.4. Other information elements are specified in Section 4.3.7.3.5.

(2) When the protocol discriminator is Protocol for mobile packet communication.

i) Protocol discriminator
ii) Information elements

Item i) is common for all messages and must be included in all messages, while item ii) is specified depending on each message type. This structure is shown in fig 4.3.7.3-1(b). Protocol discriminator is specified in Section 4.3.7.3.2. Other information elements are specified in Section 4.3.7.3.6.

(3) When the protocol discriminator is Protocol for switched virtual circuit connection packet communication.

i) Protocol discriminator
ii) Logical number
iii) Message type
iv) Information elements

Items i), ii) and iii) are common in all messages and must be included in all messages, while item iv) is specified depending on each message type. This structure is shown in Fig. 4.3.7.3-1(c). Protocol discriminator is specified in Section 4.3.7.3.2. Logical number is specified in Section 4.3.7.3.7. Message type is specified in Section 4.3.7.3.8. Other information elements are specified in Section 4.3.7.3.9.
In (1) through (3) above, unless otherwise specified, a particular information element can exist only one time in a given message.

If a field extends beyond a single octet, the larger the octet number is, the less significant the bits become. As a result, the least significant bit of the field corresponds to the smallest bit number in largest octet number in that field.

Bit

8	7	6	5	4	3	2	1	
Protocol discriminator								Octet 1
Supplementary service identifier				Call reference				Octet 2
Message type								Octet 3
Information element group field								• •

(a) Protocol for RCR standard mobile communication.

Bit

8	7	6	5	4	3	2	1	
Protocol discriminator								Octet 1
Information element group field								• •

(b) Protocol for mobile packet communication.

Bit

8	7	6	5	4	3	2	1	
Protocol discriminator								Octet 1
Logical Number								Octet 2
Message type								Octet 3
Information element group field								• •

(c) Protocol for switched virtual circuit connection packet communication.

Fig. 4.3.7.3-1 : Message format structure

4.3.7.3.2 Protocol discriminator

The protocol discriminator is used for discriminating the messages for user/network call control from other messages prescribed by the RCR standards. Also, the protocol discriminator is used for discriminating the messages prescribed by the RCR standards from the OSI network layer protocol units coded according to other standards. The protocol discriminator is shown in Fig. 4.3.7.3-2, is coded as shown in Table 4.3.7.3-1.

Bit

8	7	6	5	4	3	2	1	
Protocol discriminator								Octet 1

Fig. 4.3.7.3-2 : Protocol discriminator

Table 4.3.7.3-1 : Protocol discriminator coding

Bit 8	7	6	5	4	3	2	1	
0	0	0	0	0	0	0	0	Unusable as the protocol discriminator for messages
				~				
0	0	0	0	0	1	1	1	
0	0	0	0	1	0	0	0	Protocol for RCR standard mobile communication
0	0	0	1	0	0	0	0	Protocol for mobile packet communication
0	0	0	1	0	0	0	1	Protocol for Switched Virtual Circuit connection packet communication.
0	0	0	1	0	0	0	1	Reserved for other network layers or layer 3 protocol
				~				
0	0	1	1	1	1	1	1	
0	1	0	0	0	0	0	0	Domestic
				~				
0	1	0	0	1	1	1	1	
0	1	0	1	0	0	0	0	Reserved for other network layers or layer 3 protocol
				~				
1	1	1	1	1	1	1	1	
					Other			Reserved

4.3.7.3.3 Call reference/supplementary service identifier

Call reference is used for identifying the call on the same user/network interface. Call reference has no meaning in relation to end-to-end connections via the network.

The supplementary service identifier is used for discerning the supplementary service procedures applied to each call. The supplementary service procedures in this instance indicate the procedure according to ITU-T Q.932 and the procedures for mobile communications networks in line with RCR standards. The call reference is shown in Fig. 4.3.7.3-3. The supplementary service identifier is coded as shown in Table 4.3.7.3-2, the call reference flag in Table 4.3.7.3-3, the call reference in Table 4.3.7.3-4.

Bit 8	7	6	5	4	3	2	1	
Suppl. service identifier				* 1	Call reference			Octet 2

* 1 : Call reference flag

Figure 4.3.7.3-3 : Call reference

(1) Supplementary service identifier

Table 4.3.7.3-2 : Supplementary service identifier coding

Bit 8	7	6	5	
0	0	0	0	Mobile comm. network defined supplementary service procedure
0	0	0	1	Q.932 standard supplementary service procedure
Other				Reserved

(2) Call reference flag

Table 4.3.7.3-3 : Call reference flag coding

Bit 4	
0	Transmitted from the call originating side
1	Transmitted to the call originating side

(3) Call reference

Table 4.3.7.3-4 : Call reference coding

Bit 3	2	1	
0	0	0	Reserved
0	0	1	General
	~		
1	1	0	
1	1	1	Dummy

Note : "Dummy" refers to a call reference which is assigned to a message (e.g. a mere indication to terminal) not related to any call generated on the interface. Mainly used for supplementary services.

4.3.7.3.4 Message type

The "Message type" information element is used for identifying the function of the message being transferred. Message type information element is located in the 3rd octet of messages. Message type is coded as shown in Fig. 4.3.7.3-4 and Table 4.3.7.3-5.

Bit 8	7	6	5	4	3	2	1	
0	Message type							Octet 3

Figure 4.3.7.3-4 : Message type information element format

Table 4.3.7.3-5 : Message types coding

Bit 7	6	5	4	3	2	1	
0	0	-	-	-	-	-	Messages for call establishment
		0	0	0	0	1	ALERTing
		0	0	0	1	0	CALL PROCeeding
		0	0	1	1	1	CONNect
		0	1	1	1	1	CONNect ACKnowledge
		0	0	0	1	1	PROGress
		0	0	1	0	1	SETUP
0	1	-	-	-	-	-	Messages during call in progress
		0	0	0	0	0	USER INFOrmation
1	0	-	-	-	-	-	Messages for call release
		0	0	1	0	1	DISConnect
		0	1	1	0	1	RELease
		1	1	0	1	0	RELease COMPlete
1	1	-	-	-	-	-	Other messages
		0	0	0	1	0	FACility
		1	1	0	0	1	CONGestion CONtrol
		1	1	0	1	1	INFOrmation
		1	1	1	0	1	STATus
					Other	:	Reserved

4.3.7.3.5 Other information elements

4.3.7.3.5.1 Coding rules

The coding for other information elements must accord with the following coding standards. These standards are designed to aid each processing equipment in smoothly locating the necessary information elements for processing messages and ignoring unnecessary elements.

The following two types of information elements are regulated by the coding standards.

A) Single octet information elements ((a) and (b) of Fig. 4.3.7.3-5.)

B) Multiple octet information elements ((c) and (d) of Fig. 4.3.7.3-5.)

(a) Coding for singular octet information elements (type 1)

Bit

8	7	6	5	4	3	2	1	
1	Information element identifier			Contents of information element				Octet 1

(b) Coding for single octet information elements (type 2)

Bit

8	7	6	5	4	3	2	1	
1	Information element identifier							Octet 1

(c) Coding for multiple octet information elements (type 1)

Bit

8	7	6	5	4	3	2	1	
0	Information element identifier							Octet 1
Length of contents of information element								Octet 2
Contents of information element								Octet 3, etc.
~							~	

Fig. 4.3.7.3-5 : Formats for information elements (1/2)

(d) Coding for multiple octet information elements (type 2)

Bit 8	7	6	5	4	3	2	1	
0	Information element identifier							Octet 1
Contents of information element								Octet 2, etc.

Fig. 4.3.7.3-5 : Formats for information elements (2/2)

Note : The extension bit in the information element using bit 8 of the information is used as follows: in case of "0" the next octet is added. In case of "1", no extension is made.

The coding for information element identifier bits for the information elements described in this section is shown in Table 4.3.7.3-6.

Table 4.3.7.3-6 (a) : Coding for information elements (Codeset 0)

Bit 8	7	6	5	4	3	2	1	
1	-	-	-	-	-	-	-	Single octet information element
	0	0	1	-	-	-	-	: Locking shift
	0	1	0	0	0	0	0	: More data
	0	1	1	-	-	-	-	: Congestion level
0	-	-	-	-	-	-	-	Multiple octet information element
	0	0	0	0	1	0	0	: Bearer capability
	0	0	0	1	0	0	0	: Cause
	0	0	1	0	1	0	0	: Call state
	0	0	1	1	0	0	0	: Channel identification
	0	0	1	1	1	0	0	: Facility
	0	0	1	1	1	1	0	: Progress indicator
	0	1	0	1	0	0	0	: Display
	0	1	0	1	1	0	0	: Keypad facility
	0	1	1	0	1	0	0	: Signal
	0	1	1	1	0	0	0	: Feature activation
	0	1	1	1	0	0	1	: Feature indication
	1	1	0	1	1	0	0	: Calling party number
	1	1	0	1	1	0	1	: Calling party subaddress
	1	1	1	0	0	0	0	: Called party number
	1	1	1	0	0	0	1	: Called party subaddress
	1	1	1	1	1	0	1	: High layer compatibility
	1	1	1	1	1	1	0	: User-user
							Others	: Reserved

Table 4.3.7.3-6(b) : Coding for information elements (Codeset 5)

Bit 8	7	6	5	4	3	2	1	
1	-	-	-	-	-	-	-	Single octet information element
	0	0	0	0	0	1	0	: Re-call indication
	0	0	1	-	-	-	-	: Locking shift
0	-	-	-	-	-	-	-	Multiple octet information element
	0	0	0	0	0	0	1	: Advice of charge
	0	0	0	0	0	1	0	: High-speed data transmission DCE function
						Others		: Reserved

Table 4.3.7.3-6(c) : Coding for information elements (Codeset 6)

Bit 8	7	6	5	4	3	2	1	
1	0	0	1	-	-	-	-	: Locking shift
						Others		: Settable by operators' option

Information elements are described in alphabetical order in this chapter, however, a special order is used for each information element contained in one message within each codeset. Code values of information element identifiers in multiple octet information elements are assigned in sequential order running from lower numbers to higher numbers according to the sequence in which each information element appears in a message. This allows the receiving equipment to determine whether a specific information element exists or not without checking through the entire message.

Single octet information elements can be specified at a desired location in a message. There are two types of single octet information elements : the type 1 information element which indicates the information element identifier by bits 7, 6 and 5, and the type 2 which is used to maintain a single octet information when bits 7, 6 and 5 are set as "0 1 0."

Information elements described in this section may contain spare bits. In such cases, spare bits are set to "0". Note, however, that in the event a spare bit is set for '1' (such as for compatibility with future developments) the message should not be simply rejected. There are two types of multiple octet information elements. The 2nd octet of the type 1 information element indicates the number of octet following the octet-3 (including octet-3). The number of octets in the information element is coded in binary and the least significant bit is bit 1 (2^0). The number of octets for type 2 information elements following the octet-2 must be the value specified for each information element identifier according to RCR standard.

Use of the optional type 1 multiple octet information element is permitted even when the data length is "0". In this instance, the receiver must process this as information element being empty.

Note 1 : Type 1 multiple octets information element :
The information element which consists of multiple octets including the length of contents of information elements. The multiple octets information elements added in the future are required to use the type 1 format.

Note 2 : The network does not include any information element added in the future to the MS based on the RCR STD-27B.

4.3.7.3.5.2 Locking shift

The locking shift procedure is used for indicating the codeset that have newly come into use. Once a codeset is specified, use of the specified codeset is continued until a different locking shift information element specifying use of another codeset appears. This procedure is used only when shifting to a higher numbered value codeset.

The locking shift procedure is valid only in the message containing the locking shift information element. On initial analysis of the content of a message, the codeset currently in use is codeset "0" for all messages.

The locking shift information element is formatted according to the single octet information format and coded as shown in Fig. 4.3.7.3-6 and Table 4.3.7.3-7.

Bit 8	7	6	5	4	3	2	1	
1	0	0	1	0 * 1	Codeset identification			Octet 1

* 1 : This indicates the locking shift procedure.

Fig. 4.3.7.3-6 : Locking shift information element

Table 4.3.7.3-7 : Locking shift information element

Codeset identification

Bit 3	2	1		
0	0	0	:	Not applicable
0	0	1		Reserved
:	:	:		
:	:	:		
1	0	0		
1	0	1	:	Codeset 5: Information element for national use
1	1	0	:	Codeset 6: Network defined information element
1	1	1	:	Codeset 7: User-specific information element

4.3.7.3.5.3 Bearer capability

The Bearer capability information element is used for indicating a request for the bearer function which is provided by the network and is shown as Fig. 4.3.7.3-7 and Table 4.3.7.3-8.

Bit

8	7	6	5	4	3	2	1	
	Bearer capability							
0	0	0	0	0	1	0	0	Octet 1
	Information element identifier							
Length of the bearer capability contents								Octet 2
1 ext	Coding standard		Information transfer capability					Octet 3
0/1 ext	Transfer mode		Information transfer rate					Octet 4
0/1 ext	Structure			Configuration		Establishment		Octet 4a (note 1)
1 ext	Symmetry		Information transfer rate (destination → origination)					Octet 4b (note 1)
0/1 ext	Layer 1 Ident.		User information layer 1 protocol					Octet 5
1 ext	Sync/ async.	Negotiation	User rate					Octet 5a

Note 1 : When the default is used in all the fields for Octets 4a and 4b, these octets must be omitted. When the default is used in all the fields for Octet 4b but not used in one or more fields for Octet 4a, only Octet 4b must be omitted. In other instances, both Octets 4a and 4b are included.

Fig. 4.3.7.3-7 : Bearer capability information elements

Table 4.3.7.3-8 : Bearer capability information elements

(1) Coding standard (Octet 3)

Bit 7	6		
0	0	:	RCR standard
1	1	:	Network defined standard
Others		:	Reserved

(2) Information transfer capability (Octet 3)

Bit 5	4	3	2	1		
0	0	0	0	0	:	Speech
0	1	0	0	0	:	Unrestricted digital
1	0	1	1	1	:	Speech + data
Others					:	Reserved

(3) Transfer mode (Octet 4)

Bit 7	6		
0	0	:	Circuit mode
Others		:	Reserved

(4) Information transfer rate (Octet 4, 4b)

Bit 5	4	3	2	1		
0	0	1	1	1	:	Circuit mode 11.2kb/s
0	1	0	0	0	:	Circuit mode 5.6kb/s
Others					:	Reserved

(5) Structure (Octet 4a)

Bit 7	6	5		
0	0	0	:	Default
0	0	1	:	50 Hz structure preservation
0	1	0	:	25 Hz structure preservation
Others			:	Reserved

(6) Configuration (Octet 4a)

Bit 4	3		
0	0	:	Point-to-point
Others		:	Reserved

(7) Establishment (Octet 4a)

Bit 2	1		
0	0	:	Instantaneous connection
Others		:	Reserved

(8) Symmetry (Octet 4b)

Bit 7	6		
0	0	:	Bidirectional symmetric
Others		:	Reserved

(9) Layer 1 identification (Octet 5)

Bit 7	6		
0	1	:	Layer 1 identification
Others		:	Reserved

(10) User information layer 1 protocol (Octet 5)

Bit 5	4	3	2	1		
0	0	0	0	1	:	RCR standard rate adaption This indicates that Octet 5a defined below exits.
0	0	0	1	0	:	Recommendation G.711 μ-law speech
0	1	0	1	0	:	VSELP speech
0	1	0	1	1	:	PSI-CELP speech
0	1	1	0	0	:	CS-ACELP speech
0	1	1	0	1	:	ACELP speech
Others					:	Reserved

(11) Synchronous/Asynchronous (Octet 5a)

Bit 7		
0	:	Synchronous
1	:	Reserved

(12) Negotiation (Octet 5a)

Bit 6		
0	:	In-band negotiation not possible
1	:	Reserved

(13) User rate (Octet 5a)

Bit 5	4	3	2	1		
0	0	1	1	1	:	8Kb/s RCR standard
Others					:	Reserved

4.3.7.3.5.4 Called party number

The Called party number information element shown in Fig 4.3.7.3-8 and Table 4.3.7.3-9 is used for specifying the called party.
The maximum length of this information element is 15 octets.

<table>
<tr><td>Bit 8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td></td></tr>
<tr><td>0</td><td colspan="7">Called party number
1 1 1 0 0 0 0
Information element identifier</td><td>Octet 1</td></tr>
<tr><td colspan="8">Length of the called party number contents</td><td>Octet 2</td></tr>
<tr><td>*1</td><td colspan="3">Type of number</td><td colspan="4">Numbering plan identification</td><td>Octet 3</td></tr>
<tr><td colspan="4">2nd number</td><td colspan="4">1st number</td><td>Octet 4</td></tr>
<tr><td colspan="8">~ ~</td><td>:</td></tr>
<tr><td colspan="4">(2n-8) th number</td><td colspan="4">(2n-9) th number</td><td>Octet n-1</td></tr>
<tr><td colspan="4">Filler (in case of odd number)</td><td colspan="4">(2n-7) th number</td><td>Octet n</td></tr>
</table>

Note*1 : Odd/Even indication

Fig. 4.3.7.3-8 : Called party number information element

Table 4.3.7.3-9 : Called party number information element

(1) Odd/Even indication (Octet 3)

Bit 8		
0	:	Even (the number of digits is an even number)
1	:	Odd (the number of digits is an odd number)

(2) Type of number (Octet 3) (Note 1)

Bit 7	6	5		
0	0	0	:	Unknown -------------------------(Note 2)
0	0	1	:	International number-----------(Note 3)
0	1	0	:	National number ----------------(Note 3)
0	1	1	:	Network defined number -----(Note 4)
1	0	0	:	Local area number -------------(Note 3)
1	1	0	:	Abbreviated number
Others			:	Reserved

Note 1 : Refer to ITU-T Rec. I.330 for local area number, international, and domestic numbers.

Note 2 : Number type "unknown" is used when the user or network cannot recognize the number type, such as international numbers, national numbers, etc. In this instance, the number digit field is structured according to the dialing procedure for the network; e.g., prefix or escape digits might be present.

Note 3 : Prefix or escape digits are not included.

Note 4 : A number type "network defined number" is used to indicate administration numbers or service numbers used on the network; e.g., used to access an operator.

(3) Numbering plan identification (Octet 3)

Bit 4	3	2	1		
0	0	0	0	:	Unknown (Note)
0	0	0	1	:	ISDN/telephone numbering plan (Rec. E.164/E.163)
0	0	1	1	:	Date numbering plan (Rec. X.121)
0	1	0	0	:	Telex numbering plan (Rec. F.69)
1	0	0	0	:	National numbering plan
1	0	0	1	:	Private network numbering plan
Others				:	Reserved

Note : Numbering plan "unknown" is used when the user or network cannot be recognized the numbering plan. In this instance, the number digit field is structured according to the dialing procedure for the network; e.g., prefix or escape digits might be present.

(4) Numbering digits (Octet 4-n)

Bit 4	3	2	1		(or 8 7 6 5)
1	0	1	0	:	0
0	0	0	1	:	1
0	0	1	0	:	2
0	0	1	1	:	3
0	1	0	0	:	4
0	1	0	1	:	5

4	3	2	1		(or 8 7 6 5)
0	1	1	0	:	6
0	1	1	1	:	7
1	0	0	0	:	8
1	0	0	1	:	9
1	0	1	1	:	*
1	1	0	0	:	#
0	0	0	0	:	Filler
Others				:	Reserved

4.3.7.3.5.5 Called party subaddress

The Called party subaddress information element is used to identify the subaddress of the called party and is coded as shown in Fig. 4.3.7.3-9 and Table 4.3.7.3-10.

The maximum number of this information element is 23 octets.

<table>
<tr><td>Bit
8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td></td></tr>
<tr><td rowspan="2">0</td><td colspan="7">Called party subaddress</td><td rowspan="3">Octet 1</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td></td><td colspan="7">Information element identifier</td></tr>
<tr><td colspan="8">Length of called party subaddress contents</td><td>Octet 2</td></tr>
<tr><td rowspan="2">1</td><td colspan="3" rowspan="3">Type of subaddress</td><td rowspan="3">Odd/
Even
IND</td><td>0</td><td>0</td><td>0</td><td rowspan="3">Octet 3</td></tr>
<tr><td colspan="3" rowspan="2">Spare</td></tr>
<tr><td>ext</td></tr>
<tr><td colspan="8">Subaddress information
~ ~</td><td></td></tr>
</table>

Fig. 4.3.7.3-9 : Called party subaddress information element

Table 4.3.7.3-10 : Called party subaddress information element

(1) Type of subaddress (Octet 3)

Bit 7	6	5		
0	0	0	:	NSAP (X.213/ISO 8343 AD2)
0	1	0	:	User specific subaddress
Others			:	Reserved

(2) Odd/Even indication (Octet 3)

Bit 4		
0	:	Number of address signal is even.
1	:	Number of address signal is odd.

Note 1 : Odd/Even indication is used when the subaddress type is a user specific subaddress. The user specific subaddress shall be coded by BCD codification.

Note 2 : Details of the subaddress information are under investigation.

4.3.7.3.5.6 Calling party number

The Calling party number information element is used for identifying the origin of a call. The maximum length for this information element is 16 octets. The calling party number information shall be as per Fig. 4.3.7.3-10 and Table 4.3.7.3-11.

<table>
<tr><td>Bit</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td></td></tr>
<tr><td></td><td>0</td><td colspan="7">Calling party number
1 1 0 1 1 0 0
Information element identifier</td><td>Octet 1</td></tr>
<tr><td></td><td colspan="8">Length of calling party number contents</td><td>Octet 2</td></tr>
<tr><td></td><td>ext 1</td><td colspan="3">Type of number</td><td colspan="4">Numbering plan identification</td><td>Octet 3</td></tr>
<tr><td></td><td>Odd/even IND</td><td colspan="3">Non-presentation</td><td colspan="2">Presentation indicator</td><td colspan="2">Screening indicator</td><td>Octet 4</td></tr>
<tr><td></td><td colspan="4">2nd digit</td><td colspan="4">1st digit</td><td>Octet 5</td></tr>
<tr><td></td><td colspan="8">~ ~</td><td>:</td></tr>
<tr><td></td><td colspan="4">(2n-10)th digit</td><td colspan="4">(2n-11)th digit</td><td>Octet n-1</td></tr>
<tr><td></td><td colspan="4">Filler (in case of odd number)</td><td colspan="4">(2n-9)th digit</td><td>Octet n</td></tr>
</table>

Note : In case this parameter is sent from the network to the user and if the presentation indicator is set to "display disable" or "there is no number to display due to interconnection conditions", zeros are set in the "Odd/even indication", "Type of number", and "Numbering plan identification", and in addition, octet 5 to octet n are omitted.

Fig. 4.3.7.3-10 : Calling party number information element

Table 4.3.7.3-11 : Calling party number information element

(1) Type of number (Octet 3) (Note 1)

Bit 7	6	5		
0	0	0	:	Unknown------------------------(Note 2)
0	0	1	:	International number---------(Note 3)
0	1	0	:	National number---------------(Note 3)
0	1	1	:	Network defined number----(Note 4)
1	0	0	:	Local area number------------(Note 3)
1	1	0	:	Abbreviated number
Others			:	Reserved

Note 1 : Refer to ITU-T Rec. I.330 for international, national and local numbers.

Note 2 : Number type "unknown" is used for the user or network for which the number type, such as international numbers, national numbers, etc. cannot be recognized. In this instance, the number digit field is structured according to the dialing procedure for the network; e.g., prefix or escape digits might be present.

Note 3 : Prefix or escape digits is not included.

Note 4 : Number type "network defined number" is used to indicate administration numbers or service numbers used on the network; e.g., prefix or escape digits might be present.

(2) Numbering plan indication (Octet 3)

Bit 4	3	2	1		
0	0	0	0	:	Unknown (Note)
0	0	0	1	:	ISDN/telephone numbering plan (Rec. E.164 / E.163)
0	0	1	1	:	Date numbering plan (Rec. X.121)
0	1	0	0	:	Telex numbering plan (Rec. F.69)
1	0	0	0	:	National numbering plan
1	0	0	1	:	Private network numbering plan
Others				:	Reserved

Note : Numbering plan "unknown" is used when the user or network cannot be recognized the numbering plan. In this instance, the number digit field is structured according to the dialing procedure for the network; e.g., prefix or escape digits might be present.

(3) Presentation indicator (Octet 4)

Bit 4	3		
0	0	:	Presentation allowed
0	1	:	Presentation restricted
1	0	:	No number displayed under inter-connection conditions
1	1	:	Reserved

Note : The Presentation indicator is used to indicate whether the calling user wishes to display the calling party number to the called user over the originating user network interface. This may be required on a subscription basis.

(4) Screening indicator (Octet 4)

Bit 2	1		
0	0	:	User provided, not screened
0	1	:	User provided, with network check, passed
1	0	:	User provided, verified and failed
1	1	:	Network provided

Note : The Screening indicator indicates whether the calling party number is reported by the calling user or the network provides and reports the calling party number when the calling party number is presented to the called party.

(5) Odd/Even indication (Octet 4)

Bit 8		
0	:	Even (when the number of digits is an even number)
1	:	Odd (when the number of digits is an odd number)

(6) Calling line identification non-presentation cause (octet 4)

Bit 7	6	5		
0	0	0	:	No cause for non-presentation
0	0	1	:	Non-presentation due to user rejection
0	1	0	:	Non-presentation due to interaction with other services
0	1	1	:	Non-presentation due to origination from public telephone
1	0	0	:	Non-presentation due to unabilability of service
Others			:	Reserved

(7) Numbering digits (Octet 5-n)

Bit 4	3	2	1		(or 8 7 6 5)
1	0	1	0	:	0
0	0	0	1	:	1
0	0	1	0	:	2
0	0	1	1	:	3
0	1	0	0	:	4
0	1	0	1	:	5

4	3	2	1		(or 8 7 6 5)
0	1	1	0	:	6
0	1	1	1	:	7
1	0	0	0	:	8
1	0	0	1	:	9
1	0	1	1	:	*
1	1	0	0	:	#
0	0	0	0	:	Filler
Others				:	Reserved

4.3.7.3.5.7 Calling party subaddress

The Calling party subaddress information element is used to identify the subaddress for the calling party and is coded as shown in Fig. 4.3.7.3-11 and Table 4.3.7.3-12 below. The maximum length of this information element is 23 octets.

<table>
<tr><td colspan="8">Bit</td><td></td></tr>
<tr><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td></td></tr>
<tr><td>0</td><td colspan="7">Calling party subaddress
1 1 0 1 1 0 1
Information element identifier</td><td>Octet 1</td></tr>
<tr><td colspan="8">Length of calling party subaddress contents</td><td>Octet 2</td></tr>
<tr><td>1
ext</td><td colspan="3">Type of subaddress</td><td>Odd/even
IND</td><td colspan="3">0 0 0
Spare</td><td>Octet 3</td></tr>
<tr><td colspan="8">Subaddress information
~ ~</td><td></td></tr>
</table>

Fig.4.3.7.3-11 : Calling party subaddress information element

Table 4.3.7.3-12 : Calling party subaddress information element

(1) Subaddress type (Octet 3)

Bit 7 6 5		
0 0 0	:	NSAP (X.213 / ISO 8343 AD2)
0 1 0	:	User specific subaddress
Others	:	Reserved

(2) Odd/even indication (Octet 3)

Bit 4		
0	:	The number of address signals is an even number.
1	:	The number of address signals is an odd number

Note 1 : Odd/even indication is used when the subaddress type is a user specific subaddress. The user specific subaddress shall be coded by BCD codification.

Note 2 : Details of the subaddress information are under investigation.

4.3.7.3.5.8 Cause

The Cause information element is used for indicating the cause of generating the message or the source of message generation, and is shown in Fig. 4.3.7.3-12 and Table 4.3.7.3-13 below.

<table>
<tr><td colspan="9">Bit</td></tr>
<tr><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td></td></tr>
<tr><td>0</td><td colspan="7">Cause
0 0 0 1 0 0 0
Information element identifier</td><td>Octet 1</td></tr>
<tr><td colspan="8">Length of cause contents</td><td>Octet 2</td></tr>
<tr><td>0/1
ext</td><td colspan="2">Coding
standard</td><td>Spare</td><td colspan="4">Location</td><td>Octet 3</td></tr>
<tr><td>1
ext</td><td colspan="7">Recommendation</td><td>Octet 3a
(note 1)</td></tr>
<tr><td>1
ext</td><td colspan="7">Cause value</td><td>Octet 4</td></tr>
</table>

Fig. 4.3.7.3-12 : Cause information element

Note 1 : When the RCR standard is used for the specification type, Octet 3a can be omitted.

Table 4.3.7.3-13 : Cause information element

(1) Coding standard (Octet 3)

Bit 7	6		
0	0	:	RCR Standard
1	1	:	Standard specific to identified location indicated by Bits 4 - 1 of Octet 3.
Others		:	Reserved

(2) Location (Octet 3)

Bit 4	3	2	1		
0	0	0	0	:	User
0	0	0	1	:	Private network serving the local user
0	0	1	0	:	Public network serving the local user
0	0	1	1	:	Transit network
0	1	0	0	:	Public network serving the remote user
0	1	0	1	:	Private network serving the remote user
0	1	1	1	:	International network
1	0	1	0	:	Network beyond interworking point
Others				:	Reserved

(3) Recommendation (Octet 3a)

Bit 7	6	5	4	3	2	1		
0	0	0	0	0	0	0	:	RCR standard
Others							:	Reserved

Note : If octet 3a is omitted, RCR standard is assumed.

(4) Cause value (Octet 4)

The Cause value is divided in two fields: a Class (Bit 7 - 5) and a Value (Bit 4 - 1).

The Class indicates the general nature of the event.

Bit 7	6	5	4	3	2	1		
0	0	0	x	x	x	x		Normal event class
			0	0	0	1	:	Unallocated number
			0	0	1	0	:	No route to the specified transit network
			0	0	1	1	:	No route to destination
			0	1	1	0	:	Channel unacceptable
			0	1	1	1	:	Call awarded and being delivered in an established channel
			1	0	0	0	:	MS power OFF
			1	0	0	1	:	MS power abnormality
0	0	1	x	x	x	x	:	Normal event class
			0	0	0	0	:	Normal call clearing
			0	0	0	1	:	Called user busy
			0	0	1	0	:	No response from the called user

			0	0	1	1	:	No answer from user (user alerted)
			0	1	0	1	:	Call rejected
			0	1	1	0	:	Number changed
			1	0	1	0	:	Non-selected user clearing
			1	0	1	1	:	Out of order
			1	1	0	0	:	Invalid number format
			1	1	0	1	:	Facility rejected
			1	1	1	0	:	Response to STATUS ENQUIRY
			1	1	1	1	:	Normal, unspecified
0	1	0	x	x	x	x		<u>Class which cannot use resources</u>
			0	0	1	0	:	No available circuit or channel
			0	1	1	0	:	Network out of order
			1	0	0	1	:	Temporary failure
			1	0	1	0	:	Switching equipment congestion
			1	0	1	1	:	Access information discarded
			1	1	0	0	:	Requested circuit or channel unavailable
			1	1	1	1	:	Resource unavailable, unspecified
0	1	1	x	x	x	x		<u>Class which cannot use services</u>
			0	0	0	1	:	QOS unavailable
			0	0	1	0	:	Requested facility is not subscribed
			1	0	0	1	:	Bearer capability not permitted
			1	0	1	0	:	Presently unavailable bearer capability
			1	1	1	1	:	Service or option not available, unspecified
1	0	0	x	x	x	x		<u>Class for which service is not provided</u>
			0	0	0	1	:	Bearer capability not implemented
			0	0	1	0	:	Channel type not implemented
			0	1	0	1	:	Request facility not implemented
			0	1	1	0	:	Only restricted digital information bearer capability is available
			1	1	1	1	:	Service or option not implemented, unspecified
1	0	1	x	x	x	x		<u>Invalid message class</u>
			0	0	0	1	:	Invalid call reference is used
			0	0	1	0	:	Identified channel does not exist
			0	0	1	1	:	A suspended call exists, but this call identity does not
			0	1	0	0	:	Call identity in use
			0	1	0	1	:	No call suspended
			0	1	1	0	:	Call having the requested call identity has bean cleared
			1	0	0	0	:	Incompatible destination
			1	0	1	1	:	Invalid transit network selection
			1	1	1	1	:	Invalid message, unspecified
1	1	0	x	x	x	x		<u>Procedure error class</u>
			0	0	0	0	:	Mandatory information element missing
			0	0	0	1	:	Message type not defined or not implemented
			0	0	1	0	:	Call state does not match with message or message type not defined
			0	0	1	1	:	Information element not defined
			0	1	0	0	:	Invalid information element contents
			0	1	0	1	:	Call state does not match with message

			0	1	1	0	:	Recovery on timer expiry
			1	1	1	1	:	Protocol error, unspecified
1	1	1	x	x	x	x	:	<u>Interworking class</u>
			1	1	1	1	:	Interworking, unspecified
			Others				:	Reserved

4.3.7.3.5.9 Channel identification

The Channel identification information element is used for identifying the channel for the interface controlled by the signaling procedure, and is shown in Fig. 4.3.7.3-13 and Table 4.3.7.3-14 below.

Bit 8	7	6	5	4	3	2	1	
0	Channel identification 0	0	1	1	0	0	0 Information element identifier	Octet 1
Length of channel identification contents								Octet 2
1 ext	Int. id. present	Int. type	0 Spare	Pref./ Excl.	Control channel ind	Info. channel selection		Octet 3

Fig. 4.3.7.3-13 : Channel identification information element

Table 4.3.7.3-14 : Channel identification information element

(1) Interface identifier present (Octet 3)

Bit 7		
0	:	Interface which is identified implicitly (note*)
1	:	Reserved

Note* : Indicates the interface which contains the control channel to which this information element is transferred.

(2) Interface type (Octet 3)

Bit 6		
0	:	Indicates that the interface is basic.
1	:	Reserved

(3) Preferred/Exclusive (note**) (Octet 3)

Bit 4		
0	:	Indicates that the specified channel can be changed.
1	:	Indicates that the specified channel cannot be changed.

Note** : This information is valid only for selection of the information channel. It is not yet been decided when this information is made available because only one information channel is provided at the basic interface. The value must be "0".

(4) Control channel ind (Octet 3)

Bit 3		
0	:	Indicates that the specified channel is not a control channel.
1	:	Indicates that the specified channel is a control channel.

(5) Information channel selection (Octet 3)

<u>Basic interface</u>

Bit 2	1		
0	0	:	Without channel
0	1	:	With channel
Others		:	Reserved

Note : The information channel selection does not apply to the control channels.

4.3.7.3.5.10 Display

The Display information element is used for providing information which can be displayed to the user by the network, and is shown in Fig. 4.3.7.3-14 below.

Bit 8	7	6	5	4	3	2	1	
0	Display 0	1	0	1	0	0	0 Information element identifier	Octet 1
Length of display content								Octet 2
Display information (IA5 character) ~								

Note : Refer to Item 4.7.3.5.14 for a definition of IA5 characters.

Fig. 4.3.7.3-14 : Display information element

4.3.7.3.5.11 Feature activation

The Feature activation information element is used to invoke a supplementary service which is identified by the feature identifier number. The supplementary service which is identified by the Feature Identifier number shall be based on the service profile provided by the user and is shown in Fig. 4.3.7.3-15 below.

Bit 8	7	6	5	4	3	2	1	
0	Feature activation 0	1	1	1	0	0	0 Information element identifier	Octet 1
Length of feature activation contents								Octet 2
ext 0/1	Feature identifier number							Octet 3
ext 1	Feature identifier number (continued)							Octet 3a

Fig. 4.3.7.3-15 : Feature activation information element

Note : Feature identifier number

The feature identification number is coded as a part of feature activation and feature identification information elements and is assigned to the service feature used by the customer account. This number identifies the requested feature or features to be updated. (Refer to Table 4.3.7.3-15 below.)

Table 4.3.7.3-15 : Feature identifier versus service/function

Section	Feature ID No.	Service/function	Abbreviation	Main operator
Common procedure area	32	Call forwarding (No announcement to the calling user and no announcement to the call forwarding user) *note	CD1	
	33	Call forwarding (Announcement to the calling user and no announcement to the call forwarding user) *note	CD2	
	48	3-party conference call (switching mode)	3P	
	50	Call waiting	CW	
	52	3-party conference call (mixing mode)	AO	
	54	Call transfer	CT	
	60	Answer holding		
	61	Answering function		
	70	Modem (V.42 ANNEX)	MODEM	
	72	G3 fax	G3FAX	
Additional procedure area 1	128-255			NTT DoCoMo Group
Additional procedure area 2	256-383			Cellular Group
Additional procedure area 3	00,03,04, 11,384-511			Digital Phone Group
Additional procedure area 4	512-639			IDO
Additional procedure area 5	640-767			TU-KA Group
Additional procedure area 6	768-895			Digital TU-KA Group
	Others	Reserved		

Note* Announcement to the calling user:
Announcement used to inform the calling user that the call is transferred.

Announcement to the call forwarding user:
Announcement used to inform the call forwarding user that a call is transferred.

Common procedure area : Area used in this standard.
Additional procedure area : Area for the operator specific service, but approved for different operator's use.

4.3.7.3.5.12 Feature indication

The Feature indication information element is used by the network to convey the feature indication to the user regarding the status of the supplementary service, and is shown in Fig. 4.3.7.3-16 and Table 4.3.7.3-16 below.

<table>
<tr><td colspan="8">Bit</td><td></td></tr>
<tr><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td></td></tr>
<tr><td>0</td><td colspan="7">Feature indication
0 1 1 1 0 0 1
Information element identifier</td><td>Octet 1</td></tr>
<tr><td colspan="8">Length of feature indication contents</td><td>Octet 2</td></tr>
<tr><td>ext
0/1</td><td colspan="7">Feature identifier number</td><td>Octet 3</td></tr>
<tr><td>ext
1</td><td colspan="7">Feature identifier number (continued)</td><td>Octet 3a</td></tr>
<tr><td colspan="4">Spare
0 0 0 0</td><td colspan="4">Feature state indication</td><td>Octet 4</td></tr>
</table>

Fig. 4.3.7.3-16 : Feature indication information element

Table 4.3.7.3-16 : Feature state indication

Bit 4	3	2	1	State	Definition
0	0	0	0	Non-active	Feature is in the non-active state
0	0	0	1	Active	Feature is in the active state
0	0	1	0	Prompt	Feature prompt (waiting for input from user)
0	0	1	1	Executing	Feature is in the execution state
Other				Reserved	

4.3.7.3.5.13 High layer compatibility

The High layer compatibility information element provides methods to check the compatibility of the other party. This element is structured as shown in Fig. 4.3.7.3-17 and Table 4.3.7.3-17 below.

<table>
<tr><td colspan="8">Bit</td><td></td></tr>
<tr><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td></td></tr>
<tr><td>0</td><td colspan="7">High layer compatibility
1 1 1 1 1 0 1
Information element identifier</td><td>Octet 1</td></tr>
<tr><td>1
ext</td><td colspan="2">Coding standard</td><td colspan="3">Interpretation method</td><td colspan="2">Presentation method of protocol profile</td><td>Octet 2</td></tr>
<tr><td>1
ext</td><td colspan="7">High layer characteristic identifier</td><td>Octet 3</td></tr>
</table>

Fig. 4.3.7.3-17 : High layer compatibility information element

Table 4.3.7.3-17 : High layer compatibility information element

(1) Coding standard (Octet 2)

Bit 7	6		
0	0	:	RCR standard
1	1	:	Network defined standard
Others		:	Reserved

(2) Interpretation (Octet 2)

Bit 5	4	3		
1	0	0	:	First high layer characteristics identification
Others			:	Reserved

(3) Presentation method of protocol profile (Octet 2)

Bit 2	1		
0	1	:	High layer protocol profile (no attribute specification)
Others		:	Reserved

(4) High layer characteristic identifier (Octet 3)

Bit 7	6	5	4	3	2	1		
0	0	0	0	0	0	1	:	Telephone
0	0	0	0	1	0	0	:	G2/G3 facsimile
0	1	0	0	0	0	1	:	Document application profile for G4 facsimile
Others							:	Reserved

Note : Details of this information element are under investigation.

4.3.7.3.5.14 Keypad facility

The Keypad facility information element is used for carrying IA5 characters set by the terminal keypad, or by the user for requesting the network to transmit PB signal, is shown in Fig. 4.3.7.3-18 and Table 4.3.7.3-18 below.

Bit 8	7	6	5	4	3	2	1	
0	Keypad facility 0	1	0	1	1	0	0 Information element identifier	Octet 1
Length of keypad facility contents								Octet 2
0/1 ext	Keypad identifier							Octet 3
1 ext	Sequence number							Octet 3a
Keypad facility information ~ ~ (IA5 character)								Octet 4, etc.

Fig. 4.3.7.3-18 : Keypad facility information element

Table 4.3.7.3-18 : Keypad facility information element

(1) Keypad identifier (Octet 3)

Bit 7	6	5	4	3	2	1		
0	0	0	0	0	0	0	:	PB signal transmission REQ
0	0	0	0	0	0	1	:	IA5 character transfer
					Others		:	Reserved

Note 1 : "IA5 character" codes shown in Table 4.3.7.3-19(b) refer to the ITU-T recommended conding table for transferring characters and numbers in signals. The IA5 character code table is used for PB signal transmission request.

Note 2 : Downlink keypad identifier is assumed as PB signal transmission request.

Note 3 : Usage of KATAKANA characters:

A 7-digit KATAKANA code is used as character code (refer to Table 4.3.7.3-19 (b)). The method for expanding for this code is shown below.

(i) Each time a message is received, the default character code IA5 shown in Table 4.3.7.3-19 (a) is set.

(ii) When SO (14/0) appears in the IA5 character codes, however, a "shift-out" is performed which toggles into the 7-digit KATAKANA table.

(iii) When SI (15/0) appears next, a "shift-in" is performed to toggle back to the IA5 character code table.

(2) Sequence number (Octet 3a)

Set in binary numbers ranging from 0 to 127.

Note : Octet 3a is used when Octet 3 is used for PB signal transmission REQ.

Table 4.3.7.3-19 (a) : IA5 character codes

Bit				Bit 7 6 5	0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
4	3	2	1		0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE	SP	0	(iii)	P	(iii)	p
0	0	0	1	1	SOH	DS1	!	1	A	Q	a	q
0	0	1	0	2	STX	DS2	"	2	B	R	b	r
0	0	1	1	3	ETX	DS3	#/£ (ii)	3	C	S	c	s
0	1	0	0	4	EOT	DS4	/S (ii)	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	10	LF (i)	SUB	*	:	J	Z	j	z
1	0	1	1	11	VT (i)	ESC (iv)	+	;	K	(iii)	k	(iii)
1	1	0	0	12	FF (i)	IS4	,	<	L	(iii)	l	(iii)
1	1	0	1	13	CR (i)	IS3	-	=	M	(iii)	m	(iii)
1	1	1	0	14	SO (iv)	IS2	.	>	N	(iii)	n	(iii)
1	1	1	1	15	SI (iv)	IS1	-	?	O	-	o	DEL

Note (i) : These codes are stipulated for the purpose of controlling the vertical or horizontal transmission independently and for application.

Note (ii) : Either of them can be assigned.

Note (iii) : Combinations of these bits can be used by national or specific applications for specifying graphic characters.

Note (iv) : These codes are used as control characters for extending the code.

Note (v) : This table indicates basic 7 bit codes. In addition, there are IRV (International Reference Version) which stipulates the value in notes (ii) and (iii).

Table 4.3.7.3-19 (b) : 7-digit KATAKANA code JIS X0201

Row \ Column	0	1	2	3	4	5	6	7
0	NUL	TC7 (DLE)	(SP)	ー	タ	ミ	Not defined	Not defined
1	TC1 (SOH)	DC1	。	ア	チ	ム		
2	TC2 (STX)	DC2	「	イ	ツ	メ		
3	TC3 (ETX)	DC3	」	ウ	テ	モ		
4	TC4 (EOT)	DC4	、	エ	ト	ヤ		
5	TC5 (ENQ)	TC8 (NAK)	・	オ	ナ	ユ		
6	TC6 (ASK)	TC9 (SYN)	ヲ	カ	ニ	ヨ		
7	BEL	TC10 (ETB)	ァ	キ	ヌ	ラ		
8	FE0 (BS)	CAN	ィ	ク	ネ	リ		
9	FE1 (HT)	EM	ゥ	ケ	ノ	ル		
10	FE2 (LF)	SUB	ェ	コ	ハ	レ		
11	FE3 (VT)	ESC	ォ	サ	ヒ	ロ		
12	FE4 (FF)	IS1 (FS)	ャ	シ	フ	ワ		
13	FE5 (CR)	IS2 (GS)	ュ	ス	ヘ	ン		
14	SO	IS3 (RS)	ョ	セ	ホ	”		
15	SI	IS1 (US)	ッ	ソ	マ	’		DEL

4.3.7.3.5.15 Progress indicator

The Progress indicator information element is used for describing events that occurred while a call is being made. This information element may be repeated twice within a message. The progress indicator is shown in Fig. 4.3.7.3-19 and Table 4.3.7.3-20 below.

Bit 8	7	6	5	4	3	2	1	
0	Progress indicator 0	0	1	1	1	1	0 Information element identifier	Octet 1
1 ext	Coding standard		Spare	Location				Octet 2
1 ext	Progress data							Octet 3

Fig. 4.3.7.3-19 : Progress indicator information element

Table 4.3.7.3-20 : Progress indicator information element

(1) Coding standards (octet 2)

Bit 7 6		
0 0	:	RCR standard
1 1	:	Standard specific to identified location indicated by bits 1 thru 4 of Octet 2
Others	:	Reserved

(2) Location (octet 2)

Bit 4 3 2 1		
0 0 0 0	:	User
0 0 0 1	:	Private network connecting the local user directly
0 0 1 0	:	Public network connecting the local user directly
0 1 0 0	:	Public network connecting the remote user directly
0 1 0 1	:	Private network connecting the remote user directly
1 0 1 0	:	Network beyond interworking point
Others	:	Reserved

(3) Content of progress indicator (octet 3)

Bit 7 6 5 4 3 2 1	:	
0 0 0 0 0 0 1	:	Call is not ISDN end-to-end
0 0 0 0 0 1 0	:	Destination address is non-ISDN
0 0 0 0 0 1 1	:	Origination address is non-ISDN
0 0 0 0 1 0 0	:	Call has returned to the ISDN
0 0 0 1 0 0 0	:	In-band signal and appropriate pattern now available
Others	:	Reserved

4.3.7.3.5.16 Signal

The Signal information element is used by the network to transfer the information required for creating the tone or the alerting signals to the terminal, is shown in Fig. 4.3.7.3-20 and Table 4.3.7.3-21 below.

Bit 8	7	6	5	4	3	2	1	
0	Signal 0	1	1	0	1	0	0 Information element identifier	Octet 1
Signal value								Octet 2

Fig. 4.3.7.3-20 : Signal information element

Table 4.3.7.3-21 : Signal information element

(1) Signal values (octet 2)

Bit 8	7	6	5	4	3	2	1		
0	0	0	0	0	0	0	0	:	Dial tone ON
0	0	0	0	0	0	0	1	:	RBT ON
0	0	0	0	0	0	1	0	:	Interrupt tone ON
0	0	0	0	0	0	1	1	:	Network congestion tone ON
0	0	0	0	0	1	0	0	:	Busy tone ON
0	0	0	0	0	1	0	1	:	Confirm tone ON
0	0	0	0	0	1	1	0	:	Answer tone ON
0	0	0	0	0	1	1	1	:	Call waiting tone ON
0	0	0	0	1	0	0	0	:	Off-hook alarm tone ON
0	0	1	1	1	1	1	1	:	Tone OFF
0	1	0	0	0	0	0	0	:	Alerting ON pattern 0
0	1	0	0	0	0	0	1	:	Alerting ON pattern 1
0	1	0	0	0	0	1	0	:	Alerting ON pattern 2
0	1	0	0	0	0	1	1	:	Alerting ON pattern 3
0	1	0	0	0	1	0	0	:	Alerting ON pattern 4
0	1	0	0	0	1	0	1	:	Alerting ON pattern 5
0	1	0	0	0	1	1	0	:	Alerting ON pattern 6
0	1	0	0	0	1	1	1	:	Alerting ON pattern 7
0	1	0	0	1	1	1	1	:	Alerting OFF
Others								:	Reserved

Note 1 : "Alert ON patterns 0 thru 7" are used to specify alerting patterns and, as such, the method of usage is to be determined by the network.

Note 2 : Regarding tone signals transmitted by MS and networks and their purposes:

Examples of use of tones are listed in the sequences and status transition tables in this standard. However, the tone signal transmission source can be decided freely either the network or MS by each operator.

List of tone signals

(i) DT (Dial tone)

Signal which prompts the user for input of dial information.

(ii) RBT (Ring Back tone)

Signal which informs the calling user that a call is being alerted at the other party.

(iii) BT (busy tone)

The BT is sent by the network to the calling party to notify that the outgoing call has not been connected to the called party due to called party busy, the resource block in the network, or other causes. It is sent to notify one party that the other party disconnected the call.

(iv) CWT (call waiting tone)

Signal to notify the user that an existed call is in on hold when a call is disconnected during call waiting service or 3-party conference service.

(v) IIT (Indicating Incoming call in communications tone)

Signal which notifies the user that the 2nd call is received while the user is in communications.

(vi) HST (Hold signal tone)

The HST is sent by the network to the other party to notify that the call is put in the hold state during call waiting service or 3-party conference service (switching mode).

4.3.7.3.5.17 Advice of charge

The Advice of charge information element is sent by the network to the user to advise the total charge of the call when the call has ended.

This information element is included in the first CC message transmitted by the network to clear a call. It is transferred using a locking shift procedure with a codeset for national use. The maximum length of this information is 8 octets.
Refer to the Fig 4.3.7.3-21 and Table 4.3.7.3-22 below.

Bit 8	7	6	5	4	3	2	1	
0	Advice of charge 0	0	0	0	0	0	1 Information element identifier	Octet 1
Length of advice of charge contents								Octet 2
10th digit				1st digit				Octet 3
~							~	• • •
Filler (in case of odd number)				10(2n-6)-th digit				Octet n

Fig. 4.3.7.3-21 : Advice of charge information element

Table 4.3.7.3-22 : Advice of charge information element

(1) Numbering digits (Octet 3 - n)

Bit 4	3	2	1		(or 8 7 6 5)	4	3	2	1		(or 8 7 6 5)
1	0	1	0	:	0	0	1	1	0	:	6
0	0	0	1	:	1	0	1	1	1	:	7
0	0	1	0	:	2	1	0	0	0	:	8
0	0	1	1	:	3	1	0	0	1	:	9
0	1	0	0	:	4	0	0	0	0	:	Filler
0	1	0	1	:	5	Others				:	Reserved

4.3.7.3.5.18 More data

The more data information element is sent in the USER INFO message from the use to the network. Then this information element is transferred from the network to the destination user by the corresponding USER INFO message. The more data information element indicates that USER INFO messages which belong to the same block will continue to be transmitted to the destination user.

The use of this information element is not controlled by the network. It is coded as shown in Fig. 4.3.7.22

Bit 8	7	6	5	4	3	2	1	
1	More data 0	1	0	0	0	0	0 Information element identifier	Octet 1

Fig. 4.3.7.3-22 : More data information element

4.3.7.3.5.19 Congestion control level

The congestion control level information element is used for indicating the congestion state of call traffic and is coded as shown in Fig. 4.3.7.3-23 and Table 4.3.7.3-23 below.

Bit 8	7	6	5	4	3	2	1	
1	Congestion control level 0	1	1 Information element identifier	Congestion control level				Octet 1

Fig. 4.3.7.3-23 : Congestion control level information element

Table 4.3.7.3-23 : Congestion control level information element

Congestion control level (Octet 1)

Bit 4	3	2	1	
0	0	0	0	: RR (Receiver receivable)
1	1	1	1	: RNR (Receiver not receivable)
Others				: Reserved

4.3.7.3.5.20 Call state

The call state information element is used for indicating the present call state and is coded as shown in Fig. 4.3.7.3-24 and Table 4.3.7.3-24 below.

Bit 8	7	6	5	4	3	2	1	
0	Call state 0	0	1	0	1	0	0 Information element identifier	Octet 1
Length of call state information contents								Octet 2
coding standard		Call state value (State value is coded in binary numbers)						Octet 3

Fig. 4.3.7.3-24 : Call state information element

Table 4.3.7.3-24 : Call state information element

(1) Coding standard (Octet 3)

Bit 8	7	
0	0	RCR STD
Others		Reserved

(2) Call state value (Octet 3)

Bit 6	5	4	3	2	1	User	Network
0	0	0	0	0	0	: UCC0-Null	NCC0-Null
0	0	0	0	0	1	: UCC1-Call initiated	NCC1-Call initiated
0	0	0	0	1	1	: UCC3-Outgoing call proceeding	NCC3-Outgoing call proceeding
0	0	0	1	0	0	: UCC4-Call delivered	NCC4-Call delivered
0	0	0	1	1	0	: UCC6-Call present	NCC6-Call present
0	0	0	1	1	1	: UCC7-Call received	NCC7-Call received
0	0	1	0	0	0	: UCC8-Connect request	NCC8-Connect request
0	0	1	0	1	0	: UCC10-Active	NCC10-Active
0	0	1	0	1	1	: UCC11-Disconnect request	NCC11-Disconnect request
0	0	1	1	0	0	: UCC12-Disconnect indication	NCC12-Disconnect indication
0	1	0	0	1	1	: UCC19-Release request	NCC19-Release request
Others						: Reserved	Reserved

4.3.7.3.5.21 Facility

The purpose of the facility information element is to indicate invocation and operation of the supplementary service identified by the operation value included in this information element. This information element is coded as shown in Fig. 4.3.7.3-25 and Table 4.3.7.3-25 below.

<table>
<tr><td>Bit</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td></td></tr>
<tr><td></td><td>0</td><td colspan="7">Facility
0 0 1 1 1 0 0
Facility information element identifier</td><td>Octet 1</td></tr>
<tr><td></td><td colspan="8">Length of facility contents</td><td>Octet 2</td></tr>
<tr><td></td><td>1
ext</td><td colspan="2">0 0
Spare</td><td colspan="5">Service discriminator</td><td>Octet 3</td></tr>
<tr><td></td><td colspan="2">1 0
Class</td><td>1
Form</td><td colspan="5">Component tag</td><td>Octet 4</td></tr>
<tr><td></td><td>0
Length format</td><td colspan="7">Component length</td><td>Octet 5</td></tr>
<tr><td></td><td colspan="8">~ Component (s) ~</td><td>Octet 6
etc.</td></tr>
</table>

Note: "Component" contained in Octets 4 to 6 can be used repeatedly within a facility information element.

Fig. 4.3.7.3-25 : Facility information element

Table 4.3.7.3-25 : Facility information element

(1) Service discriminator (Octet 3)

Bit 5	4	3	2	1	
1	0	0	0	1	: Supplementary service application
Others					: Reserved

(2) Class (Octet 4)

Bit 8	7	
1	0	: Context-specific
Others		: Reserved

(3) Form (Octet 4)

Bit 6	
1	: Constructor
Others	: Reserved

(4) Component tag (Octet 4)

Bit 5	4	3	2	1	
0	0	0	0	1	: Invoke
0	0	0	1	0	: Return result
0	0	0	1	1	: Return error
0	0	1	0	0	: Reject
Others					: Reserved

(5) Length format (Octet 5, Bit 8)

Bit 8	
0	: Component length field is 1 octet
Others	: Reserved

(6) Component length (Octet 5, Bits 7 to 1)

This field indicates the length of information in the component field. (i.e., Octet 6 and its joint section). The number of octets in "component" is coded in binary numbers. The least significant bit (LSB) is bit 1 (2^0).

(7) Component (Octet 6)

The configuration of the component field differs depending on the component type indicated by the component tag field.

4.3.7.3.5.22 User-User

The User-User information element is used for transferring information between users. This information element is not interpreted by the network and is transferred transparently to the remote user and is coded as shown in Fig. 4.3.7.3-26 and Table 4.3.7.3-26 below. A maximum length of this information element in messages is 35 or 131 octets depending on the network.

<table>
<tr><td>Bit 8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td></td></tr>
<tr><td>0</td><td colspan="7">User-User
1 1 1 1 1 1 0
Information element identifier</td><td>Octet 1</td></tr>
<tr><td colspan="8">Length of user-user contents</td><td>Octet 2</td></tr>
<tr><td colspan="8">Protocol discriminator</td><td>Octet 3</td></tr>
<tr><td colspan="8">~ User information ~</td><td>Octet 4, etc.</td></tr>
</table>

Fig. 4.3.7.3-26 : User-User information element

Table 4.3.7.3-26 : User-User information element

Protocol discriminator (Octet 3)

Bit 8 7 6 5 4 3 2 1	
0 0 0 0 0 0 0 0	User original protocol (note 1)
0 0 0 0 0 0 0 1 : 0 0 0 0 0 0 1 1	} Reserved
0 0 0 0 0 1 0 0	IA5 character (note 2)
0 0 0 0 1 0 0 0	RCR standard air interface CC message
0 0 0 1 0 0 0 0 : 0 0 1 1 1 1 1 1	} Reserved for other network layer or layer 3 protocol
0 1 0 0 0 0 0 0 0 1 0 0 1 1 1 1	} Domestic use
0 1 0 1 0 0 0 0 : 1 1 1 1 1 1 1 0	} Reserved for other network layer or layer 3 protocol
Others	Reserved

Note 1: The user information is composed based on user necessity.

Note 2: The user information is configured of IA5 characters.

4.3.7.3.5.23 Re-call indication

The Re-call indication information element is used by the network to notify the user that the user may be re-called by the network after the MS is disconnected.

When the user is notified of the re-call indication, the user sets timer T390 with a value that can be re-called in the same manner as connection with police (110) or fire department (119).

Bit	8	7	6	5	4	3	2	1	
	1	Re-call indication 0	0	0	0	0	1	0 Information element identifier	Octet 1

Fig. 4.3.7.3-27 : Re-call indication information element

4.3.7.3.5.24 High-speed data transmission DCE function

This message is used to transfer DCE initialization information from a call origination user to the network when high-speed data transmission is performed. This information element is valid when the feature identifier of the feature activation information element is set to "Modem" (feature identifier number 70).

This information element is coded as shown in Fig. 4.3.7.3-28.

Bit	8	7	6	5	4	3	2	1	
		High-speed data transmission DCE function Information element identifier							Octet 1
	0	0	0	0	0	0	1	0	
	Length of high-speed data transmission DCE function								Octet 2
	0	0	0	0	0	1	0	0	
	DCE type extended information			(Note 2)	DCE type: Asynchronous DCE (Note 1)				Octet 3
	0	0	0	–	0	0	0	1	
	Command set type: See Table 4.3.7.3-29 (Note 1)				DCE protocol: See Table 4.3.7.3-30 (Note 1)				Octet 4
	–	–	–	–	–	–	–	–	
	Extended function selection information 1: Reserved (Note 1)				Extended function selection information 2: Rserved (Note 1)				Octet 5
	0	0	0	0	0	0	0	0	
	Extended function selection information 3: Reserved (Note 1)				Fixed pattern				Octet 6
	0	0	0	0	0	0	0	0	

Note 1 : This information is sent from a data communication unit added to a mobile station.

Note 2 : DCE activation information which is set as follows:
DCE activation : 1
DCE release : 0
This information is also sent from a data communication unit added to a mobile station.

Fig. 4.3.7.3-28 : High-speed data transmission DCE function format

Table 4.3.7.3-29 : Command set type information element (Octet 4, bit 5-8)

Command set type	Bit 8	7	6	5	4	3	2	1
Command set type : AT command set, (DCE Esc command allowed) (Note 1)	0	0	0	0	-	-	-	-
Command set type : AT command set, (DCE Esc command not allowed) (Note 2)	0	1	0	0	-	-	-	-
Command set type : Others (Note 1)	Reserved				-	-	-	-

Note 1 : A command set type for DCE is set.

Note 2 : When a modular interface is used in place of a digital interface, such as RS-232C, for the DTE interface, the "escape sequence command not allowed" should be specified to prevent the DCE in the IWF from independently switching to the online command mode on arrival of an escape character which is issued by the DTE to a local modem.

Even if the DCE detects an escape character in the user data, when the "escape sequence command not allowed" is specified, the DCE is initialized so as not to switch to the online command mode.

Table 4.3.7.3-30 : DCE protocol field (Octet 4, bit 1-4)

DCE protocol	Bit 8	7	6	5	4	3	2	1
DCE protocol : To be customized (selected in in-channel)	-	-	-	-	0	0	0	0
DCE protocol : MNP class 4 (V.42 ANNEX)	-	-	-	-	0	0	0	1
DCE protocol : MNP class 5	-	-	-	-	0	0	1	0
DCE protocol : MNP class 10	-	-	-	-	0	0	1	1
DCE protocol : LAPM (V.42)	-	-	-	-	0	1	0	0
DCE protocol : LAPM(V.42) + V.42 bis	-		-	-	0	1	0	1
DCE protocol : Normal mode	-	-	-	-	0	1	1	0
DCE protocol : Others	-	-	-	-	Reserved			

4.3.7.3.6 Information elements for packet communication

Table 4.3.7.3-6 (d) Coding for information elements (for packets)

Bit 8	7	6	5	4	3	2	1		
	0	0	0	0	0	1	0	:	Segmentation
	0	0	0	0	1	0	0	:	User packet data
	Other							:	Reserved

The coding standards for information elements for packet communication shall be in accord with section 4.3.7.3.5.1 “Coding standards.” However for the information elements of Type 1 which are composed of multiple octets, the most significant bit shall be bit 7 of the first octet and the least significant bit shall be bit 1 of the last octet.

4.3.7.3.6.1 Segmentation

This information element is used for controlling segmentation and reassembly packets which are transmitted or received and is coded as shown in Fig. 4.3.7.3-29 below.This information element is 3-octets long.

	Bit 8	7	6	5	4	3	2	1
Octet 1	0	Segmentation information element identifier 0000010						
Octet 2	User packet number							
Octet 3	* 1	Segment number						

* 1 : Continuous segments

Fig. 4.3.7.3-29 Segmentation information element

(1) User packet number (Octet 2)

A number which identifies a packet is assigned to each packet and is indicated by binary . These numbers are in cycles of 0 to 255

(2) Continuous segments (Octet 3)

Bit 8		Continuous segments
0	:	Continuous segments exist
1	:	No continuous segments

(3) Segment number (Octet 3)

This is number assigned to segments and is obtained by segmenting a packet and is indicated by binary (from 0 to 127).

4.3.7.3.6.2 User packet data

This information element is used for transferring packets between users and is coded as shown in Fig. 4.3.7.3-30 below. This information element is 2 to 254 octets long.

	Bit 8	7	6	5	4	3	2	1
Octet 1	0	User packet data information element identifier 0000100						
Octet 2	0/1 Ext.	User packet data contents length						
Octet 3, etc.	User packet information							

Fig. 4.3.7.3-30 User packet data information element

4.3.7.3.7 Logical number for switched virtual circuit packet communication

	Bit 8	7	6	5	4	3	2	1
Octet 2	*1	Logical number						

* 1 : Logical number flag

Fig. 4.3.7.3-31 Logical number

Table 4.3.7.3-30 Logical number coding

(1) Logical number flag

Bit 8	
0	Transmitted from the connection requesting side
1	Transmitted to the connection requesting side

(2) Logical number

Bit 7	6	5	4	3	2	1		
0	0	0	0	0	0	0	:	Reserved
0	0	0	0	0	0	1	}	General
		:						
1	1	1	1	1	1	0		
1	1	1	1	1	1	1	:	Dummy

Note : Dummy refers to the logical number set to the message when the message that is not related to any of the calls existing in the interface (simple indication to the user, etc.) is being sent.

4.3.7.3.8 Message type for switched virtual circuit connection packet communication

Message type is used for identifying the function of the message being transferred.

Message type is located in the 3rd octet of each message. Message type is coded as shown in Fig. 4.3.7.3-32 and Table 4.3.7.3-31.

	Bit 8	7	6	5	4	3	2	1
Octet 3	0	Message type						

Fig. 4.3.7.3-32 Message type information element format

Table 4.3.7.3-31 Logical type coding

Bit 7	6	5	4	3	2	1		
0	0	-	-	-	-	-	:	Message for connection
		0	0	0	0	1	:	Virtual Circuit Connection Request
		0	0	0	1	0	:	Virtual Circuit Connection Response
		0	0	1	0	0	:	Virtual Circuit Connection Reject
0	1	-	-	-	-	-	:	Message during communication
		0	0	0	0	0	:	User Information
1	0	-	-	-	-	-	:	Message for Disconnection
		0	0	0	0	1	:	Virtual Circuit Connection Release Request
		0	0	0	1	0	:	Virtual Circuit Connection Release Response
		Others					:	Reserved

4.3.7.3.9 Information elements for switched virtual circuit connection packet communication

Table 4.3.7.3-32 Information element coding

Bit 8	7	6	5	4	3	2	1		
	0	0	0	0	0	1	0	:	Segmentation
	0	0	0	0	1	0	0	:	User packet data
	0	0	0	1	0	0	0	:	Cause
	1	1	0	1	1	0	0	:	Connection destination identification code
	1	1	1	1	1	1	1	:	Operator-specific information
			Others					:	Reserved

The coding specification for information elements for Switched Virtual Circuit connection packet communication shall follow "4.3.7.3.5.1 Coding Rules". However, if at type 1, the Length of contents of information element indicates multiple octets, then the most significant bit shall be Bit 7 of the first octet and the least significant bit shall be Bit 1 of the last octet.

4.3.7.3.9.1 Segmentation

The segmentation information element is used for controlling segmentation and reassembly packets which are transmitted or received, with management separate for each logical number. The details are as illustrated in Fig. 4.3.7.3-34. This information element is 4 octets long.

Bit	8	7 6 5 4 3 2 1
Octet 1	0	Segmentation information element identifier 0000010
Octet 2	Segmentation contents length	
Octet 3	User packet number	
Octet 4	*1	Segment number

* 1 : Continuous segment

Fig. 4.3.7.3-33 Segmentation information element

(1) User packet number (Octet 2)

A number which identifies a packet is assigned to each packet and is indicated by binary. (0-255)

(2) Continuous segments (Octet 3)

Bit 8		
0	:	Continuous segment exists
1	:	No Continuous segment

Bit 8 : Continuous segment

(3) Segment number (Octet 3)

This is a number assigned to packet segments and is indicated by binary. (0-127)

4.3.7.3.9.2 User packet data

This information element is used for transferring packets between users and is coded as shown in Fig. 4.3.7.3-34. This information element length is 2-251 octets.

Bit	8	7	6	5	4	3	2	1
Octet 1	0	User packet data information element identifier 0000100						
Octet 2	0/1 Ext.	User packet data contents length						
Octet 3	User packet information							

Fig. 4.3.7.3-34 User packet data information element

4.3.7.3.9.3 Cause

Cause is used to indicate the cause of generating the message and the source of message generation made. It is coded as shown in Fig. 4.3.7.3-35 and Table 4.3.7.3-33.

Bit	8	7	6	5	4	3	2	1
Octet 1	0	Cause information element identifier 0001000						
Octet 2	Length of cause contents							
Octet 3	0/1 Ext	Coding standard		Spare		Location		
Octet 3a	1 Ext	Recommendation						
Octet 4	1 Ext	Cause value						

Fig. 4.3.7.3-35 Cause information element

Table 4.3.7.3-35 Cause information element

(1) Coding standard (Octet 3)

Bit 7	6		
0	0	:	RCR Standard
1	1	:	Standard specific indicated by Bits 4-1 of Octet 3
Others		:	Reserved

(2) Location (Octet 3)

Bit 4	3	2	1		
0	0	0	0	:	User
0	0	0	1	:	Private network serving the local user
0	0	1	0	:	Public network serving the local user
0	0	1	1	:	Transit network
0	1	0	0	:	Public network serving the remote user
0	1	0	1	:	Private network serving the remote user
0	1	1	1	:	International network
1	0	1	0	:	Network beyond interworking point
Others				:	Reserved

(3) Recommendation (Octet 3a)

Bit 7	6	5	4	3	2	1	
0	0	0	0	0	0	0	RCR standard
Others							Reserved

Note : If Octet 3a is omitted, RCR standard is assumed.

(4) Cause value (Octet 4)

The Cause value is divided in two fields : a Class (Bits 7-5) and a Value (Bits 4-1).

The Class indicates the general nature of the event.

Bit 7	6	5	4	3	2	1		
0	0	0	x	x	x	x	:	Normal event
			0	0	0	1	:	Unallocated (unassigned) number
0	0	1	x	x	x	x	:	Normal event
			0	0	0	0	:	Normal call clearing
			0	1	0	1	:	Call rejected
			1	1	0	1	:	Facility rejected
			1	1	1	1	:	Normal, unspecified
0	1	0	x	x	x	x	:	Resource unavailable
			0	1	1	0	:	Network out of order
			1	0	0	1	:	Temporary failure
			1	0	1	0	:	Switching equipment congestion
			1	1	0	0	:	Requested circuit/channel not available
			1	1	1	1	:	Resources unavailable, unspecified
0	1	1	x	x	x	x	:	Service or option not available
			0	0	1	0	:	Requested facility not subscribed
			1	1	1	1	:	Service or option not available, unspecified
1	0	0	x	x	x	x	:	Service or option not implemented
			0	1	0	1	:	Requested facility not implemented
			1	1	1	1	:	Service or option not implemented, unspecified
1	1	0	x	x	x	x	:	Protocol error
			0	0	0	0	:	Mandatory information is missing
			0	1	0	0	:	Invalid information element contents
			0	1	1	0	:	Recovery on timer expiry
			1	1	1	1	:	Protocol error, unspecified
		Others					:	Reserved

4.3.7.3.9.4 Connection destination identification code

Connection destination identification code information element is used to indicate the the connection destination for a switched virtual circuit connection as shown in Fig. 4.3.7.3-36 and Table 4.3.7.3-36.

Bit	8	7	6	5	4	3	2	1
Octet 1	0	Connection destination identification code information element identifier 1101100						
Octet 2	Length of connection destination identification code contents							
Octet 3	Coding identifier							
Octet 4,etc	Contents of connection destination identification code							

Fig. 4.3.7.3-36 Connection destination identification code information element

Table 4.3.7.3-36 Connection destination identification code information element

(1) Coding identifier

Bit 8	7	6	5	4	3	2	1		
0	0	0	0	0	0	0	1	:	BCD
Other								:	Reserved

(2) Contents of connection destination identification code

(2)-1 When Coding identifier is BCD

Bit	8	7 6 5 4 3 2 1
Octet 4	*1	Spare

Bit	8 7 6 5	4 3 2 1
Octet 5	2nd digit	1st digit
Octet 6	4th digit	3rd digit
	-	-
Octet n-1	(2n-10)th digit	(2n-11)th digit
Octet n	Filler (in case of odd number)	(2n-9)th digit

* 1 : Odd/even-indication

(a) Odd/even Indication (Octet 4)

Bit 8		Odd/even indication
0	:	Even
1	:	Odd

(b) Connection destination identification code (Octet 5 to n)

Bit 4	3	2	1	(or 8 7 6 5)	
1	0	1	0	:	0
0	0	0	1	:	1
0	0	1	0	:	2
0	0	1	1	:	3
0	1	0	0	:	4
0	1	0	1	:	5

4	3	2	1	(or 8 7 6 5)	
0	1	1	0	:	6
0	1	1	1	:	7
1	0	0	0	:	8
1	0	0	1	:	9
1	0	1	1	:	*
1	1	0	0	:	#
0	0	0	0	:	Filler
Others				:	Reserved

4.3.7.3.9.5 Operator-specific information

The "Operator-specific information" information element represents an area which the individual telecommunication operator can define freely and shall be coded as shown in Fig. 4.3.7.3-37. This information element is 2 to 129 octets long.

Bit	8	7	6	5	4	3	2	1
Octet 1	0	Operator-specific information information element identifier 1111111						
Octet 2	0	Operator-specific information content length						
Octet 3, etc.	Operator-specific information							

Fig. 4.3.7.3-37 Operator-specific information information element

4.3.7.4 Handling of error conditions

All the procedures which transfer signaling information using the protocol discriminator for the layer 3 CC message for the user/network interface specified in this standard apply only to the messages which have completed the checks outlined in items 4.3.7.4.1 to 4.3.7.4.8 which appear in order of precedence.

4.3.7.4.1 Protocol discriminator error

Received messages with protocol discriminators which utilize codes other than the RCR standard user/network call control messages are "ignored."

"Ignored" means that the network or the user end assumes that a message was not received and no processing is performed.

4.3.7.4.2 Missing messages

Received messages which do not contain a complete message type due to the message being too short are ignored.

4.3.7.4.3 Supplementary service identifier error

Received messages which include the supplementary service identifier other than "0000" or "0001" are ignored.

4.3.7.4.4 Call reference procedure error

(1) When the network or the user receives any message, except SETUP or REL COMP, having call references which cannot be identified as being related to the call being established or in progress, the network or the user sends a REL COMP message including cause #81 : "use of invalid call reference," and remains in the "null" state.

(2) When the network or the user receives a REL COMP message with a call reference which cannot be identified as being related to the call being established or in progress, the network or the user will not perform any operations.

(3) When the network or the user receives a SETUP message with a call reference which cannot be identified as being related to the call being established or in progress, and if the invalid call reference flag set to "1," the network or the user will ignore the message.

(4) When the network or the user receives a SETUP messages having the same call references which can be identified as being related to the call being established or in progress, the network or the user will ignore the message.

4.3.7.4.5 Message type or message sequence error

When the network or the user receives an unrecognized message, the network or the user maintains the present state. When the network receives an unexpected message except REL or REL COMP during a state other than the null state, the network sends a REL message and begins to clear the call. When the user receives an unexpected message except REL or REL COMP during a state other than the null state, the network maintains current state.

However, there are two exceptions to this procedure. When these occur, follow the procedure outlined below.

(1) When the network or the user receives an unexpected REL message:

If the network receives an unexpected REL message, the network disconnects and releases the information channel and then clears the connection in the network. If the cause indication is included in the REL message received from the user, or if not included, the network clears the call accompanied by cause #31 : "Normal, unspecified". After this, the network returns a REL COMP message to the user, then releases the call reference and stops all timers, and enters the "null" state. If the user receives an unexpected REL COMP message, it disconnects and releases the information channel then returns a REL COMP message to the network. Following this, it releases the call reference, stops all timers, then enters the "null" state.

(2) When the network or the user receives an unexpected REL COMP message :

If the network or user receives an unexpected REL COMP message :

The network disconnects and releases the information channel and then clears the connection in the network. If the cause indication is included in the REL COMP message received from the user, or if not included, the network clears the call accompanied by cause #111: "Protocol error, unspecified." After this, the network releases the call reference and stops all timers, then enters the "null" state. If the user end receives an unexpected REL COMP message, it disconnects and releases the information channel and releases the call reference, stops all timers, then enters the "null" state.

Transmission of an unexpected REL COMP message is not handled as normal clearing procedure; e.g., the advice of charge is not issued.

4.3.7.4.6 General information element errors

The general information error procedure can also be applied to information elements in codesets other than "0".

(1) Information element sequence error

When an information element has a smaller code than the code of the preceding variable length information element identifier, an information element sequence error is assumed to have occurred.

If either the network or the user receives a message containing an information element sequence error, the information element is ignored. If this information element is mandatory, the receiving party follow the error handling procedure for mandatory information element missing as described in (1) of Item 4.3.7.4.7.

If this information element is non-mandatory, the receiving party ignores this information element and continues processing the message.

(2) Duplicated information elements

If an information element is used repeatedly within the same message in circumstances where it is not permitted to do so in the same message, only the information element appearing first is processed and subsequent information elements are ignored.

When it is permitted to use an information element repeatedly within one message, only the content of permitted information elements is handled.

If the limit on repetitions for the information element is surpassed, the information element are processed repeatedly as many times as the limit and any information elements repeated beyond the limit are ignored.

4.3.7.4.7 Mandatory information element error

(1) Mandatory information element missing

If one or more mandatory information element is missing on reception of a message other than SETUP, DISC, REL, or REL COMP the receiving party does not perform processing for the received message or change the state. After receiving the message, it returns a REL message with cause #96: "mandatory information element missing"

If one or more information elements are missing in the SETUP or REL message which are received, a REL COMP message including cause #96: "mandatory information element missing" is returned.

Note: If the cause information element is not contained in the REL message that is received, the receiving party assumes reception of cause #31: "Normal, unspecified."

If a received DISC message does not contain the cause information element, the actions taken is the same as if a DISC message with cause #31: "normal, unspecified" was received (unless it is otherwise specified that the REL message transferred to the interface must contain cause #96: "mandatory information element missing").

If the received REL COMP message does not contain a cause information element, it is assumed that a REL COMP message was received with cause No. 31: "Normal, unspecified."

(2) Mandatory information element content error

If more than one essential information elements which include invalid content are received on reception of a message other than SETUP, DISC, REL or REL COMP, the receiving party returns a REL message with cause #100: "Invalid information clement contents."

If a received SETUP or REL message contains one or more mandatory information elements with invalid content, the received party returns a REL COMP message with cause #100: "Invalid information element contents". When a party receives a DISC message with invalid content of the cause information element, the actions taken is the same as if a DISC message with cause #31: "normal, unspecified" was received. (unless it is otherwise specified that the REL message transferred to the interface must contain cause #100: "Invalid information element contents.)"

If the receiving party receives a REL COMP message with invalid content of the cause information element, it is assumed that a REL COMP message was received with canse No. 31: "Normal, unspecified."

Generally, information elements having a length which exceeds the maximum length are processed as information elements with content error.

4.3.7.4.8 Non-mandatory information element error

The items in this sectional heading describe operation of information elements which are not mandatory.

(1) Unrecognized information element

When the entity receives a message which contains one or more unrecognized information elements, the entity processes only the information elements that are recognized as having valid content in the message.

In cases when a clearing message contains one or more unrecognized information element , the error is reported to the party transmitted this message by using the following procedure:

a) When the entity receives a DISC message containing one or more unrecognized information elements, the entity returns REL message with cause #99: "Information element not defined."

b) When the entity receives a REL message containing one or more unrecognized information elements , the entity returns REL COMP message with cause #99: "Information element not defined."

c) When the entity receives a REL COMP message containing one or more unrecognized information elements, the error reported is not for the unrecognized information.

(2) Non-mandatory information element content error

When the entity receives a message containing one or more non-mandatory information element content errors, the entity performs processing only for the message and those information elements which are recognized and have valid content.

Information elements in excess of the maximum length are handled as information elements with content error.

4.3.7.5 System parameter lists

4.3.7.5.1 Timers in the network side

Timers in the network side are shown in Table 4.3.7.5-1 below.

Table 4.3.7.5-1 : Timer in the network side (CC)

Timer No Note 1	State	Cause of start	Normal stop	At the 1st expiry	At the 2nd to nth expiries
T301	Call received	ALERT received	CONN received	Clear call	Timer is not restarted
T303	Call present	SETUP sent	ALERT, CONN, CALL PROC, or REL COMP received	Retransmit SETUP; restart T303. If REL COMP has been received, clear the call	Retransmit SETUP; restart T303. If REL COMP has been received, clear the call
T305	Disconnect indication	DISC w/o progress identifier (#8) sent	REL or DISC received	Network sends REL.	Timer is not restarted
T306 Note 2	Disconnect indication	DISC with progress identifier (#8) sent	REL or DISC received	Stop transmission of tone/announce; transmit REL.	Timer is not restarted
T308	Release request	REL sent	REL COMP or REL received	Retransmits REL; restart T308	Enter Null state
TCV302	Connection request	Virtual Circuit Connection Request sent	Virtual Circuit Connection Response or Virtual Circuit Connection Reject received	Enter Idle state	Timer is not restarted
TCV304	Connection release request	Virtual Circuit Connection Release Request sent	Virtual Circuit Connection Release Response received	Enter Idle state	Timer is not restarted

Note 1 : Timer values and numbers of retransmissions can be set by the operator.

Note 2 : The value of timer T306 depends on the length of the announcement.

4.3.7.5.2 Timer for the user side

Timers for the user side are shown in Table 4.3.7.5-2 below.

Table 4.3.7.5-2 : Timers in the user side

Timer No.	Default time-out value	State	Cause of start	Normal stop	At the 1st expiry	At the 2nd expiry
T303	7 s	Call initiated	SETUP sent	CALL PROC, ALERT, CONN, or REL COMP received	Clear internal connection and enter null state.	Timer is not restarted
T305	7 s	Disconnect request	DISC sent	REL or DISC received	Enter RT standby state	Timer is not restarted
T308	7 s	Release request	REL sent	REL COMP or REL received	Enter RT standby state	Timer is not restarted
T309 Note 1	90 s	Any state	Data link disconnected	Data link re-connected	Clear internal connection, TCH and call reference	Timer is not restarted
T313	7 s	Connect request	CONN sent	CONN ACK. received	Transmit DISC	Timer is not restarted
T390	40 s or 10 s Note 2	Any state	When the last call reference is released	• When the new call reference is set • When the RT switches to the standby state.	Enter Standby (RT) state.	Timer is not restarted
TCV301	7 s	Connection request	Virtual Circuit Connection REQ sent	Virtual Circuit Connection RESP or Virtual Circuit Connection REJ received	Ented Idle state	Timer is not restarted
TCV303	7 s	Connection release request	Virtual Circuit Connection Release REQ sent	Virtual Circuit Connection Release RESP received	Ented Idle state	Timer is not restarted

Timer No.	Default time-out value	State	Conditions ont the user side
TCV305	60 s	Connection notification	Virtual Circuit Connection Response must be returned within TCV305 after reception of Virtual Circuit Connection Request
TCV306	0.5 s	Connection	Virtual Circuit Connection Release Response must be returned, within TCV306 after reception of Virtual Circuit Connection Release Request

Note 1 : Timer T309 is a user option.
Note 2 : 40 s in case of Police (110), Fire station (119), or Re-call indication call, 10 s in other cases.

4.3.7.6 Supplementary services

4.3.7.6.1 Supplementary service types

The following supplementary service types are provided with the Personal Digital Cellular Telecommunication System.

Table 4.3.7.6-1 : Supplementary service types

Service	Ref.
• CW (call waiting)	4.3.7.6.1.1
• CLIP/CLIR	4.3.7.6.1.2
• Advice of charge	4.3.7.6.1.3
• Call transfer	4.3.7.6.1.4
• Call forwarding/Voice messaging by user selection	4.3.7.6.1.5
• 3-party call (switching mode)	4.3.7.6.1.6
• 3-party call (mixing mode)	4.3.7.6.1.7
• Answer hold	4.3.7.6.1.8
• Non-voice communication switching	4.3.7.6.1.9
• PB signal transmission	4.3.7.6.1.10
• User-user information transfer	4.3.7.6.1.11
• Hgih-speed data transmission switching	4.3.7.6.1.12

Note 1 : The sequences of individual services are shown on the following pages as examples. Refer to the state transition tables for details.

Note 2 : Whether or not to transmit a FI from the network is left up to individual telecommunication operators. FI is described in the sequence as an example.

4.3.7.6.1.1 Call waiting

(1) Definition

The call waiting function notifies an incoming call to the user during call in progress and allows the user to hold the communicating call and to answer the incoming call. It subsequently allows the user to switch between the communicating call and the holding call.

(2) Sequence

Call waiting sequences are shown in Fig. 4.3.7.6-1 to 4.3.7.6-5 below.

User A : User who subscribes the CW service (contract subscriber)

User B : User who was talking with A.

User C : User who connects with user A and activates the CW.

(A) Call waiting start-up/switching sequence

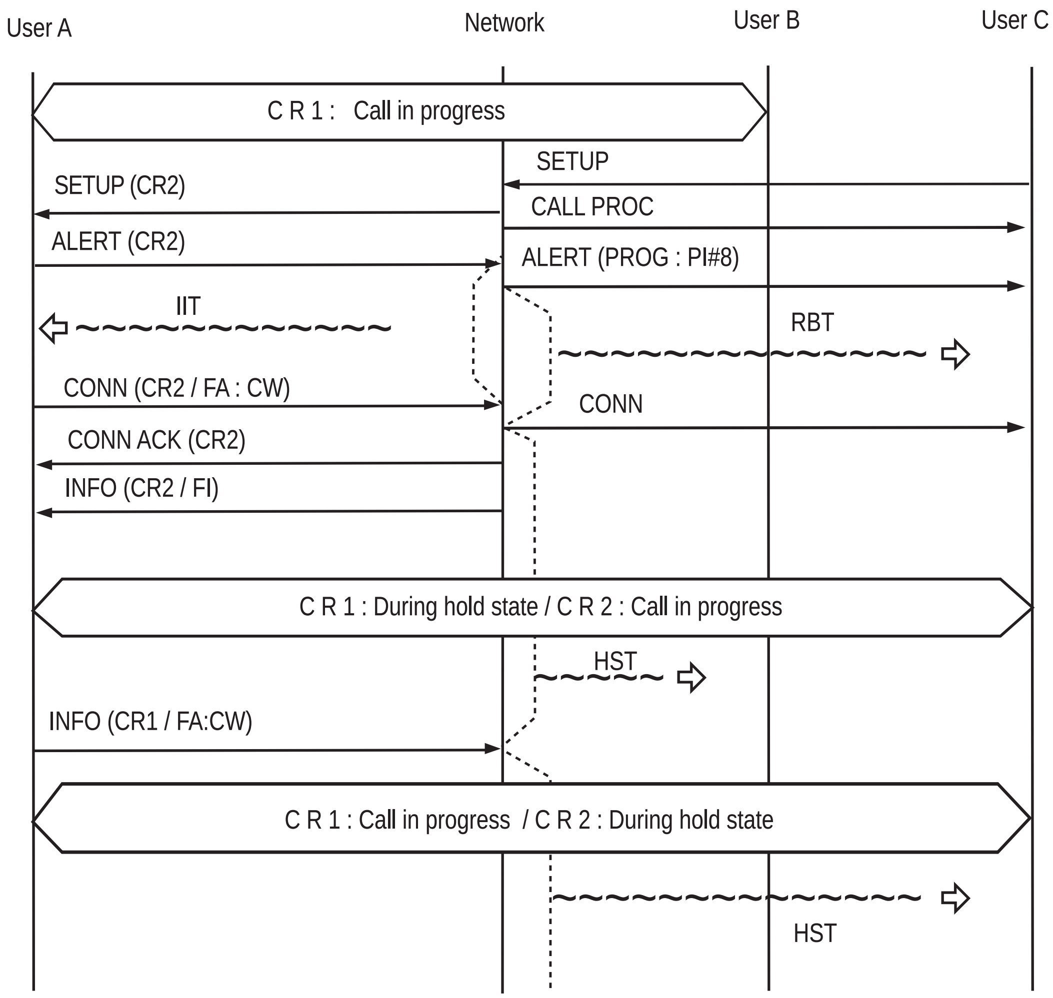


Fig. 4.3.7.6-1 : Call waiting initiation / switching sequence

(B) Call waiting disconnect sequence

1) Disconnection from the call waiting subscriber

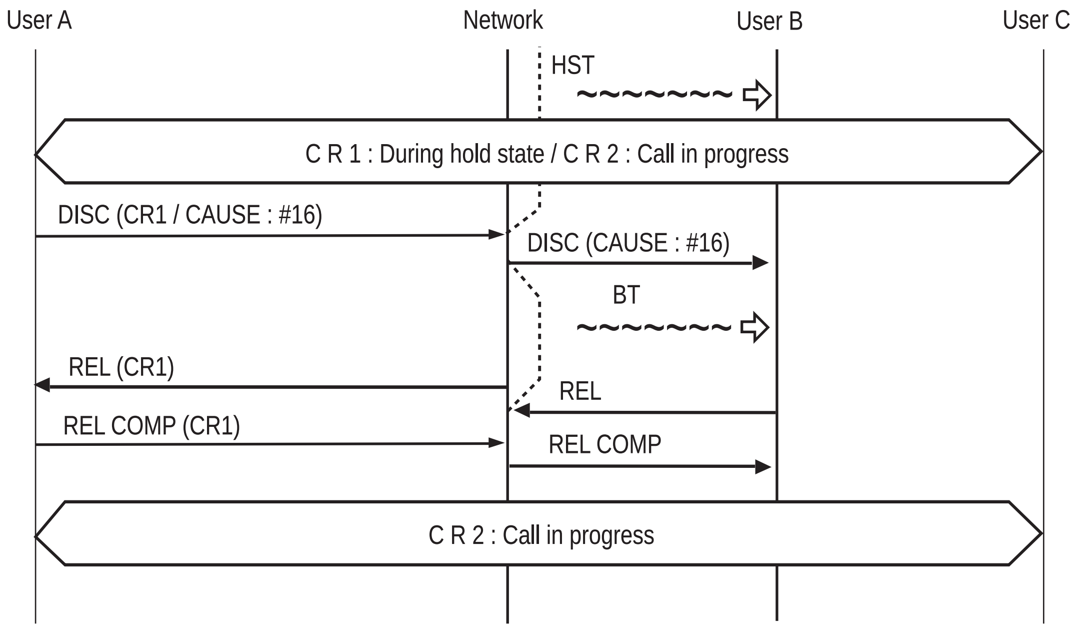


Fig. 4.3.7.6-2 : Call disconnection sequence for the call during hold state

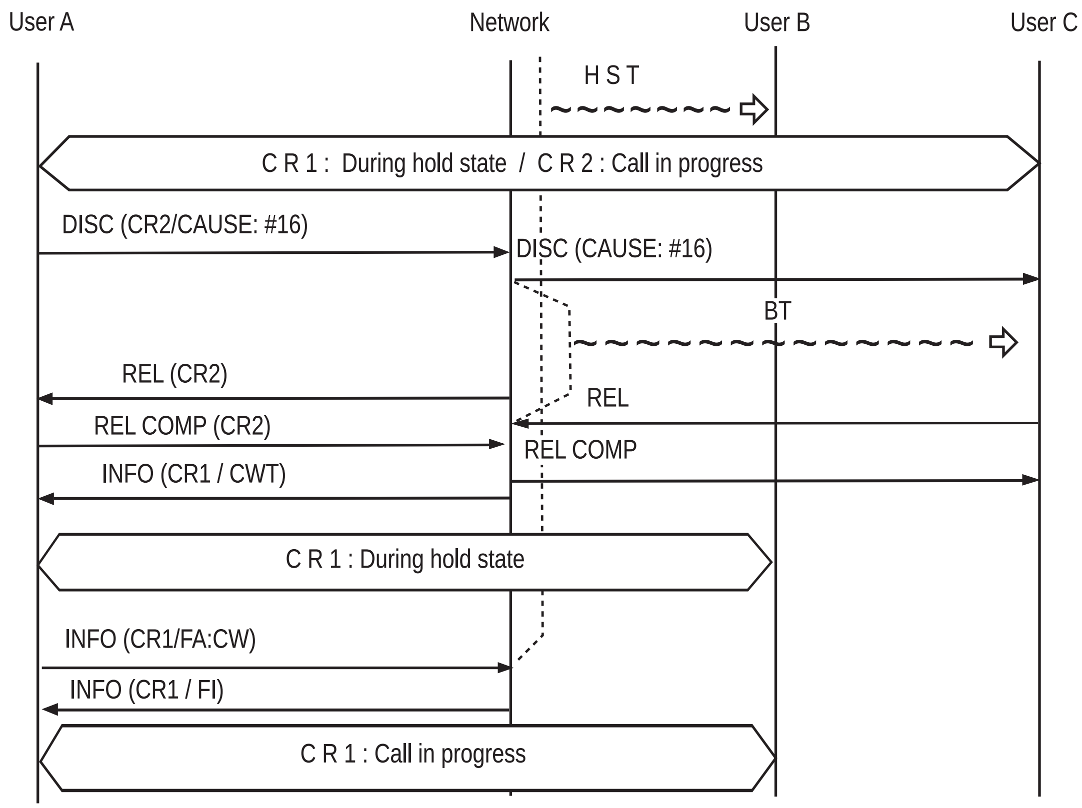


Fig. 4.3.7.6-3 : Call disconnection sequence for the call in progress

2) Disconnection from other users than call waiting subscriber

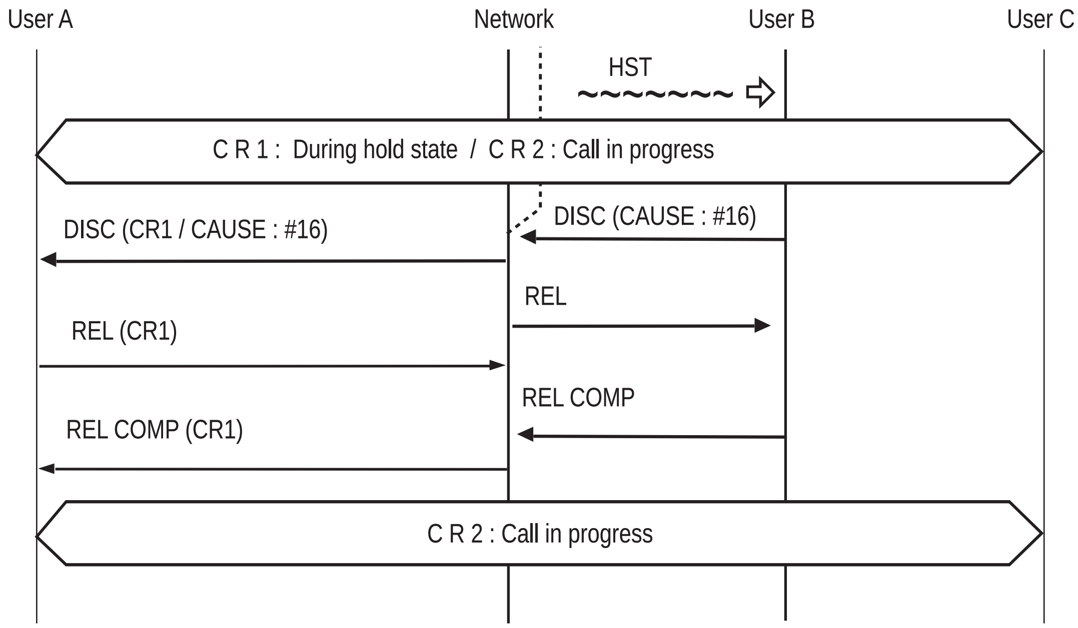


Fig. 4.3.7.6-4 : Call disconnection sequence for the call during hold state

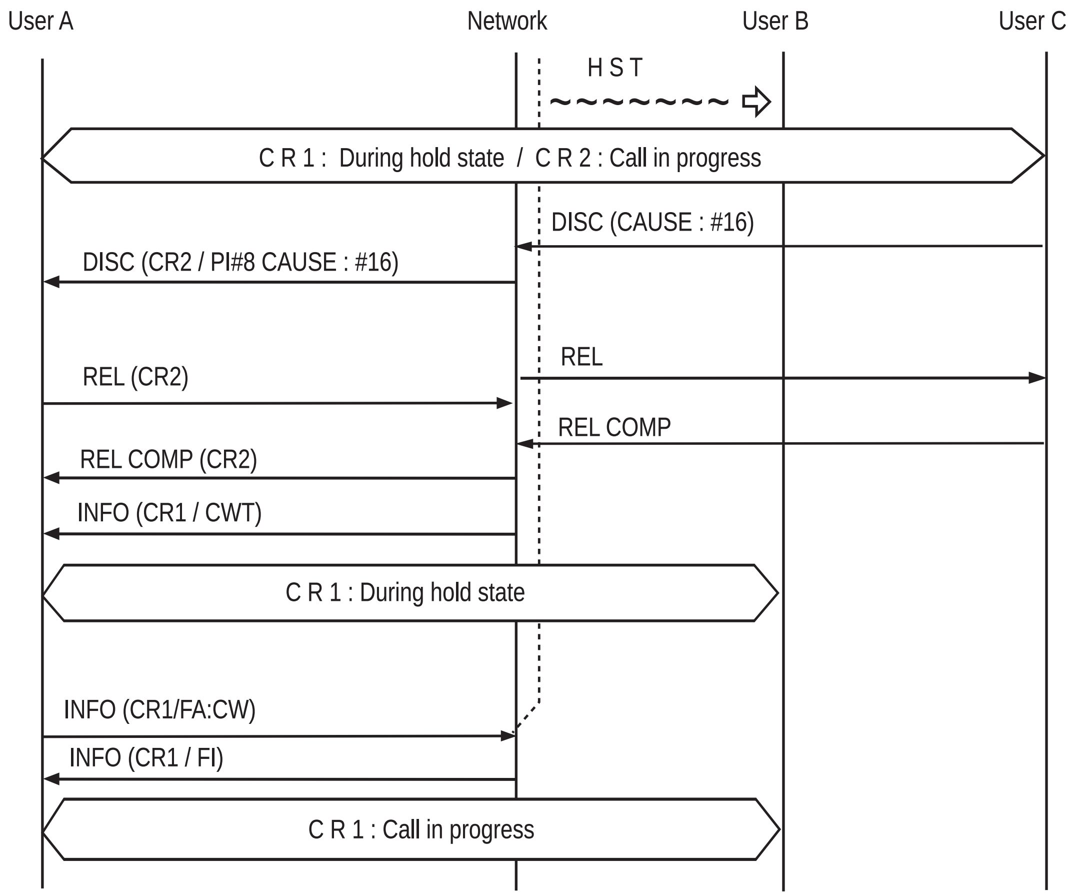


Fig. 4.3.7.6-5 : Call disconnection sequence for the call in progress

4.3.7.6.1.2 CLIP/CLIR (Calling line identification presentation/restriction)

(1) Definition

The calling line identification presentation service reports the calling user's number to the called user.

The calling user transmits the calling number and calling line identification enable/ disable indication to the network. It is indicated by dialing a special prefix before the Called party number or by the presentation indicator of the Calling party number information element.

(2) Sequence

The sequence for the CLIP/CLIR function utilizing the presentation indicator for the Calling party number information element is shown in Fig. 4.3.7.6.6 below.

Note : The service provision conditions when the prefix and the presentation indicator for the Calling party number information element are not matched up are operator optional.

Fig. 4.3.7.6-6 : CLIP/CLIR sequence

4.3.7.6.1.3 AOC (Advice of charge)

(1) Definition

The advice of charge service is used to inform the user paying for a call of the Charging information at the end of the call.

(2) Sequence

The AOC sequences are shown in Fig. 4.3.7.6-7 and 4.3.7.6-8 below.

(A) When a call is disconnected from user

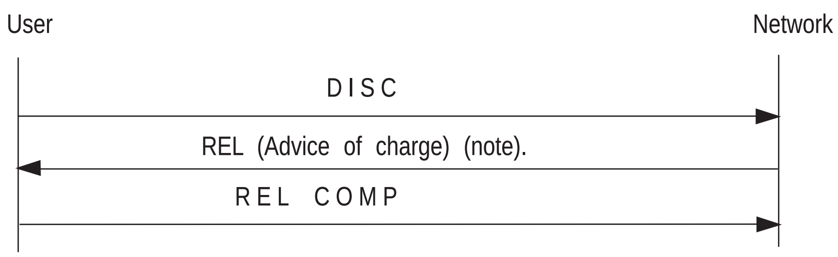


Fig. 4.3.7.6-7 : Disconnection sequence with AOC from the user

(B) When a call is disconnected from the network:

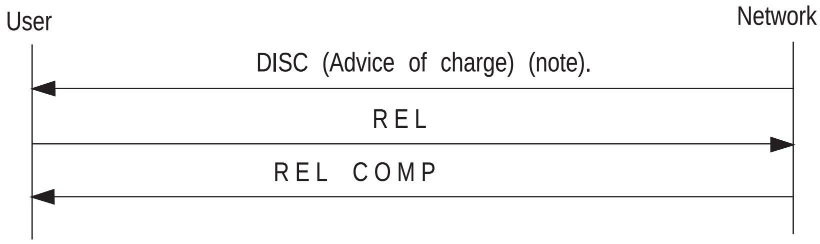


Fig. 4.3.7.6-8 : Disconnection sequence with AOC from the network

Note: Charging information is transmitted by the national defined protocol with the codeset 5 locking shift procedure.

4.3.7.6.1.4 CT (Call transfer)

(1) Definition : The call transfer function enables a user to transfer an active call to a third party.
(2) Sequence : The call transfer sequence is shown in Fig. 4.3.7.6-9 below.

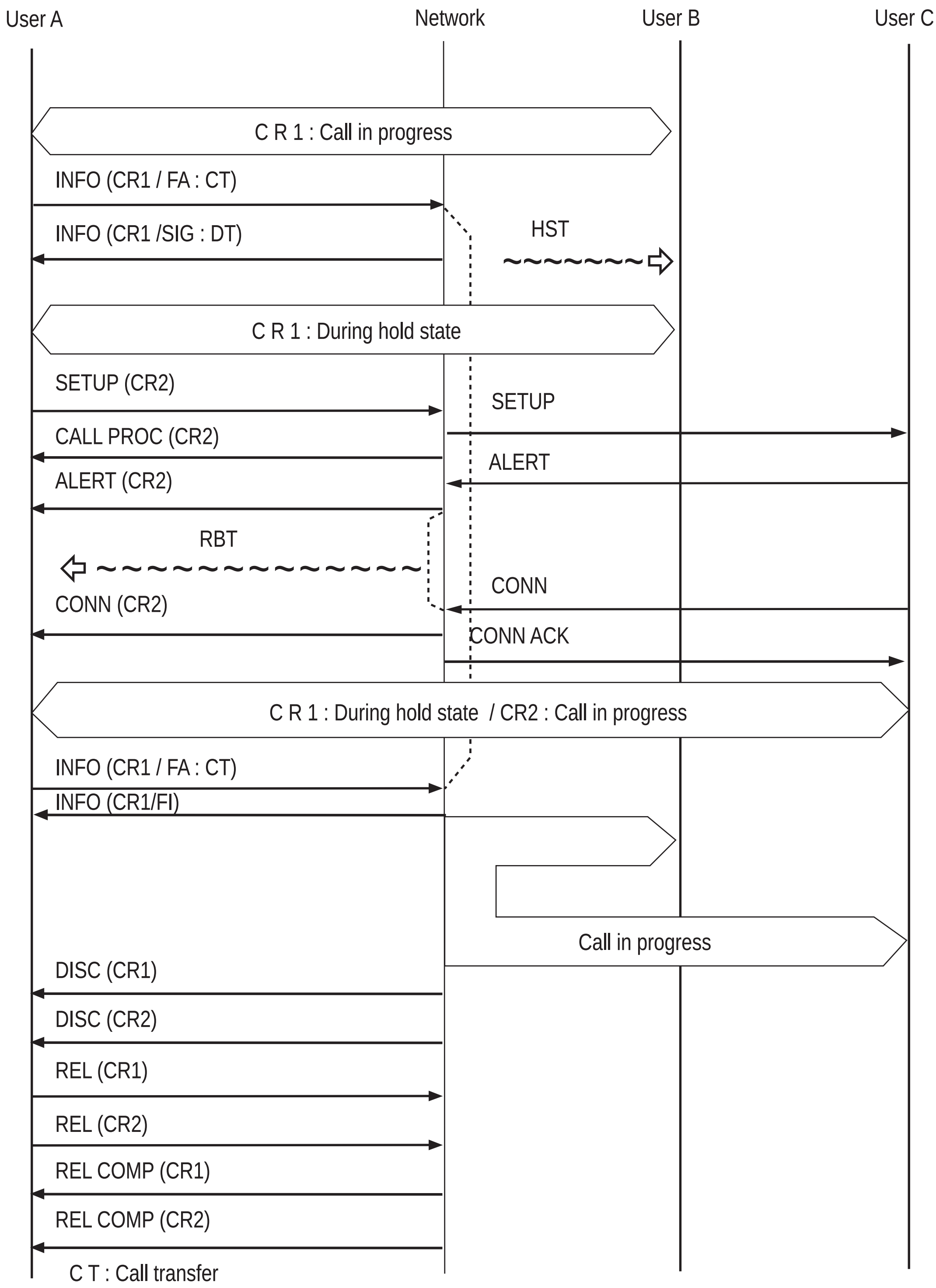


Fig. 4.3.7.6-9 : Call transfer sequence

4.3.7.6.1.5 User selective call forwarding and answering phone

(1) User selective call forwarding

The user selective call forwarding function allows the user to have the network send an incoming call to a registered number by the user's selection. The sequence for this function is shown in Fig. 4.3.7.6-10 below.

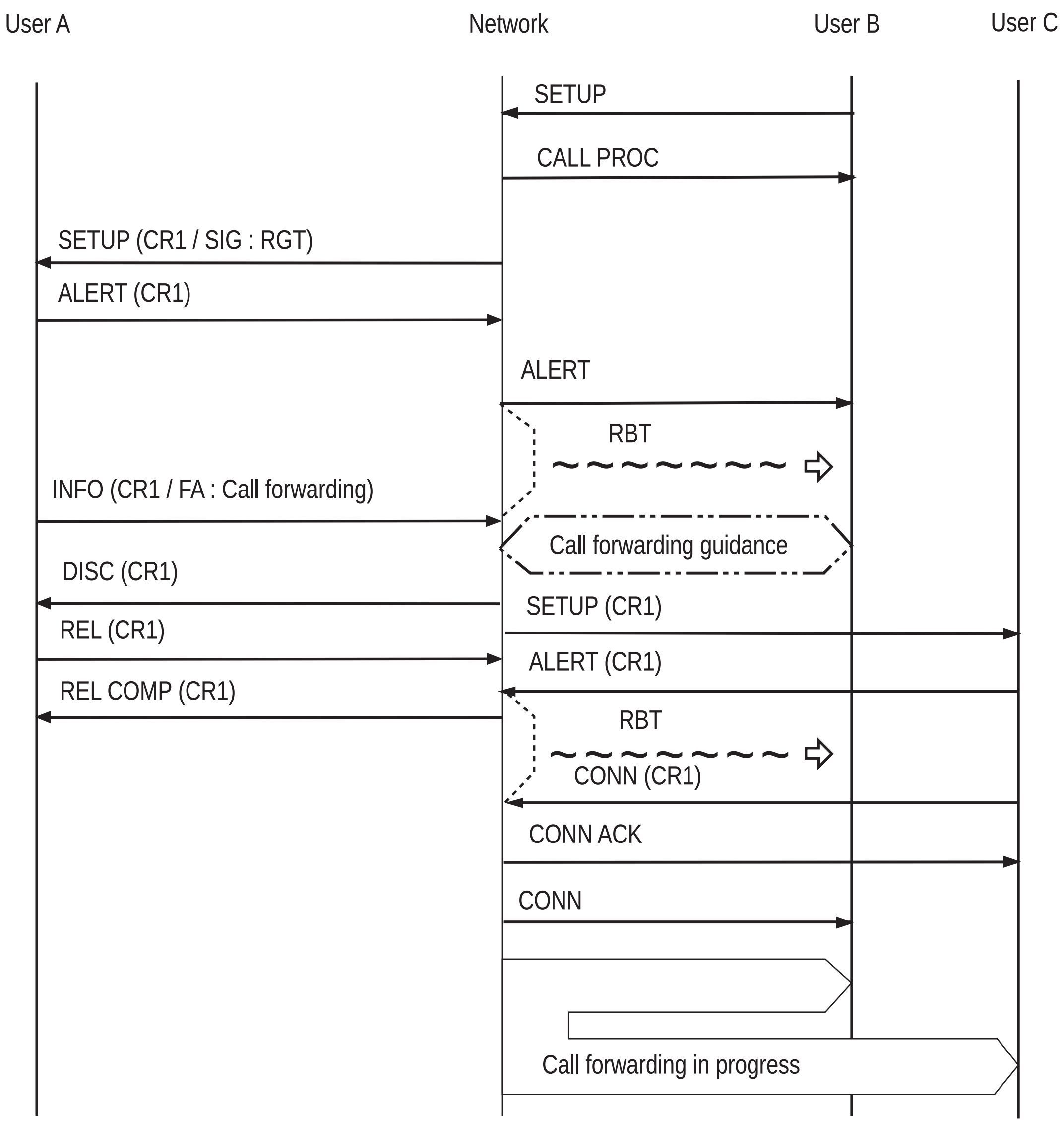


Fig. 4.3.7.6-10 : User selective call forwarding sequence

(2) User selective answering phone

The user selective answering phone function allows the user to have the network send an incoming call to the voice storage equipment by the user's selection.

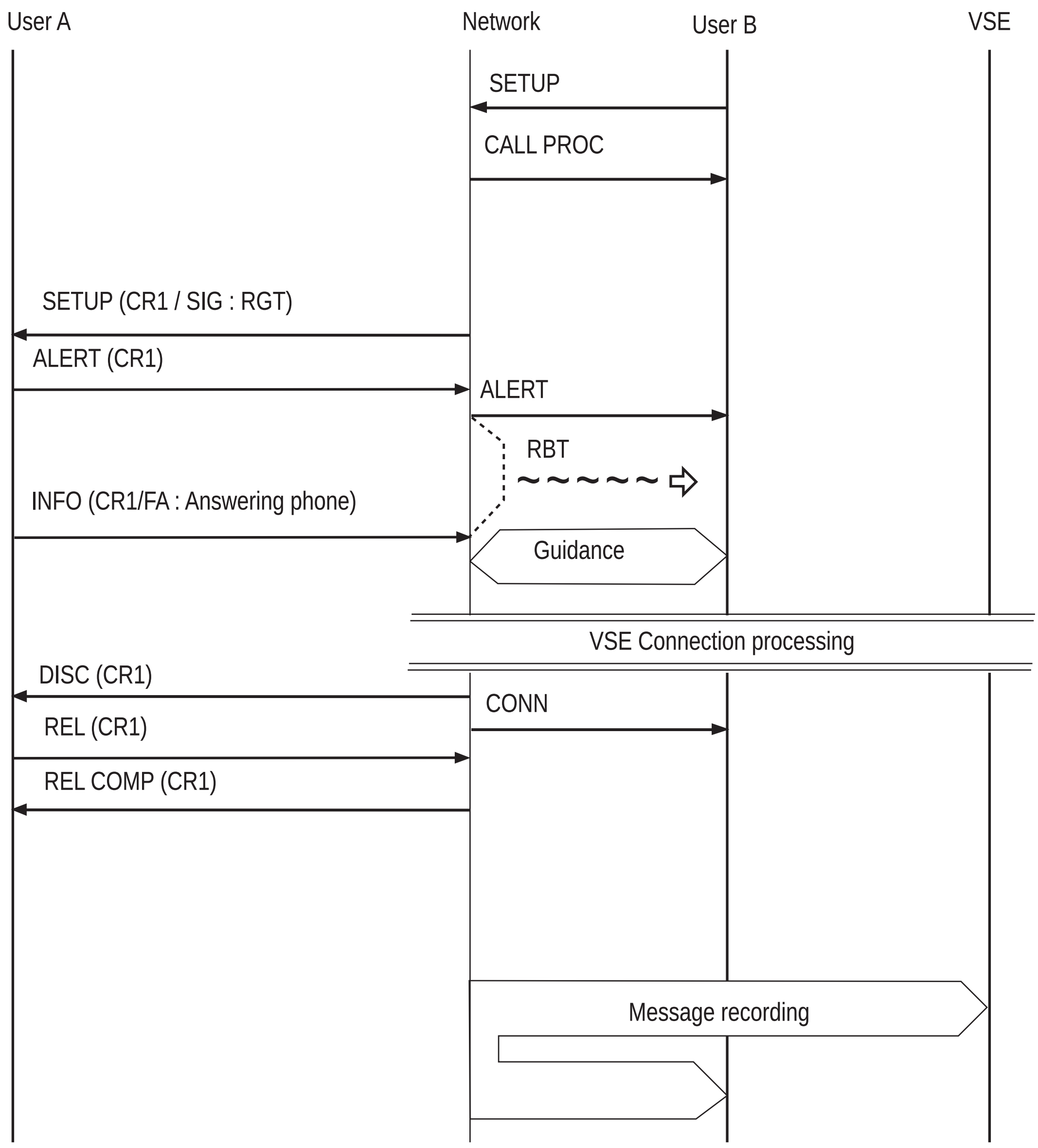


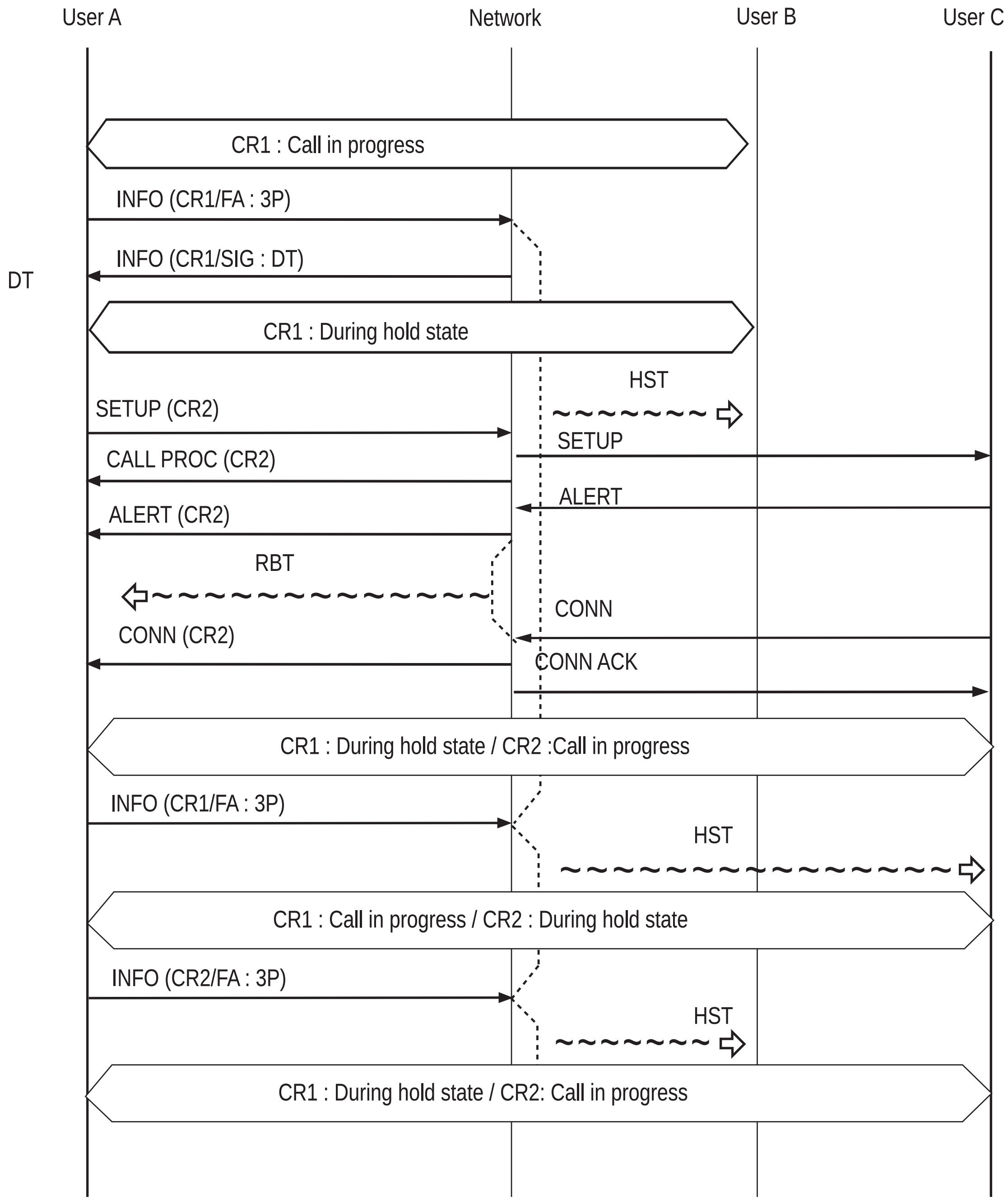
Fig. 4.3.7.6-11 : User selective answer phone sequence

4.3.7.6.1.6 Three-party service (switching mode)

(1) Definition : The three-party service function allows the user to hold an existing call and originate an additional call to a third party during call in progress .

(2) Sequence : The three-party service (switching mode) initiation sequence is shown in Fig. 4.3.7.6-12 below.

User A: User who initiates the three-party service function.
User B: User who was talking with user A.
User C: User who is called by user A.



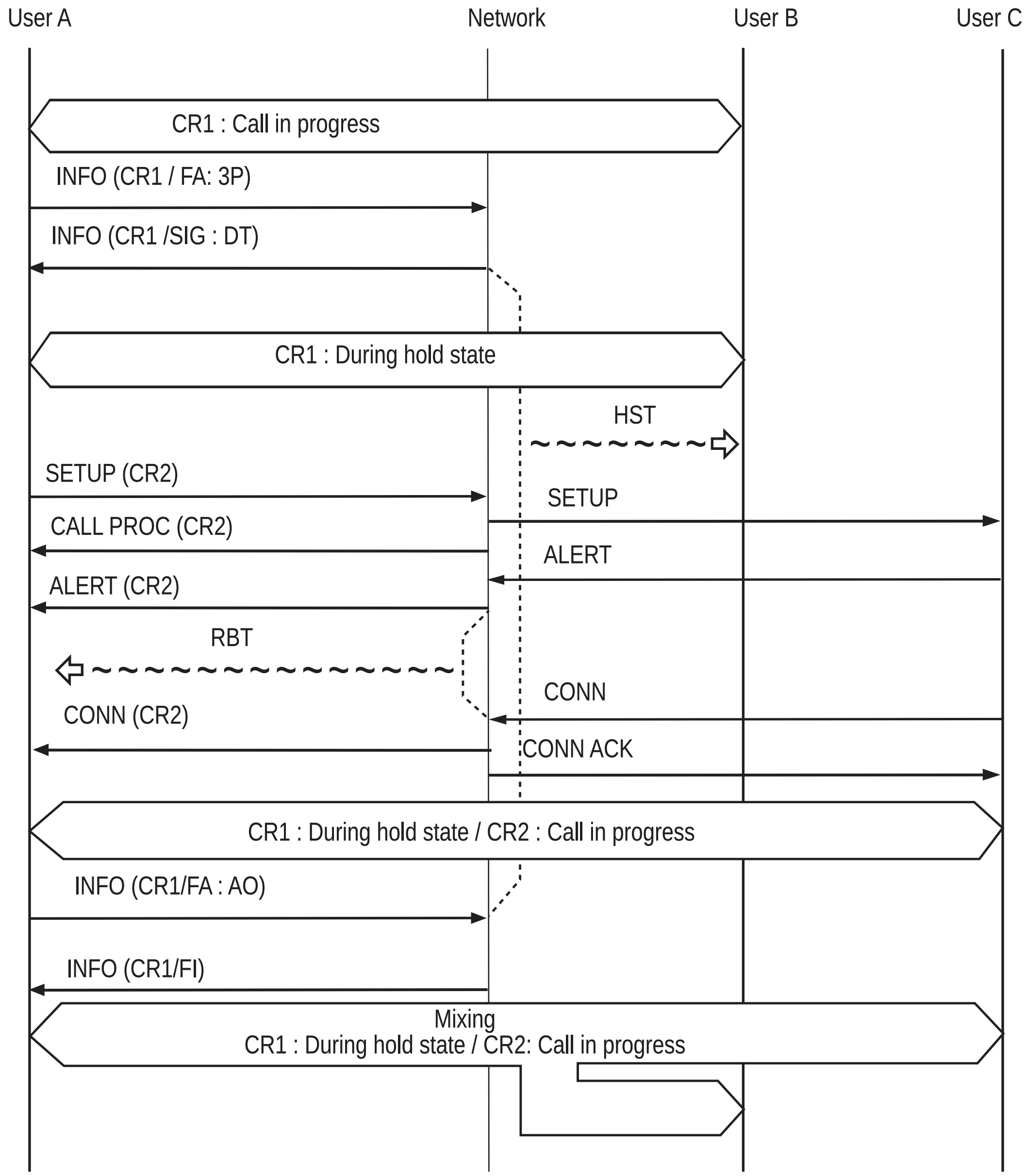
3P : Three-party service (switching mode)

Fig. 4.3.7.6-12 : Three-party service (switching mode) sequence

4.3.7.6.1.7 Three-party service (mixing mode)

(1) Definition : The three-party service function allows the user to hold an existing call and originate an additional call to a third party during call in progress. A three-way conversation among the users A, B, and C is enabled in the mixing mode.

(2) Sequence : The three-party service (mixing mode) initiation sequence is shown in Fig. 4.3.7.6-13 below.



AO : Three-party service (mixing mode)

Fig. 4.3.7.6-13 : Three-party service (mixing mode) sequence

4.3.7.6.1.8 Answer holding

(1) Definition

The answer holding service holds a incoming call and notifies it to the calling user when the called user cannot answer the incoming call immediately.

(2) Sequence

The sequence for the answer holding function is shown in Fig. 4.3.7.6-14 below.

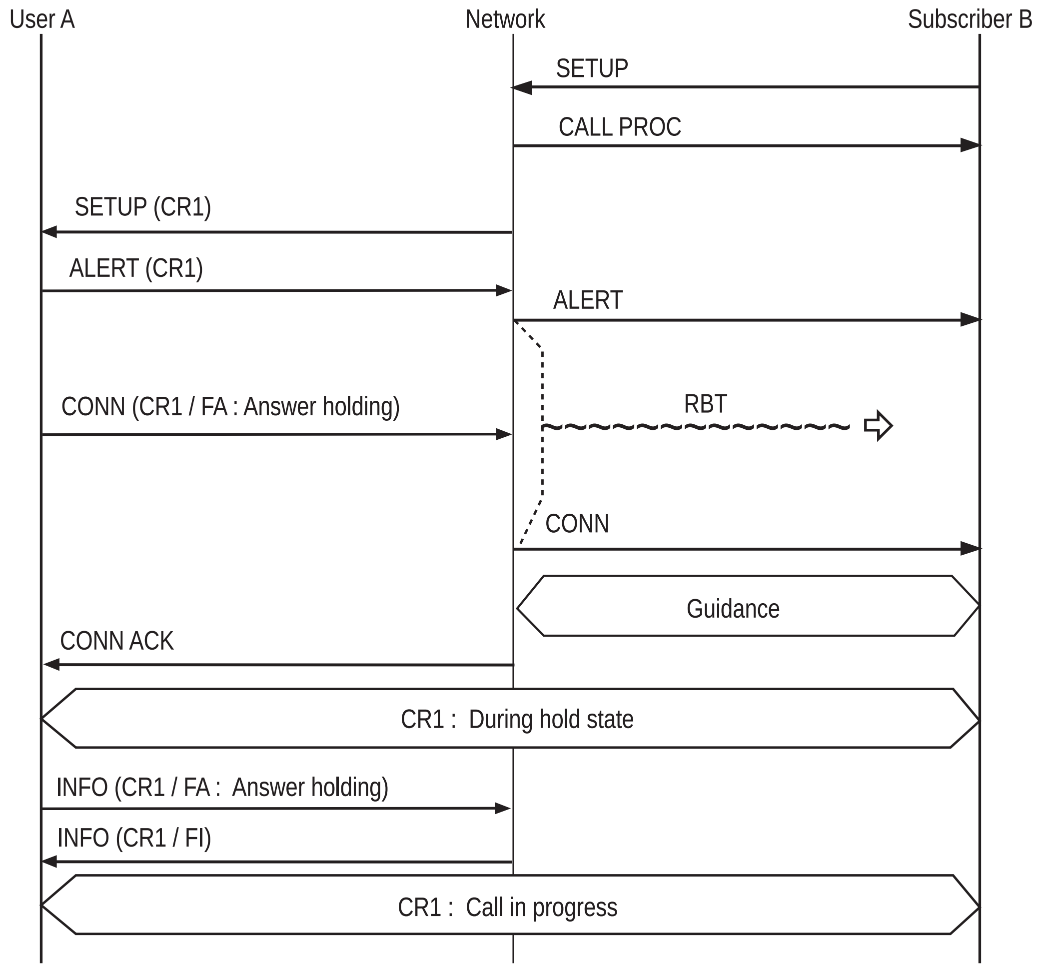


Fig. 4.3.7.6-14 : Answer holding sequence

4.3.7.6.1.9 Non-voice communication switching

(1) The non-voice communication switching function provides non-voice communication service such as FAX, MNP modem by a request from the user during voice communication.

(2) Sequence

The non-voice switching sequences are shown in Fig. 4.3.7.6-15 and 16 below.

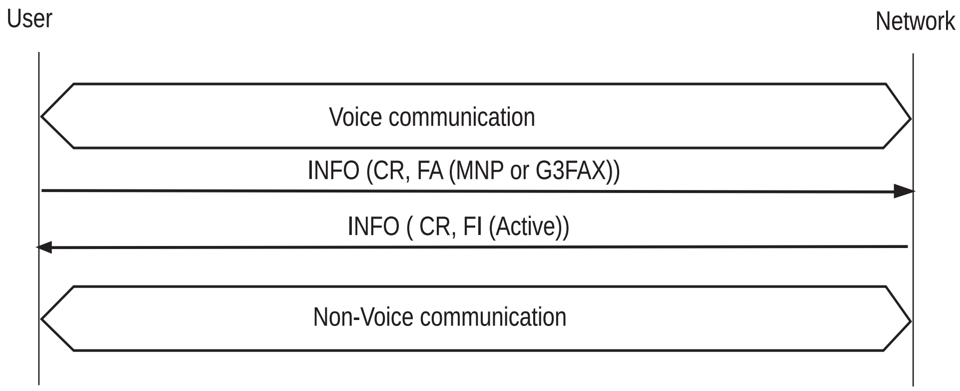


Fig. 4.3.7.6-15 : Voice to non-voice switching sequence

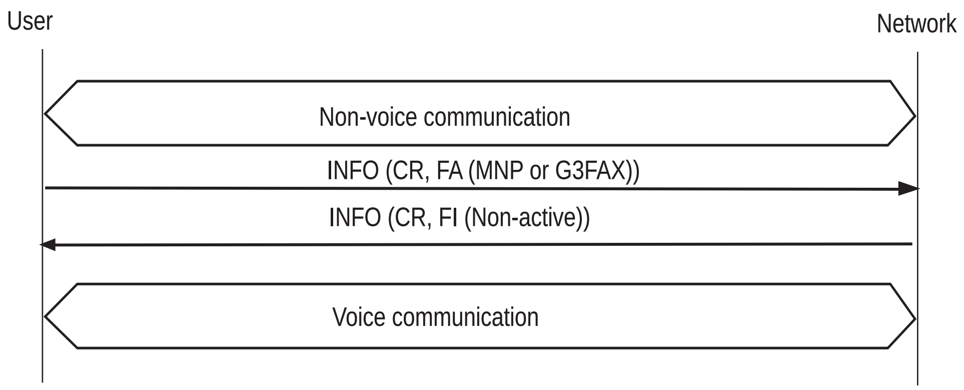


Fig. 4.3.7.6-16 : Non-voice to voice switching sequence

4.3.7.6.1.10 PB signal transmission

(1) Definition

The PB signal transmission service is used to transfer the PB signal from the mobile station.

The PB number for the PB button pressed by the user is sent to the network in a CC message and the network generates the PB signal.

(2) Sequence

The PB signal transmission sequence is shown in Fig. 4.3.7.6-17 below.

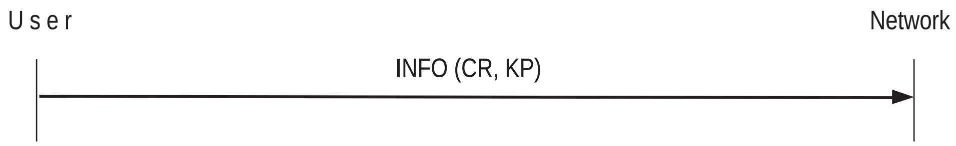


Fig. 4.3.7.6-17 : PB signal transmission sequence

*One PB signal is sent one digit or more by the INFO signal

4.3.7.6.1.11 User-user information transfer

(1) Definition

The user-user information transfer service allows the user to transmit and receive a limited amount of information over the signaling channel related to the call which is in progress with the other user.

(2) Sequence

The sequence for the user-user information transfer supplementary service is shown in Figs. 4.3.7.6-18 to 4.3.7.6-22.

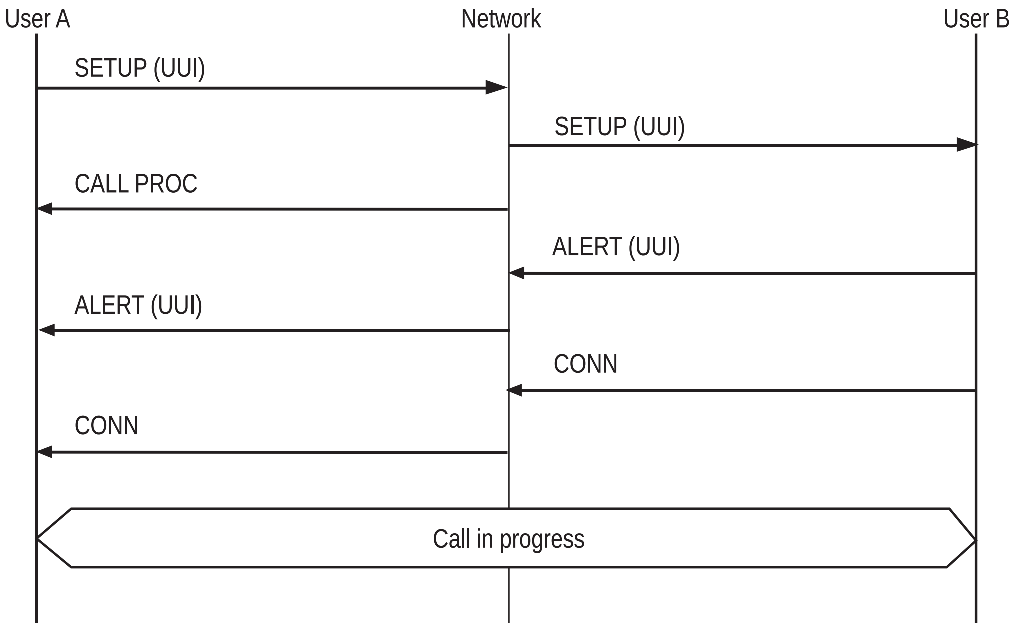


Fig. 4.3.7.6-18 : User-user information transfer (service 1 : implicit initiation procedure)

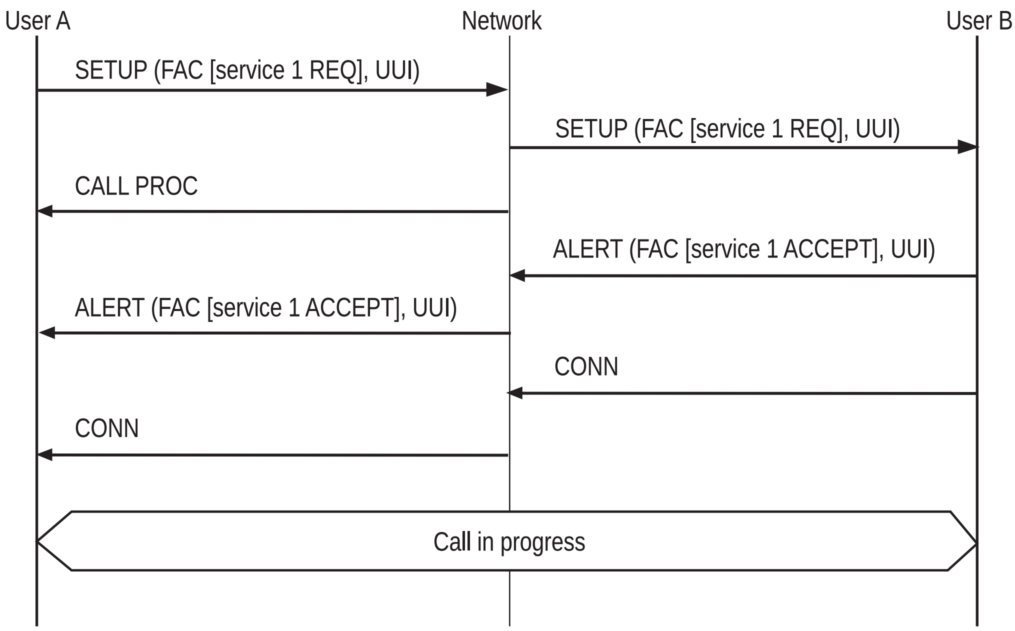


Fig. 4.3.7.6-19 : User-user information transfer (service 1 : explicit initiation procedure)

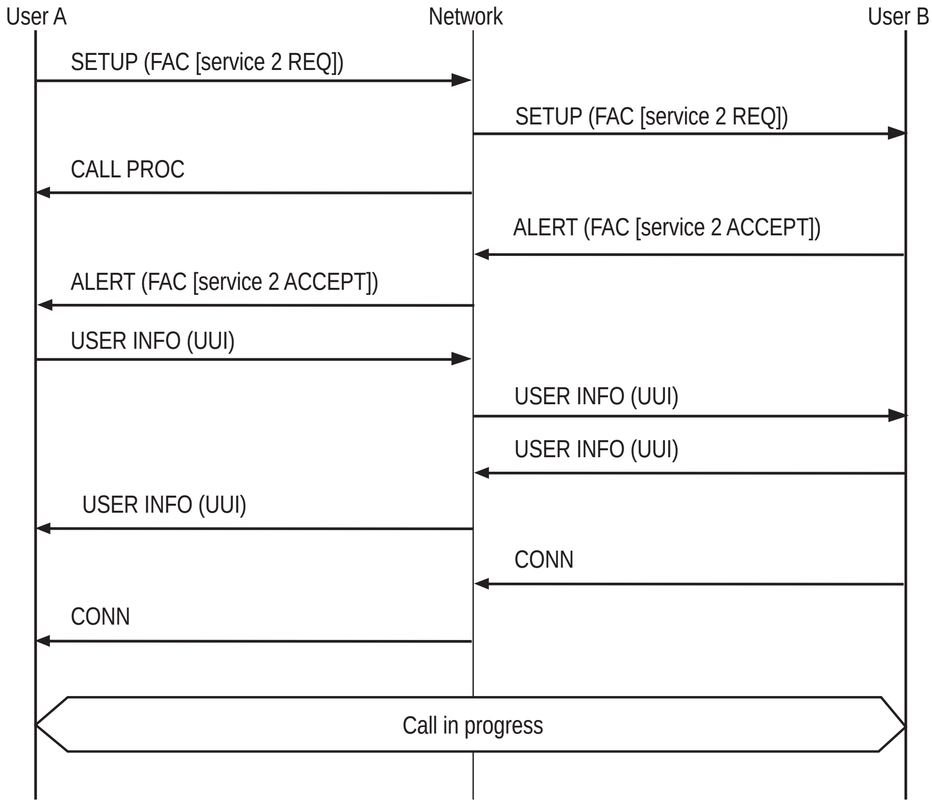


Fig. 4.3.7.6-20 : User-user information transfer (service 2)

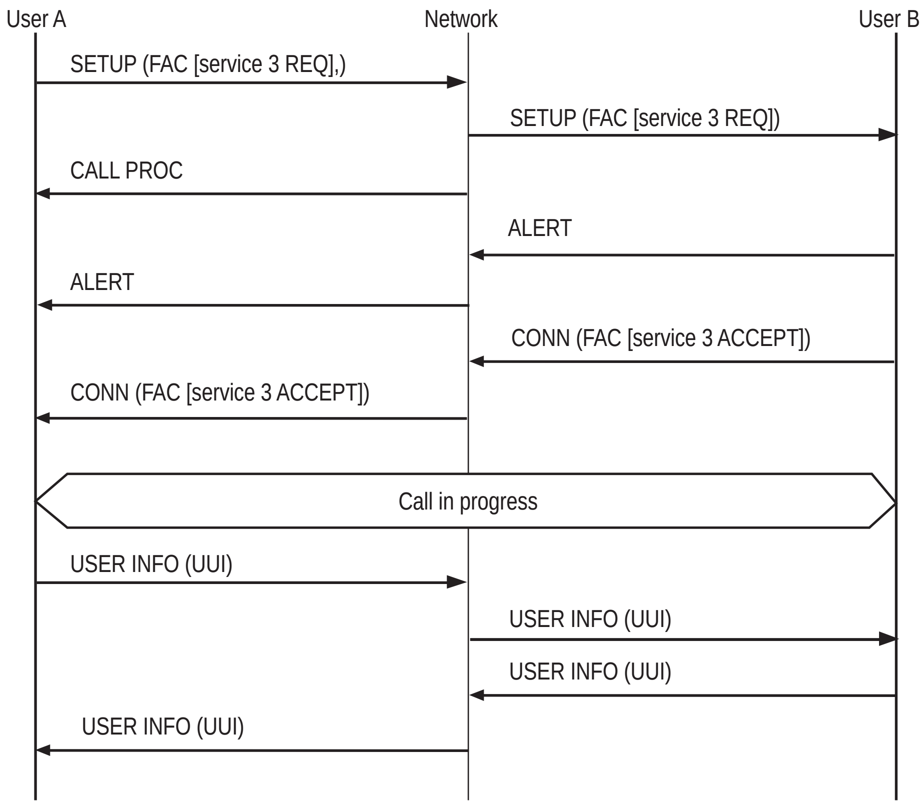


Fig. 4.3.7.6-21 : User-user information transfer (service 3 : Call establishment phase initiation procedure)

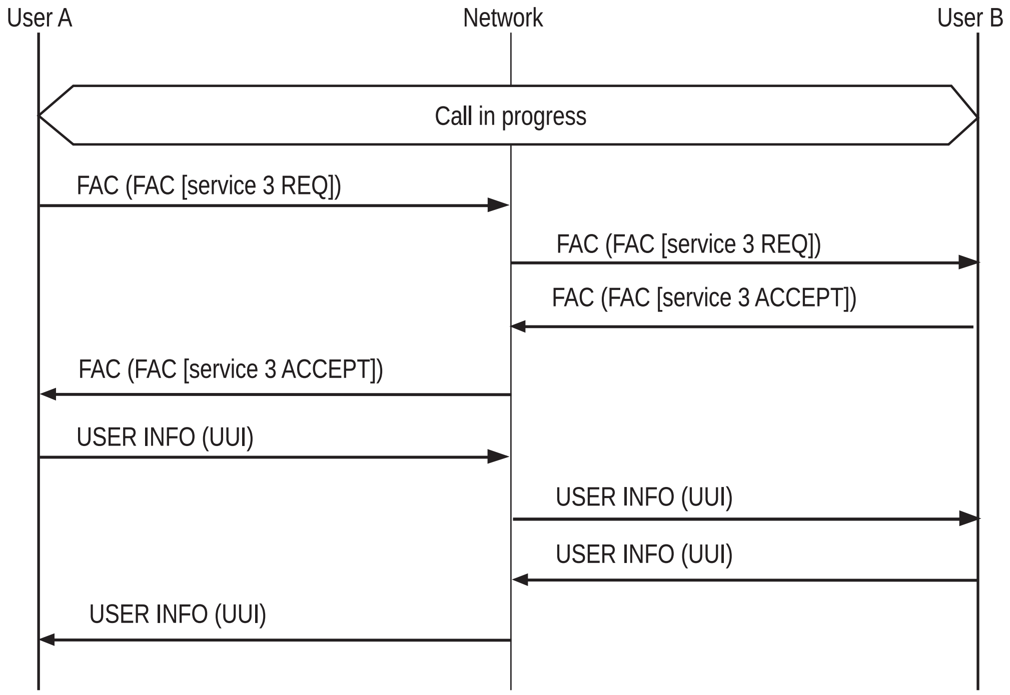


Fig. 4.3.7.6-22 : User-user information transfer (service 3 : Call in progress phase initiation procedure)

4.3.7.6.1.12 High-speed data communication switching

(1) Definition

High-speed data communication switching function provides high-speed data communication according to a request from mobile stations at call origination and during call in progress.

(2) Sequence

Sequences of high-speed data communication switching are shown in Fig. 4.3.7.6-23 to 4.3.7.6-26.

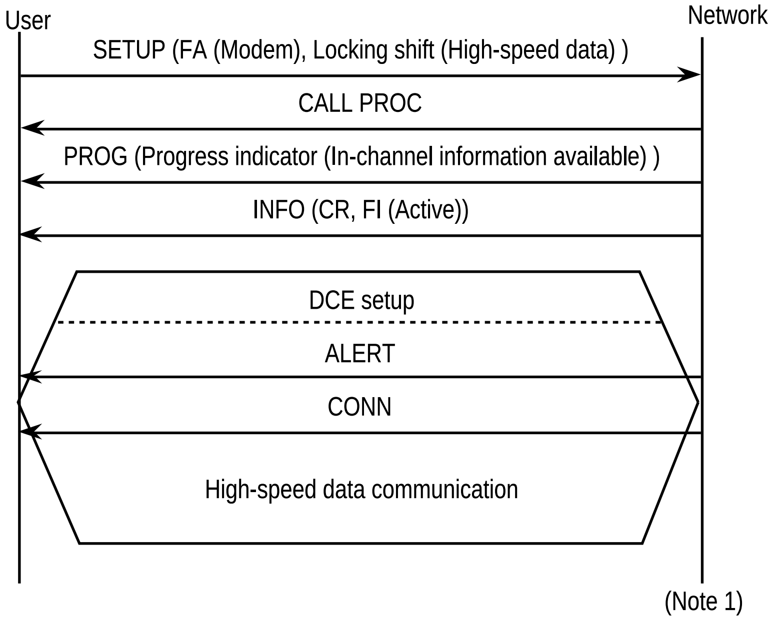


Fig. 4.3.7.6-23 : High-speed data communication switching
(Call origination: DCE setup has priority)

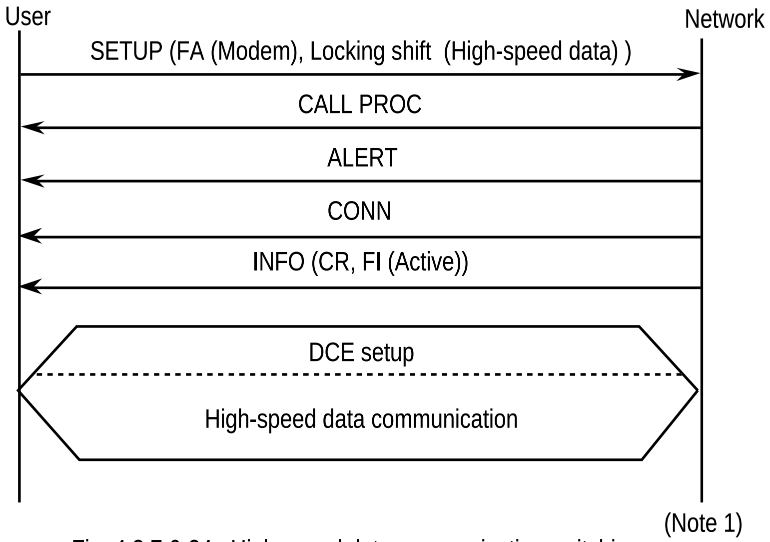


Fig. 4.3.7.6-24 : High-speed data communication switching
(Call origination : Network termination has priority)

Note 1 : Selection of the procedure depends on the network.

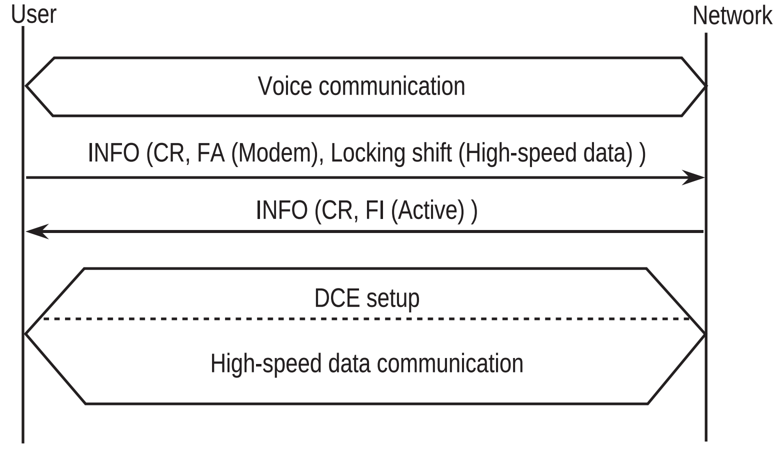


Fig. 4.3.7.6-25 : High-speed data communication switching
(Call in progress : Voice→High-speed data switching procedure)

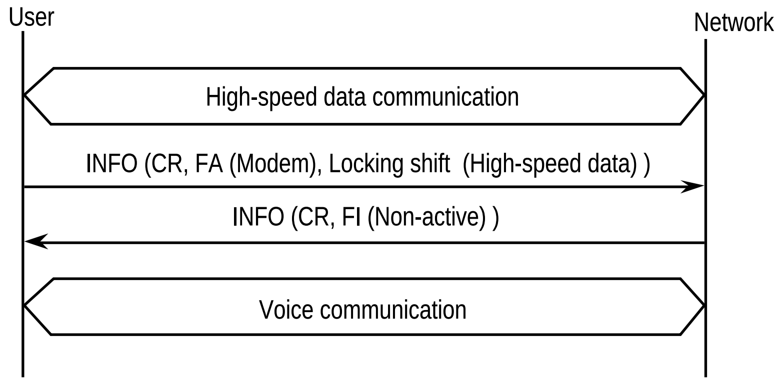


Fig. 4.3.7.6-26 : High-speed data communication switching
(Call in progress : High-speed data" Voice switching procedure)

4.3.7.7 Segment Disassembly and Assembly in Packet Communication

4.3.7.7.1 Segment Disassembly

A user packet to be transmitted can be divided into segments, if necessary. The length of one segment including common platform indication field and CC header shall not exceed the maximum layer 2 information length (N201).

If Communication initial state is set for the Communication state information element in the packet communication Registration Response message, the user packet number shall be set to the default value 0, subsegmently the user packet number shall be set to 1, ..., 255, 0, 1, ... in the transmission order of user packets.

The segment number shall be set to 0, 1, ..., N in the order of the first to the least segment into which the user packet is divided.

4.3.7.7.2 Segment Assembly

The segments with the same user packet number shall be combined in order to reproduce a user packet.

If a segment with the same segment number as the one already received is received again while the reception of segments with the same packet number is not completed, or a segment with the same packet number and the same segment number as the one already received within the range of out standing number, then the latter segment shall be discarded.

If the user packet number of the segment number of the received segment is discontinuous, that is, if a segment with an unexpected user packet number or segment number except for the doubled reception case mentioned above is received, then the user packet, which is not completed when the discontinuity is detected, shall be discarded. In this case, if the received segment number is 0, then the user packet with the same user packet number as the received segment shall be received continuously, and if it is not 0, then the received segment shall be discarded till a segment with the segment number 0 is received.

4.3.8 Control sequence

4.3.8.1 Origination

The control sequence for originating a call is shown in Fig. 4.3.8.1-1. The control sequence for origination which includes authentication for the caller who is other than the owner of the MS is shown in Fig. 4.3.8.1-2.

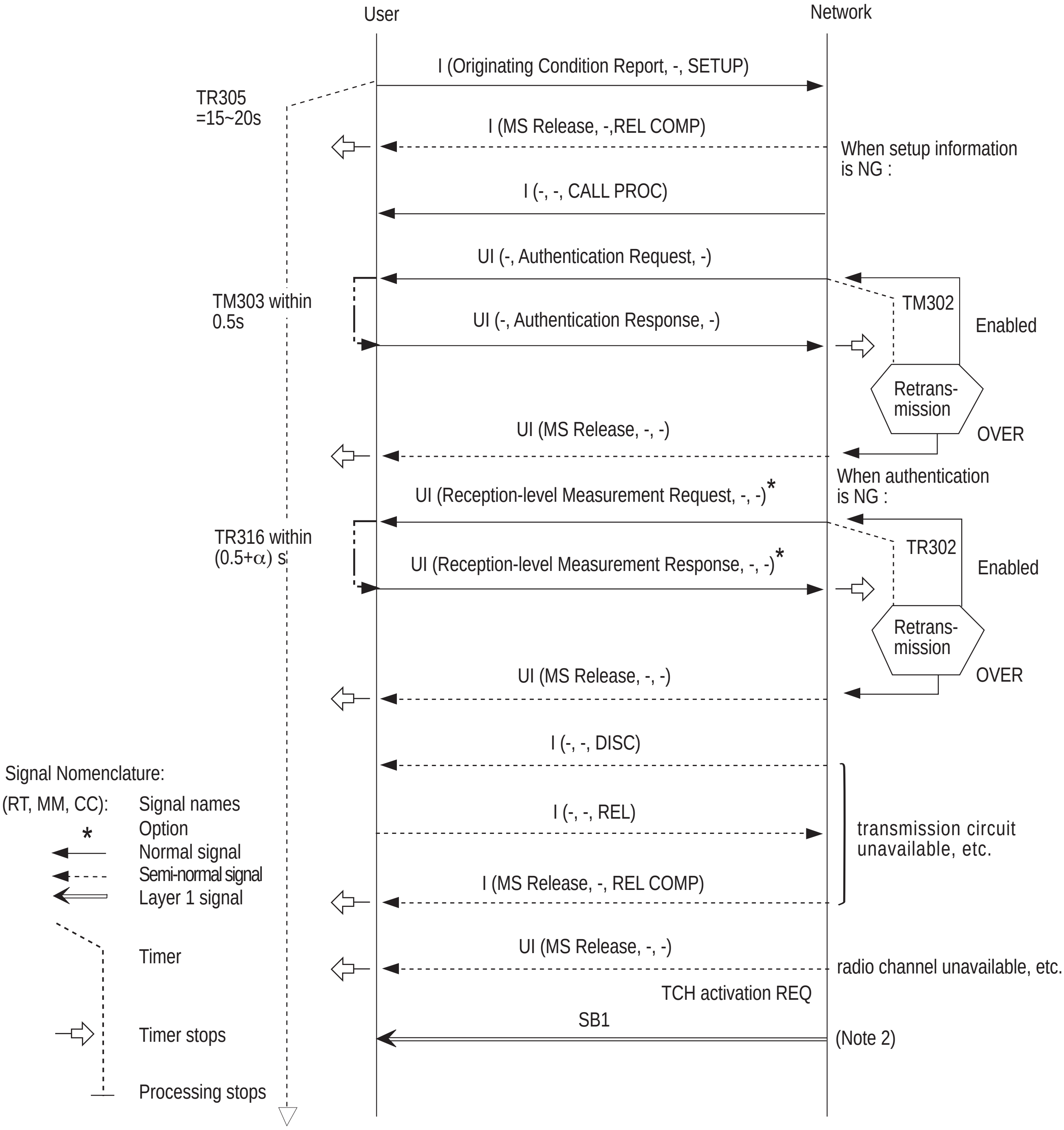


Fig. 4.3.8.1-1 : Originating control sequence (1 / 2)

Note 1 : The timers for the CC signal are omitted. (The procedure for the CC signal must be in accordance with I.451.)

Note 2 : The sync burst is transmitted continuously until the response signal reception or the timer expiry. (See the SDL diagram.)

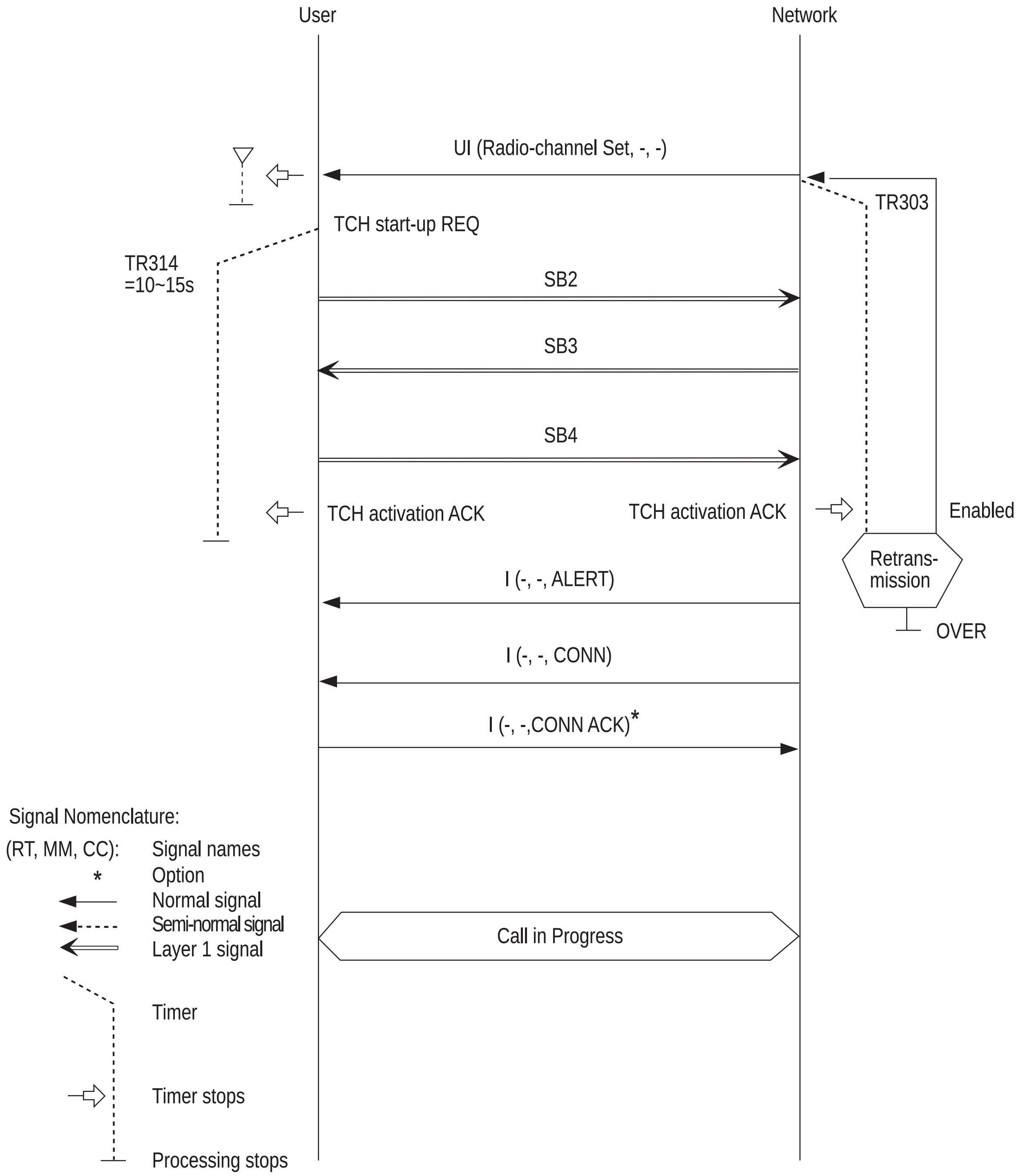


Fig. 4.3.8.1-1 : Originating control sequence (2 / 2)

Note : The timers for the CC signal are omitted. (The procedure for the CC signal must accord with I.451.)

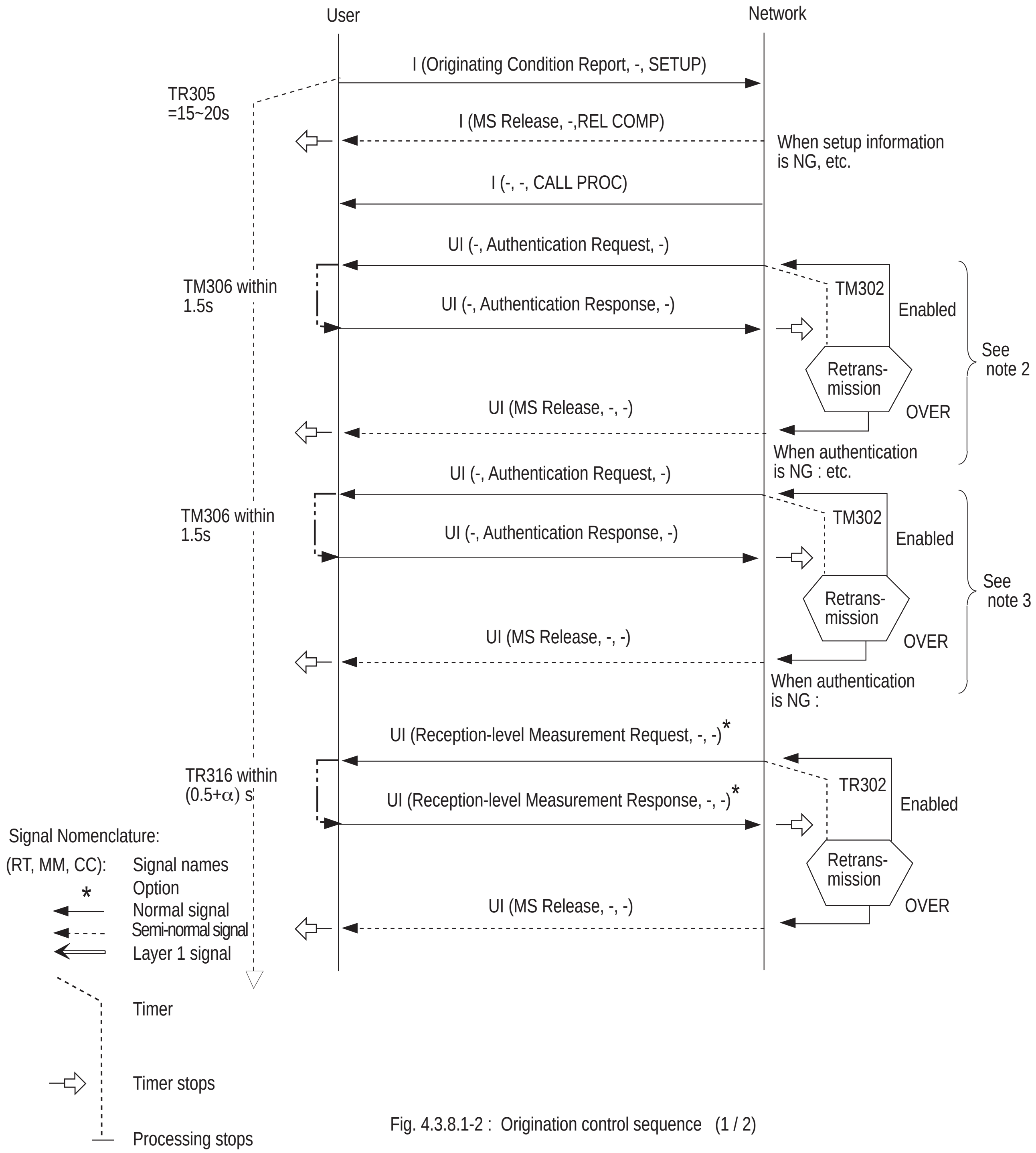


Fig. 4.3.8.1-2 : Origination control sequence (1 / 2)

Note 1 : The timer for the CC signal is omitted.(The procedure for the CC signal must accord with I.451.)
Note 2 : The authentication procedure specified in version B is performed.
Note 3 : The authentication procedure performed for the caller who is not the owner of the MS.

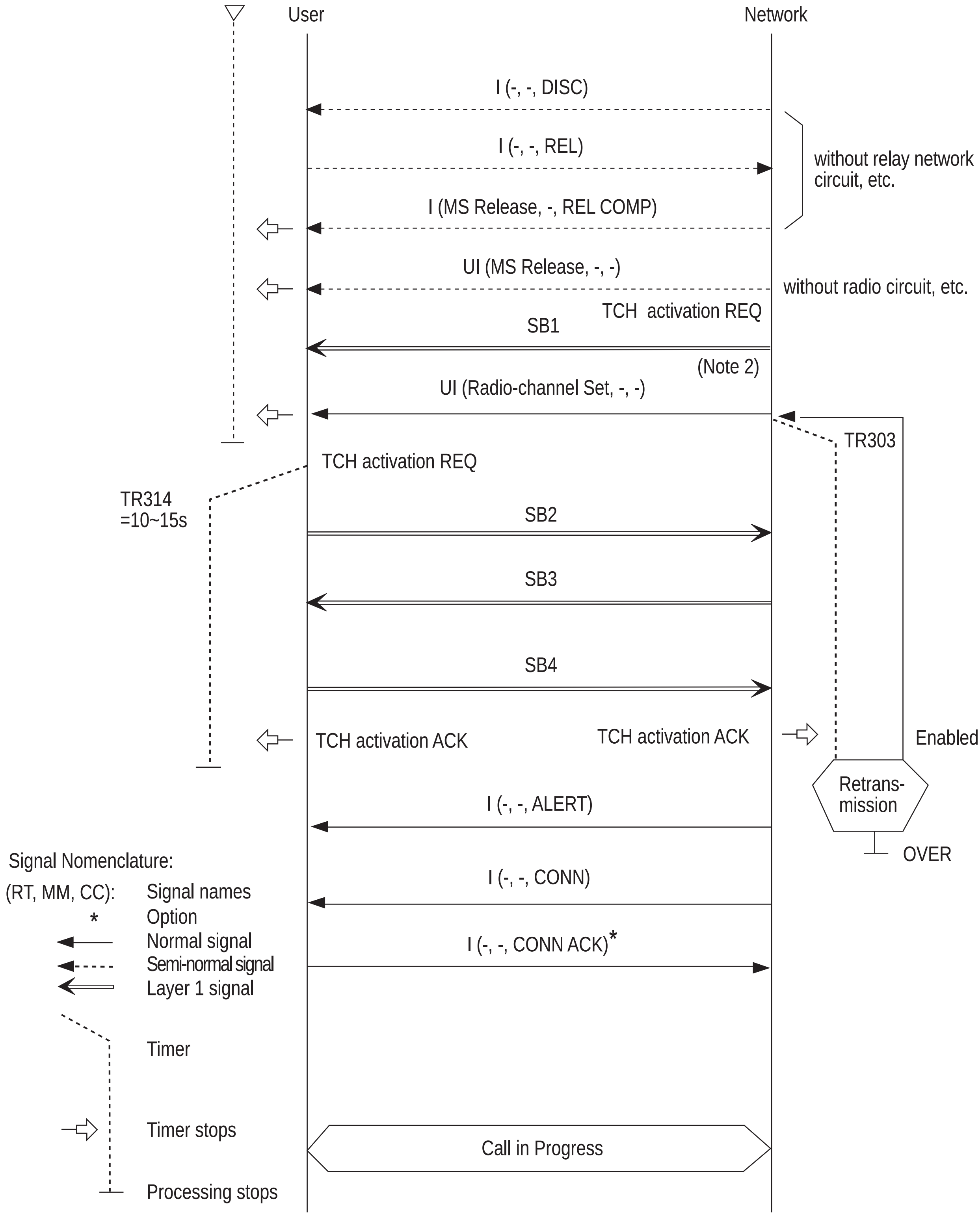


Fig. 4.3.8.1-2 : Origination control sequence (2 / 2)

Note1: The timer for the CC signal is omitted. (The procedure for the CC signal must accord with I.451.)

Note2: The sync burst is transmitted continuously until the response signal reception or the timer expiry. (See the SDL diagram.)

4.3.8.2 Termination

The control sequence for terminating call is shown in Fig. 4.3.8.2-1. The control sequence for termination which includes authentication for the termination registrated user is shown in Fig. 4.3.8.2-2.

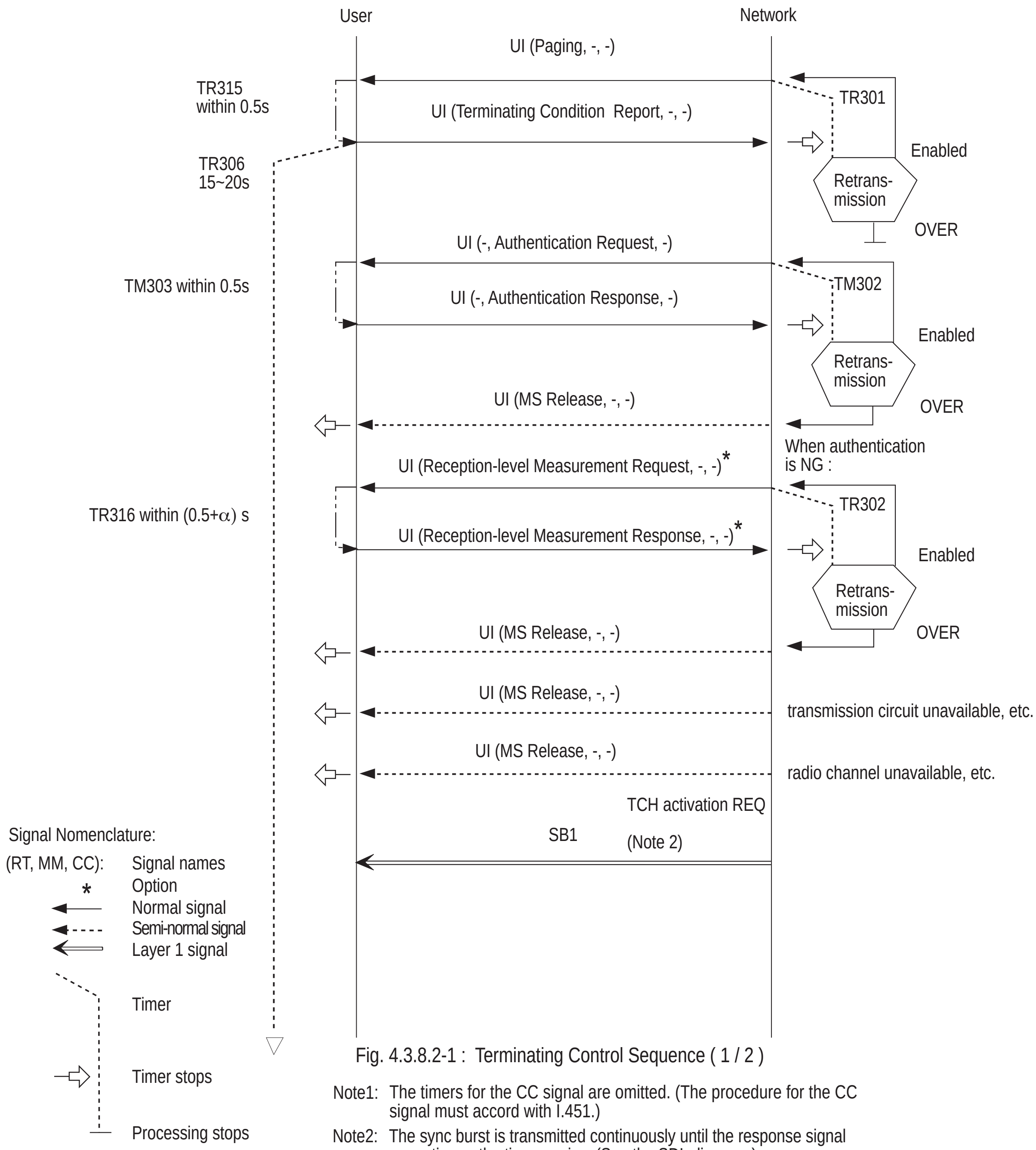


Fig. 4.3.8.2-1 : Terminating Control Sequence (1 / 2)

Note1: The timers for the CC signal are omitted. (The procedure for the CC signal must accord with I.451.)

Note2: The sync burst is transmitted continuously until the response signal reception or the timer expiry. (See the SDL diagram.)

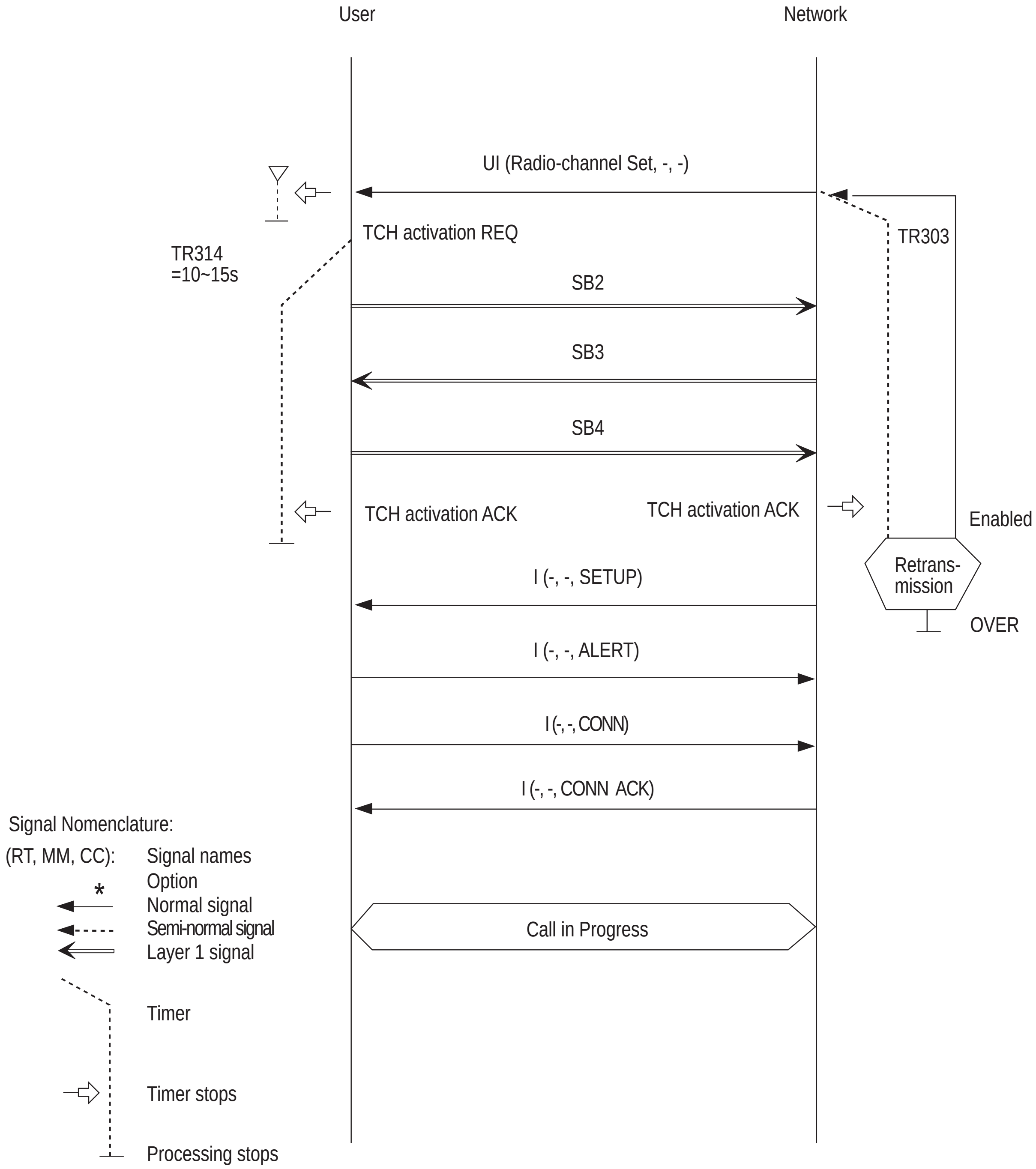


Fig. 4.3.8.2-1 : Terminating control sequence (2 / 2)

Note : The timers for the CC signal are omitted. (The procedure for the CC signal must accord with I.451.)

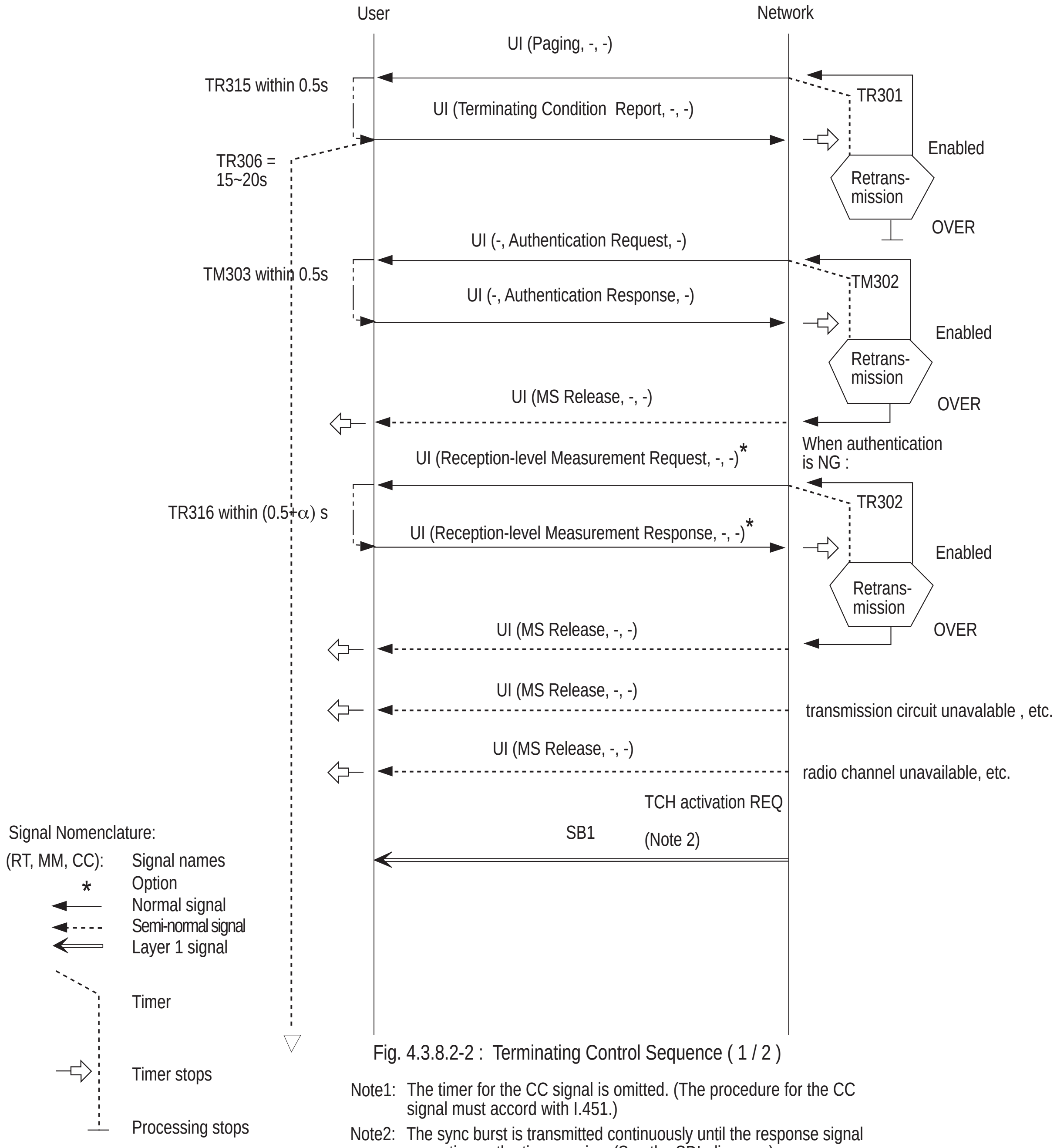


Fig. 4.3.8.2-2 : Terminating Control Sequence (1 / 2)

Note1: The timer for the CC signal is omitted. (The procedure for the CC signal must accord with I.451.)

Note2: The sync burst is transmitted continuously until the response signal reception or the timer expiry. (See the SDL diagram.)

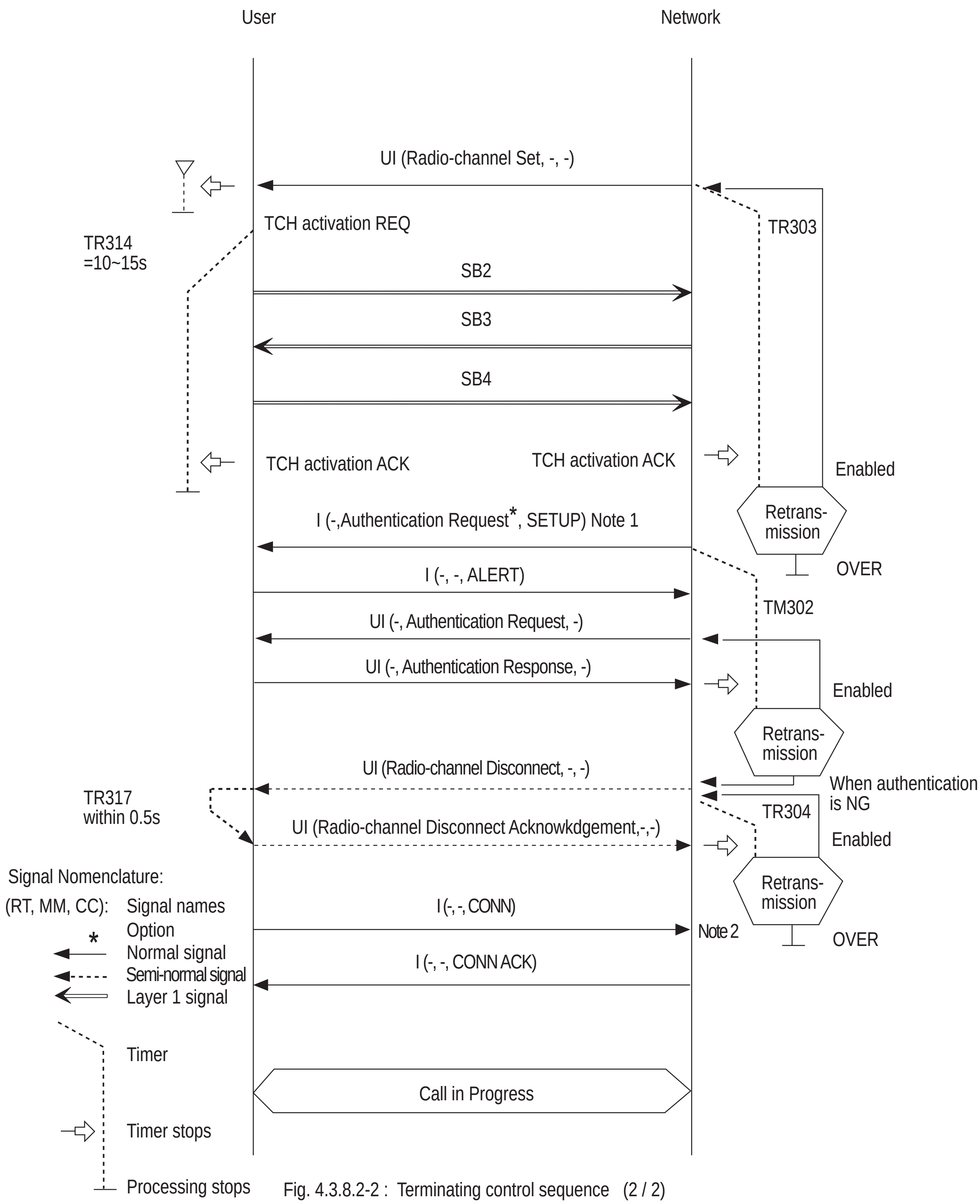


Fig. 4.3.8.2-2 : Terminating control sequence (2 / 2)

Note 1 : When authentication is performed for the in - call registered user, the authentication request and setup messages are sent in a common platform. In case termination to a user who performed termination registration, the called party number information element is mandatory in the SETUP message.

Note 2 : Timing for transmission of the Authentication Response message following the Authentication Request message sent from the user to network is not regulated.

4.3.8.3 Handover

The handover sequence is shown in Fig. 4.3.8.3-1 below.

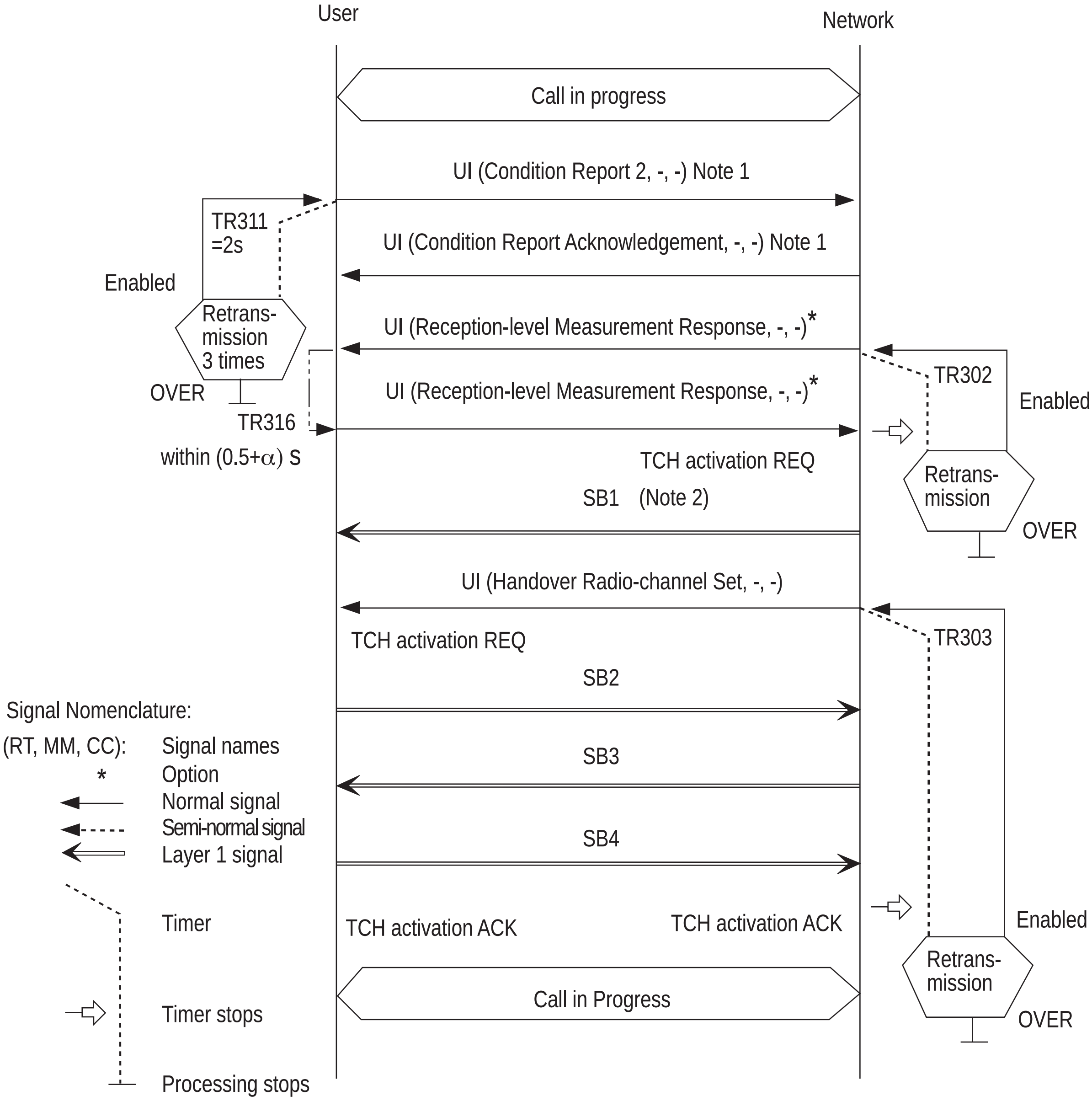


Fig. 4.3.8.3-1 : Handover sequence

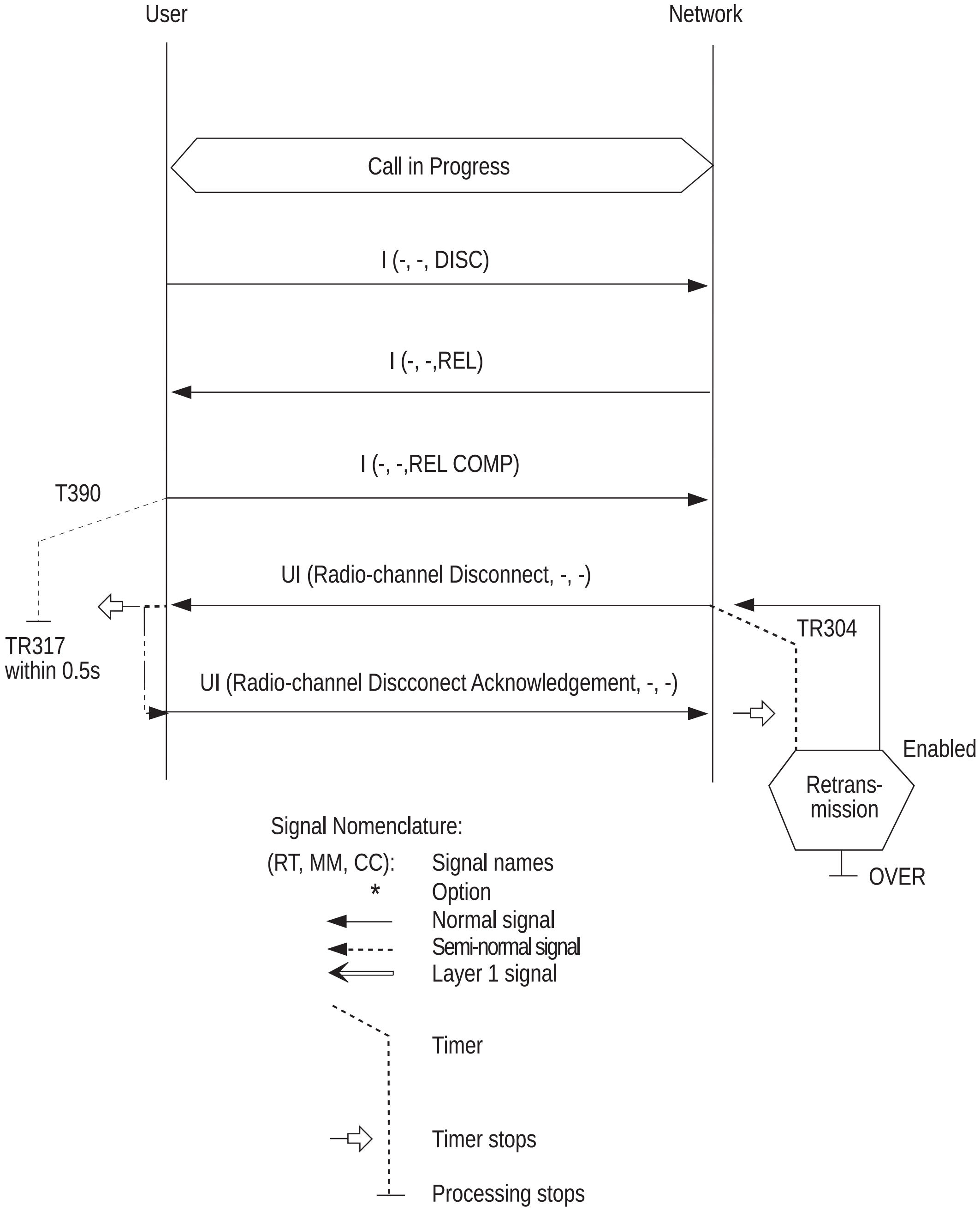
Note 1 : This figure shows a case that handover is activated with a help of the mobile station.
If the network activates handover for itself, these messages do not appear.

Note 2 : The sync burst is transmitted continuously until the response signal reception or the timer expiry. (See the SDL diagram.)

4.3.8.4 Disconnection

The disconnection sequences are shown in Fig. 4.3.8.4-1 to 4.3.8.4-3 below.

(1) Disconnection by the mobile station

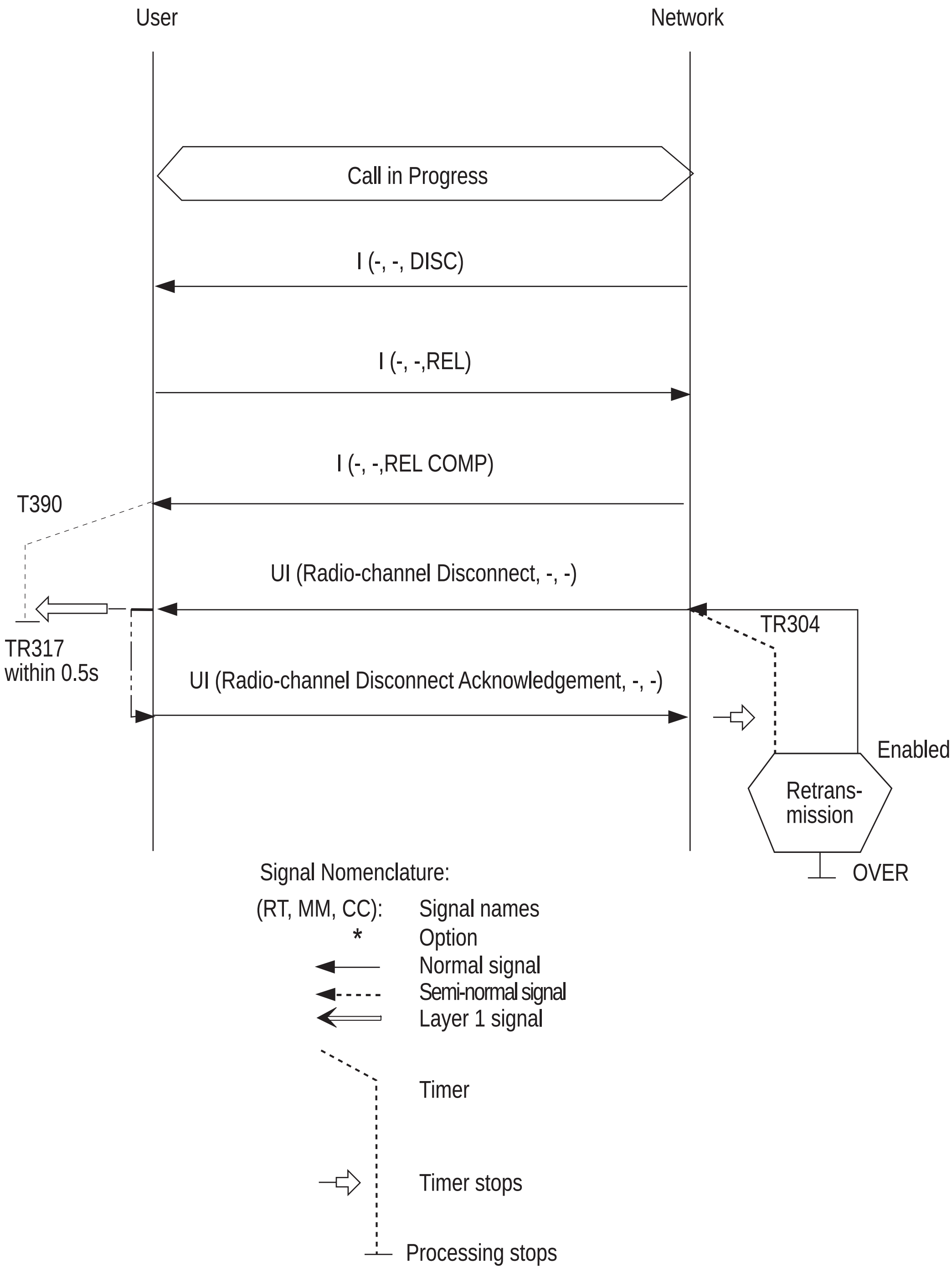


Note 1 : The timers for the CC are omitted except for T390.
(The procudure for the CC signal must be in accordance with I.451)

Note 2 : When the user operates the power ON/OFF switch while a call is in progress with a 300 mW or 800 mW MS, or when the battery for the MS drops, the MS must always execute the normal disconnection sequence before halting carrier transmission. Also with a 2W or 3W MS, when it is possible to prejudge whether carrier transmission is stopped, it is desirable to perform the normal disconnect sequence.

Fig. 4.3.8.4-1 : Disconnection sequence from the mobile station

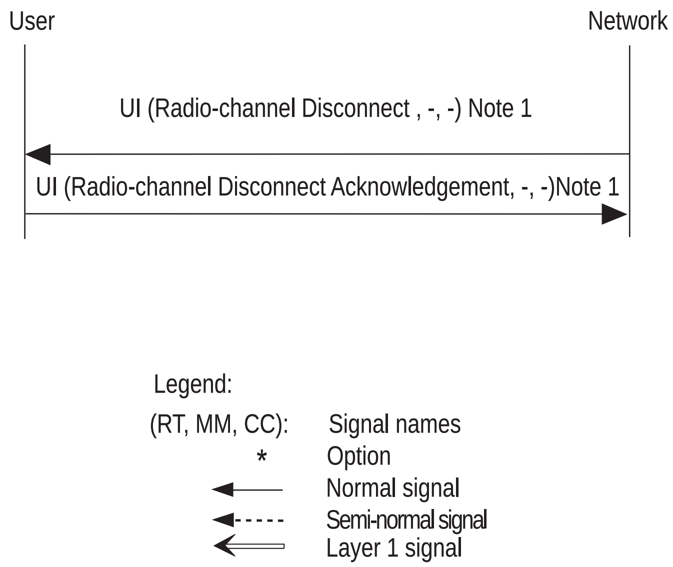
(2) Disconnection by the network side



Note : The timers for the CC signal are omitted except for T390. (The procedure for the CC signal must accord with I.451)

Fig. 4.3.8.4-2 : Disconnection sequence from the network

(3) Squelch disconnection



Note 1 : The network performs disconnection on assumption of no reception of these messages.

Fig. 4.3.8.4-3 : Squelch disconnection sequence

4.3.8.5 Location registration

The location registration sequence is shown in Fig. 4.3.8.5-1 below.

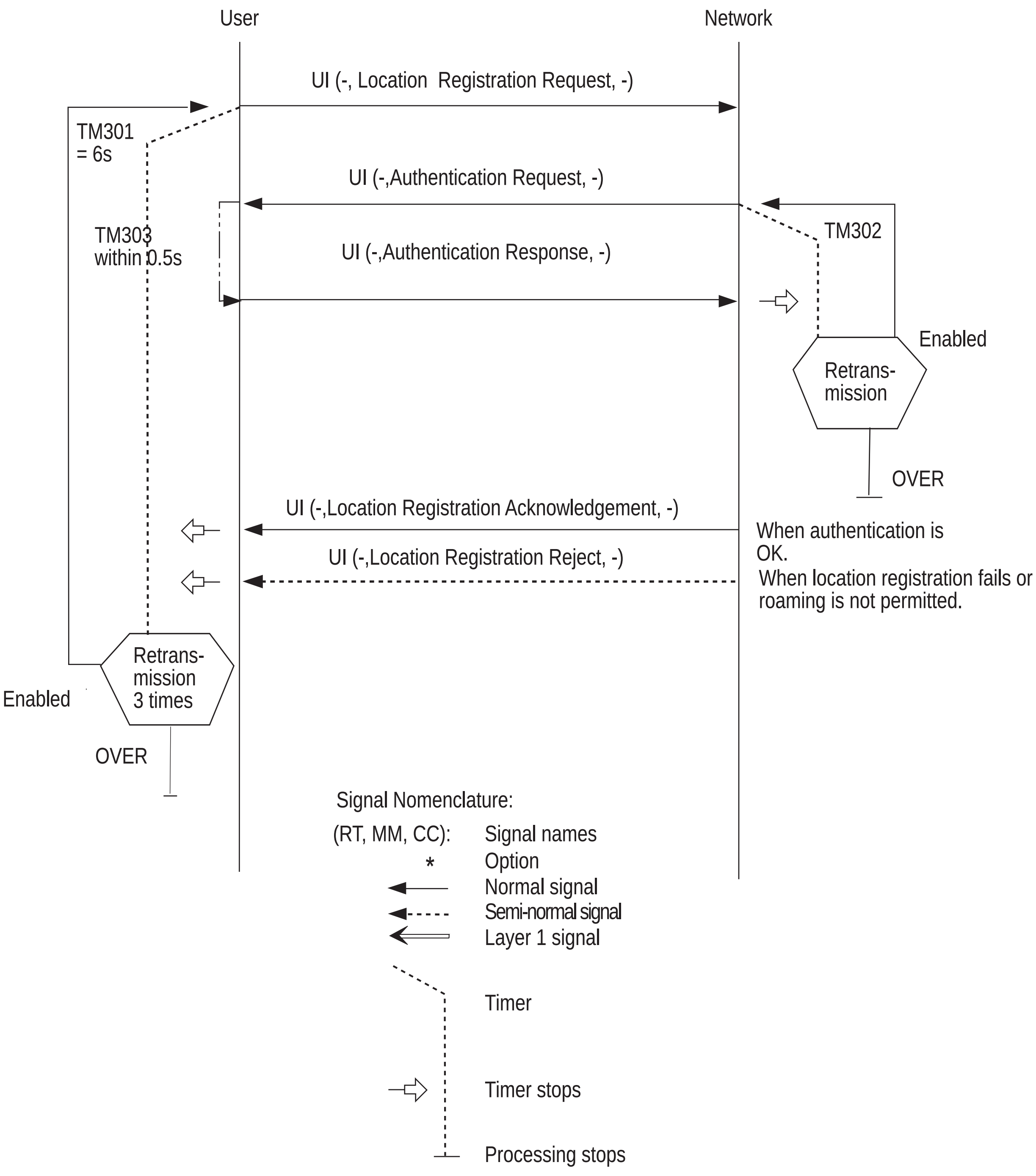
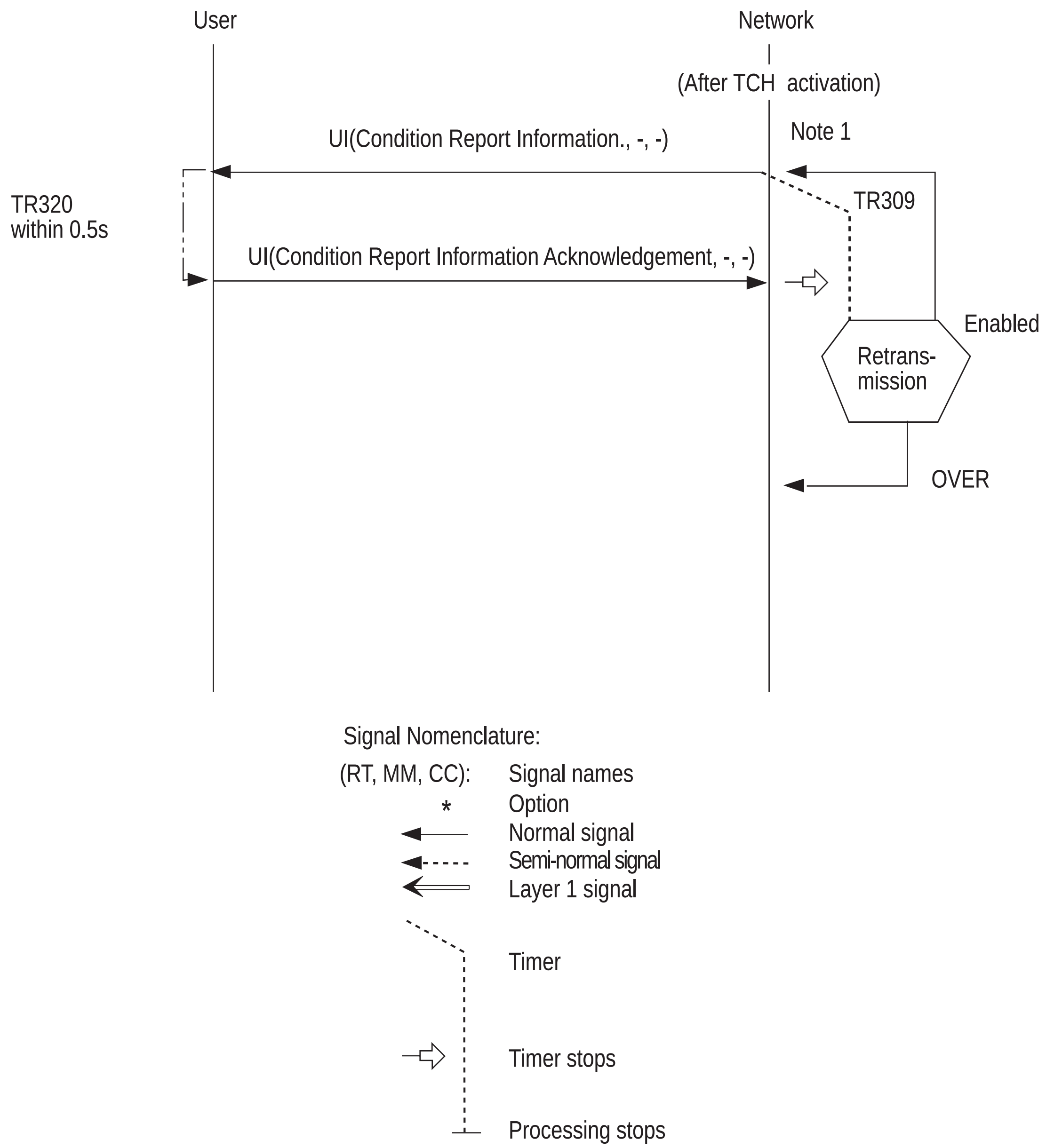


Fig.4.3.8.5-1 : Location registration sequence

4.3.8.6 RT signal sequence during communications

4.3.8.6.1 Condition report information set

The condition report information set sequence is shown in Fig. 4.3.8.6-1 below.



Note 1 : Notify when the network has the MS start peripheral zone supervision after TCH has been activated.

Fig.4.3.8.6-1 : Condition report information set sequence

4.3.8.6.2 System information set

The system information set sequence is shown in Fig. 4.3.8.6-2 below.

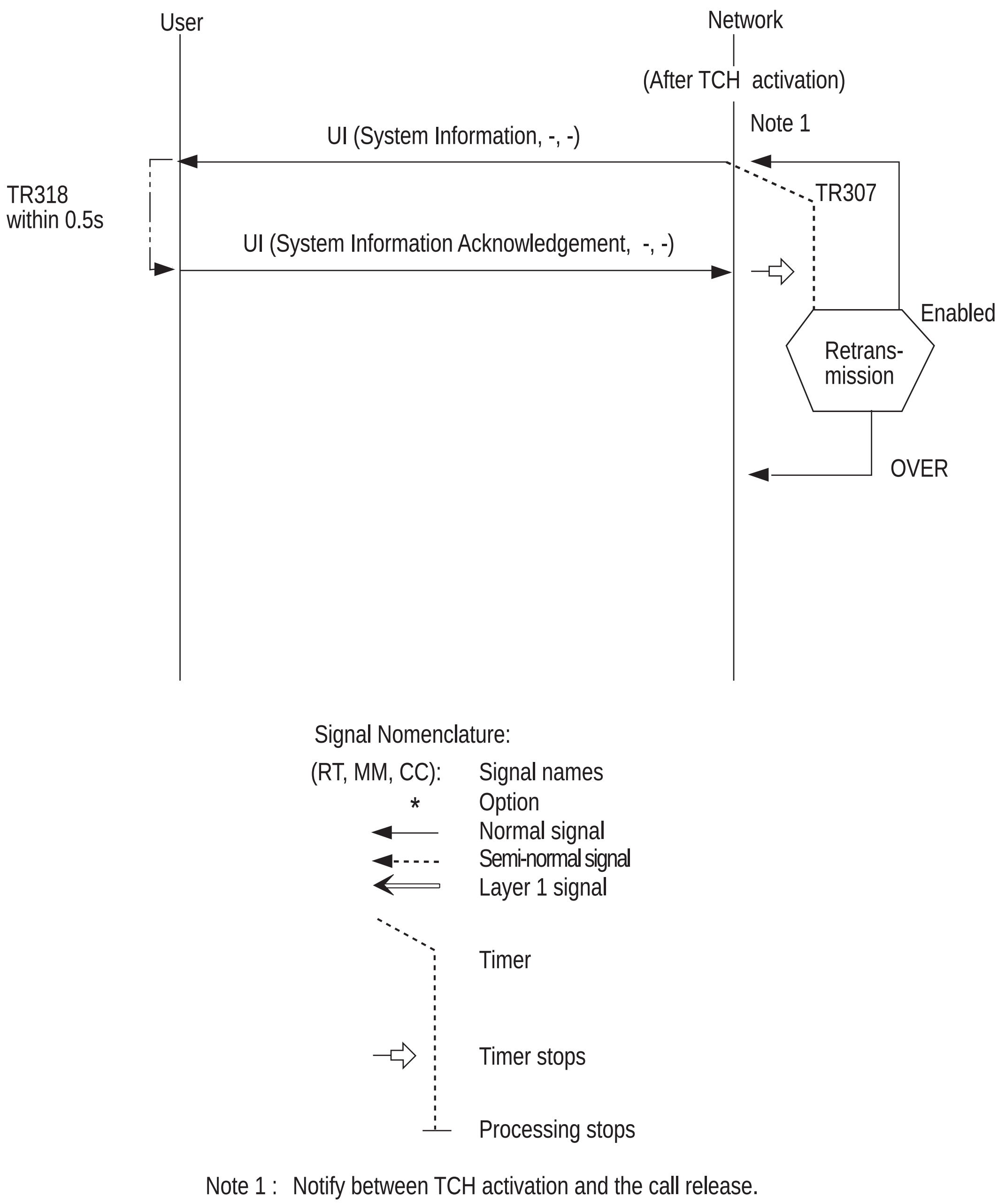
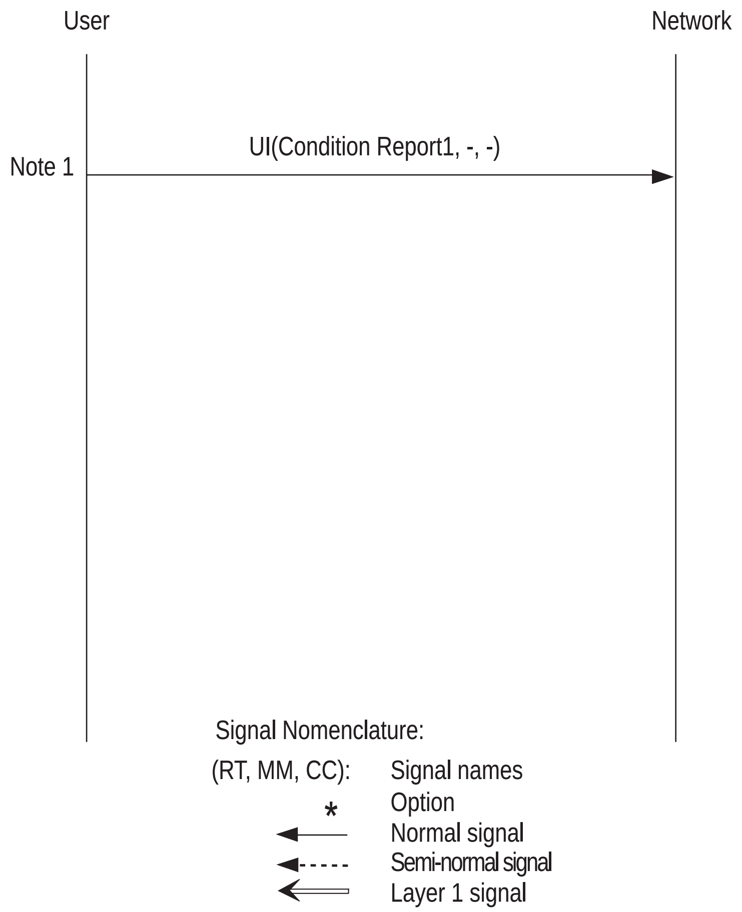


Fig.4.3.8.6-2 : System information set sequence

4.3.8.6.3 Periodical condition report

The periodical condition report sequence is shown in Fig. 4.3.8.6-3 below.

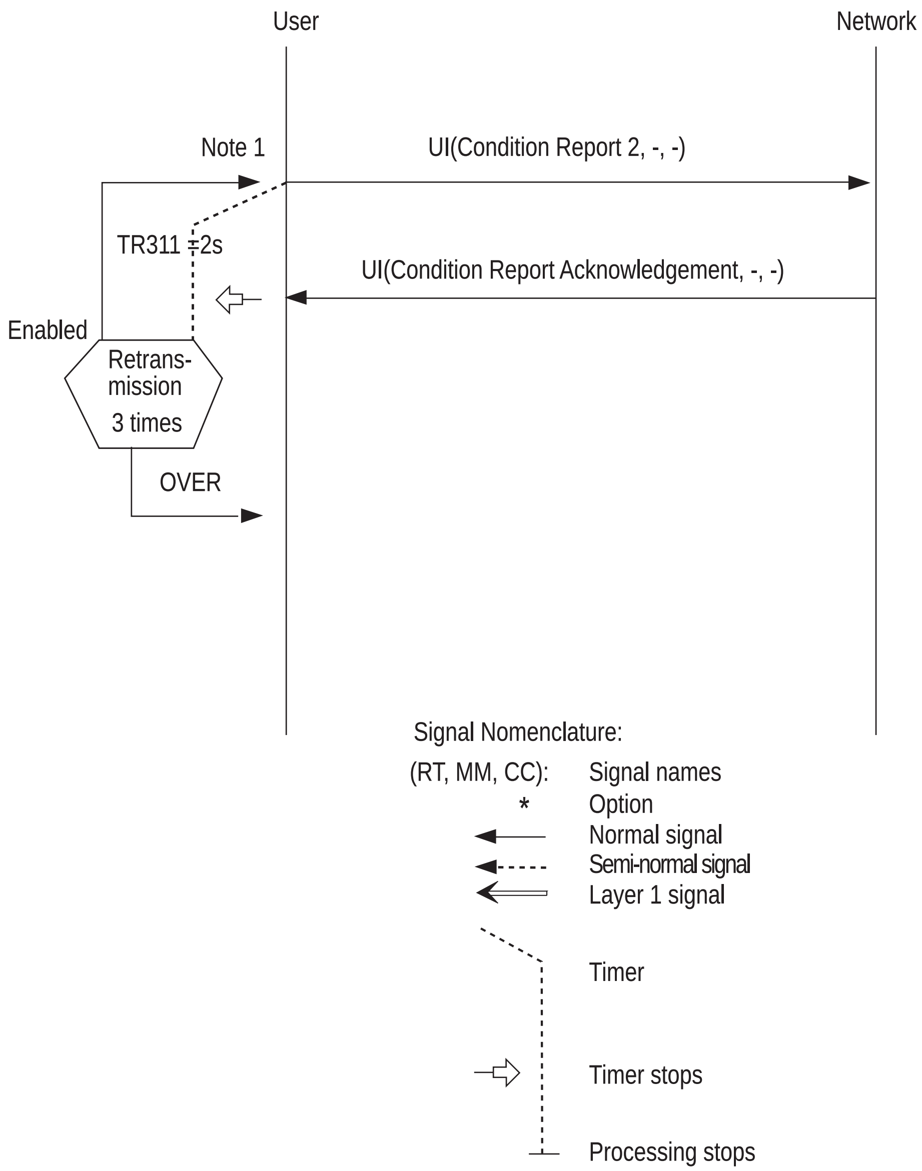


Note 1 : Report periodically from the mobile station at a specified interval during communications.

Fig.4.3.8.6-3 : Periodical condition report state sequence

4.3.8.6.4 Strong electrical field detection report

The strong electrical field detection report sequence is shown in Fig. 4.3.8.6-4 below.

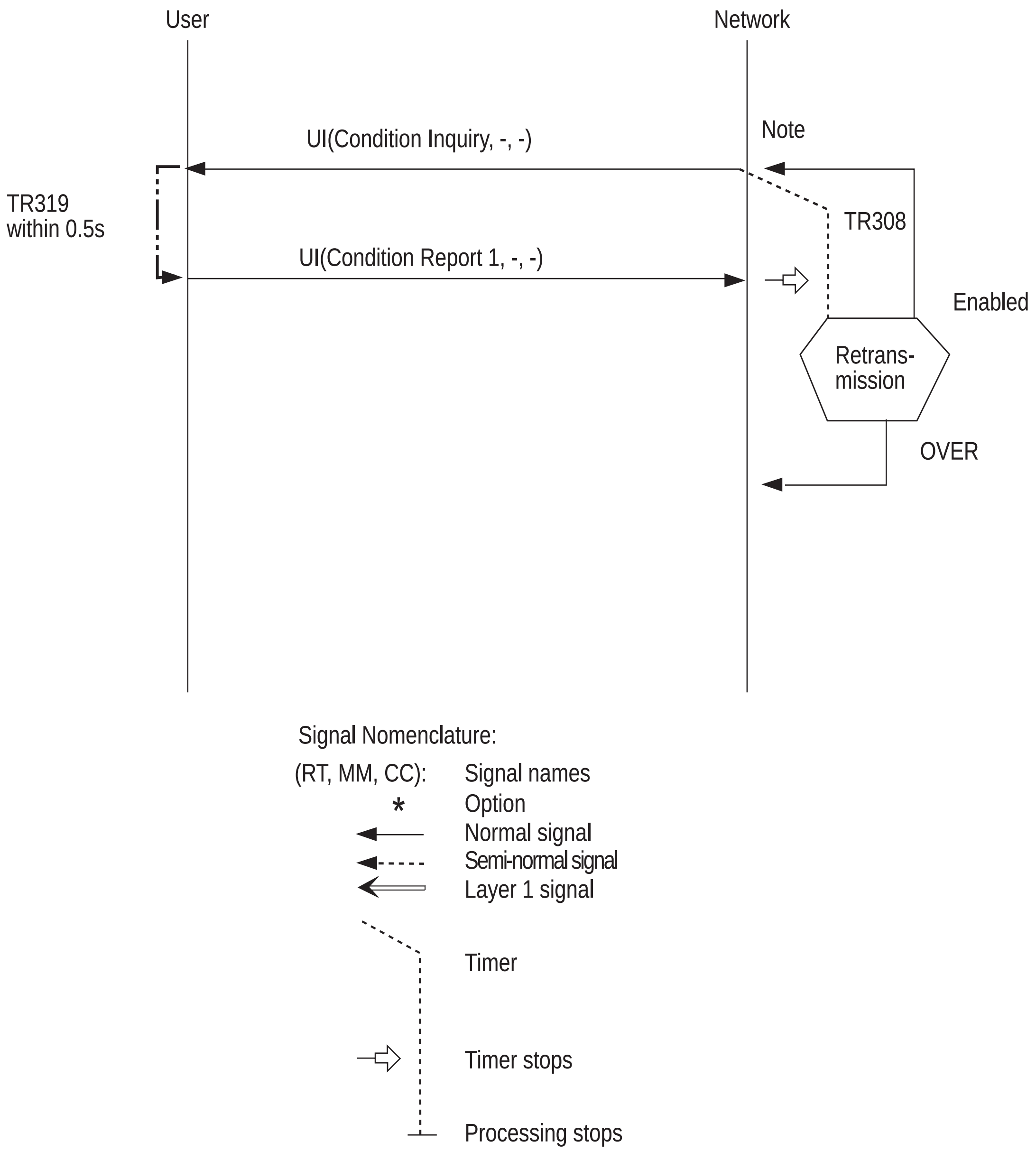


Note 1 : Report when the receive-level of the peripheral zones has been judged as exceeding the threshold for strong electrical field.

Fig.4.3.8.6-4 : Strong electrical field report sequence

4.3.8.6.5 Condition Inquiry

The condition inquiry sequence is shown in Fig. 4.3.8.6-5 below.

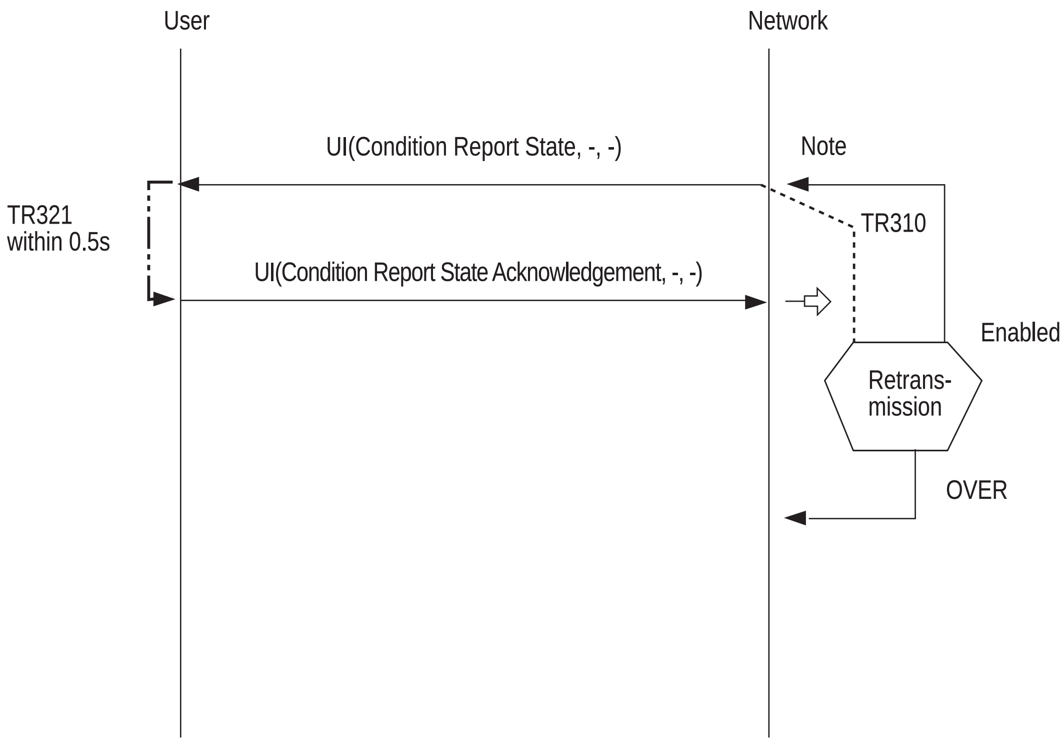


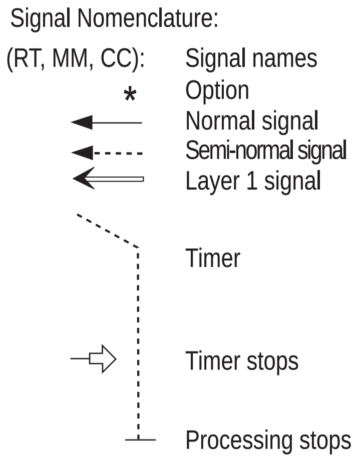
Note : The trigger of notification is left for further study.

Fig. 4.3.8.6-5 : Condition inquiry sequence

4.3.8.6.6 Condition Report State designation

The condition report state designation sequence is shown in Fig. 4.3.8.6-6 below.



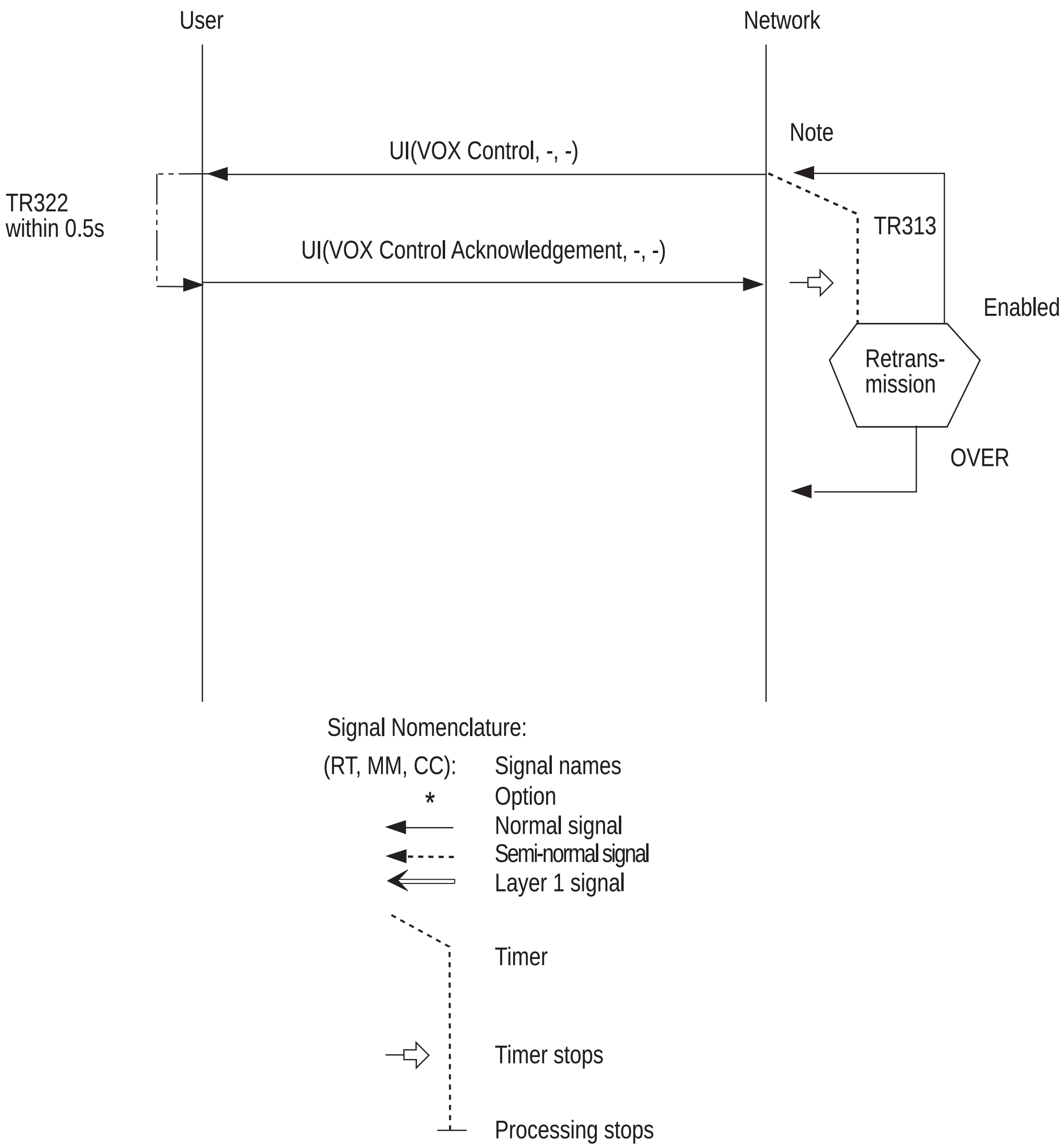


Note : The trigger of notification is left for further study.

Fig. 4.3.8.6-6 : Condition report state designation sequence

4.3.8.6.7 VOX control

The VOX control sequence is shown in Fig. 4.3.8.6-7 below.

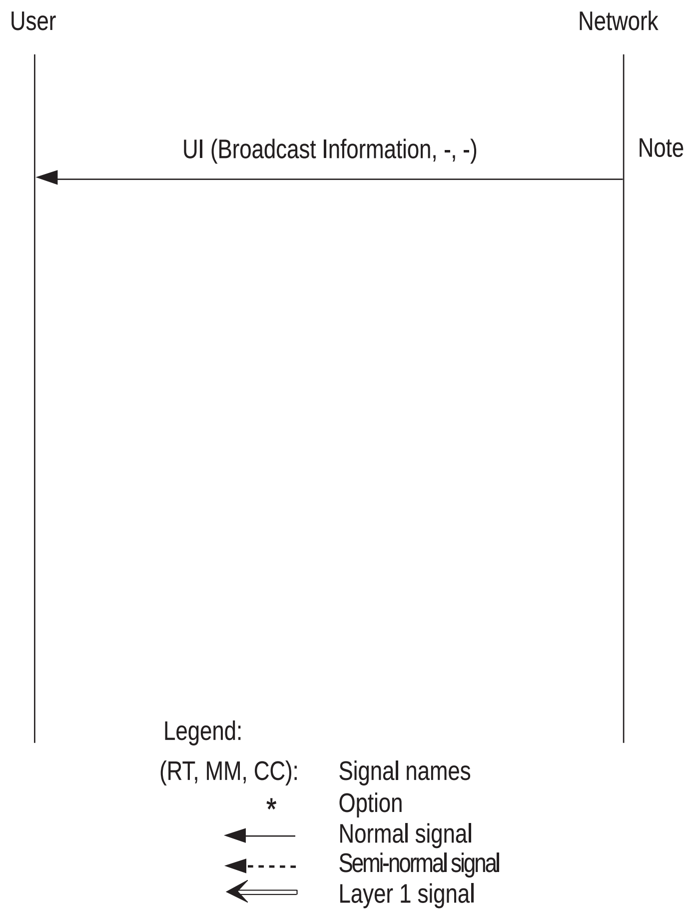


Note : The trigger of notification is left for further study.

Fig. 4.3.8.6-7 : VOX control sequence

4.3.8.7 Broadcast information

The broadcast information sequence is shown in Fig. 4.3.8.7-1 below.



Note : Notified via BCCH in each superframe from the network

Fig.4.3.8.7-1 : Broadcast information sequence

4.3.8.8 Authentication during communication

The authentication during communication sequence is shown in Fig. 4.3.8.8-1 below.

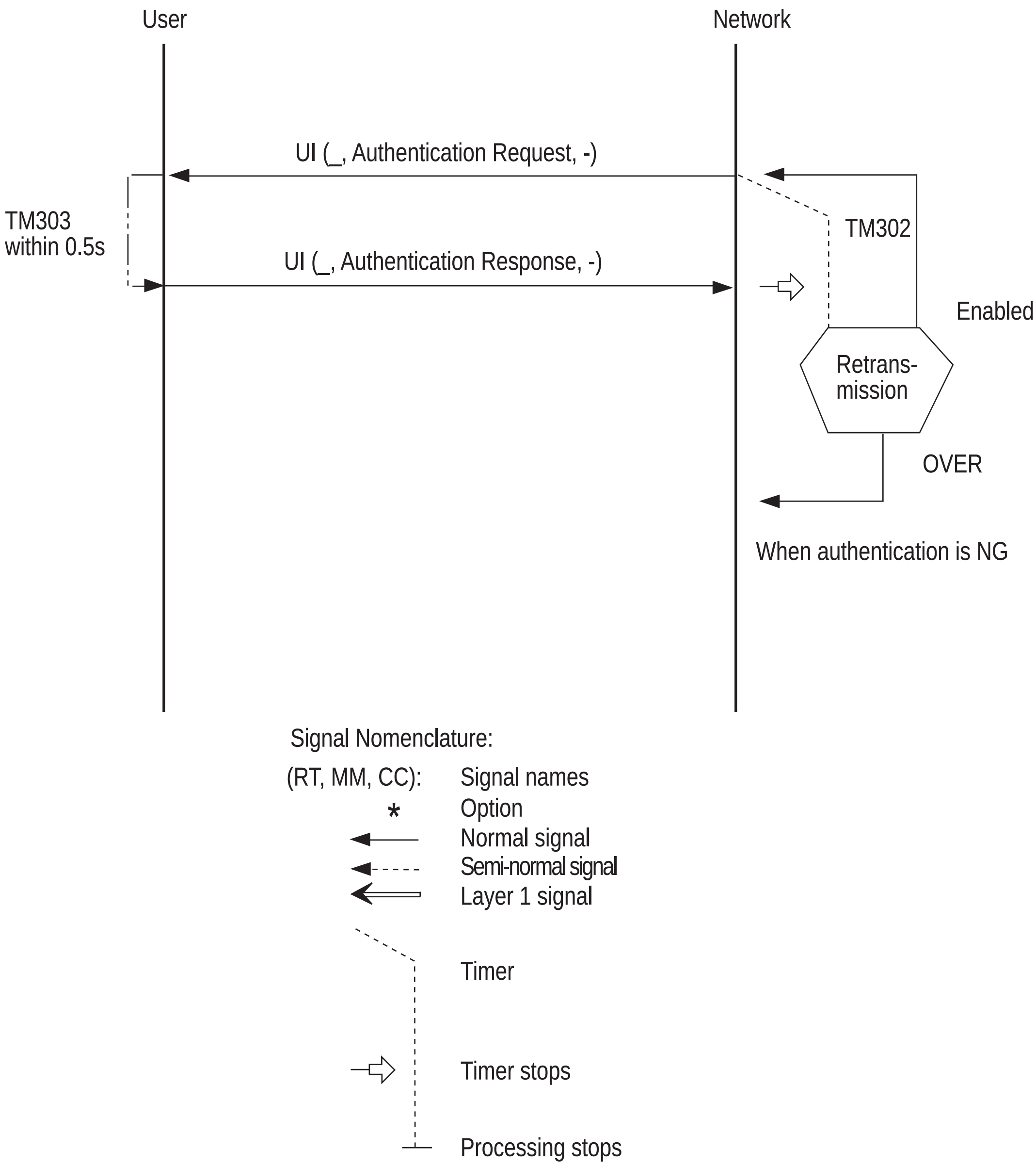


Fig. 4.3.8.8-1 : Authentication during communication sequence

4.3.8.9 Re-call

The re-call sequence is shown in Fig. 4.3.8.9-1 below.

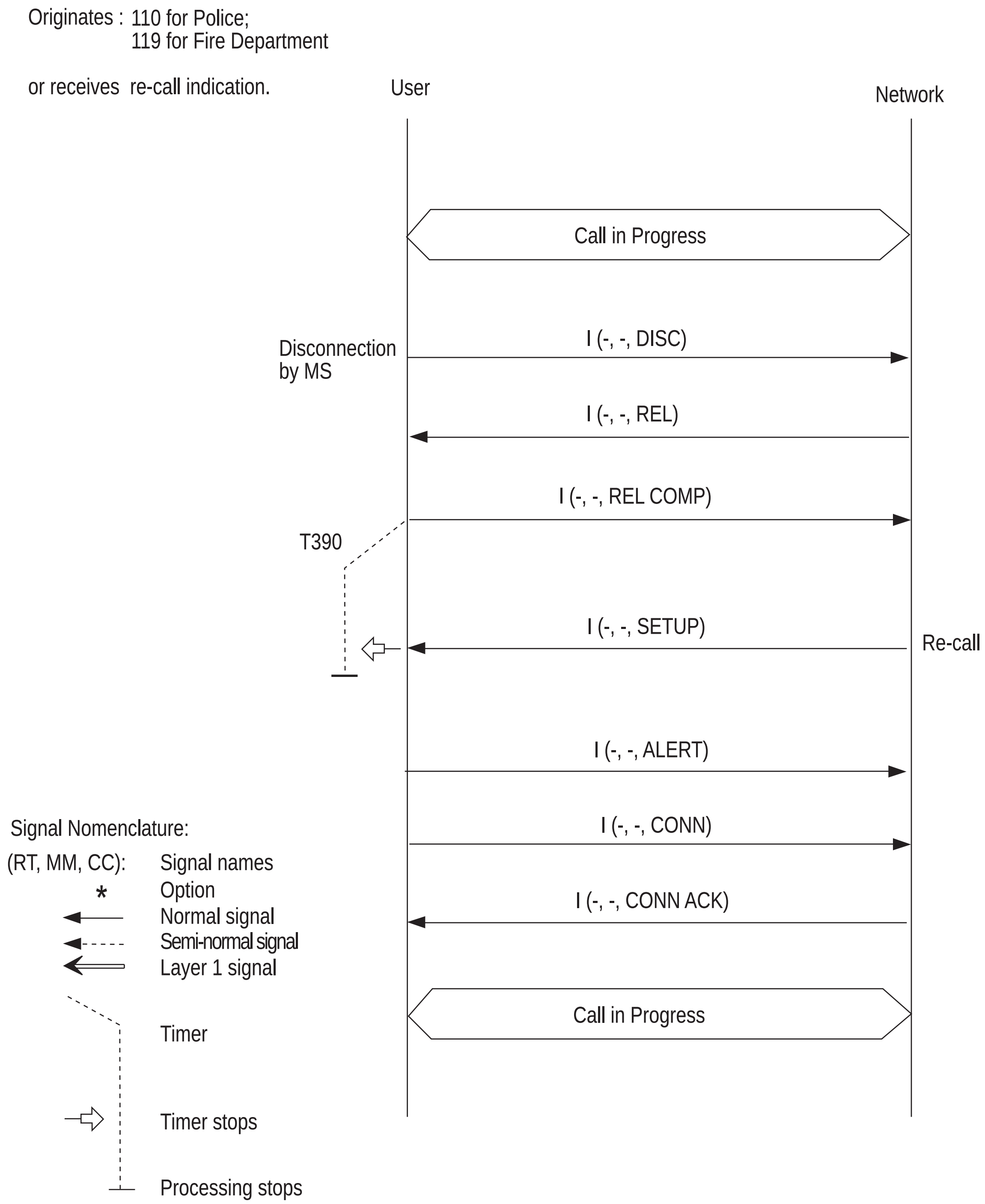


Fig. 4.3.8.9-1 : Re-call sequence

4.3.8.10 User registration

The user registration sequence is shown in Fig. 4.3.8.10-1 below.

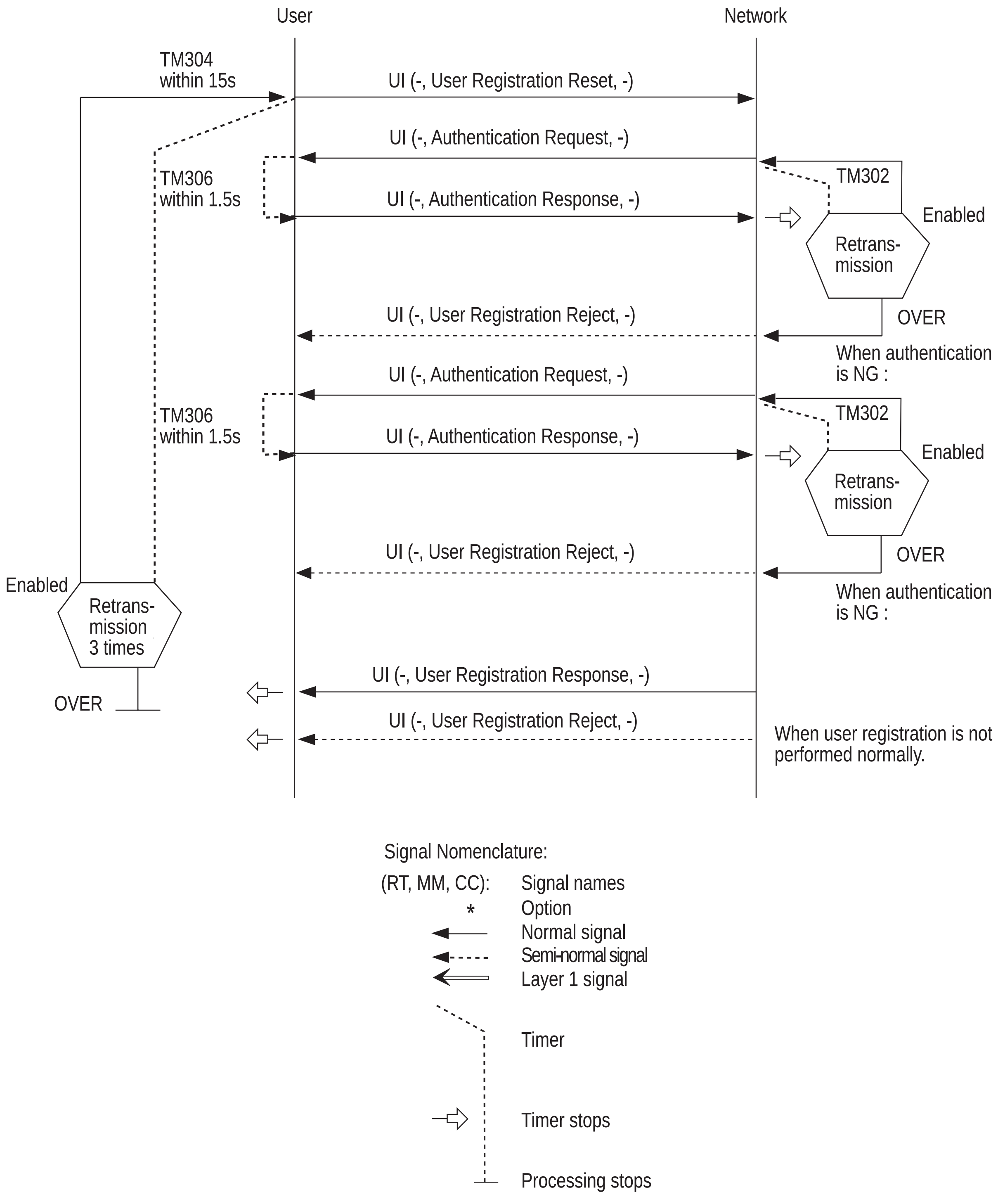


Fig.4.3.8.10-1 : User registration sequence

4.3.8.11 User deregistration

The user deregistration sequence is shown in Fig. 4.3.8.11-1 below.

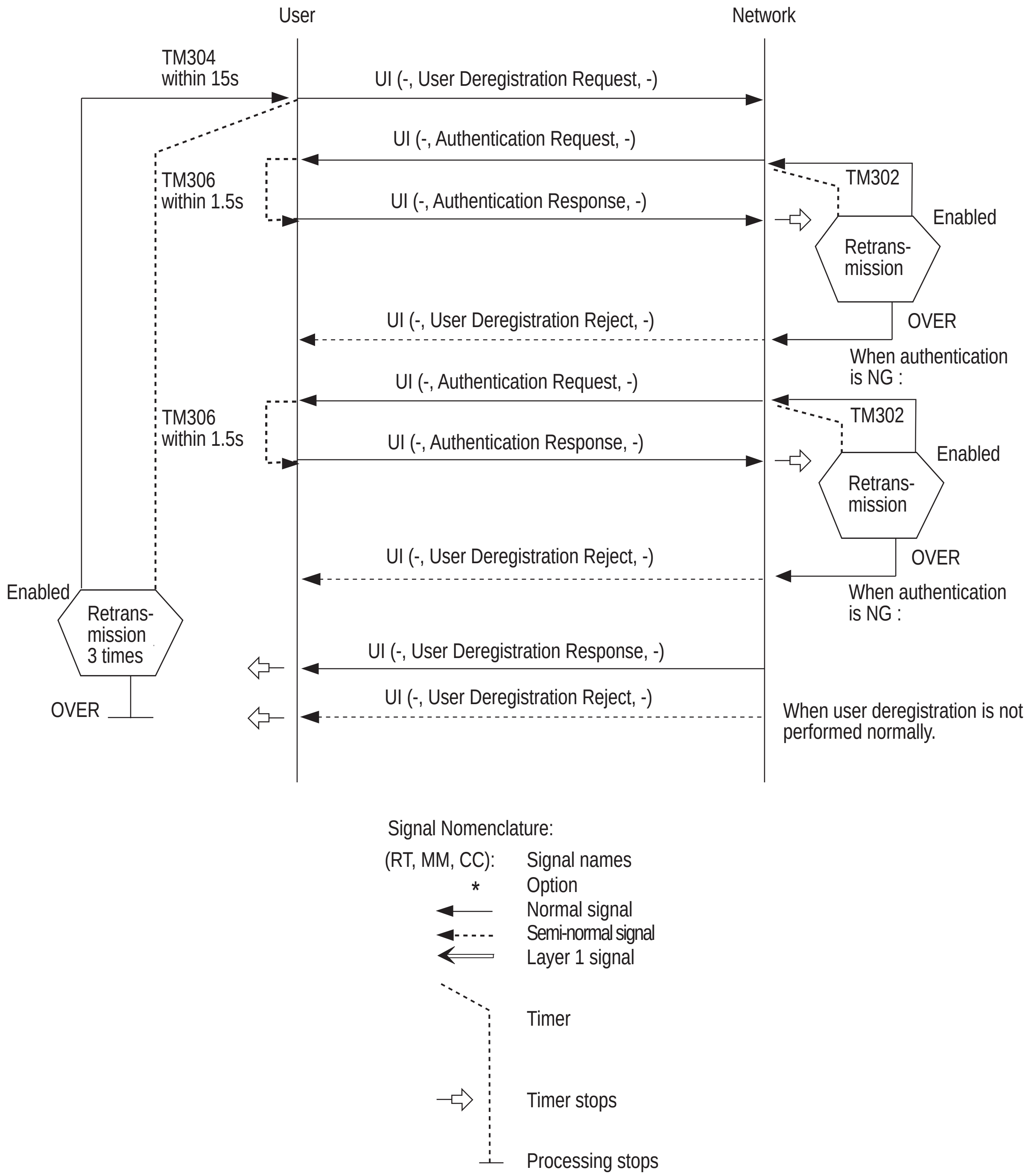


Fig.4.3.8.11-1 : User deregistration sequence

4.3.8.12 Registration reset

The registration reset sequence is shown in Fig. 4.3.8.12-1 below.

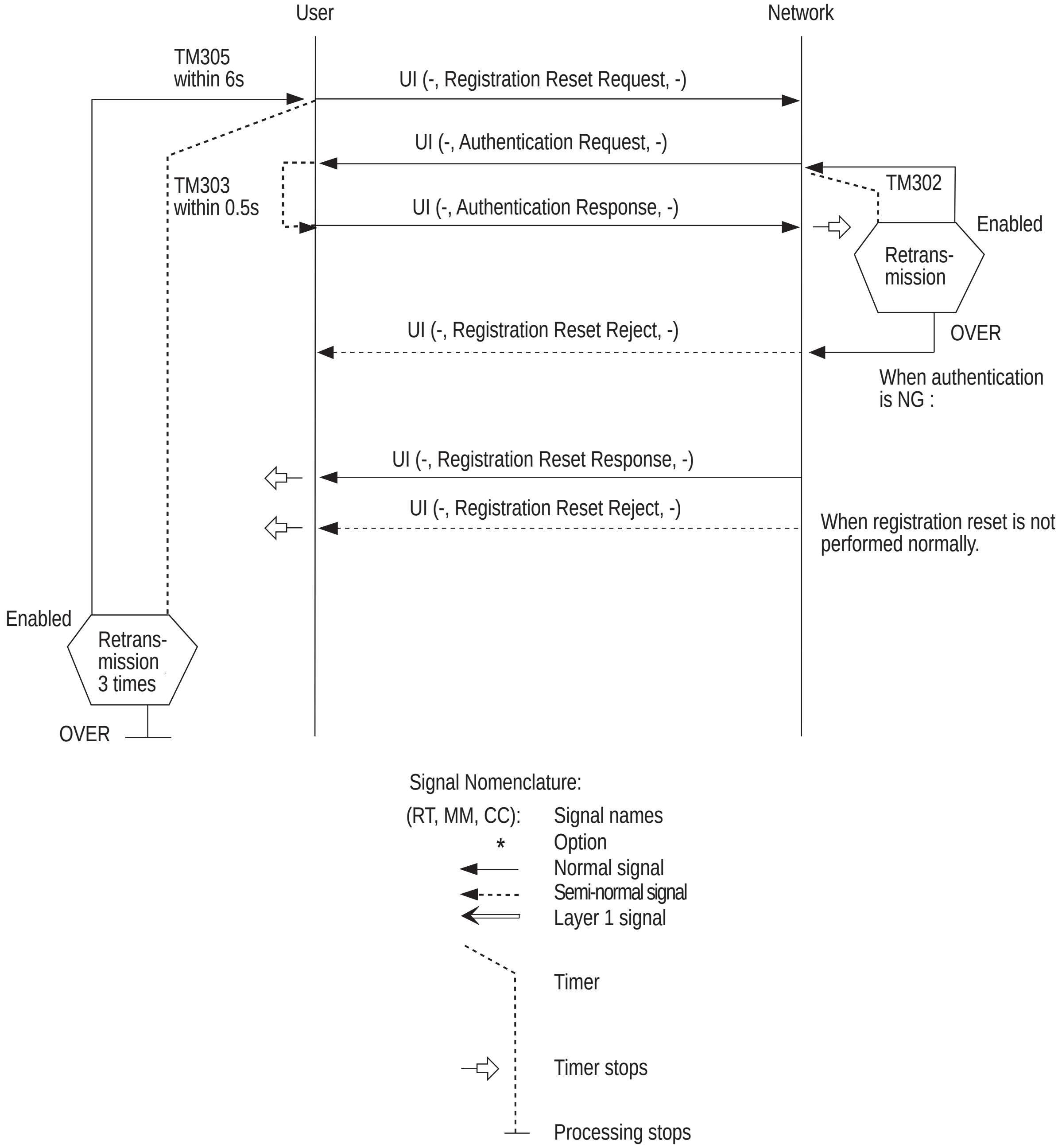
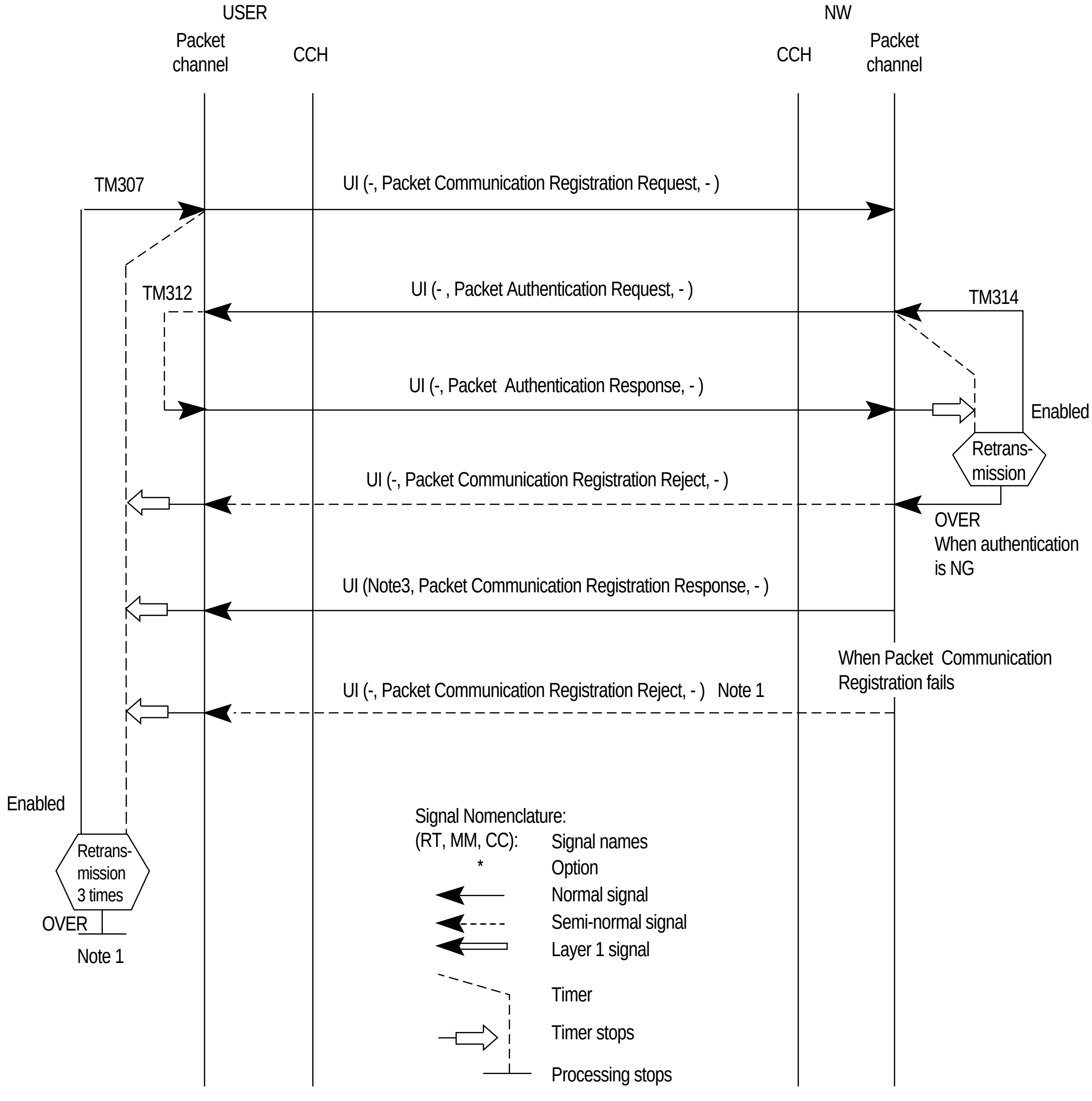


Fig.4.3.8.12-1 : Registration reset sequence

4.3.8.13 Packet origination

Fig. 4.3.8.13-1 shows the packet origination sequence.



Note 1: The user shall perform location registration, in case a Packet Communication Registration Reject message is received or the allowed number of retransmissions has been exceeded, and the user has switched to the Common control channel without completing packet communication registration or packet channel registration even after retry requested by the management entity, etc.

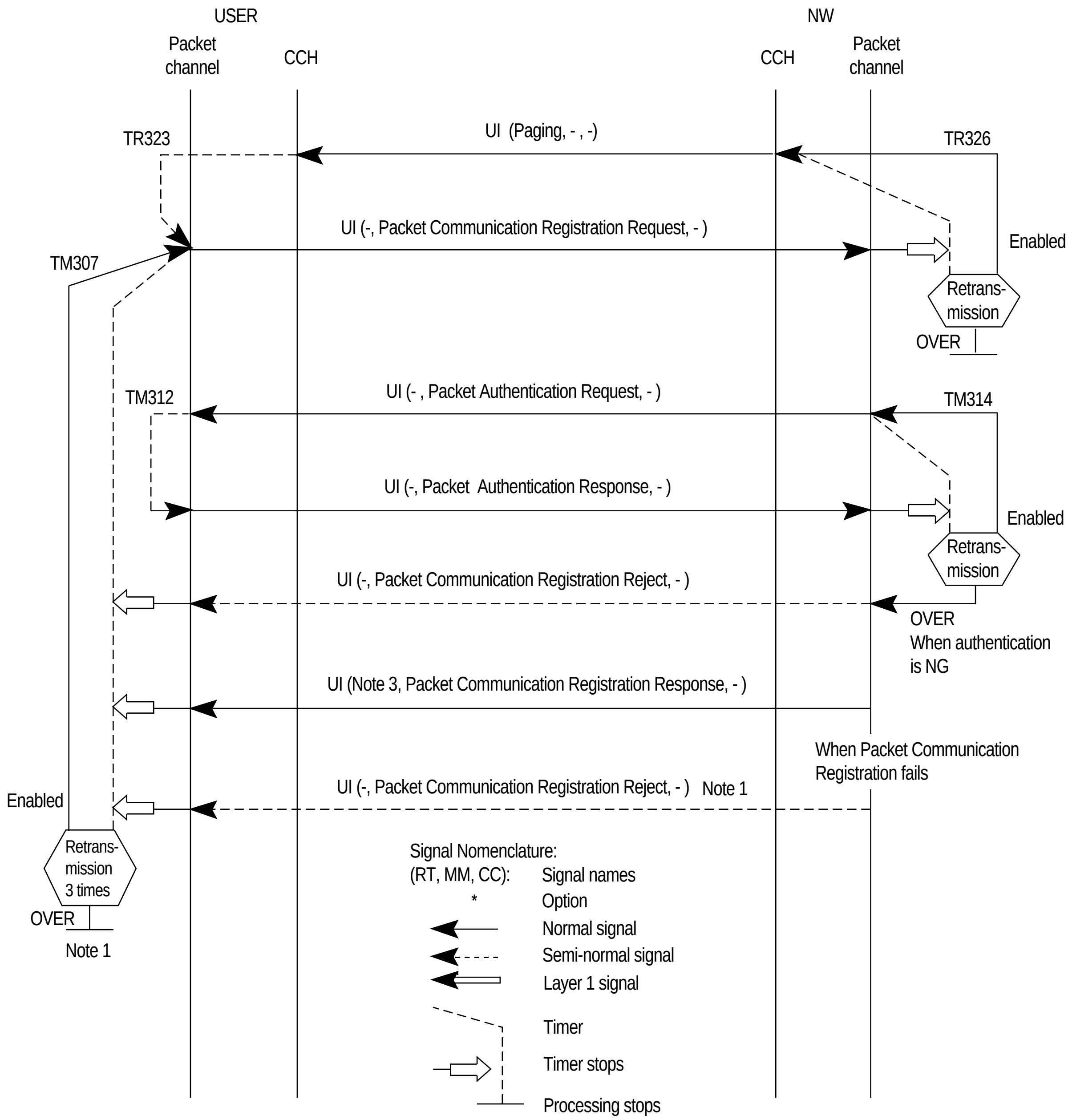
Note 2: From the time the Packet Communication Registration Request has been completed and until the completion of this sequence, the MS transmits/receives frames using the low-speed continuous reception method over the same slot as that used by the MS to transmit the Packet Communication Registration Request.

Note 3: The Packet Channel Handover Request can be included in this frame by the platform function. When included, TR338 shall be activated and the sequence shall comply with the sequence in Section 4.3.8.30 Packet Channel Handover (when the terminal registration area code is not changed) or Section 4.3.8.31 Packet Channel Handover (when the terminal registration area code is changed).

Fig. 4.3.8.13-1 : Packet origination sequence

4.3.8.14 Packet termination

Fig. 4.3.8.14-1 shows the packet termination sequence.



Note 1: The user shall perform location registration, in case a Packet Communication Registration Reject message is received or the allowed number of retransmissions has been exceeded, and the user has switched to the Common control channel without completing packet communication registration or packet channel registration even after retry requested by the management entity, etc.

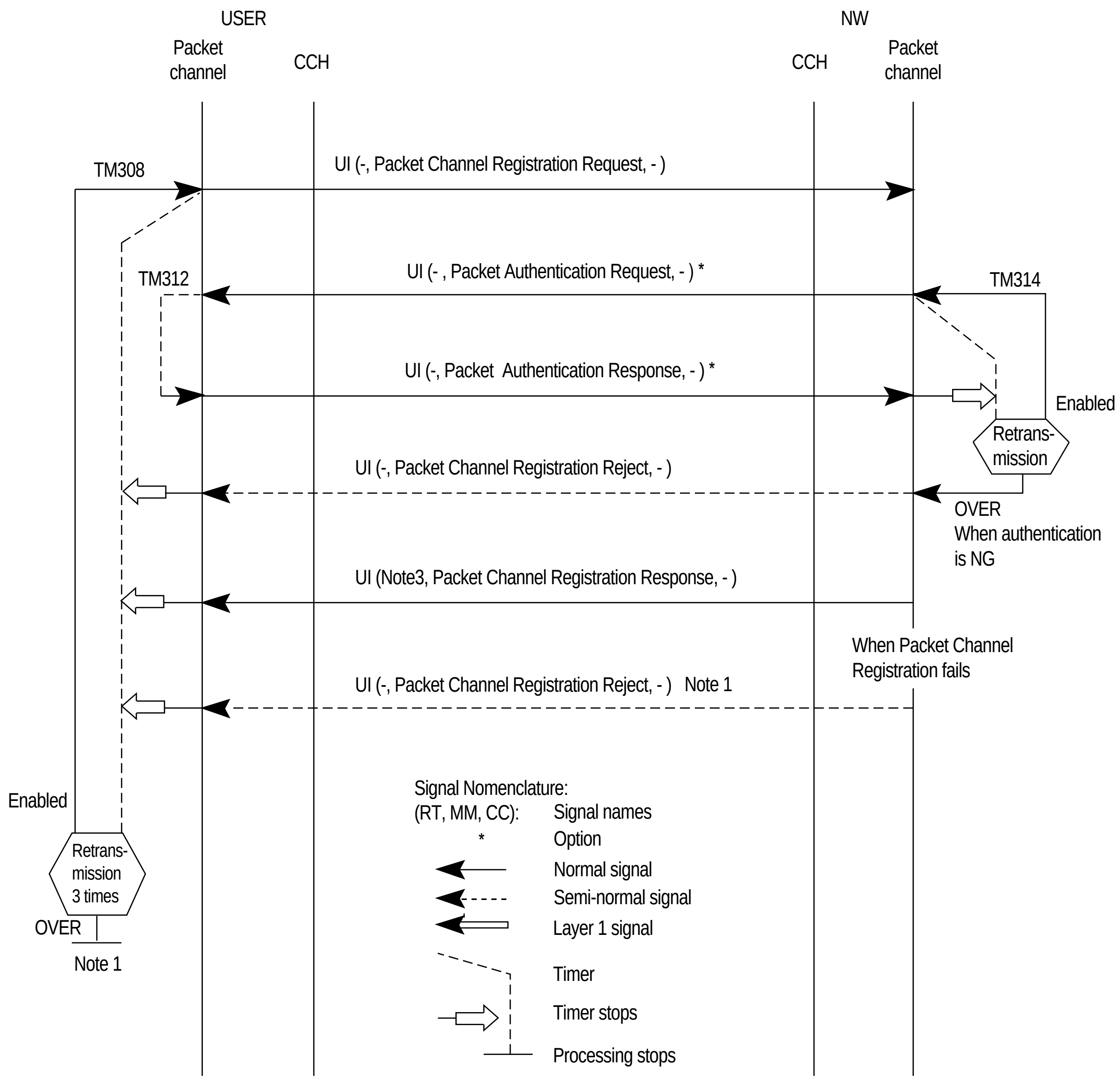
Note 2: From the time the Packet Communication Registration Request has been completed until the completion of this sequence, the MS transmits/receives frames using the low-speed continuous reception method over the same slot as that used by the MS to transmit the Packet Communication Registration Request.

Note 3: The Packet Channel Handover Request can be included in this frame by the platform function. When included, TR338 shall be activated and the sequence shall comply with the sequence in Section 4.3.8.30 Packet Channel Handover (when the terminal registration area code is not changed) or Section 4.3.8.31 Packet Channel Handover (when the terminal registration area code is changed).

Fig. 4.3.8.14-1 : Packet termination sequence

4.3.8.15 Packet channel registration

Fig. 4.3.8.15-1 shows the packet channel registration sequence. This sequence also applies to periodical packet communications registration.



Note 1: The user shall perform location registration, in case a Packet channel Registration Reject message is received or the allowed number of retransmissions has been exceeded, and the user has switched to the Common control channel without completing packet communication registration or packet channel registration even after retry requested by the management entity, etc.

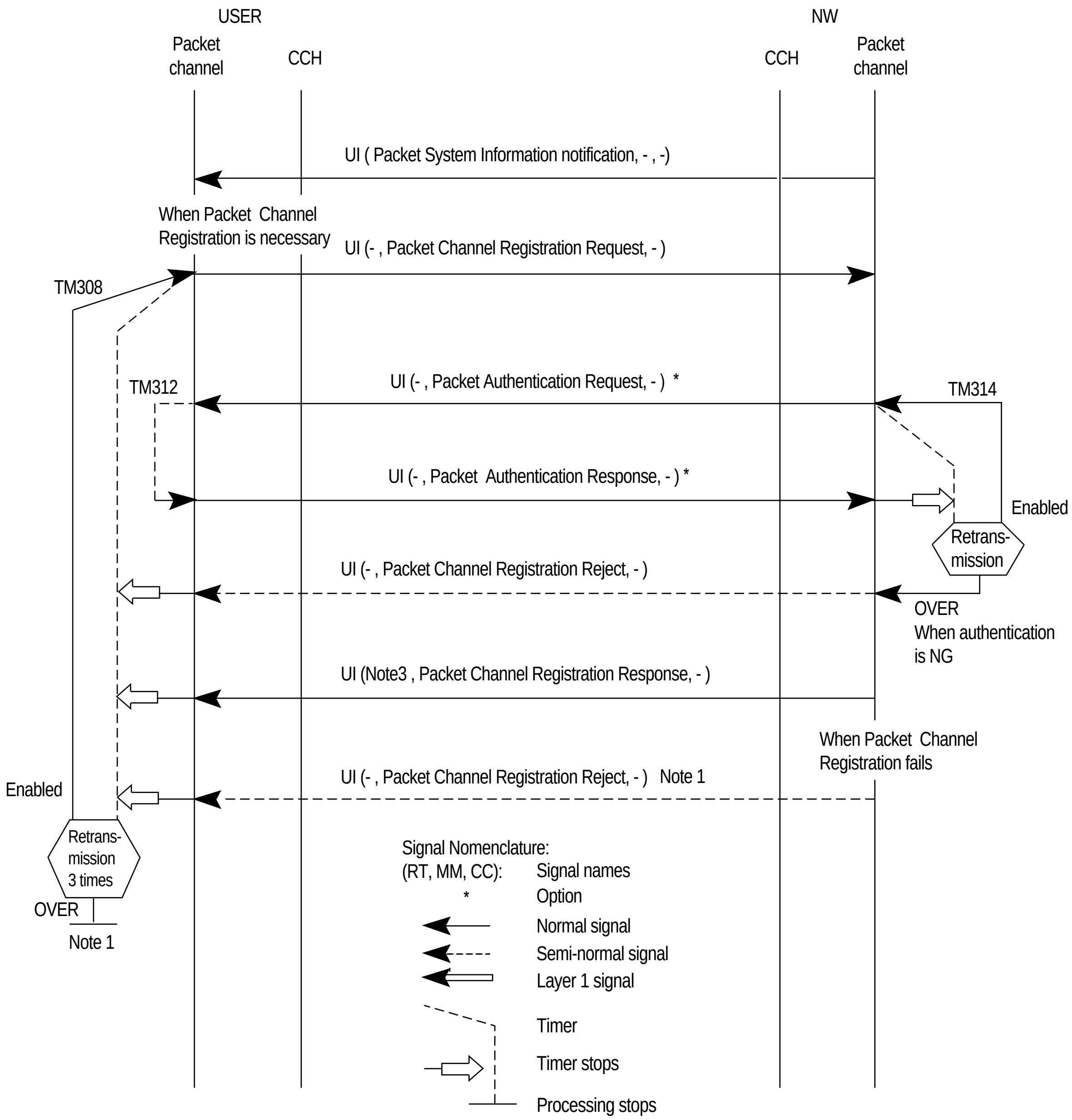
Note 2: From the time the Packet channel Registration Request has been completed until the completion of this sequence, the MS transmits/receives frames using low-speed continuous reception method over the same slot as that used by the MS to transmit the Packet Channel Registration Request.

Note 3: The Packet Channel Handover Request can be included in this frame by the platform function. When included, TR338 shall be activated and the sequence shall comply with the sequence in Section 4.3.8.30 Packet Channel Handover (when the terminal registration area code is not changed) or Section 4.3.8.31 Packet Channel Handover (when the terminal registration area code is changed).

Fig. 4.3.8.15-1 : Packet channel registration sequence

4.3.8.16 Packet system information notification

Fig. 4.3.8.16-1 shows the packet system information notification sequence



Note 1: The user shall perform location registration, in case a Packet channel Registration Reject message is received or the allowed number of retransmissions has been exceeded, and the user has switched to the Common control channel without completing packet communication registration or packet channel registration even after retry requested by the management entity, etc.

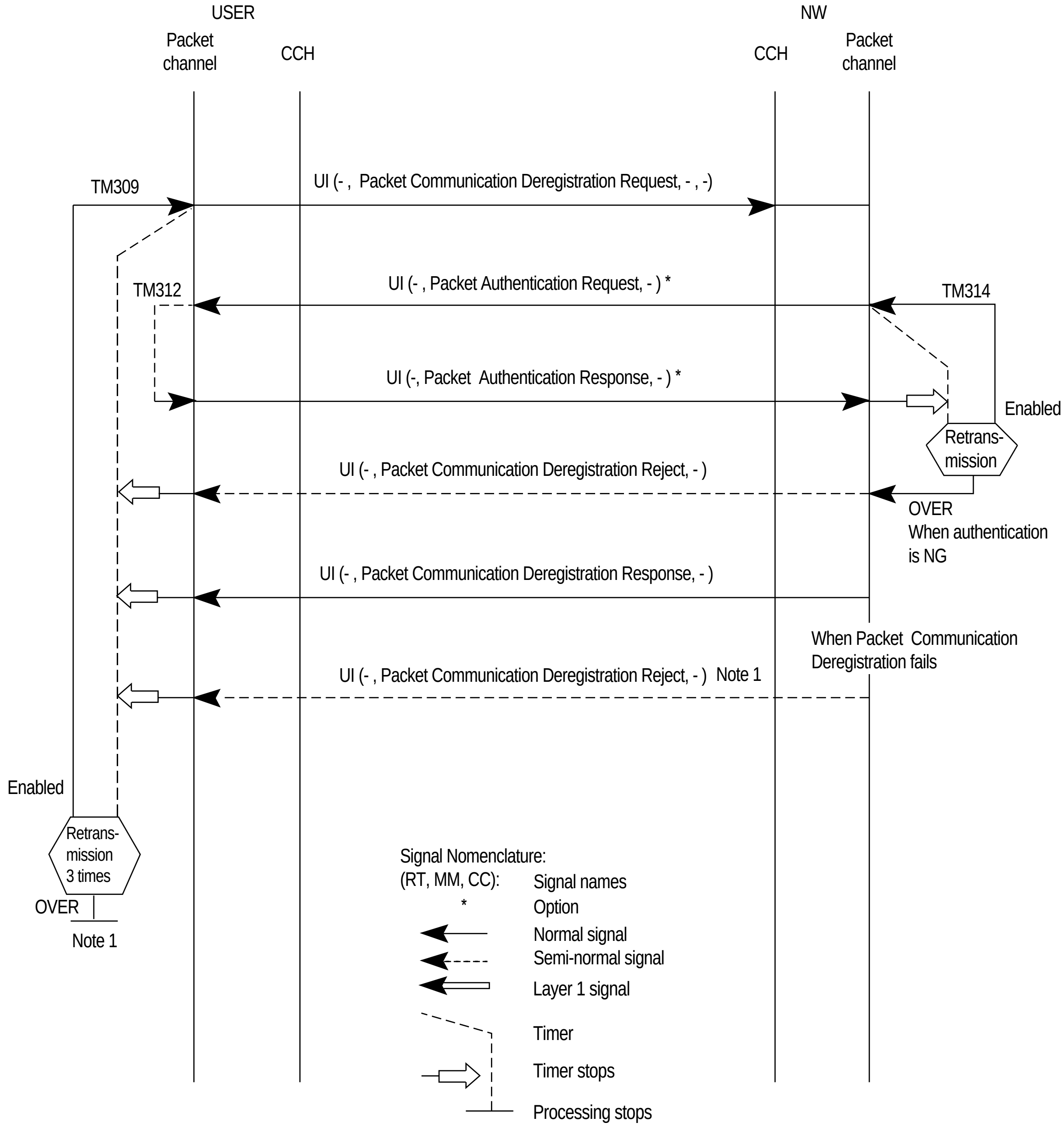
Note 2: From the time the Packet channel Registration Request has been completed until the completion of this sequence, the MS transmits/receives frames using the low-speed continuous reception method over the same slot as that used by the MS to transmit the Packet Channel Registration Request.

Note 3: The Packet Channel Handover Request can be included in this frame by the platform function. When included, TR338 shall be activated and the sequence shall comply with the sequence in Section 4.3.8.30 Packet Channel Handover (when the terminal registration area code is not changed) or Section 4.3.8.31 Packet Channel Handover (when the terminal registration area code is changed).

Fig. 4.3.8.16-1 : Packet system information notification sequence

4.3.8.17 Packet communication deregistration

Fig. 4.3.8.17-1 shows the packet communication deregistration sequence.



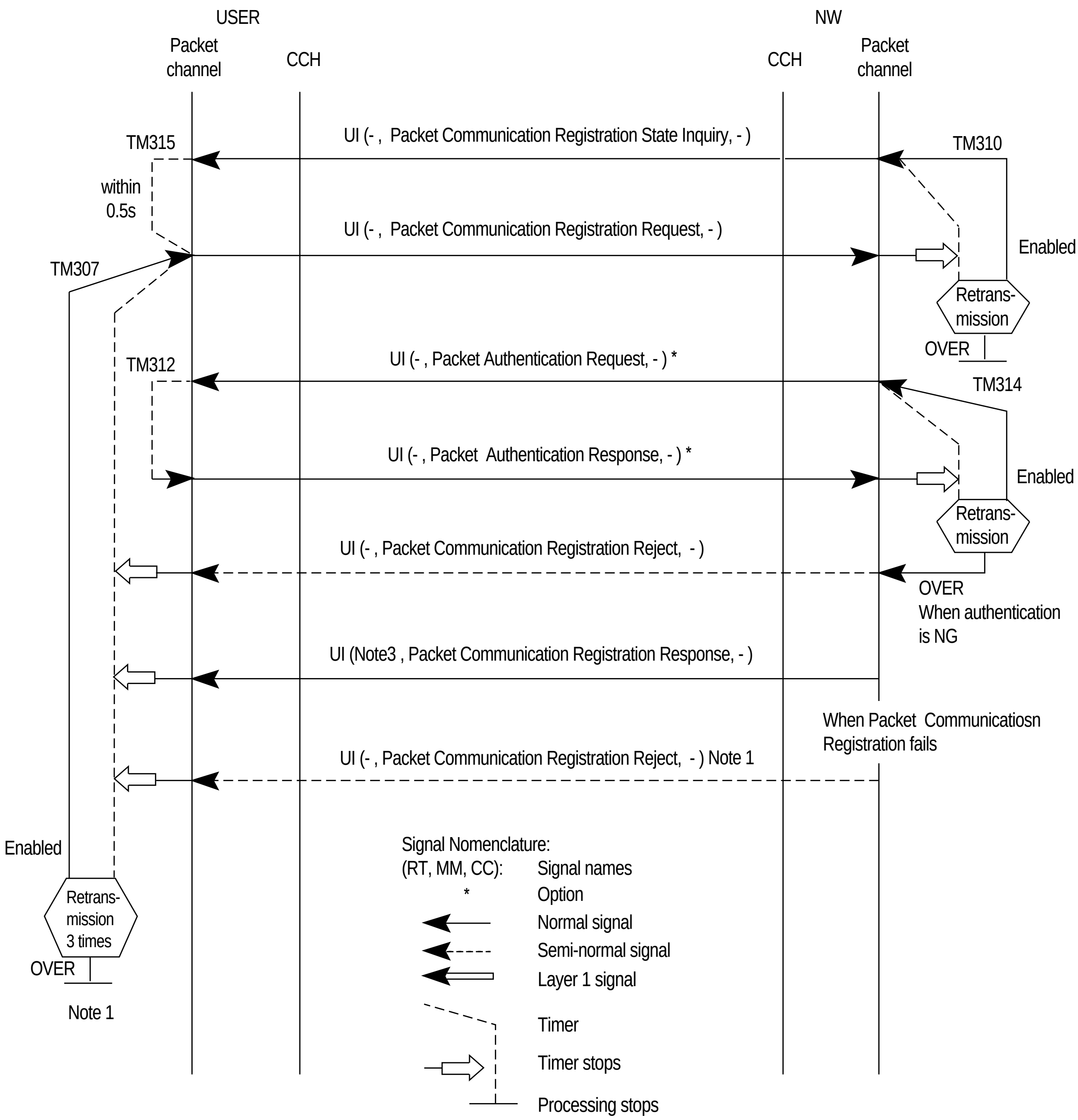
Note 1: The user shall perform location registration, in case a Packet Communication Deregistration Reject is received or the allowed number of retransmission has been exceeded, and the state is switched to the Null state.

Note 2: In Active mode, transmission/reception is performed according to the transmission/reception procedures negotiated in the packet communication registration or packet channel registration procedures. And in packet standby mode, from the time the Packet Communication Deregistration Request has been completed until the completion of this sequence, the MS transmits/receives frames using the low-speed continuous reception method over the same slot as that used by the MS to transmit the Packet Communication Deregistration Request.

Fig. 4.3.8.17-1 : Packet communication deregistration sequence

4.3.8.18 Packet communication registration state inquiry

Fig. 4.3.8.18-1 shows the packet communication registration state inquiry sequence by which the user can continue packet communication.



Note 1: The user shall perform location registration, in case a Packet Communication Registration Reject message is received or the allowed number of retransmission has been exceeded, and the user has switched to the Common control channel without completing packet communication registration or packet channel registration even after retry requested by the management entity, etc.

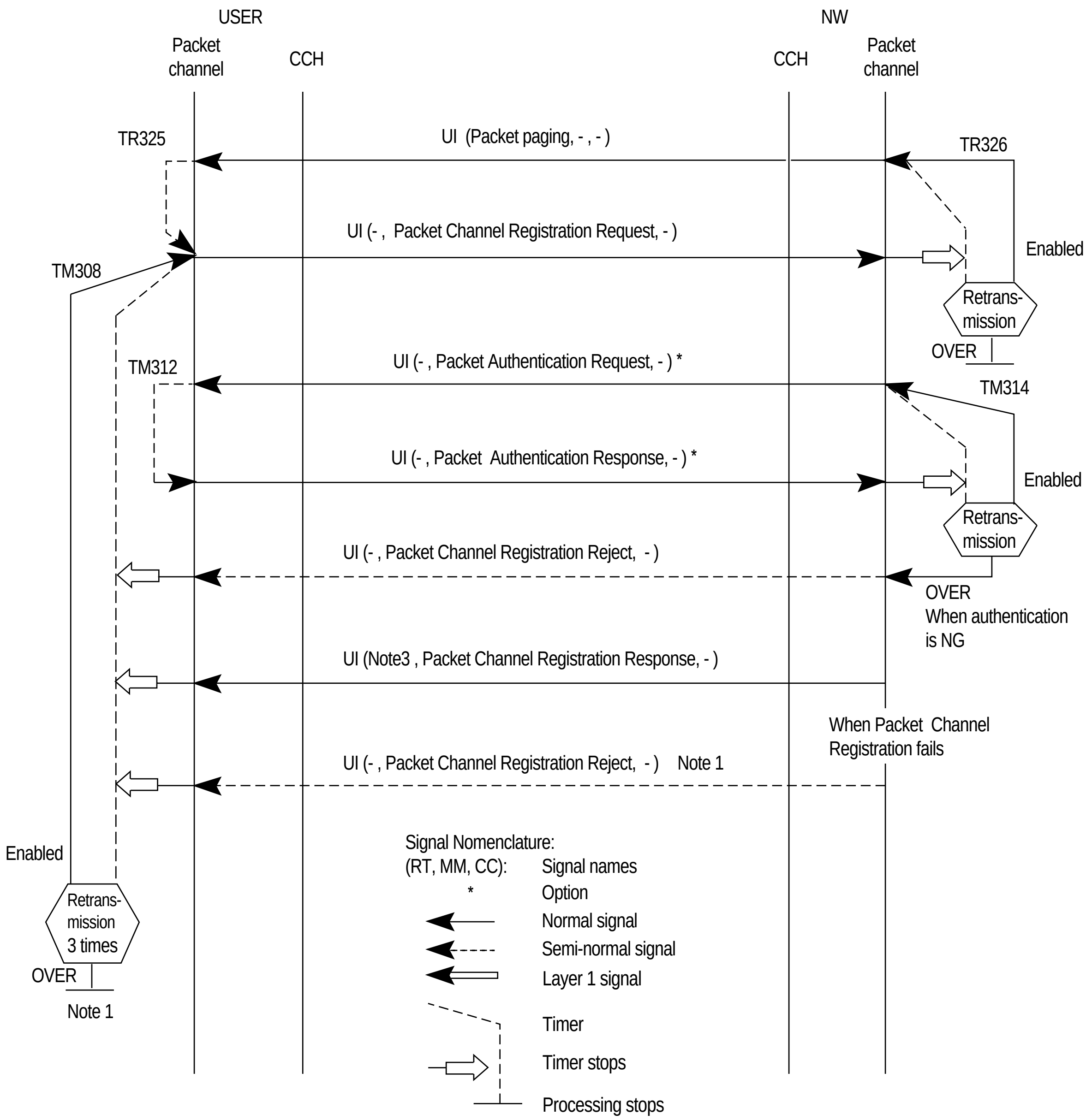
Note 2: From the time the Packet Communication Registration Request has been completed and until the completion of this sequence, the MS transmits/receives frames using the low-speed continuous reception method over the same slot as that used by the MS to transmit the Packet Communication Registration Request.

Note 3: The Packet Channel Handover Request can be included in this frame by the platform function. When included, TR338 shall be activated and the sequence shall comply with the sequence in Section 4.3.8.30 Packet Channel Handover (when the terminal registration area code is not changed) or Section 4.3.8.31 Packet Channel Handover (when the terminal registration area code is changed).

Fig. 4.3.8.18-1 : Packet communication registration state inquiry sequence (packet communication continuation)

4.3.8.19 Packet paging

Fig. 4.3.8.19-1 shows the packet paging sequence.



Note 1: The user shall perform location registration, in case a Packet channel Registration Reject message is received or the allowed number of retransmissions has been exceeded, and the user has switched to the Common control channel without completing packet communication registration or packet channel registration even after retry requested by the management entity, etc.

Note 2: From the time the Packet channel Registration Request has been completed and until the completion of this sequence, the MS transmits/receives frames using the low-speed continuous reception method over the same slot as that used by the MS to transmit the Packet Channel Registration Request.

Note 3: The Packet Channel Handover Request can be included in this frame by the platform function. When included, TR338 shall be activated and the sequence shall comply with the sequence in Section 4.3.8.30 Packet Channel Handover (when the terminal registration area code is not changed) or Section 4.3.8.31 Packet Channel Handover (when the terminal registration area code is changed).

Fig. 4.3.8.19-1: Packet paging sequence

4.3.8.20 Zone information notification

Fig. 4.3.8.20-1 shows the zone information notification sequence.

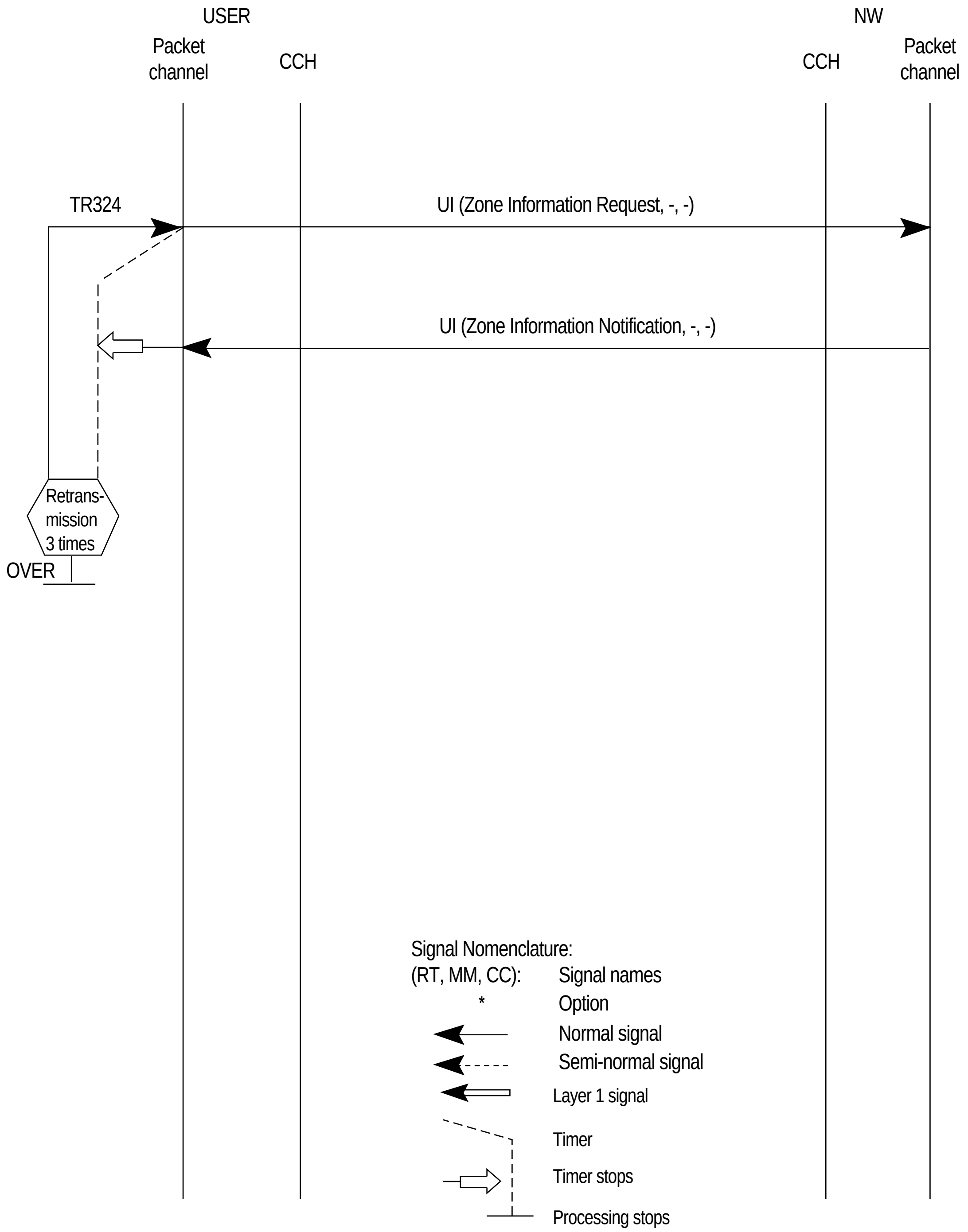


Fig. 4.3.8.20-1: Zone information notification sequence

4.3.8.21 Packet communication disconnnect request (NW activated)

Fig. 4.3.8.21-1 shows the packet communication disconnect sequence.

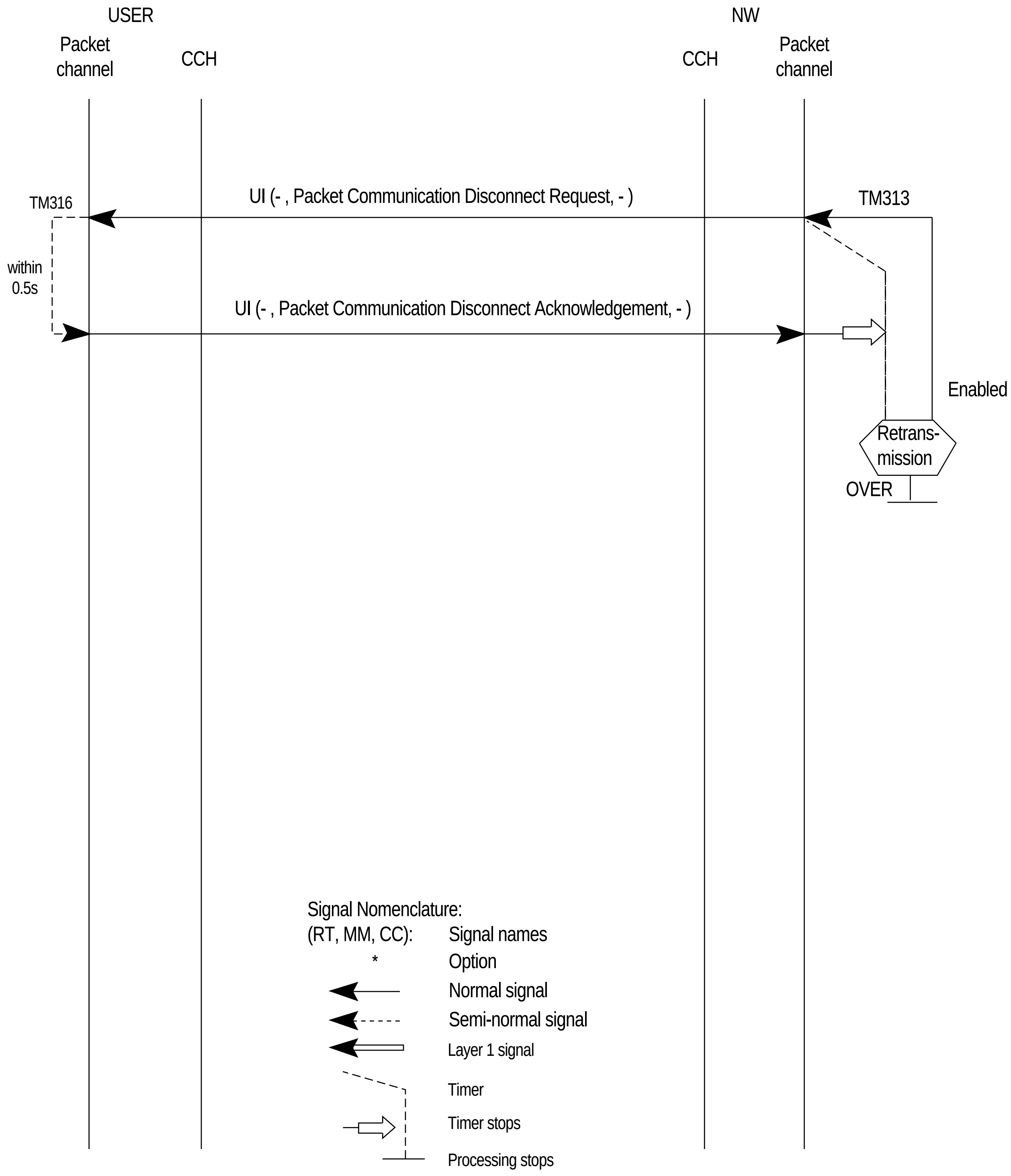


Fig. 4.3.8.21-1: Packet communication disconnect sequence (network activated)

4.3.8.22 Voice termination during packet communication (Active/Packet standby) (Voice Terminating Method 1)

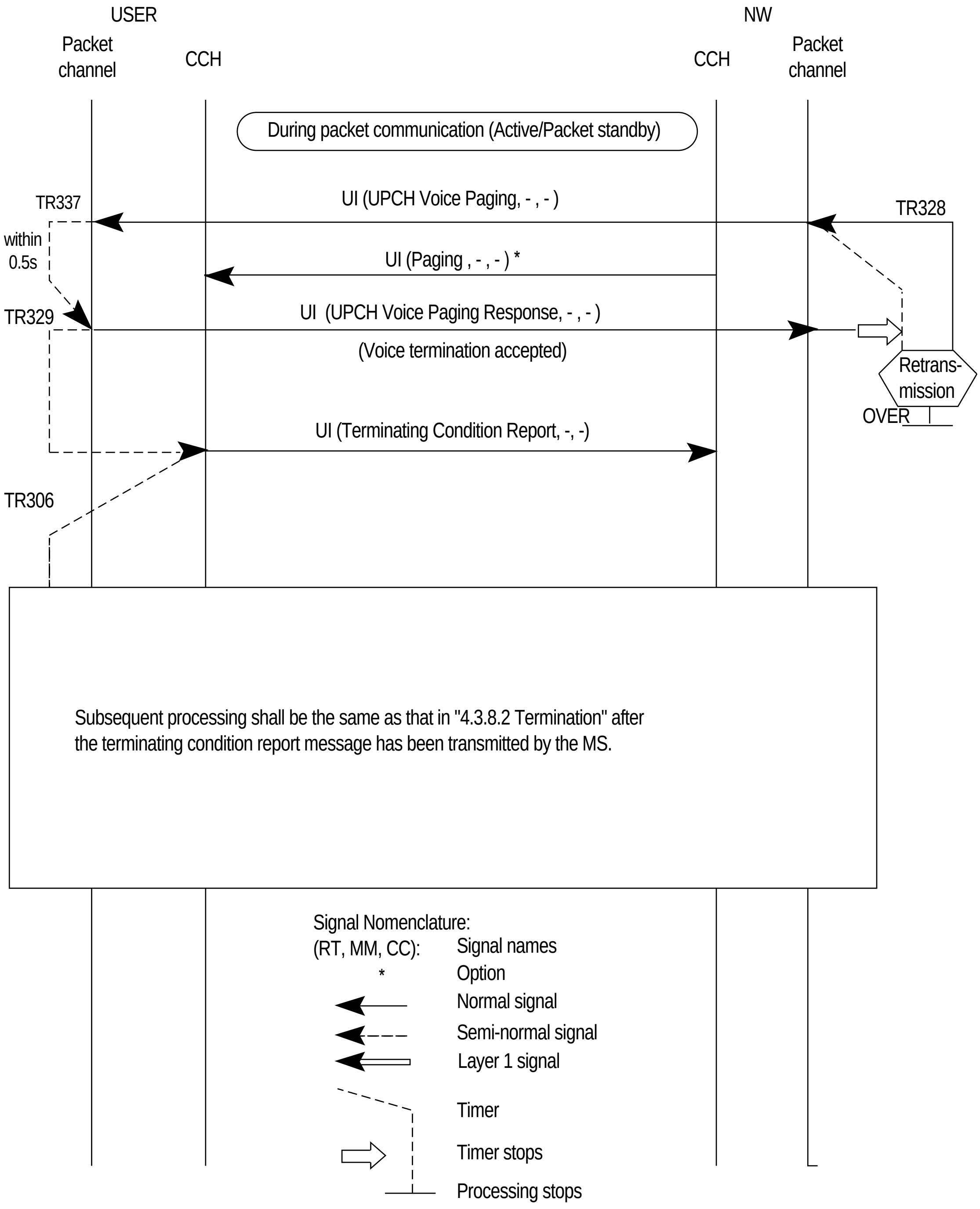


Fig. 4.3.8.22-1 Voice termination sequence during packet communication (Active/Packet standby)

4.3.8.23 Voice termination reject during packet communication (Active/Packet standby) (Voice Terminating Method 1)

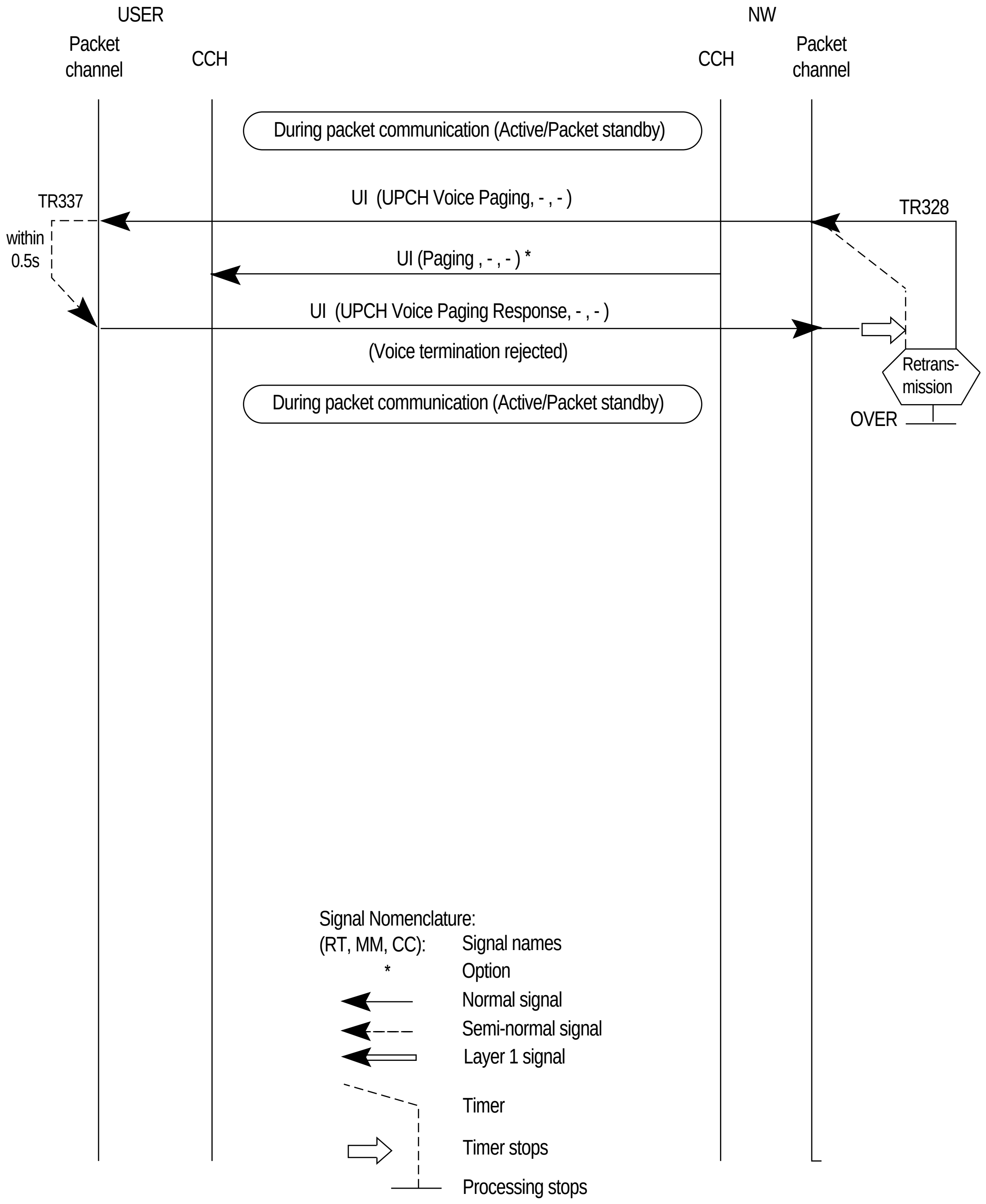
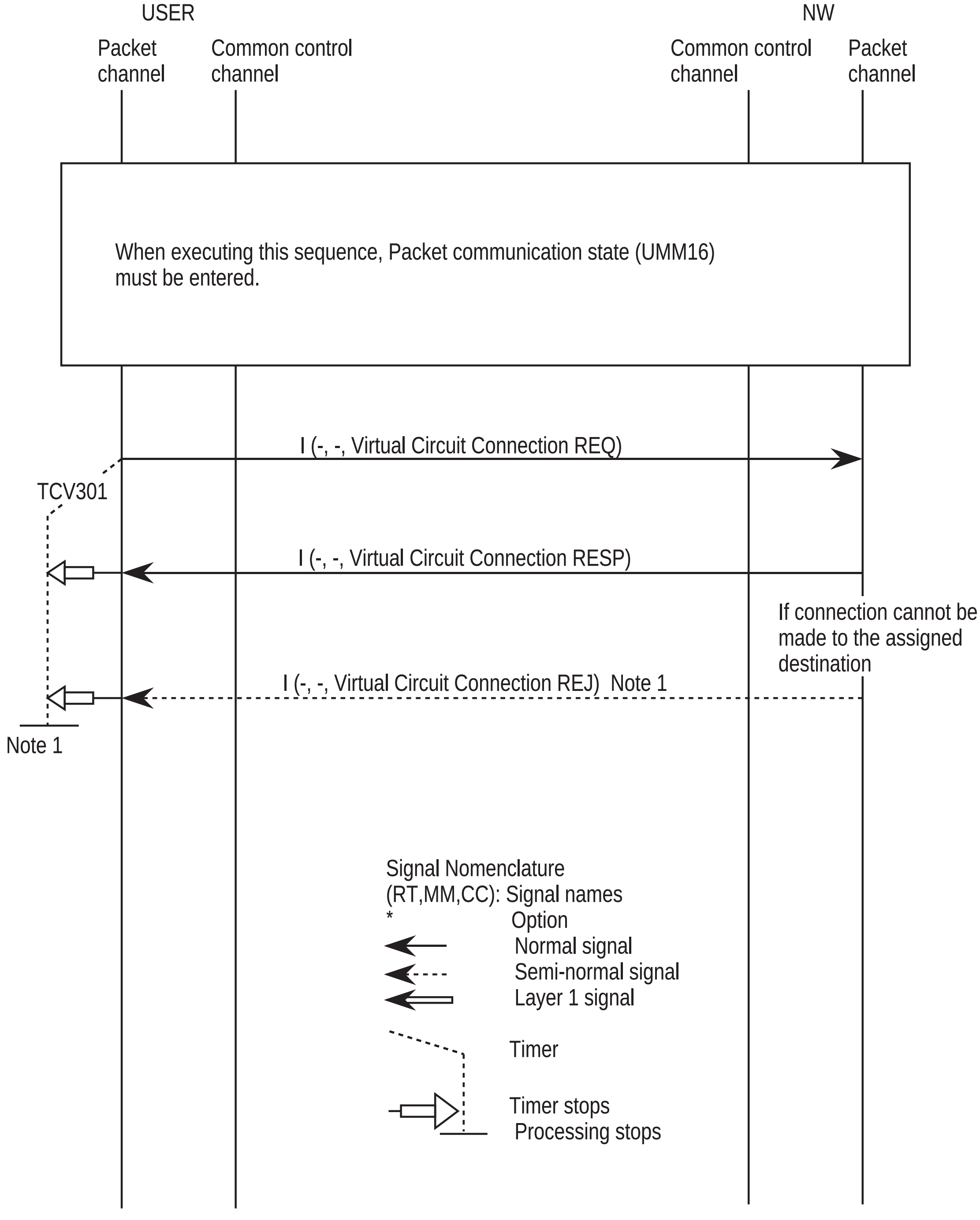


Fig. 4.3.8.23-1 Voice reception reject sequence during packet communication (Active/Packet standby)

4.3.8.24 Virtual circuit connection (user activated)

The virtual circuit connection sequence (user activated) is shown in Fig. 4.3.8.24-1 below.



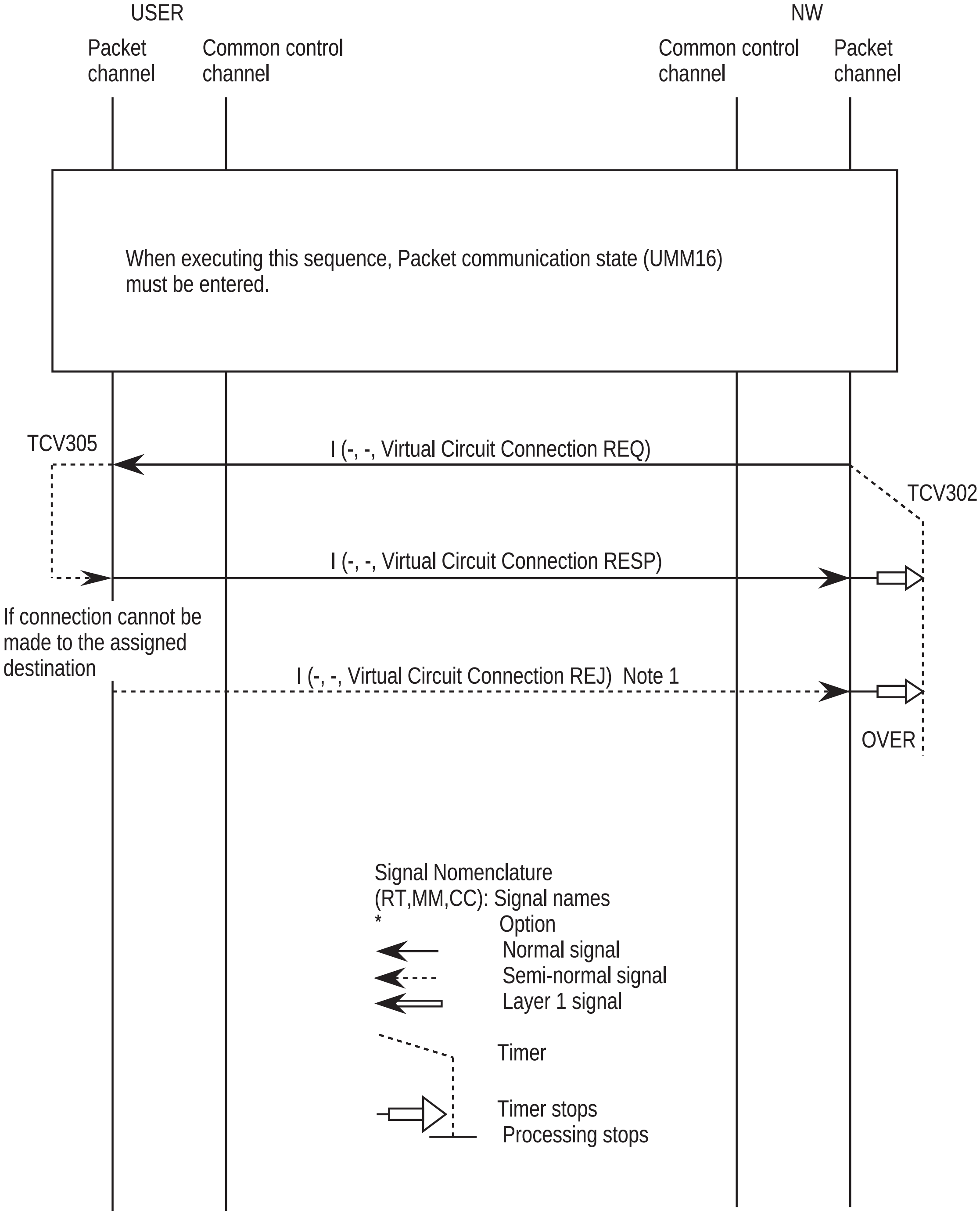
Note 1: In case of timeout or reception of a Connection Reject message on the user side, and if the packet communication is terminated, the user shall perform the packet communication deregistration procedure according to Section 4.3.8.17 "Packet communication deregistration".

Note 2: Signals on the UPCH in this sequence shall be transmitted and received in accordance with the transmission/reception procedure negotiated by packet communication registration or by the packet channel registration procedure.

Fig. 4.3.8.24-1 : Virtual circuit connection sequence (user activated)

4.3.8.25 Virtual circuit connection (network activated)

The virtual circuit connection sequence (network activated) is shown in Fig. 4.3.8.25-1 below.



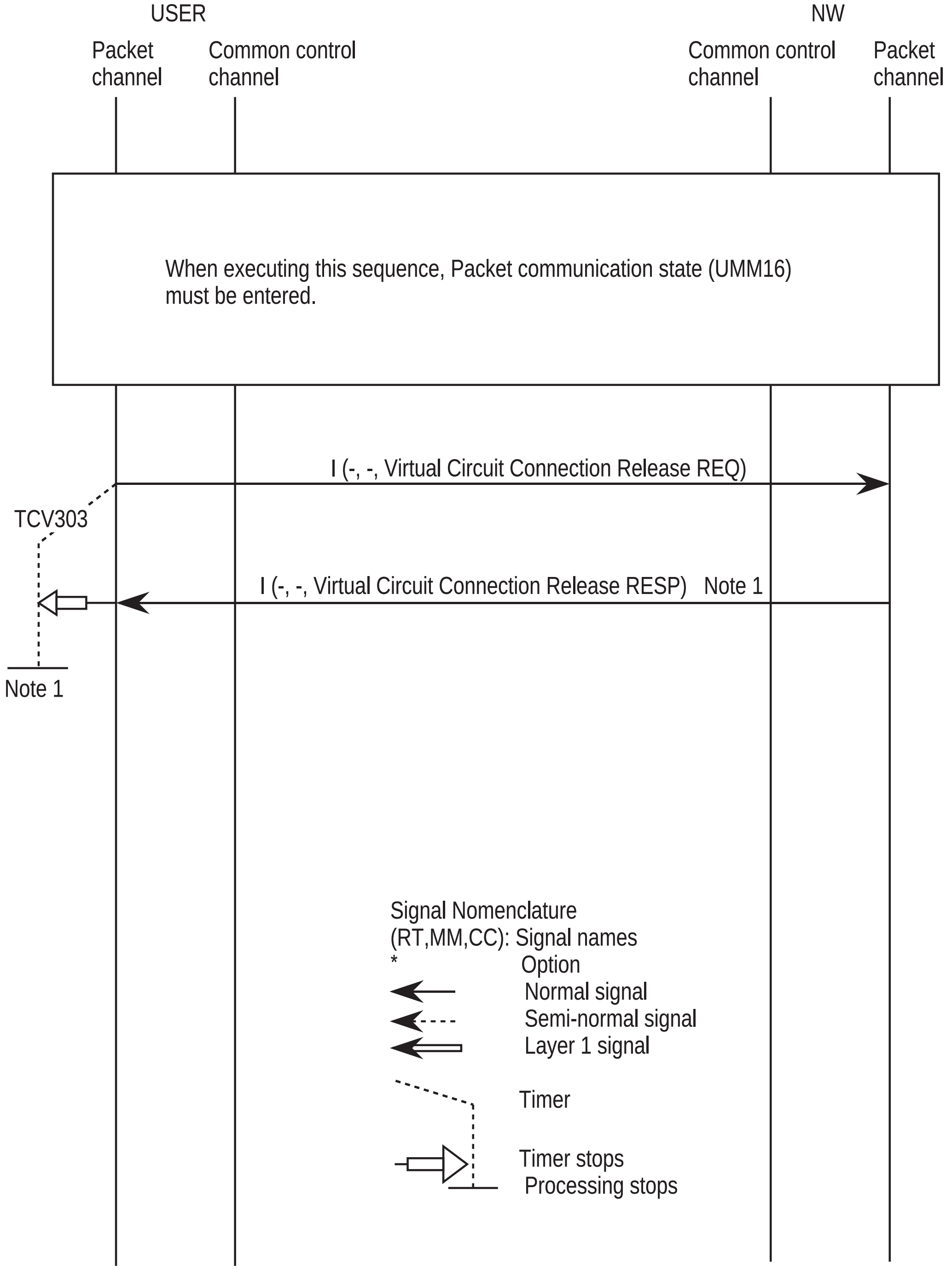
Note 1: In case of timeout or reception of a Connection Reject message on the user side, and if the packet communication is terminated, the user shall perform the packet communication deregistration procedure according to Section 4.3.8.17 "Packet communication deregistration".

Note 2: Signals on the UPCH in this sequence shall be transmitted and received in accordance with transmission/ reception procedure negotiated by packet communication registration or by the packet channel registration procedure.

Fig. 4.3.8.25-1 : Virtual circuit connection sequence (network activated)

4.3.8.26 Virtual circuit connection release (user activated)

The virtual circuit connection release (user activated) is shown in Fig. 4.3.8.26-1 below.



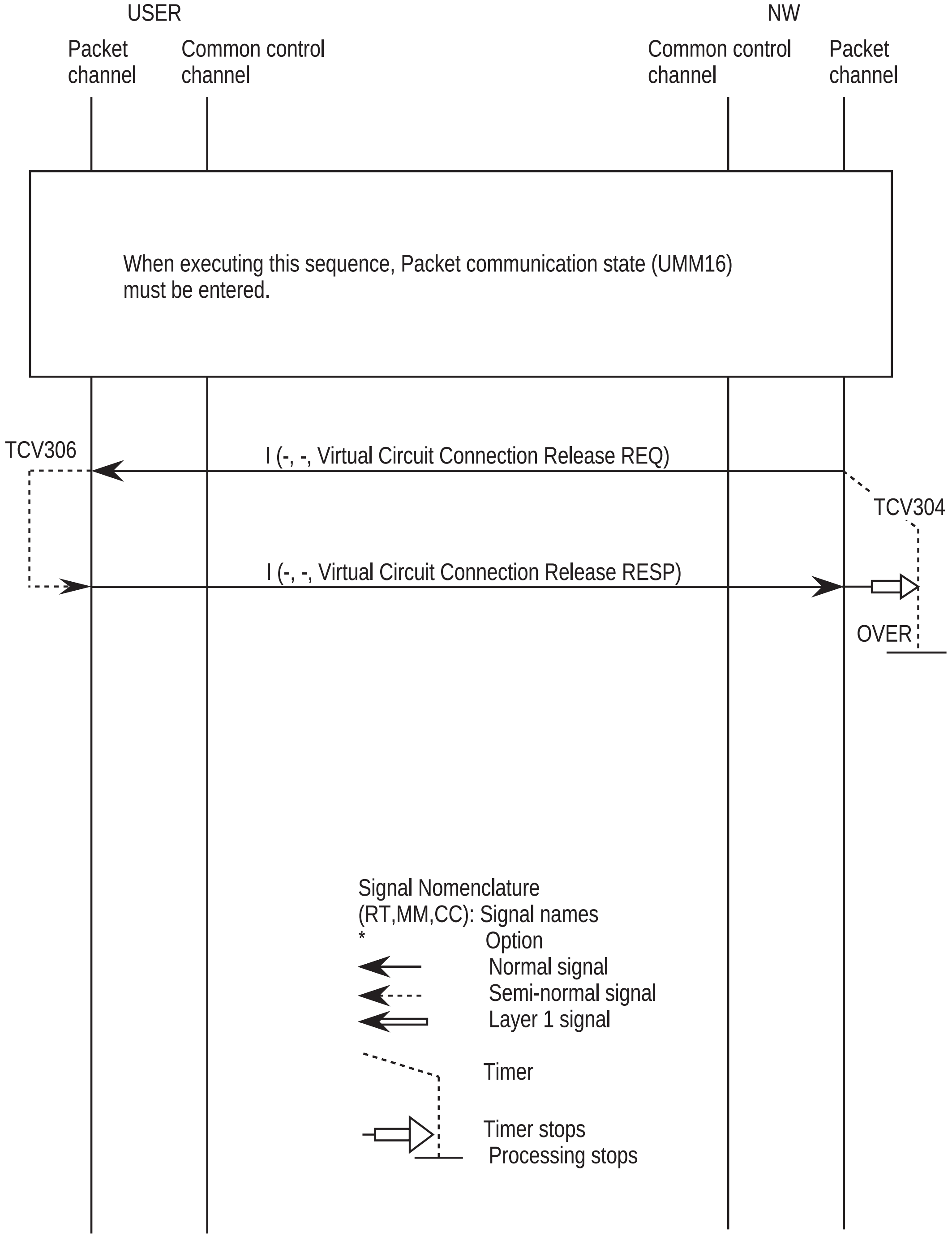
Note 1: In case of timeout or reception of a Connection Reject message on the user side, and if the packet communication is terminated, the user shall perform the packet communication deregistration procedure according to Section 4.3.8.17 "Packet communication deregistration".

Note 2: Signals on the UPCH in this sequence shall be transmitted and received in accordance with transmission/ reception procedure negotiated by packet communication registration or by the packet channel registration procedure.

Fig. 4.3.8.26-1 : Virtual circuit connection sequence release (network activated)

4.3.8.27 Virtual circuit connection release (network activated)

The virtual circuit connection sequence (network activated) is shown in Fig. 4.3.8.27-1 below.



Note 1: Signals on the UPCH in this sequence shall be transmitted and received in accordance with transmission/reception procedure negotiated by packet communication registration or by the packet channel registration procedure.

Fig. 4.3.8.27-1 : Virtual circuit connection release (network activated)

4.3.8.28 Voice paging during packet communication (Active) (Voice Terminating Method 2)

The sequence for voice paging during packet communication (Active) (Voice Terminating Method 2 ; for the case when UPCH Voice Paging 2 message is received) is shown in Fig. 4.3.8.28-1. Fig.4.3.8.28-2 and Fig.4.3.8.28-3 show the sequences for the cases where UPCH Voice Channel Request message is received directly during the packet communication (Active), which is accepted and not accepted, respectively.

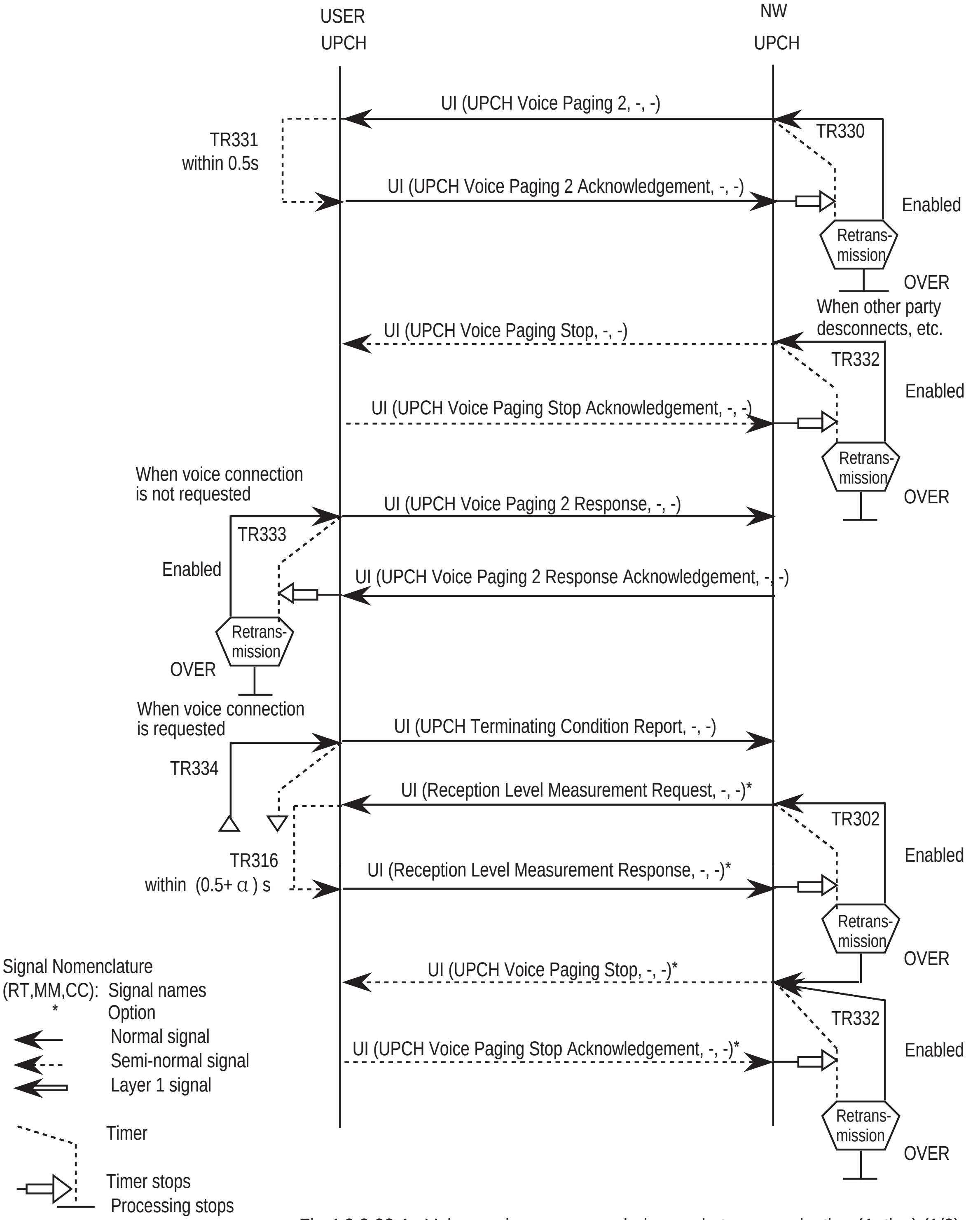
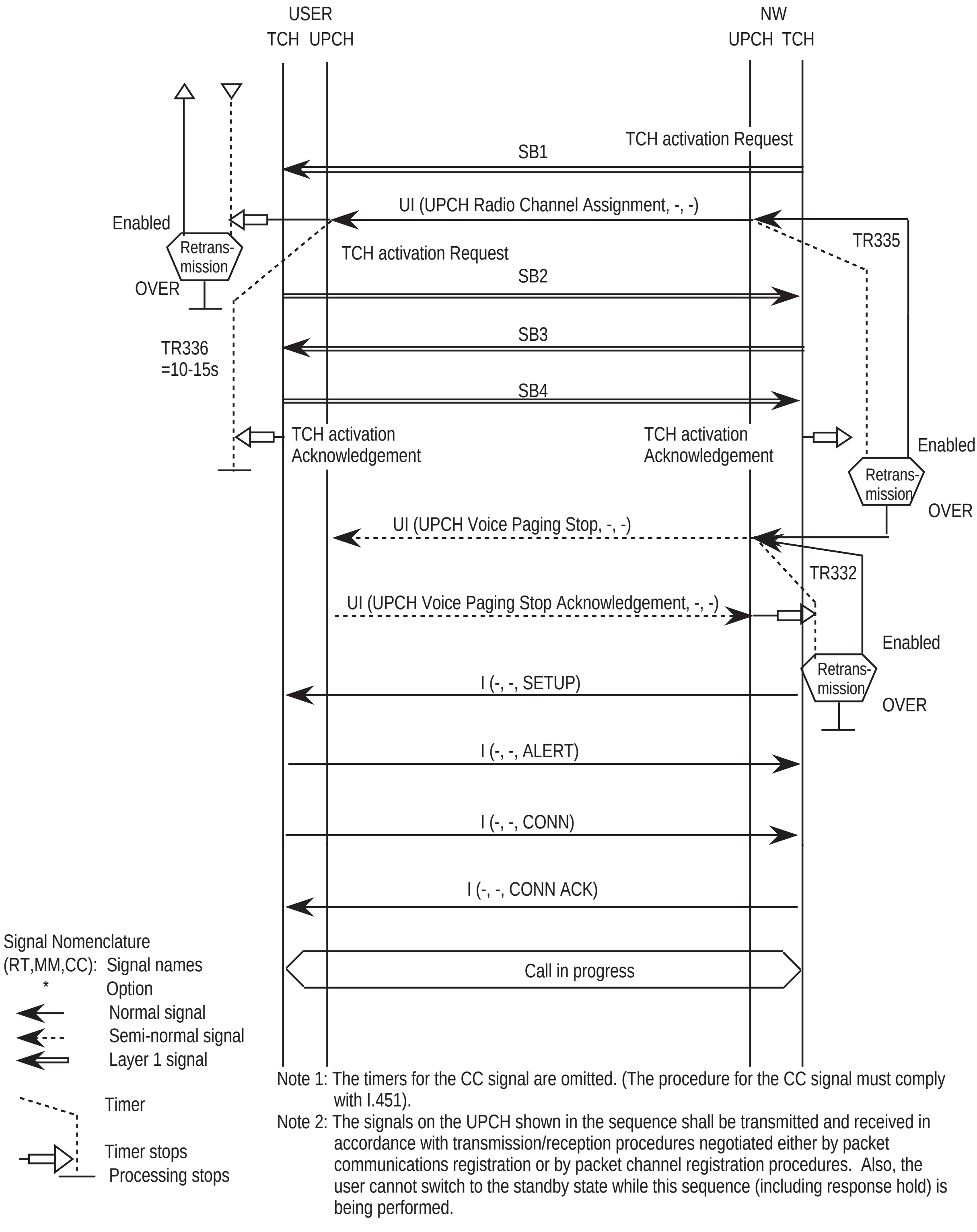


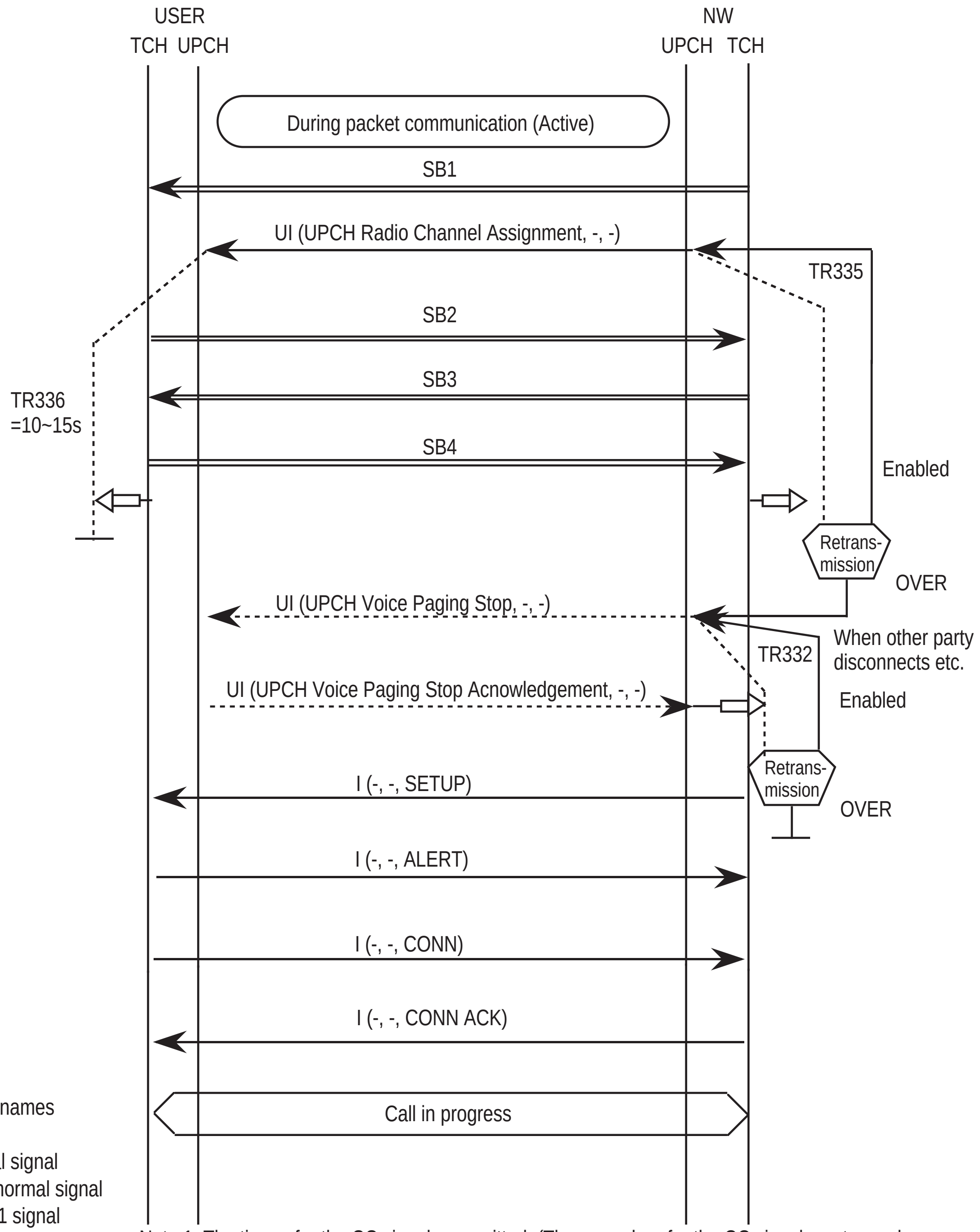
Fig.4.3.8.28-1 : Voice paging sequence during packet communication (Active) (1/2)
(In case for the user receiving UPCH Voice Paging 2 message)

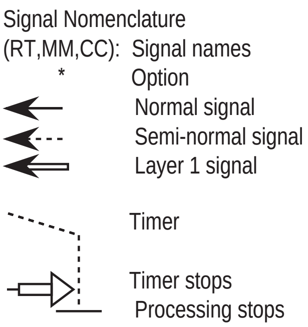


Note 1: The timers for the CC signal are omitted. (The procedure for the CC signal must comply with I.451).

Note 2: The signals on the UPCH shown in the sequence shall be transmitted and received in accordance with transmission/reception procedures negotiated either by packet communications registration or by packet channel registration procedures. Also, the user cannot switch to the standby state while this sequence (including response hold) is being performed.

Fig.4.3.8.28-1 : Voice paging sequence during packet communication (Active) (2/2)
(In case for the user receiving UPCH Voice Paging 2 message)

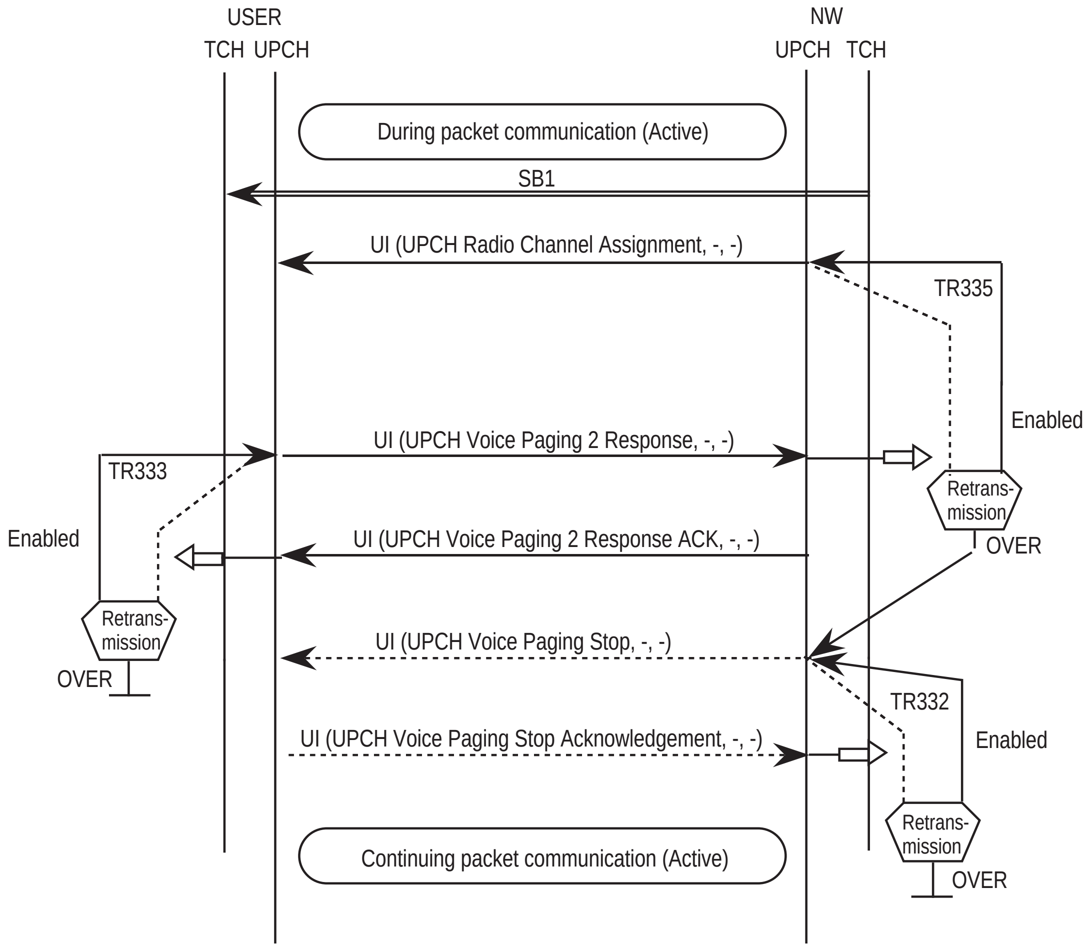




Note 1: The timers for the CC signal are omitted. (The procedure for the CC signal must comply with I.451).

Note 2: The signals on the UPCH shown in the sequence shall be transmitted and received in accordance with transmission/reception procedures negotiated either by packet communications registration or by packet channel registration procedures. Also, the user cannot switch to the standby state while this sequence (including response hold) is being performed.

Fig. 4.3.8.28-2 : Voice paging sequence during packet communication (Active)
(In case for the user receiving directly UPCH Radio Channel Assignment and starting voice termination)



Signal Nomenclature
(RT,MM,CC): Signal names
* Option
Normal signal
Semi-normal signal
Layer 1 signal

Timer

Timer stops
Processing stops

Note 1: The timers for the CC signal are omitted. (The procedure for the CC signal must comply with I.451).

Note 2: The signals on the UPCH shown in the sequence shall be transmitted and received in accordance with transmission/reception procedures negotiated either by packet communications registration or by packet channel registration procedures. Also, the user cannot switch to the standby state while this sequence (including response hold) is being performed.

Fig. 4.3.8.28-3 : Voice paging sequence during packet communication (Active)
(In case for receiving UPCH Voice Channel Request; Not accepted)

4.3.8.29 Voice paging during packet communication (Packet standby) (Voice Terminating Method 2)

The sequence for voice paging during packet communication (Packet standby) (Voice Paging Method 2) is shown in Fig. 4.3.8.29-1

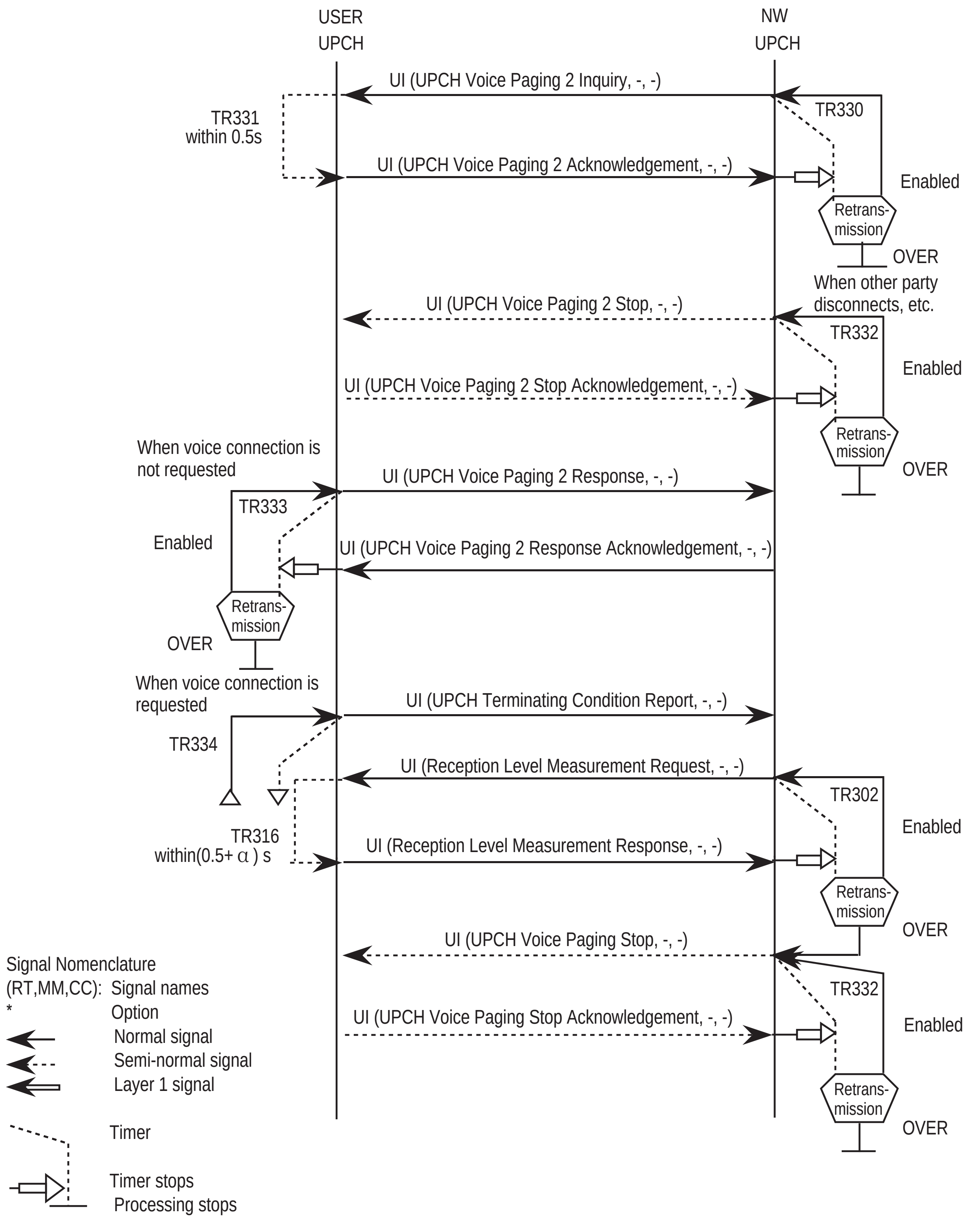
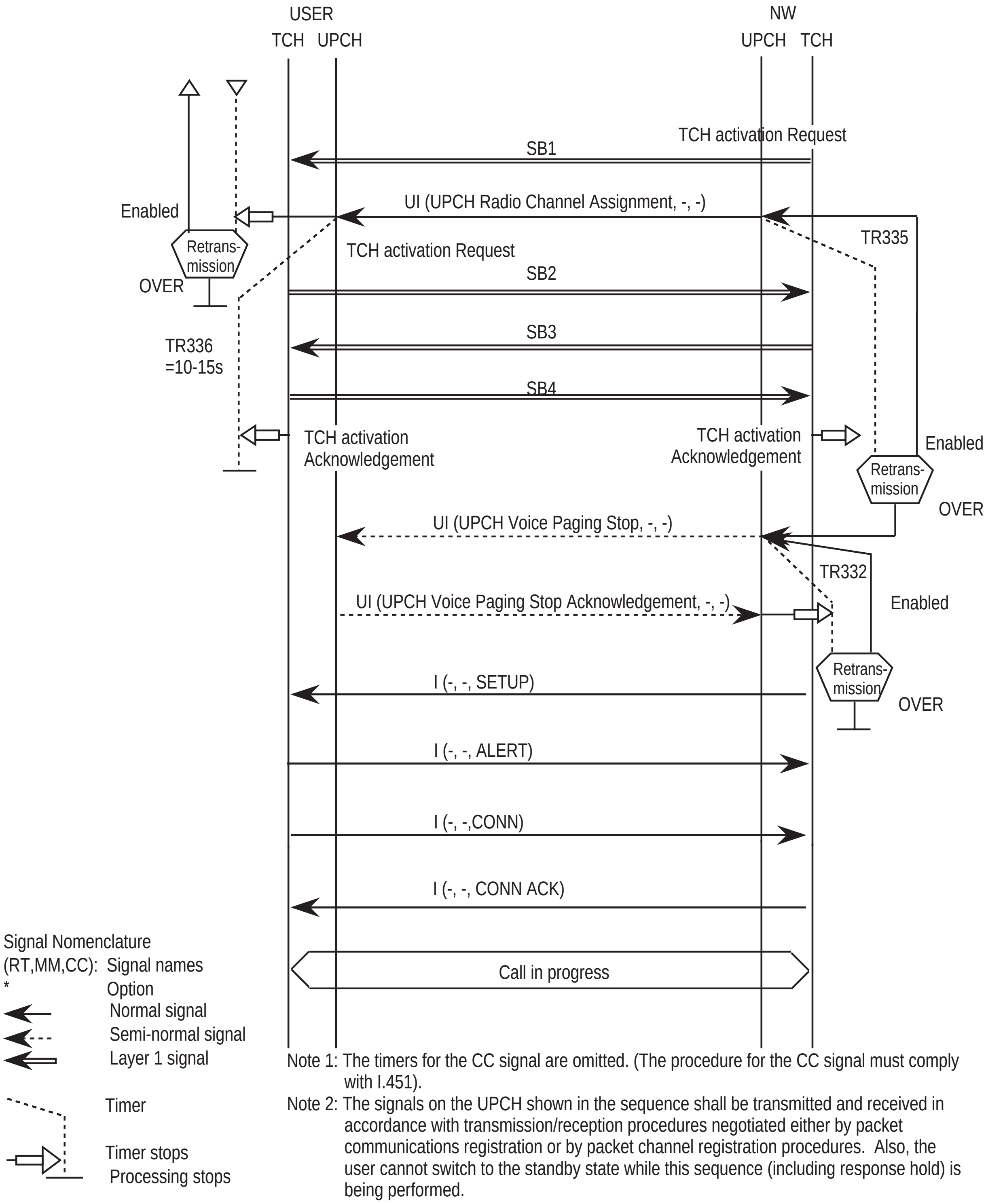


Fig.4.3.8.29-1 : Voice paging sequence during packet communication (Packet standby) (1/2)



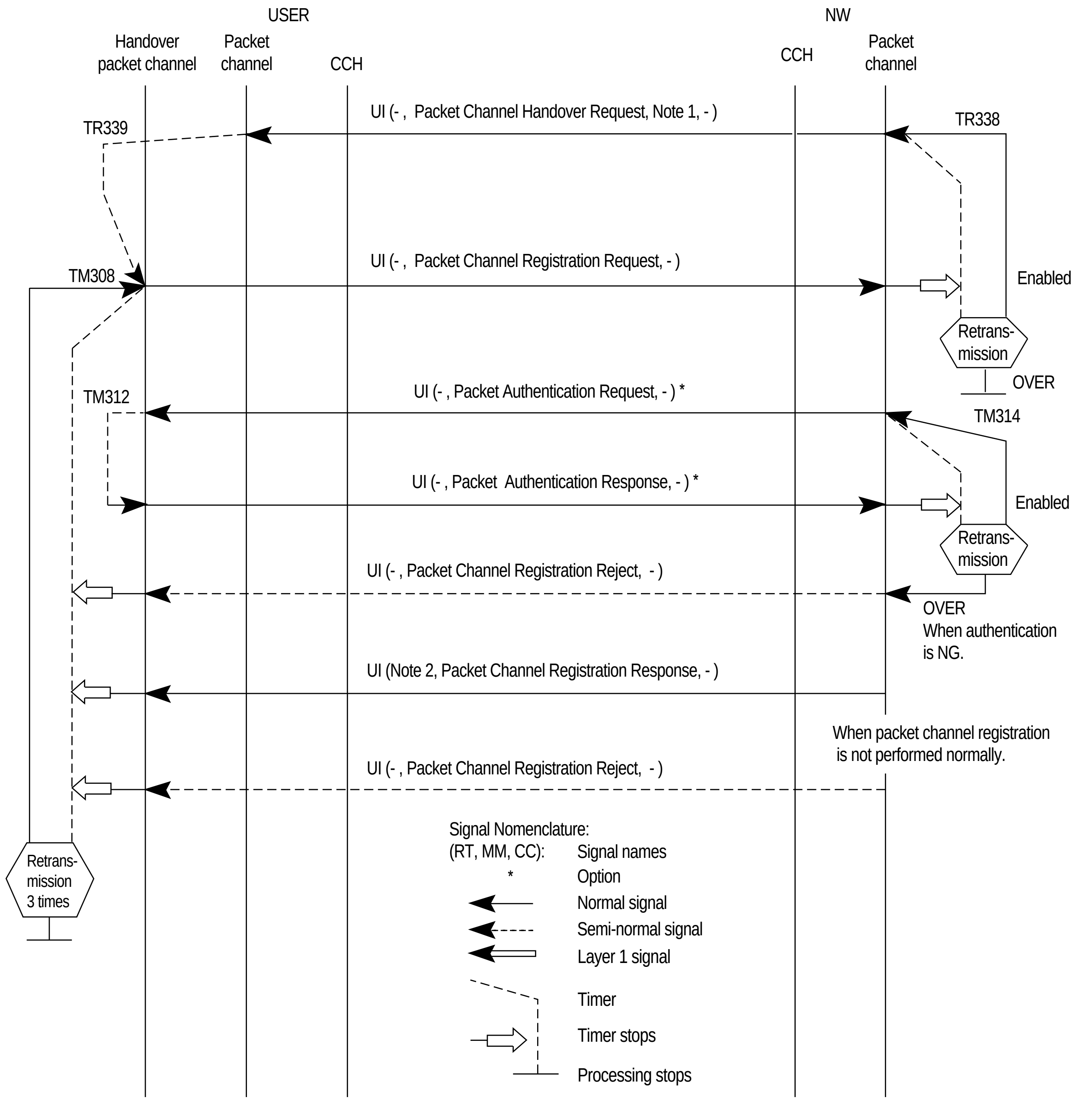
Note 1: The timers for the CC signal are omitted. (The procedure for the CC signal must comply with I.451).

Note 2: The signals on the UPCH shown in the sequence shall be transmitted and received in accordance with transmission/reception procedures negotiated either by packet communications registration or by packet channel registration procedures. Also, the user cannot switch to the standby state while this sequence (including response hold) is being performed.

Fig.4.3.8.29-1 : Voice paging sequence during packet communication (Packet standby) (2/2)

4.3.8.30 Packet channel handover (when the terminal registration area code is not changed)

Fig. 4.3.8.30-1 shows the packet channel handover sequence activated by the Packet Channel Handover Request from the network.

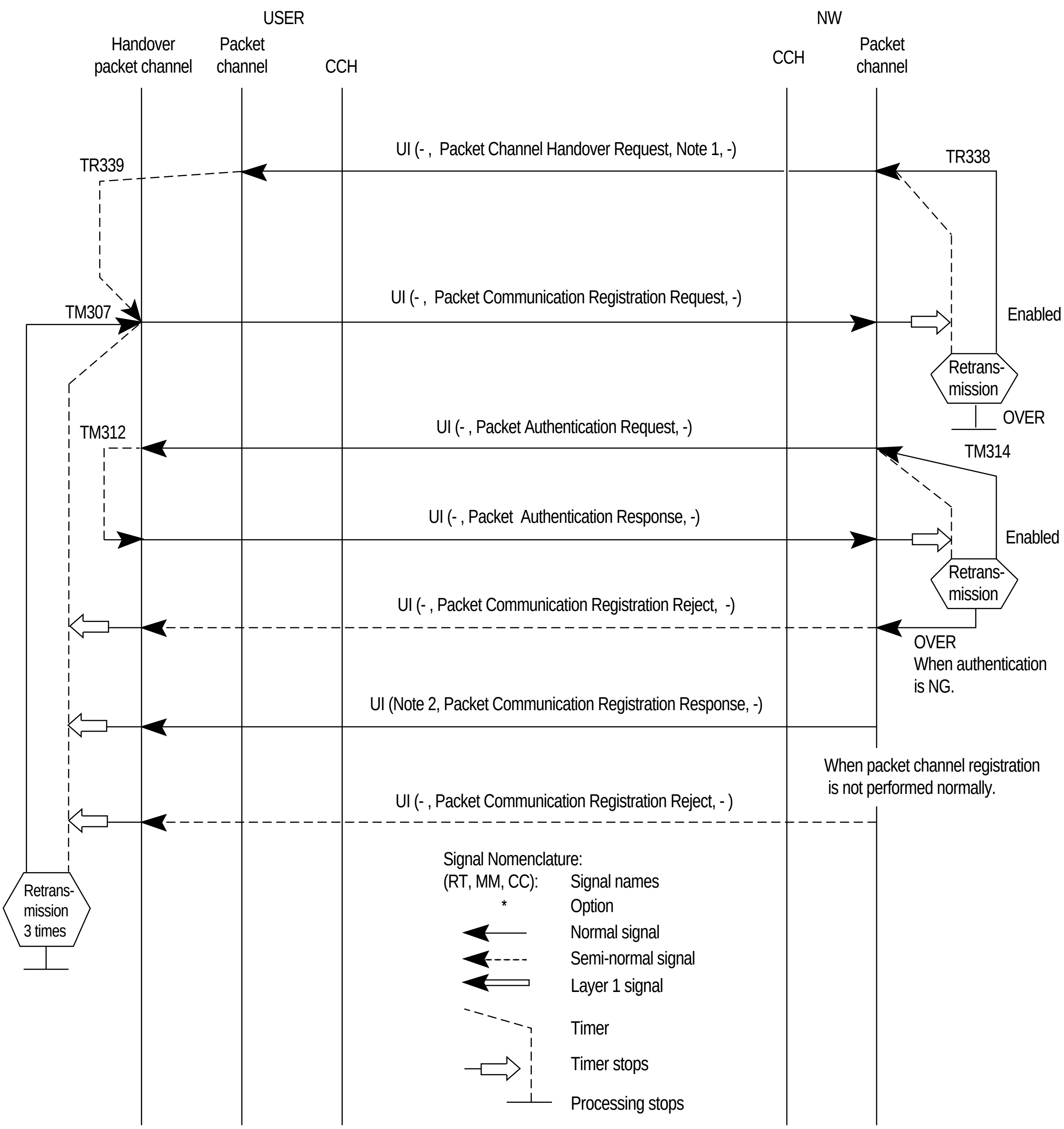


Note 1: This message can be sent with the Packet Communication Registration Response or Packet Channel Registration Response by the platform function.
Note 2: The Packet Channel Handover Request can be included in this frame by the platform function. When included, TR338 shall be activated and the sequence shall comply with the sequence in Section 4.3.8.30 Packet Channel Handover (when the terminal registration area code is not changed) or Section 4.3.8.31 Packet Channel Handover (when the terminal registration area code is changed).

Fig.4.3.8.30-1 Packet channel handover sequence (when the terminal registration area code is not changed)

4.3.8.31 Packet channel handover (when the terminal registration area code is changed)

Fig. 4.3.8.31-1 shows the packet channel handover sequence activated by the Packet Channel Handover Request from the network.



Note 1: This signal may be sent in the Packet Communication Registration Response or Packet Channel Registration Response by the platform function.

Note 2: The Packet Channel Handover Request can be included in this frame by the platform function. When included, TR338 shall be activated and the sequence shall comply with the sequence in Section 4.3.8.30 Packet Channel Handover (when the terminal registration area code is not changed) or Section 4.3.8.31 Packet Channel Handover (when the terminal registration area code is changed).

Fig.4.3.8.31-1 Packet channel handover (when the terminal registration area code is changed)

4.3.9. Communication between layers

Interlayer communications and communications between the respective layer and the management are performed with primitives. This section specifies the primitives which is used for the control from layer 3 to layer 1 between layer 3 and the management. The DL-primitive between layers 3 and 2 is described in the layer 2 specifications.

4.3.9.1 Layer 3 and management entity

4.3.9.1.1 RT and management entity

4.3.9.1.1.1 Primitives

4.3.9.1.1.1.1 MRT-ACT primitive

The MRT-ACT primitive is used by the layer 3 RT entity for requesting/acknowledging activation of the control or communication channels on layer 1 through the management. This primitive is also used for deactivating layer 1 of the handovered channel on the mobile station. The relationship between layer 1 and the MRT-ACT primitive is shown below in Fig. 4.3.9.1-1.

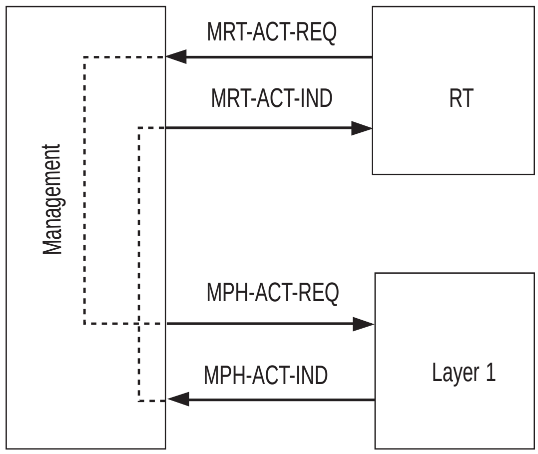


Fig. 4.3.9.1-1 : Relationship between the MRT-ACT primitive and layer 1

4.3.9.1.1.1.2 MRT-DEA primitive

The MRT-DEA primitive is used by the layer 3 RT entity for requesting/acknowledging deactivation of the control or communication channels on layer 1. The relationship between layer 1 and the MRT-DEA primitive is shown in Fig. 4.3.9.1-2 below.

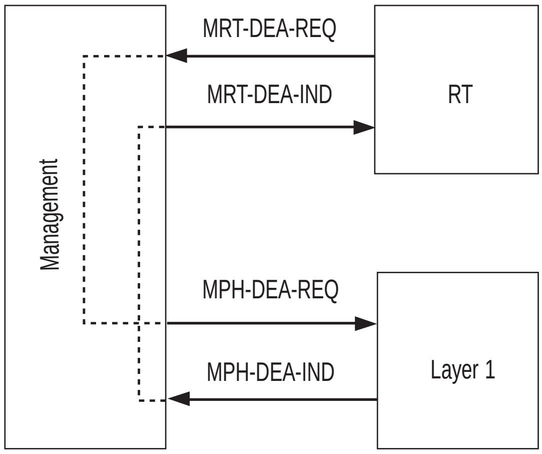


Fig. 4.3.9.1-2 : Relationship between the MRT-DEA primitive and layer 1

4.3.9.1.1.1.3 MRT-INF primitive

The MRT-INF primitive is used by the layer 3 RT entity for requesting or indicating information. The types of information i.e. parameters in the primitive are listed below.

i) Reception-level

Refers to the reception-level as measured based on the frequency or measurement conditions specified by the request.

ii) Communications quality

Refers to the reception-level and bit error ratio for the communication channel.

iii) Error status

Refers to out-of-sync, squelch, and lowering of quality, for the communication channel. And refers to out of the waiting conditions (out of communication radius) for the controlling channel.

The relationship between MRT-INF primitive and layer 1 is shown in Fig. 4.3.9.1-3.

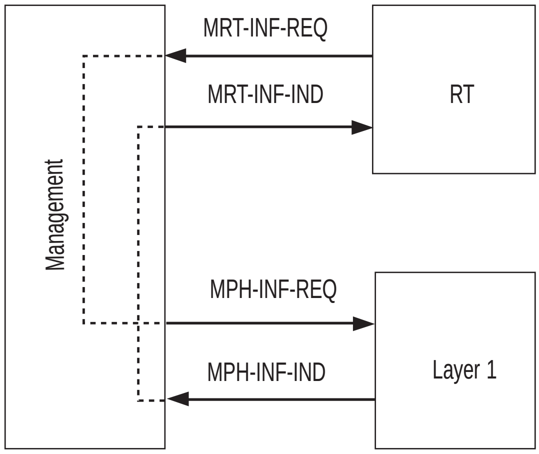


Fig. 4.3.9.1-3 : Relationship between the MRT-INF primitive and layer 1

4.3.9.1.1.2 Primitive procedures

The procedures used for the primitives are described in the RT control procedure.

4.3.9.1.2 MM and management entity

<Currently the MM does not control layers 1 and 2.>

4.3.9.1.3 CC and management entity

<Currently the CC does not control layers 1 and 2.>

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