INTEGRATED DISPATCH RADIO SYSTEM

ARIB STANDARD

RCR STD - 32A

Fascicle 1

ISSUED MARCH 17TH, 1993
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Association of Radio Industries and Businesses (ARIB)

General notes for the English version of the ARIB Standard 32A

The original "Integrated Dispatch Radio System ARIB Standard (RCR STD–32A)" is written in Japanese and has been approved by the 2nd Standard Assembly (November 15, 1995). This document is the translation of the Standard into English.

The note about IPR (Industrial Property Rights) in the INTRODUCTION of Fascicle 1 of this document applies to the use of Essential IPR for the ARIB Standard in Japan. If the ARIB Standard is adopted outside Japan, Essential IPR will be treated in accordance with policies stated by each IPR owner. The IPR owners are, however, expected to apply the rules of the preface of the "Guidelines for Treatment of Industrial Property Rights in connection with the ARIB Standard" (September 5, 1995, approved by the 1st Standard Assembly). The preface of these Guidelines states that it is "desirable that the Essential IPR which relates to any or all parts of the contents of the ARIB Standard should be used free of charge by anyone and that it would not block the use of such Essential IPR in any other country where such an ARIB Standard is adopted".

INTEGRATED DISPATCH RADIO SYSTEM (IDRA) ARIB STANDARD

INTRODUCTION

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 "Integrated Dispatch Radio System (IDRA) 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 Standards 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 ARIB Standard contains no specific reference to any Essential Industrial Property Right relating thereto, the holder of such Essential Industrial Property Right states that "YYY" is the holder of the Industrial Property Right "XXX" covering this ARIB Standard and agrees not to assert such right "XXX" and to grant a license unconditionally to the use of such right "XXX" to anyone using this ARIB Standard. However this does not apply to anyone who uses this ARIB Standard and also owns and lays claim to any other Essential Industrial Property Right whose scope is included in any or all parts of the contents of the provisions of this ARIB Standard.

Patent Holder	Name of Patent	Registration No. / Application No.
MOTOROLA, INC.	(1) MULTIPLE CONTROL SLOT TDM/FDM COMMUNICATION SYSTEM	503049 (applied 1990)
	(2) COMMUNICATION SIGNAL HAVING A TIME DOMAIN PILOT COMPONENT	510235 (applied 1991)
	(3) PEAK TO AVERAGE POWER RATIO REDUCTION METHODOLOGY FOR A QAM COMMUNICATION SYSTEM	92/06606 (PCT/US)
	(4) MULTI-CHANNEL TDM COMMUNICATION SYSTEM SLOT PHASE CORRECTION	92/08069 (PCT/US)

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PART 1 DIGITAL MCA SYSTEM

Chapter 1 General

1.1 Overview

This standard specifies the radio section interface of the telecommunication system used for digital multichannel access system in the 800 MHz and 1.5GHz frequency bands (hereinafter, "Digital MCA System").

This system will specify the land mobile telecommunication specified in accordance with article 49-7-2 of the Japanese Radio Facility Regulation ("Musen Setsubi Kisoku").

1.2 Scope of the Standard

This digital MCA system consists of a repeater station, mobile stations, and control stations. This standard specifies the radio section interface of the digital MCA system as indicated in Fig. 1.2-1

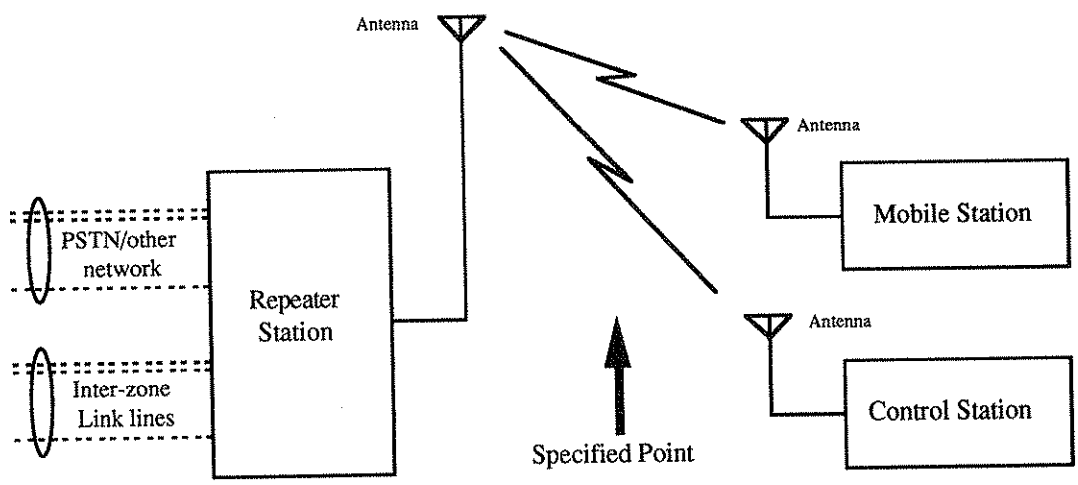


Fig. 1.2-1 Configuration of the Digital MCA Land Mobile Communication System

1.3 Principles for Standardization

This standard specifies the following articles, considering coexistence and mutual connectivity of the systems.

(a) The descriptions of Chapter 3 "Specification of Radio Equipment"

(b) Next specifications

- Essential specifications to perform basic connection and basic services
- Optional specifications, such as protocols, which will be able to be selected and which are next importance to the above essential specifications.

In addition, future expandability and flexibility of the selections are taken into account. Careful consideration should be taken, as well, not to hamper non-standardized specifications.

The following rules apply to the unused information elements in Chapter 4 "Communication Control System".

Reserved	: Refer to the field or bit pattern reserved for the future expansion of the RCR standard. Use is restricted to that specified in the RCR standard.
	Reserved field must be transmitted with '0's unless otherwise specified.
Option	: Refer to the field or bit pattern; used arbitrarily.
Preparatory	: The usage is the same as for "Option". It is called "Preparatory" in the cases where the RCR standard recommends using an extension of a particular information element.

Chapter 2 Outline of the System

2.1 System Configuration

The digital MCA system consists of control stations, mobile stations (including portable stations), and a repeater station. The basic communication occurs between a control station and a mobile station, or between mobile stations using the repeater station.

A collection of control station(s) with mobile stations, or mobile stations only (hereinafter, *Fleet*), among which communications occur, has its own unique identification code (Fleet ID). All radio stations in the fleet perform their communication on the radio channel specified by the repeater station using MCA system.

The basic concept of the digital MCA system is illustrated in Fig. 2.1-1.

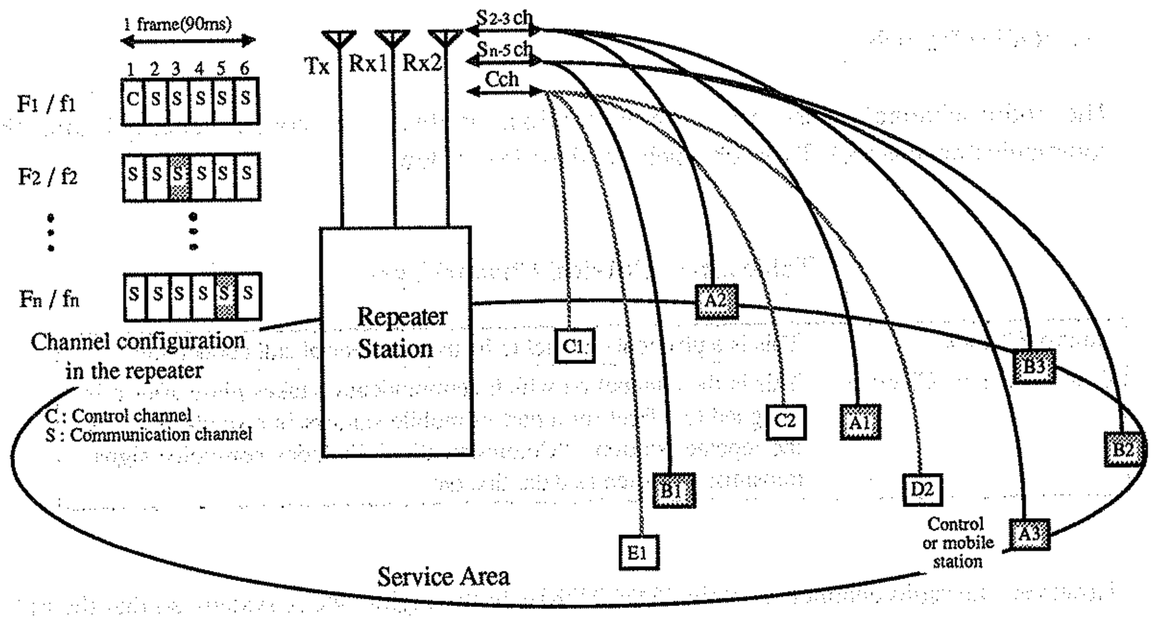


Fig. 2.1-1 Basic Concept of the Digital MCA System

The digital MCA system consists of a repeater station, control stations, and mobile stations. In Fig. 2.1-1 the symbols ("A1", "B2", etc.) represent each control station or mobile station. The letters represent a fleet ID; the numeric following represents an individual ID within the fleet. The shaded parts represent the radio stations carrying out the communication or radio channels in use, and the unshaded parts represent radio stations in an idle state or radio channels not in use.

As shown on the left side of Fig. 2.1-1, the required frequency resource (Outbound carrier frequency/Inbound carrier frequency : F1/f1, F2/f2, ~ Fn/fn) is assigned to the repeater station of the digital MCA system concerned, from the total frequency resource allocated for digital MCA. The control channel is assigned to a carrier frequency. A control station or a mobile station transmits a call request to the repeater station via that control channel. The repeater station then performs the call control process on that request.

The repeater station assigns one or more available channels, from the assigned frequency resource to the fleet where the requesting station belongs. In Fig. 2.1-1, "Cch" represents the control channel, and "S2 - 3 ch" and "Sn - 5 ch" represent communication channels. The first number following 'S' represents a carrier number and the second number represents a slot number.

2.1.1 Basic Configuration of the System

(1) Radio Stations in the System

The basic digital MCA system consists of one repeater station, multiple control stations and mobile stations.

(2) Channels of the System

(A) Radio Channels

The radio channels used for communications include the control channel and the communication channel. These channels are described below.

Table 2.1-1 Physical Channel Type

Control Channel	This is a physical channel to be used to control call connection.
Communication Channel	This is the channel on which communication takes plase after it is assigned to a fleet (or a part of mobile stations in a single fleet) by the repeater station. "Communication" includes non-voice signal transmissions such as data, fax, etc..

However, the radio channels contain TDM/TDMA in the digital MCA system, so that the radio channel described does not have one-to-one correspondence with the radio carrier (as in the analog MCA system). In the TDM/TDMA system, the radio carrier is segmented into frames at regular time intervals, then the frame is further divided into slots depending on the number of multiplex. Consequently, the radio channels are formed with the collection of slots occupying the same position in successive frames.

In the digital MCA system, a combination (one or more) of the control channels with multiple communication channels (managed by the control channels) forms a radio channel system. The radio channel arrangement is outlined below.

(a) Control Channel

One control channel can consist of one or more slots in a frame on a single carrier. Multiple control channels can be arranged either on a single carrier or on several different carriers.

(b) Communication Channel

Using a repeater station, the system assigns a communication channel to a fleet or to mobile staions and control stations in the fleet every time a call is requested. Communication includes not only normal voice signal transmission, but also non-voice signal transmissions such as data, FAX, etc. In principle, the communication channel assigned by the repeater station consists of one slot in a frame; however, it may also consist of multiple slots as required.

The radio carrier containing one or more control channels is defined as the control carrier, while the radio carrier consisting of communication channels is the communication carrier.

(B) Other Channels for Communication

In the digital MCA system, it is possible to link to the PSTN/PSDN/ISDN (provided by the first-class telecommunications common carriers) at the repeater station or control station.

It is also possible to link to other repeater stations with a dedicated line or other means.

(3) Equipment Configuration

A repeater station, a control station, and a mobile station in the digital MCA system include the radio equipment, the adapter equipment, and the power supply equipment (as shown in Fig. 2.1-2 and Fig. 2.1-3, respectively).

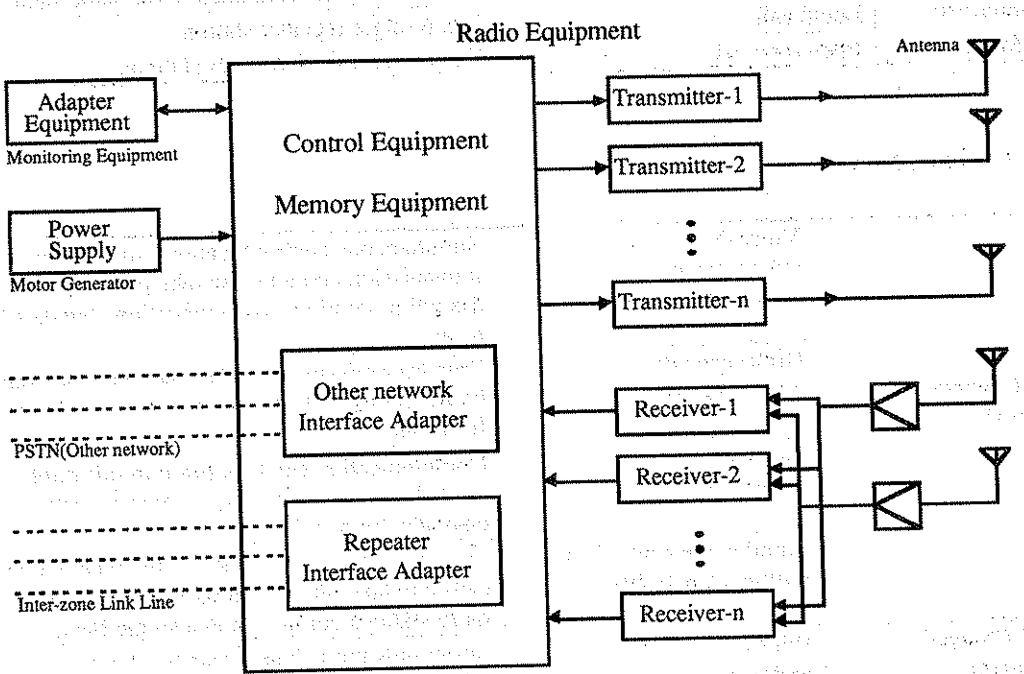


Fig. 2.1-2 Repeater Station Configuration of the Digital MCA System

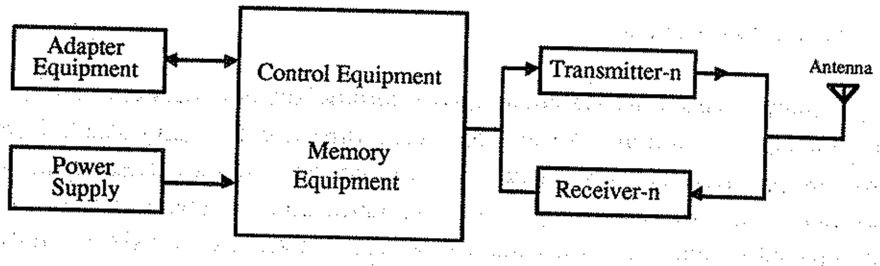


Fig. 2.1-3 Mobile Station/Control Station Configuration of the Digital MCA System

2.1.2 Offered Services

The services offered by the digital MCA system include basic services, optional services, and other network interconnect services. The optional services and the other network interconnect services may be offered, along with the basic services. However, the combination of an inter-zone call with a PSTN/PSDN interconnect call is excluded.

(1) Basic Services

Transmission Contents	Voice communication	Voice signal
	Nonvoice communication	Data, Video, Fax, etc.
Communication Mode	Group call	A Radio station belonging to a fleet can transmit to all or a part of radio stations in the same fleet.
	Individual call	A Radio station belonging to a fleet can transmit to one of radio stations contained in the same fleet.
Connection Mode	Local call	a call at a single repeater station
	Inter-zone call	a call at plural linked repeater stations

(2) Optional Services

Plural Channel Assignment	Voice-Nonvoice simultaneous communications	Simultaneous communications with different transmission contents can take place by assigning multiple communication channels for a call.
	High speed data communication	Data transmission at higher rates can take place by assigning multiple communication channels for a call.
	Full-duplex communication	Communication can take place in full-duplex mode by assigning multiple communication channels for a call.
	Simultaneous plural calls within a single fleet	Two or more of simultaneous and independent calls can take place by subgroups made up of radio stations comprised in a single fleet.
Special Channel Assignment	Prioritized channel assignment	Communication channel can be assigned with priority for an emergency call, etc..
Special Communication Service	Scrambled communication function	Secured communication can take place.

Note 1: A subgroup consists of a part of radio stations among all mobile and control stations that organize a fleet.

(3) Network Interconnect Services

PSTN/PSDN interconnect service	Communication can take place with PSTN/PSDN provided by the first class telecommunications common carriers at the repeater station or a control station.

2.2 Basic Functions of the System

The following section describes the basic and optional functions of the digital MCA system. The use of the optional functions is permitted; however, the adoption of the optional functions is limited so they don't significantly affect typical traffic, based on the operation of the basic functions only.

2.2.1 Basic Functions Required

The digital MCA system must include the following essential functions:

(A) Fleet ID Function

A unique IDentification code (ID) is assigned to a fleet, a collection of one or more control stations and mobile stations, or mobile stations only, among which communication can occur. The system includes the ability to identify the fleet with this ID.

(B) Channel Set-up Function

The system includes a channel set-up function. The Multi Channel Access (MCA) system has a dedicated control channel (hereinafter called a "Common Access Channel"), and the repeater station can assign the communication channel (hereinafter called a "User Specific Channel") to control stations and mobile stations existing in a single fleet.

(C) Channel Set-up Function With a Call Stand-by System

The system includes the channel set-up function, with a stand-by system in the channel set-up process (to reduce the blocking probability).

(D) Relay Function

The system provides a relay function to carry out communications among the radio stations in a single fleet. Accordingly, the communication mode at the repeater station must be the full-duplex mode. The bit-recovery relay mode is the basic relay mode; however, the error correcting relay mode also is provided. The transmission contents is voice and nonvoice (data, video text, FAX, etc.).

(E) Group Call Function

The system is equipped with a group call function in which a radio station belonging to a fleet can transmit to all or a part of the radio stations containeded in the same fleet.

(F) Simplex Call Function

The system provides the simplex call function, so that mobile stations and control station can carry out group calls on a pair of inbound and outbound user specific channels. Accordingly, the communication mode must be simplex mode in this case.

(G) Individual Call Function

The system provides an individual call function, so that a radio station belonging to a fleet can transmit to a single radio station in the same fleet.

(H) Communication Time-out Time Function

The system includes a communication time-out time function, to seek to provide the most efficient use of the frequency.

(I) Continuous Transmission Prevention Function

The system provides a function to allow a control station and a mobile station to discontinue transmission automatically when continuous transmission is caused by a radio failure.

2.2.2 Optional Functions

The digital MCA system may provide the following optional functions:

(A) PSTN/PSDN Interconnection

By installing the required adapter equipment, it is permitted to link to the PSTN/PSDN or other networks provided by the first class telecommunications common carriers. The connection to the first-class telecommunication common carrier telephone line that the user (the MCA system) independently to, within the scope of private communications, take place at the repeater station or the control station.*

(B) Multi-zone Connection

By installing the required adapter equipment, it is permitted to link multiple zones mutually at the repeater stations with dedicated lines or other means within the scope of private communications. *

(C) Duplex Communication

Full-duplex communication is to be possible when any of the following conditions exists:

(a) When linked to the other telecommunication networks at the repeater station.

(b) When assigning multiple user specific channels to a single call to perform an efficient communication in data transmission, etc. .

(c) When there are enough available channels to assign multiple user specific channels to a single call for voice communications, etc. .

(D) Simultaneous Communications With Voice and Non-voice

By assigning multiple user specific channels to a single call, simultaneous communication with different contents to be transmitted can take place.

(E) Data transmission at Higher Rate

By assigning multiple user specific channels to a single call, data transmission at higher rates can take place.

(F) Simultaneous Multiple Calls Within a Single Fleet

The system provides a function so that two or more of independent calls can take place simultaneously by subgroups consisted of the mobile stations belonging to a single fleet.

(G) Prioritized Channel Assignment

The system includes a function that allows it to assign the user specific channels with priority for an emergency call, etc. .

(H) Secure Communications

The system provides the ability to communicate messages that are coded.

(*) : The communication coverage and purpose are specified in the radio station license .

2.3 Communication Control System

2.3.1 Transmission System

The TDM/TDMA with multiplex number of six (as shown in Table 2.3-1) is the standard radio channel access mode in the digital MCA system. When the full rate is applied, the voice coding rate (including error correcting codes) is 7.467 kbps or less.

Table 2.3-1 Specification of the Transmission System

Item	Specification	
Communication mode	Half-duplex mode (Outbound TDM/Inbound TDMA)	
Number of TDMA multiplex	6 (when full rate is applied)	
Carrier spacing	25 kHz	
Frequency separation between transmit and receive carriers	800 MHz band	55 MHz
	1.5 GHz band	48 MHz
Modulation	M16QAM (M = 4)	
Transmission rate	64 kbps (4 k baud)	

2.3.2 Structure of the Functional Channels

The structure of the functional channels in the digital MCA system is shown in Table 2.3-2.

Table 2.3-2 Channel Structure

CAC (Common Access Channel)	BCCH (Broadcast Control Channel)	
	CCCH (Common Control Channel)	
	UPCH (User Packet Channel)	
USC (User Specific Channel)	TCH (Traffic Channel)	
	UPCH (User Packet Channel)	
	ACCH (Associated Control Channel)	FACCH (Fast Associated Control Channel)
		SACCH (Slow Associated Control Channel)
RCCH (Radio Control Channel)		

(A) Common Access Channel(CAC)

Common access channel corresponds to the control channel in the analog MCA system, and is commonly accessed by the system users for broadcasting information and setting up calls, etc. .

(a) Broadcast Control Channel(BCCH)

Broadcast control channel is a unidirectional (outbound) channel used by the repeater station to send information such as channel structure, system information, access information, etc., to mobile stations.

(b) Common Control Channel(CCCH)

Common control channel is a bi-directional channel used to transfer information necessary for call set-ups between the repeater station and mobile stations/control stations.

(c) User Packet Channel(UPCH)

User packet channel is a bi-directional point-to-multipoint channel used for the end-to-end transfer of system control data.

(B) User Specific Channel(USC)

User specific channel corresponds to the speech (voice) channel in the analog MCA system and is provided exclusively for system users communicating with each other.

(a) Traffic Channel(TCH)

Traffic channel is a bi-directional channel used for the end-to-end transfer of user information.

(b) Associated Control Channel(ACCH)

Associated Control Channel is a generic term for bi-directional channel transfer between the repeater station and mobile stations/control stations. They are associated with the assigned traffic channels. In this system, the associated control channel is asymmetric between inbound and outbound channels. Associated control channels may be either of two types, depending on the mapping method:

(i) Fast Associated Control Channel(FACCH)

Fast associated control channel allows for fast data transfer by temporarily stealing a traffic channel or user packet channel.

(ii) Slow Associated Control Channel(SACCH)

Slow Associated Control Channel always associated with a Traffic Channel, and is used for slow data transfer.

(c) User Packet Channel(UPCH)

User packet channel is a bi-directional point-to-multipoint channel used for end-to-end transfer of user packet data.

(C) Radio Control Channel(RCCH)

Radio Control Channel allows the transfer of radio channel control information, such as physical slot assignment and usage, etc., between the repeater station and mobile stations/control stations. The radio control channel is uniquely defined for this system.

2.3.3 Radio Channel Control

(1) Control Procedure

The control procedure must be specified, based on the unified communication rule at a single repeater station. In addition, the following conditions must exist:

(A) Communication Time-out Time

The communication time-out time is controlled by the broadcast signal from the repeater station. The communication time-out time must be within 300 seconds, and the communication time-out limit can be configured, depending on the status of user specific channel usage.

(B) Conditions of Call Termination

A call is terminated when any of the following conditions is met:

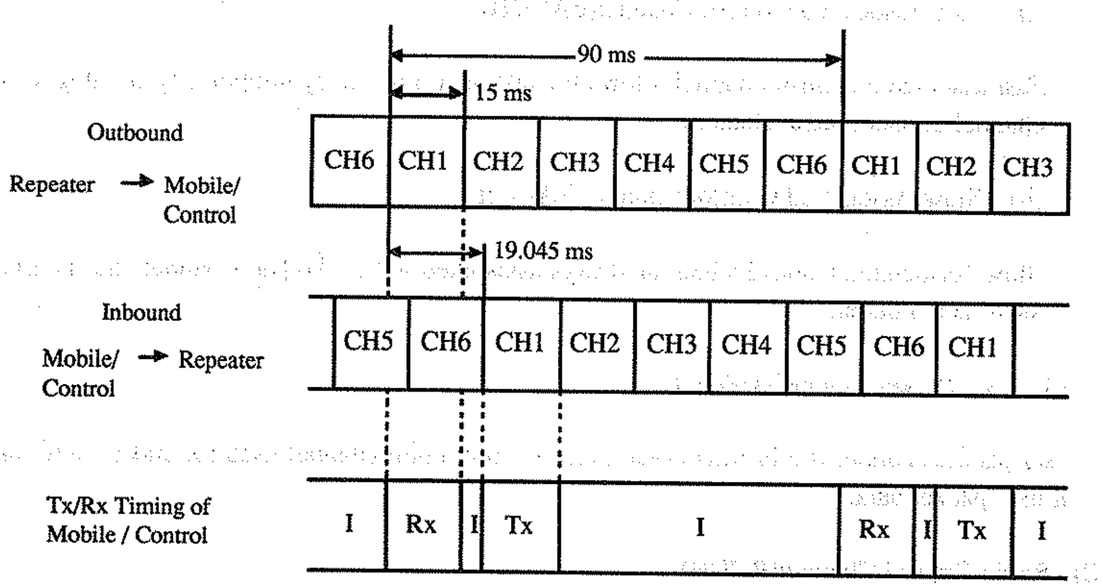
(a) When a call disconnection message is received.

(b) When degradation of receive signals is detected.

(c) When the communication time-out time elapsed.

(2) Slot Arrangement

Fig. 2.3-1 displays the transmit and receive slot arrangement of the repeater station and mobile stations/ control stations in the six-channel TDMA frame format.



CHi (i=1~6) : Slot (Physical channel), Tx : Transmission, Rx : Reception, I : Idle

Fig. 2.3-1 Slot Arrangement

2.4 Principle Rules of Protocol

The communication protocol of the digital MCA system is divided into the communication link establishment phase, the communication phase, and the communication link release phase.

Communication link establishment phase	: This phase mainly operates on a common access channel, including establishment of idle state at mobile stations/control stations and channel assignment associated with call initiation. As an option, a part of operation can take place on a user specific channel.
Communication phase	: This phase operates on the user specific channel including the user data transfer (voice and non-voice) and the individual access control/transmission mode switching associated with PTT operations.
Communication link release phase	: This phase operates to release the user specific channel. The termination of the call is dependent on the communication mode.

In the digital MCA system, the following three layers exist for every phase referring to the OSI model. However, it does not strictly match the standard model, because push-to-talk communication is the basic operation (so the protocol that provides faster responses is requested).

Layer-1 : Basic interface (corresponds to the physical layer)

This layer specifies the physical structure of the channels. The usable physical structure (basic slot format, subplot format, etc.) differs in each phase.

Layer-2 : Transmission control (corresponds to the data link layer)

This layer is different from the standard layer-2: The main functions are random access control (including retry control), individual access control, call control for battery-saving, and individual access control for time alignment control. Non-acknowledged information transmission mode is the basic transmission mode, and the plural frame acknowledged operation mode is not supported.

Layer-3 : Call control (corresponds to the network layer)

This layer specifies the call set-up, holding a call and releasing a call as the standard layer-3 does.

2.5 ID Code Scheme

This standard assumes the use of the following four IDs in the digital MCA system:

(1) System Code : The code to identify each of the digital MCA system.

(2) Subscriber Unit Code : The code to identify a particular mobile station/control station within the entire digital MCA system. It consists of the fleet ID and the unit ID.

(a) Fleet ID : The code to identify the fleet within the entire digital MCA system.

(b) Unit ID : The code to identify an individual mobile station/control station in a single fleet.

(3) Called Party Code : The code to identify one or more of mobile station(s)/control station(s) in a fleet to which the call is directed.

Chapter 3 Specification of Radio Equipment

3.1 Outline

This chapter describes the technical requirements and specifications of the radio equipment in the digital MCA system.

In this chapter, "a mobile station" includes both a mobile station and a control station.

3.2 General Specification

(1) Radio Frequency Band

The frequency bands to be used are 800 MHz and 1.5 GHz bands.

800 MHz band :	850 ~ 860 MHz	(Outbound)
	905 ~ 915 MHz	(Inbound)
1.5 GHz band :	1501 ~ 1525 MHz	(Outbound)
	1453 ~ 1477 MHz	(Inbound)

(2) Carrier Frequency Spacing

A carrier frequency spacing is 25 kHz.

(3) Transmit and Receive Frequency Separation

800 MHz band :	55 MHz
1.5 GHz band :	48 MHz

(4) Antenna Power

Antenna power is 2 W or less for a mobile station, and 40 W or less for a repeater station.

(5) Modulation Scheme

Modulation scheme is the M16QAM ('M' represents "Multi-subcarrier" and the number of subcarriers. 'M' is to be 4).

For the mobile station, an AGC preamble (composed of a carrier signal) is transmitted to improve demodulation of the received signals at the repeater station. A mobile station may also require linearizer or other technology to improve non-linear distortion of transmit signal. An AGC preamble signal may be used for training. (Refer to Annex-1).

(6) Access Mode

Access mode is TDMA (Time Division Multiple Access).

(7) Number of Multiplex

As to the number of multiplex of TDMA, a six-plex system is the basic system for voice transmission.

(8) Communication Mode

Communication mode is half-duplex using TDM (Time Division Multiplex) for the outbound (repeater station to mobile station) and TDMA for the inbound (mobile station to repeater station). However, a mobile station may operate with full-duplex in individual communication (including when connecting to the other communication network system).

At the repeater station, the bit-recovery relay mode is the basic, however, the error correcting relay mode is also possible.

(9) Transmission Rate

A transmission rate of the signal is 64 kbps.

(10) Voice Coding System

The voice coding system is arbitrary. The voice coding rate is 7.467 kbps (672 bits/90 ms) or less, including error correcting codes.

(11) Frame Length

A frame length of 90 ms (6-plex configuration) is the basic length.

(12) Diversity

A repeater station uses the diversity reception. It is not specified for a mobile station.

(13) Automatic Frequency Control(AFC)

Transmitter of a mobile station is equipped with AFC.

(14) Antenna Power Control of the Mobile Station

A mobile station has a function to control antenna power for minimum required level (hereinafter "transmission power control").

(15) Time Alignment Control

A mobile station is capable of adjusting its transmission timing, according to the command from a repeater station.

(16) Fading Compensation

At the transmitting end, the signals (which contain same number of pilot symbols in each subcarrier and their locations are properly offset among each of the subcarriers) is transmitted so that proper interpolation is performed for fading compensation at the receiving end.
(Annex-2)

(17) Security Measures

A mobile station is able to have a unique code to prevent unauthorized usage. An encipher system may be used as necessary, to guard the privacy of communicated information.

(18) Measures for Electromagnetic Environment

Considerable countermeasures prevents the possibility of electromagnetic interference between the mounted mobile station and automotive electronics devices.

(19) Radio Station Identification (ID) Numbers

A system ID number and transmission procedure are defined, sufficiently considering efficient management of the radio stations as well as security of communication privacy.

(20) Measures for Irregular Emissions

In a mobile station, no emission is allowed, unless a mobile station ID number and system parameters have been provided, and the required signals from the repeater station are being received.

For the repeater station, functions and capability are installed to update the carrier and channel configuration (to minimize system damage caused by irregular emissions).

(21) Processing Delay Characteristics

Delays (caused by voice coding, time division multiplexing, and other processing) are within a range so that conversation flow is not affected.

(22) Prohibition of Continuous Transmission

A mobile station has a function to automatically stop transmission within 600 seconds when transmitting continuously by a failure.

3.3 Specification Regarding the Modulation

(1) Modulation Scheme

The modulation is the M16QAM.

The modulation procedure that specifies the modulation scheme is shown in Fig. 3.3-1.

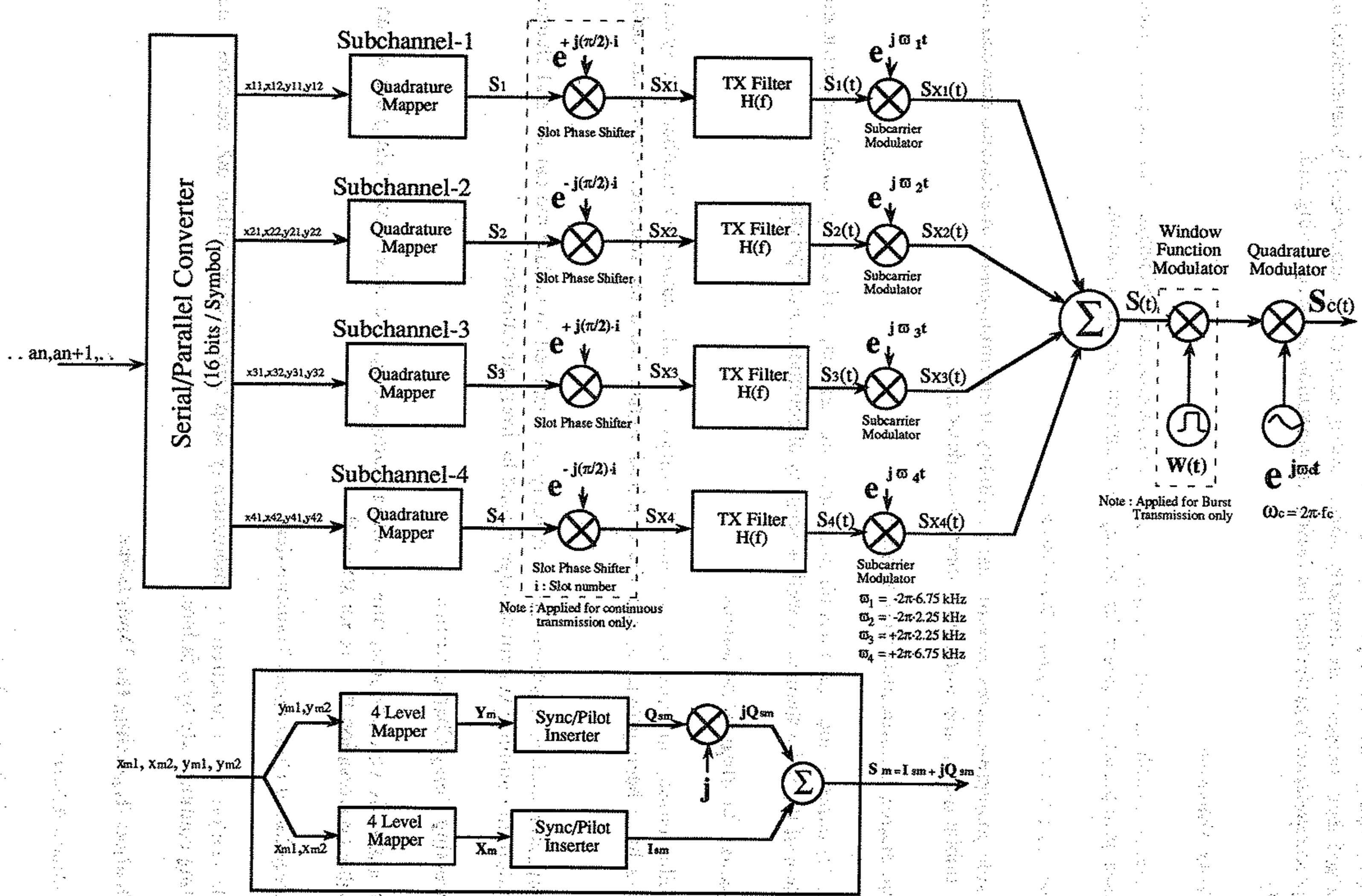


Fig. 3.3-1 M16QAM Modulation Diagram

(2) Coding

(A) Serial/Parallel Conversion

The serial input of the binary data stream a(n) is converted into four sets of 4-bit parallel data [(xm1, xm2), (ym1, ym2)] (m=1~4) by every 16 bits. Then each of 4-bit parallel data is input to the corresponding subchannel signal path.

The serial/parallel conversion and bit-mapping to the subcarriers are shown in Table 3.3-1.

Table 3.3-1 Serial/Parallel Conversion

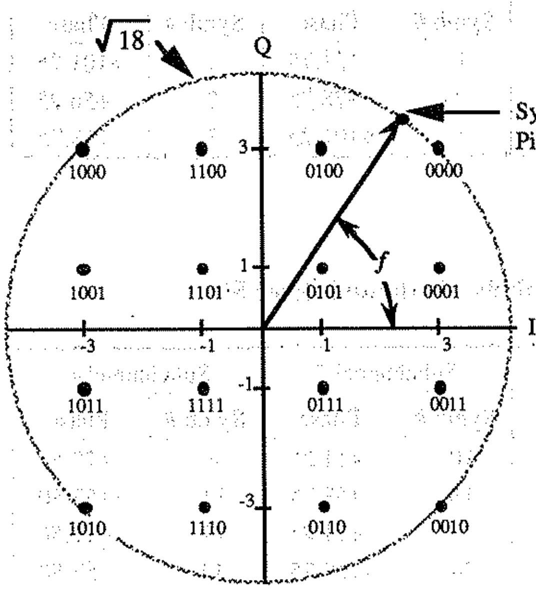
Parallel Data	Sub - 1	Sub - 2	Sub - 3	Sub - 4
xm1	a (n+0)	a (n+4)	a (n+8)	a (n+12)
xm2	a (n+1)	a (n+5)	a (n+9)	a (n+13)
ym1	a (n+2)	a (n+6)	a (n+10)	a (n+14)
ym2	a (n+3)	a (n+7)	a (n+11)	a (n+15)

m: Subchannel Number

(B) Quadrature Mapping

Each 4-bit parallel data [(xm1, xm2), (ym1, ym2)] (m=1~4) input to each subchannel is further divided into two sets of 2-bit data (xm1, xm2), (ym1, ym2), and fed to the 4-level mappers of I and Q channels, then converted into 16-level quadrature code (Xm, Ym).

Four-level mapping rule is shown in Table 3.3-2. The signal constellation diagram of the 16-level quadrature code is shown in Fig. 3.3-2.



Note : Sync and Pilot symbols are positioned on the circle of radius $\sqrt{18}$

I component = $\sqrt{18}$ x cos (ø)

Q component = $\sqrt{18}$ x sin (ø)

Fig. 3.3-2 Signal Constellation Diagram

Table 3.3-2 4 Level Mapping Rule

xm1, xm2 or ym1, ym2	10	11	01	00
Xm or Ym	-3	-1	+1	+3

(C) Sync/Pilot Symbol Insertion

The sync and pilot symbols are added to the stream of the 16-level quadrature code (Xm, Ym), to form the stream of the sub symbols (Ism, Qsm) on each subchannel. A set of sub symbols at the same position in the four sub channels is referenced as a symbol.

Hereinafter, a complex expression simplifies the following descriptions.

Now, the sub symbol is expressed as Sm = Ism + jQsm (m = 1 ~ 4) in complex value (Multiply Q channel component Qsm by j, then added to the I channel component Ism).

Sync and Pilot symbols are arranged on the circle radius $\sqrt{18}$ that contains the ideal maximum signal points. The plots of the sync and pilot symbols on the signal constellation diagram are shown in Fig. 3.3-2. The values(phase angle) of these sync and pilot symbols and their locations in a slot (symbol number) are as shown in Table 3.3-3. The slot structures used in the digital MCA system are as shown in Fig. 3.3-3. Details of the slot structure is described in "4.2.2.2 Slot structure".

Table 3.3-3a Sync Symbols

Subchannel-1		Subchannel-2		Subchannel-3		Subchannel-4	
Symb #	Phase	Symb #	Phase	Symb #	Phase	Symb #	Phase
1	-101.25	1	+123.75	1	-123.75	1	+101.25
2	-56.25	2	-78.75	2	+78.75	2	+56.25
3	+168.75	3	-101.25	3	+101.25	3	-168.75

Table 3.3-3b Pilot Symbols (Outbound Basic Slot)

Subchannel-1		Subchannel-2		Subchannel-3		Subchannel-4	
Symb #	Phase	Symb #	Phase	Symb #	Phase	Symb #	Phase
6	-33.75	10	-135.00	10	+11.25	6	+22.50
14	+146.25	18	+45.00	18	-168.75	14	-157.50
22	-33.75	26	-135.00	26	+11.25	22	+22.50
30	+146.25	34	+45.00	34	-168.75	30	-157.50
38	-33.75	42	-135.00	42	+11.25	38	+22.50
46	+146.25	50	+45.00	50	-168.75	46	-157.50
54	-33.75	58	-135.00	58	+11.25	54	+22.50

Table 3.3-3c Pilot Symbols (Inbound Basic Slot)

Subchannel-1		Subchannel-2		Subchannel-3		Subchannel-4	
Symb #	Phase	Symb #	Phase	Symb #	Phase	Symb #	Phase
6	-11.25	10	+146.25	10	-67.50	6	+101.25
14	+168.75	18	-33.75	18	+112.50	14	-78.75
22	-11.25	26	+146.25	26	-67.50	22	+101.25
30	+168.75	34	-33.75	34	+112.50	30	-78.75
38	-11.25	42	+146.25	42	-67.50	38	+101.25
46	+168.75	50	-33.75	50	+112.50	46	-78.75
53	-146.25	53	+101.25	53	+168.75	53	-168.75

Table 3.3-3d Pilot Symbols (Inbound Subslot)

Subchannel-1		Subchannel-2		Subchannel-3		Subchannel-4	
Symb #	Phase	Symb #	Phase	Symb #	Phase	Symb #	Phase
6	-11.25	10	+146.25	10	-67.50	6	+101.25
14	+168.75	17	+101.25	17	-78.75	14	-78.75
20	-33.75	20	-101.25	20	+11.25	20	+78.75

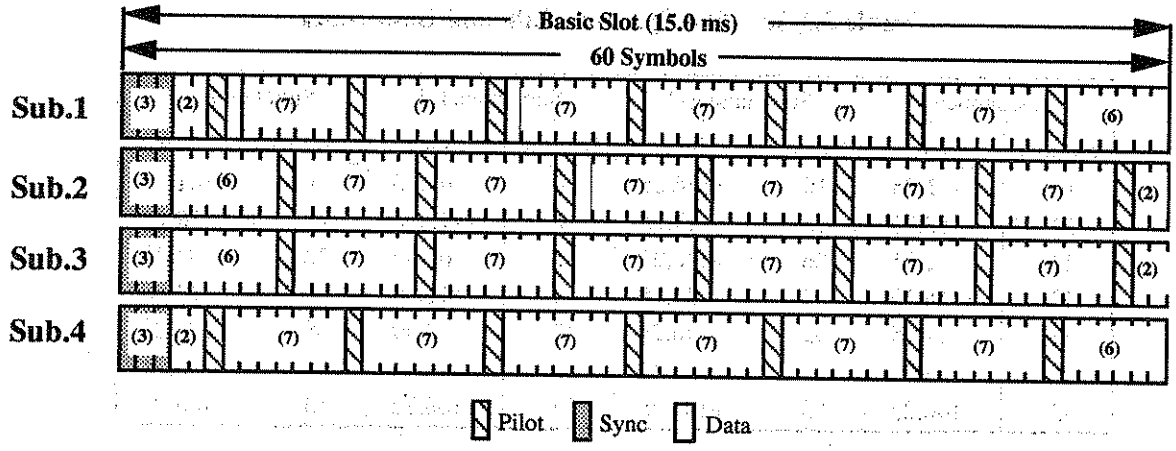


Fig. 3.3-3A Structure of Outbound Basic Slot

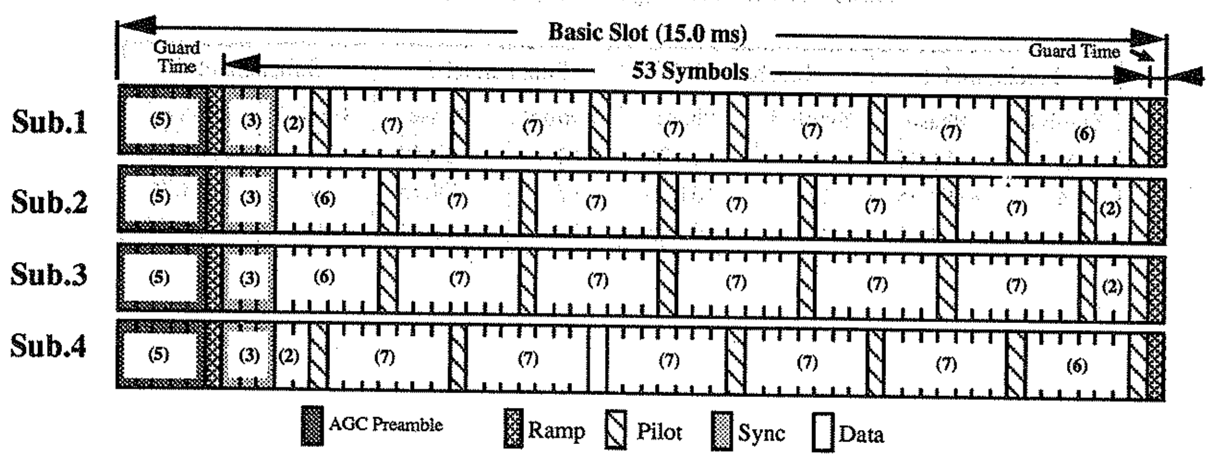


Fig. 3.3-3B Structure of Inbound Basic Slot

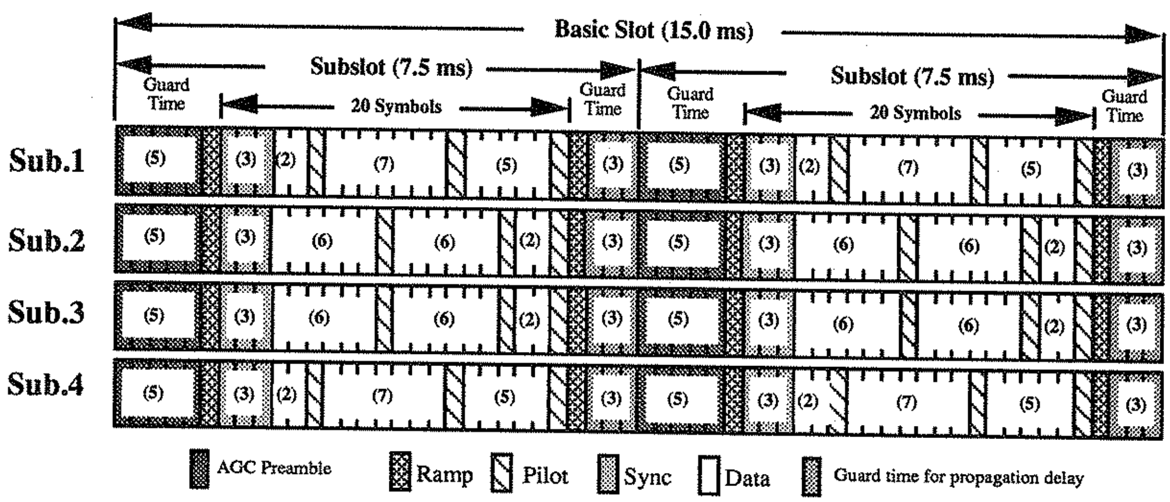


Fig. 3.3-3C Structure of Inbound Subslot

Fig. 3.3-3 Slot Structure

(D) Rotation of the Signal Constellation (Subcarrier Phase Control)

When a repeater station (outbound) transmits slot signals continuously, the sub symbols Sm (m = 1~ 4) are rotated in their phases (on the signal constellation plane) at the beginning of every slot, and converted to the rotated sub symbols Sxm (m = 1~ 4). The phase rotation procedure is shown in Fig. 3.3-1. Slot number 'i' is the serial number, 0 at the first slot, then incremented by 1 at every subsequent slot.

(3) Baseband Filtering

The rotated sub symbols Sxm (m = 1~ 4) are baseband filtered by the transmission filter specified below, and converted to the subchannel signal Sm(t) (m = 1 ~ 4).

(A) The baseband filtering uses the Root Nyquist Raised Cosine Spectrum H(f) specified by the following formula ;

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

where, T = 250 μs (4 k symbols/sec)

(B) Roll-off factor 'a' is 0.2.

(C) Phase characteristic of H(f) is linear.

(4) Quadrature Modulation

(A) Subcarrier Modulation

Each of the baseband filtered subchannel signal Sm(t) (m = 1 ~ 4) modulates the corresponding subcarrier, then produces the subcarrier signal Sxm(t).

$$Sxm(t) = Sm(t) \cdot \exp (j\omega_m \cdot t)$$

where, $Sm(t) = F^{-1} [H(f) \cdot F \{ Imk(t) \}] + j \cdot F^{-1} [H(f) \cdot F \{ Qmk(t) \}]$

'm' represents subchannel number, 'k' represents symbol number, F[x] and F^{-1} [X] represent Fourier transformation and its inverse transformation, respectively.

$\omega_m = 2\pi \cdot$ fm represents angular frequency of subcarriers, and each subcarrier frequency is as shown below ;

f_1 = - 6.75 kHz
f_2 = - 2.25 kHz
f_3 = + 2.25 kHz
f_4 = + 6.75 kHz

All subcarrier phases are aligned to 0° at the first Sync symbol time (when symbol output becomes maximum). For a repeater station, subcarrier phase is controlled by the rotation of the signal constellation after the first slot.

(B) Subcarrier Signal Combining

Subcarrier signals are combined, then produce M16QAM signal S(t).

$$S(t) = \sum_{m=1}^{4} [Sxm(t)] \qquad \text{m : Subcarrier number}$$

$$= Sx1(t) + Sx2(t) + Sx3(t) + Sx4(t)$$

(C) Carrier Modulation

The quadrature modulation modulates the carrier with the M16QAM signal.

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

where, $Sc(t) = F^{-1}[H(f) \cdot F\{ Ik(t) \}] + j \cdot F^{-1}[H(f) \cdot F\{ Qk(t) \}]$

'k' represents symbol number; F [x] and F^{-1} [X] represent Fourier transformation and its inverse transformation, respectively.

(5) AGC Preamble

A mobile station transmits an AGC preamble signal (composed of the carrier signal prior to the burst signal) to improve the receive characteristic of the repeater station, and for training the transmitter linearizer, etc..

(A) Waveform (envelop) of the AGC preamble meets the timings and power levels specified in Fig. 3.3-4 or Fig. 3.3-5, and Table 3.3-4 and Table 3.3-5. The timings are those internal to a mobile station; the power levels are those relative to the average power of the burst signal modulated with the digital signal.

(B) Transmission spectrum of the AGC preamble meets 3.4.1 (5) "Adjacent Channel Coupled Power".

Table 3.3-4. AGC Preamble Timing

Time	Operation Item	Min.	Typical	Max.
t0	Transmitter turns on	-	-45	-
t1	AGC preamble starts	25	40	65
t2	AGC preamble rises min. power level	365	500	515
t3	AGC preamble falls min. power level	675	750	905
t4	AGC preamble ends	-	-	1000
t5	M16QAM burst starts	-	ts-(4/3)T	-
ts	First symbol output	-	1625	-

Note 1: Values are in µs. T(symbol time) is 250 µs.

Table 3.3-5. AGC Preamble and M16QAM Burst Power

Power	Operation Item	Typical
a0	Carrier-off leakage power	32nW (- 45 dBm)
a1	Power level when no signal	a(av) - 19 dB
a2	AGC preamble min. power level [Note-1]	a(av) + 0 dB
a3	AGC preamble peak power level (Min.) [Note-2]	a(av) + 5 dB
	(Typ.)	a(av) + 8 dB
	(Max.)	a(av) + 14 dB
a4	Upper limit of peak power within a slot	a(av) + 14 dB
a(av)	Average power of M16QAM burst	0 dB

Notes 1: AGC preamble level is below the power level (a2) during the time segment t2 ~ t3.

2: AGC preamble level reaches the power level (a3) within the time segment t2 ~ t3.

(6) Transient Response Characteristic of the Burst Transmission

To avoid interference with the other carriers (caused by the rapid changes in amplitude at rising and falling edges of the burst), the window function controls the envelop at the burst edges.

(A) Transmission Timings and Power Ranges of the Burst

The envelop of the burst signal modulated with the digital signal meets the timings and power levels specified in the Fig. 3.3-4, Fig. 3.3-5, Table. 3.3-5 and Table. 3.3-6. The timings are those at the mobile station.

Table 3.3-6. M16QAM Burst Signal Timing

Time	Operation Item	Typical	Tolerance
t5(twb1)	Front window function starts	ts - (4/3)T	-
t6(twe1)	Front window function ends	ts - (2/3)T	-
ts	First symbol output	1625	-
te	Last symbol output [Note-2]	ts + T (n - 1)	-
T	Symbol Time	250	-
t7(twb2)	Post window function starts	te + (2/3)T	-
t8(twe2)	Post window function ends	te + (4/3)T	+50
t9	Transmitter turns off	t8 + 241.7	+50

Notes 1: Values are in μs. T(symbol time) is 250 μs.

2: Number of symbols in a burst is 53 symbols(Basic slot) or 20 symbols(Subslot)

(B) Treatment of the Rising Edge of the Burst

The window function W1(t), shown below, limits impulse responses at the rising edge of the burst.

$$W1(t) = \begin{cases} 0 & t < twb1 \\ \{ 1 - \cos [\pi (t - twb1)/(twe1 - twb1)] \} /2 & twb1 \le t < twe1 \\ 1 & twe1 \le t \end{cases}$$

Where, twb1 is ts - (4/3) T, and twe1 is ts - (2/3) T. 'ts' represents the first sync symbol timing; 'T' represents the symbol time(250 μs).

(C) Treatment of the Falling Edge of the Burst

The window function W2(t) shown below is used to limit impulse responses at the falling edge of the burst.

$$W2(t) = \begin{cases} 1 & t < twb2 \\ \{ 1 + \cos [\pi (t - twb2)/(twe2 - twb2)] \} /2 & twb2 \le t < twe2 \\ 0 & twe2 \le t \end{cases}$$

Where, twb2 is te + (2/3) T, and twe2 is te + (4/3) T. 'te' represents the last pilot symbol timing; 'T' represents the symbol time(250 μs).

(7) Transmission Spectrum

Transmission spectrum meets 3.4.1 (5) "Adjacent Channel Coupled Power".

(8) Modulation Rate

The modulation rate of each subcarrier is 4 k symbols/sec (16 kbps).

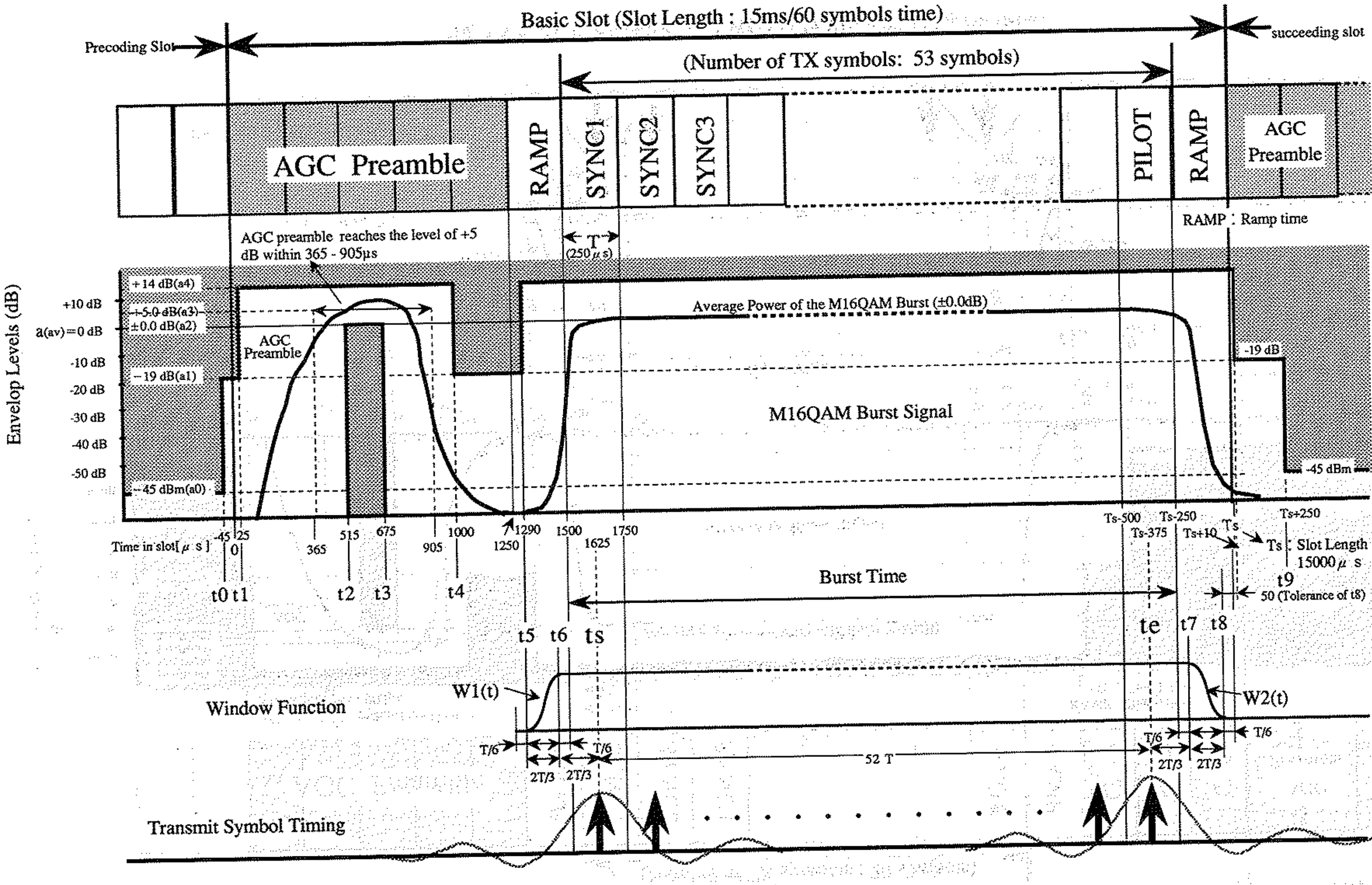


Fig. 3.3-4 AGC Preamble and M16QAM Burst Timings (Basic Slot)

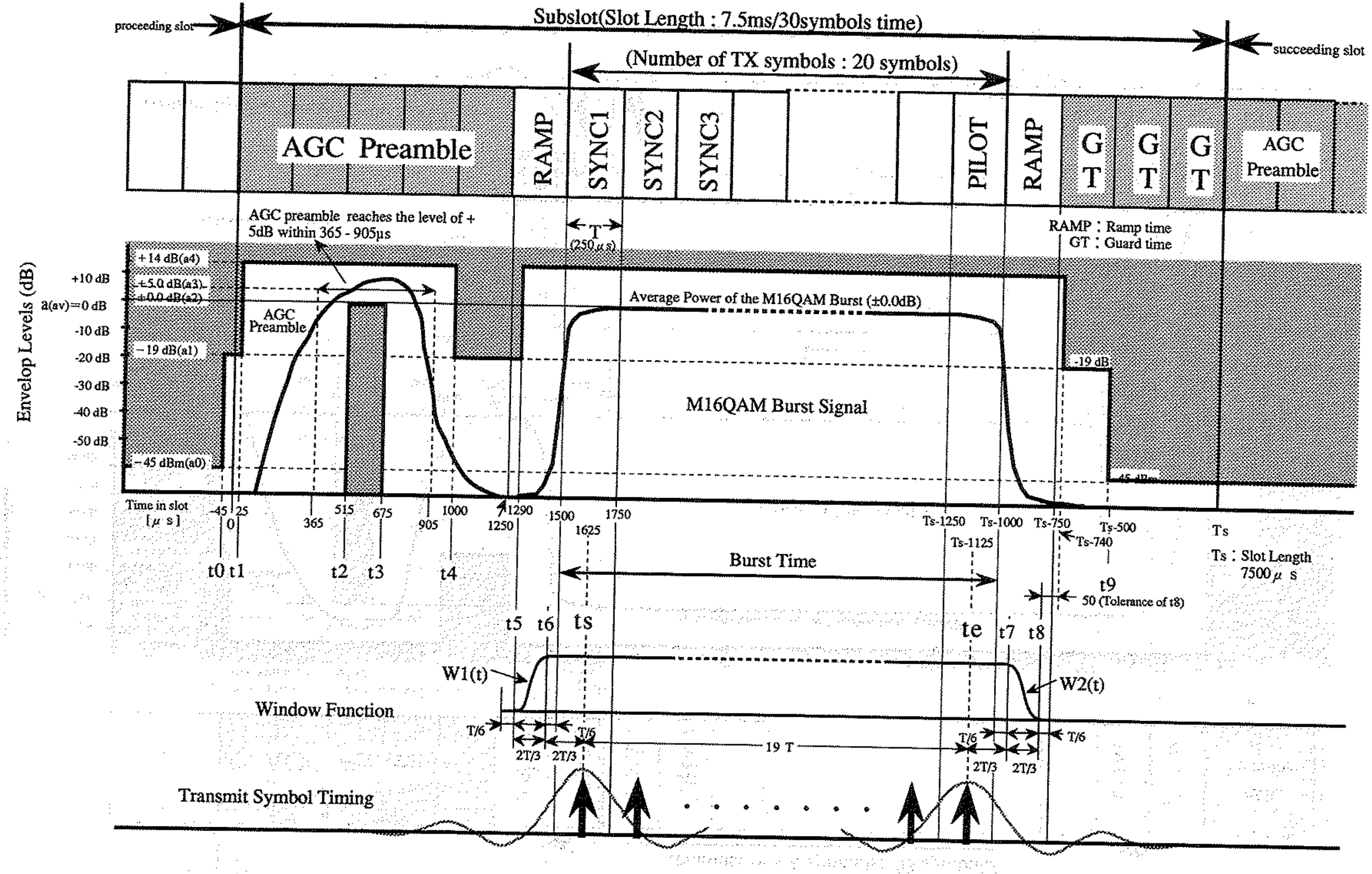


Fig. 3.3-5 AGC Preamble and M16QAM Burst Timings (Subslot)

3.4 Specifications of Transmitter and Receiver

3.4.1 Transmitter

(1) Frequency Tolerance

For a repeater station, frequency tolerance is within $\pm 0.1 \times 10^{-6}$ or less.

For a mobile station, it is within $\pm 0.15 \times 10^{-6}$ or less when tracking, and within $\pm 2.0 \times 10^{-6}$ when not tracking.

(2) Spurious Emission

For a repeater station, the greatest allowed strength of spurious emission is –60dB or less relative to the output power, or 2.5 μW.

For a mobile station, it is –60dB or less relative to the output power, or 0.25μW or less.

(3) Occupied Bandwidth

Occupied bandwidth is 20 kHz or less.

(4) Antenna Power Tolerance

Antenna power tolerance is within +20% and -50%. Where, antenna power of a mobile station means an average power within a time segment transmitting a burst.

(5) Adjacent Channel Coupled Power

Adjacent channel coupled power is the power emitted within the ±9.0 kHz bandwidth centering the frequencies at ±25 kHz away from the carrier frequency concerned, and it is as follows ;

For a repeater station, it is at least -55 dB or less relative to the output power.

For a mobile station, it is 6.3μW or less and –50dB or less relative to the output power.

(6) Carrier-off Leakage Power

The power emitted into the slots not transmitting is 32 nW or less for the occupied bandwidth of the transmitting frequency, 4 nW or less for the frequency within the transmission frequency band except for the occupied bandwidth, and –60dB or less relative to the output power, or 0.25μW or less for the frequencies outside of the transmission frequency band.

(7) Radiated Spurious Emission

Radiated spurious emission is 2.5μW or less.

(8) Transmission Power Control

A mobile station has two types of the transmission power control functions; Autonomous and Repeater commanded (forced) power control functions.

(A) Autonomous Power Control

When the forced power control is inactive, autonomous power control function always works. The output power of the burst is controlled, depending on the average of the receiving signal level just before the transmission. However, the power control level does not change during a burst.

Table 3.4-1 Autonomous Power Control

Receive Signal Level	Output Power
40 dBμ or greater	240 mW or less
50 dBμ or greater	24 mW or less

(B) Forced Power Control

When activated, the forced power control function overrides the autonomous power control function. Commands from the repeater station can control the output power of the burst. Details are provided in "4.3.10.6 Transmission power control".

Control Range : 0 ~ -20 dB of the rated power output
Control Step : 10 dB
Control Tolerance : within +2 ~ -4 dB

(9) Accuracy of Transmission Rate

Accuracy of the transmission rate is within $\pm 5.0 \times 10^{-6}$.

(10) Modulation Accuracy

The modulation accuracy is 15 % or less, which is the root-mean-square of the sub symbol error (i.e., the ratio of the difference between actual signal point and the corresponding ideal signal point to the ideal maximum signal points($\sqrt{18}$)). Errors of sub symbols in four subcarriers to the ideal signal points are individually divided by $\sqrt{18}$, squared and summed together. The sum is divided by the number of sub symbols, then square rooted. The sync and pilot (sub)symbols is included in the measurement.

(11) Tolerance of Subcarrier Frequency

Tolerance of Subcarrier Frequency is within $\pm 5.0 \times 10^{-6}$.

(12) Symbol Timing Alignment

Symbol timing alignment among sub channels is defined as: the relative timing error of sub symbol modulation among the four sub channels. It is within 7.0 μs for the pair of sub channels giving the largest timing error.

(13) Time Alignment Control

The time alignment control range is 0 ~ 750 μs. The step of the time alignment control is 62.5 μs.

(14) Burst Transmission Timing

Burst transmission timing is specified by the position of the sync symbols. It is within ±45.0 μs referring to the standard transmission timing determined by the outbound signal.

3.4.2 Receiver

(1) Frequency Variation of Local Oscillator

The frequency variation of the local oscillator is not specified.

(2) Receiver Sensitivity

The signal modulated with the 511-bit binary pseudo random noise sequence is applied to the receiver. The receiver input levels, which give the Bit Error Rate (BER) equal to 1×10^{-2} under the static condition and 3×10^{-2} under the faded condition, meet the values shown in Table 3.4-2 and 3.4-3 below.

Table 3.4-2. Receiver Sensitivity for a Repeater Station

Bit Error Rate(BER)	1×10^{-2} (Static)	3×10^{-2} (Faded)
Receiver Input Level	9.0 dBμ or less (Standard Sensitivity)	7.0 dBμ or less

Fading conditions : Maximum Doppler Frequencies are 70 Hz at 1.5 GHz band, and 40 Hz at 800 MHz band.

Table 3.4-3. Receiver Sensitivity for a Mobile Station

Bit Error Rate(BER)	1×10^{-2} (Static)	3×10^{-2} (Faded)
Receiver Input Level	9.0 dBμ or less (Standard Sensitivity)	13.0 dBμ or less

Fading conditions : Maximum Doppler Frequencies are 70 Hz at 1.5 GHz band, and 40 Hz at 800 MHz band.

(3) Spurious Response

The desired signal with a level equal to the [Standard Sensitivity *+ 3 dB] is applied to the receiver. Then, the interference signal modulated with the digital signal (32,767-bit binary PN sequence) and detuned ±50 kHz or more from the desired signal is added. Then the level is adjusted for BER of 1 x 10^{-2}. The ratio of the interference signal level to the [Standard Sensitivity *+ 3 dB] is 53 dB or greater.

* Standard Sensitivity : See Table 3.4-2 and Table 3.4-3

(4) Adjacent Channel Selectivity

The desired signal with a level equal to the [Standard Sensitivity* + 3 dB] is applied to the receiver. Then, the interference signal(detuned ±25 kHz from the desired signal) modulated with the digital signal (32,767-bit binary PN sequence) is added to the desired signal. Then the level is adjusted for BER of 1 x 10^{-2} . The ratio of the interference signal level to the [Standard Sensitivity *+ 3 dB] is 42 dB or greater.

* Standard Sensitivity : See Table 3.4-2 and Table 3.4-3

(5) Intermodulation Characteristics

The desired signal with a level equal to the [Standard Sensitivity* + 3 dB] is applied to the receiver. Then, the interference signals, unmodulated and detuned ±50 kHz from the desired signal, and detuned ±100 kHz and modulated with the digital signal (32,767-bit binary PN sequence), are added. The interference signal levels are adjusted for BER of 1 x 10^{-2}. The ratio of the interference signal level to the [Standard Sensitivity* + 3 dB] is 53 dB or greater.

* Standard Sensitivity : See Table 3.4-2 and Table 3.4-3

(6) Conducted Spurious Emission

Conducted spurious emission is 4 nW or less.

(7) Radiated Spurious Emission

Radiated spurious emission is 4 nW or less for the frequencies at 1 GHz or lower, and 20 nW or less for the frequencies between 1 GHz ~ 3 GHz.

(8) Burst Reception Timing

A repeater station must be able to receive a burst signal on a subslot within the range -45 ~ +795 μs from the reference timing (the receive timing when there is no propagation delay).

On a basic slot, the repeater station must also receive the burst signal within the range that the reception timing range (specified by a repeater station) and the burst transmission timing tolerance are combined.

3.4.3 Controller

A mobile station includes the memory device to save the mobile identification number, system parameters, etc..

3.4.4 Repeater Antenna

When installed, it is the basic that the vertical gain characteristic of the repeater antenna is to be at least 10 dB attenuation from the main beam gain at the direction 3° or more below the horizontal. However, the vertical gain characteristic of the repeater antenna may be determined depending on the geographical feature of individual systems. The adjacent channel coupled power and carrier-off leakage power of mobile stations must be considered.

Chapter 4 Communication Control System

4.1 Outline

This chapter defines the physical radio channels and the functional channels in the TDM/TDMA system. The relationship between the two is clarified, and the coding procedure (for the control information transmitted on these channels) is specified.

The protocols for various communication controls, such as the establishment and release of the communication links implemented on these channels, are also specified.

In this chapter, "a mobile station" includes both a mobile station and a control station.

4.2 Basic Interface Requirements

4.2.1 Radio Carriers

One or more radio carrier(s), from those allocated to the digital MCA system, are assigned to each system depending on its scale. From these assigned carriers, single or multiple radio carrier(s) are used as control carrier(s), and the rest as communication carriers.

(1) Control Carrier

Common-use slots are those slots on the radio carrier that can be commonly accessed by all users in a system for communication control (such as communication link establishment). Among the radio carriers assigned to the system, those which include Common-use slots are called as control carriers. For each system, one or more radio carrier(s) can be assigned as control carriers.

(2) Communication Carrier

Following the communication link establishment, a slot is assigned to a user for exclusive use. This slot is called an individually assigned slot. Radio carriers that consist of individually assigned slots only are called communication carriers.

4.2.2 Structure of the Radio Channel

A slot determines a time-interval, which defines the minimum transmission unit on the radio carrier. A cyclic period of an number of slots on the radio carrier makes up a frame. A frame specifies the multiplex structure of the radio channel. Generally, a radio channel consists of a series of slots occupying the same position of each frame. Radio channels are classified into the following types according to the type of slots on the channel:

(1) Control Channel

A radio channel consists of common-use slots is called a control channel.

(2) Communication Channel

A radio channel made up of individually assigned slots is called a communication channel.

4.2.2.1 Frame Structure

The basic frame is prescribed at six slots (90 ms). A super frame can be constructed by multiples of integer of a basic frame. The corresponding outbound and inbound frames make a pair. The frame offset, the outbound frame delay relative to the inbound frame, is 70.955 ms. Conversely, the inbound frame delay, relative to the outbound frame (referred to as transmit-receive offset) can be calculated by the formula, (frame length) - (frame offset). Accordingly, transmit-receive offset in full rate is 19.045 ms. Fig. 4.2-1 shows the general frame structure of the TDM/TDMA system.

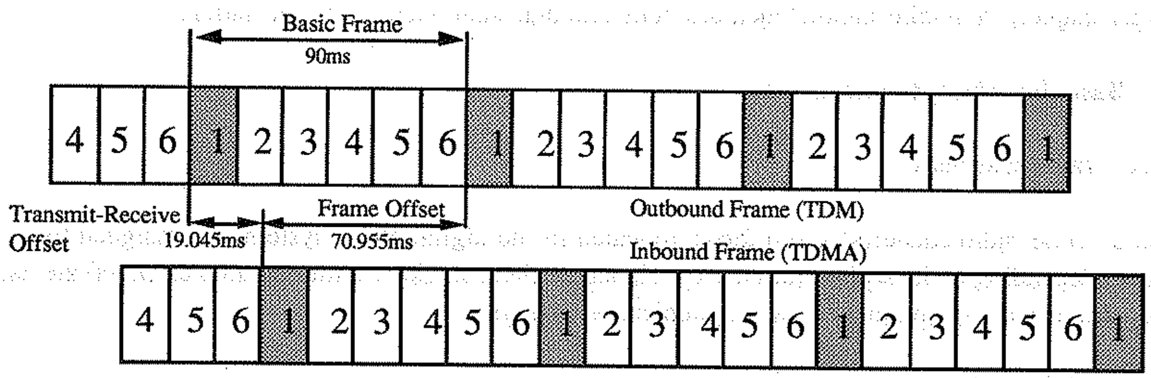


Fig. 4.2-1 TDM/TDMA Frame Structure (Example in Full-rate)

4.2.2.2 Slot Structure

As mentioned in Section 3.3, two types of slots, a basic slot which is 15.0 ms in length and a subslot which is 7.5 ms in length, are defined. A signal transmitted in each slot consists of sync symbols, pilot symbols, and data symbols. For inbound slots, a guard time is provided between adjacent slots for protection against mutual interference.

Hereinafter, the signal transmitted in an outbound slot is referred to as a "slot signal", and the signal in an inbound slot is a "burst". This distinguishes the concept of "slot" from a transmission time duration.

(1) Outbound Physical Slot

Table 4.2-1 shows the structure of an outbound physical slot. In outbound slots, only a basic slot for 800 bits data are used, and signals are transmitted continuously without a guard time.

(2) Inbound Physical Slot

Table 4.2-1 and Table 4.2-2 shows the structure of an inbound physical slot. In inbound slots, either a basic slot format including 688 bits data or subslot format including 224 bits data can be used. Each burst is transmitted with a guard time provided, to allow for transmission ramp-up and ramp-down control.

Table 4.2-1 Basic Slot Format

Direction	Slot Length	Number of Symbols	Length of Guard Time	Sync Symbols	Pilot Symbols	Data Symbols	Number of Bits*
Outbound	15 ms	Slot signal 60	None	3	7	50	800
Inbound	15 ms	Burst 53	7 symbols 1.75 ms	3	7	43	688

Table 4.2-2 Subslot Format

Direction	Slot Length	Number of Symbols	Length of Guard Time	Sync Symbols	Pilot Symbols	Data Symbols	Number of Bits*
Inbound	7.5 ms	20	10 symbols 2.5 ms	3	3	14	224

Note : Symbol refers to a collection of sub symbols of four subcarriers at same symbol time.
(*) : Number of all data bits (Data symbols x 4 x 4)

(3) Mapping of Bit Stream into Data Symbols

After channel coding, the resulting bit stream is mapped into data symbols and into their respective subcarriers (refer to Tables 4.2-3 through 4.2-5).

Table 4.2-3 Bit Stream Mapping of Outbound Basic Slot

Symbol number	Subcarrier 1	Subcarrier 2	Subcarrier 3	Subcarrier 4
1	SYNC1 _ 1	SYNC2 _ 1	SYNC3 _ 1	SYNC4 _ 1
2	SYNC1 _ 2	SYNC2 _ 2	SYNC3 _ 2	SYNC4 _ 2
3	SYNC1 _ 3	SYNC2 _ 3	SYNC3 _ 3	SYNC4 _ 3
4	D1 - D4	D5 - D8	D9 - D12	D13 - D16
5	D17 - D20	D21 - D24	D25 - D28	D29 - D32
6	PILOT1 _ 1	D37 - D40	D41 - D44	PILOT4 _ 1
7	D33 - D36	D53 - D56	D57 - D60	D45 - D48
8	D49 - D52	D69 - D72	D73 - D76	D61 - D64
9	D65 - D68	D85 - D88	D89 - D92	D77 - D80
10	D81 - D84	PILOT2 _ 1	PILOT3 _ 1	D93 - D96
11	D97 - D100	D101 - D104	D105 - D108	D109 - D112
12	D113 - D116	D117 - D120	D121 - D124	D125 - D128
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
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-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
59	D769 - D772	D773 - D776	D777 - D780	D781 - D784
60	D785 - D788	D789 - D792	D793 - D796	D797 - D800

Table 4.2-4 Bit Stream Mapping of Inbound Basic Slot

Symbol number	Subcarrier 1	Subcarrier 2	Subcarrier 3	Subcarrier 4
1	SYNC1_1	SYNC2_1	SYNC3_1	SYNC4_1
2	SYNC1_2	SYNC2_2	SYNC3_2	SYNC4_2
3	SYNC1_3	SYNC2_3	SYNC3_3	SYNC4_3
4	D1 - D4	D5 - D8	D9 - D12	D13 - D16
5	D17 - D20	D21 - D24	D25 - D28	D29 - D32
6	PILOT1_1	D37 - D40	D41 - D44	PILOT4_1
7	D33 - D36	D53 - D56	D57 - D60	D45 - D48
8	D49 - D52	D69 - D72	D73 - D76	D61 - D64
9	D65 - D68	D85 - D88	D89 - D92	D77 - D80
10	D81 - D84	PILOT2_1	PILOT3_1	D93 - D96
11	D97 - D100	D101 - D104	D105 - D108	D109 - D112
12	D113 - D116	D117 - D120	D121 - D124	D125 - D128
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
51	D657 - D660	D661 - D664	D665 - D668	D669 - D672
52	D673 - D676	D677 - D680	D681 - D684	D685 - D688
53	PILOT1_7	PILOT2_7	PILOT3_7	PILOT4_7

Table 4.2-5 Bit Stream Mapping of Inbound Subslot

Symbol number	Subcarrier 1	Subcarrier 2	Subcarrier 3	Subcarrier 4
1	SYNC1_1	SYNC2_1	SYNC3_1	SYNC4_1
2	SYNC1_2	SYNC2_2	SYNC3_2	SYNC4_2
3	SYNC1_3	SYNC2_3	SYNC3_3	SYNC4_3
4	D1 - D4	D5 - D8	D9 - D12	D13 - D16
5	D17 - D20	D21 - D24	D25 - D28	D29 - D32
6	PILOT1_1	D37 - D40	D41 - D44	PILOT4_1
7	D33 - D36	D53 - D56	D57 - D60	D45 - D48
8	D49 - D52	D69 - D72	D73 - D76	D61 - D64
9	D65 - D68	D85 - D88	D89 - D92	D77 - D80
10	D81 - D84	PILOT2_1	PILOT3_1	D93 - D96
11	D97 - D100	D101 - D104	D105 - D108	D109 - D112
12	D113 - D116	D117 - D120	D121 - D124	D125 - D128
13	D129 - D132	D133 - D136	D137 - D140	D141 - D144
14	PILOT1_2	D149 - D152	D153 - D156	PILOT4_2
15	D145 - D148	D165 - D168	D169 - D172	D157 - D160
16	D161 - D164	D181 - D184	D185 - D188	D173 - D176
17	D177 - D180	PILOT2_2	PILOT3_2	D189 - D192
18	D193 - D196	D197 - D200	D201 - D204	D205 - D208
19	D209 - D212	D213 - D216	D215 - D220	D221 - D224
20	PILOT1_3	PILOT2_3	PILOT3_3	PILOT4_3

4.2.3 Definition of Functional Channels

For this system, the idea described in CCITT Rec.Q.1063 and CCIR Report "Digital Cellular Public Land Mobile Telephone System (DCPLMTS)" is to be applied; the channel structure mentioned below is to be adopted. However, since the basic form of a call is group communication (point-to-multipoint), the functional channel definitions may not always conform to those currently existing. The functional channel structure is shown in Table 4.2-6.

Table 4.2-6 Functional Channel Structure

Functional Channel Structure		
Common Access Channel (CAC)	Broadcast Control Channel (BCCH)	
	Common Control Channel (CCCH)	
	User Packet Channel (UPCH)	
User Specific Channel (USC)	Traffic Channel (TCH)	
	User Packet Channel (UPCH)	
	Associated Control Channel (ACCH)	Fast Associated Control Channel (FACCH)
		Slow Associated Control Channel (SACCH)
Radio Control Channel (RCCH)		

(1) Common Access Channel (CAC)

Common access channel corresponds to the control channel in an analog MCA, and is commonly accessed by system users for broadcasting information and setting up calls, etc..

(A) Broadcast Control Channel (BCCH)

Broadcast control channel is a unidirectional(outbound) channel used by the repeater to send information (such as channel structure, system information, access information, etc.) to mobile stations.

(B) Common Control Channel (CCCH)

Common control channel is a bi-directional channel used to transfer information necessary for call set-ups between the repeater and a mobile station.

(C) User Packet Channel (UPCH)

This is a bi-directional point-to-multipoint channel used to transfer system control data between the repeater and mobile stations.

(2) User Specific Channel (USC)

User specific channel corresponds to the speech (voice) channel in an analog MCA system and is used exclusively by system users for communicating with each other.

(A) Traffic Channel (TCH)

Traffic channel is a bi-directional channel used for end-to-end transfer of user information.

(B) User Packet Channel (UPCH)

User packet channel is a bi-directional point-to-multipoint channel used for end-to-end transfer of user packet data.

(C) Associated Control Channel (ACCH)

Associated control channel is a generic term for bi-directional channels to transfer between the repeater and mobile stations. They are associated with the assigned traffic channels. The associated control channels may be either of two types, depending on the mapping method.

(a) Fast Associated Control Channel(FACCH)

Fast associated control channel allows fast data transfer by temporarily stealing the traffic channel or the user packet channel. In this specification, there are two types of FACCH: fast associated control channel 1 and fast associated control channel 2. Either is used, depending on the channel to be stolen.

(b) Slow Associated Control Channel(SACCH)

Slow associated control channel always associated with the traffic channel, etc., and is used for slow data transfer.

(3) Radio Control Channel (RCCH)

Radio control channel is used to transfer radio channel control information (such as physical slot assignment and usage, etc.) between the repeater and mobile stations. In this standard, the radio control channel is classified into three types according to the mapping method and usage:

(A) Radio Control Channel 1 (RCCH1)

Radio control channel 1 is a unidirectional (outbound) channel used to send information on physical slot usage, access control, etc..

(B) Radio Control Channel 2 (RCCH2)

Radio control channel 2 is a unidirectional (outbound) channel that goes with the outbound BCCH, CCCH and UPCH, and is used to send information on reception control, call control, etc..

(C) Radio Control Channel 3 (RCCH3)

Radio control channel 3 is a unidirectional (Inbound) channel used to send information on the individual access control, etc..

4.2.4 Mapping of Functional Channel into Physical Slots

4.2.4.1 Basic Principle on Mapping

The common access channels (CAC) are mapped into data bits in the common-use slots. The user-specific channels map into the individually assigned slots, and the radio control channels (RCCH) map into both the common-use slots and the individually assigned slots. The slot formats used in the common-use slots and the individually assigned slots, and their data bit capacity, are shown in Table 4.2-7. As for the inbound subslots, two subslots occupy one basic slot. Referenced on the time axis, the subslot occupying the first half of the basic slot is referenced as subslot-1, the second half as subslot-2.

Table 4.2-7 Slot Format and Number of Data Bits

Classification	Slot Format		Number of Data Bits
Common-use Slot	Outbound Slot	Basic Slot	800 bits
	Inbound Slot	Subslot	224 bits x 2
Individually Assigned Slot	Outbound Slot	Basic Slot	800 bits
	Inbound Slot	Basic Slot	688 bits
		Subslot	224 bits x 2

One or more functional channel(s) can be mapped into one basic slot or subslot. Each functional channel can transmit mutually independent information. Thus, even when functional channels of the same name are simultaneously mapped into a single slot, mutually independent information can be transmitted between respective functional channels.

Depending on the frame, the same portion of the slots in a single radio channel can be used to carry different functional channels. In such a case, hereinafter, all possible functional channels in a particular configuration are enumerated.

4.2.4.2 Mapping of Functional Channels into Common-use Slots

The mapping of functional channels into the common-use slots is shown in Fig. 4.2-2. However, the mapping positions of the respective functional channels shown in the figure do not correspond exactly to the data bit position. Mapping details are provided in Section 4.2.6.

In outbound slots, one radio control channel 1 (RCCH1) is mapped into a fixed position on the slot. RCCH1 is used to transmits information on physical slot usage, access control, etc..

In outbound slots where two identical channel configurations are mapped simultaneously in a single slot (for example, (RCCH2 + BCCH/CCCH/UPCH) x 2), or in inbound transmissions consisting of 2 subslots, each of the two identical configurations are distinguished by adding a suffix to the configuration name. Hereinafter, this suffix is -F for the first one, and -B for the second.

Outbound common-use slot (Basic slot format: 800 bits)

RCCH1 (112)	RCCH2 + BCCH/CCCH/UPCH-F (344)	RCCH2 + BCCH/CCCH/UPCH-B (344)

Inbound common-use slot (Subslot format: 224 bits x 2)

CCCH/UPCH-F (224)	CCCH/UPCH-B (224)

Fig. 4.2-2 Mapping of Functional Channel into Common-use Slots

4.2.4.3 Mapping of Functional Channels into Individually Assigned Slots

Fig. 4.2-3 shows the mapping of the functional channels into the individually assigned slots. However, the mapping positions of the respective functional channels shown in the figure do not exactly correspond to the data bit positions to be transmitted. Mapping details are prescribed in Section 4.2.6.

In the individually assigned slots, aside from functional channels, a 120 bit filling field for outbound and a 464 bit filling field for inbound, are defined. A filler pattern (to be transmitted in place of a functional channel that is idle) is also defined. These are represented by the generic name FILL. The FILL is used in case that no functional channels are defined on the data bits.

As in the common-use slots, outbound slots have one RCCH1 mapped into a fixed position on the slot. In both inbound and outbound slots, the fast associated control channel that steals a TCH is denoted as FACCH1, and that which steals UPCH as FACCH2. Also, the radio control channel used to send the individual access control information from the mobile station is denoted as RCCH3.

In outbound slots where two identical channel configurations are mapped simultaneously in a single slot (for example, SACCH, UPCH or FILL, or in inbound transmissions consisting of 2 subslots), each of the two identical configurations are distinguished by adding a suffix to the configuration name. The suffix -F is added to the first one and -B to the second one.

For the individually assigned slots, the functional channel mapping method differs depending on the transmission modes (2 types for outbound, 3 for inbound) prescribed in Section 4.3. Fig. 4.2-3 shows the mapping prescribed for each transmission mode.

Outbound individually assigned slot (Basic slot format: 800 bits)
Outbound TCH transmission mode

RCCH1 (112)	SACCH (16)	TCH/FACCH1/FILL (672)

Outbound UPCH transmission mode

RCCH1 (112)	SACCH -F(16)	UPCH/FACCH2 /FILL-F (208)	FILL-F (120)	SACCH -B(16)	UPCH/FACCH2 /FILL-B (208)	FILL-B (120)

Inbound individually assigned slot (Basic slot format: 688 bits)
Inbound TCH transmission mode (individual access permission)

SACCH (16)	TCH/FACCH1 (672)

Inbound TCH transmission mode (individual access permission)

SACCH (16)	FILL (464)	RCCH3 (208)

Inbound individually assigned slot (Subslot format: 224 bits x2)
Inbound UPCH transmission mode

SACCH -F(16)	UPCH/FACCH2-F (208)	SACCH -B(16)	UPCH/FACCH2-B (208)

Inbound TCH transmission mode (user access permission) and UPCH transmission mode

SACCH -F(16)	RCCH3-F (208)	SACCH -B(16)	RCCH3-B (208)

Fig. 4.2-3 Mapping of Functional Channel into Individually Assigned Slots

4.2.5 Mapping of Functional Channels into Radio Channels

4.2.5.1 Mapping of Common Access Channels into Radio Channels

The common access channel is a logical channel composed of a series of functional channel elements (BCCH/CCCH/UPCH). It is mapped (two CACs per slot for both inbound and outbound) into physical slots (common-use slots). The transmission interval of the functional channel elements is prescribed by the mapping method of the common access channel into the radio channel.

For the outbound common access channels, a super frame structure is defined, based on the transmit cycle of the functional channel elements. As shown in Fig. 4.2-4, a super frame structure is determined by the number of slots that make up one cycle. Details of a super frame are prescribed in Section 4.3.8.

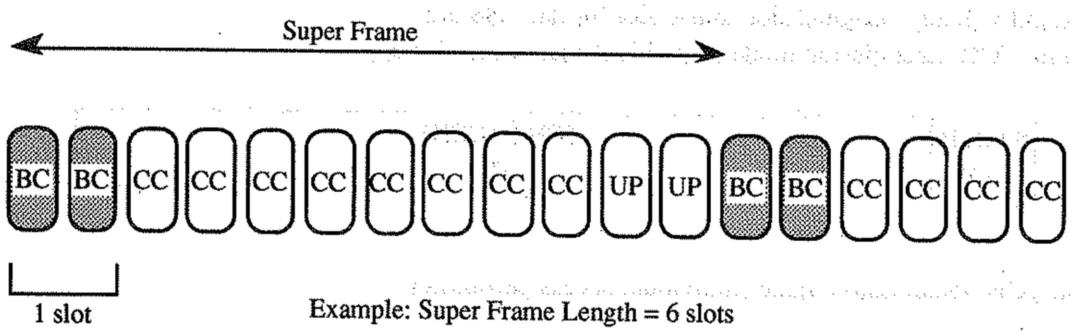


Fig. 4.2-4 Example of the Common Access Channel Super Frame Structure

One common access channel can be mapped into one or more radio channel(s) (control channels) on a single radio carrier. The common access channel super frame structure and the method of mapping into a radio channel are arbitrary for each repeater. The appropriate information is notified through the broadcast control channel (BCCH).

Mapping examples of the outbound common access channel into a radio channel are shown in Fig. 4.2-5 through 4.2-8.

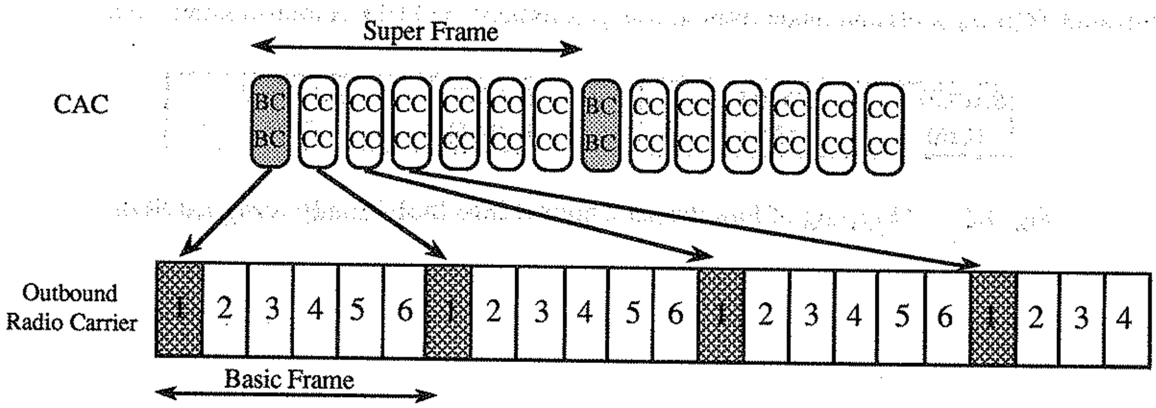


Fig. 4.2-5 Mapping Example of a Single CAC into a Single Radio Channel

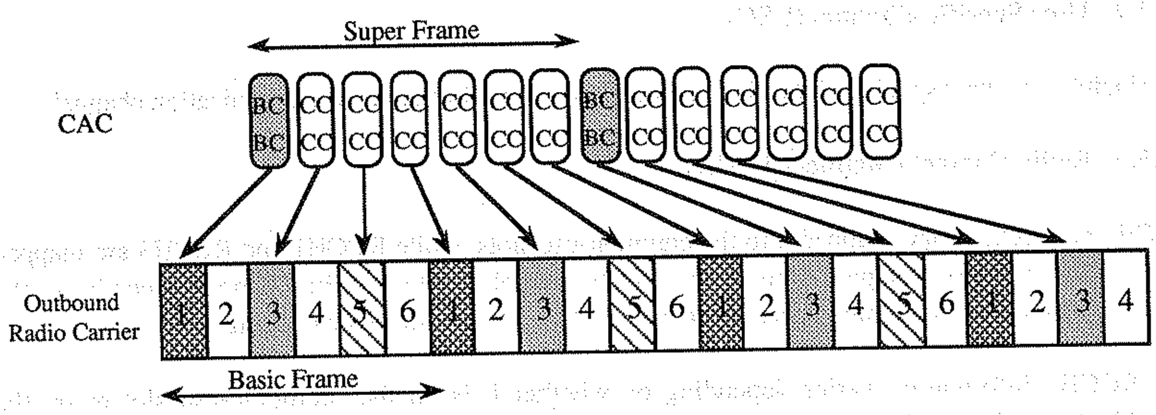


Fig. 4.2-6 Mapping Example of a Single CAC into Multiple Radio Channels

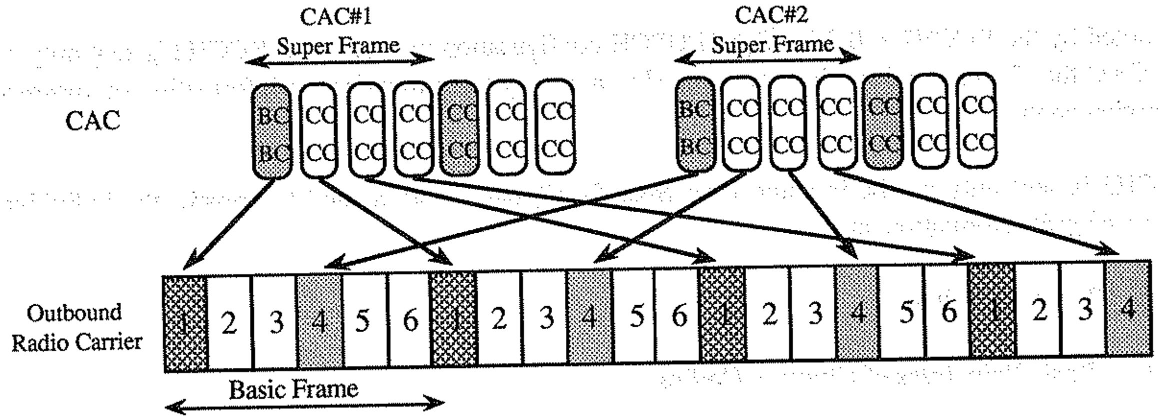


Fig. 4.2-7 Mapping Example of Multiple CACs into Multiple Radio Channels on a Single Radio Carrier

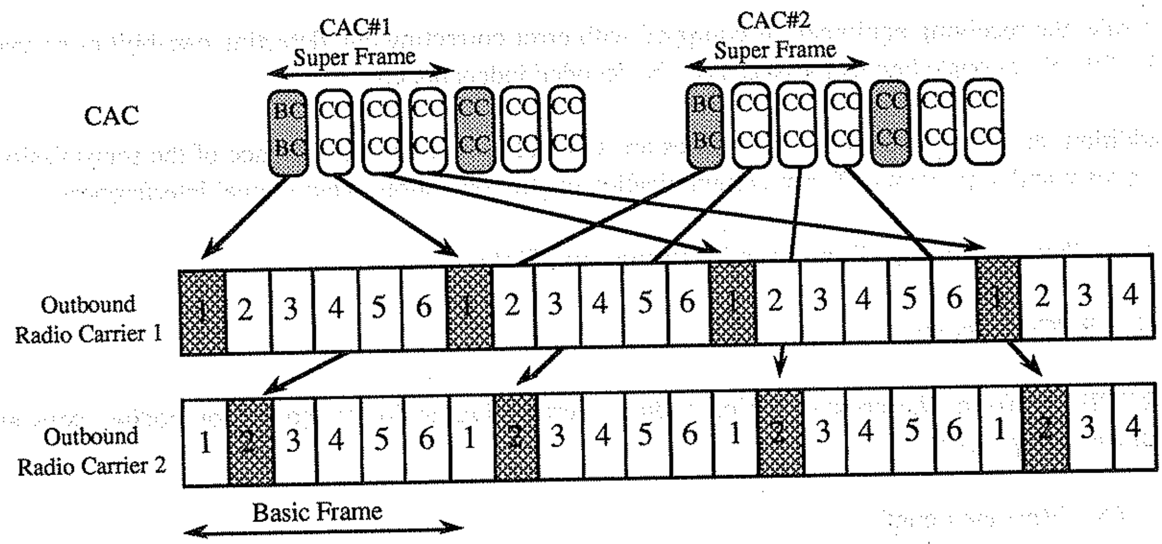


Fig. 4.2-8 Mapping Example of Multiple CACs into Multiple Radio Channels on Different Radio Carriers

The inbound common access channel is mapped into the inbound radio channel. This channel corresponds to the outbound radio channel into which the outbound common access channel is mapped.

4.2.5.2 User Specific Channel (USC)

In principle, one user specific channel is mapped into one radio channel (communication channel).

4.2.5.3 Radio Control Channel (RCCH)

RCCH1 and RCCH2 are mapped into the common-use slots, while RCCH1 and RCCH3 are mapped into the individually assigned slots. Each RCCH mapping into a radio channel depends on the mapping method of the common access channel, or the user specific channel being mapped.

The RCCH1 information varies depending on whether it is on the common-use slot or on the individually assigned slot. RCCH1 is sent along with CAC or USC being mapped into the slot concerned, and is used to transfer the appropriate control information.

As noted by the RCCH2 + BCCH/CCCH/UPCH configuration in Fig. 4.2-2, RCCH2 is sent only on the CAC that forms a pair within the same slot, and is used to transfer the information on message reception control, etc..

RCCH3 is sent only on the inbound User Specific Channel, and is used to transfer the individual access control information, etc..

4.2.6 Channel Coding

4.2.6.1 Basic Principles of Channel Coding

Channel coding prescribes the encoding method when transmitting messages through functional channels on physical slots. The decoding method is not specified.

As a rule, the receiving equipment is equipped with error correcting and detecting capabilities so that each of the functional channel messages can be decoded independently.

In addition, the functional channel messages are scrambled to keep code balance of the transmission data stream and to prevent different communication control operations from mutual interferences.

4.2.6.2 Channel Coding of Outbound Common-use Slots

(1) RCCH1 Coding

RCCH1 performs the error detection coding , scrambling, and error correction coding steps as shown in Fig. 4.2-9.

(A) Message Length

The maximum length of messages to be transmitted through RCCH1 is 46 bits.

(B) Error Detection Code

A 5-bit CRC code (generated from the message bits) is appended to the message.

CRC coding starts from the octet with the smallest octet number, and from the MSB within each octet.

5-bit CRC Generator Polynomial : X^5+X^4+1

(C) Scramble

The resulting 51 bits (after appending the CRC code) are scrambled using the output of a PN (9,5) shift register (details to be prescribed in Section 4.2.6.7).

(D) Bit Append

Five '0' bits are appended to the scrambled bits end.

(E) Error Correction Code

The resulting 56 bits (from the steps above) are input to the convolutional encoder described below. The output bits are read alternately from outputs 1 and 2.

Convolutional Encoder : Encoding Rate R = 1/2 Code (Constraint Length K = 6)
Generator Polynomial : $G1(D) = 1 + D + D^3 + D^5$
$G2(D) = 1 + D^2 + D^3 + D^4 + D^5$

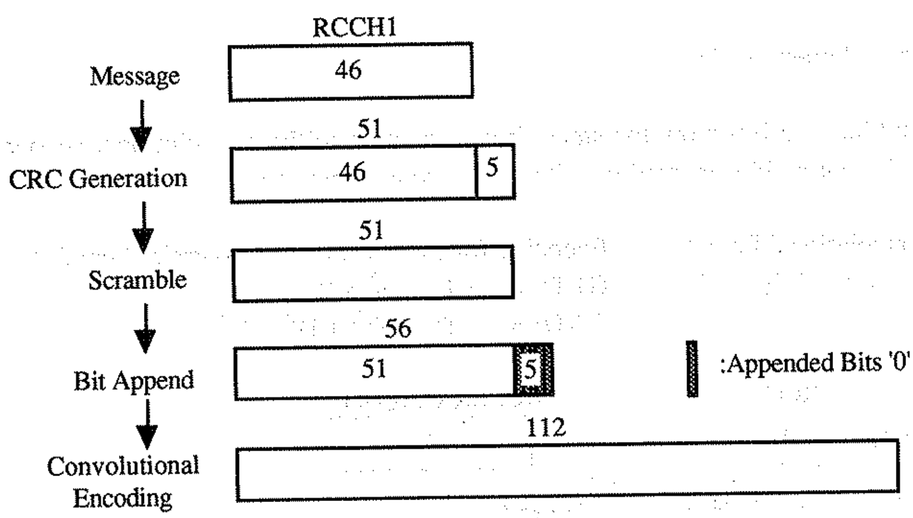


Fig. 4.2-9 RCCH1 Coding

(2) Coding of RCCH2 with Outbound Common Access Channels

RCCH2 with the outbound common access channel (BCCH/CCCH/UPCH) undergoes the steps of error detection coding, scrambling, and error correction coding as shown in Fig. 4.2-10.

(A) Message Length

The length of a message that can be transmitted through RCCH2 is 26 bits.

The length of a message that can be transmitted through the outbound common access channel (BCCH/CCCH/UPCH) is 104 bits.

(B) Error Detection Code

The functional channel messages are concatenated by appending BCCH/CCCH/UPCH to RCCH2. A 17-bit CRC code generated from the concatenated message bits is appended.

CRC coding starts from the octet with the smallest octet number, and from the MSB within each octet.

17-bit CRC Generator Polynomial : $X^{17} + X^{16} + X^{15} + X^{13} + X^{12} + X^{8} + X^{7} + X^{5} + X^{2} + 1$

(C) Scramble

The resulting 147 bits after appending the CRC code are scrambled using the output of a PN(9,5) shift register(details to be prescribed in Section 4.2.6.7).

(D) Bit Insertion and Append

The resulting bits after scrambling are numbered from 1 to 147, starting from the MSB. Then a '0' bit is inserted after every bit numbered X, where X satisfies the condition, X mod 7 = 0 (20 in all, excluding X=147). Five '0's are further appended to the bits end.

(E) Error Correction Code

The resulting 172 bits from the steps above are input to the convolutional encoder described below. The output bits are read out alternately from outputs 1 and 2.

Convolutional Encoder : Encoding Rate R = 1/2 Code(Constraint Length K = 6)
Generator Polynomial : $G1(D) = 1 + D + D^3 + D^5$
$G2(D) = 1 + D^2 + D^3 + D^4 + D^5$

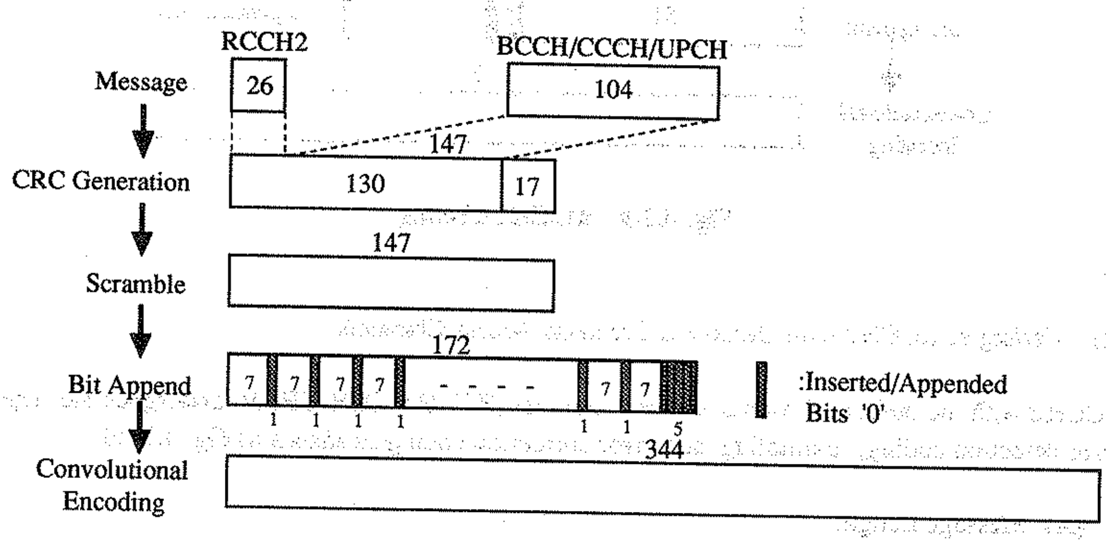


Fig. 4.2-10 Coding of RCCH2 with Outbound Common Access Channel

(3) Mapping into Data Bits

The encoded functional channels (RCCH1 and RCCH2 + BCCH/CCCH/UPCH) are mapped into the data bits of an outbound basic slot (800 bits: D1 to D800) as shown in Fig. 4.2-11.

(A) Block Partitioning of Functional Channels

The RCCH1 encoded bits (112 bits) are partitioned into 7 blocks (B1 to B7), a block consisting of 16 bits.

Two RCCH2 + BCCH/CCCH/UPCH encoded bits (-F and -B, 344 bits each) are concatenated, and the concatenated bits are partitioned into 43 blocks(B1 to B43), a block consisting of 16 bits.

(B) Data Bit Mapping

The partitioned 7 RCCH1 blocks are mapped into data bits D1 to D112 of the outbound basic slot. The bits are read out by columns, 2 bits at a time, starting from B1 down to B7.

Likewise, the partitioned 43 RCCH2 + BCCH/CCCH/UPCH blocks are mapped into data bits (D113 to D800) by reading out bits by columns, 2 bits at a time.
(Table 3-1 of Annex-3)

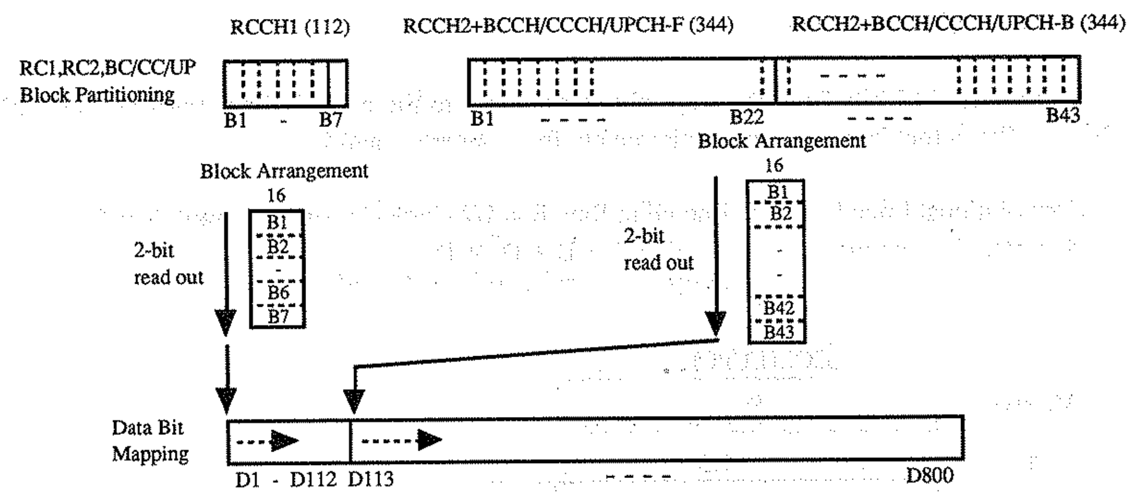


Fig. 4.2-11 Data Bit Mapping into an Outbound Common-use Slot

4.2.6.3 Channel Coding of Inbound Common-use Slot

(1) Coding of Inbound Common Access Channels

Inbound Common Access Channels (CCCH/UPCH) undergoes the steps of error detection coding, scrambling, and error correction coding as shown in Fig. 4.2-12.

(A) Message Length

The length of message that can be transmitted through Common Access Channels (CCCH/UPCH) is 90 bits.

(B) Error Detection Code

A 17-bit CRC code generated from the message bits is appended to the message end.

CRC coding starts from the octet with the smallest octet number and from the MSB within each octet.

17-bit CRC Generator Polynomial : $X^{17} + X^{16} + X^{15} + X^{13} + X^{12} + X^{8} + X^{7} + X^{5} + X^{2} + 1$

(C) Scramble

The resulting 107 bits after appending CRC code are scrambled using the output of a PN(9,5) shift register(details to be prescribed in Section 4.2.6.7).

(D) Bit Append

Five '0's are appended to the scrambled bits end.

(E) Error Correction Code

The resulting 112 bits from the steps above are input to the convolutional encoder described below. The output bits are read out alternately from outputs 1 and 2.

Convolutional Encoder : Encoding Rate R = 1/2 Code(Constraint Length K = 6)
Generator Polynomial : $G1(D) = 1 + D + D^3 + D^5$
$G2(D) = 1 + D^2 + D^3 + D^4 + D^5$

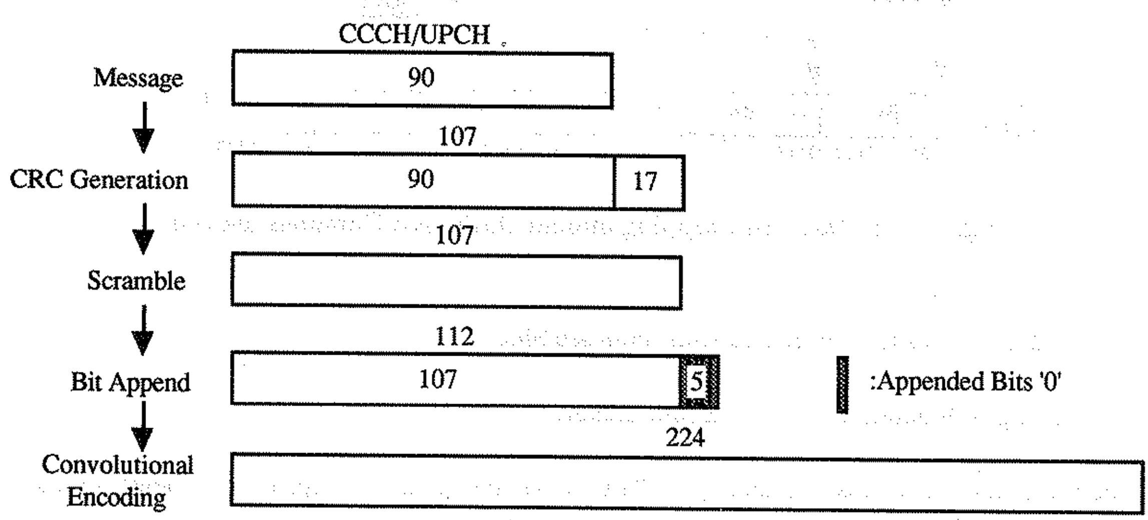


Fig. 4.2-12 Coding of Inbound Common Access Channels

(2) Mapping into Data Bits

The encoded functional channels (CCCH/UPCH) are mapped into the data bits of an inbound subslot (224 bits:, D1 to D224) as shown in Fig. 4.2-13.

CCCH/UPCH-F is mapped into subslot 1, while CCCH/UPCH-B is mapped into subslot 2.

(A) Block Partitioning of Functional Channels

The CAC (CCCH/UPCH) encoded bits (224 bits) are partitioned into 14 blocks (B1 to B14), a block consisting of 16 bits.

(B) Data Bit Mapping

The partitioned 14 Common Access Channel blocks are mapped into data bits from D1 to D224 of inbound subslots by reading out bits by columns, 2 bits at a time, starting from B1 down to B14. (Table 3-2 of Annex-3)

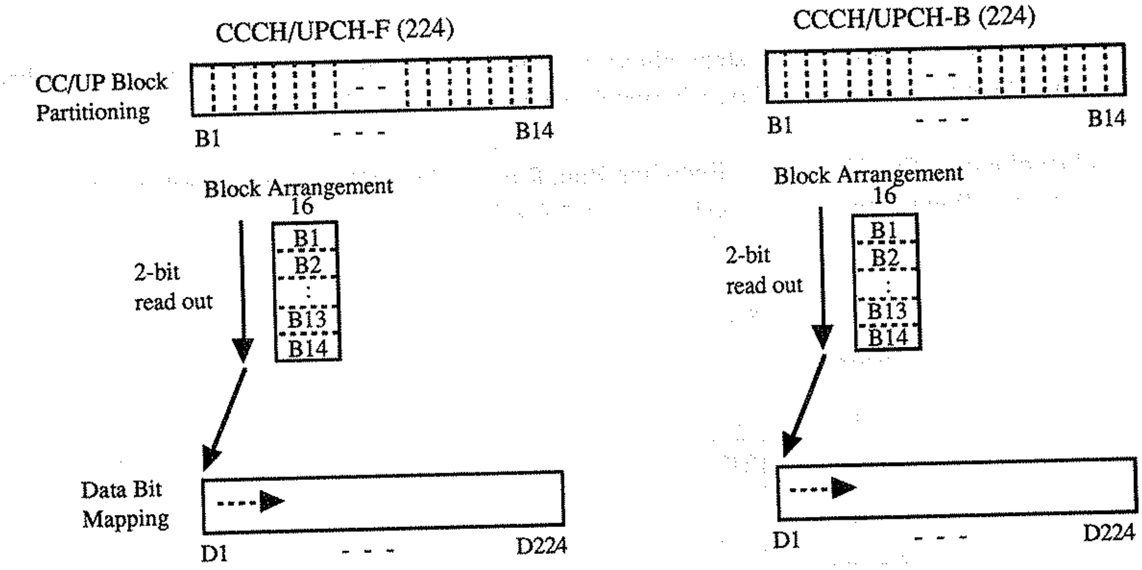


Fig. 4.2-13 Data Bit Mapping into Inbound Common-use Slots

4.2.6.4 Channel Coding of Outbound Individually Assigned Slots

(1) RCCH1 Coding

As in the common-use slots, RCCH1 in individually assigned slots undergoes the steps of error detection coding, scrambling, and error correction coding as shown in Fig. 4.2-9.

(2) SACCH Coding

SACCH undergoes the steps of error detection coding, scrambling, and error correction coding as shown in Fig. 4.2-14.

(A) Message Length

The length of a message that can be transmitted through SACCH is 2 bits.

(B) Error Detection Code

A 2-bit NOT pattern of the SACCH bits(XOR with '11') are appended as parity bits.

(C) Scramble

The resulting 4 bits after appending the NOT pattern are scrambled using the output of a PN (9,5) shift register (details to be prescribed in Section 4.2.6.7).

(D) Bit Append

Four '0's are appended to the bits end resulting from the above procedures.

(E) Error Correction Code

The resulting 8 bits from the steps above are input to the convolutional encoder described below. The output bits are read out alternately from output 1 and 2.

Convolutional Encoder : Encoding Rate R = 1/2 Code (Constraint Length K = 5)
Generator Polynomial : $G1(D) = 1 + D^3 + D^4$
$G2(D) = 1 + D + D^2 + D^4$

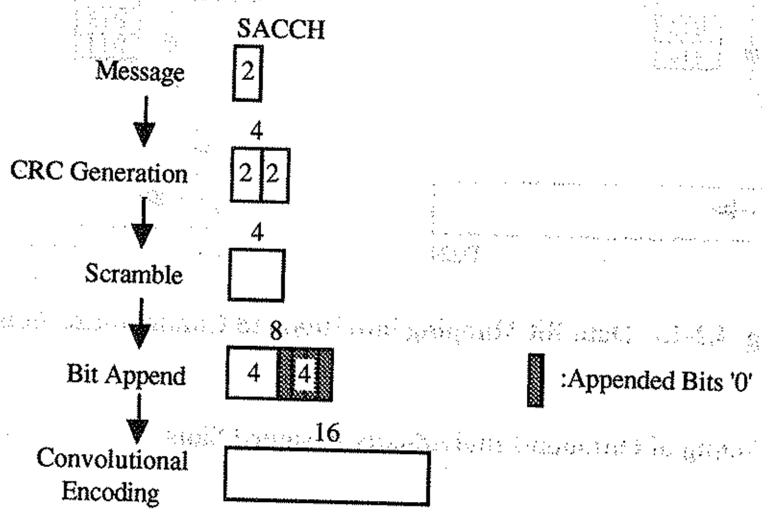


Fig. 4.2-14 SACCH Coding

(3) Traffic Channel Coding

The coding method of Traffic Channels(TCH) is not prescribed.

(4) FACCH1 Coding

FACCH1 undergoes the steps of error detection coding, scrambling, and error correction coding as shown in Fig. 4.2-15.

(A) Message Length

The length of a message that can be transmitted through FACCH1 is 274 bits.

(B) Error Detection Code

A 16-bit CRC code generated from the message bits is appended to the message end.

CRC coding starts from the octet with the smallest octet number, and from the MSB within each octet.

16-bit CRC Generator Polynomial : $X^{16} + X^{15} + X^{12} + X^{11} + X^{10} + X^8 + X^7 + X^6 + X^5 + X^3 + X^2 + 1$

(C) Scramble

The resulting 290 bits after appending CRC code are scrambled using the output of a PN(9,5) shift register (details to be prescribed in Section 4.2.6.7).

(D) Bit Insertion and Append

The resulting bits after scrambling are numbered from 1 to 290, starting from the MSB. Then, a '0' bit is inserted after every bit numbered X, where X satisfies the condition, X mod 7 = 0(41 bits in all). Five '0's are appended to the scrambled bits end.

(E) Error Correction Code

The resulting 336 bits from the steps above are input to the convolutional encoder described below. The output bits are read out alternately from outputs 1 and 2.

Convolutional Encoder : Encoding Rate R = 1/2 Code (Constraint Length K = 6)
Generator Polynomial : $G1(D) = 1 + D + D^3 + D^5$
$G2(D) = 1 + D^2 + D^3 + D^4 + D^5$

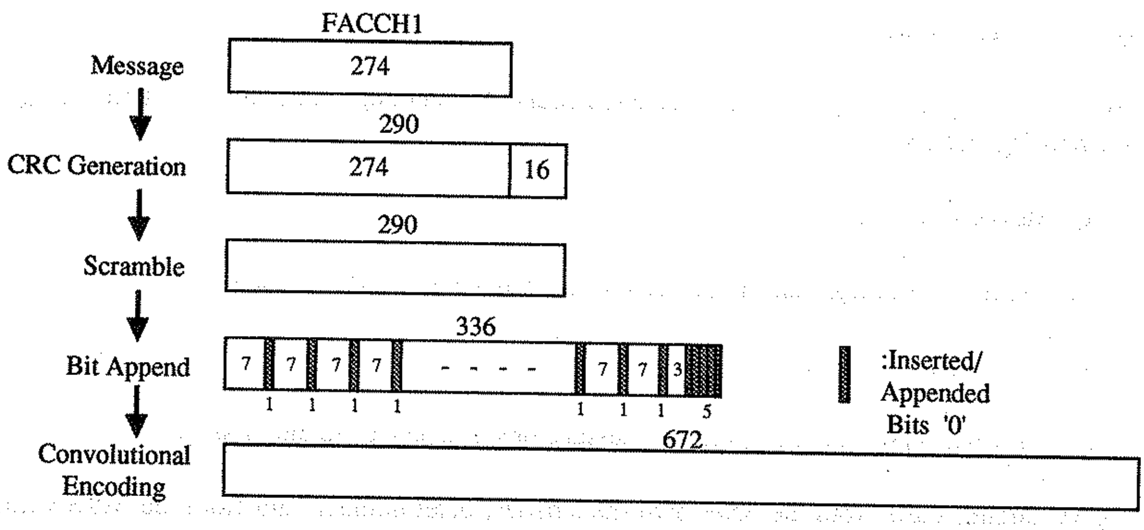


Fig. 4.2-15 FACCH1 Coding

(5) FACCH2 Coding

FACCH2 undergoes the steps of error detection coding, scrambling, and error correction coding as shown in Fig. 4.2-16.

(A) Message Length

The length of a message that can be transmitted through FACCH2 is 82 bits.

(B) Error Detection Code

A 17-bit CRC code generated from the message bits is appended to the message end.

CRC coding starts from the octet with the smallest octet number and from the MSB within each octet.

17-bit CRC Generator Polynomial : $X^{17} + X^{16} + X^{15} + X^{13} + X^{12} + X^{8} + X^{7} + X^{5} + X^{2} + 1$

(C) Scramble

The resulting 99 bits after appending CRC code are scrambled using the output of a PN(9,5) shift register(details to be prescribed in Section 4.2.6.7).

(D) Bit Append

Five ‘0’s are appended to the scrambled bits end.

(E) Error Correction Code

The resulting 104 bits from the steps above are input to the convolutional encoder described below. The output bits are read out alternately from outputs 1 and 2.

Convolutional Encoder : Encoding Rate R = 1/2 Code(Constraint Length K = 6)
Generator Polynomial : $G1(D) = 1 + D + D^3 + D^5$
$G2(D) = 1 + D^2 + D^3 + D^4 + D^5$

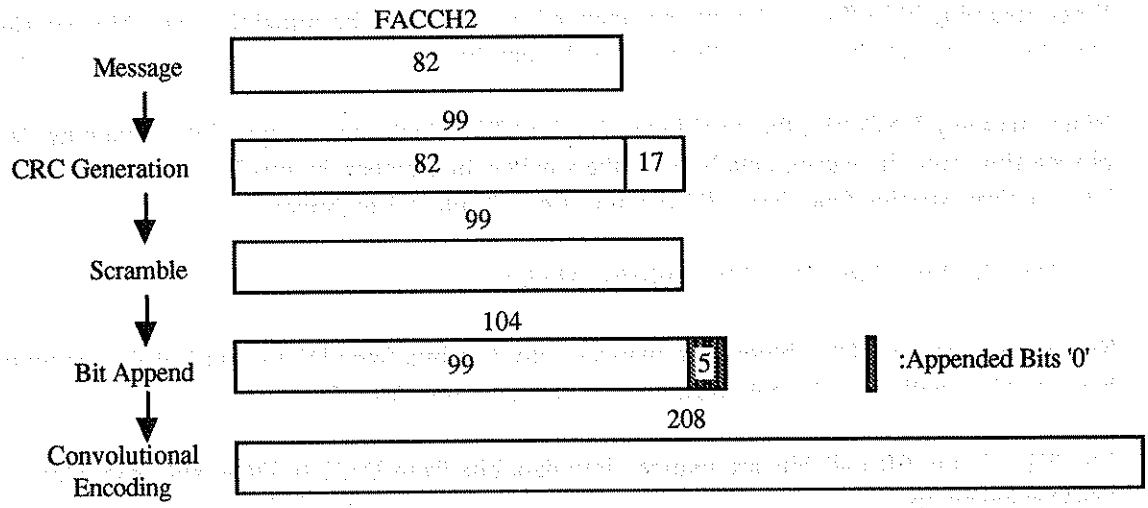


Fig. 4.2-16 FACCH2 Coding

(6) FILL Pattern Coding

The bit pattern used for FILL is not prescribed.

(7) User Packet Channel Coding

The coding method for the user packet channel (UPCH) is not prescribed.

(8) Mapping into Data Bits

The encoded functional channels are mapped into data bits of an outbound basic slot (800 bits : D1 to D800) as shown in Fig. 4.2-17.

(A) Block Partitioning of Functional Channels

The encoded functional channels shown below are to be partitioned into blocks consisting of 16 bits as follows :

RCCH1 : 7 blocks(B1 to B7)
FACCH1 : 42 blocks(B1 to B42)
FACCH2 : 13 blocks(B1 to B13)

(B) Data Bit Mapping(TCH Transmission Mode)

The partitioned 7 RCCH1 blocks are mapped into data bits from D1 to D112 of the outbound basic slot by reading out by columns, 2 bits at time, starting from B1 down to B7.

The SACCH bits are mapped starting from D113-D114 and at every 86 bits intervals afterward (D113-D114, D199-D200, D285-D286, D371-D372, D457-D458, D543-D544, D629-D630, and D715-D716) by reading out by columns, 2 bits at a time.

When mapping TCH/FILL, the bits are mapped in order into the remaining data bits, starting from the vacant data bit which is the smallest bit number.

When mapping FACCH1, the partitioned 42 FACCH1 blocks are mapped into remaining data bits starting from the vacant data bit with the smallest bit number, by reading out by columns, 2 bits at a time, starting from block B1 down to B42. (Table 3-3 of Annex-3)

(C) Data Bit Mapping(UPCH Transmission Mode)

The partitioned 7 RCCH1 blocks are mapped into data bits from D1 to D112 of the outbound basic slot by reading out by columns, 2 bits at time, starting from B1 down to B7.

The FILL-F and FILL-B bits are mapped into data bits from D337 to D456 and from D681 to D800 respectively.

The SACCH-F bits are mapped starting from D113-D114 and at every 28-bit interval afterward (D113-D114, D141-D142, D169-D170, D197-D198, D225-D226, D253-D254, D281-D282, and D309-D310) by reading out 2 bits at a time.

The SACCH-B bits are mapped starting from D457-D458 and at every 28-bit interval afterward (D457-D458, D485-D486, D513-D514, D541-D542, D569-D570, D597-D598, D625-D626, and D653-D654) by reading out 2 bits at a time.

UPCH/FILL-F bits are mapped in order into the remaining data bits starting from the vacant data bit with the smallest number. Likewise, UPCH/FILL-B bits are mapped in order into the remaining data bits of the second half, starting from the vacant data bit with the smallest number.

When mapping FACCH2, the 13 blocks of the partitioned FACCH2-F are mapped in order into the remaining data bits with the smallest bit number of the first half of the slots. The bits are read out by column, 2 bits at a time, starting from B1 down to B13. Likewise, the FACCH2-B bits are mapped into the second half of the slot in the same manner.
(Table 3-4 of Annex-3)

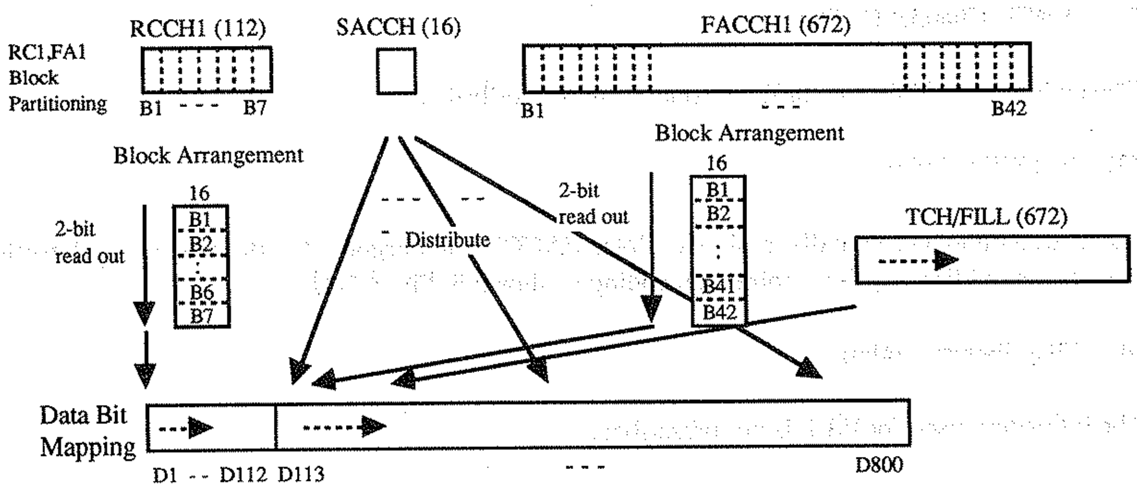


Fig. 4.2-17a Data Bit Mapping of Outbound Individually Assigned Slot - (TCH Transmission Mode)

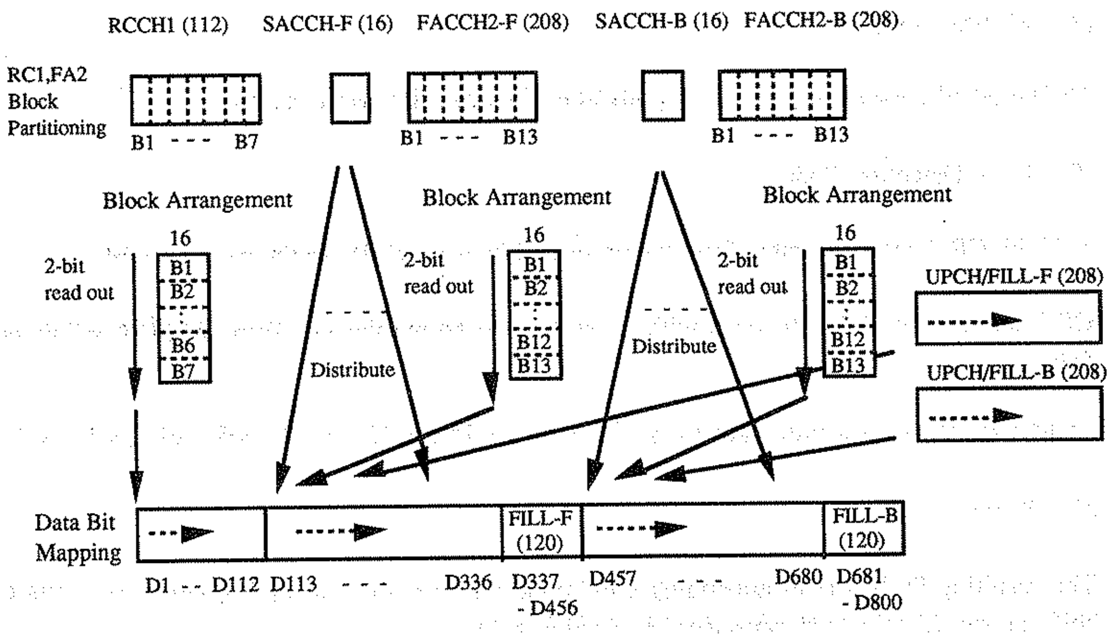


Fig. 4.2-17b Data Bit Mapping of Outbound Individually Assigned Slot - (UPCH Transmission Mode)

4.2.6.5 Channel Coding of Inbound Individually Assigned Slots

(1) SACCH Coding

As in outbound individually assigned slots, SACCH undergoes the steps of error detection coding, scrambling and error correction coding as shown in Fig. 4.2-14.

(2) Traffic Channel Coding

The coding method for the traffic channel is not prescribed.

(3) FACCH1 Coding

As in outbound individually assigned slots, FACCH1 undergoes the steps of error detection coding, scrambling and error correction coding as shown in Fig. 4.2-15.

(4) FILL Pattern Coding

The bit pattern used for FILL is not prescribed.

(5) RCCH3 Coding

The RCCH3 undergoes the steps of error detection coding, error correction coding and scramble according to the procedure shown in Fig. 4.2-18.

(A) Message Length

The length of a message that can be transmitted through RCCH3 is 82 bits.

(B) Error Detection Code

A 17-bit CRC code generated from the message bits is appended to the message end.

CRC coding starts from the octet with the smallest octet number and from the MSB within each octet.

17-bit CRC Generator Polynomial : $X^{17} + X^{16} + X^{15} + X^{13} + X^{12} + X^{8} + X^{7} + X^{5} + X^{2} + 1$

(C) Scramble

The resulting 99 bits after appending CRC code are scrambled using the output of a PN(9,5) shift register (details to be prescribed in Section 4.2.6.7).

(D) Bit Append

Five '0's are appended to the scrambled bits end.

(E) Error Correction Code

The resulting 104 bits from the steps above are input to the convolutional encoder described below. The output bits are read out alternately from outputs 1 and 2.

Convolutional Encoder	: Encoding Rate R = 1/2 Code(Constraint Length K = 6)
Generator Polynomial	: $G1(D) = 1 + D + D^3 + D^5$
	$G2(D) = 1 + D^2 + D^3 + D^4 + D^5$

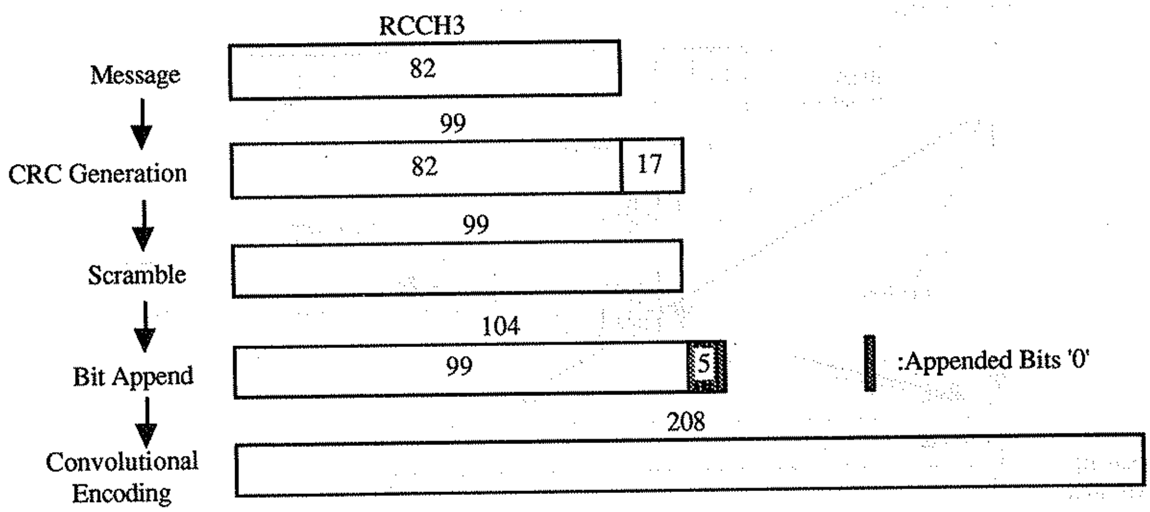


Fig. 4.2-18 RCCH3 Coding

(6) Mapping into Data Bits

The encoded functional channels are mapped into the data bits of an inbound basic slot (688 bits : D1 to D688) as shown in Fig. 4.2-19.

(A) Block Partitioning of Functional Channels

The encoded functional channels shown below are to be partitioned into blocks consisting of 16 bits as follows :

FACCH1	:	42 blocks (B1 to B42)
RCCH3	:	13 blocks (B1 to B13)

(B) Data Bit Mapping (TCH Transmission Mode)

The SACCH bits are mapped starting from D1-D2 and at every 86 bit interval afterward (D1-D2, D87-D88, D173-D174, D259-D260, D345-D346, D431-D432, D517-D518, and D603-D604) by reading out 2 bits at a time.

When mapping TCH, the TCH bits are mapped in order into the remaining data bits starting from the vacant data bit with the smallest bit number.

When mapping FACCH1, the partitioned 42 FACCH1 blocks are mapped into the remaining data bits. This process starts from the vacant data bit with the smallest bit number, by reading out columns, 2 bits at a time, starting from block B1 down to B42.

When mapping RCCH3, the first, FILL bits are mapped in order into the remaining data bits. This process starts from the vacant data bit with the smallest number; next, the partitioned 13 RCCH3 blocks are mapped in order into the remaining data bits in the same way, by reading out by columns, 2 bits at a time, starting from B1 down to B13 (Table 3-5, 6 of Annex-3).

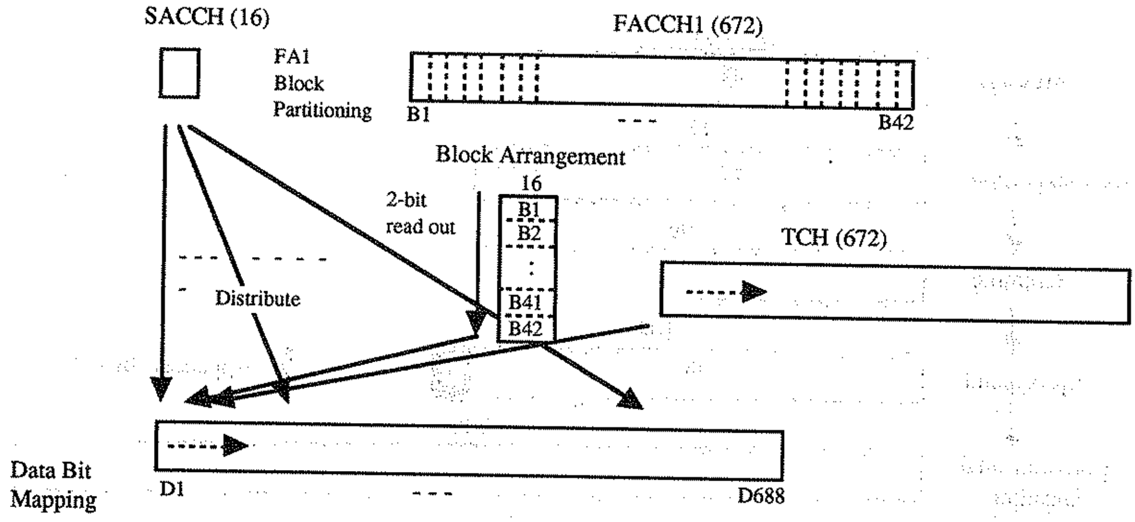


Fig. 4.2-19a Data Bit Mapping of Inbound Individually Assigned Slot (Basic Slot) -TCH/FACCH1

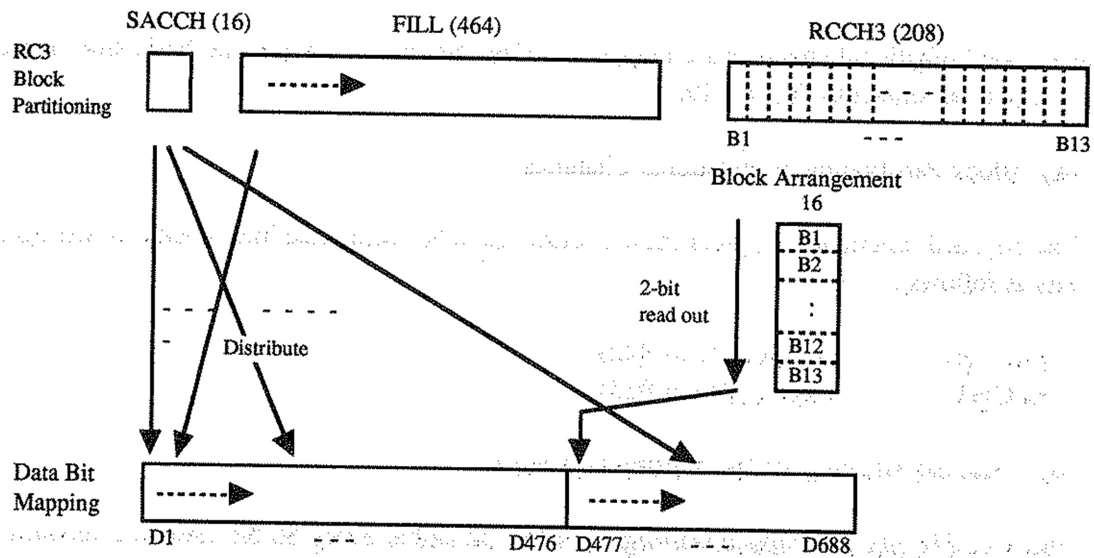


Fig. 4.2-19b Data Bit Mapping of Inbound Individually Assigned Slot (Basic Slot) - RCCH3

4.2.6.6 Channel Coding of Inbound Individually Assigned Slot (Subslot Format)

(1) SACCH Coding

As in outbound individually assigned slot, SACCH undergoes the steps of error detection coding, scrambling and error correction coding as shown in Fig. 4.2-14.

(2) User Packet Channel Coding

The coding method for User Packet Channel is not prescribed.

(3) FACCH2 Coding

As in outbound individually assigned slot, FACCH2 undergoes the steps of error detection coding, scrambling and error correction coding as shown in Fig. 4.2-16.

(4) RCCH3 Coding

As shown in inbound individually assigned slot (basic slot format), RCCH3 undergoes the steps of error detection coding, scrambling and error correction coding as shown in Fig. 4.2-18.

(5) Mapping into Data Bits

The encoded functional channels are mapped into the data bits of an inbound subslot (224 bits: D1 to D224) as shown in Fig. 4.2-20. UPCH/FACCH2/RCCH3-F is mapped into subslot 1, while UPCH/FACCH2/RCCH3-B is mapped into subslot 2.

(A) Block Partitioning of Functional Channels

The encoded functional channels are partitioned into blocks consisting of 16 bits as follows :

FACCH2	: 13 blocks (B1 to B13)
RCCH3	: 13 blocks (B1 to B13)

(B) Data Bit Mapping

The SACCH bits are mapped starting from D1-D2 and at every 28 bit interval afterward (D1-D2, D29-D30, D57-D58, D85-D86, D113-D114, D141-D142, D169-D170, and D197-D198) by reading out 2 bits at a time.

When mapping UPCH, the UPCH bits are mapped in order into the remaining data bits starting from the vacant data bit with the smallest bit number.

When mapping FACCH2, the partitioned 13 FACCH2 blocks are mapped into the remaining data bits starting from the vacant data bit with the smallest bit number, by reading out by columns, 2 bits at a time, starting from block B1 down to B13.

When mapping RCCH3, the partitioned 13 RCCH3 blocks are mapped in order into the remaining data bits starting from the vacant data bit with the smallest number, by reading out by columns, 2 bits at a time, starting from B1 down to B13 (Table 3-7 of Annex-3).

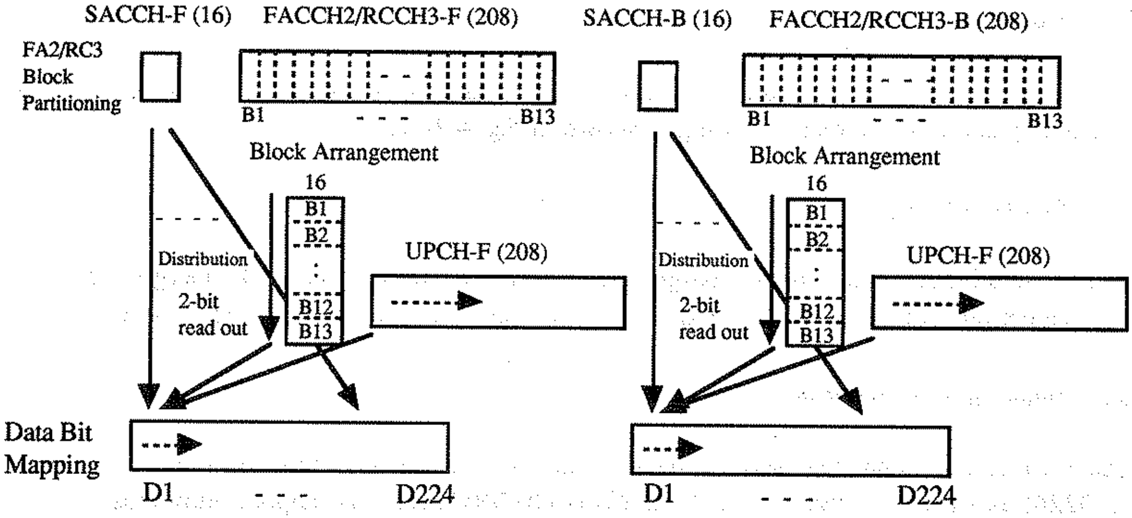


Fig. 4.2-20 Data Bit Mapping of Inbound Individually Assigned Slot (Subslot)

4.2.6.7 Scramble

The prescribed scrambling used in functional channel coding is described below.

(1) Scramble Method

Scramble is performed by taking the XOR between the functional channel message after appending the error detecting code (scramble data) and the output pattern of a PN (9,5) shift register (scramble pattern), by making correspondence between the order from MSB to LSB for scramble data, and output order from the shift register for the scramble pattern, respectively.

(2) Configuration of the PN (9,5) Shift Register.

The configuration of the PN (9,5) shift register is shown in Fig. 4.2-21. At the start of the scrambling process, the shift register is initialized to a predetermined setting based on the functional channel configuration. With the shift register properly initialized, the scramble pattern is derived from the shift register.

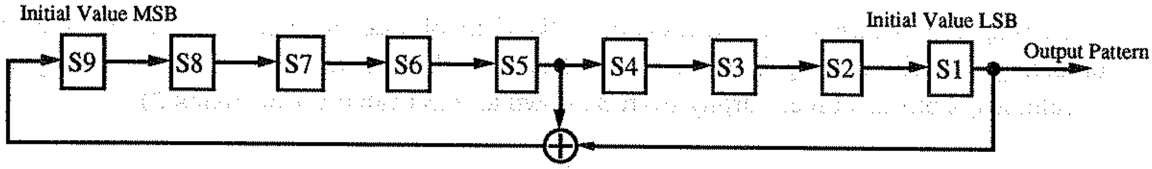


Fig. 4.2-21 Configuration of PN(9,5) Shift Register

(3) Shift Register Initial Value

The initial setting of the PN (9,5) shift register is as shown in Table 4.2-8. The assignment of the Link Channel Number (LCN) found in the table is prescribed in Section 4.3.3.

Table 4.2-8 Register Initial Values

Functional Channels			Register Initial Value
Common Access Channel and RCCH2	RCCH2 + BCCH	outbound	'111111111' (all 1s)
	RCCH2 + CCCH	outbound	'111111111' (all 1s)
	RCCH2 + UPCH	outbound	'111111111' (all 1s)
	CCCH/UPCH	inbound	'111111111' (all 1s)
User Specific Channel	FACCH1, FACCH2		lower 9 bits of LCN*
	SACCH		lower 9 bits of LCN*
RCCH1, RCCH3	RCCH1		'111111111' (all 1s)
	RCCH3		lower 9 bits of LCN*

(*) : "LCN" stands for the Link Channel Number

(4) Descramble Method

The same PN (9,5) shift register shown in Fig. 4.2-21 is used to decode (descramble) the scrambled code. The scrambled pattern is obtained after initializing the shift register according to Table 4.2-8, and the scrambled code can be decoded by taking its XOR with the scramble pattern obtained from the shift register.

4.3 Transmission Control

This section prescribes the transmission control between a mobile station and a repeater station on the radio channel.

4.3.1 Format of Radio Control Channel

The radio control channel (RCCH) is mapped into both common-use slots and individually assigned slots. It transmits a transmission control information regarding usage of physical slot, access control, re-transmission and repetitive transmission control, time alignment control and so on.

There are three types of the radio control channels (RCCH). RCCH1 is mapped into both outbound common-use slots and individually assigned slots. RCCH2 is mapped only into outbound common-use slots (two channels in one slot). RCCH3 is mapped only into inbound individually assigned slots. Each transmits a complete and independent message in its slot. Table 4.3-1 shows signal length and message length for each of these channels.

Table 4.3-1 Signal Length and Message Length of Radio Control Channel

Functional Channel	Mapping	Signal Length	Message Length
RCCH1	All outbound slots	112 bits	46 bits
RCCH2	Outbound common access slot	344 bits*	26 bits
RCCH3	Inbound individually assigned slot	208 bits	82 bits

(*) Signal length including the outbound common access channel

4.3.1.1 Message Transmitted on RCCH1

RCCH1 is mapped into all outbound slots and always transmits a different single message, depending on whether it is mapped into a common-use slot or an individually assigned slot.

(1) Common Access Control Message

This is a message when mapped into RCCH1 of an outbound common-use slot. It transmits a physical slot information and a inbound slot access control information. Table 4.3-2 shows the message format.

Table 4.3-2 Format of the Common Access Control Message

octet \ bit	7	6	5	4	3	2	1	0
1	Slot Type		Access Control Information 1			Access Control Information 2		
2	Individual Access Assignment Information							
3								
4								
5								
6	Individual Access Type		CAC Mapping Information					

Each information element in the message format is as follows. Detailed usage is prescribed beginning in Section 4.3.5.

Slot Type (octet 1 : 2 bits)

Specifies the carrier and slot types of this slot.

Bit : 7 6	
0 0	common-use slot on control carrier
0 1	(individually assigned slot on control carrier : used in user transmission control message)
1 0	reserved
1 1	(individually assigned slot on communication carrier : used in user transmission control message)

Access Control Information 1 (octet 1 : 3 bits)

Specifies the access condition of inbound subslot 1.

Bit : 5 4 3	
- - 0	random access permission
- - 1	individual access permission
- 0 -	CCCH transmit permission
- 1 -	UPCH transmit permission
0 - -	receive state indication (NG : No Good)
1 - -	receive state indication (OK)

Access Control Information 2 (octet 1 : 3 bits)

Specifies the access condition of inbound subslot 2.

Bit : 2 1 0

Same as access control information 1.

Individual Access Assignment Information (octet 2 to octet 5 : 32 bits)

Specifies the subscriber unit code (Fleet ID + unit ID) when individual access permission is asserted.

Hex :	
0 0 0 0 0 0 0 0	no individual access permission (random access permission)
0 0 0 0 0 0 0 1	
:	subscriber unit code
F F F F F F F F	

Individual Access Type (octet 6 : 2 bits)

Specifies the transmission type when individual access permission is asserted.

Bit : 7 6	
0 0	regular transmission
0 1	re-transmission
others	preparatory

CAC Mapping Information (octet 6 : 4 bits)

Specifies the CAC mapping information for faster CAC fetch.

Bit : 5 4 3 2	
- - - 0	single CAC mapped (no other CAC in this radio carrier)
- - - 1	plural CACs mapped (other CAC(s) in this radio carrier)
- 0 0 -	this CAC mapped into a single radio channel
- 1 0 -	this CAC mapped into plural radio channel (head of Radio Channel)
- 1 1 -	this CAC mapped into plural radio channel (non-head of Radio Channel)
others	preparatory

(2) User Transmission Control Message

This is a message mapped into RCCH1 of an outbound individually assigned slot. It transmits the transmission control information for the user assigned to this slot. Table 4.3-3 shows the message format.

Table 4.3-3 Format of the Transmission Control Message

octet \ bit	7	6	5	4	3	2	1	0
1	Slot Type		Inbound Transmission Mode		Time Alignment Control/ Transmission Power Control			
2	User Assignment Information							
3								
4								
5								
6	Outbound Transmission Mode		Inbound Relay Mode		Outbound Relay Mode			

Each information element in the message format is as follows. Detailed usage is prescribed from Section 4.3.5.

Slot Type (octet 1 : 2 bits)

Specifies the carrier and slot types of this slot.

Bit : 7 6	
0 0	(common-use slot on control carrier : used in the common access control message)
0 1	individually assigned slot on control carrier
1 0	reserved
1 1	individually assigned slot on communication carrier

Inbound Transmission Mode (octet 1 : 2 bits)

Specifies the inbound transmission mode and access condition of this slot.

Bit : 5 4	
0 0	inbound TCH transmission mode (user access permitted state)
0 1	inbound UPCH transmission mode
1 0	inbound TCH transmission mode (individual access permitted state : time alignment control is valid)
1 1	inbound TCH transmission mode (individual access permitted state : transmission power control is valid)

Time Alignment Control/Transmission Power Control (octet 1 : 4 bits)

Specifies the time alignment control value or transmission power control value in TCH transmission mode (individual access permitted state). The field of inbound transmission mode determines which one is indicated. In case that steal indication (in the field of outbound transmission mode) is asserted, it also transmits an optional information.

Bit : 3 2 1 0	
0 0 0 0	
:	time alignment control value/transmit power control value
:	/ optional information
1 1 1 1	

(Details are prescribed in Section 4.3.10.4, 4.3-10.5, and Section 4.3.10.6.)

User Assignment Information (octet 2 to octet 5 : 32 bits)

Specifies the Fleet ID of the fleet assigned this communication channel, or the subscriber unit code (Fleet ID + unit ID) when inbound individual access permitted state is asserted. In case steal indication in the field of outbound transmission mode is asserted, it also transmits an optional information.

Hex :	
0 0 0 0 0 0 0 0	idle indication
0 0 0 0 0 0 0 1	
:	
:	Fleet ID/subscriber unit code/optional information
:	
F F F F F F F F	

Outbound Transmission Mode (octet 6 : 2 bits)

Specifies the outbound transmission mode of this communication channel. It also indicates the presence of channel stealing by the optional information in the time alignment/transmission power control and the user assignment information fields.

Bit: 7	6	
-	0	outbound TCH transmission mode
-	1	outbound UPCH transmission mode
0	-	steal indication (no user assignment information stealing)
1	-	steal indication (user assignment information stealing)

Inbound Relay Mode (octet 6 : 2 bits)

Specifies the inbound relay mode of this communication channel

Bit: 5	4	
0	0	repeat without error correction
0	1	repeat with error correcting mode 1
1	0	repeat with error correcting mode 2
1	1	repeat with error correcting mode 3

Outbound Relay Mode (octet 6 : 2 bits)

Specifies the outbound relay mode of this communication channel.

Bit: 3	2	
0	0	repeat without error correction
0	1	repeat with error correcting mode 1
1	0	repeat with error correcting mode 2
1	1	repeat with error correcting mode 3

4.3.1.2 Message Transmitted on RCCH2

RCCH2 is mapped into two positions of an outbound common-use slot and each transmits an independent single message. Each RCCH2 transmits information related to the succeeding Common Access Channel.

(1) Common Reception Control Message

This is a message to be mapped into the RCCH2 of an outbound common-use slot and transmits an information related to the transmission control of the outbound Common Access Channel. Table 4.3-4 shows the message format.

Table 4.3-4 Format of Common Reception Control Message

octet \ bit	7	6	5	4	3	2	1	0
1	Channel Type		Repetitive Transmission Counter				←	
2	Link Channel Number							→
3	Reception Instruction		Call Group Temporary Expansion					
4	Concatenated Transmission							

Each information element in the message format is as follows. Detailed usage is prescribed beginning in Section 4.3.3.

Channel Type (octet 1 : 3 bits)

Specifies the functional channel type of the succeeding outbound Common Access Channel.

Bit: 7 6	
0 0	BCCH transmission indication (head of super frame)
0 1	BCCH transmission indication (no head of super frame)
1 0	CCCH transmission indication
1 1	UPCH transmission indication

Repetitive Transmission Counter (octet 1 : 4 bits)

Specifies the number of remaining repetitive transmission of the associated outbound Common Access Channel (CCCH). This is an option field when transmitting other functional channels (BCCH/UPCH).

Bit: 5 4 3 2	
0 0 0 0	
:	
:	number of remaining transmissions (0 to 15)
:	
1 1 1 1	

Link Channel Number (octet 1 to octet 2 : 10 bits)

Specifies the link channel number assigned to the mobile station(s) to receive the associated Common Access Channel (CCCH/UPCH) transmitted. This is an option field when transmitting other functional channel (BCCH).

Hex :		
	0 0 0	preparatory
	0 0 1	
	:	
	:	link channel number (1 to 1023 : decimal)
	:	
	3 F F	

Reception Instruction (octet 3 : 2 bits)

Specifies the presence or absence of the forced Head BCCH reception indication and temporary expansion of call group.

Bit : 7	6	
-	0	no instruction of the forced reception of Head BCCH
-	1	instruction of the forced reception of Head BCCH
0	-	no indication of call group temporary expansion
1	-	indication of call group temporary expansion

Call Group Temporary Expansion (octet 3 : 6 bits)

Specifies the expanded call group number during call group temporary expansion.

Hex :		
	0 0	instruction to receive all call slots
	0 1	
	:	
	:	call group number (1 to 63)
	:	
	3 F	

Concatenated Transmission (octet 4 : 2 bits)

Specifies concatenated message transmission on the outbound Common Access Channel.

Bit : 7	6	
0	0	no concatenated transmission (each message is independent)
0	1	concatenated transmission (first half of the message)
1	0	concatenated transmission (second half of the message)
1	1	preparatory

4.3.1.3 Message Transmitted on RCCH3

RCCH3 is mapped into an inbound individually assigned slot. It transmits a message to request a change of the inbound transmission mode. It also transmits a message related to the individual access request and release when in TCH transfer mode.

(1) User Access Control Message

This is a message mapped into RCCH3 of inbound individually assigned slot and changes inbound transfer mode in the user specific channel requests/releases of the individual access permission in TCH transmission mode. Table 4.3-5 shows the message format.

Table 4.3-5 Format of User Transmit Prerogative Control Message

<table>
<tr><th>octet \ bit</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>0</th></tr>
<tr><td>1</td><td colspan="6">Message Type</td><td colspan="2">Reserved</td></tr>
<tr><td>2</td><td colspan="4">Request Code of Transmission Mode</td><td colspan="2">Reserved</td><td colspan="2">←</td></tr>
<tr><td>3</td><td colspan="8">Link Channel Number →</td></tr>
<tr><td>4</td><td colspan="8" rowspan="4">Subscriber Unit Code</td></tr>
<tr><td>5</td></tr>
<tr><td>6</td></tr>
<tr><td>7</td></tr>
<tr><td>8</td><td colspan="8" rowspan="3">← Option</td></tr>
<tr><td>9</td></tr>
<tr><td>10</td></tr>
<tr><td>11</td><td colspan="2">→</td><td colspan="6"></td></tr>
</table>

Each information element in the message format is as follows. Detailed usage is prescribed beginning in Section 4.3.10, through the end of the document.

<u>Message Type (octet 1 : 6 bits)</u>

Specifies the access control operation this message requests. The individual access request message is valid in user access permitted state on TCH transmission mode, and UPCH transmission mode. The individual access release request message is valid only in Individual access permitted state on TCH transmission mode, and UPCH transmission mode. Transmission mode change request message is valid in any mode/state.

Bit : 7 6 5 4 3 2	
0 0 0 0 1 0	transmission mode change request
0 0 0 1 1 0	individual access request
0 0 1 0 1 0	individual access release request
others	reserved

Reserved (octet 1 : 2 bits)

Bit : 1 0
- - reserved (default values : zero)

Request Code of Transmission Mode (octet 2 : 4 bits)

Indicates the transmission mode and the relay mode which this message requests to switch in transmission mode change request. In individual access request/release request message, this field is used to indicate requesting relay mode. In this case, inbound TCH transmission mode is indicated on bit 5 and 4 (pattern '1 0').

Bit : 7	6	5	4	
-	-	0	0	reserved
-	-	0	1	inbound UPCH transmission mode
-	-	1	0	inbound TCH transmission mode
-	-	1	1	reserved
0	0	-	-	repeat without error correction
0	1	-	-	repeat with error correction mode 1
1	0	-	-	repeat with error correction mode 2
1	1	-	-	repeat with error correction mode 3

Reserved (octet 2 : 2 bits)

Bit : 3 2
- - reserved (default value : zero)

Link Channel Number (octet 2 to octet 3 : 10 bits)

Specifies the Link Channel Number assigned to this call.

Hex : 0 0 0 reserved
0 0 1
:
: link channel number (1 to 1023 : decimal)
:
3 F F

Subscriber Unit Code (octet 4 to octet 7 : 32 bits)

Specifies the subscriber unit code of the mobile station which transmits this message.

Hex : 0 0 0 0 0 0 0 0 reserved
0 0 0 0 0 0 0 1
:
: subscriber unit code
:
F F F F F F F F

Option (octet 8 to octet 11 : 26 bits)

Arbitrary.

4.3.2 Format of Slow Associated Control Channel

Slow Associated Control Channel(SACCH) is mapped into an individually assigned slot and is always associated with a Traffic Channel, etc.. It transmits control data at low speed between repeater station and mobile stations.

In this standard, the Slow Associated Control Channel(SACCH) is used to transfer information identifying the functional channels mapped into the individually assigned slot. For this reason, the usage is prescribed in this section.

(1) Message Transmitted on Slow Associated Control Channel(SACCH)

Slow Associated Control Channel(SACCH) can transmit a 2-bit message. A single message can be transmitted independently on each functional channel. Table 4.3-6 shows the format of a message transmitted on Slow Associated Control Channel(SACCH).

Table 4.3-6 Format of Functional Channel Discrimination Message

octet \ bit	7	6	5	4	3	2	1	0
1	Channel Type							

This information element in the message format is as follows.

<u>Channel Type (octet 1 : 2 bits)</u>

Specifies functional channel type with which this channel is associated.

Bit : <u>7 6</u>
0 0 TCH/UPCH (in TCH transmission mode/UPCH transmission mode)
0 1 FACCH1/FACCH2 (in TCH transmission mode/UPCH transmission mode)
1 0 RCCH3 (valid only for inbound SACCH)
1 1 FILL (valid only for outbound SACCH)

4.3.3 Link Channel Number

The Link Channel Number(LCN) is a logical channel number from 1 to 1023 (10 bits) used for transmission control and managed by the repeater station. LCN management is independent in each repeater station, so independent LCN can be used in the different repeater stations.

The repeater station assigns one LCN to every call initiated, and keeps and uses it during the communication with mobile stations related with the call, then release the LCN when the call is terminated. When assigning/releasing LCN, the repeater station manages LCN to avoid assigning the same LCN to plural calls simultaneously.

4.3.3.1 Usage of Link Channel Number in Common Access Channels

When transmitting outbound CCCH and UPCH in Common Access Channels, the Link Channel Number(LCN) is indicated in the RCCH2 preceding CAC. All messages associated with the same call have the same LCN.

When a mobile station receives the first outbound CCCH directed to itself, the mobile station stores the LCN in RCCH2 preceding the CCCH until the call is terminated and the mobile station reverts to the idle state. The mobile station can thus confirm whether or not succeeding outbound CCCH/UPCH messages are related to the same call.

4.3.3.2 Usage of Link Channel Number in User Specific Channels

In user specific channels, the stored LCN is used for encoding/decoding (scramble/descramble) as described in Section 4.2.6.7. When transmitting RCCH3, the stored LCN is indicated in the transmitted message.

4.3.4 Radio Carrier Transmission Conditions at the Repeater Station

(1) Frame Synchronization between Radio Carriers

Outbound frames in the radio carriers must be synchronized with each other.

(2) Control Carrier transmission

Control carrier is usually and continuously transmitted.

(3) Communication carrier transmission

Communication carrier is continuously transmitted when at least one communication channel in the carrier is used. It can stop transmitting when all channels are not used.

4.3.5 Fetching/Keeping/Releasing the Control Channel

4.3.5.1 Fetching the Control Channel

A mobile station starts fetching the control carrier when it is turned on or when it enters a service area. This fetching action is as follows:

(1) Detecting the Sync-Symbols

A mobile station starts to receive a radio carrier from among the control carrier candidates and detects the sync symbols from the outbound slots of 15 ms cycle.

(2) Receiving Radio Control Channel (RCCH1)

When the mobile station is able to detect the sync symbols, it receives Radio Control Channel 1 (RCCH1) on arbitrary slots.

(3) Fetching the Control Channel Synchronization

The mobile station checks whether a carrier is a control carrier or not by looking at the slot type in the RCCH1. When the carrier is not a control carrier, the mobile station changes the frequency to that of another control carrier candidate and receives RCCH1 again.

When the carrier is a control carrier, the mobile station checks if the slot is a common-use slot. If it is not, the mobile station receives another RCCH1 in the same control carrier to look for a common-use slot. After coming upon a common-use slot, the mobile station starts to receive one or more slots repeating in a frame (TDMA receiving action) and keeps the control channel. When synchronization is established, the mobile station stores the slot timing and frame timing of the received carrier.

4.3.5.2 Fetching the Communication Channel

When a communication channel is assigned to the mobile station, the mobile station starts to fetch the communication channel. This fetch action is as follows :

(1) Detecting the Sync Symbols

The mobile station changes to the carrier instructed by the repeater station and detects the sync symbols in the specified slot position, referring to the memorized, slot timing. If the mobile station can not detect sync symbols within a specified receive window, it goes back to the control channel fetching action.

(2) Receiving Radio Control Channel 1 (RCCH1)

When the mobile station succeeded in detecting the sync symbols, it then receives the Radio Control Channel 1 (RCCH1) on the slot.

(3) Fetching the Communication Channel

The mobile station checks if the communication channel is assigned to itself by looking at the slot type and user assignment information in RCCH1. If inappropriate RCCH1 messages satisfying the coding rule(CRC) are received a specified number of times (Ns1) successively on the Communication Channel, it reverts to the control channel and goes into the idle action.

4.3.5.3 Conditions of Keeping Synchronization of Communication Channel

The Condition that a mobile station is maintaining synchronization on the communication channel is as follows. If the mobile station can not keep synchronization, it reverts to the idle state on the control channel.

(1) Receiving RCCH1

A mobile station keeping synchronization checks that a channel is assigned to it, by receiving all outbound RCCH1s on the communication channel. In the outbound RCCH1s on the channel, if the mobile station receives the inappropriate messages satisfying the coding rule (CRC) successively for the specified number of times(Ns1), it reverts to the idle state on the control channel.

4.3.6 Conditions of Transmitting Slot at the Mobile Station

4.3.6.1 Basic Rules of Transmitting Slots at the Mobile Station

A mobile station transmitting an inbound "burst" has to receive the corresponding outbound slot (the just before transmitted outbound slot in the same frame position with specified transmit-receive offset). Fig. 4.3-1 shows the relationship between inbound and outbound slots.

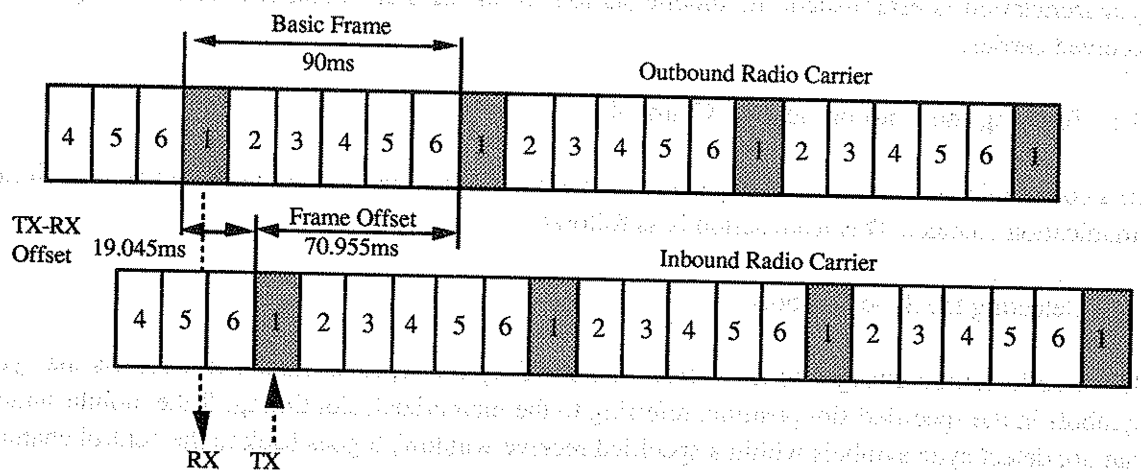


Fig. 4.3-1 Relationship Between Inbound/Outbound Slot

4.3.6.2 Conditions of Transmitting in Common-use Slot

For inbound common-use slots, only the subslot format is allowed. In outbound slots, RCCH1 indicates access information about the corresponding inbound slots. Each access control information-1 and -2 in RCCH1 specifies the access condition of the corresponding inbound subslot-1 and -2 (The subslot of the first half defined on the time axis is subslot-1, and that of the second half is subslot-2).

The transmission condition of a mobile station in common-use slot is to receive the access control information correctly concerning the slot to use, and to check if the mobile station can transmit on the slot.

4.3.6.3 Conditions of Transmitting in Individually Assigned Slot

For an individually assigned slot, on the assumption that the mobile station can confirm that the communication channel is assigned to itself by receiving RCCH1, it can transmit under the conditions specified as follows;

(1) Transmission Conditions in User Access Permitted State at TCH Transmission Mode

In user access permitted state at TCH transmission mode, only the subslot format is allowed to be used for inbound slots. In outbound slots, RCCH1 specifies the access condition of the corresponding inbound slot. Inbound transmission mode in the RCCH1 message specifies the access conditions of the corresponding inbound slot both for subslot-1 and -2.

The transmission condition is to receive the access control information correctly concerning the slot to use, and to check if the mobile station can transmit on the slot. The mobile station must randomly choose either of the two subslots. Details is prescribed in Section 4.3.10.

(2) Transmission Conditions in Individual Access Permitted State at TCH Transmission Mode

In Individual access permitted state at TCH transmission mode, only the basic slot format is allowed to use for inbound slots. In outbound slots, the RCCH1 message specifies the access conditions of the corresponding inbound slot.

The transmission condition in this case is to receive the access control information concerning the slot to transmit on correctly, and to check if the mobile station can transmit on the slot. However, once the mobile station can recognize the slot on which it can transmit, thereafter, it can continue to transmit in succeeding inbound slots even if it fails to receive RCCH1 correctly.

The mobile station stops transmission immediately when it recognizes that it has lost its individual access permission, or when it fails to receive RCCH1 the specified number of times successively. Details is prescribed in Section 4.3.10.

(3) Transmission Conditions in UPCH Transmission Mode

In UPCH transmission mode, only the subslot format is allowed to be used for inbound slots. In the outbound slots, RCCH1 specifies the access condition of the corresponding inbound slot. The inbound transmission mode in the RCCH1 message specifies the access condition of the corresponding inbound slots both for subslot-1 and -2.

The transmission condition in this case is to receive the access control information concerning the slot to transmit on correctly, and to check if the mobile station can transmit on the slot. The mobile station must randomly choose either of the two subslots. However, once the mobile station can recognize the slot on which it can transmit, thereafter, it can continue to transmit succeeding inbound slots even if it fails to receive RCCH1 correctly.

The mobile station stops transmission immediately when it recognizes that it can not transmit by the RCCH1, or when it fails to receive RCCH1 the specified number of times successively. Details is prescribed in Section 4.3.10.

4.3.7 Access Control Scheme for Common Access Channel

In this section, the access control scheme for inbound Common Access Channel is specified.

4.3.7.1 Access Mode of Inbound Common Access Channel

In inbound Common Access Channel, there are two types of access mode, namely, random access mode and individual access mode. The repeater station specifies the access mode for each subslot.

(1) Random Access Mode

This access mode allows transmission from plural unspecified mobile stations, and the repeater station usually allocates all slots as random access slots. Random access mode is used to send call requests from mobile stations.

(2) Individual Access Mode

This access mode allows transmission from a specific mobile station and the repeater station assigns the individual access permission to each subslot at need. To specify the mobile station, the subscriber unit code (Fleet ID + unit ID) is used.

Individual access mode is used to send extension messages after call request and call response signals.

4.3.7.2 Random Access Transmission Control

The random access transmission control scheme for Common Access Channel is as follows. Here, the slot interval when describing time relationship (such as the previous slot or the next slot) corresponds to the frame length (not depends on mapping of CAC into the radio channel).

(1) Control Operation at the Repeater Station

The repeater station specifies the access condition of subslot-1 and -2 in the access control information-1 and -2 of the common access message of the outbound RCCH1. The repeater station usually assigns the random access permission to all subslots. It prompts inbound transmission from mobile stations by indicating the random access permission in the access control information.

When the repeater station receives an inbound signal correctly, it shows the receive status indication (OK) in the access control information of RCCH1 in the next outbound slot. In this case, when receiving in subslot-1, the indication is shown in access information-1. When in subslot-2, indication is shown in access information-2. The receive status indication is to show receive status (NG) if no signal has been received correctly in the previous slot.

(2) Control Operation at the Mobile Station

When initiating an inbound transmission request (random access), the mobile station receives the outbound RCCH1 and checks if random access is allowed in subslot-1 and/or -2 (by referring to the access control information). If random access is not allowed for both subslot-1 and -2, the mobile station receives RCCH1 in the other slots. It checks if random access is allowed in the same manner.

The mobile station is allowed to send an inbound signal in the subslot with random access permission. When random access is allowed for both subslot-1 and -2, a mobile station has the capability to choose either of them randomly at every access at each mobile station.

After sending an inbound signal, the mobile station receives the next outbound RCCH1 and checks the receive status indication in the access control information corresponding to the subslot used for the transmission. Only when the mobile station recognizes receive status indication (NG), it attempts a random delay retry.

(3) Random Delay Retry Control

To avoid further collision by the same mobile stations on retry after collision by random access, mobile stations have the capability to control the delay for retry randomly.

A) Condition of Random Delay Retry

After sending an inbound signal in random access slot, if the mobile station succeeded in receiving the next RCCH1 and recognizes a receive status indication(NG), the mobile station is to delay re-transmission randomly and then send the same inbound signal again.

Here, the mobile station must not exceed the maximum number of re-transmission(Na1).

B) Condition of Random Delay Value

The random delay factor is an integer N, where N is specified as Na2 (minimum number of random delay slots) <= N <= Na3 (maximum number of random delay slots). Random delay is given as basic slot length (15 ms) * N. The integer N is randomly chosen by each mobile station for each retry.

4.3.7.3 Individual Access Transmission

The individual access transmission control scheme for Common Access Channel is specified as follows. Here, the slot interval when describing time relationship (such as the previous slot or the next slot, etc.) corresponds to the frame length.

(1) Control Operation at Repeater Station

The repeater station specifies the access conditions of subslot1 and 2 in the access control information 1 and 2 of an outbound RCCH1's common access message. When recognizing a need for an inbound signal with individual access mode, the repeater station assigns the individual access permission to either or both of subslot 1 and/or 2. This indicates individual access permission in the access control information, the subscriber unit code in the individual access assignment information, and regular transmission in the incividual access type, prompting inbound signal transmission from the mobile station.

When the repeater station receives an inbound signal from a mobile station in the specified slot correctly, it shows received status indication (OK) in the access control information in RCCH1 of the next slot. In this case, when receiving in subslot-1, the indication is shown in access control information-1, and when receiving in subslot-2, in access control information-2.

If the repeater station can not receive the inbound signal in the specified slot correctly, it can assign individual access permission slot in the same manner and prompt the same mobile station to transmit again. In this case, the repeater station indicates re-transmission in the field of individual access type. The repeater station must not re-assign more than the specified maximum number of individual re-transmission (Na4).

(2) Control Operation at Mobile Station

When initiating an inbound transmission request (individual access), the mobile station receives the outbound RCCH1 and checks if individual access permission is shown in the access control information in either or both of subslot-1 or -2, and checks if its own subscriber unit code is shown in the individual assignment information. When its own individual access permission is not shown in either subslot-1 or -2, the mobile station receives RCCH1 in the other slots and checks again in the same manner.

The mobile station sends an inbound signal in the subslot with individual access permission indicated. When individual access permission is shown in both subslot-1 and -2, the mobile station can send in either or both of the subslots.

After sending an inbound signal, the mobile station receives the next RCCH1. It checks the receive status indication in the access control information that corresponds to the subslot used for the transmission. When recognizing a receive status (NG), the mobile station does individual access control again.

(3) Multiple Burst Transmission Control in Individual Access.

When the repeater station prompts more inbound "burst" signals from a mobile station, it assigns another individual access permitted subslot with regular transmission in the field of individual access type each time when it prompts a new inbound signal.

When re-transmission is indicated in individual access type, the mobile station is to re-transmit the inbound signal in the slot; when regular transmission is indicated, it is to send the following new burst.

4.3.8 Call Control Scheme for Common Access Channel

This section stipulates the call control scheme for Common Access Channels. It specifies the case for signal transmission on outbound CAC (CCCH) to a mobile station in the idle state.

4.3.8.1 Determination of Common Access Channel Structure

For outbound Common Access Channels, a super frame structure is provided to enable battery-saving operation for the mobile station.

(1) Super Frame Structure

The super frame structure for outbound Common Access Channels is defined according to the parameters shown in Table 4.3-7 and illustrated in Fig. 4.3-2. These parameters are defined by the following relationship :

$$Sa = Sb + Sc + Sd$$

The values of these parameters are notified through BCCH.

Table 4.3-7 Super Frame Parameters

Parameter	Symbol	Range	Contents
Super frame length	Sa	2–63	Number of slots in super frame
Number of fixed BCCHs	Sb	1 – 62	Number of BCCH slots in fixed positions
Number of call CCCHs	Sc	1 – 62	Number of CCCH slots for calls
Number of fixed UPCHs	Sd	0 – 61	Number of UPCH slots in fixed positions

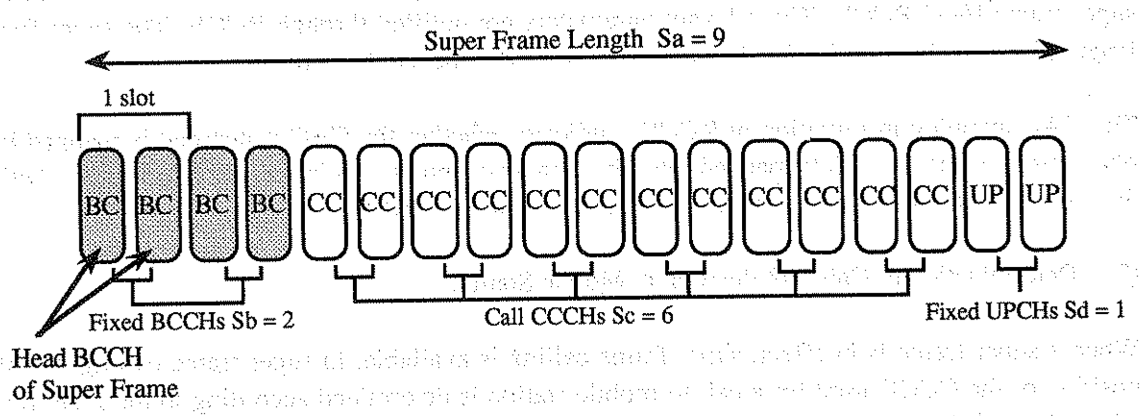


Fig. 4.3-2 Example of Common Access Channel Super Frame Structure

(A) Super Frame Length

This indicates the length of the Common Access Channel super frame cycle in terms of the number of slots.

(B) Number of Fixed BCCHs

This indicates the number of slots exclusively assigned for BCCH. The first BCCH slot, which is made up of 2 BCCHs, is fixed as the first slot of the super frame. This first BCCH slot is called the "Head BCCH", and is indicated in the channel type field of the RCCH2 preceding it.

(C) Number of Call CCCHs

This indicates the number of CCCH slots in the super frame that can be used to perform a call. When not used for a call, these CCCH slots can be used as slots for another functional channels (BCCH/UPCH).

(D) Number of Fixed UPCHs

This indicates the number of slots in the super frame used exclusively for UPCH, arranged at fixed positions at the end of the super frame.

The (super frame) cycle mentioned above is non-existent when a super frame structure is not in effect, and a slot position can be arbitrarily assigned to any functional channel. However, in this case a minimum transmission cycle of the BCCH is to be guaranteed. That is, there must be at least 1 BCCH slot within this interval.

(2) Mapping into Radio Channels

Common Access Channel can be mapped into a single or plural radio channel(s) in the same radio carrier. The radio channel mapping is defined by a mapping pattern of a radio channel bearing a super frame Head BCCH. The relevant parameters are notified through BCCH. The super frame length (Sa) must be divisible by the number of radio channels to be mapped.

The CAC mapping information in RCCH1 indicates whether the CAC concerned is mapped into plural radio channels. If it is mapped into plural radio channels, this information indicates whether the radio channel is the same as that which contains the Head BCCH.

(3) Determination of Call Slot Position at Mobile Station

When a super frame is in effect, super frame calling is available. In super frame calling, the slot position of the CCCH used for a call to mobile station is determined according to the Fleet ID to which the called mobile station belongs. However, non-super frame calling is also available even if a super frame is in effect. In non-super frame calling, every unspecified position of the CCCH can be used to call a mobile station. The determination of the calling type (super frame or non-super frame calling) can be specified in every call request from mobile stations.

When making a super frame calling, letting 'n' be the Fleet ID, the slot number Nk (called the Call Group Number) of the call CCCH is given by the following equation :

$$Nk = (n-1) \bmod (Sc) + 1$$

The 2 CCCHs in the call slot have equal priority, and either can be used for transmitting the call signal. Fig 4.3-3 illustrates an example of how the position of a call slot is calculated.

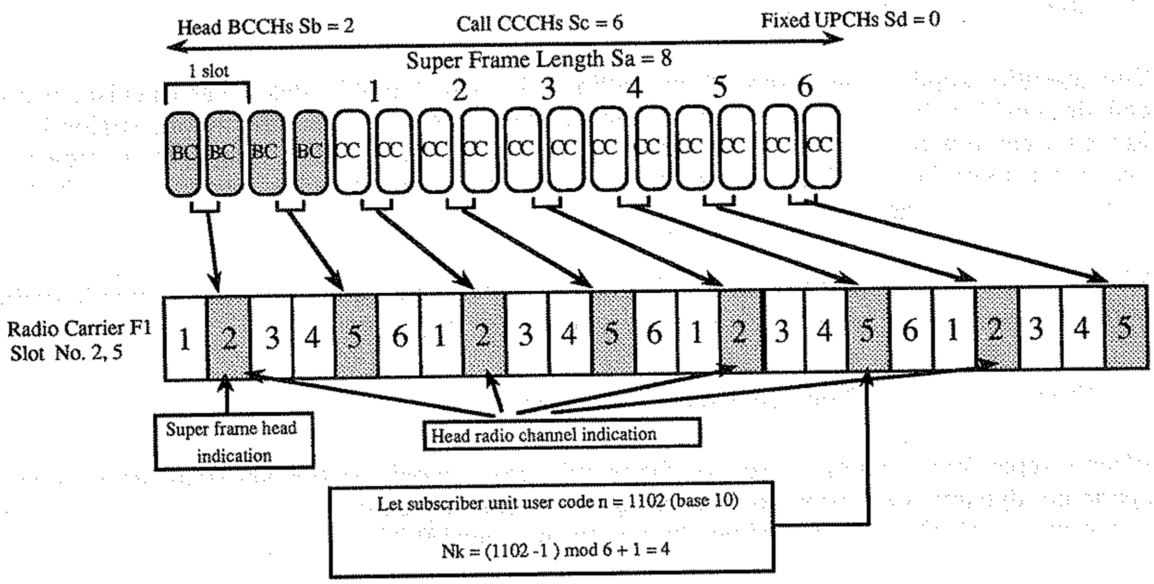


Fig. 4.3-3 Example of Call Slot Position Calculation

4.3.8.2 Call Control

For CCCH transmission on Common Access Channel to a mobile station in the idle state, a capability whereby the repetitive transmission of the same signal a number of times is provided. Whether such repetitive transmission is valid or not is previously defined about every outbound control signals (messages) to be transmitted on the CCCH.

When a super frame calling is used, a call group expansion temporary procedure is prescribed which takes into consideration the efficient use of call slots and system-wide call involving entire fleets.

(1) Repetitive Call

The CCCH signal on an outbound Common Access Channel is transmitted a maximum of 16 times. The count of repetitions of each CCCH signal is indicated in the repetition count field of the RCCH2 preceding each CCCH signal.

When super frame calling is used, the repetition interval is specified to be a multiple of the super frame length, and the call signal is transmitted repeatedly on the same CCCH slot position. This interval is referred to as the repetitive transmission cycle Nr. The number of repetition and the repetitive transmission cycle are broadcast through the BCCH.

When a super frame structure is not in effect or a non-super frame calling is used, the interval between each repetitive transmission is not specified. In this case, the signals are transmitted within a specified time interval (Tr), the prescribed number of times. The specified time interval (Tr) and the number of repetitions is broadcast through the BCCH, too.

Also, because CAC can be mapped to multiple radio channels in this case, the repeater station controls the repetitive signals to be sent on the same radio channels.

(2) Battery Saving Operation

This operation applies when a super frame calling is in used. A mobile station can calculate its own call slot position from its Fleet ID. By acknowledging its slot position, the mobile station in the idle state can operate in battery-saving mode by receiving only the slots directed to it. However, even when super frame calling is in use, each mobile station can select whether it goes into battery-saving operation or not.

When a super frame structure is not in effect or a no-super frame calling is used, the mobile station in the idle state receives all slots in an outbound Common Access Channel.

(3) Procedure for Call Group Temporary Expansion

When a super frame calling is used, on the premise that a mobile station performs battery-saving operation, dynamic expansion control (call group temporary expansion) of the call slot position (call group number) can be carried out through the outbound RCCH2.

While being in battery-saving mode, the mobile station receives only the slots corresponding to its own call group number. When the RCCH2 of any received slot indicates call group temporary expansion, the mobile station receives a following 1 slot corresponding to the indicated group number. The mobile station then behaves in accordance with the both instructions indicated in the 2 RCCH2s within the received (original) slot. Therefore, when both RCCH2s indicated call group temporary expansion, a total of three expansion slots are received, including the first original slot.

By using the function described above, the repeater station can easily make an announcement call by instructing all mobile stations to receive a specific position of slot. Also, when there is congestion of call requests from a particular call group number, the call signal can be partially sent through a vacant slot. This way, efficient use of outbound slots is realized and wait time can be shortened.

(4) Instruction of Forced BCCH Reception

When a super frame is in effect, a mobile station in battery-saving mode receives only the CCCH slots destined for it. Since it does not receive the Head BCCH, there is a possibility that notification on information updates through BCCH is not received in a timely manner.

When the repeater station does not have any signal to transmit on a call CCCH slot, it is able to use this slot for transmitting BCCH message.

Also, it can indicate a forced reception of the Head BCCH (forced BCCH receive instruction) through the RCCH2 in a call CCCH slot.

Even in battery-saving mode, when a mobile station receives a BCCH in its own call CCCH slot, it is able to take in the BCCH information. Likewise, when it receives a forced BCCH receive instruction on the RCCH2, it performs reception of the Head BCCH. However, once the Head BCCH is received in response to a forced Head BCCH receive instruction, the mobile station may not respond to other succeeding forced BCCH receive instructions until it recognizes the cancellation of the forced BCCH receive instruction.

4.3.8.3 Concatenated Transmission Control on Outbound Common Access Channels

In outbound Common Access Channel transmission, the basic operation is to transmit 2 independent messages on two functional channels within a single slot. To enable the transmission of a message whose length exceeds the maximum length that can be transmitted in on functional channel, a capability is provided whereby two functional channels are used to transmit the concatenated entire long message. This, however, is to be limited only to two functional channels of the same type within a single slot.

In case of a concatenated transmission on the outbound Common Access Channel, the repeater station divides the message into two halves, the first half and the send half. Each of these halves is coded as two functional channel and the concatenated transmission indication (first/second half of message) is appropriately set in the RCCH2 messages preceding the functional channels.

When a mobile station receives a concatenated transmission indication on an outbound Common Access Channel, it is to decode the two Common Access Channel signals within the slot, and concatenate them to treat as a single message.

4.3.9 UPCH Transmission on Common Access Channel

4.3.9.1 Definition of UPCH on Common Access Channel

User Packet Channel (UPCH), when mapped into Common Access Channel, is defined as a channel used for the transmission of system-related control data between the repeater station and a specific mobile station. This differs from the UPCH used in transparent real-time relay communication on User Specific Channels.

4.3.9.2 UPCH Transmission Control on Common Access Channels

The usage and transmission control method for the UPCH on Common Access Channels are an option for each system.

4.3.10 Transmission Control for User Specific Channels

This section stipulates the transmission control method for the functional channels in User Specific Channel category.

4.3.10.1 Inbound Transmission Control on User Specific Channels

User Specific Channels are used for the end-to-end transfer of user data between mobile stations (including other wired communication circuit). They work for relay transmission on information channels (TCH/UPCH), and for the transfer of control information between repeater station and mobile stations through transmission on control channels (FACCH1, FACCH2/RCCH1, RCCH3).

The inbound transmission control of these functional channels are prescribed in the following two types of inbound transmission modes :

(1) Inbound TCH Transmission Mode

The inbound TCH transmission mode performs relay transmission of TCH on User Specific Channel. In this mode, the inbound signal can be transmitted using a basic slot or subslot format on TCH, FACCH1, or RCCH3. The inbound transmission is prescribed according to the following two states :

(A) User Access Permitted State

Among the mobile stations to which a particular User Specific Channel has been assigned, every mobile station has access on the channel. In this mode, the inbound signal transmission using only a subslot format can be permitted, and only RCCH3 can be transmitted.

(B) Individual Access Permitted State

Among the mobile stations to which User specific Channel has been assigned, only a particular mobile station that has been granted individual access permission can transmit an inbound message. In this mode, the inbound signal transmission using only a basic format can be permitted, and can transmit TCH, FACCH1 or RCCH3.

(2) Inbound UPCH Transmission Mode

The Inbound UPCH transmission mode performs relay transmission on the UPCH User Specific Channel. In this mode, the inbound message can be transmitted with the subslot format only. The mobile station group assigned a particular User Specific Channel can make random transmission using a UPCH, FACCH2, or RCCH3.

Conditions for the respective transmission modes are summarized in Table 4.3-8. As for the functional channel mapping in each mode, refer to Section 4.2.6.

Table 4.3-8 Inbound Transmission Modes in User Specific Channels

Transmission Mode		Inbound Format	Functional Channel	Access Mode
TCH Transmission Mode	User Access Permission	Subslot	RCCH3	Group
	Individual Access Permission	Basic Slot	TCH/FACCH1/RCCH3	Individual
UPCH Transmission Mode		Subslot	UPCH/FACCH2/RCCH3	Group

(3) Setting and Changing of Inbound Transmission Mode

The inbound transmission mode on User Specific Channels is supervised by the repeater station per User Specific Channel in use, and is set and changed according to requests from the mobile stations. The repeater station indicates the current transmission mode in the inbound transmission mode indication field on outbound RCCH1. The mobile station can specify the transmission mode during a call request of the communication concerned. It can also request a change of the transmission mode even after assignment of User Specific Channel.

(A) Setting the Transmission Mode During a Call Request

In the message of the call request, the mobile station can specify the starting transmission mode (TCH transmission mode : user access permitted state, TCH transmission mode : individual access permitted state, and UPCH transmission mode) of the User Specific Channel that is assigned to it. In this case, however, setting of the TCH transmission mode-individual access permitted state can be possible only for the calling mobile station transmitting a call request or the called mobile station during an individual call. This setting applies to every assignment of User Specific Channel, independently.

(B) Changing the Transmission Mode after Assignment of User Specific Channel

A mobile station can change the inbound transmission mode after a User Specific Channel has been assigned by transmitting request message on the inbound RCCH3. However, the RCCH3 transmission is to conform to the slot format and access mode permitted by the transmission mode currently in effect.

(4) Inbound Error Correction Mode at a Repeater Station

Associated with the setting and changing the transmission mode on User Specific Channels, the mobile station can set and change the error correction mode at the repeater station. The correspondence between the error correction mode and encoding method is defined per system. The repeater station indicates its current inbound error correction mode in inbound relay mode field on outbound RCCH1. After the assignment of a User Specific Channel, a mobile station can also request a change of error correction mode only.

(5) Validity of the Inbound RCCH3 Message according to the Inbound Transmission Mode

Validity of the inbound RCCH3 message according to the inbound transmission mode is prescribed in Table 4.3-9. In the table, the description of valid or invalid is specified whether the message is validly treated or not.

Table 4.3-9 Validity of the Inbound RCCH3 Message

RCCH3 Message \ Inbound Transmission Mode Indicated in RCCH1		TCH (User Access Permission) Subslot	TCH (Individual Access Permission) Basic Slot	UPCH Subslot
Transmission Mode Change Request (to TCH Mode)	without changing relay mode	Invalid	Invalid *1	Valid *2
	with changing relay mode	Valid	Valid *1	
Transmission Mode Change Request (to UPCH Mode)	without changing relay mode	Valid *2	Valid *1 *2	Invalid
	with changing relay mode			Valid
Individual Access Request (to TCH Mode)	without changing relay mode	Valid	Invalid *1	Valid *2
	with changing relay mode	Valid	Invalid *1	
Individual Access Release Request (to TCH Mode)	without changing relay mode	Invalid	Valid *1	Invalid *2
	with changing relay mode	Invalid	Valid *1	

(*1) In this case, only a specific mobile station with individual access permission at inbound TCH transmission mode can transmit a message.
(*2) Since relay mode is determined depending on transmission mode, the relay mode is changed depending on the changes of transmission mode in these control operations.

4.3.10.2 Transmission Control in Inbound TCH Transmission Mode

In inbound TCH transmission mode, a mobile station sends a user access control message through RCCH3 when making a request to change the transmission mode or when acquiring or releasing an individual access permission. Transmission on TCH/FACCH1 is enabled when Individual Access Permission is in effect. Transmission control method in each state of the TCH transmission is prescribed as follows. In each transmission, the functional channel type is indicated in the Slow Associated Control Channel (SACCH) preceding the particular functional channel.

(1) Transmission Control in User Access Permission State

The indication of user access permitted state in TCH transmission mode is in the inbound transmission mode field in RCCH1 message. In this state, the Fleet ID of the mobile station group for which the particular channel has been assigned is likewise indicated in the user assignment information field. A mobile station checks that the channel is the one assigned to itself.

Only the subslot format is permitted in this state. When a mobile station sends a user access control message (RCCH3), it checks that user access permission is in effect. When transmitting, the mobile station randomly selects either subslot-1 or subslot-2, (or both) and transmit successively on every slot of the assigned User Specific Channel. When transmitting in either subslot-1 or subslot-2, the mobile station randomly selects between subslot-1 and subslot-2 for every transmission. The successive RCCH3 transmission is to be terminated when any of the following conditions is true :

(a) when the mobile station confirms that its requested transmission mode/state is indicated

(b) when the mobile station confirms that the access permission has been granted to another mobile station

(c) when the mobile station fails to receive the outbound RCCH1 message

(d) when the RCCH3 message has been transmitted the prescribed number of times (Nu1)

The repeater station treats the two RCCH3 messages received in the subslots (-F and -B) equally. When two RCCH3 messages (occupying one basic slot) are received correctly, the repeater station randomly selects one of them and appropriately responds to the request.

(2) Transmission Control in Individual Access Permission State

The indication of individual access permitted state in TCH transmission mode is in the inbound transmission mode field in the RCCH1 message. In this state, the subscriber unit code of the mobile station which has been granted individual access are likewise indicated in the user assignment information field. The mobile station checks that it has been granted individual access.

Only the inbound basic slot format is permitted in this state. The mobile station verifies that individual access permission is in effect, and transmits according to the indicated time alignment control and transmit power control. Time alignment control and transmit power control are prescribed in Section 4.3.10.5 and 4.3.10.6, respectively.

(A) TCH/FACCH1 Transmission Control

The mobile station granted individual access can successively transmit in every inbound slot of the assigned User Specific Channel. Either TCH or FACCH1 can be arbitrarily selected in every slot to be transmitted. The mobile station terminates transmission when any of the following condition is true:

(a) when the mobile station confirms that individual access has been granted to another mobile station
(b) when the mobile station confirms that user access permitted state is indicated
(c) when the mobile station confirms that UPCH transmission mode is indicated
(d) when the mobile station fails to receive RCCH1 successively exceeding the prescribed number of times (Nu2)

(B) RCCH3 Transmission Control

The mobile station granted individual access can successively transmit a user access control message (RCCH3) on every slot of the assigned User Specific Channel. This transmission is also done according to the instructions of time alignment control and transmit power control information in the outbound RCCH1 message. RCCH3 transmission is terminated when any of the following conditions is true :

(a) when the mobile station confirms that its requested transmission mode/state is indicated
(b) when the mobile station fails to receive RCCH1 a prescribed number of times (Nu2)
(c) when the RCCH3 message has been transmitted the prescribed number of times (Nu3)

4.3.10.3 Transmission Control for Inbound UPCH Transmission Mode

In inbound UPCH transmission mode, only the subslot format is permitted, and a mobile station can perform random transmission on all subslots on either UPCH, FACCH2, or RCCH3. In each transmission, the functional channel type used is indicated in the Slow Associated Control Channel (SACCH) preceding the particular functional channel.

(1) UPCH Transmission Mode Transmission Control

The indication of UPCH transmission mode is in the inbound transmission mode field in the RCCH1 message. Likewise the Fleet ID of the mobile station group for which the particular channel has been assigned is indicated in the user assignment information field. The mobile station checks that the channel is the one assigned to it.

(A) RCCH3 Transmission Control

When a mobile station transmits a user access control message (RCCH3), it checks that UPCH transmission mode is in effect. It then successively transmits the RCCH3 message in every slot of the assigned User Specific Channel. RCCH3 transmission terminates when any of the following is true :

(a) when the mobile station confirms that its requested transmission mode/state is indicated
(b) when the mobile station confirms that TCH transmission mode is indicated
(c) when the mobile station fails to receive the outbound RCCH1 message
(d) when the RCCH3 message has been transmitted the prescribed number of times (Nu4)

(B) UPCH Transmission Control

In UPCH transmission mode, a mobile station can transmit in any subslot available to UPCH or FACCH2. UPCH/FACCH2 transmission terminates when any of the following condition is true:

(a) when the mobile station confirms that TCH transmission mode is indicated
(b) when the mobile station fails to receive RCCH1 successively exceeding the prescribed number of times (Nu5)

4.3.10.4 Transmission Control in Outbound User Specific Channel

In relay transmission from inbound to outbound using a single channel, the outbound transmission mode for User Specific Channel is determined in accordance with inbound transmission mode on that channel. However, for transmissions using more User Specific Channels, inter-zone transmission, and transmission with other wired communication circuits, the outbound transmission mode for User Specific Channel can be set independently of inbound transmission mode on that channel concerned.

(1) Setting of the Outbound Transmission Mode

In relay transmission from inbound circuit to outbound circuit on a single channel, the outbound transmission mode indication in the RCCH1 message is set equal to the corresponding inbound transmission mode.

However, in transmissions using more channels, inter-zone transmissions, and transmission with other wired communication circuits, the outbound transmission mode for User Specific Channel is set in accordance with the corresponding transmission mode of the incoming channel (other inbound User Specific Channel or other wired communication circuit) with which the outbound channel is connected, regardless of the transmission mode setting for the inbound channel. The repeater station sets the outbound transmission mode indication in the RCCH1 message according to the transmission mode of the incoming channel.

(2) User Assignment Information and Time Alignment Control/Transmission Power Control Field Stealing

By using the steal indication in the field of outbound transmission mode, the repeater station can send optional information by temporarily stealing the fields of both time alignment/transmit power control and the user assignment information on the RCCH1 message (this operation is simply referred to as user assignment information stealing). However, user assignment information stealing is not done when the repeater station needs to indicate time alignment control or transmit power control. Furthermore, user assignment information stealing is not done in consecutive slots.

(3) Transmission Control in Outbound TCH Transmission Mode at a Repeater Station

When a TCH message has been received from the incoming channel (inbound User Specific Channel or other wired communication circuit) with which the outbound channel is connected, the repeater station relays the TCH message as an outbound signal. When there is no TCH message to relay, the repeater station transmits a filler pattern (FILL). Regardless of the presence or absence of a TCH message to relay, when a request to transmit Fast Associated Control Channel 1 (FACCH1) message is generated, the repeater station is free to arbitrarily transmit the FACCH1 message.

(4) UPCH Transmission Mode Transmission Control at a Repeater Station

When a UPCH message from the incoming channel (inbound User Specific Channel or other wired communication circuit) with which the outbound channel is connected, the repeater station relays the UPCH message as an outbound signal. In such a case, the message received from subslot-1 is relayed through UPCH-F and the message from subslot-2 is relayed through UPCH-B. When there is no UPCH message to relay, the repeater station transmits a filler pattern (FILL).

Regardless of the presence or absence of a UPCH message to relay, when a request to transmit Fast Associated Control Channel 2 (FACCH2) message is generated, the repeater station is free to arbitrarily transmit the FACCH2 message.

4.3.10.5 Time Alignment Control

The following time alignment control is performed when individual access permitted state in TCH transmission mode is in effect in User Specific Channels :

(1) Outline of Time Alignment Control

Inbound basic slots formats in User Specific Channels are not provided with propagation delay absorbing guard times at their back ends. For this reason, when transmitting an inbound 'burst' in basic slot format (TCH and FACCH1), it is possible that adjacent slots interfere with each other as result of propagation delays in the radio channels.

In this system, the repeater station has a time alignment control function whereby it measures the propagation delay of the inbound burst. To prevent interference, it sends a transmit timing parameter to the mobile station that transmitted the burst, and the mobile station in turn adjusts its transmit timing based on this parameter.

(2) Timing Reference

At the repeater station, the reference point for measuring each slot timing is specified, as it is at the terminal of the repeater station transmit/receive antenna.

(3) Time Alignment Control Value and Control Reference

The correspondence between the time alignment value in the user transmission control message in outbound RCCH1 and the control value is shown in Table 4.3-10.

The reference on which the control value is based to adjust the time alignment at the mobile station is the transmit timing of the reference burst signal described below. Before transmitting, the mobile station permitted individual access adjusts its timing according to the indicated control value, based on the transmit timing of the reference burst signal.

(A) Reference Burst Signal in Requesting Channel Assignment with Individual Access Permission

When a User Specific Channel has been assigned to a mobile station after making a call request, it can make another request to be set to individual access permitted state from the start. For every User Specific Channel assigned, individual access permitted state can be set only for the calling mobile station which initiated the call request or the called mobile station which sends the call response in individual call.

When individual access permission is granted to the calling mobile station, the inbound burst signal (CCCH) for making the call request is used the reference burst signal. However, when individual access permission is granted to the mobile station in an individual call, the inbound burst signal (CCCH) sending the call response is used as the reference burst signal.

(B) Reference Burst Signal during Transition from User Access Permitted State to Individual Access Permitted State

A mobile station can alter the state of TCH transmission mode from user access permitted state to individual access permitted state by sending an individual access request message (RCCH3). In such a case, this inbound burst signal (RCCH3) is used as the reference burst signal.

Table 4.3-10 Correspondence between Time Alignment Control Value and Mobile Station Operation

Value	Mobile Station Operation	Value	Mobile Station Operation
0000	Transmit at reference burst timing	1000	Advance 8/4 symbol time and transmit
0001	Advance 1/4 symbol time and transmit	1001	Advance 9/4 symbol time and transmit
0010	Advance 2/4 symbol time and transmit	1010	Advance 10/4 symbol time and transmit
0011	Advance 3/4 symbol time and transmit	1011	Advance 11/4 symbol time and transmit
0100	Advance 4/4 symbol time and transmit	1100	Advance 12/4 symbol time and transmit
0101	Advance 5/4 symbol time and transmit	1101	Preparatory
0110	Advance 6/4 symbol time and transmit	1110	Preparatory
0111	Advance 7/4 symbol time and transmit	1111	Preparatory

(4) Time Alignment Control Operation

The repeater station measures the receive timing of the reference burst signal. Based on this measured timing, the repeater station calculates the time alignment control value. Through the outbound RCCH1, the repeater station sends the control value and the subscriber unit code which sent the reference burst signal.

When a mobile station in individual access permitted state transmits an inbound signal, it does so in accordance with the time alignment control value indicated in the outbound RCCH1. The instruction of time alignment control is to be valid only when the indication of the subscriber unit code itself, and the appropriate slot type and inbound transmission mode is checked correctly by the mobile station in the outbound RCCH1 message. So during user assignment information stealing, instruction of time alignment control is not valid.

The time alignment control operations at the repeater station and mobile station are described next.

(A) Operation in Requesting Channel Assignment with Individual Access Permission

The repeater station has the capability to perform timing measurement of the inbound CCCH. It measures the received timing of the reference burst signal (call request signal or call response signal) and indicates the time alignment control value corresponding to this measured timing, together with indicating the individual access permitted state, on RCCH1 of the assigned User Specific Channel.

When a mobile station requests channel assignment with individual access permission, it uses the transmit timing of the reference burst signal (inbound CCCH) as a timing reference. Inbound signal transmissions after moving to User Specific Channel is be made (time adjusted) according to the time alignment control value indicated in the outbound RCCH1 message.

(B) Operation during Transition from User Access Permission to Individual Access Permission

The repeater station measures the receive timing of the reference burst signal (RCCH3) and indicates the time alignment control value corresponding to this measured timing, together with indicating the individual access permission, in the outbound RCCH1 message which indicates transition to individual access permitted state.

The mobile station uses the transmit timing of the inbound RCCH3 as a reference timing. Inbound signal transmissions after transition to individual access permitted state is made according to the time alignment control value indicated in the outbound RCCH1.

(C) Operation during Individual Access State

The repeater station measures the receive timing of TCH/FACCH1/RCCH3 inbound basic slots even in individual access permitted state. As the need arises, the repeater station is able to indicate the time alignment control value (a change in the control value or the same control value) through the outbound RCCH1 which indicates individual access permitted state.

The mobile station maintains the transmit timing after transition to individual access permitted state and continually receive the outbound RCCH1 to verify that there is no change in the time alignment control value.

When the mobile station in individual access permitted state receives a time alignment control indication to instruct changing the control value in the outbound RCCH1, it adjusts its transmit timing of the subsequent inbound signals based on the new indication.

Fig. 4.3-4 shows examples of time alignment control operations.

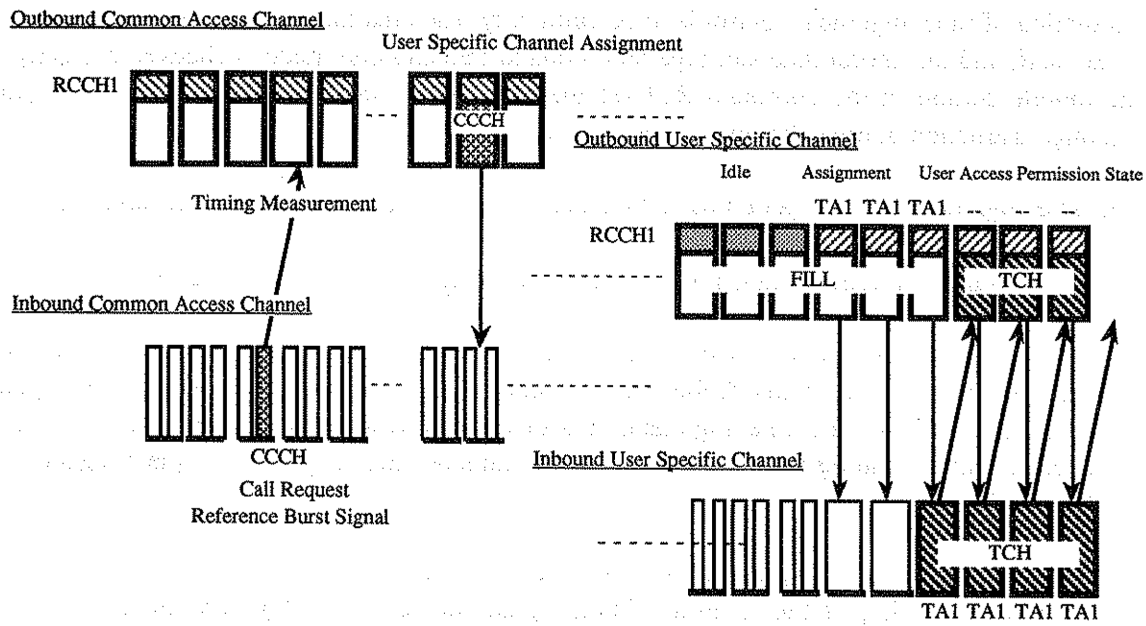
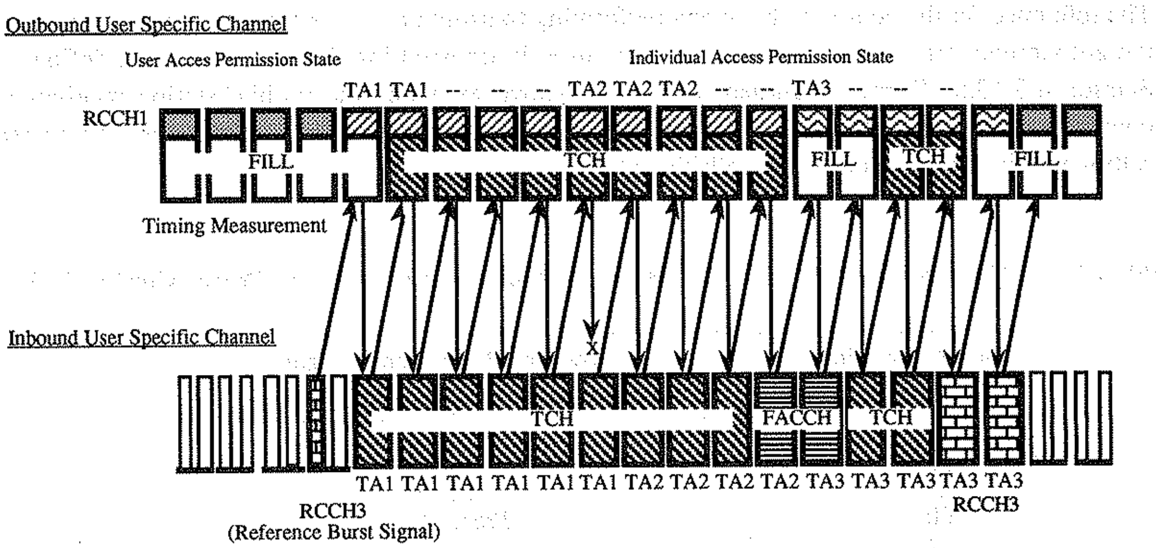


Fig. 4.3-4a Time Alignment Control Operation Example 1



*TA1 to TA3 indicates the time alignment control value and adjustment value."--" indicates no control indication.

Fig. 4.3-4b Time Alignment Control Operation Example 2

4.3.10.6 Transmit Power Control

In this section, forced transmit power control at a mobile station is stipulated.

(1) Types of Transmit Power Control

A mobile station has two types of transmit power control functions, namely, autonomous transmit power control and forced transmit power control.

(A) Autonomous Transmit Power Control Function

This function enables every unspecified mobile station to autonomously control its transmit power according to the received signal strength of the outbound carrier from the repeater station, and applies to all radio carriers. Autonomous transmit power control is prescribed in Section 3.4.1(8) "Transmit Power Control".

(B) Forced Transmit Power Control Function

According to the average power of the inbound burst from a specific mobile station, the repeater station instructs the transmitting mobile station to forcibly control its transmit power through outbound RCCH1 message. The forced transmit power control function enables the mobile station to control its transmit power according to this instruction. This control function applies only to the User Specific Channel in the state of individual access permission of inbound TCH transmission mode.

(2) Forced Transmit Power Control Value and the Control Reference

Table 4.3-11 shows the correspondence between the control indication and the forced transmit power control value.

The reference for the control value when performing transmit power control at the mobile station is the autonomous transmit power control value used in transmitting the reference burst defined in Section 4.3.10.5, "Time Alignment Control". However, when the mobile station receives an control indication exceeding its controllable range for transmit power, it can choose the nearest setting within the range of its controllable values.

Table 4.3-11 Correspondence between Control Indication and Transmit Power Control Value

Control Indication	Transmit Power Control Value
0000	Reference burst signal transmit power
0001	Preparatory
0010	-10 dB
0011	Preparatory
0100	-20 dB
1001	Preparatory
1010	+10 dB
1011	Preparatory
1100	+20 dB
Others	Preparatory

(3) Forced Transmit Power Control Operation

The repeater station can instruct forced transmit power control a specific mobile station to which individual access permission of TCH transmission mode is assigned in User Specific Channel. In such a case the forced transmit power control indication, together with the subscriber unit code, is instructed to the mobile station granted individual access through the outbound RCCH1 to indicate individual access permission.

The mobile station stores the autonomous transmit power control value used in transmitting the reference burst signal. In individual access permitted state, if there is no indication of forced transmit power control, the mobile station maintains the stored transmit power. Further, it does not perform autonomous transmit power control in this state. In other words, in individual access permitted state, the mobile station does not control (adjust) its transmit power even when the input at its receiver exceeds the threshold prescribed in its autonomous transmit power control function.

When a mobile station receives a transmit power control instruction on outbound RCCH1 during transmission of FACCH1/TCH/RCCH3, it then operates according to this instruction and controls its transmit power after the next inbound burst. This is to be confirmed from the subscriber unit code in the user assignment information in the RCCH1 message. The mobile station can also check the slot type and inbound transmission mode.

The instruction of forced transmit power control is to be valid only when the indication of the subscriber unit code itself, and the appropriate slot type and inbound transmission mode is checked correctly by the mobile station in the outbound RCCH1 message. So during user assignment information stealing, instruction of forced transmit power control is not valid.

4.3.10.7 Channel State Supervision at a Repeater Station

The repeater station has the ability to supervise the state of every User Specific Channel assigned to mobile station groups.

(1) Types of Channel State Supervision

The repeater station has two types of channel state supervision function, namely, individual access permitted state supervision and idle state supervision as follows.

(A) Individual Access Permitted State Supervision Function

This Function involves supervision by the repeater station of the transmission state of a specific mobile station granted individual access permission for inbound TCH transmission.

(B) Message Trunking Supervision Function

This function involves supervision by the repeater station during the time between the message transmissions. The message trunking refers to the condition where no inbound signal is being received from mobile stations on the User Specific Channel assigned to them.

(2) Individual Access Permitted State Supervision

The repeater station is enabled to supervise the following conditions when individual access permission is in effect on inbound TCH transmission mode. In detecting appropriate combination of conditions that is not in effect, the repeater station is able to deprive a individual access permission of a mobile station, and to return to the user access permitted state.

(A) Inbound Sync Symbol Supervision

The inbound sync symbol can be detected on the channel at least once within a prescribed time interval (Tv1).

(B) Inbound SACCH Decoding Error Supervision

The inbound SACCH on the channel can be correctly decoded at least once within a prescribed time interval (Tv2).

(C) Inbound Time Alignment Control Supervision

The signal is being transmitted in accordance with the time alignment control instruction by the repeater station.

(D) Inbound Transmit Power Control Supervision

The signal is being transmitted in accordance with the transmit power control instruction by the repeater station.

(3) Message Trunking Supervision

The repeater station is capable of supervising the following condition on currently assigned User Specific Channel. This condition is used for disconnection control of call control.

(A) Inbound Sync Symbol Supervision

The inbound sync symbol can be detected on the channel at least once within a prescribed time interval. The time value is prescribed in Section 4.4, "Call Control System".

4.3.11 Value of Counters and Timers used for Transmission Control

Table 4.3-12 and Table 4.3-13 show the values of various counters and timers used in the transmission control prescribed in this chapter.

Table 4.3-12 Value of Counters

Symbol	Value	Station	Reference	Description
Ns1	5	Mobile station	4.3.5.2, 3	Number of successive incorrect RCCH1 receptions
Na1	*	Mobile station	4.3.7.2	Number of maximum random delay re-transmissions
Na2	12	Mobile station	4.3.7.2	Number of minimum random delay slots
Na3	*	Mobile station	4.3.7.2	Number of maximum random delay slots
Na4	1	Repeater station	4.3.7.3	Number of maximum possible individual re-transmissions
Nu1	3 Frames	Mobile station	4.3.10.2	Number of maximum RCCH3 transmissions (user access permission)
Nu2	10	Mobile station	4.3.10.2	Number of RCCH1 reception failures
Nu3	10	Mobile station	4.3.10.2	Number of maximum RCCH3 transmissions (individual access permission)
Nu4	5	Mobile station	4.3.10.3	Number of maximum RCCH3 transmissions (UPCH transmission)
Nu5	10	Mobile station	4.3.10.3	Number of RCCH1 reception failures

(*) Use the numerical value provided by the BCCH system information broadcast message.

Table 4.3-13 Value of Timers

Symbol	Value	Station	Reference	Description
Tv1	1.0 sec.	Repeater station	4.3.10.7	Inbound sync symbol no detect interval
Tv2	0.5 sec.	Repeater station	4.3.10.7	SACCH decode error detect time

4.4 Call Control System

The call control system is classified as an upper layer protocol . It operates over the services provided by the transmission control described in the previous section. It corresponds to the Layer-2/Data Link Layer in the OSI reference model. The call control corresponds to the Layer-3/Network Layer in the OSI reference model, prescribes the control procedure regarding setting-up, holding, and releasing of the call.

The call control is divided into three control phases: communication link establishment phase, communication phase, and communication link release phase. In the communication link establishment phase, a mobile station establishes the idle state (CAC fetch), and frequency resource is allocated in response to a request for frequency resource (associated with the initiation and reception of a call).

During the communication phase, maintenance and reassignment of the assigned channel and change of channel usage occur following the communication link establishment. In the communication link release phase, the assigned channel is released.

The definition of the states and state transitions in the call control are shown in annex-4 and annex-5.

4.4.1 Communication Link Establishment Phase

In the communication link establishment phase, functions exist to establish the idle state at a mobile station, and to assign a channel with the waiting system in response to a request for frequency resource (associated with initiation and reception of a call).

4.4.1.1 Selection Rule for CAC System

A mobile station is assigned (registered) a single control carrier number (frequency number) per system in its memory device. However, a system can increase number of CACs when the block is expanded as number of mobile stations increases. In this case, the system has plural CACs, and a group of mobile stations is formed on every CAC. Each CAC is assigned the CAC system number, and the group of mobile stations formed on the First CAC system is to be called the "Subscriber group of the First CAC system".

The subscriber groups of the CAC systems are to be adaptively determined depending on the system scale for even traffic among CACs by the following rule. For this purpose, the control carrier saved (registered) in a memory device of the mobile station must have a function as the roost channel (the channel to receive the broadcast information required to reach the CAC currently assigned to the mobile station).

The CAC system number for a mobile station is obtained from the Fleet ID of the mobile station and the number of CAC systems (Total number of CAC systems active in the system).

CAC system number CAC#i = (Fleet ID Nuc) mod (Number of CAC systems nc) + 1

When a mobile station receives the "Control Channel Information Broadcast Message" on the BCCH and if the CAC system number indicated in the message is different from the one the mobile station recognizes, the mobile station shall not initiate a call until it fetches the correct CAC by reception of the "Additional Control Channel Information Broadcast Message".

When the number of call CCCH Sc in the transmission control is determined for even traffic among CACs at a repeater station, it is to be chosen to be mutually prime with the number of CAC systems nc.

4.4.1.2 Transmission and Reception Rule for BCCH Messages

(1) Outline of BCCH Functions

BCCH(Broadcast Control Channel) refers to the channel on which a repeater station regularly broadcast the information on the control channel structure, system information, control information, etc. to mobile stations. All the BCCH messages are designed to contain a message type in the first octet and the system code in the second and third octets so that the mobile station can recognize whether the repeater station, transmitting the BCCH concerned, is the desired one. The following messages are transmitted on BCCH.

(a) Control Channel Information Broadcast Message

This message is to broadcast the information on the physical structure of the CAC (including carrier/slot number information when acting CAC is active).

(b) Additional Control Channel Information Broadcast Message

This message is to broadcast the information on the physical structure of all the CACs when plural CACs are assigned in the system.

(c) System Information Broadcast Message

This message is to broadcast the information on the service levels, available protocols and their parameters offered by the system.

(d) Temporary Control Information Broadcast Message

This message is to broadcast the information on the temporary controls being applied by the system.

(e) Option Message(BCCH)

The option message (BCCH) is the message which can be defined arbitrarily by each system. Therefore, this standard does not specify the treatment of this message.

(2) BCCH Transmission Rule of the Repeater Station

The maximal transmission interval of each BCCH message is specified as shown in the table below to facilitate the reception of BCCH messages at mobile stations coming into the system (including the mobile stations powered up).

Table 4.4.1.2-1 Maximum Time Interval of BCCH Message

Message Type	Maximum Time Interval of Transmission
Control Channel Information Broadcast Message	6 seconds
Additional Control Channel Information Broadcast Message	
System Information Broadcast Message	6 seconds
Temporary Control Information Broadcast Message	
Option Message(BCCH)	Not specified

The repeater station must transmit each BCCH message within the time interval specified in the Table 4.4.1.2-1.

(3) BCCH Reception Rule at Mobile Stations

A mobile station must receive all of the BCCH messages from the repeater station every time coming into the system (including when powered up). The mobile station can initiate a call only after receiving all BCCH messages. However, it is not specified regarding the need of the option message(BCCH) reception. When the BCCH message is received, the message information is to be valid for the following 180 seconds. The mobile station must not initiate a call after any of BCCH messages has become invalid.

The condition of the BCCH message reception is not specified for the call reception.

4.4.1.3 Acting CAC Operation

The acting CAC operation refers to the following operations; When the inbound control carrier containing the CAC is interfered and unusable, another CAC is temporarily assigned on the different frequency from that of the CAC being interfered and the call control operation is resumed. The CAC contained in the control carrier saved in the memory device of the mobile station is called "Regular CAC", and the CAC temporarily assigned on the different carrier is called "Acting CAC". When the acting CAC operation is activated, the "Control Channel Information Broadcast Message" and the "Additional Control Channel Information Broadcast Message" are transmitted on the outbound path of the regular CAC(BCCH) to indicate the concerned CAC in the acting CAC operation, and also the physical information of the acting CAC.

The CAC operation is divided into the following three states, then the change of above BCCH messages and the operations of the mobile stations are specified in each state.

(1) In Normal Operation

The "Control Channel Information Broadcast Message" on the regular CAC indicates the regular CAC as active and the acting CAC information as the advance notice of candidate. The "Additional Control Channel Information Broadcast Message" on all the CACs within the system indicates the regular CAC as "Active" and the regular CAC information as the directed CAC.

Table 4.4.1.3-1 "Control Channel Information Broadcast Message" and "Additional Control Channel Information Broadcast Message" Contents in Normal Operation

Regular CAC	Acting CAC
Control Channel Information Broadcast Message (see below)	N / A (not applicable)
Additional Control Channel Information Broadcast Message (see below)	

Control Channel Information Broadcast Message

Octet \ Bit	7	6	5	4	3	2	1	0
10	R	A						
11	Acting CAC Information							
12								

Additional Control Channel Information Broadcast Message

Octet \ Bit	7	6	5	4	3	2	1	0
5	R	A						
6	Regular CAC Information							
7								

: Operation Classification
Bit 7 R = Regular CAC, A = Acting CAC
Bit 6 A = Active, I = Inactive

: Channel Assignment Information

(2) In Acting CAC Operation

The "Control Channel Information Broadcast Message" on the regular CAC indicates the regular CAC as "Inactive" and the acting CAC information as the directed CAC. The "Additional Control Channel Information Broadcast Message" on all the CACs within the system indicates the acting CAC as "Active" and the acting CAC information as the directed CAC.

The "Control Channel Information Broadcast Message" on the acting CAC indicates the acting CAC as "Active" and the regular CAC information as the advance notice of candidate. The "Additional Control Channel Information Broadcast Message" on all the CACs within the system indicates the acting CAC as "Active" and the acting CAC information as the directed CAC.

A mobile station is to move onto the acting CAC as the acting CAC operation is recognized from either the "Control Channel Information Broadcast Message" or the "Additional Control Channel Information Broadcast Message".

The repeater station must guarantee to continue acting CAC operation at least 180 seconds.

Table 4.4.1.3-2 "Control Channel Information Broadcast Message" and "Additional Control Channel Information Broadcast Message" Contents in Acting CAC Operation

Regular CAC

Control Channel Information Broadcast Message

Octet \ Bit	7	6	5	4	3	2	1	0
10	R	I						
11	Acting CAC Information							
12								

Additional Control Channel Information Broadcast Message

Octet \ Bit	7	6	5	4	3	2	1	0
5	A	A						
6	Acting CAC Information							
7								

Acting CAC

Control Channel Information Broadcast Message

Octet \ Bit	7	6	5	4	3	2	1	0
10	A	A						
11	Regular CAC Information							
12								

Additional Control Channel Information Broadcast Message

Octet \ Bit	7	6	5	4	3	2	1	0
5	A	A						
6	Acting CAC Information							
7								

(shaded box) : Operation Classification
Bit 7 R = Regular CAC, A = Acting CAC
Bit 6 A = Active, I = Inactive

(white box) : Channel Assignment Information

(3) In Regular CAC Recovery Operation

The "Control Channel Information Broadcast Message" on the regular CAC indicates the regular CAC as "Active" and the acting CAC information as the advance notice of candidate. The "Additional Control Channel Information Broadcast Message" on all the CACs within the system indicates the regular CAC as "Active" and the regular CAC information as the directed CAC.

The "Control Channel Information Broadcast Message" on the acting CAC indicates the acting CAC as "Inactive" and the regular CAC information as the directed CAC. The "Additional Control Channel Information Broadcast Message" on all the CACs within the system indicates the acting CAC as "Inactive" and the regular CAC information as the directed CAC.

A mobile station receiving the acting CAC is to move onto the regular CAC as the regular CAC recovery operation is recognized from either the "Control Channel Information Broadcast Message" or the "Additional Control Channel Information Broadcast Message".

A repeater station must guarantee to continue the regular CAC recovery operation at least 180 seconds.

Table 4.4.1.3-3 "Control Channel Information Broadcast Message" and "Additional Control Channel Information Broadcast Message" Contents in Regular CAC Recovery Operation

Regular CAC

Control Channel Information Broadcast Message

Octet \ Bit	7	6	5	4	3	2	1	0
9	R	A						
10	Acting CAC Information							
11								

Additional Control Channel Information Broadcast Message

Octet \ Bit	7	6	5	4	3	2	1	0
5	R	A						
6	Regular CAC Information							
7								

Acting CAC

Control Channel Information Broadcast Message

Octet \ Bit	7	6	5	4	3	2	1	0
9	A	I						
10	Regular CAC Information							
11								

Additional Control Channel Information Broadcast Message

Octet \ Bit	7	6	5	4	3	2	1	0
5	R	A						
6	Regular CAC Information							
7								

(shaded) : Operation Classification
Bit 7 R = Regular CAC, A = Acting CAC
Bit 6 A = Active, I = Inactive

(blank) : Channel Assignment Information

4.4.1.4 System Status

When the system status in the "System Information Broadcast Message" indicates that the receiving CAC is in test operation, the said CAC must be treated as invalid and the mobile station must be prohibited to initiate or receive calls. Other operations of the mobile station on the CAC are not specified.

When the said system status indicates that the control carrier containing the receiving CAC is in test operation, the current control carrier must be treated as invalid and the mobile station must be prohibited operations associated with initiation or reception of calls on the said control carrier. Other operations of the mobile station on the control carrier concerned are not specified.

4.4.1.5 Communication Link Establishment

(1) Call Initiation

There are three protocol classifications in the call initiation; a normal call request, a CAC expanded call request and a CAC-USC expanded call request.

The normal call request is the protocol classification requiring one type of the inbound CAC to complete a call request.

The CAC expanded call request is a protocol classification requiring two types of the inbound CAC to complete a call request.

The CAC-USC expanded call request is a protocol classification completing a call request as follows; First, send a request for USC by one type of the inbound CAC, then send an additional information to the first CAC message on the granted USC.

(a) Simplex Call Request Message

This message is sent when a mobile station requests a normal call (other than fleet wide call) with single zone coverage and simplex mode to a repeater station. This message is for that a mobile station makes the first access to a repeater station.

(b) Half-duplex Call Request Message

This message is sent when a mobile station requests a normal call (other than fleet wide call) with single zone coverage and half-duplex mode to a repeater station. This message is for that a mobile station makes the first access to a repeater station.

(c) Duplex Mode Call Request Message

This message is sent when a mobile station requests a normal call (other than fleet wide call) with single zone coverage and duplex mode to a repeater station. This message is for that a mobile station makes the first access to a repeater station.

(d) Fleet-wide Call Request Message

This message is sent when a mobile station requests a fleet-wide call (a call involving all mobile stations within the fleet) to a repeater station. This message is for that a mobile station makes the first access to a repeater station.

(e) Inter-zone Fleet-wide Call Request Message

This message is sent when a mobile station requests a fleet-wide call (a call involving all mobile stations within the fleet) including an inter-zone communication (linking a call to other repeater stations) to a repeater station. This message is for that a mobile station makes the first access to a repeater station.

(f) PSTN Interconnect Call Request Message

This message is sent when a mobile station requests a PSTN interconnect call (linking a call to the PSTN) to a repeater station. This message is for that a mobile station makes the first access to a repeater station.

(g) PSTN Interconnect Call Request Supplement Message

This message is sent following the "PSTN Interconnect Request Message" when a mobile station requests a PSTN interconnect call (linking a call to the PSTN) to a repeater station. The information element to be supplemented is a telephone number. This message is sent under the condition the PSTN communication has been requested in the preceding "PSTN Interconnect Request Message".

The physical channel (Common-use slot = CAC or Individually assigned slot = USC), on which this message is transmitted, can be determined by each system. The "System Information Broadcast Message"/"Temporary Control Information Broadcast Message" in the BCCH messages notify mobile stations which this message is to be sent on either CAC or USC.

This message is defined only for the CAC extension call request and the CAC-USC extension call request.

(h) Simplex Inter-zone Call Request Message

This message is sent when a mobile station requests an inter-zone communication (linking a call to other repeater stations) with simplex mode to a repeater station. This message is for that a mobile station makes the first access to a repeater station.

(i) Half-duplex Inter-zone Call Request Message

This message is sent when a mobile station requests an inter-zone communication (linking a call to other repeater stations) with half-duplex mode to a repeater station. This message is for that a mobile station makes the first access to a repeater station.

(j) Duplex Inter-zone Call Request Message

This message is sent when a mobile station requests an inter-zone communication (linking a call to other repeater stations) with duplex mode to a repeater station. This message is for that a mobile station makes the first access to a repeater station.

(k) Inter-zone Call Request Supplement Message

This message is sent following the "Inter-zone Call Request Messages" or the "Inter-zone Fleet-wide Call Request Message", when a mobile station requests an inter-zone communication (linking a call to other repeater stations) to a repeater station. The information element to be supplemented is one or more of the zone number(s). This message is sent under the condition the inter-zone communication involving more than two zones (including the zone the call initiator locates) or plural slots have been requested in the preceding "Inter-zone Call Request Messages"/"Inter-zone Fleet-wide Call Request Message".

This message is defined only for the CAC extension call request.

(l) Call Response Message

This message is sent to notify the mobile station requesting an individual call that the repeater station has received the call request sent.

(m) PSTN Interconnect Call Response Message

This message is sent to notify the mobile station requesting a PSTN interconnect call that the repeater station has received the call request sent.

(n) Inter-zone Call Response Message

This message is sent to notify the mobile station having requested an inter-zone call that the repeater station has received the call request sent.

(o) Call Reject Message

This message is sent to notify a call rejection to the mobile station sent the call request when the repeater station rejects call request messages from mobile stations. This message indicates the reason of the rejection to enable proper judgment on whether the mobile station retries.

(p) PSTN Call Disconnect Message

This message is sent to notify that the repeater station stops processing of the "PSTN Interconnect Call Request Message" to the mobile stations which have given up the call request and which have received "PSTN Interconnect Call Response Message" and are waiting the process completion.

(q) PSTN Disconnect Request Message

This message is sent to notify the repeater station that the mobile station gave up a call because of no response from the calling number, etc. after the reception of "PSTN Interconnect Call Response Message".

(2) Channel Assignment and Call Reception

(a) Busy-queue Message

This message is sent to notify the mobile station that the call request has been busy-queued at the repeater station when the repeater station can not assign frequency resource (channels) to the mobile station sent the call request immediately. In this case, the call set-up control is to be the waiting system. This message is also an acknowledge of the "Call Request Message" to the mobile station initiated the call so that it can stop re-sending the message.

Consequently, this message can be used as an advance notice of a call reception when the receiving mobile stations receive this message. At the receiving mobile stations, the busy-queue indication is displayed to an operator so that call initiations can be suspended (call loss rate can be reduced) until the repeater station sends "Channel Assignment Message".

(b) Busy-queue Cancel Message

This message is sent to notify the concerned mobile stations that the busy-queue has been canceled at the repeater station, and the "Busy-queue Message" previously sent is not valid any more.

(c) Channel Assignment Message

This message is sent to notify the information on the physical channel to be used for communication and the channel usage to the mobile stations (both initiating and receiving).

(d) Transpond Request Message

This message is sent to notify the receiving mobile station that the repeater station has received the individual call request. In addition this message is to request the said mobile station to send back the "Transpond Response Message". The repeater station sets up the individual call only when the said "Transpond Response Message" is received.

(e) Transpond Response Message

This message is sent to notify whether the receiving mobile station is able to receive the individual call when the said mobile station received the "Transpond Request Message".

(f) System-wide Call Message

This message is sent to force to direct all the mobile stations (all users) subscribing the system to the common communication channel so that the repeater station can notify the same information to them.

(g) Fleet-wide Call Message

This message is sent to force to direct all the mobile stations of the fleet to the common communication channel when the repeater station received "Fleet-wide Call Request Message" or "Inter-zone Fleet-wide Call Request Message" from the mobile station.

(3) Other Messages

(a) CAC/User Message

This message is sent when a mobile station requests the repeater station to transfer a short message.

(b) Option

The option is a message arbitrarily definable by each system or among mobile stations.

(c) CAC/UPCH Message

This functional channel will not be available for general users in principle. The system operator is to define independently for each system, and to be used for system maintenance and management, etc..

4.4.2 Communication Phase

The call control (Layer-3) in the communication phase is not to be specified in this RCR standard because it is classified as the optional services of the system its own. Only FACCH is available as the functional channel, and to use an optional message area in the message format to be described later.

The optional services for end-to-end during communication such as switching TCH/UPCH or error correcting mode, etc. can be made by using the transmission control (Layer-2).

4.4.3 Communication Link Release Phase

There are the following five types of the communication link release.

(1) Autonomous Release Control upon Communication Time-out at Repeater Station and Mobile Stations

The repeater station and mobile stations measure the communication time from the first transmission (first of 'n' repetitive transmission) of the "Channel Assignment Message", and release the communication link when the communication time indicated in the said message has passed.

(2) Autonomous Release Control upon Response Time-out at Repeater Station

The repeater station is to release the communication link when the repeater station has not received any signals from mobile stations for the specified time period from the time of the channel assignment. The mean for the signal detection is to utilize the supervision function specified in the transmission control (Layer-2). However, this provision is not applied to the PSTN interconnect calls. For inter-zone calls, this provision is applied when the linked repeater stations has not received any signals from the mobile stations simultaneously for the specified time period.

When plural slots are used with simplex mode, the response time-out detection is carried out independently on each slot, and the communication links are to be released slot by slot. For half-duplex calls, the communication link is released upon detection of the response time-out on the mobile stations at both ends. For duplex calls, the communication link is released upon detection of the response time-out on either of the two mobile station ends.

The response time-out time is specified by the transmission contents as follows

Table 4.4.3-1 Response Time-out Time

Transmission Contents	Time-out Time
Voice	Tr + 3 seconds
Non-voice	Tr + 1 second

Notes 1: Tr can be obtained from the data transmitted on BCCH using the following formula.
Tr = ("Number of outbound CCCH repetitions" - 1)
x "Outbound CCCH repetition interval"
2: The correspondence between Voice/Non-voice and transmission mode(refer to Section 4.4.4.3.3.6) is defined for every system.

(3) Autonomous Release Control upon Message Trunked Time-out at Repeater Station

The repeater station is to release the communication link when the repeater station has not received any signals from mobile stations for the specified time period after the reception of the first inbound burst from a mobile station following the channel assignment. signals from mobile stations for the specified time period from the time of the channel assignment. The mean for the signal detection is to utilize the supervision function specified in the transmission control (Layer-2). However, this provision is not applied to the PSTN interconnect calls. For inter-zone calls, this provision is applied when the linked repeater stations have not received any signals from the mobile stations simultaneously for the specified time period.

When multiple slots are used with simplex mode, the trunked time-out detection is carried out independently on each slot, and the communication links are to be released slot by slot. For half-duplex calls, the communication link is released upon detection of the message trunked time-out on the mobile stations at both ends. For duplex calls, the communication link is released upon detection of the message trunked time-out on either of the two mobile station ends.

The message trunked time-out time is specified by the transmission contents as follows

Table 4.4.3-2 Message Trunked Time-out Time

Transmission Contents	Time-out Time
Voice	3 seconds
Non-voice	1 second

Note: The correspondence between Voice/Non-voice and transmission mode (refer to Section 4.4.4.3.3.6) is defined for every system.

(4) Autonomous Release Control upon Degradation of Channel Quality at Mobile Station

The mobile station is to release the communication link when channel quality degradation on the outbound channel is detected during the call. The mean for the signal detection is to utilize the supervision function specified in the transmission control (Layer-2).

(5) Release Control upon Disconnection Request from the Terminal Station (Mobile Station, Telephone on PSTN End) at Repeater station and Mobile Station

Per the disconnection request from a terminal station, the repeater station is to send out the "Call Disconnect Message" to all the terminal stations involved in the call. Consequently communication link is released.

(A) Call Termination Method

The calling party release (only the call initiating terminal can transmit "Call Disconnect Request Message") is to be the basic for mobile stations. However, the first party release (either call initiating terminal or call receiving terminal can transmit "Call Disconnect Request Message") is enabled for individual calls and PSTN interconnect calls. The repeater station is not to distinguish between call initiating and call receiving terminals so that all "Call Disconnect Request Message" from the mobile stations with same Fleet ID are to be valid.

(B) Call Termination Message

(a) Call Disconnect Request Message

This message is sent so that the mobile station on the call notifies the repeater station the communication has been done.

(b) Call Disconnect Message

This message is sent when the repeater station instructs the mobile stations to disconnect the channel. This message is the response to the "Call Disconnect Request Message" from a mobile station, or it is sent when any of the communication time-out, the response time-out or message trunked time-out has occurred. The mobile stations received this message move to the idle state on the CAC.

4.4.4 Definition of Message Functions and Contents

In this section, the structure of the messages used in the call control is specified.

4.4.4.1 General Rules

(1) In case that size of a content exceeds an octet, the bit number becomes small as the octet number becomes larger. The least significant bit of the information content locates at the smallest numbered bit of the largest numbered octet. An example is shown in the Fig. 4.4.4.1-1.

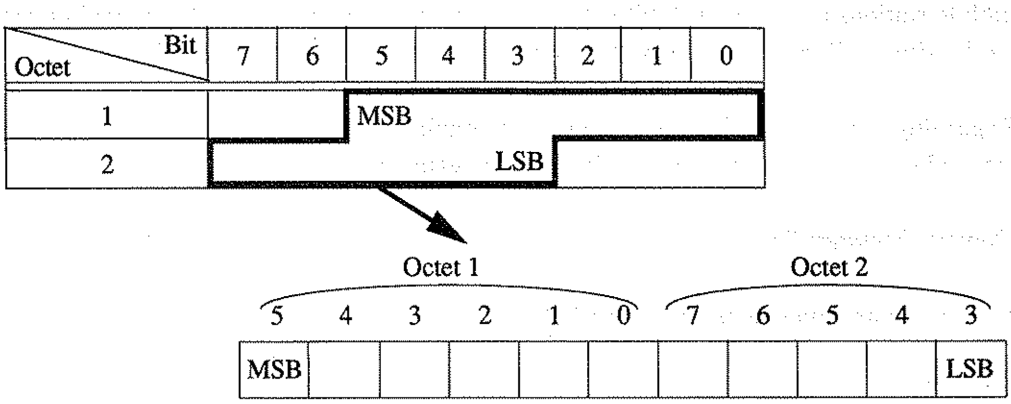


Fig. 4.4.4.1-1 Mapping Method for the Information Size Exceeding 1 Octet

(2) When messages are transmitted using the concatenate transmission indicator of RCCH2 on the outbound Common Access Channel, the concatenation of the first and the second halves of the message is to be defined as a single concatenate message. In this case, the smallest numbered octet in the second half of the message is to be connected to the largest numbered octet in the first half of the message. However, the messages which may require the concatenate transmission are to be concatenated only when concatenation is required. Besides, the message type is not to be contained in the first octet of BCCH/CCCH/UPCH-B of the second half of the message when concatenated. The notation in this section is shown in Fig. 4.4.4.1-2.

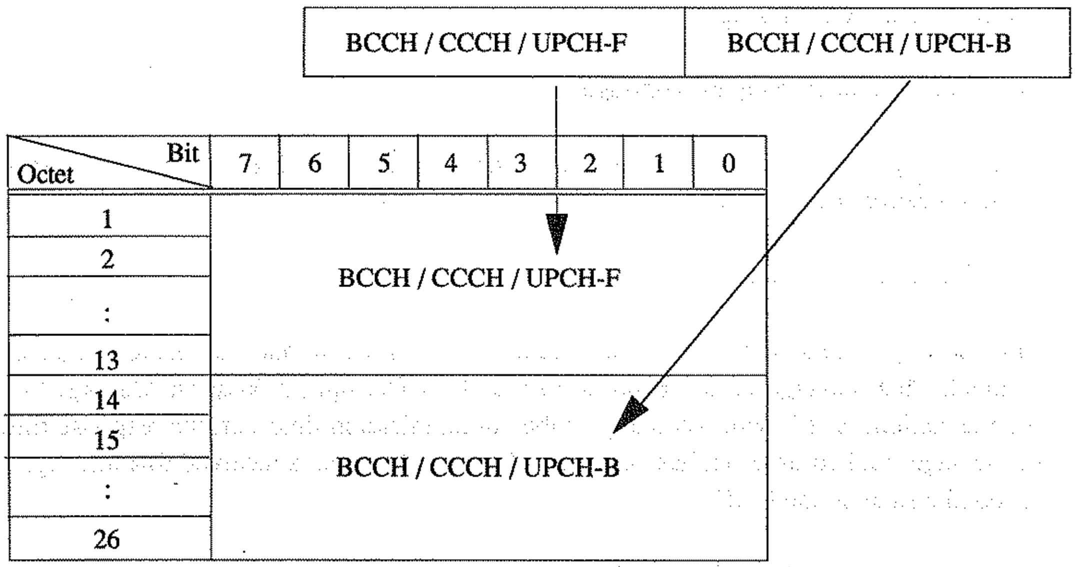


Fig. 4.4.4.1-2 Notation for Concatenate Transmission

(3) The field designated as "Reserved" is to be specified in the future, therefore both repeater station and mobile stations are to be obligated to transmit with filling the all-zero pattern in those fields. However, messages with non-all-zero pattern filled in those fields must not be simply disposed to secure the compatibility of future implementation.

The "Reserved pattern" is to be specified in the future, therefore both repeater station and mobile stations are to be prohibited to use. However, messages with "Reserved pattern" must not be simply disposed to secure the compatibility of future implementation.

(4) Regarding ':' and '~' indicating ranges in the explanation of information elements, the upper side value of ':' is to correspond to the left side value of '~'.

4.4.4.2 Control Message Types

The names of all control messages are shown below ;

4.4.4.2.1 BCCH

(1) Control Channel Information Broadcast Message (Outbound)
(2) Additional Control Channel Information Broadcast Message (Outbound)
(3) System Information Broadcast Message (Outbound)
(4) Temporary Control Information Broadcast Message (Outbound)
(5) Option (Outbound)

4.4.4.2.2 CCCH

(1) Simplex Call Request Message (Inbound)
(2) Half-duplex Call Request Message (Inbound)
(3) Duplex Call Request Message (Inbound)

(4) PSTN Interconnect Call Request Message (Inbound)
(5) PSTN Interconnect Call Request Supplement Message (Inbound)
(6) Simplex Inter-zone Call Request Message (Inbound)
(7) Half-duplex Inter-zone Call Request Message (Inbound)
(8) Duplex Inter-zone Call Request Message (Inbound)
(9) Inter-zone Call Request Supplement Message (Inbound)
(10) Call Response Message (Outbound)
(11) PSTN Interconnect Call Response Message (Outbound)
(12) Inter-zone Call Response Message (Outbound)
(13) Busy Queue Message (Outbound)
(14) Busy Queue Cancel Message (Outbound)
(15) Call Reject Message (Outbound)
(16) Channel Assignment Message (Outbound)
(17) Transpond Request Message (Outbound)
(18) Transpond Response Message (Inbound)
(19) Fleet-wide Call Request Message (Inbound)
(20) Fleet-wide Call Message (Outbound)
(21) Inter-zone Fleet-wide Call Request Message (Inbound)
(22) System-wide Call Message (Outbound)
(23) PSTN Call Disconnect Request Message (Inbound)
(24) PSTN Call Disconnect Message (Outbound)
(25) User Message (Inbound)
(26) User Message (Outbound)
(27) Option Message (Inbound)
(28) Option Message (Outbound)

4.4.4.2.3 FACCH1

(1) Call Disconnect Request Message (Inbound)
(2) Call Disconnect Indication Message (Outbound)
(3) PSTN Interconnect Call Supplement Message II (Inbound)
(4) Option Message (Inbound)
(5) Option Message (Outbound)

4.4.4.2.4 FACCH2

(1) Call Disconnect Request Message (Inbound)
(2) Call Disconnect Indication Message (Outbound)
(3) Option Message (Inbound)
(4) Option Message (Outbound)

4.4.4.3 Message Format

In this section, the message format and its elements are described.

The messages are divided into two classes; the standard messages coded into 6 bits of message type and the expanded messages coded into 12 bits of the message type, enabling proper selection for use depending on the purpose.

The message formats specified in this section are all regarding the standard messages, except for the specification for the bit format of the message type.

4.4.4.3.1 Definition of the Message Types

The message type is the information element to be used to distinguish a function of each message from the others. For the standard messages, the message type is mapped in the first octet, and for the expanded messages, the message type is mapped into the first and the second octets.

The bit format of the message type for the standard and the expanded messages are separately shown below;

(1) Bit Format of the Standard Message Types

```
Bit : 7 6 5 4 3 2
      - - - - - 0     Inbound
      - - - - - 1     Outbound
      - - - - 0 -     Message Group-1
      - - - - 1 -     Message Group-2
      0 0 0 0 - -
            :         Message Numbers
      1 1 1 0 - -
```

As shown above, the message types are classified into message group-1 and -2.

The attribute classification of message group-1 and -2 is not specified, however, the messages of the message group-2 with '1' at the MSB of the message number can be used freely as options.

For both the message group-1 and -2, those messages with '1111' (binary) as the message number are the expanded messages.

(2) Bit Format of the Expanded Message Types

```
Bit : 7 6 5 4 3 2 1 0 7 6 5 4
      - - - - - 0 - - - - - -     Inbound
      - - - - - 1 - - - - - -     Outbound
      - - - - 0 - - - - - - -     Message Group-1
      - - - - 1 - - - - - - -     Message Group-2
      1 1 1 1 - - - - - - - -     Expanded Message Indicator (a fixed value)
      - - - - - - 0 0 0 0 0 0
                  :               Message Numbers
      - - - - - - 1 1 1 1 1 1
```

The attribute classification of message group-1 and -2 is not specified, however, the messages of both the message group-1 and -2 can be used freely as options.

The standard message types are listed in Table 4.4.4.3.1-1.

Table 4.4.4.3.1-1 List of the Message Types (1/2)

Message Name	Message Type *1		Functional Channel Name			Notes
	765432	HEX	Name		Size *2	
Control Channel Information Broadcast Message	000101	14		BCCH	104 bits	Outbound
Additional Control Channel Information Broadcast Message	001001	24			104/208 bits	
System Information Broadcast Message	001101	34			104 bits	
Temporary Control Information Broadcast Message	010001	44				
Option	1xxx11	-C				
Simplex Call Request Message	000100	10		CCCH	90 bits	Inbound
Half-duplex Call Request Message	001000	20				
Duplex Call Request Message	001100	30				
PSTN Interconnect Call Request Message	010000	40				
PSTN Interconnect Call Request Supplement Message	010100	50				
Simplex Inter-zone Call Request Message	011000	60				
Half-duplex Inter-zone Call Request Message	011100	70				
Duplex Inter-zone Call Request Message	100000	80	C			
Inter-zone Call Request Supplement Message	100100	90	A			
Transpond Response Message	111000	E0	C			
Fleet-wide Call Request Message	000110	18				
Inter-zone Fleet-wide Call Request Message	001010	28				
PSTN Call Disconnect Request Message	010010	48				
User Message	010110	58				
Option Message	1xxx10	-8				
Call Response Message	000101	14			104 bits	Outbound
Pstn Interconnect Call Response Message	010001	44				
Inter-zone Call Response Message	011001	64				
Busy-queue Message	101001	A4				
Busy-queue Cancel Message	101101	B4				

Table 4.4.4.3.1-1 List of the Message Types (2/2)

Message Name	Message Type *1		Functional Channel Name			Notes
	765432	HEX		Name	Size *2	
Call Reject Message	110001	C4	CAC	CCCH	104bits	Outbound
Channel Assignment Message	110101	D4			104/208 bits	
Transpond Request Message	111001	E4			104 bits	
System-wide Call Message	001111	3C				
Fleet-wide Call Message	000111	1C				
PSTN Call Disconnect Message	010011	4C				
User Message	010111	5C				
Option Message	1xxx11	-C				
Call Disconnect Request Message	000100	10	USC	FACCH 1	274 bits	Inbound
PSTN Interconnect Call Extension Message II	001100	30				
Option Message	1xxx10	-8				
Call Disconnect Message	000101	14				Outbound
Option Message	1xxx11	-C				
Call Disconnect Request Message	000100	10		FACCH 2	82 bits	Inbound
Option Message	1xxx10	-8				
Call Disconnect Message	000101	14				Outbound
Option Message	1xxx11	-C				

Notes 1: 'x' and '-' indicates "Don't care".
However, it indicates the message is an expanded message when 'xxx' is '111' (binary).
HEX values are expressed as bit-1 and -0 to be '0's.
2: Size indicates a message size before error correction coding and scrambling processes.

4.4.4.3.2 Control Message Format and Explanation of Each Element.

4.4.4.3.2.1 BCCH

(1) Control Channel Information Broadcast Message

A repeater station notifies mobile stations the physical structure of the radio channels using this message and the "Additional Control Channel Information Broadcast Message" described next.

This message shows the physical structure of the CAC transmitting this message.

Besides, this message is always placed at the head of the BCCH message series and it is identified by the channel type in the RCCH2 message placed in front of the BCCH.

Table 4.4.4.3.2.1-1 Format of Control Channel Information Broadcast Message

Message type : Control Channel Information Broadcast Message
Message direction : Outbound
Functional channel : BCCH

octet \ bit	7	6	5	4	3	2	1	0
1	Control Channel Information Broadcast Message 0	0	0	1 Message type	0	1	Reserved	
2	System code							
3								
4	CAC system number							
5	Number of CAC systems							
6	TDM/TDMA frame length				Reserved			
7	Channel Structure (Number of fixed BCCHs)							
8	Channel Structure (Number of call CCCHs)							
9	Channel Structure (Number of fixed UPCHs)							
10	Operation classification		←					
11	Regular/Acting channel assignment information							
12								→
13	Reserved							

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

System Code (octet 2~3 : 16 bits)

Refer to Section 4.4.4.3.3.1 "System Code".

CAC System Number (octet 4 : 8 bits)

Indicates the system number of this CAC.

Bit : 7 6 5 4 3 2 1 0	
0 0 0 0 0 0 0 0	reserved
0 0 0 0 0 0 0 1 : 1 1 1 1 1 1 1 1	CAC system number 1 ~ 255

Number of CAC Systems (octet 5 : 8 bits)

Indicates the number of CAC systems operating in this system.

Bit : 7 6 5 4 3 2 1 0	
0 0 0 0 0 0 0 0	reserved
0 0 0 0 0 0 0 1	
:	number of CAC systems 1 ~ 255
1 1 1 1 1 1 1 1	

TDM/TDMA Frame Length (octet 6 : 4 bits)

Indicates the TDM/TDMA frame length of this CAC.

Bit : 7 6 5 4	
0 0 0 0	reserved
0 0 0 1	
:	reserved
0 1 0 1	
0 1 1 0	6 slots
0 1 1 1	
:	reserved
1 1 1 1	

Channel Structure Information (octet 7 ~ 9 : 24 bits)

Indicates the super frame structure of this CAC.

Number of the fixed BCCHs (octet 7)

Bit : 7 6 5 4 3 2 1 0	
0 0 0 0 0 0 0 0	reserved
0 0 0 0 0 0 0 1	
:	number of the fixed BCCHs 1 ~ 62
0 0 1 1 1 1 1 0	
0 0 1 1 1 1 1 1	
:	reserved
1 1 1 1 1 1 1 1	

Number of the call CCCHs (octet 8)

Bit : 7 6 5 4 3 2 1 0	
0 0 0 0 0 0 0 0	reserved
0 0 0 0 0 0 0 1	
:	number of the call CCCHs 1 ~ 62
0 0 1 1 1 1 1 0	
0 0 1 1 1 1 1 1	
:	reserved
1 1 1 1 1 1 1 1	

Number of the fixed UPCHs (octet 9)

Bit : 7 6 5 4 3 2 1 0	
0 0 0 0 0 0 0 0	
:	number of the fixed UPCHs 0 ~ 61
0 0 1 1 1 1 0 1	
0 0 1 1 1 1 1 0	
:	reserved
1 1 1 1 1 1 1 1	

Operation Classification (octet 10 : 2 bits)

Indicates the operation classification of this CAC.

Bit : 7 6	
0 -	regular CAC
1 -	acting CAC
- 0	inactive
- 1	active

The regular CAC refers to the CAC specified by the CAC system number in this message and to be dedicated for the regular operation.

The acting CAC refers to the CAC to be temporarily assigned and acting for the regular CAC when the regular CAC can not be used for the system control operations.

Inactive refers to the state in which the CAC indicated is not used for the system control operations at present.

Active refers to the state in which the CAC indicated is used for the system control operations at present.

Regular/Acting Channel Assignment Information (octet 10 ~ 12 : 22 bits)

Refer to Section 4.4.4.3.3.2 "Channel Assignment Information".

When the operation classification indicates the regular CAC, and if indicated as active, the acting CAC channel assignment information indicates as advance notice of the candidate, while if indicated as inactive, it indicates as the direction to the active CAC.

When the operation classification indicates the acting CAC, and if indicated as active, the regular CAC channel assignment information indicates as advance notice of the candidate , while if indicated as inactive, it indicates as the direction to the active CAC.

(2) Additional Control Channel Information Broadcast Message

This message is to show the physical structure of all CACs.

This message is 13 octets long if the number of CAC systems is three or less, and 26 octets long if the number of CAC systems exceeds three.

Table 4.4.4.3.2.1-2 Format of Additional Control Channel Information Broadcast Message

Message type : Additional Control Channel Information Broadcast Message
Message direction : Outbound
Functional channel : BCCH

octet \ bit	7	6	5	4	3	2	1	0
1	Additional Control Channel Information Broadcast Message 0	0	1	0	0	1 Message type	Reserved	
2	System code							
3								
4	Number of CAC systems							
5	Operation classification		←					
6	CAC #n + 0 Channel assignment information							
7								→
8	Operation classification		←					
9	CAC #n + 1 Channel assignment information							
10								→
11	Operation classification		←					
12	CAC #n + 2 Channel assignment information							
13								→
14	Operation classification		←					
15	CAC #n + 3 Channel assignment information							
16								→
17	Operation classification		←					
18	CAC #n + 4 Channel assignment information							
19								→
20	Operation classification		←					
21	CAC #n + 5 Channel assignment information							
22								→
23 ~ 25	Reserved							
26	Additional Information Number							

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

System Code (octet 2~3 : 16 bits)

Refer to Section 4.4.4.3.3.1 "System Code".

Number of CAC Systems (octet 4 : 8 bits)

Indicates the number of CAC systems operating in this system.

Bit : 7 6 5 4 3 2 1 0	
0 0 0 0 0 0 0 0	reserved
0 0 0 0 0 0 0 1	
:	number of CAC systems 1 ~ 255
1 1 1 1 1 1 1 1	

Operation Classification (octet 5 ~ 20 : 2 bits each)

Indicates the operation classification of this CAC.

Depending on the number of CAC systems, CAC channel assignment information is to be placed successive positions from the CAC #n+0.

Bit : 7 6	
0 -	egular CAC
1 -	acting CAC
- 0	inactive
- 1	active

The regular CAC refers to the CAC specified by the CAC system number in this message and to be dedicated for the regular operation.

The acting CAC refers to the CAC to be temporarily assigned and acting for the regular CAC when the regular CAC can not be used for the system control operations.

Inactive refers to the state in which the CAC indicated is not used for the system control operations at present.

Active refers to the state in which the CAC indicated is used for the system control operations at present.

CAC #n + 0 ~ #n+5 Channel Assignment Information (octet 5 ~ 22 : 22 bits each)

Refer to Section 4.4.4.3.3.2 "Channel Assignment Information".

All of the CAC channel assignment information is shown.

Depending on the number of CAC systems, CAC channel assignment information is to be placed successive positions from the CAC #n + 0.

When the regular CAC is indicated in the corresponding operation classification, the regular CAC channel assignment information is indicated, and when the acting CAC is indicated, the acting CAC channel assignment information is indicated as the direction to the active CAC.

Additional Information Number (octet 26 : 8 bits)

Indicates the sequential number to be used when broadcasting information on all the CAC systems using this message more than once.

Bit: 7 6 5 4 3 2 1 0	
0 0 0 0 0 0 0 0	reserved
0 0 0 0 0 0 0 1	
:	sequential number (1 ~ 43)
0 0 1 0 1 0 1 1	
0 0 1 0 1 1 0 0	
:	reserved
1 1 1 1 1 1 1 1	

The value of 'n' in CAC #n is to be obtained by the following formula, letting the sequential number to be obtained as SQn;

$$n = (SQn - 1) \times 6 + 1$$

In case the number of CAC systems is three or less, 'n' is specified to be '1'.

(3) System Information Broadcast Message

The repeater station notifies mobile stations the system operation information using this message.

By referring to this message, mobile stations can know the service level, the protocol classes, etc., offered by the system.

Table 4.4.4.3.2.1-3 Format of System Information Broadcast Message

Message type : System Information Broadcast Message
Message direction : Outbound
Functional channel : BCCH

<table>
<tr><th>octet \ bit</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>0</th></tr>
<tr><td rowspan="2">1</td><td colspan="6">System Information Broadcast Message</td><td colspan="2" rowspan="2">Reserved</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td></td><td colspan="6">Message type</td><td colspan="2"></td></tr>
<tr><td>2</td><td colspan="8" rowspan="2">System code</td></tr>
<tr><td>3</td></tr>
<tr><td>4</td><td colspan="4">Offered protocol types</td><td colspan="4">Maximum number of requestable slots</td></tr>
<tr><td>5</td><td colspan="8">Offered transmission mode</td></tr>
<tr><td>6</td><td colspan="8">Offered system services</td></tr>
<tr><td>7</td><td colspan="8">Offered optional system services</td></tr>
<tr><td>8</td><td colspan="2">System status</td><td colspan="6">Number of outbound CCCH repetitions</td></tr>
<tr><td>9</td><td colspan="5">Outbound CCCH repetition interval</td><td colspan="3">Maximum number of random delay retries</td></tr>
<tr><td>10</td><td colspan="8">Maximum number of random delay slots</td></tr>
<tr><td>11</td><td colspan="8" rowspan="3">Reserved</td></tr>
<tr><td>12</td></tr>
<tr><td>13</td></tr>
</table>

<u>Message Type (octet 1 : 6 bits)</u>

Refer to Section 4.4.4.3.1 "Definition of Message Types".

<u>System Code (octet 2~3 : 16 bits)</u>

Refer to Section 4.4.4.3.3.1 "System Code".

<u>Offered Protocol Types (octet 4 : 4 bits)</u>

Indicates the expanded call request types offered by the system when requesting a PSTN interconnect call or an inter-zone call. This information element is not applicable when a PSTN interconnect call or an inter-zone call is disabled by the offered system services.

Bit: 7 6 5 4	
0 0 - -	CAC expanded call request disabled
0 1 - -	CAC expanded call request enabled (up to two transmissions)
1 0 - -	reserved
1 1 - -	reserved
- - 0 0	CAC-USC expanded call request disabled
- - 0 1	CAC-USC expanded call request enabled (up to two messages)
- - 1 0	reserved
- - 1 1	reserved
others	reserved

Maximum Number of Requestable Slots (octet 4 : 4 bits)

Indicates the maximum number of USCs (slots) which a mobile station can use during a single call.

Bit: 3 2 1 0	
0 0 0 1	reserved
:	1~ 6 slots
0 1 1 0	
others	reserved

Offered Transmission Mode (octet 5 : 8 bits)

Indicates the error correcting relay mode in TCH and UPCH offered by the system.

Bit: 7 6 5 4 3 2 1 0	
0 - - - - - - -	TCH error correcting relay #1 disabled
1 - - - - - - -	TCH error correcting relay #1 enabled
- 0 - - - - - -	TCH error correcting relay #2 disabled
- 1 - - - - - -	TCH error correcting relay #2 enabled
- - 0 - - - - -	TCH error correcting relay #3 disabled
- - 1 - - - - -	TCH error correcting relay #3 enabled
- - - - 0 - - -	UPCH error correcting relay #1 disabled
- - - - 1 - - -	UPCH error correcting relay #1 enabled
- - - - - 0 - -	UPCH error correcting relay #2 disabled
- - - - - 1 - -	UPCH error correcting relay #2 enabled
- - - - - - 0 -	UPCH error correcting relay #3 disabled
- - - - - - 1 -	UPCH error correcting relay #3 enabled
others	reserved

Offered System Services (octet 6 : 8 bits)

Indicates the communication services offered by the system.

Bit : 7 6 5 4 3 2 1 0	
0 - - - - - - -	Inter-zone calls disabled
1 - - - - - - -	Inter-zone calls enabled
- 0 - - - - - -	PSTN interconnect calls disabled
- 1 - - - - - -	PSTN interconnect calls enabled
- - 0 - - - - -	user message transmission disabled
- - 1 - - - - -	user message transmission enabled
- - - 0 - - - -	option
- - - 1 - - - -	option
- - - - 0 - - -	plural slot assignment disabled
- - - - 1 - - -	plural slot assignment enabled
- - - - - 0 - -	half-duplex/duplex call disabled
- - - - - 1 - -	half-duplex/duplex call enabled
- - - - - - 0 -	option
- - - - - - 1 -	option
- - - - - - - 0	option
- - - - - - - 1	option

Plural slot assignment indicates whether plural slot request can be accepted in simplex calls.

Offered Optional System Services (octet 7 : 8 bits)

Indicates the service availability other than the offered system services in the system.

Bit : 7 6 5 4 3 2 1 0	
all bits	option

System Status (octet 8 : 2 bits)

Indicates the status of the system controlling the control carrier containing this CAC.

Bit : 7 6	
0 0	in normal operation
0 1	CAC in test operation
1 1	control carrier in test operation
others	reserved

The "CAC in test operation" indicates all information transmitted on the CAC is invalid.

The "Control carrier in test operation" indicates all information transmitted on the control carrier is invalid.

Number of Outbound CCCH Repetitions (octet 8 : 6 bits)

Indicates the total number of transmissions per single control message on the outbound CCCH.

Bit: 5 4 3 2 1 0	
0 0 0 0 0 0	reserved
0 0 0 0 0 1	
:	number of repetitions (1 ~ 63)
1 1 1 1 1 1	

Outbound CCCH Repetition Interval (octet 9 : 5 bits)

Indicates the transmission interval of the control message repetitions on the outbound CCCH.

Bit: 7 6 5 4 3	
0 0 0 0 0	reserved
0 0 0 0 1	
:	repetition interval (1 ~ 31 times of super frame length)
1 1 1 1 1	

Maximum Number of Random Delay Retries (octet 9 : 3 bits)

Indicates the maximum number of retries when a mobile station makes the random delay retry.

Bit: 2 1 0	
0 0 0	retry disabled
0 0 1	
:	max. number of retries (1 ~ 7)
1 1 1	

Maximum N umber of Random Delay Slots (octet 10 : 8 bits)

Indicates the maximum delay time in number of slots (integer number of times of 15 ms) when a mobile station makes the random delay retry. However, the minimum delay time for re-transmission is to be 12-slot time (180 ms). The mobile station must suspend re-transmission for the random time period between the 12-slot time and the maximum number of random delay slots, then retransmit the message after the said random time.

Bit: 7 6 5 4 3 2 1 0	
0 0 0 0 0 0 0 0	
:	reserved
0 0 0 0 1 0 1 1	
0 0 0 0 1 1 0 0	
:	maximum number of slots (12 ~ 255)
1 1 1 1 1 1 1 1	

This information is not applicable when the "Maximum Number of Random Delay Retries" is indicated as '0'.

(4) Temporary System Control Information Broadcast Message

The repeater station notifies mobile stations of the information on the temporarily specified system operations using this message.

By referring to this message, mobile stations can know the current control information of the system.

Table 4.4.4.3.2.1-4 Format of Temporary System Control Information Broadcast Message

Message type : Temporary System Control Information Broadcast Message
Message direction : Outbound
Functional channel : BCCH

<table>
<tr><td>octet \ bit</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td>1</td><td colspan="6">Temporary System Control Information Broadcast Message
0 1 0 0 0 1
Message type</td><td colspan="2">Reserved</td></tr>
<tr><td>2</td><td colspan="8" rowspan="2">System code</td></tr>
<tr><td>3</td></tr>
<tr><td>4</td><td colspan="4">Control on Protocol types</td><td colspan="4">Control on Number of requestable slots</td></tr>
<tr><td>5</td><td colspan="8">Control on Transmission modes</td></tr>
<tr><td>6</td><td colspan="8">Control on System services</td></tr>
<tr><td>7</td><td colspan="8">Control on Optional services</td></tr>
<tr><td>8</td><td colspan="4">Control on Communication time-out time</td><td colspan="4">Control on Communication time-out time for PSTN/PSDN interconnect calls</td></tr>
<tr><td>9</td><td colspan="8" rowspan="5">Reserved</td></tr>
<tr><td>10</td></tr>
<tr><td>11</td></tr>
<tr><td>12</td></tr>
<tr><td>13</td></tr>
</table>

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

System Code (octet 2~3 : 16 bits)

Refer to Section 4.4.4.3.3.1 "System Code".

Control on Protocol Types (octet 4 : 4 bits)

Indicates the expanded call request types currently offered by the system. The expanded call request types not offered in the "System Information Broadcast Message" are also disabled in this information element.

Bit : 7 6 5 4	
0 0 - -	CAC expanded call request disabled
0 1 - -	CAC expanded call request enabled (up to two transmissions)
1 0 - -	reserved
1 1 - -	reserved
- - 0 0	CAC-USC expanded call request disabled
- - 0 1	CAC-USC expanded call request enabled (up to two messages)
- - 1 0	reserved
- - 1 1	reserved
others	reserved

Control on Number of Requestable Slots (octet 4 : 4 bits)

Indicates the current control information on the maximum number of USCs (slots) which a mobile station can use during a call.

The number of slots specified in this information element is not to exceed that of indicated in the maximum number of requestable slots of the "System Information Broadcast Message".

Bit : 3 2 1 0	
0 0 0 0	reserved
:	1 ~ 6 slots
0 1 1 0	
others	reserved

Control on Transmission Modes (octet 5 : 8 bits)

Indicates the temporary control information on the error correcting relay mode in TCH and UPCH offered by the system.

Those transmission modes not offered in the offered transmission modes of the "System Information Broadcast Message" are also disabled in this information element.

Bit : 7 6 5 4 3 2 1 0	
0 - - - - - - -	TCH error correcting relay #1 disabled
1 - - - - - - -	TCH error correcting relay #1 enabled
- 0 - - - - - -	TCH error correcting relay #2 disabled
- 1 - - - - - -	TCH error correcting relay #2 enabled
- - 0 - - - - -	TCH error correcting relay #3 disabled
- - 1 - - - - -	TCH error correcting relay #3 enabled
- - - - 0 - - -	UPCH error correcting relay #1 disabled
- - - - 1 - - -	UPCH error correcting relay #1 enabled
- - - - - 0 - -	UPCH error correcting relay #2 disabled
- - - - - 1 - -	UPCH error correcting relay #2 enabled
- - - - - - 0 -	UPCH error correcting relay #3 disabled
- - - - - - 1 -	UPCH error correcting relay #3 enabled
others	reserved

Control on System Services (octet 6 : 8 bits)

Indicates the temporary control information on the services offered by the system.

Those services not offered by the system services of the "System Information Broadcast Message" are also disabled in this information element.

Bit : 7 6 5 4 3 2 1 0	
0 - - - - - - -	Inter-zone calls disabled
1 - - - - - - -	Inter-zone calls enabled
- 0 - - - - - -	PSTN interconnect calls disabled
- 1 - - - - - -	PSTN interconnect calls enabled
- - 0 - - - - -	user message transmission disabled
- - 1 - - - - -	user message transmission enabled
- - - 0 - - - -	option
- - - 1 - - - -	option
- - - - 0 - - -	plural slot assignment disabled
- - - - 1 - - -	plural slot assignment enabled
- - - - - 0 - -	half-duplex/duplex call disabled
- - - - - 1 - -	half-duplex/duplex call enabled
- - - - - - 0 -	option
- - - - - - 1 -	option
- - - - - - - 0	call disabled
- - - - - - - 1	call enabled

Plural slot assignment indicates control on whether plural slot request can be accepted in simplex calls.

Call disabled/enabled indicates the information to control call initiations at mobile stations. When the call is disabled, mobile stations are prohibited call initiation operations. However, the operations other than call initiation are not specified.

Control on Optional System Services (octet 7 : 8 bits)

Indicates the temporary control information on the optional services offered by the system.

Bit : 7 6 5 4 3 2 1 0
all bits option

Control on Communication Time-out Time (octet 8 : 4 bits)

Indicates the current maximum allowable communication time period for non-interconnect calls.

Bit : 3 2 1 0	
0 0 0 0	reserved
0 0 0 1	15 seconds
0 0 1 0	30 seconds
0 0 1 1	45 seconds
0 1 0 0	60 seconds
0 1 0 1	75 seconds
0 1 1 0	90 seconds
0 1 1 1	105 seconds
1 0 0 0	120 seconds
1 0 0 1	150 seconds
1 0 1 0	180 seconds
1 0 1 1	210 seconds
1 1 0 0	240 seconds
1 1 0 1	270 seconds
1 1 1 0	300 seconds
1 1 1 1	reserved

Control on Communication Time-out Time for PSTN/PSDN Interconnect Calls (octet 8 : 4 bits)

Indicates the current maximum allowable communication time in particular for interconnect calls with the telecommunication network systems provided by the common carriers (PSTN/PSDN).

Bit : 3	2	1	0	
0	0	0	0	reserved
0	0	0	1	15 seconds
0	0	1	0	30 seconds
0	0	1	1	45 seconds
0	1	0	0	60 seconds
0	1	0	1	75 seconds
0	1	1	0	90 seconds
0	1	1	1	105 seconds
1	0	0	0	120 seconds
1	0	0	1	150 seconds
1	0	1	0	180 seconds
1	0	1	1	210 seconds
1	1	0	0	240 seconds
1	1	0	1	270 seconds
1	1	1	0	300 seconds
1	1	1	1	reserved

(5) Option Message

The repeater station can notify mobile stations the optional information using this message.

Table 4.4.4.3.2.1-5 Format of Option Message

Message type : Option Message
Message direction : Outbound
Functional channel : BCCH

octet \ bit	7	6	5	4	3	2	1	0
1	Control Channel Information Broadcast Message 1	x	x	x	1	1 Message type	Reserved	
2	System code							
3								
4	Reserved							
5								
6								
7								
8								
9								
10								
11								
12								
13								

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

System Code (octet 2~3 : 16 bits)

Refer to Section 4.4.4.3.3.1 "System Code".

4.4.4.3.2.2 CCCH

(1) Simplex Call Request Message (Inbound)

The mobile station transmits this message to request an assignment of the user specific channel when initiating a simplex normal call.

Table 4.4.4.3.2.2-1 Format of Simplex Call Request Message

Message type : Simplex Call Request Message
Message direction : Inbound
Functional channel : CCCH

<table>
<tr><th>octet \ bit</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>0</th></tr>
<tr><td>1</td><td colspan="6">Simplex Call Request Message
0 0 0 1 0 0
Message type</td><td colspan="2">←</td></tr>
<tr><td>2</td><td colspan="8" rowspan="2">Called party code
→</td></tr>
<tr><td>3</td></tr>
<tr><td>4</td><td colspan="8" rowspan="4">Subscriber unit code of call initiator</td></tr>
<tr><td>5</td></tr>
<tr><td>6</td></tr>
<tr><td>7</td></tr>
<tr><td>8</td><td colspan="4">Communication mode</td><td colspan="4">Transmission mode</td></tr>
<tr><td>9</td><td colspan="2">Slot assignment</td><td colspan="2">Protocol type</td><td colspan="4">Number of requesting slots</td></tr>
<tr><td>10</td><td colspan="8">←</td></tr>
<tr><td>11</td><td colspan="8">Extended transmission mode</td></tr>
<tr><td>12</td><td colspan="2">→</td><td colspan="6"></td></tr>
</table>

<u>Message Type (octet 1 : 6 bits)</u>

Refer to Section 4.4.4.3.1 "Definition of Message Types".

<u>Called Party Code (octet 1~3 : 18 bits)</u>

Refer to Section 4.4.4.3.3.3 "Called Party Code".

The mobile station initiating the call sets the called party code.

<u>Subscriber Unit Code of Call Initiator (octet 4 ~ 7 : 32 bits)</u>

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The mobile station initiating the call sets its own subscriber unit code.

Communication Mode (octet 8 : 4 bits)

Refer to Section 4.4.4.3.3.5 "Communication Modes".

Bit: 7	6	5	4	
0	0	-	-	Group call
0	1	-	-	Subgroup call
1	0	-	-	Individual call
1	1	-	-	reserved
-	-	0	0	simplex mode
-	-	0	1	reserved
-	-	1	0	reserved
-	-	1	1	reserved

Transmission Mode (octet 8 : 4 bits)

Refer to Section 4.4.4.3.3.6 "Transmission Modes".

Bit: 3	2	1	0	
0	0	-	-	reserved
0	1	-	-	UPCH transmission mode
1	0	-	-	TCH transmission mode (with user access permission)
1	1	-	-	TCH transmission mode (with individual access permission)
-	-	0	0	no error correcting relay mode
-	-	0	1	error correcting relay mode #1
-	-	1	0	error correcting relay mode #2
-	-	1	1	error correcting relay mode #3

The individual access permission is not to be given to any mobile station upon channel assignment when TCH transmission mode (with user access permission) is set. However, the individual access permission will be given to the mobile station initiating the call upon channel assignment when TCH transmission mode (with individual access permission) is set.

Slot Assignment (octet 9 : 2 bits)

Refer to Section 4.4.4.3.3.8 "Slot Assignment".

Bit: 7	6	
0	-	1 carrier
1	-	2 carriers
-	0	slot assignment with the fixed pattern (3 slots interval)
-	1	slot assignment with an arbitrary pattern

Protocol Type (octet 9 : 2 bits)

Refer to Section 4.4.4.3.3.9 "Protocol Types".

Bit : 5 4	
0 0	normal call request
0 1	reserved
1 0	reserved
1 1	option

Number of Requesting Slots (octet 9 : 4 bits)

The mobile station initiating the call sets the number of slots required for communication in this information element. When plural slots are requested, the same communication mode is set to all slots. However, it is possible to set the transmission mode slot by slot as required. In such a case, the communication modes are specified in the extended transmission mode rather than in this transmission mode.

Refer to Section 4.4.4.3.3.10 "Number of Requesting Slots".

Bit : 3 2 1 0	
0 0 0 0	reserved
0 0 0 1	1 slot
0 0 1 0	2 slots
:	:
0 1 1 0	6 slots
0 1 1 1	
	reserved
1 1 1 1	

Extended Transmission Mode (octet 10 ~ 12 : 18 bits)

Refer to Section 4.4.4.3.3.7 "Extended Transmission Mode".

(2) Half-duplex Call Request Message (Inbound)

The mobile station transmits this message to request for an assignment of the user specific channel when initiating a half-duplex normal call.

Table 4.4.4.3.2.2-2 Format of Half-duplex Call Request Message

Message type : Half-duplex Call Request Message
Message direction : Inbound
Functional channel : CCCH

octet \ bit	7	6	5	4	3	2	1	0
1	Half-duplex Call Request Message 0	0	1	0	0	0 Message type	←	
2	Called party code							
3								→
4	Subscriber unit code of call initiator							
5								
6								
7								
8	Communication mode				Transmission mode			
9	Slot assignment		Protocol type		Number of requesting slots			
10	← Reserved							
11								
12		→						

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 “Definition of Message Types”.

Called Party Code (octet 1~3 : 18 bits)

Refer to Section 4.4.4.3.3.3 “Called Party Code”.

The mobile station initiating the call sets the called party code.

Subscriber Unit Code of Call Initiator (octet 4 ~ 7 : 32 bits)

Refer to Section 4.4.4.3.3.4 “Subscriber Unit Code of Call Initiator”.

The mobile station initiating the call sets its own subscriber unit code.

Communication Mode (octet 8 : 4 bits)

Refer to Section 4.4.4.3.3.5 "Communication Modes".

Bit : 7	6	5	4	
0	0	-	-	Group call
0	1	-	-	Subgroup call
1	0	-	-	Individual call
1	1	-	-	reserved
-	-	0	0	reserved
-	-	0	1	half-duplex mode
-	-	1	0	reserved
-	-	1	1	reserved

Transmission Mode (octet 8 : 4 bits)

Refer to Section 4.4.4.3.3.6 "Transmission Modes".

Bit : 3	2	1	0	
0	0	-	-	reserved
0	1	-	-	UPCH transmission mode
1	0	-	-	reserved
1	1	-	-	TCH transmission mode (with individual access permission)
-	-	0	0	no error correcting relay mode
-	-	0	1	error correcting relay mode #1
-	-	1	0	error correcting relay mode #2
-	-	1	1	error correcting relay mode #3

Slot Assignment (octet 9 : 2 bits)

This information element is to be invalid. The mobile station is to transmit all '0's.

Protocol Type (octet 9 : 2 bits)

Refer to Section 4.4.4.3.3.9 "Protocol Types".

Bit : 5	4	
0	0	normal call request
0	1	reserved
1	0	reserved
1	1	option

Number of Requesting Slots (octet 9 : 4 bits)

This information element is to be invalid. The mobile station is to transmit with all '0's.

(3) Duplex Call Request Message (Inbound)

The mobile station transmits this message to request an assignment of the user specific channel when initiating a duplex normal call.

Table 4.4.4.3.2.2-3 Format of Duplex Call Request Message

Message type : Duplex Call Request Message
Message direction : Inbound
Functional channel : CCCH

<table>
<tr><td>octet \ bit</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td>1</td><td colspan="6">Duplex Call Request Message
0 0 1 1 0 0
Message type</td><td colspan="2">←</td></tr>
<tr><td>2</td><td colspan="8" rowspan="2">Called party code
→</td></tr>
<tr><td>3</td></tr>
<tr><td>4</td><td colspan="8" rowspan="4">Subscriber unit code of call initiator</td></tr>
<tr><td>5</td></tr>
<tr><td>6</td></tr>
<tr><td>7</td></tr>
<tr><td>8</td><td colspan="4">Communication mode</td><td colspan="4">Transmission mode</td></tr>
<tr><td>9</td><td colspan="2">Slot assignment</td><td colspan="2">Protocol type</td><td colspan="4">Number of requesting slots</td></tr>
<tr><td>10</td><td colspan="8" rowspan="2">←
Reserved</td></tr>
<tr><td>11</td></tr>
<tr><td>12</td><td colspan="2">→</td><td colspan="6"></td></tr>
</table>

<u>Message Type (octet 1 : 6 bits)</u>

Refer to Section 4.4.4.3.1 "Definition of Message Types".

<u>Called Party Code (octet 1~3 : 18 bits)</u>

Refer to Section 4.4.4.3.3.3 "Called Party Code".

The mobile station initiating the call sets the called party code.

<u>Subscriber Unit Code of Call Initiator (octet 4 ~ 7 : 32 bits)</u>

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The mobile station initiating the call sets its own subscriber unit code.

Communication Mode (octet 8 : 4 bits)

Refer to Section 4.4.4.3.3.5 "Communication Modes".

Bit: 7	6	5	4	
0	0	-	-	reserved
0	1	-	-	reserved
1	0	-	-	Individual call
1	1	-	-	reserved
-	-	0	0	reserved
-	-	0	1	reserved
-	-	1	0	reserved
-	-	1	1	duplex mode

Transmission Mode (octet 8 : 4 bits)

Refer to Section 4.4.4.3.3.6 "Transmission Modes".

Bit: 3	2	1	0	
0	0	-	-	reserved
0	1	-	-	UPCH transmission mode
1	0	-	-	reserved
1	1	-	-	TCH transmission mode (with individual access permission)
-	-	0	0	no error correcting relay mode
-	-	0	1	error correcting relay mode #1
-	-	1	0	error correcting relay mode #2
-	-	1	1	error correcting relay mode #3

Slot Assignment (octet 9 : 2 bits)

This information element is to be invalid. The mobile station is to transmit all '0's.

Protocol Type (octet 9 : 2 bits)

Refer to Section 4.4.4.3.3.9 "Protocol Types".

Bit: 5	4	
0	0	normal call request
0	1	reserved
1	0	reserved
1	1	option

Number of Requesting Slots (octet 9 : 4 bits)

This information element is to be invalid. The mobile station is to transmit all '0's.

(4) PSTN Interconnect Call Request Message (Inbound)

The mobile station transmits this message to request an assignment of the user specific channel when initiating the PSTN interconnect call. This message is to be used with the "PSTN Interconnect Call Request Supplement Message" or the "PSTN Interconnect Call Request Supplement Message II".

Table 4.4.4.3.2.2-4 Format of PSTN Interconnect Call Request Message

Message type : PSTN Interconnect Call Request Message
Message direction : Inbound
Functional channel : CCCH

octet \ bit	7	6	5	4	3	2	1	0
1	PSTN Interconnect Call Request Message 0	1	0	0	0	0 Message type	←	
2	Called party code							
3								→
4	Subscriber unit code of call initiator							
5								
6								
7								
8	Communication mode				Transmission mode			
9	Slot assignment		Protocol type		Number of requesting slots			
10	1st digit number				2nd digit number			
11	3rd digit number				4th digit number			
12	Reserved							

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

Called Party Code (octet 1~3 : 18 bits)

Refer to Section 4.4.4.3.3.3 "Called Party Code".

The mobile station initiating the call sets the called party code.

When the individual call is set in the communication mode, this information element is to be invalid, and the mobile station is to transmit all '0's.

Subscriber Unit Code of Call Initiator (octet 4 ~ 7 : 32 bits)

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The mobile station initiating the call sets its own subscriber unit code.

When the individual call is set in the communication mode, this information element is to be invalid, and the mobile station is to transmit all '0's.

Communication Mode (octet 8 : 4 bits)

Refer to Section 4.4.4.3.3.5 "Communication Modes".

Bit: 7	6	5	4	
0	0	-	-	Group call
0	1	-	-	Subgroup call
1	0	-	-	Individual call
1	1	-	-	reserved
-	-	0	0	simplex mode
-	-	0	1	reserved
-	-	1	0	reserved
-	-	1	1	duplex mode

Only simplex mode can be set for Group and Subgroup calls.

Either simplex mode or duplex mode can be set for individual calls.

Transmission Mode (octet 8 : 4 bits)

Refer to Section 4.4.4.3.3.6 "Transmission Modes".

Bit: 3	2	1	0	
0	0	-	-	reserved
0	1	-	-	UPCH transmission mode
1	0	-	-	TCH transmission mode (with user access permission)
1	1	-	-	TCH transmission mode (with individual access permission)
-	-	0	0	no error correcting relay mode
-	-	0	1	error correcting relay mode #1
-	-	1	0	error correcting relay mode #2
-	-	1	1	error correcting relay mode #3

When either Group or Subgroup call is set in the communication mode, the individual access permission is not to be given to any mobile station upon channel assignment when TCH transmission mode (with user access permission) is set. However, the individual access permission is to be given to the mobile station initiating the call upon channel assignment when TCH transmission mode (with individual access permission) is specified.

When duplex mode and individual call are set in the communication mode, the individual access permission is to be given to mobile stations upon channel assignment (user or individual access permission).

When simplex mode and individual call are set in the communication mode, the assignment of the access permission is to be same as that of a Group or a Subgroup call.

When call initiation with CAC-USC expanded call request is set, TCH transmission mode (with individual access permission) must be set to send the "PSTN Interconnect Call Request Supplement Message II" using FACCH1.

Slot Assignment (octet 9 : 2 bits)

This information element is to be invalid. The mobile station is to transmit all '0's.

Protocol Type (octet 9 : 2 bits)

Refer to Section 4.4.4.3.3.9 "Protocol Types".

Bit : 5 4	
0 0	reserved
0 1	CAC expanded call request
1 0	CAC-USC expanded call request
1 1	option

Number of Requesting Slots (octet 9 : 4 bits)

This information element is to be invalid. The mobile station is to transmit all '0's.

1st ~ 4th Digit Numbers (octet 10 ~ 11 : 4 bits each)

Refer to Section 4.4.4.3.3.11 " 'n'-th Digit Number".

When CAC-USC expanded call request is set, this information element is to be reserved.

Bit : 7 6 5 4	
0 0 0 0	filler
0 0 0 1	
:	Telephone number 1 ~ 9
1 0 0 1	
1 0 1 0	Telephone number 0
1 0 1 1	*
1 1 0 0	#
others	option

(5) PSTN Interconnect Call Request Supplement Message (Inbound)

This message supplies additional information to that of the "PSTN Interconnect Call Request Message" when the mobile station has initiated the "PSTN Interconnect Call Request Message" with CAC expanded call request.

This message is to be used with the "PSTN Interconnect Call Request Message".

Table 4.4.4.3.2.2-5 Format of PSTN Interconnect Call Request Supplement Message

Message type : PSTN Interconnect Call Request Supplement Message
Message direction : Inbound
Functional channel : CCCH

octet \ bit	7	6	5	4	3	2	1	0
1	PSTN Interconnect Call Request Supplement Message 0	1	0	1	0	0 Message type	Reserved	
2	Subscriber unit code of call initiator							
3								
4								
5								
6	5th digit number				6th digit number			
7	7th digit number				8th digit number			
8	9th digit number				10th digit number			
9	11th digit number				12th digit number			
10	13th digit number				14th digit number			
11	15th digit number				Trunkline designation information			
12	Reserved							

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

Subscriber Unit Code of Call Initiator (octet 2 ~ 5 : 32 bits)

Refer to Section 4.4.4.3.3.3 "Subscriber Unit Code of Call Initiator".

The mobile station initiating the call sets the same subscriber unit code as in the preceding "PSTN Interconnect Call Request Message".

5th ~ 16th Digit Numbers (octet 6 ~ 11 : 4 bits each)

Refer to Section 4.4.4.3.3.11 " 'n'-th Digit Number".

Bit : 7 6 5 4	
0 0 0 0	filler
0 0 0 1 : 1 0 0 1	Telephone number '1' ~ '9'
1 0 1 0	Telephone number '0'
1 0 1 1	*
1 1 0 0	#
others	option

Trunkline Designation Information (octet 11 : 4 bits)

The mobile station designates the trunkline in this information element when initiating the call.

Bit : 3 2 1 0	
all bits	option

(6) Simplex Inter-zone Call Request Message (Inbound)

The mobile station transmits this message to request an assignment of the user specific channel when initiating a simplex inter-zone call.

This message may be followed by the "Inter-zone Call Request Supplement Message".

Table 4.4.4.3.2.2-6 Format of Simplex Inter-zone Call Request Message

Message type : Simplex Inter-zone Call Request Message
Message direction : Inbound
Functional channel : CCCH

octet \ bit	7	6	5	4	3	2	1	0
1	Simplex Inter-zone Call Request Message 0	1	1	0	0	0 Message type	←	
2	Called party code							
3								→
4	Subscriber unit code of call initiator							
5								
6								
7								
8	Communication mode				Transmission mode			
9	Slot assignment		Protocol type		Number of requesting slots			
10	Linking zone #1							
11								
12	Number of linking zones							

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

Called Party Code (octet 1~3 : 18 bits)

Refer to Section 4.4.4.3.3.3 "Called party Code".

The mobile station initiating the call sets the called party code.

Subscriber Unit Code of Call Initiator (octet 4 ~ 7 : 32 bits)

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The mobile station initiating the call sets its own subscriber unit code.

Communication Mode (octet 8 : 4 bits)

Refer to Section 4.4.4.3.3.5 "Communication Modes".

Bit : 7	6	5	4	
0	0	-	-	Group call
0	1	-	-	Subgroup call
1	0	-	-	Individual call
1	1	-	-	reserved
-	-	0	0	simplex mode
-	-	0	1	reserved
-	-	1	0	reserved
-	-	1	1	reserved

Transmission Mode (octet 8 : 4 bits)

Refer to Section 4.4.4.3.3.6 "Transmission Modes".

Bit : 3	2	1	0	
0	0	-	-	reserved
0	1	-	-	UPCH transmission mode
1	0	-	-	TCH transmission mode (with user access permission)
1	1	-	-	TCH transmission mode (with individual access permission)
-	-	0	0	no error correcting relay mode
-	-	0	1	error correcting relay mode #1
-	-	1	0	error correcting relay mode #2
-	-	1	1	error correcting relay mode #3

When either Group or Subgroup call is set in the communication mode, the individual access permission is not to be given to any mobile station upon channel assignment if TCH transmission mode (with user access permission) is set. However, the individual access permission is to be given to the mobile station initiating the call upon channel assignment when TCH transmission mode (with individual access permission) is specified.

When individual call is set in the communication mode, the assignment of the access permission is to be the same as that of a Group or a Subgroup call.

Slot Assignment (octet 9 : 2 bits)

Refer to Section 4.4.4.3.3.8 "Slot Assignment".

Bit : 7	6	
0	-	1 carrier
1	-	2 carriers
-	0	slot assignment with the fixed pattern (3 slots interval)
-	1	slot assignment with an arbitrary pattern

Protocol Type (octet 9 : 2 bits)

Refer to Section 4.4.4.3.3.9 "Protocol Types".

Bit : 5 4	
0 0	normal call request
0 1	CAC expanded call request
1 0	reserved
1 1	option

When designating plural zones, the mobile station must initiate the call with CAC expanded call request, then the "Inter-zone Call Request Supplement Message" must follow.

When designating plural slots, and when normal call request is set, all the slots assigned are to have the same attributes designated in transmission mode. On the other hand, when CAC expanded call request is set, the extended transmission mode in the "Inter-zone Call Request Supplement Message" is to be valid.

When designating both plural zones and plural slots, the extended transmission mode in the "Inter-zone Call Request Supplement Message" is always to be valid.

Number of Requesting Slots (octet 9 : 4 bits)

The mobile station initiating the call sets the number of slots required for its communication in this information element. When multiple slots are requested, the same communication mode is to be set to all slots. However, it is possible to set the transmission mode slot by slot as required. In such a case, the communication modes are to be specified in the extended transmission mode of the "Inter-zone Call Request Supplement Message" rather than in the transmission mode of this message.

Refer to Section 4.4.4.3.3.10 "Number of Requesting Slots".

Bit : 3 2 1 0	
0 0 0 0	reserved
0 0 0 1	1 slot
0 0 1 0	2 slots
:	:
0 1 1 0	6 slots
0 1 1 1	
:	reserved
1 1 1 1	

Linking Zone #1 (octet 10 ~ 11 : 16 bits)

The system code is set. Refer to Section 4.4.4.3.3.1 "System Code".

Number of Linking Zones (octet 12 : 2 bits)

Bit : 7 6	
0 0	not specified
0 1	number of zone-1
1 0	number of zones-2
1 1	number of zones-3

When designating number of zones-2 or -3, or extended transmission mode, CAC expanded call request must be set, then the "Inter-zone Call Request Supplement Message" must follow.

(7) Half-duplex Inter-zone Call Request Message (Inbound)

The mobile station transmits this message to request for an assignment of the user specific channel when initiating a half-duplex inter-zone call.

This message may be followed by the "Inter-zone Call Request Supplement Message".

Table 4.4.4.3.2.2-7 Format of Half-duplex Inter-zone Call Request Message

Message type : Half-duplex Inter-zone Call Request Message
Message direction : Inbound
Functional channel : CCCH

<table>
<tr><th>octet \ bit</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>0</th></tr>
<tr><td>1</td><td colspan="6">Half-duplex Inter-zone Call Request Message
0 1 1 1 0 0
Message type</td><td colspan="2">←</td></tr>
<tr><td>2</td><td colspan="8" rowspan="2">Called party code →</td></tr>
<tr><td>3</td></tr>
<tr><td>4</td><td colspan="8" rowspan="4">Subscriber unit code of call initiator</td></tr>
<tr><td>5</td></tr>
<tr><td>6</td></tr>
<tr><td>7</td></tr>
<tr><td>8</td><td colspan="4">Communication mode</td><td colspan="4">Transmission mode</td></tr>
<tr><td>9</td><td colspan="2">Slot assignment</td><td colspan="2">Protocol type</td><td colspan="4">Number of requesting slots</td></tr>
<tr><td>10</td><td colspan="8" rowspan="2">Linking zone #1</td></tr>
<tr><td>11</td></tr>
<tr><td>12</td><td colspan="2">Number of linking zones</td><td colspan="6"></td></tr>
</table>

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

Called Party Code (octet 1~3 : 18 bits)

Refer to Section 4.4.4.3.3.3 "Called Party Code".

The mobile station initiating the call sets the called party code.

Subscriber Unit Code of Call Initiator (octet 4 ~ 7 : 32 bits)

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The mobile station initiating the call sets its own subscriber unit code.

Communication Mode (octet 8 : 4 bits)

Refer to Section 4.4.4.3.3.5 "Communication Modes".

Bit : 7 6 5 4	
0 0 - -	Group call
0 1 - -	Subgroup call
1 0 - -	Individual call
1 1 - -	reserved
- - 0 0	reserved
- - 0 1	half-duplex mode
- - 1 0	reserved
- - 1 1	reserved

Transmission Mode (octet 8 : 4 bits)

Refer to Section 4.4.4.3.3.6 "Transmission Modes".

Bit : 3 2 1 0	
0 0 - -	reserved
0 1 - -	UPCH transmission mode
1 0 - -	reserved
1 1 - -	TCH transmission mode (with individual access permission)
- - 0 0	no error correcting relay mode
- - 0 1	error correcting relay mode #1
- - 1 0	error correcting relay mode #2
- - 1 1	error correcting relay mode #3

Slot Assignment (octet 9 : 2 bits)

This information element is to be invalid. The mobile station is to transmit all '0's.

Protocol Type (octet 9 : 2 bits)

Refer to Section 4.4.4.3.3.9 "Protocol Types".

Bit : 5 4	
0 0	normal call request
0 1	CAC expanded call request
1 0	reserved
1 1	option

When designating plural zones, the mobile station must initiate the call with CAC expanded call request, then the "Inter-zone Call Request Supplement Message" must follow.

Number of Requesting Slots (octet 9 : 4 bits)

This information element is to be invalid. The mobile station is to transmit all '0's.

Linking Zone #1 (octet 10 ~ 11 : 16 bits)

The system code is set. Refer to Section 4.4.4.3.3.1 "System Code".

Number of Linking Zones (octet 12 : 2 bits)

Bit : 7 6	
0 0	not specified
0 1	number of zone-1
1 0	number of zones-2
1 1	number of zones-3

When designating number of zones-2 or -3, or extended transmission mode, CAC expanded call request must be set, then the "Inter-zone Call Request Supplement Message" must follow.

(8) Duplex Inter-zone Call Request Message (Inbound)

The mobile station transmits this message to request for an assignment of the user specific channel when initiating a duplex inter-zone call.

Table 4.4.4.3.2.2-8 Format of Duplex Inter-zone Call Request Message

Message type : Duplex Inter-zone Call Request Message
Message direction : Inbound
Functional channel : CCCH

octet \ bit	7	6	5	4	3	2	1	0
1	Duplex Inter-zone Call Request Message 1	0	0	0	0	0 Message type	←	
2	Called party code							
3								→
4	Subscriber unit code of call initiator							
5								
6								
7								
8	Communication mode				Transmission mode			
9	Slot assignment		Protocol type		Number of requesting slots			
10	Linking zone #1							
11								
12	Number of linking zones							

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

Called Party Code (octet 1~3 : 18 bits)

Refer to Section 4.4.4.3.3.3 "Called Party Code".

The mobile station initiating the call sets the called party code.

Subscriber Unit Code of Call Initiator (octet 4 ~ 7 : 32 bits)

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The mobile station initiating the call sets its own subscriber unit code.

Communication Mode (octet 8 : 4 bits)

Refer to Section 4.4.4.3.3.5 "Communication Modes".

Bit: 7	6	5	4	
0	0	-	-	reserved
0	1	-	-	reserved
1	0	-	-	Individual call
1	1	-	-	reserved
-	-	0	0	reserved
-	-	0	1	reserved
-	-	1	0	reserved
-	-	1	1	duplex mode

Transmission Mode (octet 8 : 4 bits)

Refer to Section 4.4.4.3.3.6 "Transmission Modes".

Bit: 3	2	1	0	
0	0	-	-	reserved
0	1	-	-	UPCH transmission mode
1	0	-	-	reserved
1	1	-	-	TCH transmission mode (with individual access permission)
-	-	0	0	no error correcting relay mode
-	-	0	1	error correcting relay mode #1
-	-	1	0	error correcting relay mode #2
-	-	1	1	error correcting relay mode #3

Slot Assignment (octet 9 : 2 bits)

This information element is to be invalid. The mobile station is to transmit all '0's.

Protocol Type (octet 9 : 2 bits)

Refer to Section 4.4.4.3.3.9 "Protocol Types".

Bit: 5	4	
0	0	normal call request
0	1	reserved
1	0	reserved
1	1	option

Number of Requesting Slots (octet 9 : 4 bits)

This information element is to be invalid. The mobile station is to transmit all '0's.

Linking Zone #1 (octet 10 ~ 11 : 16 bits)

The system code is set. Refer to Section 4.4.4.3.3.1 "System Code".

Number of Linking Zones (octet 12 : 2 bits)

Bit: 7	6	
0	0	not specified
0	1	number of zone-1
1	0	reserved
1	1	reserved

(9) Inter-zone Call Request Supplement Message (Inbound)

This message supplies additional information to that of either the "Inter-zone Call Request Message" or the "Inter-zone Fleet-wide Call Request Message" when the mobile station has initiated the inter-zone call request with these messages.

This message is transmitted when designating two or more zones, or when designating simplex and plural slots with extended transmission mode in the "Inter-zone Call Request Message" or the "Inter-zone Fleet-wide Call Request Message".

Table 4.4.4.3.2.2-9 Format of Inter-zone Call Request Supplement Message

Message type : Inter-zone Call Request Supplement Message
Message direction : Inbound
Functional channel : CCCH

<table>
<tr><th>octet \ bit</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>0</th></tr>
<tr><td>1</td><td colspan="6">Inter-zone Call Request Supplement Message
1 0 0 1 0 0
Message type</td><td colspan="2">Reserved</td></tr>
<tr><td>2</td><td colspan="8" rowspan="4">Subscriber unit code of call initiator</td></tr>
<tr><td>3</td></tr>
<tr><td>4</td></tr>
<tr><td>5</td></tr>
<tr><td>6</td><td colspan="8" rowspan="2">Linking zone #2</td></tr>
<tr><td>7</td></tr>
<tr><td>8</td><td colspan="8" rowspan="2">Linking zone #3</td></tr>
<tr><td>9</td></tr>
<tr><td>10</td><td colspan="8">←</td></tr>
<tr><td>11</td><td colspan="8">Extended transmission mode</td></tr>
<tr><td>12</td><td colspan="2">→</td><td colspan="6"></td></tr>
</table>

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

Subscriber Unit Code of Call Initiator (octet 2 ~ 5 : 32 bits)

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The mobile station initiating the call sets the same subscriber unit code as in the preceding either "Inter-zone Call Request Message" or the "Inter-zone Fleet-wide Call Request Message".

Linking Zone #2 ~ #3 (octet 6 ~ 7 , 8 ~ 9 : 16 bits each)

The system code is set. Refer to Section 4.4.4.3.3.1 "System Code".

This information element is valid only when designating plural zones. Otherwise It is invalid and the mobile station is to transmit all '0's.

Extended Transmission Mode (octet 10 ~ 12 : 18 bits)

Refer to Section 4.4.4.3.3.7 "Extended Transmission Mode".

This information element is valid only when requesting plural slots in "Simplex Inter-zone Call Request Message". Otherwise it is invalid and the mobile station is to transmit all '0's.

(10) Call Response Message (Outbound)

The repeater station transmits this message in response to the "Call Request Message" with an individual call designated from a mobile station.

Table 4.4.4.3.2.2-10 Format of Call Response Message

Message type : Call Response Message
Message direction : Outbound
Functional channel : CCCH

octet \ bit	7	6	5	4	3	2	1	0
1	Call Response Message 0	0	0	1	0	1 Message type	←	
2	Called party code							
3								→
4	Subscriber unit code of call initiator							
5								
6								
7								
8	Reserved							
9								
10								
11								
12								
13								

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

Called Party Code (octet 1~3 : 18 bits)

Refer to Section 4.4.4.3.3.3 "Called Party Code".

The called party code is set by copying from the corresponding "Call Request Message"

Subscriber Unit Code of Call Initiator (octet 4 ~ 7 : 32 bits)

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The subscriber unit code is set by copying from the corresponding "Call Request Message".

(11) PSTN Interconnect Call Response Message (Outbound)

The repeater station transmits this message in response to the "PSTN Interconnect Call Request Message" from a mobile station.

Table 4.4.4.3.2.2-11 Format of PSTN Interconnect Call Response Message

Message type : PSTN Interconnect Call Response Message
Message direction : Outbound
Functional channel : CCCH

octet \ bit	7	6	5	4	3	2	1	0
1	PSTN Interconnect Call Response Message 0	1	0	0	0	1 Message type	←	
2	Called party code							
3								→
4	Subscriber unit code of call initiator							
5								
6								
7								
8	Reserved							
9								
10								
11								
12								
13								

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

Called Party Code (octet 1~3 : 18 bits)

Refer to Section 4.4.4.3.3.3 "Called Party Code".

The called party code is set by copying from the corresponding "PSTN Interconnect Call Request Message".

Subscriber Unit Code of Call Initiator (octet 4 ~ 7 : 32 bits)

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The subscriber unit code is set by copying from the corresponding "PSTN Interconnect Call Request Message".

(12) Inter-zone Call Response Message (Outbound)

The repeater station transmits this message in response to the "Inter-zone Call Request Message" from a mobile station.

Table 4.4.4.3.2.2-12 Format of Inter-zone Call Response Message

Message type : Inter-zone Call Response Message
Message direction : Outbound
Functional channel : CCCH

<table>
<tr><td>octet \ bit</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td>1</td><td colspan="6">Inter-zone Call Response Message
0 1 1 0 0 1
Message type</td><td colspan="2">←</td></tr>
<tr><td>2</td><td colspan="8" rowspan="2">Called party code
→</td></tr>
<tr><td>3</td></tr>
<tr><td>4</td><td colspan="8" rowspan="4">Subscriber unit code of call initiator</td></tr>
<tr><td>5</td></tr>
<tr><td>6</td></tr>
<tr><td>7</td></tr>
<tr><td>8</td><td colspan="8" rowspan="6">Reserved</td></tr>
<tr><td>9</td></tr>
<tr><td>10</td></tr>
<tr><td>11</td></tr>
<tr><td>12</td></tr>
<tr><td>13</td></tr>
</table>

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

Called Party Code (octet 1~3 : 18 bits)

Refer to Section 4.4.4.3.3.3 "Called Party Code".

The called party code is set by copying from the corresponding "Inter-zone Call Request Message".

Subscriber Unit Code of Call Initiator (octet 4 ~ 7 : 32 bits)

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The subscriber unit code is set by copying from the corresponding "Inter-zone Call Request Message".

(13) Busy-queue Message (Outbound)

The repeater station transmits this message to notify that the call request is put in the busy-queue when the user specific channels can not be assigned immediately upon receiving a call request.

If a call request with the same mobile unit code of the call initiator has been busy-queued, the repeater station also transmits this message.

Table 4.4.4.3.2.2-13 Format of Busy-queue Message

Message type : Busy-queue Message
Message direction : Outbound
Functional channel : CCCH

octet \ bit	7	6	5	4	3	2	1	0
1	Busy-queue Message 1	0	1	0	0	1 Message type	←	
2	Called party code							
3								→
4	Subscriber unit code of call initiator							
5								
6								
7								
8	Reserved							
9								
10	Busy-queue types							
11	Reserved							
12								
13								

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

Called Party Code (octet 1~3 : 18 bits)

Refer to Section 4.4.4.3.3.3 "Called party Code".

The called party code is set by copying from the corresponding "Call Request Message"

Subscriber Unit Code of Call Initiator (octet 4 ~ 7 : 32 bits)

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The subscriber unit code is set by copying from the corresponding "Call Request Message".

Busy-queue Types (octet 10 : 8 bits)

Indicates the types of busy-queue.

Bit: 7 6 5 4 3 2 1 0	
0 0 0 0 0 0 0 0	reserved
0 0 0 0 0 0 0 1	call request accepted
others	option

(14) Busy-queue Cancellation Message (Outbound)

The repeater station transmits this message to notify the removal of the call request from the busy-queue to the mobile stations having been busy-queued.

When initiating any of "Fleet-wide Call Message", "Inter-zone Fleet-wide Call Message", "System-wide Call Message" or "PSTN Disconnect Indication Message", the call request in the busy-queue is also removed. However, the repeater station does not transmit this message in such cases.

Table 4.4.4.3.2.2-14 Format of Busy-queue Cancellation Message

Message type : Busy-queue Cancellation Message
Message direction : Outbound
Functional channel : CCCH

octet \ bit	7	6	5	4	3	2	1	0
1	Busy-queue Cancellation Message 1	0	1	1	0	1 Message type	←	
2	Called party code							
3								→
4	Subscriber unit code of call initiator							
5								
6								
7								
8	Reserved							
9								
10	Reason of the busy-queue cancellation							
11	Reserved							
12								
13								

<u>Message Type (octet 1 : 6 bits)</u>

Refer to Section 4.4.4.3.1 "Definition of Message Types".

<u>Called Party Code (octet 1~3 : 18 bits)</u>

Refer to Section 4.4.4.3.3.3 "Called Party Code".

The called party code is set by copying from the corresponding "Call Request Message".

<u>Subscriber Unit Code of Call Initiator (octet 4 ~ 7 : 32 bits)</u>

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The subscriber unit code is set by copying from the corresponding "Call Request Message".

Reason of the Busy-queue Cancellation (octet 10 : 8 bits)

Indicates the reason of the busy-queue cancellation.

Bit : 7 6 5 4 3 2 1 0	
0 0 0 0 - - - -	reserved
0 0 0 1 - - - -	
:	option
1 1 1 1 - - - -	
- - - - 0 0 0 0	reserved
- - - - 0 0 0 1	reserved
- - - - 0 0 1 0	busy-queue time timed out
- - - - 0 0 1 1	equipment failure
- - - - 0 1 0 0	
:	option
- - - - 1 1 1 1	

(15) Call Reject Message (Outbound)

The repeater station transmits this message to notify that the call request can not be accepted.

Table 4.4.4.3.2.2-15 Format of Call Reject Message

Message type : Call Rejection Message
Message direction : Outbound
Functional channel : CCCH

<table>
<tr><th>octet \ bit</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>0</th></tr>
<tr><td rowspan="3">1</td><td colspan="6">Call Reject Message</td><td colspan="2" rowspan="3">←</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td colspan="6">Message type</td></tr>
<tr><td>2</td><td colspan="8" rowspan="2">Called party code
→</td></tr>
<tr><td>3</td></tr>
<tr><td>4</td><td colspan="8" rowspan="4">Subscriber unit code of call initiator</td></tr>
<tr><td>5</td></tr>
<tr><td>6</td></tr>
<tr><td>7</td></tr>
<tr><td>8</td><td colspan="4">Acceptable communication mode</td><td colspan="4">Acceptable transmission mode</td></tr>
<tr><td>9</td><td colspan="2">Acceptable slot assignment</td><td colspan="2">Reserved</td><td colspan="4">Acceptable number of requesting slots</td></tr>
<tr><td>10</td><td colspan="8">Reason for call reject</td></tr>
<tr><td>11</td><td colspan="8" rowspan="3">Reserved</td></tr>
<tr><td>12</td></tr>
<tr><td>13</td></tr>
</table>

<u>Message Type (octet 1 : 6 bits)</u>

Refer to Section 4.4.4.3.1 "Definition of Message Types".

<u>Called Party Code (octet 1~3 : 18 bits)</u>

Refer to Section 4.4.4.3.3.3 "Called Party Code".

The called party code is set by copying from the corresponding "Call Request Message".

<u>Subscriber Unit Code of Call Initiator (octet 4 ~ 7 : 32 bits)</u>

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The subscriber unit code is set by copying from the corresponding "Call Request Message".

Acceptable Communication Mode (octet 8 : 4 bits)

The communication mode that can be accepted at the call receiving mobile station is designated in this information element. However, this information element is invalid except when the response code is individual call reception reject (acceptable call information valid).

Refer to Section 4.4.4.3.3.5 "Communication Modes".

Bit: 7	6	5	4	
0	0	-	-	Group call
0	1	-	-	Subgroup call
1	0	-	-	Individual call
1	1	-	-	reserved
-	-	0	0	simplex mode
-	-	0	1	half-duplex mode
-	-	1	0	reserved
-	-	1	1	duplex mode

Acceptable Transmission Mode (octet 8 : 4 bits)

The transmission mode that can be accepted at the call receiving mobile station is designated in this information element. However, this information element is to be invalid except when the response code is individual call reception reject (acceptable call information valid).

Refer to Section 4.4.4.3.3.6 "Transmission Modes".

Bit: 3	2	1	0	
0	0	-	-	reserved
0	1	-	-	UPCH transmission mode
1	0	-	-	TCH transmission mode (with user access permission)
1	1	-	-	TCH transmission mode (with individual access permission)
-	-	0	0	no error correcting relay mode
-	-	0	1	error correcting relay mode #1
-	-	1	0	error correcting relay mode #2
-	-	1	1	error correcting relay mode #3

Acceptable Slot Assignment (octet 9 : 2 bits)

The slot assignment that can be accepted at the call receiving mobile station is designated in this information element. However, this information element is to be invalid other than when the response code is individual call reception reject (acceptable call information valid).

Refer to Section 4.4.4.3.3.8 "Slot Assignment".

Bit: 7	6	
0	-	1 carrier
1	-	2 carriers
-	0	slot assignment with the fixed pattern (3 slots interval)
-	1	slot assignment with an arbitrary pattern

Acceptable Number of Slots (octet 9 : 4 bits)

The number of slots that can be accepted at the call receiving mobile station is designated in this information element. However, this element is to be invalid except when the response code is individual call reception reject (acceptable call information valid).

Refer to Section 4.4.4.3.3.10 "Number of Requesting Slots".

Bit: 3 2 1 0	
0 0 0 0	reserved
0 0 0 1	1 slot
0 0 1 0	2 slots
:	:
0 1 1 0	6 slots
0 1 1 1	
:	reserved
1 1 1 1	

Reason of Call Reject (octet 10 : 8 bits)

Indicates the reason of call reject.

Bit: 7 6 5 4 3 2 1 0	
0 0 0 0 - - - -	reserved
0 0 0 1 - - - -	
:	option
1 1 1 1 - - - -	
- - - - 0 0 0 0	reserved
- - - - 0 0 0 1	congestion
- - - - 0 0 1 0	mismatch of call information
- - - - 0 0 1 1	equipment failure
- - - - 0 1 0 0	busy on call receiving mobile station
- - - - 0 1 0 1	individual call reception reject (acceptable call information valid)
- - - - 0 1 1 0	individual call reception reject (acceptable call information invalid)
- - - - 0 1 1 1	
:	option
- - - - 1 1 1 1	

Busy on call receiving mobile station indicates that other communication is in progress involving the group of mobile stations specified by the called party code in the corresponding "Call Request Message".

Individual call reception reject (acceptable call information valid) indicates that the call request may be accepted if the call information is as indicated in this information elements, even if the call request was rejected at the call receiving mobile station.

Individual call reception reject (acceptable call information invalid) indicates that the call request was rejected, and that the acceptable information was not specified by the call receiving mobile station.

(16) Channel Assignment Message (Outbound)

The repeater station transmits to assign the slot(s) to the call initiator.

This message is 13 octet long when assigning one or more slots on a single carrier, and 26 octet long when assigning plural slots on two different carriers.

Table 4.4.4.3.2.2-16 Format of Channel Assignment Message

Message type : Channel Assignment Message
Message direction : Outbound
Functional channel : CCCH

octet \ bit	7	6	5	4	3	2	1	0
1	Channel Assignment Message 1	1	0	1	0	1 Message type	←	
2	Called party code							
3								→
4	Subscriber unit code of call initiator							
5								
6								
7								
8	Communication mode				Communication time-out time			
9	Slot assignment		←					
10	1st carrier/channel assignment information							
11								→
12	Zone number of call initiator							
13								
14	Reserved		←					
15	2nd carrier/channel assignment information							
16								→
17	Reserved							
:								
26								

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

Called Party Code (octet 1~3 : 18 bits)

Refer to Section 4.4.4.3.3.3 "Called Party Code ".

The called party code is set by copying from the corresponding "Call Request Message"

Subscriber Unit Code of Call Initiator (octet 4 ~ 7 : 32 bits)

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator ".

The subscriber unit code is set by copying from the corresponding "Call Request Message".

Communication Mode (octet 8 : 4 bits)

Refer to Section 4.4.4.3.3.5 "Communication Modes".

The communication mode is set by copying from the corresponding "Call Request Message"

Bit : 7	6	5	4	
0	0	-	-	Group call
0	1	-	-	Subgroup call
1	0	-	-	Individual call
1	1	-	-	reserved
-	-	0	0	simplex mode
-	-	0	1	half-duplex mode
-	-	1	0	reserved
-	-	1	1	duplex mode

Communication Time-out Time Control (octet 8 : 4 bits)

Refer to Section 4.4.4.3.3.12 "Communication Time-out Time".

Bit : 3	2	1	0	
0	0	0	0	reserved
0	0	0	1	15 seconds
0	0	1	0	30 seconds
0	0	1	1	45 seconds
0	1	0	0	60 seconds
0	1	0	1	75 seconds
0	1	1	0	90 seconds
0	1	1	1	105 seconds
1	0	0	0	120 seconds
1	0	0	1	150 seconds
1	0	1	0	180 seconds
1	0	1	1	210 seconds
1	1	0	0	240 seconds
1	1	0	1	270 seconds
1	1	1	0	300 seconds
1	1	1	1	option

Slot Assignment (octet 9 : 2 bits)

Refer to Section 4.4.4.3.3.8 "Slot Assignment".

Bit : 7	6	
0	-	1 carrier
1	-	2 carriers
-	0	slot assignment with the fixed pattern (3 slots interval)
-	1	slot assignment with an arbitrary pattern

1st Channel Assignment Information (octet 9 ~ 11 : 22 bits)

Refer to Section 4.4.4.3.3.13 "1st Carrier/Channel Assignment Information ".

Zone Number of Call Initiator (octet 12 ~ 13 : 16 bits)

Refer to Section 4.4.4.3.3.1 "System Code".

Indicates the system code of the home zone of a call initiating mobile station.

2nd Carrier/channel Assignment Information (octet 14 ~ 16 : 22 bits)

Refer to Section 4.4.4.3.3.14 "2nd Carrier/channel Assignment Information".

(17) Transpond Request Message (Outbound)

The repeater station transmits this message to request a response to the call receiving mobile station when the individual call is requested.

Table 4.4.4.3.2.2-17 Format of Transpond Request Message

Message type : Transpond Request Message
Message direction : Outbound
Functional channel : CCCH

octet \ bit	7	6	5	4	3	2	1	0
1	Transpond Request Message 1	1	1	0	0	1 Message type	←	
2	Called party code							
3								→
4	Subscriber unit code of call initiator							
5								
6								
7								
8	Communication mode				Transmission mode			
9	Slot assignment		Reserved		Number of requesting slots			
10	Reserved							
11								
12								
13								

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

Called Party Code (octet 1~3 : 18 bits)

Refer to Section 4.4.4.3.3.3 "Called Party Code ".

The called party code is set by copying from the corresponding "Call Request Message".

Subscriber Unit Code of Call Initiator (octet 4 ~ 7 : 32 bits)

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The subscriber unit code is set by copying from the corresponding "Call Request Message".

Communication Mode (octet 8 : 4 bits)

Refer to Section 4.4.4.3.3.5 "Communication Modes".

The communication mode is set by copying from the corresponding "Call Request Message".

Bit : 7 6 5 4

7	6	5	4	
0	0	-	-	reserved
0	1	-	-	reserved
1	0	-	-	Individual call
1	1	-	-	reserved
-	-	0	0	simplex mode
-	-	0	1	half-duplex mode
-	-	1	0	reserved
-	-	1	1	duplex mode

Transmission Mode (octet 8 : 4 bits)

Refer to Section 4.4.4.3.3.6 "Transmission Modes".

The transmission mode is set by copying from the corresponding "Call Request Message".

Bit : 3 2 1 0

3	2	1	0	
0	0	-	-	reserved
0	1	-	-	UPCH transmission mode
1	0	-	-	TCH transmission mode (with user access permission)
1	1	-	-	TCH transmission mode (with individual access permission)
-	-	0	0	no error correcting relay mode
-	-	0	1	error correcting relay mode #1
-	-	1	0	error correcting relay mode #2
-	-	1	1	error correcting relay mode #3

Slot Assignment (octet 9 : 2 bits)

Refer to Section 4.4.4.3.3.8 "Slot Assignment".

The slot assignment is set by copying from the corresponding "Call Request Message".

This information element is invalid when either half-duplex or duplex is designated in the communication mode.

Bit : 7 6

7	6	
0	-	1 carrier
1	-	2 carriers
-	0	slot assignment with the fixed pattern (3 slots interval)
-	1	slot assignment with an arbitrary pattern

Number of Requesting Slots (octet 9 : 4 bits)

Refer to Section 4.4.4.3.3.10 "Number of Requesting Slots".

Bit : 3 2 1 0	
0 0 0 0	reserved
0 0 0 1	1 slot
0 0 1 0	2 slots
:	:
0 1 1 0	6 slots
0 1 1 1	
:	reserved
1 1 1 1	

(18) Transpond Response Message (Inbound)

The call receiving mobile station transmits this message to the repeater station in respond to the transpond request when the individual call is requested.

Table 4.4.4.3.2.2-18 Format of Transpond Response Message

Message type : Transpond Response Message
Message direction : Inbound
Functional channel : CCCH

octet \ bit	7	6	5	4	3	2	1	0
1	Transpond Response Message 1	1	1	0	0	0 Message type	←	
2	Called party code							
3								→
4	Subscriber unit code of call initiator							
5								
6								
7								
8	Acceptable communication mode				Acceptable transmission mode			
9	Acceptable slot assignment		Reserved		Acceptable number of requesting slots			
10	Response code							
11	←			Reserved				
12		→						

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

Called Party Code (octet 1~3 : 18 bits)

Refer to Section 4.4.4.3.3.3 "Called Party Code ".

The called party code is set by copying from the corresponding "Transpond Request Message" .

Subscriber Unit Code of Call Initiator (octet 4 ~ 7 : 32 bits)

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The call receiving mobile station sets its own subscriber unit code.

Acceptable Communication Mode (octet 8 : 4 bits)

The communication modes that can be accepted at the call receiving mobile station is designated in this information element. However, this information element is to be invalid other than when the response code is call reception reject (acceptable call information valid).

Refer to Section 4.4.4.3.3.5 "Communication Modes".

Bit : 7	6	5	4	
0	0	-	-	reserved
0	1	-	-	reserved
1	0	-	-	Individual call
1	1	-	-	reserved
-	-	0	0	simplex mode
-	-	0	1	half-duplex mode
-	-	1	0	reserved
-	-	1	1	duplex mode

Acceptable Transmission Mode (octet 8 : 4 bits)

The transmission mode that can be accepted at the call receiving mobile station is designated in this information element. However, this information element is to be invalid other than when the response code is call reception reject (acceptable call information valid).

Refer to Section 4.4.4.3.3.6 "Transmission Modes".

Bit : 3	2	1	0	
0	0	-	-	reserved
0	1	-	-	UPCH transmission mode
1	0	-	-	TCH transmission mode (with user access permission)
1	1	-	-	TCH transmission mode (with individual access permission)
-	-	0	0	no error correcting relay mode
-	-	0	1	error correcting relay mode #1
-	-	1	0	error correcting relay mode #2
-	-	1	1	error correcting relay mode #3

Acceptable Slot Assignment (octet 9 : 2 bits)

The slot assignment that can be accepted at the call receiving mobile station is designated in this information element. However, this information element is to be invalid other than when the response code is call reception reject (acceptable call information valid).

Refer to Section 4.4.4.3.3.8 "Slot Assignment ".

Bit : 7	6	
0	-	1 carrier
1	-	2 carriers
-	0	slot assignment with the fixed pattern (3 slots interval)
-	1	slot assignment with an arbitrary pattern

Acceptable Number of Slots (octet 9 : 4 bits)

The number of slots that can be accepted at the call receiving mobile station is designated in this information element. However, this information element is to be invalid other than when the response code is call reception reject (acceptable call information valid).

Refer to Section 4.4.4.3.3.10 "Number of Requesting Slots".

Bit: 3 2 1 0	
0 0 0 0	reserved
0 0 0 1	1 slot
0 0 1 0	2 slots
:	:
0 1 1 0	6 slots
0 1 1 1	
:	reserved
1 1 1 1	

Response Code (octet 10 : 8 bits)

Indicates whether a call reception is acceptable or unacceptable.

Bit: 7 6 5 4 3 2 1 0	
0 0 0 0 0 0 0 0	reserved
0 0 0 0 0 0 0 1	call reception acceptable
0 0 0 0 0 0 1 0	call reception reject (acceptable call information valid)
0 0 0 0 0 0 1 1	call reception reject (acceptable call information invalid)
0 0 0 0 0 1 0 0	
:	option
1 1 1 1 1 1 1 1	

Call reception reject (acceptable call information valid) indicates that the call request may be accepted if the call information is as indicated in this information elements even if the call request was rejected at the call receiving mobile station.

Call reception reject (acceptable call information invalid) indicates that the call request was rejected and the acceptable call information was not specified by the call receiving mobile station.

(19) Fleet-wide Call Request Message (Inbound)

The mobile station transmits this message to request for a fleet-wide call to communicate among all mobile stations belonging to this fleet.

Table 4.4.4.3.2.2-19 Format of Fleet-wide Call Request Message

Message type : Fleet-wide Call Request Message
Message direction : Inbound
Functional channel : CCCH

octet \ bit	7	6	5	4	3	2	1	0
1	Fleet-wide Call Request Message 0	0	0	1	1	0 Message type	←	
2	Called party code							
3								→
4	Subscriber unit code of call initiator							
5								
6								
7								
8	Communication mode				Transmission mode			
9	Reserved		Protocol type		←			
10	Reserved							
11								
12	→							

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

Called Party Code (octet 1~3 : 18 bits)

Refer to Section 4.4.4.3.3.3 "Called Party Code".

The mobile station initiating the call sets the called party code.

Subscriber Unit Code of Call Initiator (octet 4 ~ 7 : 32 bits)

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The mobile station initiating the call sets its own subscriber unit code.

Communication Mode (octet 8 : 4 bits)

Refer to Section 4.4.4.3.3.5 "Communication Modes".

Bit : 7	6	5	4	
0	0	-	-	Group call
0	1	-	-	reserved
1	0	-	-	reserved
1	1	-	-	reserved
-	-	0	0	simplex mode
-	-	0	1	half-duplex-mode
-	-	1	0	reserved
-	-	1	1	reserved

Transmission Mode (octet 8 : 4 bits)

Refer to Section 4.4.4.3.3.6 "Transmission Modes".

Bit : 3	2	1	0	
0	0	-	-	reserved
0	1	-	-	UPCH transmission mode
1	0	-	-	TCH transmission mode (with user access permission)
1	1	-	-	TCH transmission mode (with individual access permission)
-	-	0	0	no error correcting relay mode
-	-	0	1	error correcting relay mode #1
-	-	1	0	error correcting relay mode #2
-	-	1	1	error correcting relay mode #3

The individual access permission is not to be given to any mobile station upon channel assignment when TCH transmission mode (with user access permission) is set. However, the individual access permission is to be given to the mobile station initiating the call upon channel assignment when TCH transmission mode (with individual access permission) is set.

Protocol Type (octet 9 : 2 bits)

Refer to Section 4.4.4.3.3.9 "Protocol Type".

Bit : 5	4	
0	0	normal call request
0	1	reserved
1	0	reserved
1	1	option

(20) Fleet-wide Call Message (Outbound)

The repeater station transmits this message to notify the start of the fleet-wide call among all mobile stations belonging to the fleet.

Table 4.4.4.3.2.2-20 Format of Fleet-wide Call Message

Message type : Fleet-wide Call Message
Message direction : Outbound
Functional channel : CCCH

<table>
<tr><th>octet \ bit</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>0</th></tr>
<tr><td>1</td><td colspan="6">Fleet-wide Call Message
0 0 0 1 1 1
Message type</td><td colspan="2">←</td></tr>
<tr><td>2</td><td colspan="8" rowspan="2">Called party code →</td></tr>
<tr><td>3</td></tr>
<tr><td>4</td><td colspan="8" rowspan="4">Subscriber unit code of call initiator</td></tr>
<tr><td>5</td></tr>
<tr><td>6</td></tr>
<tr><td>7</td></tr>
<tr><td>8</td><td colspan="4">Communication mode</td><td colspan="4">Communication time-out time</td></tr>
<tr><td>9</td><td colspan="2">Reserved</td><td colspan="6" rowspan="3">← Channel assignment information →</td></tr>
<tr><td>10</td><td colspan="2"></td></tr>
<tr><td>11</td><td colspan="2"></td></tr>
<tr><td>12</td><td colspan="8" rowspan="2">Zone number of call initiator</td></tr>
<tr><td>13</td></tr>
</table>

<u>Message Type (octet 1 : 6 bits)</u>

Refer to Section 4.4.4.3.1 "Definition of Message Types".

<u>Call Party Code (octet 1~3 : 18 bits)</u>

Refer to Section 4.4.4.3.3.3 "Call Party Code".

The called party code is set by copying from the corresponding "Fleet-wide Request Message".

<u>Subscriber Unit Code of Call Initiator (octet 4 ~ 7 : 32 bits)</u>

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The subscriber unit code is set by copying from the corresponding "Fleet-wide Call Request Message".

Communication Mode (octet 8 : 4 bits)

Refer to Section 4.4.4.3.3.5 "Communication Modes".

Bit : 7	6	5	4	
0	0	-	-	Group call
0	1	-	-	reserved
1	0	-	-	reserved
1	1	-	-	reserved
-	-	0	0	simplex mode
-	-	0	1	half-duplex-mode
-	-	1	0	reserved
-	-	1	1	reserved

Communication Time out Time (octet 8 : 4 bits)

Refer to Section 4.4.4.3.3.12 "Communication Time out Time".

Bit : 7	6	5	4	
0	0	0	0	reserved
0	0	0	1	15 seconds
0	0	1	0	30 seconds
0	0	1	1	45 seconds
0	1	0	0	60 seconds
0	1	0	1	75 seconds
0	1	1	0	90 seconds
0	1	1	1	105 seconds
1	0	0	0	120 seconds
1	0	0	1	150 seconds
1	0	1	0	180 seconds
1	0	1	1	210 seconds
1	1	0	0	240 seconds
1	1	0	1	270 seconds
1	1	1	0	300 seconds
1	1	1	1	option

Channel Assignment Information (octet 9 ~ 11 : 22 bits)

Refer to Section 4.4.4.3.3.2 "Channel Assignment Information".

Zone Number of Call Initiator (octet 12 ~ 13 : 16 bits)

Refer to Section 4.4.4.3.3.1 "System Code".

The system code of the zone the call initiator belongs to is set.

(21) Inter-zone Fleet-wide Call Request Message (Inbound)

The mobile station transmits this message to request for a fleet-wide call to communicate among all mobile stations belonging to this fleet including other zones.

This message may be followed by the "Inter-zone Call Supplement Message".

Table 4.4.4.3.2.2-21 Format of Inter-zone Fleet-wide Call Request Message

Message type : Inter-zone Fleet-wide Call Request Message
Message direction : Inbound
Functional channel : CCCH

octet \ bit	7	6	5	4	3	2	1	0
1	Inter-zone Fleet-wide Call Request Message 0	0	1	0	1	0 Message type	←	
2	Called party code							
3								→
4	Subscriber unit code of call initiator							
5								
6								
7								
8	Communication mode				Transmission mode			
9	Reserved		Protocol type		Reserved			
10	Linking zone #1							
11								
12	Number of linking zones							

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

Called Party Code (octet 1~3 : 18 bits)

Refer to Section 4.4.4.3.3.3 "Called Party Code".

The mobile station initiating the call sets the called party code.

Subscriber Unit Code of Call Initiator (octet 4 ~ 7 : 32 bits)

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The mobile station initiating the call sets its own subscriber unit code.

Communication Mode (octet 8 : 4 bits)

Refer to Section 4.4.4.3.3.5 "Communication Modes".

Bit : 7 6 5 4	
0 0 - -	Group call
0 1 - -	reserved
1 0 - -	reserved
1 1 - -	reserved
- - 0 0	simplex mode
- - 0 1	reserved
- - 1 0	reserved
- - 1 1	reserved

Transmission Mode (octet 8 : 4 bits)

Refer to Section 4.4.4.3.3.6 "Transmission Modes".

Bit : 3 2 1 0	
0 0 - -	reserved
0 1 - -	UPCH transmission mode
1 0 - -	TCH transmission mode (with user access permission)
1 1 - -	TCH transmission mode (with individual access permission)
- - 0 0	no error correcting relay mode
- - 0 1	error correcting relay mode #1
- - 1 0	error correcting relay mode #2
- - 1 1	error correcting relay mode #3

The individual access permission is not to be given to any mobile station upon channel assignment when TCH transmission mode (with user access permission) is set, However the individual access permission is to be given to the mobile station initiating the call upon channel assignment when TCH transmission mode (with individual access permission) is set.

Protocol Type (octet 9 : 2 bits)

Refer to Section 4.4.4.3.3.9 "Protocol Type".

Bit : 5 4	
0 0	normal call request
0 1	CAC expanded call request
1 0	reserved
1 1	option

When designating plural zones, the mobile station must initiate the call with CAC expanded call request, then the "Inter-zone Call Request Supplement Message" must follow.

Linking Zone #1 (octet 10 ~ 11 : 16 bits)

Specify the system code. Refer to Section 4.4.4.3.3.1 "System code".

Number of Linking Zones (octet 12 : 2 bits)

Bit : 7 6	
0 0	not specified
0 1	number of zone-1
1 0	number of zones-2
1 1	number of zones-3

When designating number of zones-2 or -3, CAC expanded call request must be set, then the "Inter-zone Call Request Supplement Message" must follow.

(22) System-wide Call Message (Outbound)

The repeater station transmits this message to notify the start of the system-wide call.

Table 4.4.4.3.2.2-22 Format of System-wide Call Message

Message type : System-wide Call Message
Message direction : Outbound
Functional channel : CCCH

octet \ bit	7	6	5	4	3	2	1	0
1	System-wide Call Message 0	0	1	1	1	1 Message type	←	
2	Option							
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								→

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

(23) PSTN Call Disconnect Request Message (Inbound)

The mobile station transmits this message to cancel the previously transmitted "PSTN Interconnect Call Request Message".

Table 4.4.4.3.2.2-23 Format of PSTN Call Disconnect Request Message

Message type : PSTN Call Disconnect Request Message
Message direction : Inbound
Functional channel : CCCH

octet \ bit	7	6	5	4	3	2	1	0
1	PSTN Call Disconnect Request Message 0	1	0	0	1	0 Message type	←	
2	Called party code							
3								→
4	Subscriber unit code of call initiator							
5								
6								
7								
8	← Reserved							
9								
10								
11								
12		→						

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

Called Party Code (octet 1~3 : 18 bits)

Refer to Section 4.4.4.3.3.3 "Called Party Code".

The mobile station initiated the call sets the same called party code as set in the corresponding "PSTN Interconnect Call Request Message".

The repeater station is to dispose this message if the called party code in this message does not match that of the "PSTN Interconnect Call Request Message".

Subscriber Unit Code of Call Initiator (octet 4 ~ 7 : 32 bits)

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The mobile station initiated the call sets its own subscriber unit code.

(24) PSTN Call Disconnect Message (Outbound)

The repeater station transmits this message to notify the grant of the "PSTN Call Disconnect Request Message"to the mobile station.

Table 4.4.4.3.2.2-24 Format of PSTN Call Disconnect Message

Message type : PSTN Call Disconnect Message
Message direction : Outbound
Functional channel : CCCH

octet \ bit	7	6	5	4	3	2	1	0
1	PSTN Call Disconnect Message 0	1	0	0	1	1 Message type	← Called party code	
2	Called party code							
3								→
4	Subscriber unit code of call initiator							
5								
6								
7								
8	Reserved							
9								
10								
11								
12								
13								

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

Called Party Code (octet 1~3 : 18 bits)

Refer to Section 4.4.4.3.3.3 "Called Party Code".

The called party code is set by copying from the corresponding "PSTN Call Disconnect Request Message"

Subscriber Unit Code of Call Initiator (octet 4 ~ 7 : 32 bits)

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The subscriber unit code is set by copying from the corresponding "PSTN Call Disconnect Request Message"

(25) User Message (Inbound)

This is the inbound message to be transmitted when a mobile station sends the user messages to other mobile station(s) on the common access channel but not the user specific channel.

Table 4.4.4.3.2.2-25 Format of User Message

Message type : User Message
Message direction : Inbound
Functional channel : CCCH

<table>
<tr><th>octet \ bit</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>0</th></tr>
<tr><td>1</td><td colspan="6">User Message
0 1 0 1 1 0
Message type</td><td colspan="2">←</td></tr>
<tr><td>2</td><td colspan="8" rowspan="2">Called party code →</td></tr>
<tr><td>3</td></tr>
<tr><td>4</td><td colspan="8" rowspan="4">Subscriber unit code of call initiator</td></tr>
<tr><td>5</td></tr>
<tr><td>6</td></tr>
<tr><td>7</td></tr>
<tr><td>8</td><td colspan="8" rowspan="4">← Option</td></tr>
<tr><td>9</td></tr>
<tr><td>10</td></tr>
<tr><td>11</td></tr>
<tr><td>12</td><td colspan="2">→</td><td colspan="6"></td></tr>
</table>

<u>Message Type (octet 1 : 6 bits)</u>

Refer to Section 4.4.4.3.1 "Definition of Message Types".

<u>Called Party Code (octet 1~3 : 18 bits)</u>

Refer to Section 4.4.4.3.3.3 "Called Party Code".

The mobile station initiated the call the user message sets the called party code.

<u>Subscriber Unit Code of Call Initiator (octet 4 ~ 7 : 32 bits)</u>

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The mobile station initiated the call the user message sets its own subscriber unit code.

(26) User Message (Outbound)

This is the outbound message to be transmitted when a mobile station sends the user messages to other mobile station(s) on the common access channel but not the user specific channel.

Table 4.4.4.3.2.2-26 Format of User Message

Message type : User Message
Message direction : Outbound
Functional channel : CCCH

octet \ bit	7	6	5	4	3	2	1	0
1	0	1	0	1	1	1	←	
	User Message / Message type							
2	Called party code							
3								→
4	Subscriber unit code of call initiator							
5								
6								
7								
8	← Option							
9								
10								
11								
12			→	← Reserved				
13								→

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

Called Party Code (octet 1~3 : 18 bits)

Refer to Section 4.4.4.3.3.3 "Called Party Code".

The called party code is set by copying from the corresponding "User Message (Inbound)".

Subscriber Unit Code of Call Initiator (octet 4 ~ 7 : 32 bits)

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The subscriber unit code is set by copying from the corresponding "User Message (Inbound)".

(27) Option (Inbound)

This is the inbound message used arbitrarily.

Table 4.4.4.3.2.2-27 Format of Option

Message type : Option
Message direction : Inbound
Functional channel : CCCH

octet \ bit	7	6	5	4	3	2	1	0
1	Option 1	x	x	x	1	0 Message type	←	
2	Option							
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

<u>Message Type (octet 1 : 6 bits)</u>

Refer to Section 4.4.4.3.1 "Definition of Message Types".

(28) Option (Outbound)

This is the outbound message used arbitrarily.

Table 4.4.4.3.2.2-28 Format of Option

Message type : Option
Message direction : Outbound
Functional channel : CCCH

octet \ bit	7	6	5	4	3	2	1	0
1	Option 1	x	x	x	1	1 Message type	←	
2	Option							
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								→

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

4.4.4.3.2.3 FACCH1

(1) Call Disconnect Request Message (Inbound)

The mobile station transmits this message to request for a call disconnection while operating in TCH transmission mode (Individual access permitted state). When operating in inbound UPCH transmission mode, "Call Disconnect Request Message"of FACCH2 is to be used.

Table 4.4.4.3.2.3-1 Format of Call Disconnect Request Message

Message type : Call Disconnect Request Message
Message direction : Inbound
Functional channel : FACCH1

octet \ bit	7	6	5	4	3	2	1	0
1	Call Disconnect Request Message 0	0	0 Message type	1	0	0	Reserved	
2	Subscriber unit code of call initiator							
3								
4								
5								
6	← Reserved							
7								
8								
9								
10								
11								
12								
13								
14								
:								
35	→							

<u>Message Type (octet 1 : 6 bits)</u>

Refer to Section 4.4.4.3.1 "Definition of Message Types".

<u>Subscriber Unit Code of Call Initiator (octet 2 ~ 5 : 32 bits)</u>

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The mobile station requesting call disconnection sets its own subscriber unit code.

(2) Call Disconnect Indication Message (Outbound)

The repeater station transmits this message to notify that the "Call Disconnect Request Message"from the mobile station in outbound TCH transmission mode was granted, or that the repeater disconnected the call. When operating in outbound UPCH transmission mode, "Call Disconnect Indication Message" of FACCH2 is to be used.

Table 4.4.4.3.2.3-2 Format of Call Disconnect Indication Message

Message type : Call Disconnect Message
Message direction : Outbound
Functional channel : FACCH1

octet \ bit	7	6	5	4	3	2	1	0
1	Call Disconnect Indication Message 0	0	0	1	0	1 Message type	Reserved	
2	Subscriber unit code of call initiator							
3								
4								
5								
6	Reason for call disconnection							
7	← Reserved							
8								
9								
10								
11								
12								
13								
14								
:								
35	→							

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

Subscriber Unit Code of Call Initiator (octet 2 ~ 5 : 32 bits)

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The subscriber unit code is set by copying from the corresponding "Call Disconnect Request Message"in case the call disconnection was initiated by the "Call Disconnect Request Message".

The subscriber unit code is set by copying from the corresponding "Call Request Message"in case the call disconnection is initiated by the repeater station.

Reason for Call Disconnection (octet 6 : 8 bits)

Indicates the reason for call disconnection.

Bit: 7 6 5 4 3 2 1 0	
0 0 0 0 - - - -	reserved
0 0 0 1 - - - -	
:	option
1 1 1 1 - - - -	
- - - - 0 0 0 0	reserved
- - - - 0 0 0 1	System-wide call initiation
- - - - 0 0 1 0	Fleet-wide call initiation
- - - - 0 0 1 1	equipment failure
- - - - 0 1 0 0	reception of call disconnection request
- - - - 0 1 0 1	
:	option
- - - - 1 1 1 1	

(3) PSTN Interconnect Call Request Supplement Message II (Inbound)

This message supplies additional information to that of the "PSTN Interconnect Call Request Message"when the mobile station has initiated the "PSTN Interconnect Call Request Message"with CAC-USC expanded call request.

This message is to be used with the "PSTN Interconnect Call Request Message".

This message can be used only in TCH transmission mode (individual access permitted state).

Table 4.4.4.3.2.3-3 Format of PSTN Interconnect Call Request Supplement Message II

Message type : PSTN Interconnect Call Request Supplement Message II
Message direction : Inbound
Functional channel : FACCH1

octet \ bit	7	6	5	4	3	2	1	0
1	PSTN Interconnect Call Request Supplement Message II 0	0	1	1	0	0 Message type	Reserved	
2	Subscriber unit code of call initiator							
3								
4								
5								
6	1st digit number				2nd digit number			
7	3rd digit number				4th digit number			
8	5th digit number				6th digit number			
9	7th digit number				8th digit number			
10	9th digit number				10th digit number			
11	11th digit number				12th digit number			
12	13th digit number				14th digit number			
13	15th digit number				Trunk line destination information			
14	← Option							
:								
31								
32								
33								
34								
35	→							

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

Subscriber Unit Code of Call Initiator (octet 2 ~ 5 : 32 bits)

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The mobile station initiating the call sets the same subscriber unit code as in the preceding "PSTN Interconnect Call Request Message".

1st ~ 15th Digit Numbers (octet 6 ~ 13 : 4 bits each)

Refer to Section 4.4.4.3.3.11 " 'n'-th Digit Number".

Bit : 7 6 5 4	
0 0 0 0	filler
0 0 0 1	
:	Telephone number '1' ~ '9'
1 0 0 1	
1 0 1 0	Telephone number '0'
1 0 1 1	*
1 1 0 0	#
others	option

Trunk line destination information (octet 13 : 4 bits)

The mobile station designates the trunk line when initiates a call.

Bit : 3 2 1 0	
all bits	option

(4) Option (Inbound)

This is the inbound message used arbitrarily.

Table 4.4.4.3.2.3-4 Format of Option

Message type : Option
Message direction : Inbound
Functional channel : FACCH1

octet \ bit	7	6	5	4	3	2	1	0
1	Option 1	x	x	x	1	0 Message type	←	
2	Option							
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
:								
35	→							

<u>Message Type (octet 1 : 6 bits)</u>

Refer to Section 4.4.4.3.1 "Definition of Message Types".

(5) Option (Outbound)

This is the outbound message used arbitrarily.

Table 4.4.4.3.2.3-5 Format of Option

Message type : Option
Message direction : Outbound
Functional channel : FACCH1

octet \ bit	7	6	5	4	3	2	1	0
1	Option 1	x	x	x	1	1 Message type	←	
2	Option							
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
:								
35	→							

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

4.4.4.3.2.4 FACCH2

(1) Call Disconnect Request Message (Inbound)

The mobile station transmits this message to request for call disconnection while operating in UPCH transmission mode. When operating in inbound TCH transmission mode (Individual access permitted state), "Call Disconnect Request Message"of FACCH1 is to be used.

Table 4.4.4.3.2.4-1 Format of Call Disconnect Request Message

Message type : Call Disconnect Request Message
Message direction : Inbound
Functional channel : FACCH2

octet \ bit	7	6	5	4	3	2	1	0
1	Call Disconnect Request Message 0	0	0	1	0	0 Message type	Reserved	
2	Subscriber unit code of call initiator							
3								
4								
5								
6	← Reserved							
7								
8								
9								
10								
11	→							

<u>Message Type (octet 1 : 6 bits)</u>

Refer to Section 4.4.4.3.1 "Definition of Message Types".

<u>Subscriber Unit Code of Call Initiator (octet 2 ~ 5 : 32 bits)</u>

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The mobile station requesting call disconnection sets its own subscriber unit code.

(2) Call Disconnect Indication Message (Outbound)

The repeater station transmits this message to notify that the "Call Disconnect Request Message"from the mobile station in outbound UPCH transmission mode was granted, or that the repeater disconnected the call. When operating in outbound TCH transmission mode, the "Call Disconnect Indication Message" of FACCH1 is to be used.

Table 4.4.4.3.2.4-2 Format of Call Disconnect Indication Message

Message type : Call Disconnect Indication Message
Message direction : Outbound
Functional channel : FACCH2

octet \ bit	7	6	5	4	3	2	1	0
1	Call Disconnect Indication Message 0	0	0	1	0	1 Message type	Reserved	
2	Subscriber unit code of call initiator							
3								
4								
5								
6	Reason for call disconnection							
7	← Reserved							
8								
9								
10								
11	→							

Message Type (octet 1 : 6 bits)

Refer to Section 4.4.4.3.1 "Definition of Message Types".

Subscriber Unit Code of Call Initiator (octet 2 ~ 5 : 32 bits)

Refer to Section 4.4.4.3.3.4 "Subscriber Unit Code of Call Initiator".

The mobile unit code is set by copying from the corresponding "Call Disconnect Request Message"in case the call disconnection was initiated by the "Call Disconnect Request Message". The subscriber unit code is set by copying from the corresponding "Call Request Message"in case the call disconnection is initiated by the repeater station.

Reason for Call Disconnection (octet 6 : 8 bits)

Indicates the reason for call disconnection.

Bit: 7 6 5 4 3 2 1 0	
0 0 0 0 - - - -	reserved
0 0 0 1 - - - -	
:	option
1 1 1 1 - - - -	
- - - - 0 0 0 0	reserved
- - - - 0 0 0 1	System wide call initiation
- - - - 0 0 1 0	Fleet-wide call initiation
- - - - 0 0 1 1	equipment failure
- - - - 0 1 0 0	reception of call disconnection request
- - - - 0 1 0 1	
:	option
- - - - 1 1 1 1	

(3) Option (Inbound)

This is the inbound message used arbitrarily.

Table 4.4.4.3.2.4-3 Format of Option

Message type : Option
Message direction : Inbound
Functional channel : FACCH2

octet \ bit	7	6	5	4	3	2	1	0
1	Option 1	x	x Message type	x	1	0	←	
2								
3								
4								
5								
6				Option				
7								
8								
9								
10								
11		→						

<u>Message Type (octet 1 : 6 bits)</u>

Refer to Section 4.4.4.3.1 "Definition of Message Types".

(4) Option (Outbound)

This is the outbound message used arbitrarily.

Table 4.4.4.3.2.4-4 Format of Option

Message type : Option
Message direction : Outbound
Functional channel : FACCH2

octet \ bit	7	6	5	4	3	2	1	0
1	Option 1	x	x Message type	x	1	1	←	
2	Option							
3								
4								
5								
6								
7								
8								
9								
10								
11	→							

<u>Message Type (octet 1 : 6 bits)</u>

Refer to Section 4.4.4.3.1 "Definition of Message Types".

4.4.4.3.3 Detailed Description on the Information Elements

The information elements are described in detail in the following sections.

4.4.4.3.3.1 System Code (16 bits)

The system code is an identifier of the system.

Table 4.4.4.3.3.1-1 Format of System Code

octet \ bit	7	6	5	4	3	2	1	0
+0	TRB code				←			
+1	System ID							→

TRB Code (4 bits)

Bit: 7 6 5 4	
0 0 0 0	
:	TRB code (0 ~ 15)
1 1 1 1	

Translator'sNote : TRB stands for the Telecommunication Regulatory Bureau, a part of the MPT (Ministry of Posts and Telecommunications) organization. Local TRBs are in charge of licensing, supervision of radio stations, etc.. RRB(Radio Regulatory Bureau), abbreviation of the old name, may be used, too.

System ID (12 bits)

Bit: 3 2 1 0 7 6 5 4 3 2 1 0	
0 0 0 0 0 0 0 0 0 0 0 0	reserved
0 0 0 0 0 0 0 0 0 0 0 1	
:	System ID (1 ~ 4095)
1 1 1 1 1 1 1 1 1 1 1 1	

4.4.4.3.3.2 Channel Assignment Information (22 bits)

The channel assignment information is an information element to indicate the channel to be assigned when assigning channels.

Table 4.4.4.3.3.2-1 Format of Channel Assignment Information

octet \ bit	7	6	5	4	3	2	1	0
+0			Reserved					
+1	Slot assignment pattern						←	
+2	Frequency number							→

Slot Assignment Pattern (6 bits)

```
Bit : 7 6 5 4 3 2
      1 - - - - -    slot number 5
      - 1 - - - -    slot number 4
          :               :
      - - - - 1 -    slot number 1
      - - - - - 1    slot number 0
```

Frequency Number (10 bits)

```
Hex :  0 0 0    no assignment
       0 0 1
         :      frequency number (1 ~ 1023)
       3 F F
```

4.4.4.3.3.3 Called Party Code (18 bits)

The called party code is an information element to indicate the grouping of mobile station(s) to which the call is directed.

The call receiving mobile station is to identify the call directed to itself with this information element.

Table 4.4.4.3.3.3-1 Format of Called Party Code

octet \ bit	7	6	5	4	3	2	1	0
+0							Called party code	
+1	Called party code							
+2								

Called Party Code (18 bits)

Hex :	0 0 0 0 0	no assignment
	0 0 0 0 1	
	:	specify individual IDs excluding MSB.
	1 F F F F	
	2 0 0 0 0	
	:	specify subgroup IDs excluding MSB.
	3 F F F E	
	3 F F F F	specify group (Fleet) ID

4.4.4.3.3.4 Subscriber Unit Code of Call Initiator (32 Bits)

The subscriber unit code of call initiator is an information element to indicate the individual ID of the mobile station initiating the call.

The call initiating mobile station is to identify a call response directed to itself with this information element.

The call receiving mobile station is to identify the call directed to its own fleet with the fleet ID extracted from this information element.

Table 4.4.4.3.3.4-1 Format of Subscriber Unit Code of Call Initiator

octet \ bit	7	6	5	4	3	2	1	0
+0	Subscriber unit code							
+1								
+2								
+3								

<u>Subscriber Unit Code of Call Initiator (32 bits)</u>

Hex : 0 0 0 0 0 0 0 0 reserved
0 0 0 0 0 0 0 1
: fleet ID + unit ID
F F F F F F F F

It is specified that the unit ID is to be all '0's for the calls from other telecommunication networks.

4.4.4.3.3.5 Communication Mode

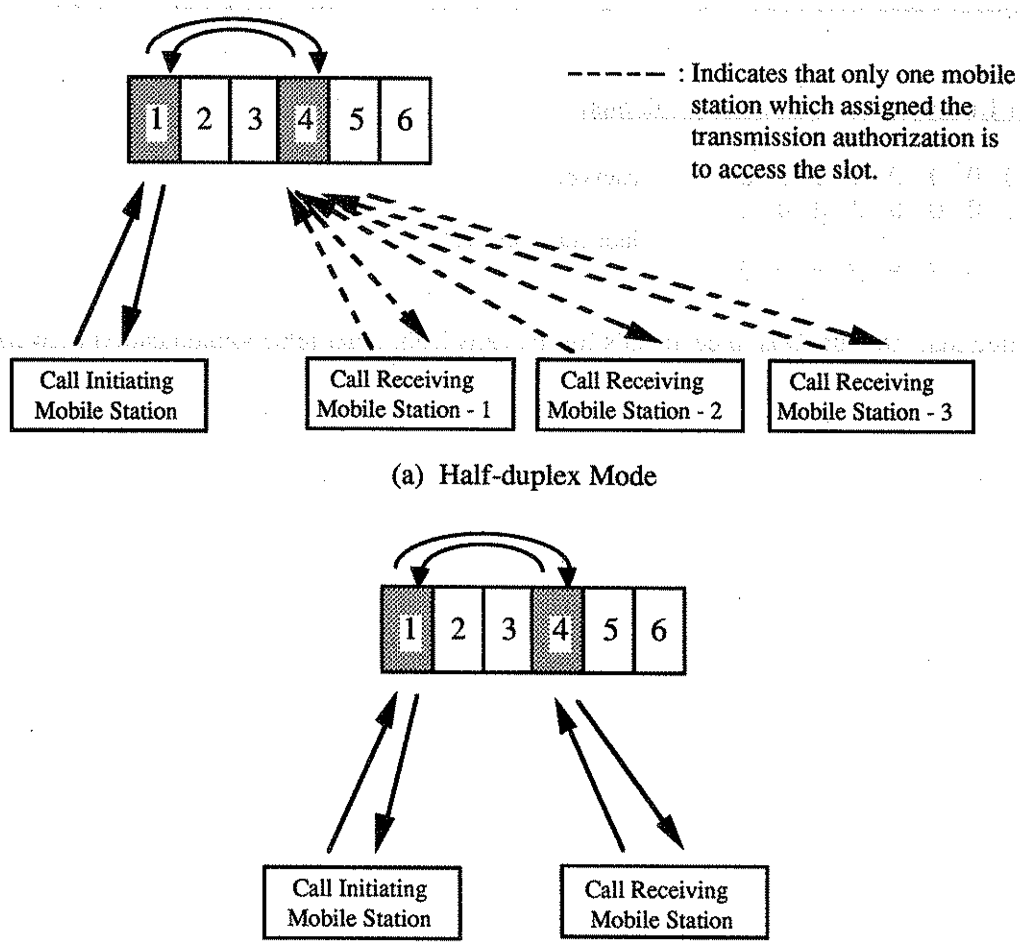
The communication mode is an information element to indicate the communication mode in the communication phase.

Bit: 7	6	5	4	
0	0	-	-	Group call
0	1	-	-	Subgroup call
1	0	-	-	Individual call
1	1	-	-	reserved
-	-	0	0	simplex mode
-	-	0	1	half-duplex mode
-	-	1	0	reserved
-	-	1	1	duplex mode

Duplex mode is valid only for individual calls, and can not be specified with group or subgroup calls.

Half-duplex mode is the communication mode in which the call initiating mobile station operates with duplex mode and other mobile stations operate with simplex mode.

In half-duplex and duplex modes, the assigned two slots are cross-coupled at the repeater station. The concept of the cross-coupling of slots are illustrated in Fig. 4.4.4.3.3.5-1.



(b) Duplex Mode

Fig. 4.4.4.3.3.5-1 Concept of Cross-coupling of Slots

4.4.4.3.3.6 Transmission Mode

The transmission mode is an information element to indicate the initial transmission mode of TCH or UPCH at the beginning of the communication phase. This information element may be accompanied by the information element of the extended transmission mode in some cases.

Bit : 3 2 1 0	
0 0 - -	reserved
0 1 - -	UPCH transmission mode
1 0 - -	TCH transmission mode (with user access permission)
1 1 - -	TCH transmission mode (with individual access permission)
- - 0 0	no error correcting relay mode
- - 0 1	error correcting relay mode #1
- - 1 0	error correcting relay mode #2
- - 1 1	error correcting relay mode #3

When specifying TCH transmission mode, "with user access permission" is to request the inbound transmission mode to be user access permitted state at the beginning of the communication phase, while "with individual access permission" is to request the inbound transmission mode to be individual access permitted state for the mobile station initiated the call at the beginning of the communication phase.

When TCH transmission mode "with individual access permission" is specified, the repeater station performs the time alignment control and the power output control on this call request message.

4.4.4.3.3.7 Extended Transmission Mode

The extended transmission mode is an information element to specify the initial transmission modes of TCH or UPCH, slot-by-slot, at the beginning of the communication phase when requesting simplex mode multiple slots. This information element is always specified in a pair with the transmission mode.

```
Bit : 7 6 5 4 3 2 1 0 7 6 5 4 3 2 1 0 7 6
      0 - - - - - - - - - - - - - - - - -   slot #1 TCH transmission mode
      1 - - - - - - - - - - - - - - - - -   slot #1 UPCH transmission mode
      - 0 0 - - - - - - - - - - - - - - -   slot #1 no error correcting relay mode
      - 0 1 - - - - - - - - - - - - - - -   slot #1 error correcting relay mode #1
      - 1 0 - - - - - - - - - - - - - - -   slot #1 error correcting relay mode #2
      - 1 1 - - - - - - - - - - - - - - -   slot #1 error correcting relay mode #3
                      :                                   :
      - - - - - - - - - - - - - - - 0 - -   slot #6 TCH transmission mode
      - - - - - - - - - - - - - - - 1 - -   slot #6 UPCH transmission mode
      - - - - - - - - - - - - - - - - 0 0   slot #6 no error correcting relay mode
      - - - - - - - - - - - - - - - - 0 1   slot #6 error correcting relay mode #1
      - - - - - - - - - - - - - - - - 1 0   slot #6 error correcting relay mode #2
      - - - - - - - - - - - - - - - - 1 1   slot #6 error correcting relay mode #3
```

Depending on the number of requesting slots, the information is to be valid in incremental order from slot #1 to #6, and every 3 bits from the MSB are to specify the modes for slot #1 to #6.

As to the error correcting modes, the designation in this information element is to take priority, and the designation in the transmission control is to be invalid.

As to the access permission assignment in the TCH transmission mode, the designation in the transmission control is to be applied. That is, when "with user access permission" is specified in the transmission control, the individual access permission is not assigned to any slots which this information element designates as TCH transmission mode. On the other hand, when "with individual access permission" is specified in the transmission control, the individual access permission is assigned to the mobile station initiated the call on all slots which this information element designates as TCH transmission mode.

As to the correspondence between this information element and the slot assignment pattern of the channel assignment information in the outbound message, the transmission mode designation for slot #1 to #6 in this information element corresponds to the LSB to the MSB order of the slot assignment pattern in the first frequency, successively the LSB to the MSB order of the slot assignment pattern in the second frequency if slots are assigned on two carriers. An example is shown in Fig. 4.4.4.3.3.7-1.

When "with individual access permission" is specified, the repeater station is to perform the time alignment control and the power output control on this message, and to set the inbound transmission mode as individual access permitted state for the mobile station initiated the call.

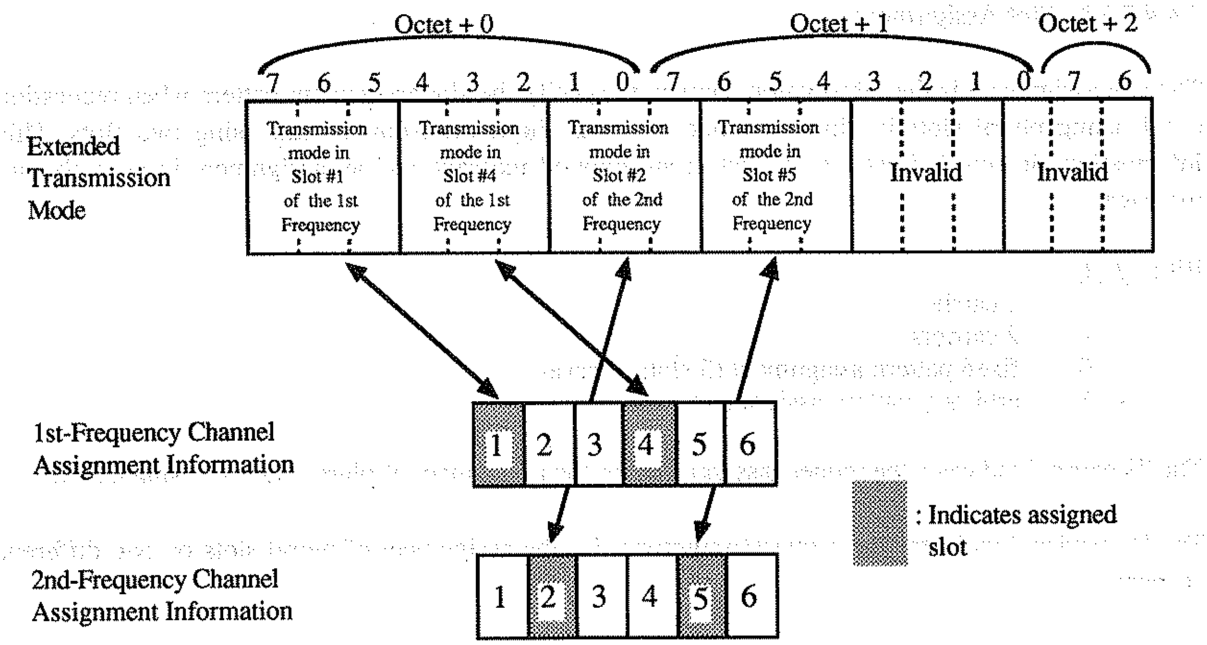


Fig. 4.4.4.3.3.7-1 Correspondence Between Extended Transmission Mode and Channel Assignment Information

4.4.4.3.3.8 Slot Assignment

The slot assignment is the information element to specify the slot assignment pattern when requesting a call using plural slots in simplex mode or a half-duplex/full-duplex call using two slots. This information element indicates a request in an inbound message and an assignment in an outbound message.

Bit : 7 6

7	6	
0	-	1 carrier
1	-	2 carriers
-	0	fixed pattern assignment (3 slots interval)
-	1	arbitrary pattern assignment

The "1 carrier" indicates the request/assignment for the assignment of plural slots on a single carrier.

The "2 carriers" indicates the request/assignment for the assignment of plural slots on two different carriers.

The repeater station assigns slots as the form requested by a mobile station in principle, however, may assign "one carrier" when the mobile station request "two carriers".

The fixed pattern (3 slots interval) refers to the slot assignment with the combination of physical slots #1 - #4, #2 - #5 or #3 - #6. An example of the fixed pattern with two-slot assignment on a single carrier is shown in Fig. 4.4.4.3.3.8-1.

The arbitrary assignment refers a slot-assignment with the arbitrary combination of physical slots.

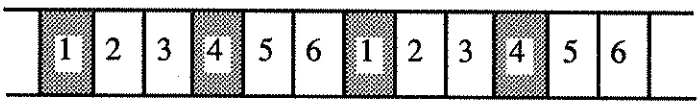


Fig. 4.4.4.3.3.8-1 Example of Fixed Pattern Assignment

4.4.4.3.3.9 Protocol Type

The protocol type is the information element to specify the form of a call initiation in the communication link establishment phase.

Bit : 5 4	
0 0	normal call request
0 1	CAC expanded call request
1 0	CAC-USC expanded call request
1 1	option

The "normal call request" indicates a general form of call initiation to request the communication link set-up with a single message transmission.

The "CAC expanded call request" indicates a form of call initiation to request the communication link set-up with the truncate transmission on CAC.

The "CAC-USC expanded transmission" indicates a form of call initiation to request the communication link set-up with the following procedure; request for a USC with a single CAC message and get it assigned first, then transmit the supplement message on the assigned USC to supply additional information to the first CAC message.

4.4.4.3.3.10 Number of Requesting Slots

The number of requesting slots is the information element to specify the number of slots to be assigned in the communication link establishment phase.

It designates the number of slots to be used for the call. The same communication mode is to be applied even when plural slots are requested. However, the transmission mode can be set arbitrarily for every slot, in this case, it is to be specified in the extended transmission mode separately from designation in the transmission mode.

Bit: 3 2 1 0	
0 0 0 0	reserved
0 0 0 1	1 slot
0 0 1 0	2 slots
:	:
0 1 1 0	6 slots
0 1 1 1	
:	reserved
1 1 1 1	

Plural slot assignment can be requested for simplex mode calls only.

4.4.4.3.3.11 'n'-th Digit Number

The 'n'-th digit number is the information element to specify a telephone number to be dialed onto the public switched telephone network.

Bit : 3 2 1 0	
0 0 0 0	filler
0 0 0 1	
:	telephone number '1' ~ '9'
1 0 0 1	
1 0 1 0	telephone number '0'
1 0 1 1	*
1 1 0 0	#
others	option

The telephone number is to be filled in dialing order from the 1st digit number. When the telephone number is shorter than the specified maximum length, the filler codes must be appended in the remaining field.

4.4.4.3.3.12 Communication Time-out Time

The communication time-out time is the information element to indicate the maximum time period for which assigned USC can be used for a single call.

Bit : 3	2	1	0	
0	0	0	0	reserved
0	0	0	1	15 seconds
0	0	1	0	30 seconds
0	0	1	1	45 seconds
0	1	0	0	60 seconds
0	1	0	1	75 seconds
0	1	1	0	90 seconds
0	1	1	1	105 seconds
1	0	0	0	120 seconds
1	0	0	1	150 seconds
1	0	1	0	180 seconds
1	0	1	1	210 seconds
1	1	0	0	240 seconds
1	1	0	1	270 seconds
1	1	1	0	300 seconds
1	1	1	1	option

The beginning of the communication time-out time at the first transmission of the CCCH repetitions of the channel assignment message.

4.4.4.3.3.13 1st Carrier/Channel Assignment Information

The 1st carrier/channel assignment Information is the information element to indicate the channel assignment when "1 carrier" is indicated, or the channel assignment on the first of the two carrier frequencies when "2 carriers" is indicated.

Refer to Table 4.4.4.3.3.2-1 for the information format.

In the 1-carrier slot assignment for full-duplex or half-duplex calls, the call initiating mobile station is to transmit and receive on the slot indicated on the LSB side of the channel assignment pattern, and the call receiving mobile station is to transmit and receive on the slot indicated on the MSB side of the channel assignment pattern. An example of the slot access of the duplex call with 1-carrier slot assignment is shown in Fig. 4.4.4.3.3.13-1

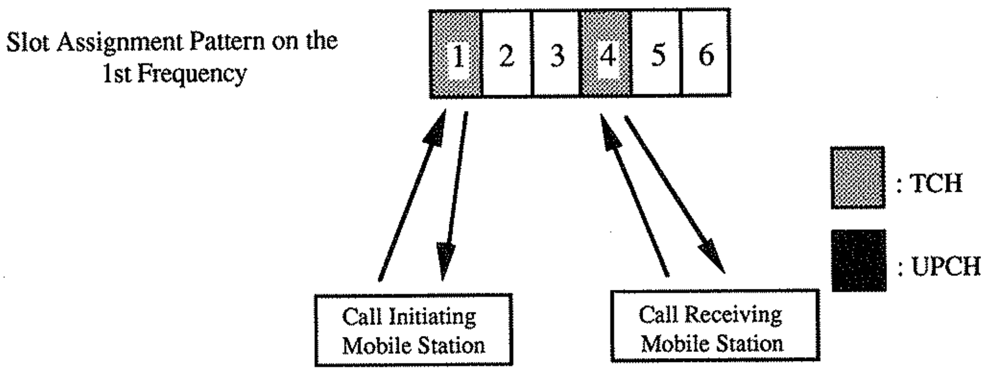


Fig. 4.4.4.3.3.13-1 Example of the Slot Access of Full-duplex Call with1-carrier Slot Assignment

In the 2-carrier slot assignment for duplex or half-duplex calls, the call initiating mobile station transmits and receives on the slot indicated in this information element. An example of the slot access of a duplex call with 2-carrier slot assignment is shown in Fig. 4.4.4.3.3.13-2

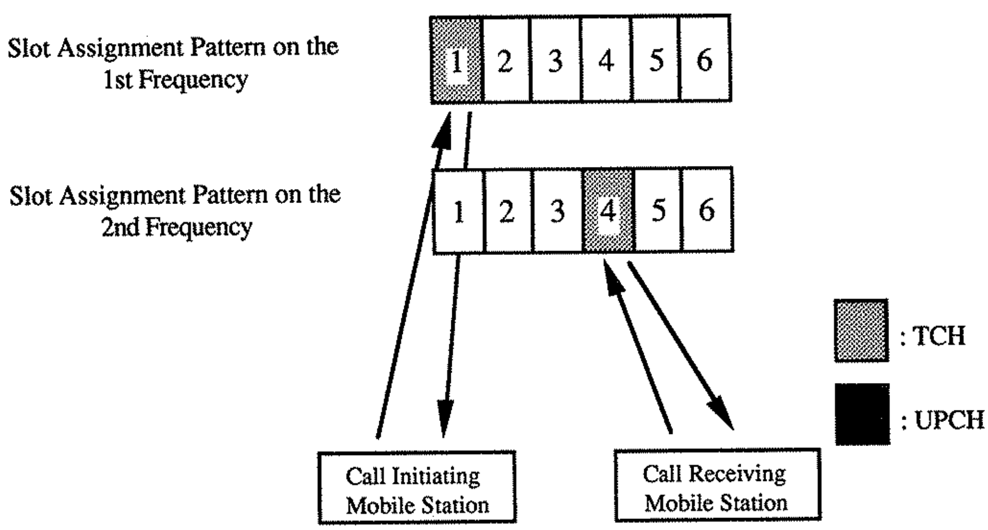


Fig. 4.4.4.3.3.13-2 Example of the Slot Access of Full-duplex Call with 2-carrier Slot Assignment

4.4.4.3.3.14 2nd Carrier/Channel Assignment Information

The 2nd carrier/channel assignment Information is the information element to indicate the channels to be assigned on the second carrier frequency when "2 carrier" is indicated.

Refer to Table 4.4.4.3.3.2-1 for the information format.

In the 2-carrier slot assignment for duplex or half-duplex calls, the call receiving mobile station transmits and receives on the slot indicated in this information element.

Refer to Fig. 4.4.4.3.3.13-2 for details.

4.4.5 Control Sequence

In this section, the typical control sequences of each protocol phase required for this standard are shown. In Communication Link Establishment Phase and Communication Phase, the control sequences of the group (subgroup) call and Individual call are separately shown in two cases. One case is that there is no available channel at the repeater station (i.e., the request is busy-queued then channel assignment follows); the other case is that there are available channels (i.e., channel assignment is made immediately). In Communication Link Release Phase, the control sequence is collectively shown for all types of calls.

In the figures, every control message transmitted is shown with functional channel which transmits the said control message, and the message direction is shown by an arrow. The transmission control (Layer-2) messages and the call control (Layer-3) messages are distinguished by the notation shown in the Fig. 4.4-1a. For these cases, the same message is repeatedly transmitted and messages are transmitted successively like the traffic channel (TCH). The notation of the period of message transmission continuation is shown in Fig. 4.4-1b

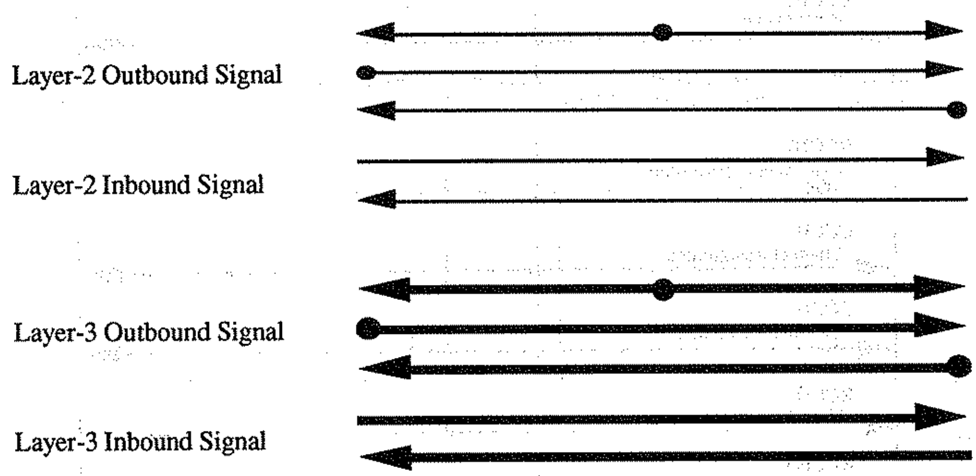


Fig. 4.4-1a Notation - 1 for the Control Sequence Diagrams

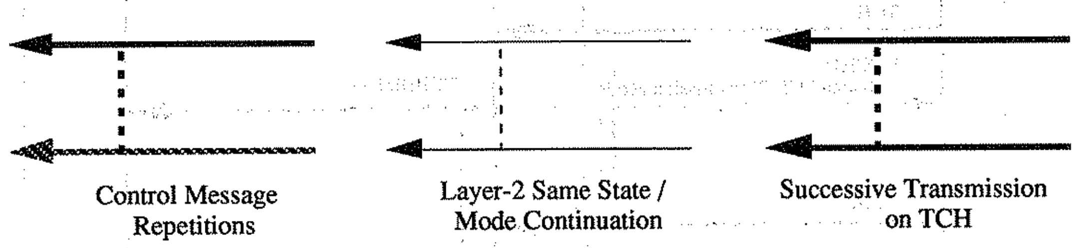


Fig. 4.4-1b Notation - 2 for the Control Sequence Figures

In the figures, the layer-2 outbound message line which does not reach the mobile station indicates either of the following cases; the message is not directed to the mobile station, the mobile station may not be able to receive the message depending on the timing, the mobile station is instructed not to receive the message by the preceding message, etc.. The necessity of these message reception is to conform the provision in Section 4.3.

4.4.5.1 Communication Link Establishment Phase-Communication Phase in Group (Subgroup) Calls

The control sequences of the call initiation and reception and subsequent communications in group (subgroup) call with simplex mode are shown in Fig. 4.4-2a, b and Fig. 4.4-3a, b.

(1) Call Establishment with Busy-queue

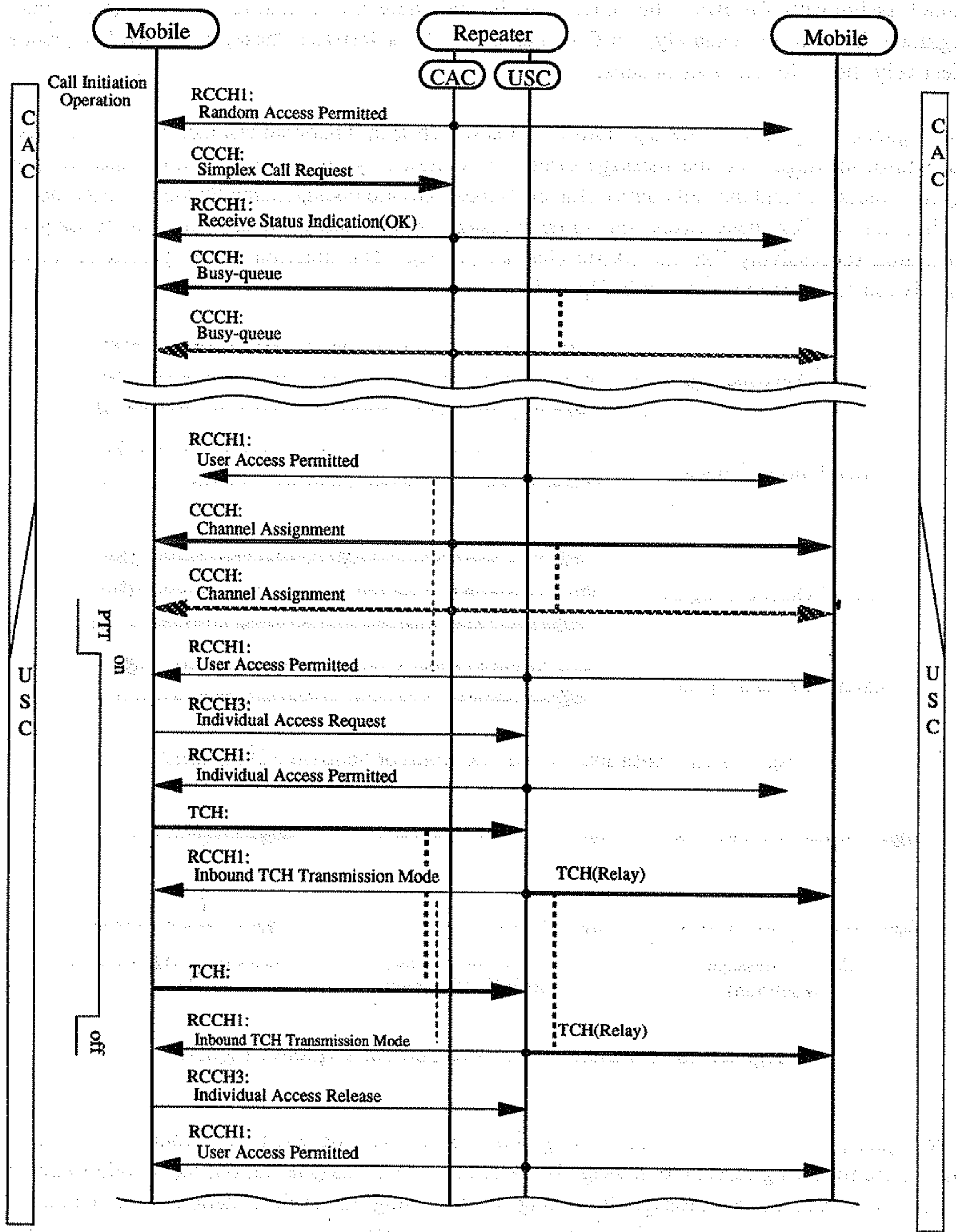


Fig. 4.4-2a Communication Link Establishment - Communication Phase/Group (Subgroup) Calls with Call Establishment with Busy-queue (1/2)

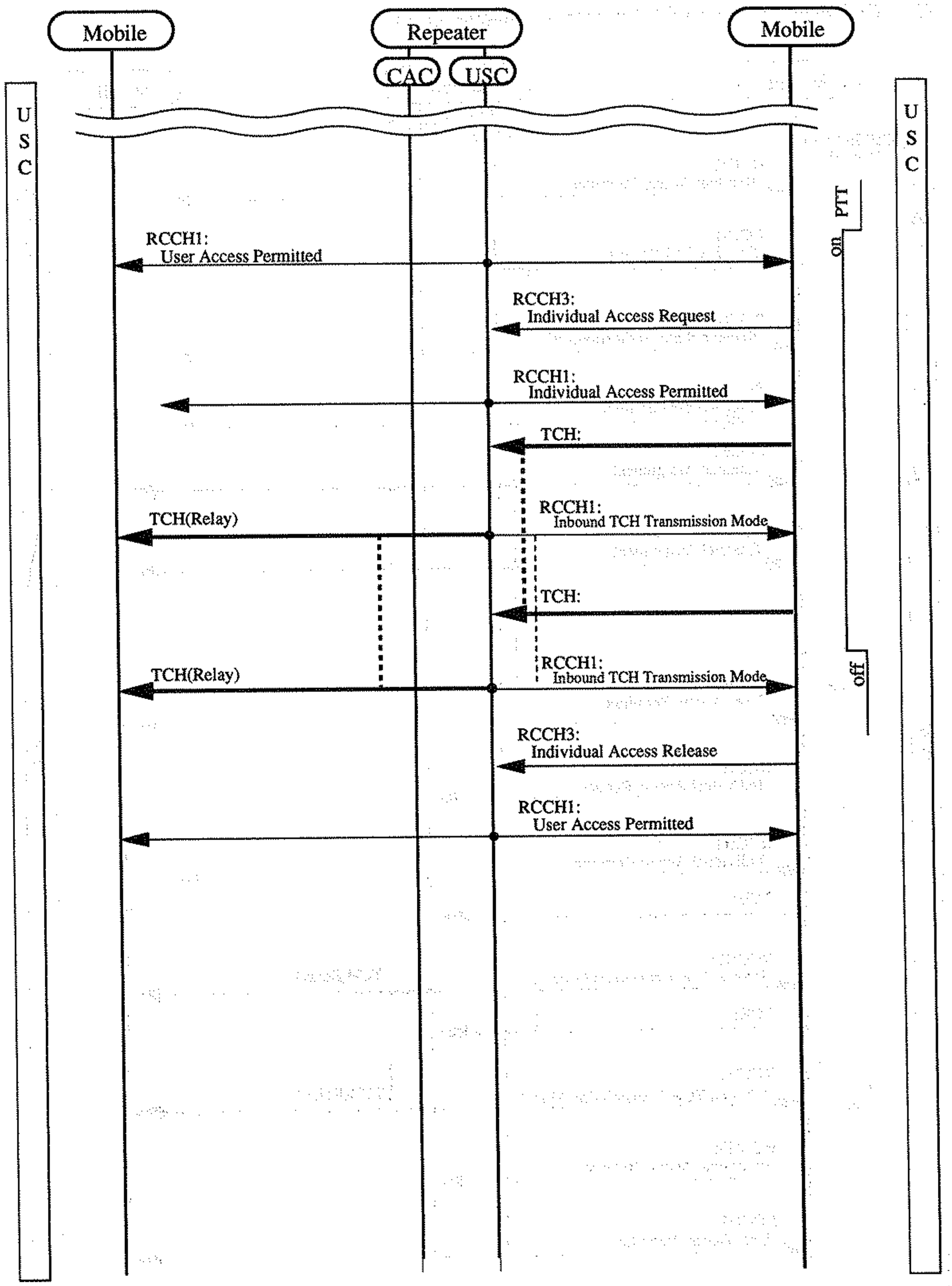


Fig. 4.4-2b Communication Link Establishment - Communication Phase/Group (Subgroup) Calls with Call Establishment with Busy-queue (2/2)

(2) Call Establishment with Immediate Channel Grant

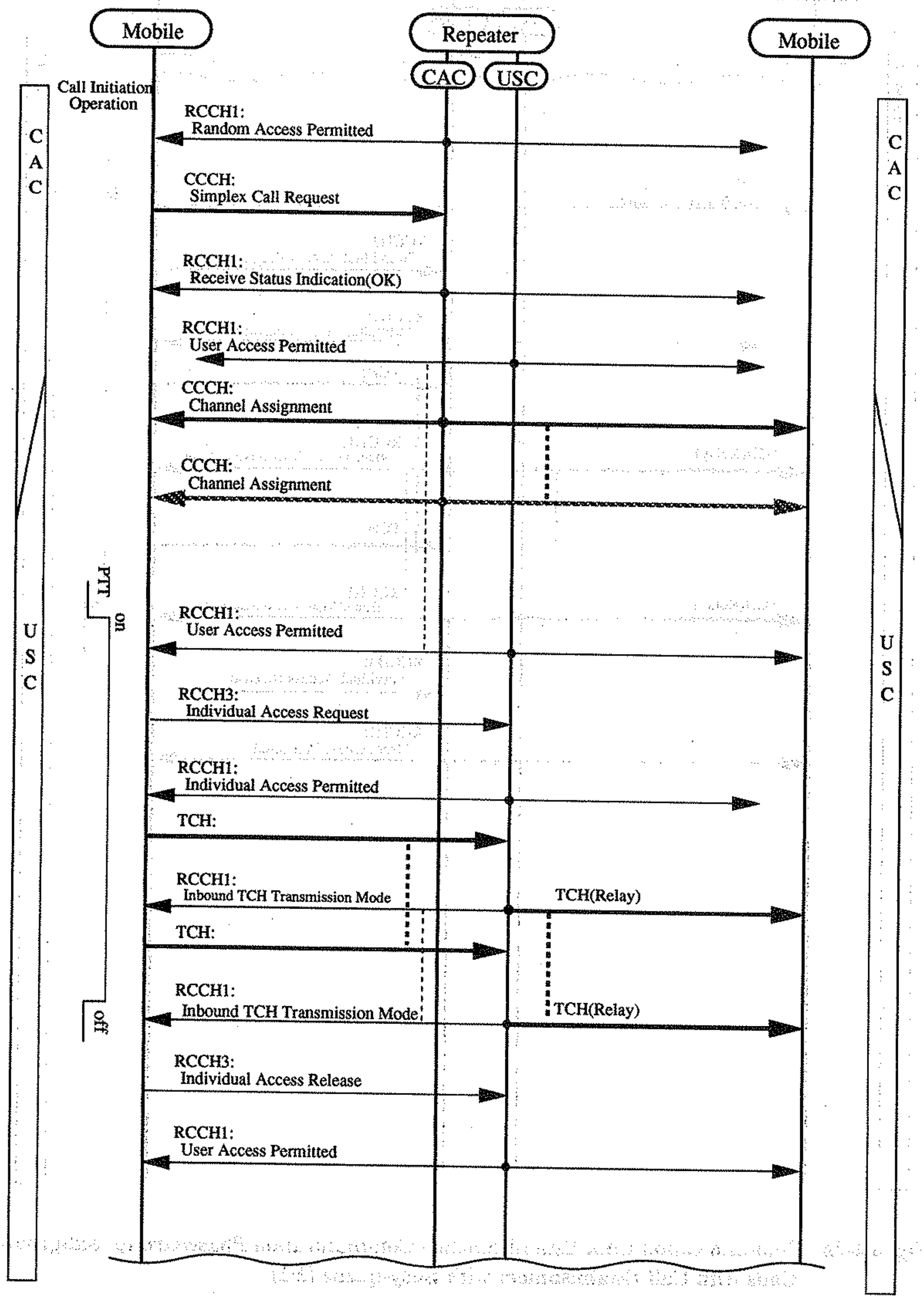


Fig. 4.4-3a Communication Link Establishment - Communication Phase/Group (Subgroup) Calls with Immediate Call Establishment (1/2)

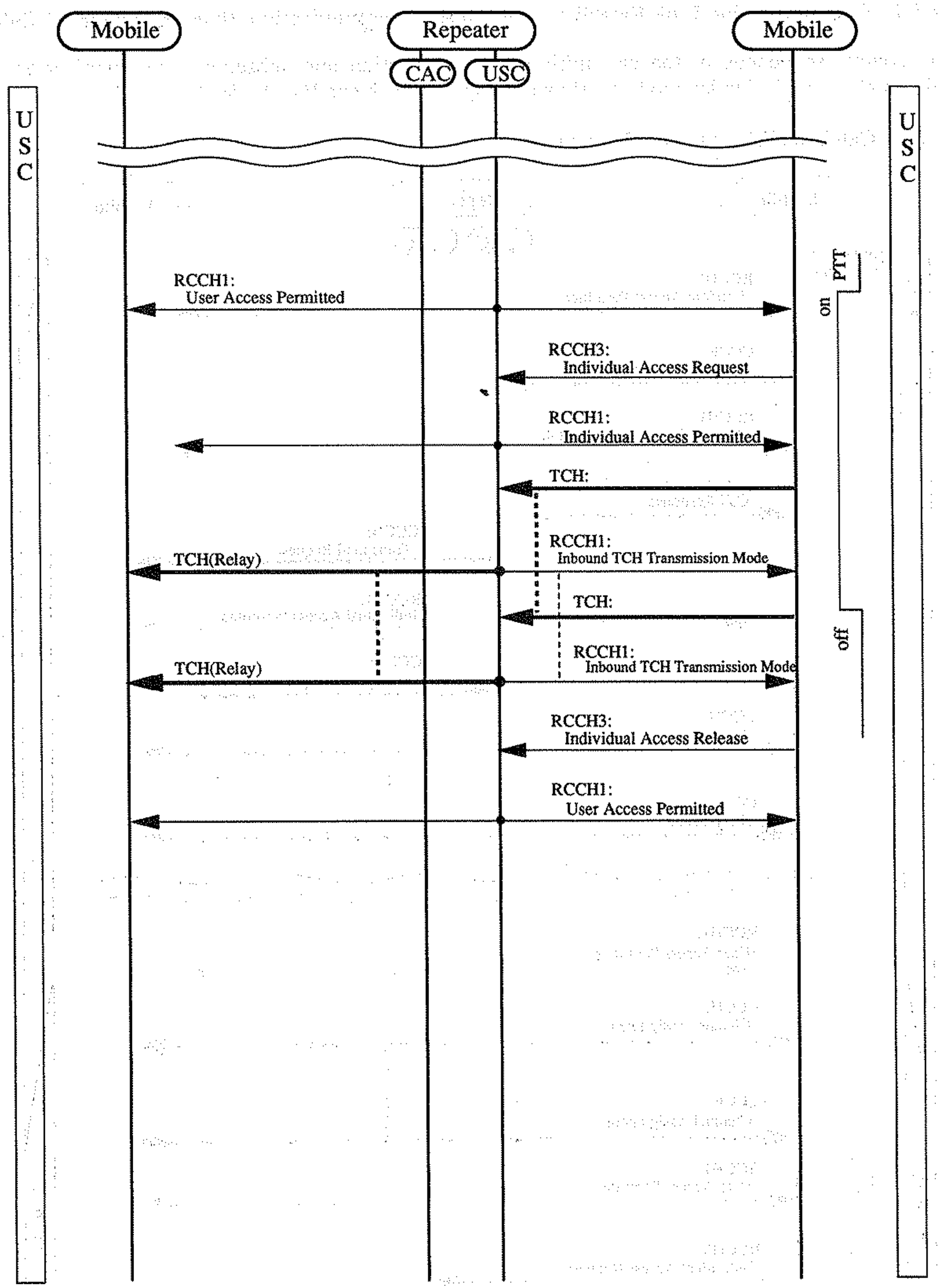


Fig. 4.4-3b Communication Link Establishment - Communication Phase/Group (Subgroup) Calls with Immediate Call Establishment (2/2)

4.4.5.2 Communication Link Establishment Phase - Communication Phase in Individual Calls

The control sequences of the call initiation and reception and subsequent communications in Individual call with simplex mode are shown in Fig. 4.4-4a, b and Fig. 4.4.5a, b.

(1) Call Establishment with Busy-queue

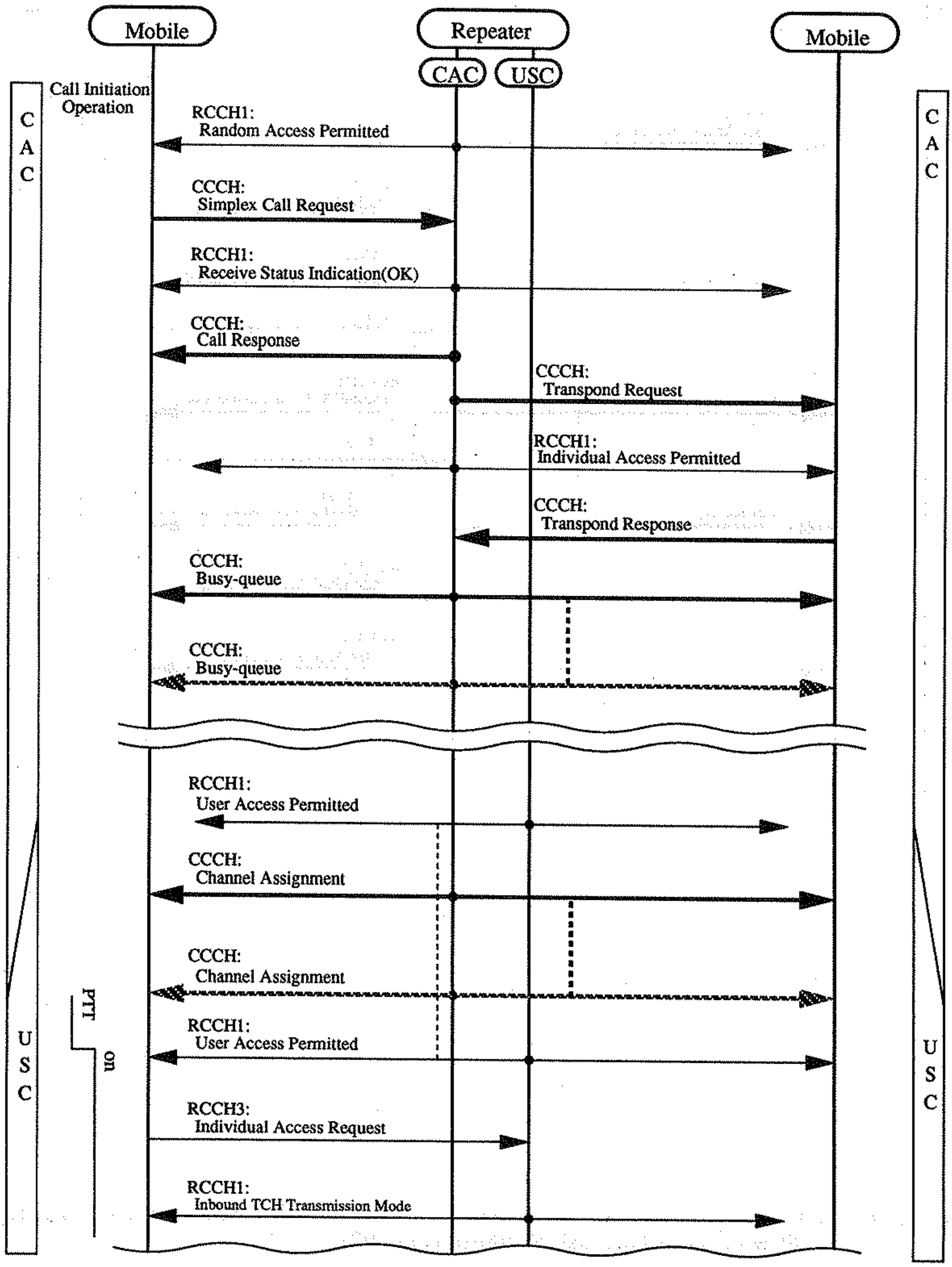


Fig. 4.4-4a Communication Link Establishment - Communication Phase/Individual Calls with Call Establishment with Busy-queue (1/2)

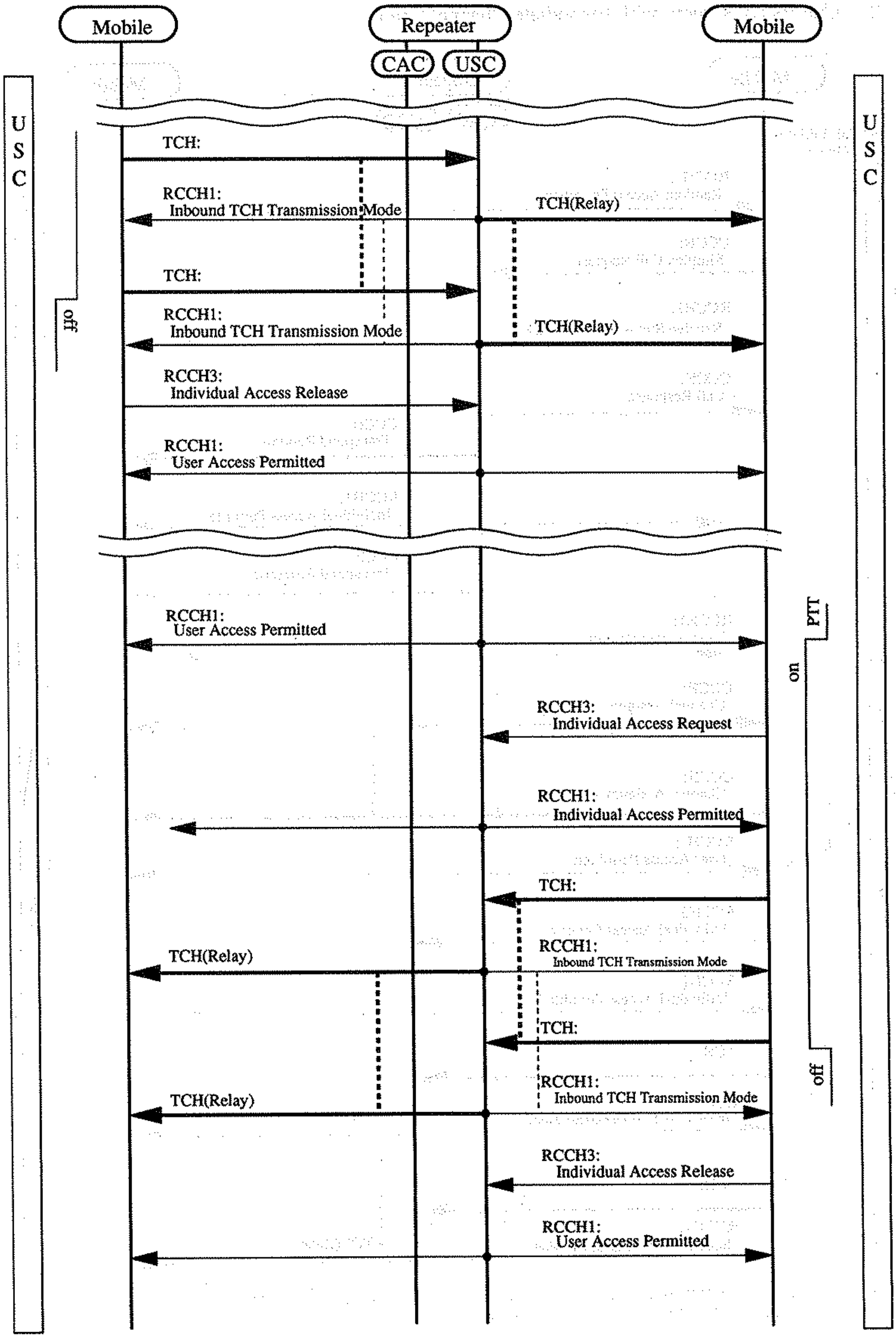


Fig. 4.4-4b Communication Link Establishment - Communication Phase/Individual Calls with Call Establishment with Busy-queue (2/2)

(2) Call Establishment with Immediate Channel Grant

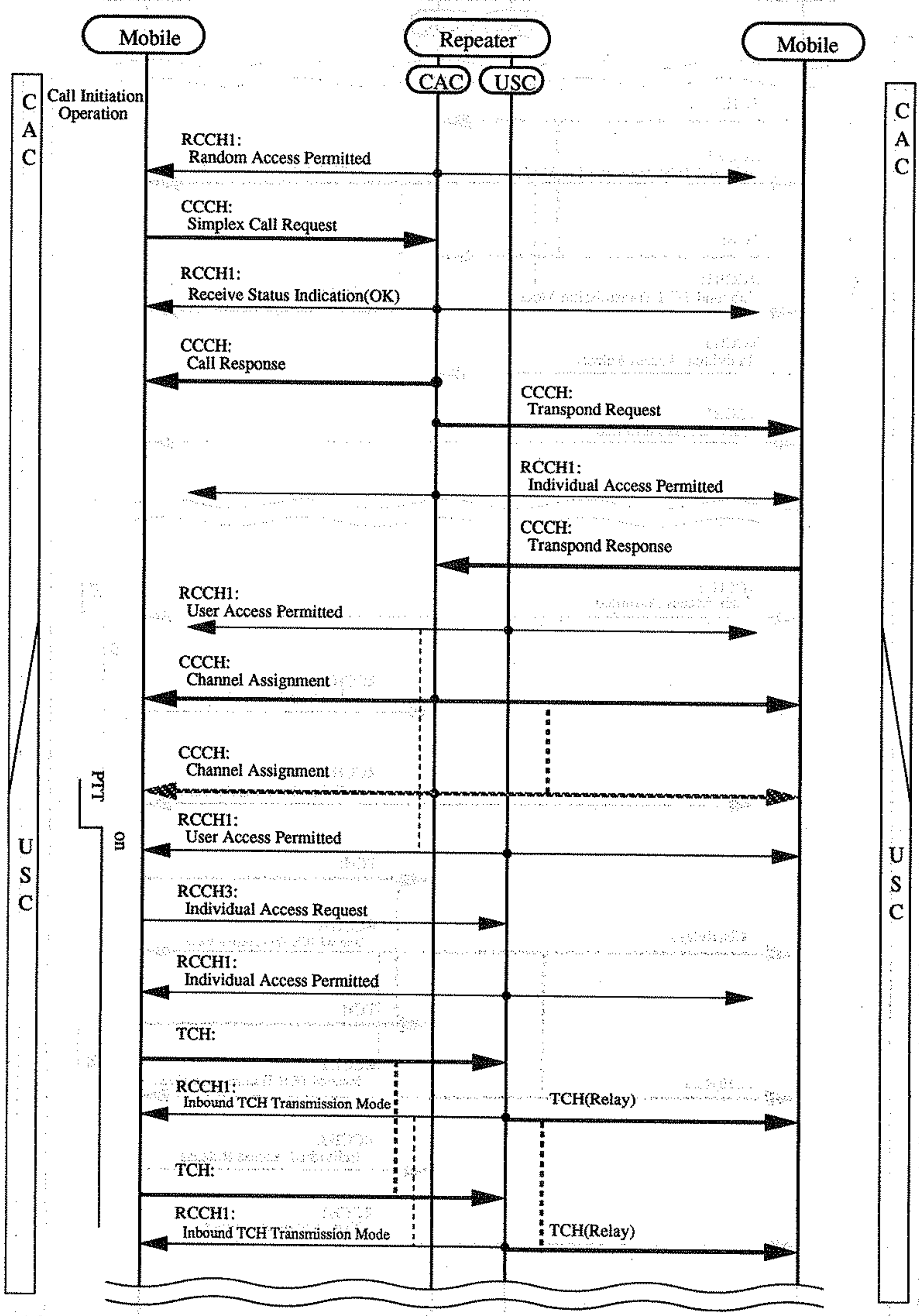


Fig. 4.4-5a Communication Link Establishment - Communication Phase/Individual Calls with Immediate Call Establishment (1/2)

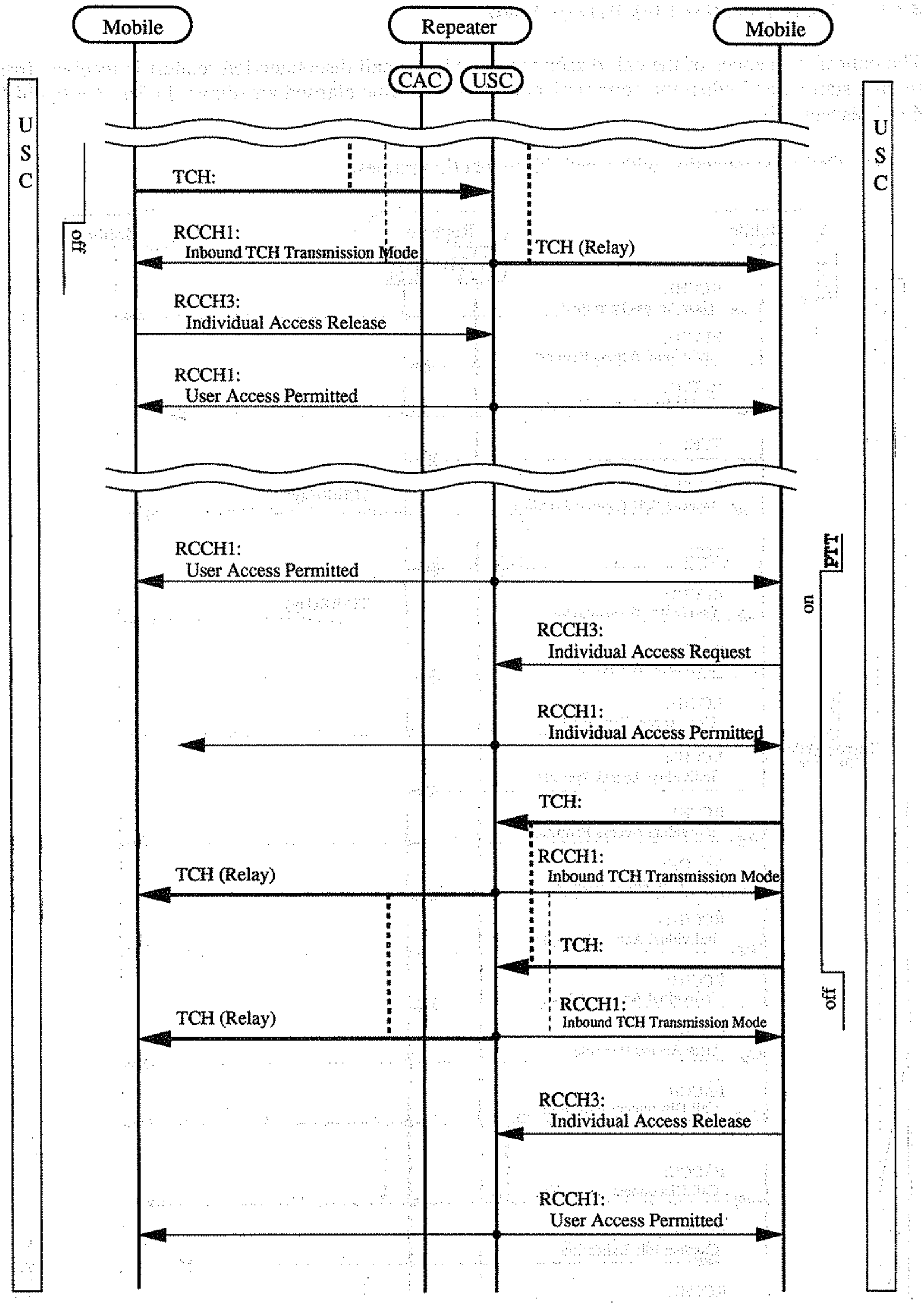


Fig. 4.4-5b Communication Link Establishment - Communication Phase/Individual Calls with Immediate Call Establishment (2/2)

4.4.5.3 Communication Link Release Phase

The control sequences of the call disconnection when a call disconnection request is received from a mobile station, and when the communication time-out time elapsed are shown in Fig. 4.4-6 and Fig. 4.4-7 respectively.

(1) Call Disconnection with a call Disconnection request

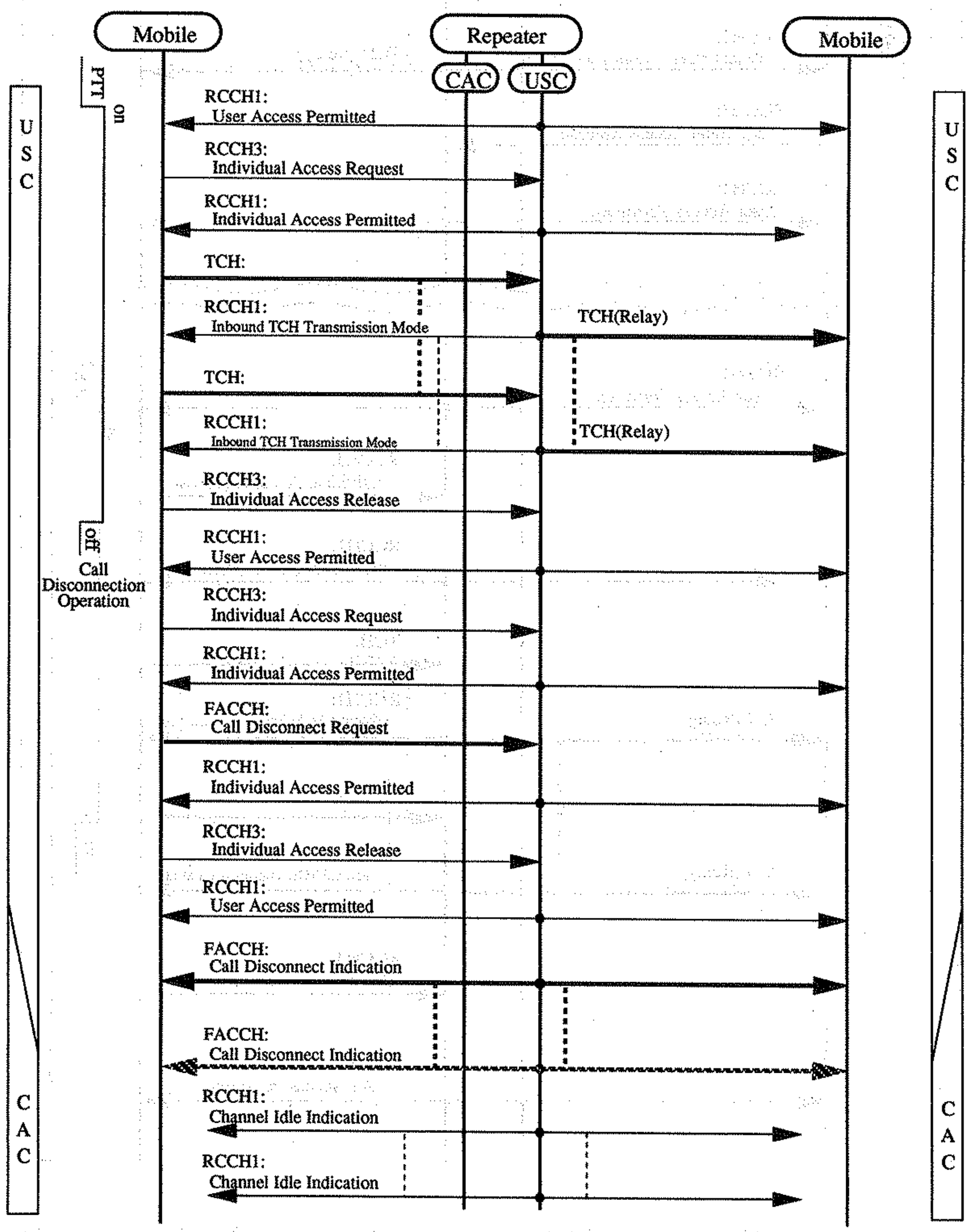


Fig. 4.4-6 Communication Link Release Phase/Call Disconnection with Call Disconnection Request

(2) Call Disconnection at Repeater

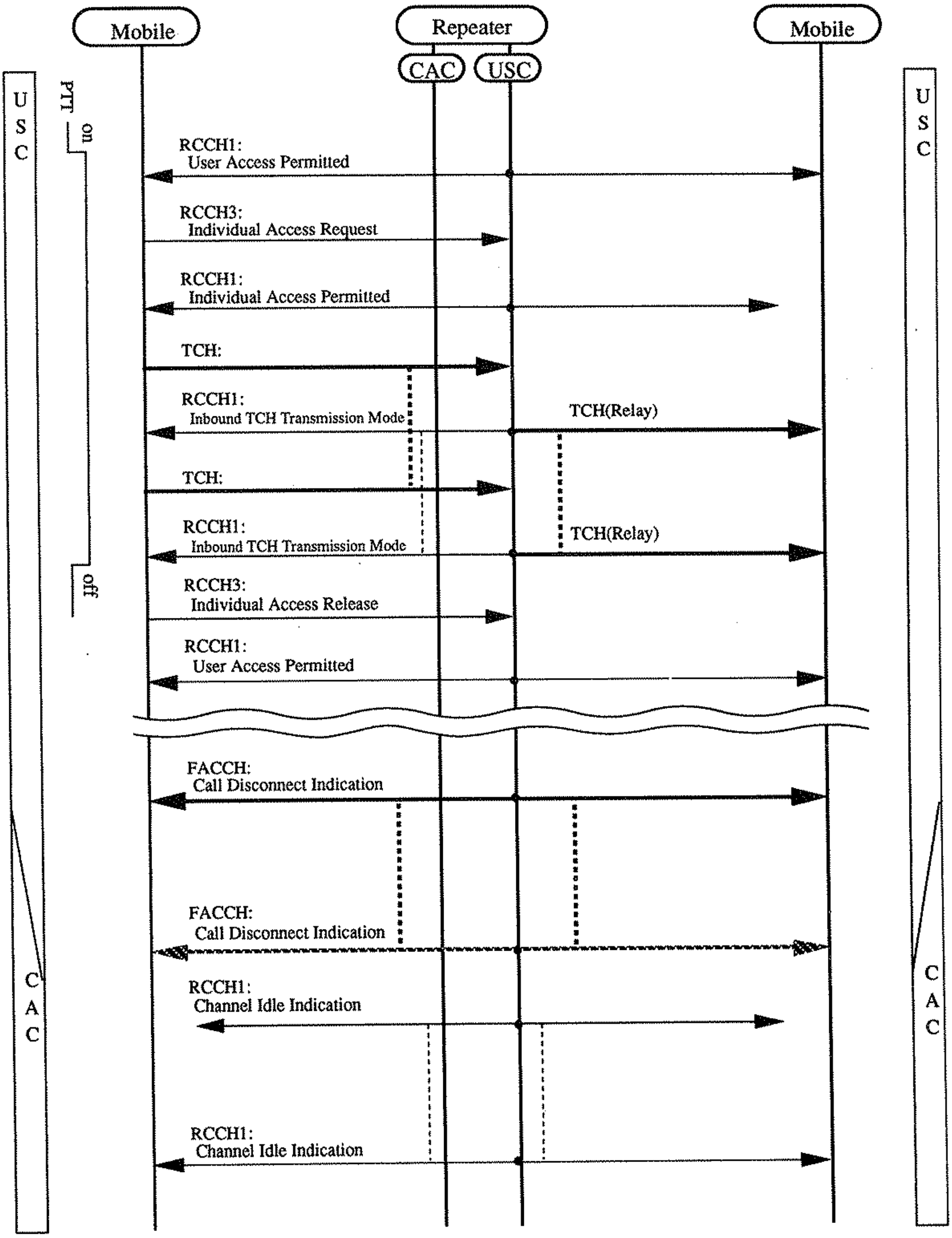


Fig. 4.4-7 Communication Link Release Phase/Call Disconnection with Communication Time-out Time

Chapter 5 Voice Coding System

In the digital MCA system, the transmission rate of the coded voice signal is to be 7.467 kbps (672 bits per 90 ms) or less including error correcting codes. However, the voice coding system is not specified.

Chapter 6 Measuring Method

In the following measuring methods describing more than one method, any of them can be used as long as measurement accuracy is satisfied.

In this chapter, "a mobile station" includes both a mobile station and a control station.

6.1 Measuring Methods for a Mobile Station

(1) The operating mode of a mobile station is as shown in the table below .

Operation for Transmitter Measurement		Operation for Receiver Measurement	
Transmit Mode	Synchronization Mode	Receive Mode	Synchronization Mode
Burst Transmission Continuous Transmission (Frequency measurement)	Asynchronous Transmission Synchronous Transmission (Time alignment measurement)	Continuous Signal Reception	Slave Mode Synchronization

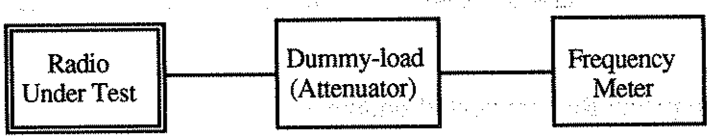
(2) A standard coded test signal used for modulation is to be the 511-bit Binary Pseudo Random Noise Sequence(CCITT V.52) and is to be sent on all data symbols of User Specific Channel or hole of a slot.

6.1.1 Transmitter

(1) Frequency Tolerance

I. Frequency Tolerance(Frequency Counter Method)

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) A frequency counter is to be used as a frequency meter.

(b) Using the pulse measurement function of the counter, set the gate time so that the entire burst period can be measured.

(c) The frequency counter has an accuracy to within one-tenth of the frequency tolerance specification. If it is necessary to increase resolution of short burst measurements, increase displayable digits by using averaging function, calibrate with a known frequency, or input the signal at a lower frequency by mixing it down with a known frequency.

(C) State of Radio Under Test

(a) Set the radio under test in a test mode which outputs an unmodulated carrier(Center frequency).

(b) Or, set the radio under test in a test mode which outputs an unmodulated signal from only one of the four subcarriers. In this case, the subcarrier frequency(offset from the main carrier) is added to the measured value.

(c) Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

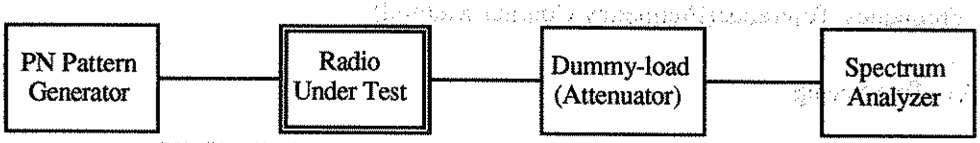
Measure the frequency of 10 or more(100 for example) bursts, then average all measurements for the result.

(E) Other Methods

The frequency of a reference oscillator output can be measured directly, as long as the radio under test is designed accordingly. The frequency accuracy of the reference oscillator must be equal to the frequency accuracy of the transmitter output.

II. Frequency Tolerance (Spectrum Analyzer Method)

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) A digital storage type spectrum analyzer is to be used.

(b) Setting of spectrum analyzer is as follows:

• Center frequency	Carrier frequency
• Sweep frequency bandwidth	2 ~ 20 kHz
• Resolution bandwidth	Approx. 100 Hz
• Video bandwidth	Same as resolution bandwidth

• Y-axis scale	1 dB/div.
• Input level	At least 50dB higher than internal noise of spectrum analyzer
• Sampling points	400 points or more(e.g. 1001 points)
• Sweep time	Every sample covers the whole slot under measurement (AGC preamble + M16QAM burst). (90 sec or longer for 1001 points, for example)
• Sampling mode	Positive peak
• Sweep mode	Single sweep

(C) State of Radio Under Test.

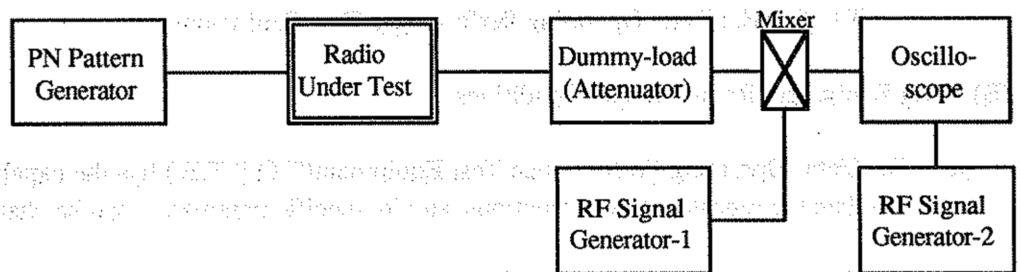
Set the radio under test for transmission at the test frequency.

(D) Measurement procedures

Measure the frequency at the deepest point of the central dip of spectrum of the four subchannels. If a peak (caused by carrier feedthrough) appears at the dip, measure the frequency at the peak.

III. Frequency Tolerance(Lissajous Method)

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) The RF signal generator-1 can output a stable unmodulated signal at the frequency around 1MHz lower than the test frequency.

(b) The RF signal generator-2 can output a stable unmodulated signal around 1MHz.

(C) State of Radio Under Test

Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

(a) Generate the standard coded test signal or the code signal with fixed pattern with the pattern generator.

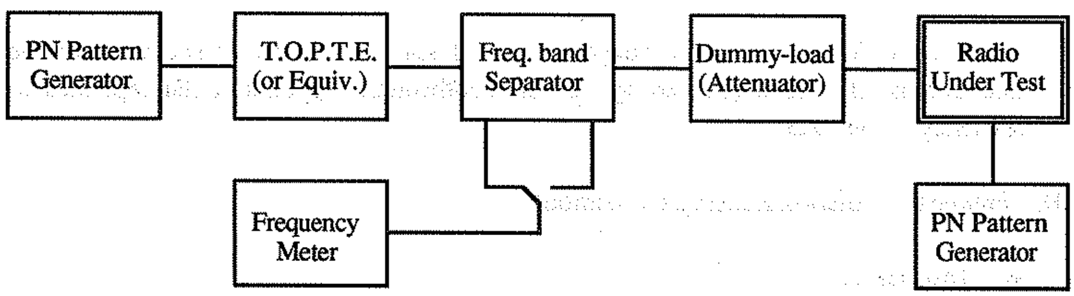
(b) Adjust the frequency of the RF signal generator-2 to stop Lissajous Figure(on the oscilloscope screen) which formed by the mixed-down signal and output signal of the RF signal generator-2.

(c) Measure the frequencies of the RF signal generator-1 and -2, F1 and F2, by the frequency counter , then compute the test frequency F by the following formula:

$$F = F1 + F2$$

IV. Frequency Tolerance(Frequency Tracking Accuracy)

(A) Test Set-up



T.O.P.T.E. : Total Operating Performance Test Equipment

(B) Test Equipment Requirements/Conditions

(a) The Total Operating Performance Test Equipment(T.O.P.T.E.) has the capability to simulate the repeater station functions, and its specific parameters can be changed.

(b) The frequency meter is to be the frequency measuring equipment described in (10) "Modulation Accuracy", (1) I. "Frequency Tolerance(Frequency counter method)" or (1) III. "Frequency Tolerance(Lissajous Method)", or a Frequency Counter.

(C) State of Radio Under Test

If necessary for the frequency measurement, set the radio under test in an appropriate test mode.

(D) Measurement Procedures

(a) The T.O.P.T.E. is adjusted so that the frequency equals to the test frequency, and the output level equals to 9 dBμ at the input of the radio under test.

(b) Confirm that the output frequency of the radio under test tracks as varying the T.O.P.T.E. output frequency.

(c) Measure the output frequency of the radio under test by the frequency meter(F1).

(d) Measure the output frequency of the T.O.P.T.E. by the frequency meter(F2).

(e) Compute the Frequency Tracking Accuracy(ΔF) by the following formula ;

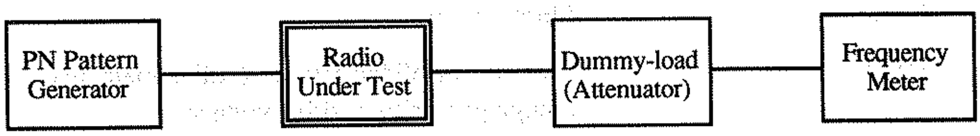
$\Delta F = (|F1 - F2| - (Fs))/(Ft)$

Where : Fs = Nominal Tx/Rx Frequency Separation

Ft : Nominal Transmit Frequency

V. Frequency Tolerance(Phase Locus Method)

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

The frequency meter is to be the frequency measuring equipment described in (10) "Modulation Accuracy".

(C) State of Radio Under Test

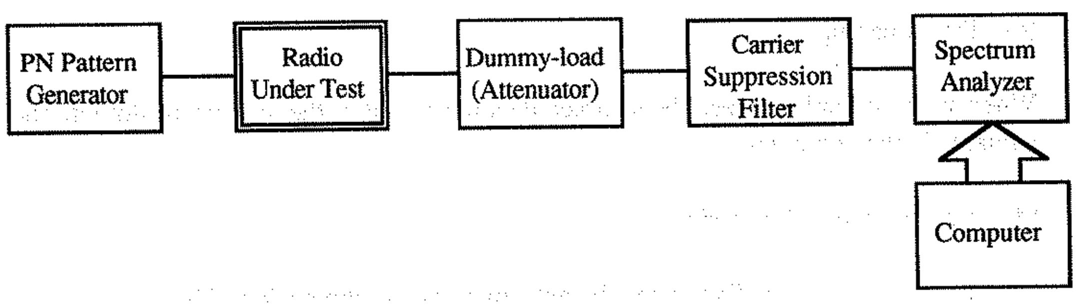
Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

Measure the output frequency of the radio under test by the frequency meter.

(2) Strength of Spurious Emission

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) Use the carrier suppression filter as required. Attenuation at the carrier frequency is to be 30 dB or more.

(b) A digital storage type spectrum analyzer is to be used.

(c) Setting of spectrum analyzer is as follows:

• Center frequency	Spurious frequency
• Sweep frequency bandwidth	0 Hz
• Resolution bandwidth	30 kHz
• Video bandwidth	Same as resolution bandwidth
• Y-axis scale	10 dB/div.
• Input level	70 ~ 90% of full scale for the maximum amplitude.
• Sweep mode	Single sweep
• Trigger mode	Free-run or Video-trigger (Adjustment may be needed though generally positive voltage)
• Sweep time	27 ms or less
• Detect mode	Sample mode

(C) State of Radio Under Test

Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

(a) Center Frequency Setting

Set the center frequency of the spectrum analyzer at the spurious frequency.

(b) Measurement of Power Distribution

Measure the power distribution by the spectrum analyzer with single sweep.

(c) Data Reading

When sweep completes, read the sampled data in and out of the measuring slot into the array valuable in the computer.

(d) Antilogarithm Conversion

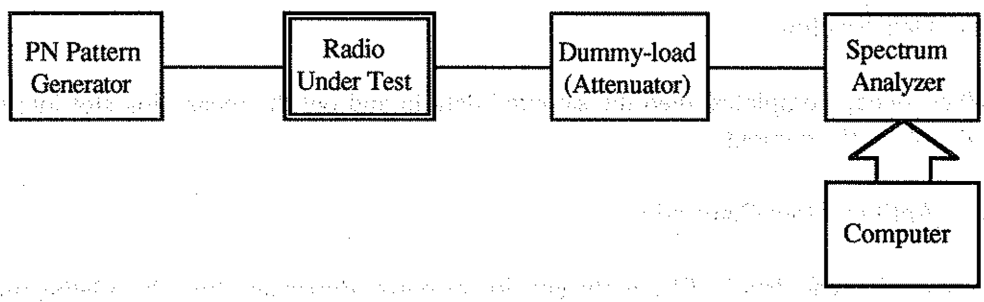
Convert the read data in dBm using the anti-log to power dimension (Watt)

(e) Averaging Power

Compute average powers from the converted data in and out of the measuring slot separately. Sampling intervals are the reciprocal of twice the frequency difference between outer subcarriers(36 kHz), or less.

(3) Occupied Bandwidth

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) A digital storage type spectrum analyzer is to be used.

(b) Setting of spectrum analyzer is as follows:

• Center frequency	Carrier frequency
• Sweep frequency bandwidth	Approx. 75 kHz
• Resolution bandwidth	Approx. 100 Hz
• Video bandwidth	Same as resolution bandwidth
• Y-axis scale	10 dB/div.
• Input level	Carrier signal level to be at least 50dB higher than internal noise of spectrum analyzer
• Sampling points	400 points or more.(e.g. 1001 points)
• Sweep time	Every sample covers the whole slot under measurement (AGC preamble + M16QAM burst). (90 sec or longer for 1001 points, for example)
• Detect mode	Positive peak
• Sweep mode	Single sweep

(c) The computer internal or external to the spectrum analyzer is to process the data measured by the spectrum analyzer.

(d) Data transmission rate is adjusted to the specification of the radio under test.

(C) State of Radio Under Test

Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

(a) Measurement

Measure the power distribution by the spectrum analyzer with single sweep.

(b) Data Reading

When sweep completes, read the sampled data in and out the measuring slot into the array valuable in the computer.

(c) Antilogarithm Conversion

Convert the read data in dBm to the anti-log of power dimension (may be relative numbers).

(d) Total Power Computation

Total all the converted sample data, and save it as the total power.

(e) Compute the Lower Limit Frequency

Add the converted sample data successively upwards from the lowest frequency point, and find the sample point where the sum reaches 0.5% of the total power. Convert the sample point to the frequency and save it as the lower limit frequency.

(f) Compute the Upper Limit Frequency

Total the converted sample data successively downwards from the highest frequency point, and find the sample point where the sum reaches 0.5% of the total power. Convert the sample point to the frequency and save it as the upper limit frequency.

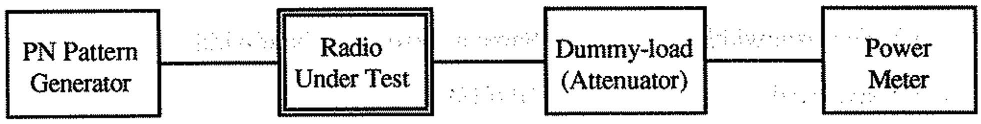
(g) Compute the Occupied Bandwidth

Compute the Occupied Bandwidth as "Upper Limit Frequency" - "Lower Limit Frequency".

(4) Antenna Power Tolerance

I. Antenna Power Tolerance(I)

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

A power meter whose time constant is much larger than the burst interval is to be used.

(C) State of Radio Under Test

Set the radio under test for transmission at the test frequency. The radio is to transmit one burst per frame.

(D) Measurement Procedures

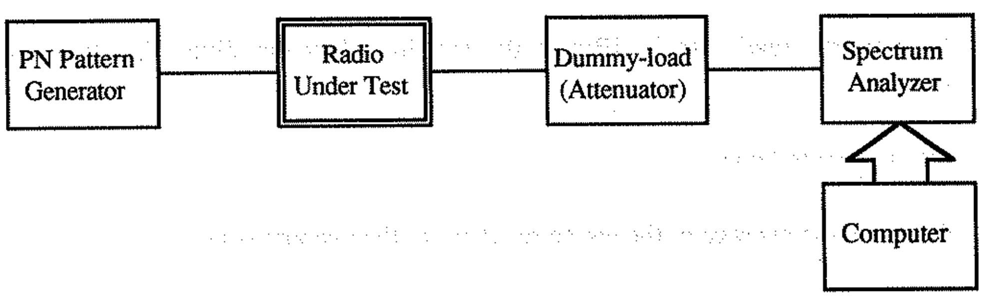
(a) Measure the power (Pm) by the power meter for sufficiently long time.

(b) Compute the average power within a slot (P) using correcting factor of the AGC preamble to the slot length(B = 16.1 ms for the basic slot. However, it is to be modified depending on the waveform of the AGC preamble) and the slot length(T = 15 ms for the basic slot.).

$$P = Pm \times (T/B) \times 6$$

II. Antenna Power Tolerance(II)

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) A digital storage type spectrum analyzer is to be used.

(b) Setting of Spectrum analyzer is as follows:

• Center frequency	Carrier frequency
• Sweep frequency bandwidth	0 Hz
• Resolution bandwidth	Approx. 100 kHz
• Video bandwidth	Same as resolution bandwidth
• Y-axis scale	10 dB/div.
• Input level	70 ~ 90% of full scale for the maximum amplitude.
• Sweep mode	Single sweep
• Trigger mode	Free-run or Video-trigger (Adjustment may be needed though generally positive voltage)
• Sweep time	27 ms or less
• Detect mode	Sample mode

(C) State of Radio Under Test

Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

(a) Measurement

Measure the power distribution by the spectrum analyzer with single sweep.

(b) Data Reading

When sweep completes, read the sampled data in and out the measuring slot into the array valuable in the computer.

(c) Antilogarithm Conversion

Convert the read data in dBm to the anti-log of power dimension (may be relative numbers).

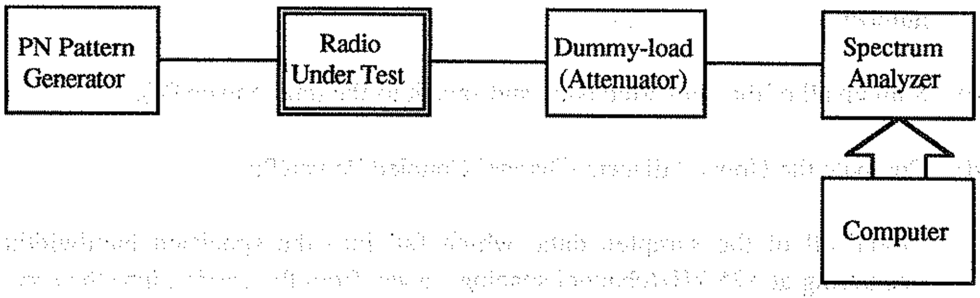
(d) Compute Power

Compute the average of the converted data for the average power.

Sampling interval is the reciprocal of twice of the frequency difference between outer subcarriers (36 kHz), or less.

(5) Adjacent Channel Coupled Power

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) A digital storage type spectrum analyzer is to be used.

(b) Setting of spectrum analyzer is as follows:

• Center frequency	Carrier frequency
• Sweep frequency bandwidth	Approx. 100 kHz
• Resolution bandwidth	Less than approx. 1kHz
• Video bandwidth	Approx. 3 times of resolution bandwidth
• Y-axis scale	10 dB/div.
• Sampling points	400 points or more(e.g. 1001 points)
• Sweep time	Every sample covers the whole slot under measurement (AGC preamble + M16QAM burst). (90 sec or longer for 1001 points, for example)
• Input level	Around the max. linear region of the mixer internal to the spectrum analyzer. (e.g. -10 dBm ~ -30 dBm)
• Display mode	Max. hold
• Detect mode	Positive peak
• Sweep mode	Single sweep

(c) The computer internal or external to the spectrum analyzer is to process the data measured by the spectrum analyzer.

(C) State of Radio Under Test

Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

(a) After sweep completes, read all of the sampled data into the array variable in the computer.

(b) Convert all of the data in dBm to the anti-log of power dimension (may be relative numbers).

(c) Sum up all of the converted data, and save it as the total power(Pc).

(d) Compute the Upper Adjacent Channel Coupled Power(Pu)

- Read all of the sampled data, which fall into the specified bandwidth(18 kHz) centering at +25 kHz(channel spacing) away from the carrier, into the array variable in the computer.
- Convert all of the data in dBm to the anti-log of power dimension, then sum them up(Pu) .

(e) Compute the Lower Adjacent Channel Coupled Power(Pl)

- Read all of the sampled data, which fall into the specified bandwidth(18 kHz) centering at -25 kHz(channel spacing) away from the carrier, into the array variable in the computer.
- Convert all of the data in dBm to the anti-log of power dimension, then add them up(Pl) .

(f) Get the measurement results by the following formulas ;

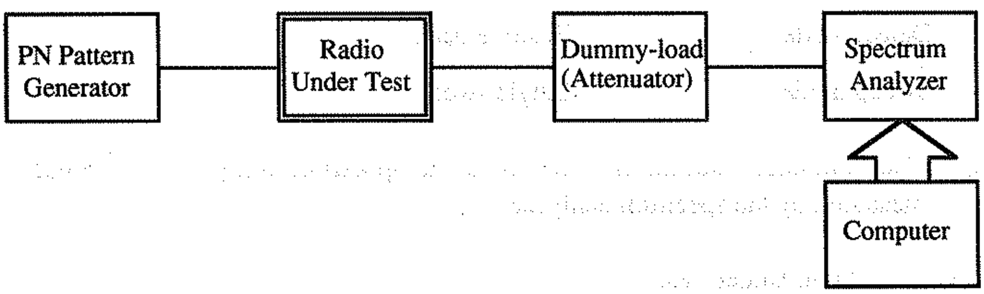
Upper Adjacent Channel Coupled Power Ratio = 10 log (Pc/Pu)

Lower Adjacent Channel Coupled Power Ratio = 10 log (Pc/Pl)

The results are expressed in dB.

(6) Carrier-off Leakage Power

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) A digital storage type spectrum analyzer is to be used.

(b) Setting of spectrum analyzer is as follows:

• Center frequency	Carrier frequency
• Sweep frequency bandwidth	0 Hz
• Resolution bandwidth	30 kHz
• Video bandwidth	Same as resolution bandwidth
• Y-axis scale	10 dB/div.
• Input level	Below the Max. input level, and average noise level of the spectrum analyzer is to be -10 dB or lower than the Carrier-off Leakage Power specification
• Sweep mode	Single sweep
• Trigger mode	Free-run or Video-trigger (Adjustment may be needed though generally positive voltage)
• Sweep time	27 ms or less
• Detect mode	Sample mode

(C) State of Radio Under Test

Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

(a) Measurement

Measure the power distribution by the spectrum analyzer with single sweep.

(b) Data Reading

When sweep completes, read the sampled data during carrier-off into the array value in the computer.

(c) Antilogarithm Conversion

Convert the read data in dBm to the anti-log of power dimension (Watt).

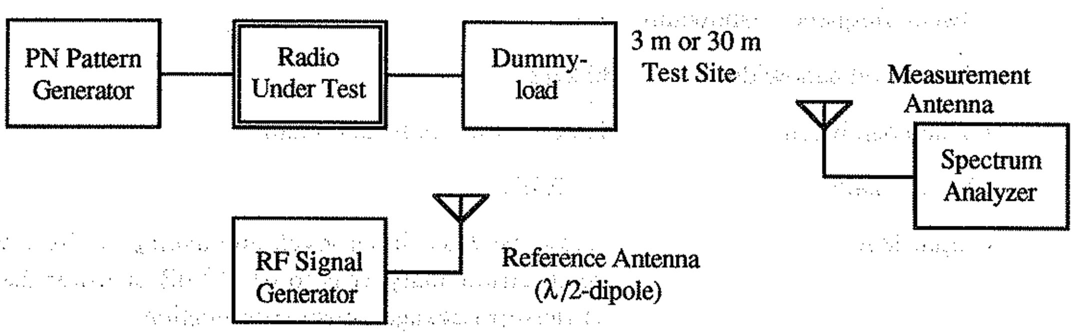
(d) Compute Power

Compute the average of the converted data for the average power.

Sampling interval is the reciprocal of twice of the frequency difference between outer subcarriers(36 kHz), or less.

(7) Radiated Spurious Emission

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) Terminate antenna terminal of the radio under test with dummy load.

(b) Take measurements at an open test site in accordance with IEC Pub. 489-6 Annex K if one edge of the radio housing exceeds 60 cm or if the measurement frequency is less than 100 MHz. Otherwise, take measurements at an open test site in accordance with Annex K or L.

(c) At frequencies 300 MHz or higher, it is best to suppress any ground reflected waves in order to avoid trouble caused by increased complexity of the height pattern. For this, the measurement antenna is of high directivity. The radio under test is as high as possible. If ground reflected waves cannot be suppressed adequately, arrange a shielding curtain around the center, or deploy a radio wave absorber.

(C) State of Radio Under Test

Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

(a) Set the radio under test on a rotating stand and check its any spectrum within a specified frequency range.

(b) Tune the spectrum analyzer with one given frequency component from the spectrum ascertained in (a).

(c) Vertically polarize the measurement antenna.

(d) Rotate the stand and obtain the maximum reading of the spurious power (average power within a burst).

(e) Vary the measurement antenna height between 1 - 4 meters above the ground for the maximum reading of the spurious power .

(f) Repeat steps (d) and (e) until the maximum reading does not increase any more. Record the frequency, the maximum reading of the spurious power, and antenna height measurement at this point.

(g) Horizontally polarize the measurement antenna, and repeat steps (d) - (f).

(h) Perform steps (b) - (g) for all the frequency components determined in step (a).

(i) Replace the radio under test with a reference antenna fed by an RF signal generator.

(j) Tune the reference antenna to the frequency component measured in step (f).

(k) Vertically polarize both the reference antenna and the measurement antenna.

(l) Vary the measurement antenna height between 1 meter and 4 meters above the ground. Adjust the output level of the RF signal generator so that the maximum reading of the spectrum analyzer obtained during this antenna adjustment matches the maximum value obtained in step (f). Record the output level of the RF signal generator and the height of the measurement antenna at this point.

(m) Horizontally polarize both the reference antenna and the measurement antenna and repeat step (g).

(n) Repeat steps (j) - (m) for all frequency components measured up to step (m).

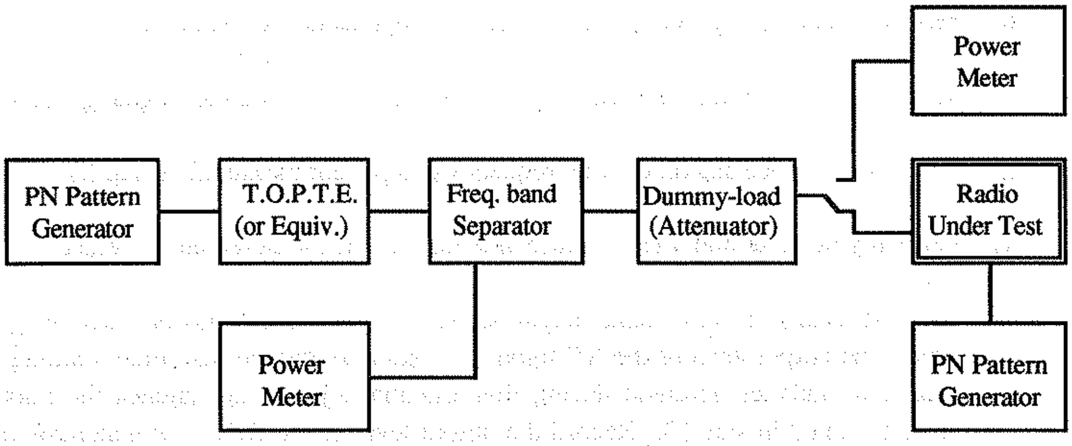
(E) Computation of Results

Radiated spurious emission is the sum of the output levels of the RF signal generator as obtained in procedure (d), the gain of the reference antenna, and the correction for the cable loss (between the RF signal generator and the reference antenna).

(8) Transmission Power Control

I. Autonomous Transmission Power Control

(A) Test Set-up



T.O.P.T.E. : Total Operating Performance Test Equipment

(B) Test Equipment Requirements/Conditions

(a) The Total Operating Performance Test Equipment(T.O.P.T.E.) can simulate the repeater station functions, and its specific parameters can be changed.

(b) The power meter is to be a power measuring equipment described in (4) "Antenna Power Tolerance".

(c) The test set-up must be calibrated prior to the measurements.

(C) State of Radio Under Test

Set the radio under test in an appropriate test mode for the measurements.

(D) Measurement Procedures

(a) The T.O.P.T.E. is tuned to the test frequency.

(b) Feed the specified signal level to the radio under test, then measure the output power of the radio.

II. Forced Transmission Power Control

(A) Test Set-up

Same as I. "Autonomous Transmission Power Control".

(B) Test Equipment Requirements/Conditions

Same as I. "Autonomous Transmission Power Control".

(C) State of Radio Under Test

Same as I. "Autonomous Transmission Power Control".

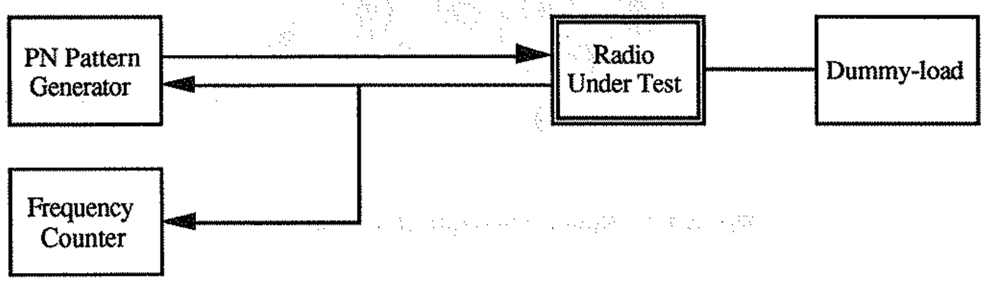
(D) Measurement Procedures

(a) The T.O.P.T.E. is adjusted so that the frequency equals to the test frequency, and the output level equals to 9 dBμ at the input of the radio under test.

(b) Send the specified command signal from the T.O.P.T.E. to the radio under test, then measure the output power of the radio.

(9) Accuracy of Data Transmission Rate

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

A frequency counter is to have the resolution one digit higher than the specification of the data transmission rate (clock frequency tolerance).

(C) State of Radio Under Test

Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

Measure the clock frequency of the radio under test.

(E) Computation of Results

Compute the deviation of the measurement in procedure (d) to the nominal value.

(10) Modulation Accuracy

(A) Definition of the Modulation Accuracy

If the ideal transmitter output signal is passed through the ideal receive root roll-off filter, then each symbol of the signal is sampled at ideal timing (i.e., there is no symbol interference among symbols). However, in an actual transmitter output signal, symbol interference occurs because the transmission path deviates from the ideal characteristics. The modulation accuracy can be obtained by measuring symbol errors caused by symbol interference. Fig. 6.1-1 illustrates such symbol errors.

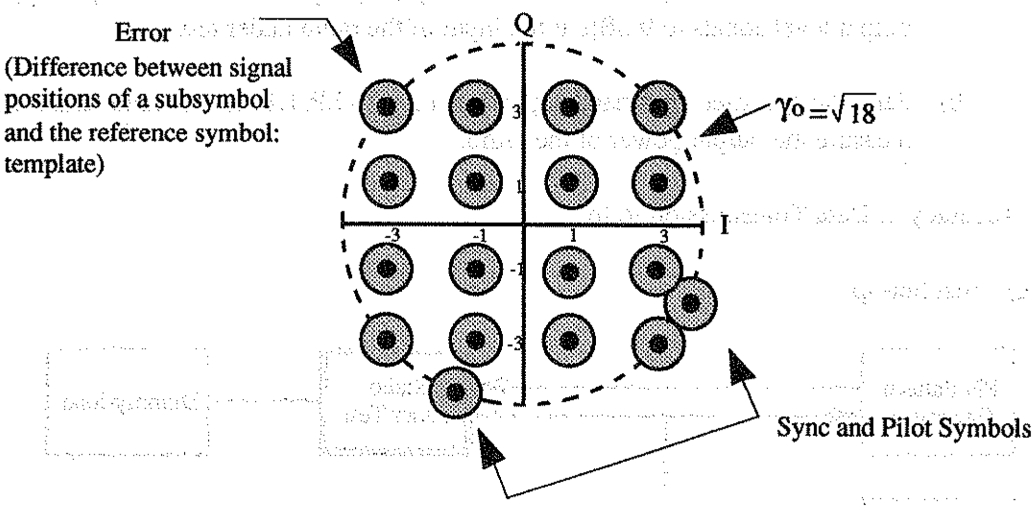


Fig. 6.1-1 Signal Constellation Diagram

The formula defining the modulation accuracy is shown below:

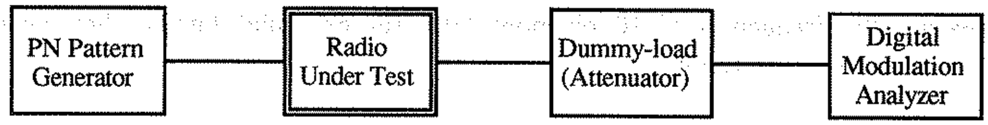
$$\varepsilon = \frac{\sqrt{\frac{1}{N}\sum_{i=1}^{N}\left| V_{mi}\,\alpha\exp(j\phi) - V_i - V_o \right|^2}}{\gamma_o} \times 100\%$$

where ;

	i	: Subsymbol number
	N	: Total number of subsymbol for the measurement
	Vmi	: Vector of i-th subsymbol
	Vi	: Reference Symbol vector determined by the i-th subsymbol
	Vo	: Origin offset level
	α	: Gain parameter(scalar value)
	ϕ	: Phase parameter (scalar value)
	γ_o	: Maximum magnitude of the Signal Constellation Diagram ($\sqrt{18}$).

Unknown parameters Vo, α and ϕ are chosen for the minimum value of the modulation accuracy ε given by the above formula.

(B) Test set-up



(C) Test Equipment Requirements/Conditions

The digital modulation analyzer is to have a function of the receive root roll-off filter, and have capability to measure the root mean square of the difference between actually transmitted signal and the reference symbols.

(D) State of Radio Under Test

Set the radio under test for transmission at the test frequency.

(E) Measurement Procedures

(a) Measure the error on each subsymbol which is the difference between reference and actually transmitted subsymbol positions on the signal constellation plane.

(b) Sum up square of all errors obtained in (a), divide it by the number of subsymbols contained in four subchannels(or number of measured subsymbols), then get its square root. The total number of subsymbols is to be 212.

(11) Subcarrier Frequency Tolerance

I. Frequency Tolerance (Frequency Counter Method)

(A) Test Set-up

Same as (1) I. "Frequency Tolerance (Frequency Counter Method)".

(B) Test Equipment Requirements/Conditions

Same as (1) I. "Frequency Tolerance (Frequency Counter Method)".

(C) State of Radio Under Test

(a) Set the radio in a test mode which outputs an unmodulated signal from one of the four subcarriers at a time. Any of the four subcarriers can be selected.

(b) Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

Measure the frequency of 10 or more (100 for example) bursts, then average all measurements for the result.

(E) Other Methods

The frequency of a reference oscillator output can be measured directly, as long as the radio under test is designed such that the frequency accuracy of the reference oscillator is equal to the frequency accuracy of the transmitter output.

II. Frequency Tolerance(Phase Locus Method)

(A) Test Set-up

Same as (1) V. "Frequency Tolerance (Phase Locus Method)".

(B) Test Equipment Requirements/Conditions

Same as (1) V. "Frequency Tolerance (Phase Locus Method)".

(C) State of Radio Under Test

Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

Measure the four subcarrier frequencies of the output of the radio under test by the frequency meter.

(12) Subsymbol Timing Synchronization

(A) Test Set-up

Same as (10) "Modulation Accuracy".

(B) Test Equipment Requirements/Conditions

The digital modulation analyzer is to detect the best symbol synchronization timing of four subcarriers independently, in addition to the functions for the modulation accuracy measurement.

(C) State of Radio Under Test

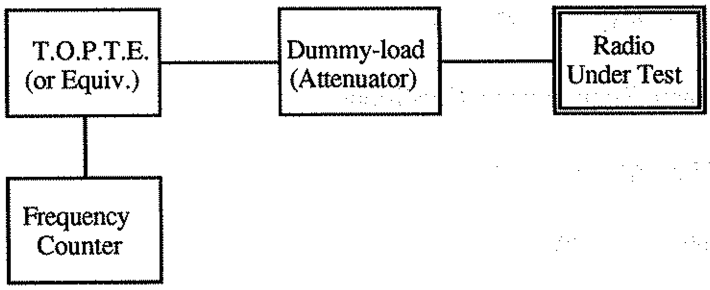
Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

Compute the timing differences among the symbol synchronization timings detected on each subcarrier independently.

(13) Time Alignment Control

(A) Test Set-up



T.O.P.T.E. : Total Operating Performance Test Equipment

(B) Test Equipment Requirements/Conditions

(a) The Total Operating Performance Test Equipment (T.O.P.T.E.) has the capability to simulate the repeater station functions, and its specific parameters can be changed.

(b) The T.O.P.T.E. is to have the function to output the timing difference between its own transmission and the transmission of the radio under test. The accuracy of the timing difference to be output is to be10 times of the specification, or better.

(c) The Frequency counter can measure the time intervals. The accuracy of the time interval measurement is to be10 times of the specification, or better.

(d) The combined accuracy of (b) and (c) is to be 10 times of the specification, or better.

(e) The measurement described above is the rated output power with no fading condition.

(C) State of Radio Under Test

Set the radio under test in normal operation mode.

(D) Measurement Procedures

(a) The T.O.P.T.E. activates a communication channel for the radio under test, then send time alignment control command with normal timing(no time advance).

(b) The T.O.P.T.E. outputs the timing difference between its own transmission and the transmission of the radio under test.

(c) Measure the timing difference by the Frequency counter with the time interval mode.

(d) Change the time alignment value to 1/4 symbol time and 3 symbol time, then repeat steps (a) to (b) on each time alignment value.

(14) Burst Transmission Timing

(A) Test Set-up

Same as (13) "Time Alignment Control".

(B) Test Equipment Requirements/Conditions

Same as (13) "Time Alignment Control".

(C) State of Radio Under Test

Set the radio under test in normal operation mode.

(D) Measurement Procedures

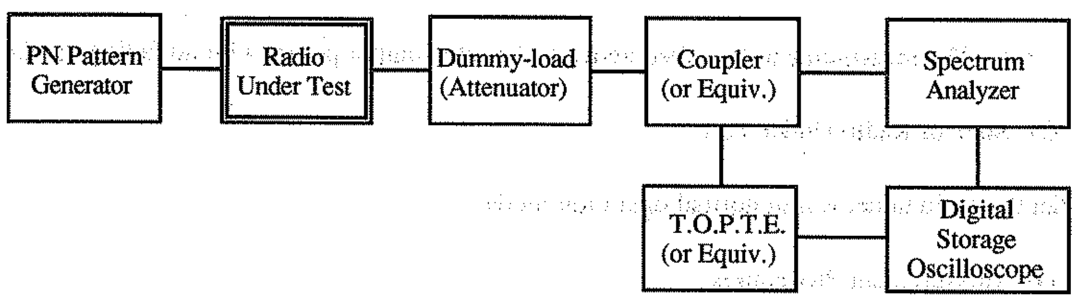
(a) The T.O.P.T.E. activates a communication channel for the radio under test, then send time alignment control command with normal timing(no time advance).

(b) The T.O.P.T.E. outputs the timing difference between its own transmission and the transmission of the radio under test.

(c) Measure the timing difference by the Frequency counter with the time interval mode.

(15) Transition Response Characteristics of the Burst Transmission and AGC Preamble.

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) The Total Operating Performance Test Equipment(T.O.P.T.E.) is to be capable to output the trigger signal corresponding to the burst timing of the radio under test.

(b) The spectrum analyzer is to equip with the video output terminal, Vertical axis of the oscilloscope must be calibrated by the power meter as the system in conjunction with the spectrum analyzer.

(c) Setting of spectrum analyzer is as follows:

• Center frequency	Carrier frequency
• Sweep frequency bandwidth	0 Hz
• Resolution bandwidth	Approx. 100 kHz
• Y-axis scale	10 dB/div.
• Input level	Below the Max. input level, and average noise level of the spectrum analyzer is to be 10 or more dB less than the specification of Carrier-off Leakage Power

(d) Video output signal is fed to the digital storage oscilloscope.

• Sweep trigger	External trigger
• Sweep time	Approx. 200 μs

(C) State of Radio Under Test

Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

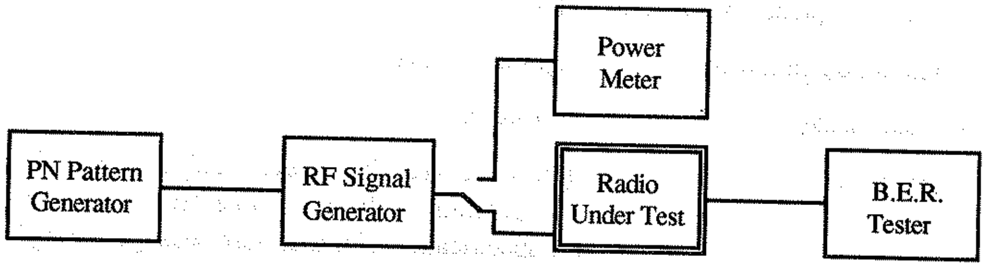
Measure the video output signal from the spectrum analyzer on the oscilloscope.

6.1.2 Receiver

(1) Receiver Sensitivity

I. Receiver Sensitivity (Static)

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) RF Signal Generator.

• Frequency	Specified frequency range
• Stability	Within $\pm 5 \times 10^{-8}$
• Modulation accuracy	Within 3% of RMS. vector error (recommended value)
• Modulation rate	4 kbaud

(b) Pattern Generator

• Clock accuracy	Within $\pm 1 \times 10^{-6}$
• Generated pattern	To continuously generate the standard coded test signals (511-bit Binary Pseudo Random Noise Sequence based on CCITT V.52) in user specific channels. As well, must generate specified patterns as required for communication in other channels.

(C) State of Radio Under Test

(a) Set the radio under test for reception at the test frequency.

(b) Demodulation data is to be user specific channel portions (the standard coded test signal portions).

(D) Measurement Procedures

(a) Set the frequency of the RF signal generator to the test frequency.

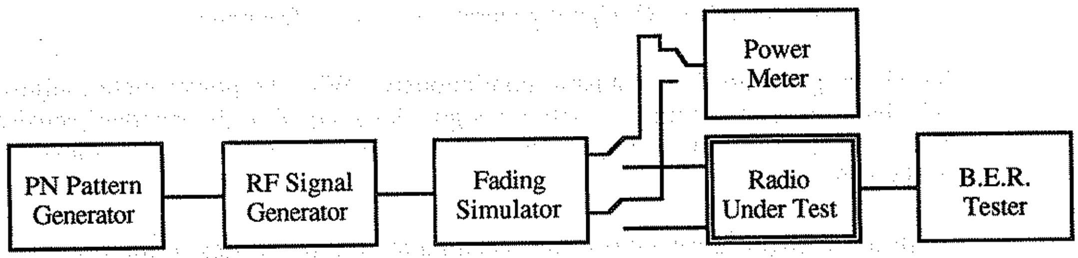
(b) RF signal generator is to transmit continuously . With the power meter, adjust the RF signal generator output to obtain a signal level equal to the standard sensitivity level (static). Then, change switches and apply the signal to the radio under test.

(c) With the BER (bit error rate) tester, accumulate the bit stream in the user specific channels and measure the bit error rate for at least 2556 bits.

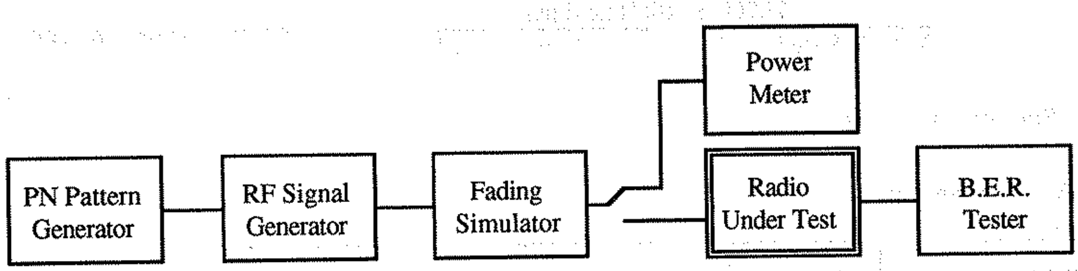
II. Receiver Sensitivity (Faded)

(A) Test Set-up

(a) With Diversity



(b) Without Diversity



(B) Test Equipment Requirements/Conditions

(a) RF Signal Generator.

• Frequency	Specified frequency range
• Stability	Within ±5 x 10^{-8}
• Modulation accuracy	Within 3% of RMS. vector error (recommended value)
• Modulation rate	4 kbaud

(b) Pattern Generator.

• Clock accuracy	Within ±1 x 10^{-6}
• Generated pattern	To continuously generate the standard coded test signals (511-bit Binary Pseudo Random Noise Sequence based on CCITT V.52) in user specific channels. As well, must generate specified patterns as required for communication in other channels.

(c) Fading Simulator

In accordance with IEC Pub. 489-6 Annex C. Maximum Doppler frequency is to be 40 Hz (800 MHz band) and 70 Hz (1.5 GHz band) of Rayleigh fading

(C) State of Radio Under Test.

(a) Set the radio under test for reception at the test frequency.

(b) Demodulation data is to be user specific channel portions (the standard coded test signal portions).

(D) Measurement Procedures

(a) Set the frequency of the RF signal generator to the test frequency.

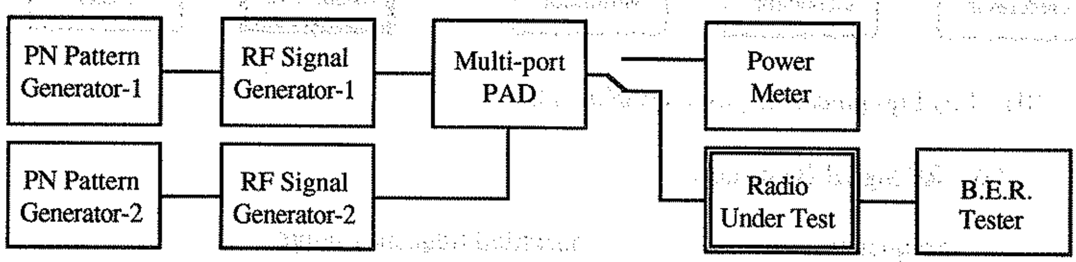
(b) RF signal generator is to transmit continuously. With the power meter, adjust the RF signal generator output to obtain a signal level equal to the standard sensitivity level (mean value with fading). Then, change switches and apply the signal to the radio under test.

(c) With the BER(bit error rate) tester, accumulate the bit strings in the user specific channels and measure the bit error rate at minimum for the larger of 2556 bits or :

$$\frac{43{,}200 \times \text{Bit Rate (bps)}}{\text{Vehicle Speed (km/h)} \times \text{Test Frequency (MHz)}} \qquad \text{Bit Rate (bps) : 64,000}$$

(2) Spurious Response

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) RF Signal Generator-1 and -2

• Frequency	Specified frequency range
• Stability	Within ±5 x 10^{-8}
• Modulation accuracy	Within 3% of RMS. vector error (recommended value)
• Modulation rate	4 kbaud
• Adjacent channel coupled power	86 dB or greater at ± 50 kHz off (recommended value) 87 dB or greater at ± 100 kHz off (recommended value)

(b) Pattern Generator-1

- Clock accuracy — Within $\pm 1 \times 10^{-6}$
- Generated pattern — To continuously generate the standard coded test signals (511-bit Binary Pseudo Random Noise Sequence based on CCITT V.52) in user specific channels. As well, must generate specified patterns as required for communication in other channels.

(c) Pattern Generator-2

- Clock accuracy — Within $\pm 1 \times 10^{-6}$
- Generated pattern — To continuously generate digital signals (32,767-bit Binary Pseudo Random Noise Sequence based on CCITT O.151).

(C) State of Radio Under Test

(a) Set the radio under test for reception at the test frequency.

(b) Demodulation data is to be user specific channel portions (standard coded test signal portions).

(D) Measurement Procedures

(a) Set the RF signal generator-1 to the test frequency.

(b) Set the RF signal generator-2 to the spurious frequency(*).

(c) RF signal generator-1 is to transmit continuously. With the power meter, adjust the output of RF signal generator-1 to obtain a signal level equal to [standard sensitivity + 3 dB].

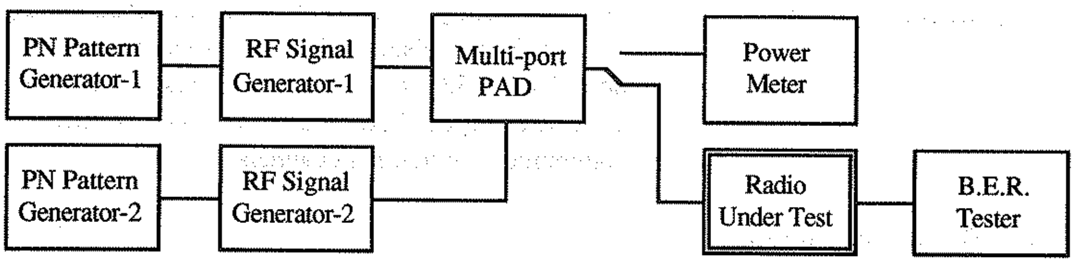
(d) RF signal generator-2 is to transmit continuously. With the power meter, adjust the output of RF signal generator-2 to obtain a signal level equal to (standard sensitivity + 3 dB) + (spurious response specification) [dBμ]. Then, change switches and apply the signal to the radio under test.

(e) With the BER(bit error rate) tester, accumulate the bit strings in the user specific channels and measure the bit error rate for at least 2556 bits.

(*) Spurious frequency is the frequency of undesired signals which degrade a bit error rate and must be ascertained. As one method of measuring this, use a receiver capable of receiving IF frequencies and specify the spurious frequency from the IF level of the radio under test.

(3) Adjacent Channel Selectivity

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) RF Signal Generator-1 and -2

• Frequency	Specified frequency range
• Stability	Within $\pm 5 \times 10^{-8}$
• Modulation accuracy	Within 3% of RMS. vector error (recommended value)
• Modulation rate	4 kbaud
• Adjacent channel coupled power	75 dB or greater at ± 25 kHz off (recommended value)

(b) Pattern Generator-1

• Clock accuracy	Within $\pm 1 \times 10^{-6}$
• Generated pattern	To continuously generate the standard coded test signals (511-bit Binary Pseudo Random Noise Sequence based on CCITT V.52) in user specific channels. As well, must generate specified patterns as required for communication in other channels.

(c) Pattern Generator-2

• Clock accuracy	Within $\pm 1 \times 10^{-6}$
• Generated pattern	To continuously generate digital signals (32,767 -bit Binary Pseudo Random Noise Sequence based on CCITT O.151).

(C) State of Radio Under Test

(a) Set the radio under test for reception at the test frequency.

(b) Demodulation data is to be user specific channel portions (standard coded test signal portions).

(D) Measurement Procedures

(a) Set the frequency of the RF signal generator-1 to the test frequency.

(b) Set the frequency of the RF signal generator-2 to the adjacent channel frequency of the test frequency [+25 kHz (or -25 kHz)].

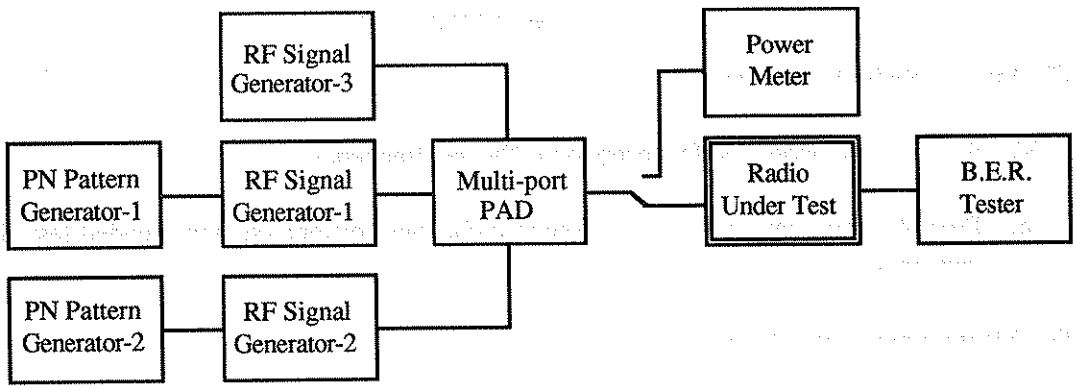
(c) RF signal generator-1 is to transmit continuously . With the power meter, adjust the output of RF signal generator-1 to obtain a signal level equal to [standard sensitivity + 3 dB].

(d) RF signal generator-2 is to transmit continuously. With the power meter, adjust the output of RF signal generator-2 to obtain a signal level equal to (standard sensitivity + 3 dB) + (adjacent channel selectivity specification) [dBμ] . Then, change switches and apply the signal to the radio under test.

(e) With the BER(bit error rate) tester, accumulate the bit strings in the user specific channels and measure the bit error rate for at least 2556 bits.

(4) Intermodulation characteristics

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) RF Signal Generator-1 and -2

• Frequency	Specified frequency range
• Stability	Within $\pm 5 \times 10^{-8}$
• Modulation accuracy	Within 3% of RMS. vector error (recommended value)
• Modulation rate	4 kbaud
• Adjacent channel coupled power	87 dB or greater at ±100 kHz off (recommended value)

(b) RF Signal Generator-3

• Frequency	Specified frequency range
• Stability	Within $\pm 5 \times 10^{-8}$
• Adjacent channel coupled power	93 dB or greater at ±50 kHz off (recommended value)

(c) Pattern Generator-1

• Clock accuracy	Within $\pm 1 \times 10^{-6}$
• Generated pattern	To continuously generate the standard coded test signals (511-bit Binary Pseudo Random Noise Sequence based on CCITT V.52) in user specific channels. As well, must generate specified patterns as required for communication in other channels.

(d) Pattern Generator-2

• Clock accuracy	Within $\pm 1 \times 10^{-6}$
• Generated pattern	To continuously generate digital signals (32,767 -bit Binary Pseudo Random Noise Sequence based on CCITT O.151).

(C) State of Radio Under Test

(a) Set the radio under test for reception at the test frequency.

(b) Demodulation data is to be user specific channel portions (standard coded test signal portions).

(D) Measurement Procedures

(a) Set the frequency of the RF signal generator-1 to the test frequency.

(b) Set the frequency of the RF signal generator-3 to the test frequency +50 kHz (or -50 kHz), and that of the RF signal generator-2 to the test frequency +100 kHz (or -100 kHz).

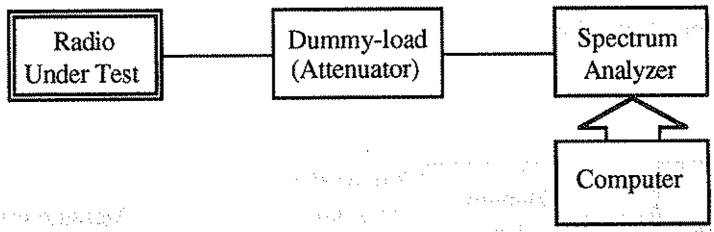
(c) RF signal generator-1 is to transmit continuously . With the power meter, adjust the output of RF signal generator-1 to obtain a signal level equal to [standard sensitivity + 3 dB].

(d) RF signal generator-3 is to transmit unmodulated signal continuously and RF signal generator-2 is to transmit continuously. With the power meter, adjust the outputs of RF signal generator-2 and -3 to obtain a signal level equal to (standard sensitivity + 3 dB) + (intermodulation characteristic specification) [dBμ] . Then, change switches and apply the signal to the radio under test.

(e) With the BER(bit error rate) tester, accumulate the bit strings in the user specific channels and measure the bit error rate for at least 2556 bits.

(5) Conducted Spurious Emission

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) Attenuation of the dummy load (attenuator) is to be approx. 20 dB.

(b) Setting of spectrum analyzer is as follows:

• Center frequency	Conducted spurious frequency
• Sweep frequency bandwidth	0 Hz
• Resolution bandwidth	Approx. 100 kHz
• Video bandwidth	Same as resolution bandwidth
• Y-axis scale	10 dB/div.
• Input level	70 ~ 90 % of full scale for the maximum amplitude; or as large as possible if the amplitude is small.
• Sweep mode	Single sweep
• Sweep time	27 ms or less
• Detect mode	Sample mode

(C) State of Radio Under Test

Set the radio under test in reception mode and able to receive at the test frequency.

(D) Measurement Procedures

(a) Set the center frequency of the spectrum analyzer to the spurious frequency.

(b) Measure the power distribution by the spectrum analyzer with single sweep.

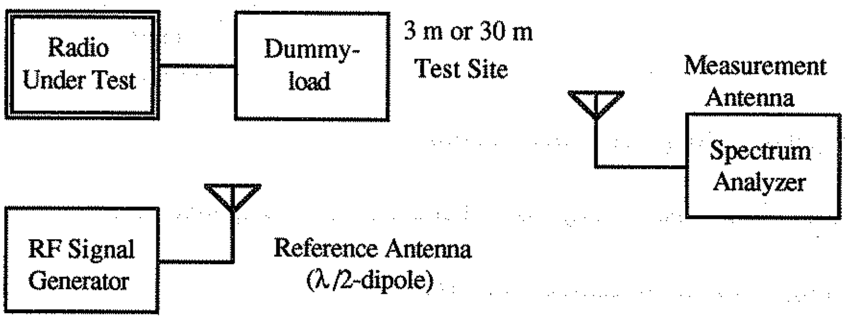
(c) After the sweep is finished, read the sampled data into the array variables of the computer. For burst emission, include all sampled data within a burst segment; for a continuous emission, include all sampled data within the sweep segment.

(d) Convert the read data in dBm to the anti-log of power dimension(Watt).

(e) Average the converted anti-log data to obtain average power values. For burst emission, data within bursts are averaged. For a continuous emission, data within sweep segments are averaged. Sampling intervals are the reciprocal of twice of the frequency difference between outer subcarriers(36 kHz), or less.

(6) Radiated Spurious Emission

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

Same as "6.1.1 (7) Radiated Spurious Emission (Transmitter) (B)."

(C) State of Radio Under Test

Set the radio under test for reception at the test frequency.

(D) Measurement Procedures

Same as "6.1.1 (7) Radiated Spurious Emission (Transmitter) (D)."

6.2 Measuring Methods for a Repeater Station

(1) The operating mode of a repeater station is as shown in the table below .

Operation for Transmitter Measurement		Operation for Receiver Measurement	
Transmit Mode	Synchronization Mode	Receive Mode	Synchronization Mode
Continuous Transmission	Master Mode Synchronization	Continuous Signal Reception	Asynchronous Reception
		Burst Signal Reception	Windowed Reception

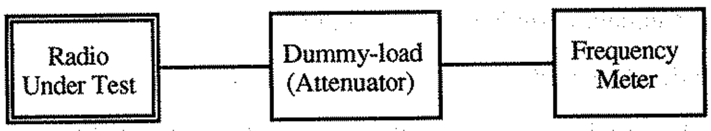
(2) A standard coded test signal used for modulation is to be the 511-bit Binary Pseudo Random Noise Sequence(CCITT V.52) and is to be sent on User Specific Channels or all slots.

6.2.1 Transmitter

(1) Frequency Tolerance

I. Frequency Tolerance(Frequency Counter Method)

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) A frequency counter is to be used as a frequency meter.

(b) The frequency counter has an accuracy to within one-tenth of the frequency tolerance specification by calibrating with a known frequency, or by mixing down the input signal with a known frequency.

(C) State of Radio Under Test

(a) Set the radio under test in a test mode which outputs an unmodulated carrier(Center frequency).

(b) Or, set the radio under test in a test mode which outputs an unmodulated signal from only one of the four subcarriers. In this case, the subcarrier frequency(offset from the main carrier) is added to the measured value.

(c) Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

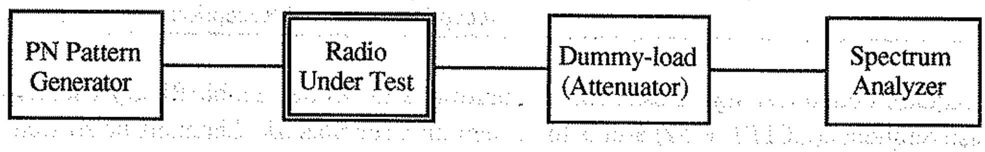
Measure the frequency after warm-up time elapsed.

(E) Other Methods

The frequency of a reference oscillator output can be measured directly if a radio under test is designed such that the frequency accuracy of the reference oscillator is equal to the frequency accuracy of the transmitter output.

II. Frequency Tolerance(Spectrum Analyzer Method)

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) A digital storage type spectrum analyzer is to be used.

(b) Setting of spectrum analyzer is as follows:

• Center frequency	Carrier frequency
• Sweep frequency bandwidth	2 ~ 20 kHz
• Resolution bandwidth	Approx. 100 Hz
• Video bandwidth	Same as resolution bandwidth
• Y-axis scale	1 dB/div.
• Input level	At least 50dB higher than internal noise of spectrum analyzer
• Sampling points	400 points or more(e.g. 1001 points)
• Sweep time	Every sample covers the whole slot under measurement (AGC preamble + M16QAM burst). (90 sec or longer for 1001 points, for example)
• Sampling mode	Positive peak
• Sweep mode	Single sweep

(C) State of Radio Under Test

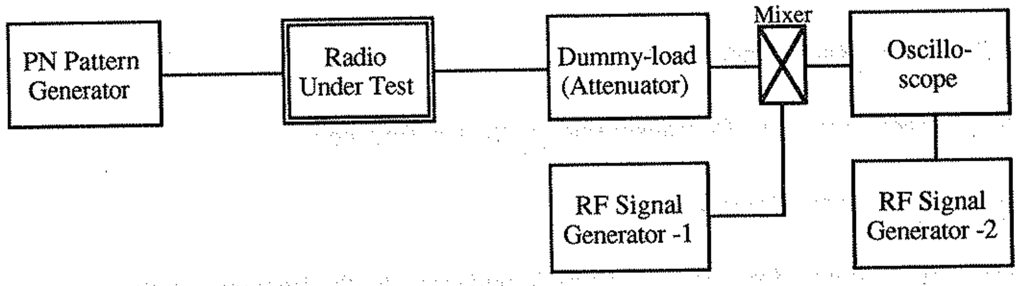
Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

Measure the frequency at the deepest point of the central dip of spectrum of the four subchannels.

III. Frequency Tolerance(Lissajous Method)

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) The RF signal generator-1 can output a stable unmodulated signal at the frequency around 1MHz lower than the test frequency.

(b) The RF signal generator-2 can output a stable unmodulated signal around 1MHz.

(C) State of Radio Under Test

Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

(a) Generate the standard coded test signal or the code signal with fixed pattern with the pattern generator.

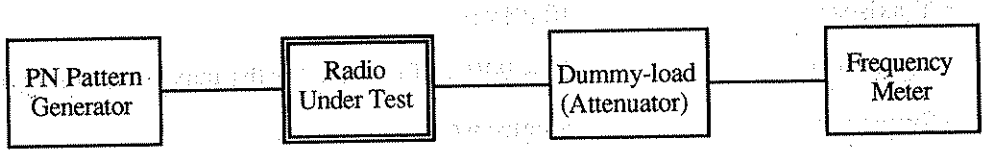
(b) Adjust the frequency of the RF signal generator-2 to stop Lissajous Figure (on the oscilloscope screen) which formed by the mixed-down signal and output signal of the RF signal generator-2.

(c) Measure the frequencies of the RF signal generator-1 and -2, F1 and F2, by the frequency counter , then compute the test frequency F by the following formula ;

$$F = F1 + F2$$

IV. Frequency Tolerance (Phase Locus Method)

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

The frequency meter is to be a frequency measuring equipment described in (8) "Modulation Accuracy".

(C) State of Radio Under Test

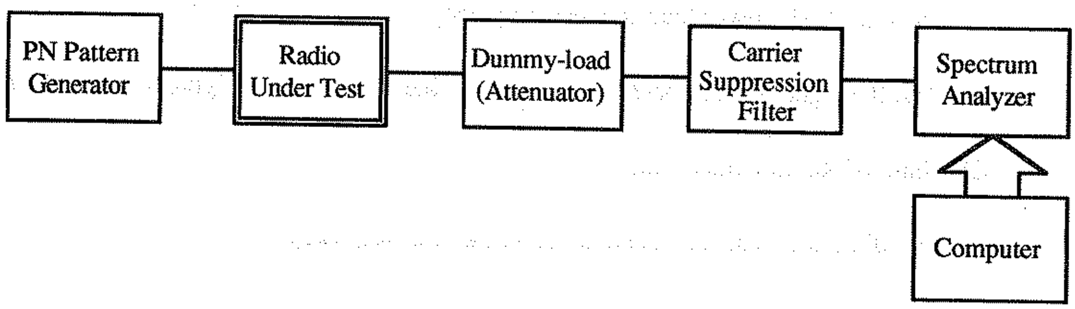
Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

Measure the output frequency of the radio under test by the frequency meter.

(2) Strength of Spurious Emission

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) Use the carrier suppression filter as required. Attenuation at the carrier frequency is to be 30 dB or more.

(b) A digital storage type spectrum analyzer is to be used.

(c) Setting of spectrum analyzer is as follows:

• Center frequency	Spurious frequency
• Sweep frequency bandwidth	0 Hz
• Resolution bandwidth	30 kHz
• Video bandwidth	Same as resolution bandwidth
• Y-axis scale	10 dB/div.
• Input level	70 ~ 90% of full scale for the maximum amplitude.
• Sweep mode	Single sweep
• Trigger mode	Free-run or Video-trigger (Adjustment may be needed though generally positive voltage)

• Sweep time 27 ms or less

• Detect mode Sample mode

(C) State of Radio Under Test

Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

(a) Center Frequency Setting

Set the center frequency of the spectrum analyzer at the spurious frequency.

(b) Measurement of Power Distribution

Measure the power distribution by the spectrum analyzer with single sweep.

(c) Data Reading

After the sweep is finished, read the sampled data in and out of the measuring slot into the array valuable in the computer.

(d) Antilogarithm Conversion

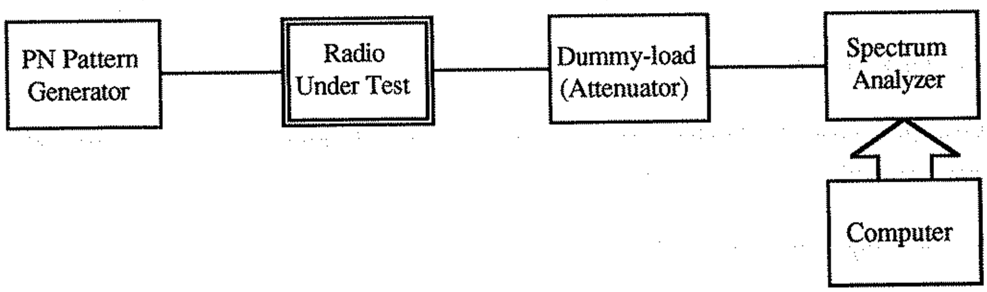
Convert the read data in dBm to the anti-log of power dimension(Watt)

(e) Averaging Power

Compute average powers from the converted data in and out of the measuring slot separately. Sampling intervals are the reciprocal of twice of the frequency difference between outer subcarriers(36 kHz), or less.

(3) Occupied Bandwidth

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) A digital storage type spectrum analyzer is to be used.

(b) Setting of spectrum analyzer is as follows:

• Center frequency	Carrier frequency
• Sweep frequency bandwidth	Approx. 75 kHz
• Resolution bandwidth	Approx. 100 Hz
• Video bandwidth	Same as resolution bandwidth
• Y-axis scale	10 dB/div.
• Input level	Carrier signal level to be at least 50dB higher than internal noise of spectrum analyzer
• Sampling points	400 points or more.(e.g. 1001 points)
• Sweep time	Smaller time as far as measurement error is negligible
• Detect mode	Positive peak
• Sweep mode	Single sweep

(c) The computer internal or external to the spectrum analyzer is to process the data measured by the spectrum analyzer.

(d) Data transmission rate is adjusted to the specification of the radio under test.

(C) State of Radio Under Test

Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

(a) Measurement

Measure the power distribution by the spectrum analyzer with single sweep.

(b) Data Reading

After the sweep is finished, read the sampled data in and out the measuring slot into the array valuable in the computer.

(c) Antilogarithm Conversion

Convert the read data in dBm to the anti-log of power dimension (may be relative numbers).

(d) Total Power Computation

Sum up all of the converted sample data, and save it as the total power.

(e) Compute the Lower Limit Frequency

Sum up the converted sample data successively upwards from the lowest frequency point, and find the sample point where the sum reaches 0.5% of the total power. Convert the sample point to the frequency and save it as the lower limit frequency.

(f) Compute the Upper Limit Frequency

Sum up the converted sample data successively downwards from the highest frequency point, and find the sample point where the sum reaches 0.5% of the total power. Convert the sample point to the frequency and save it as the upper limit frequency.

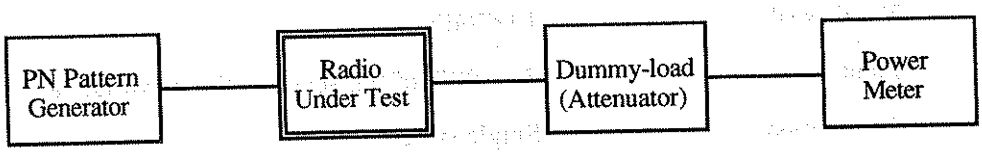
(g) Compute the Occupied Bandwidth

Compute the Occupied Bandwidth as "Upper Limit Frequency" - "Lower Limit Frequency".

(4) Antenna Power Tolerance

I. Antenna Power Tolerance(I)

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(C) State of Radio Under Test

Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

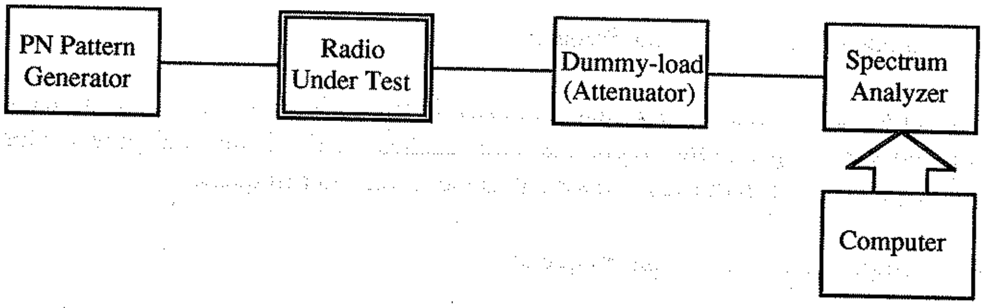
(a) Measure the power (Pm) by the power meter for sufficiently long time.

(b) The average power of the repeater station is :

$$P = Pm$$

II. Antenna Power Tolerance(II)

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) A digital storage type spectrum analyzer is to be used.

(b) Setting of spectrum analyzer is as follows:

• Center frequency	Carrier frequency
• Sweep frequency bandwidth	0 Hz
• Resolution bandwidth	Approx. 100 kHz
• Video bandwidth	Same as resolution bandwidth
• Y-axis scale	10 dB/div.
• Input level	70 ~ 90% of full scale for the maximum amplitude.
• Sweep mode	Single sweep
• Trigger mode	Free-run
• Sweep time	27 ms or less
• Detect mode	Sample mode

(C) State of Radio Under Test

Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

(a) Measurement

Measure the power distribution by the spectrum analyzer with single sweep.

(b) Data Reading

After the sweep is finished, read the sampled data in the sweep segment into the array valuable in the computer.

(c) Antilogarithm Conversion

Convert the read data in dBm to the anti-log of power dimension (may be relative numbers).

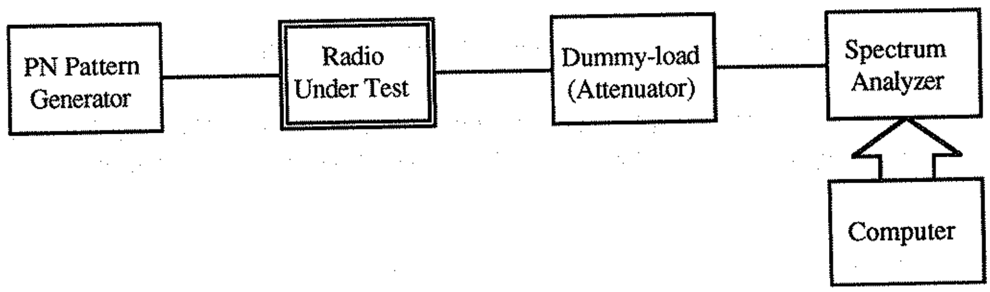
(d) Compute Power

Compute the average of the converted data for the average power.

Sampling interval is the reciprocal of twice of the frequency difference between outer subcarriers (36 kHz), or less.

(5) Adjacent Channel Coupled Power

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) A digital storage type spectrum analyzer is to be used.

(b) Setting of spectrum analyzer is as follows:

• Center frequency	Carrier frequency
• Sweep frequency bandwidth	Approx. 100 kHz
• Resolution bandwidth	Approx. 1 kHz
• Video bandwidth	3 times of resolution bandwidth
• Y-axis scale	10 dB/div.
• Sampling points	400 points or more(e.g. 1001 points)
• Sweep time	Smaller time as far as measurement error is negligible
• Input level	Around the max. linear region of the mixer internal to the spectrum analyzer. (e.g. -10 dBm ~ -30 dBm)

- Display mode Max. hold
- Detect mode Positive peak
- Sweep mode Single sweep

(c) The computer internal or external to the spectrum analyzer is to process the data measured by the spectrum analyzer.

(C) State of Radio Under Test

Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

(a) After the sweep is finished, read all of the sampled data into the array variable in the computer.

(b) Convert all of the data in dBm to the anti-log of power dimension (may be relative numbers).

(c) Sum up all of the converted data, and save it as the total power(Pc).

(d) Compute the Upper Adjacent Channel Coupled Power(Pu)

- Read all of the sampled data, which fall into the specified bandwidth(18 kHz) centering at +25 kHz(channel spacing) away from the carrier, into the array variable in the computer.

- Convert all of the data in dBm to the anti-log of power dimension, then sum them up(Pu) .

(e) Compute the Lower Adjacent Channel Coupled Power(Pl)

- Read all of the sampled data, which fall into the specified bandwidth(18 kHz) centering at -25 kHz(channel spacing) away from the carrier, into the array variable in the computer.

- Convert all of the data in dBm to the anti-log of power dimension, then sum them up(Pl) .

(f) Get the measurement results by the following formulas ;

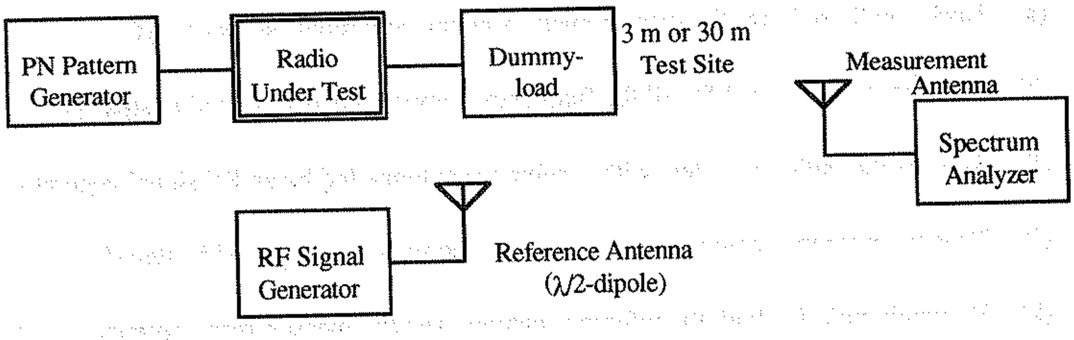
Upper Adjacent Channel Coupled Power Ratio = 10 log (Pc/Pu)

Lower Adjacent Channel Coupled Power Ratio = 10 log (Pc/Pl)

The results are expressed in dB.

(6) Radiated Spurious Emission

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) Terminate antenna terminal of the radio under test with dummy load.

(b) Take measurements at an open test site in accordance with IEC Pub. 489-6 Annex K if one edge of the radio housing exceeds 60 cm or if the measurement frequency is less than 100 MHz. Otherwise, take measurements at an open test site in accordance with Annex K or L.

(c) At frequencies 300 MHz or higher, it is best to suppress any ground reflected waves in order to avoid any trouble caused by increased complexity of the height pattern. For this, the measurement antenna is of high directivity and the height of the radio under test is as high as possible. If ground reflected waves cannot be suppressed adequately, arrange a shielding curtain around the center, or deploy a radio wave absorber.

(C) State of Radio Under Test

Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

(a) Set the radio under test on a rotating stand and check if any spectrum within a specified frequency range.

(b) Tune the spectrum analyzer with one given frequency component from the spectrum ascertained in (a).

(c) Vertically polarize the measurement antenna.

(d) Rotate the stand and obtain the maximum reading of the spurious power.

(e) Vary the measurement antenna height between 1 meter to 4 meters above the ground for the maximum reading of the spurious power .

(f) Repeat Steps (d) and (e) until the maximum reading does not increase any more, and record the frequency, the maximum reading of the spurious power and measurement antenna height at this point.

(g) Horizontally polarize the measurement antenna, and repeat steps (d) - (f).

(h) Perform steps (b) - (g) for all the frequency components determined in step (a).

(i) Replace the radio under test with a reference antenna fed by an RF signal generator.

(j) Tune the reference antenna to the frequency component measured in step (f).

(k) Vertically polarize both the reference antenna and the measurement antenna.

(l) Vary the measurement antenna height between 1 meter and 4 meters above the ground and adjust the output level of the RF signal generator so that the maximum reading of the spectrum analyzer obtained during this antenna adjustment matches the maximum value obtained in step (f). Record the output level of the RF signal generator and the height of the measurement antenna at this point.

(m) Horizontally polarize both the reference antenna and the measurement antenna and repeat step (l).

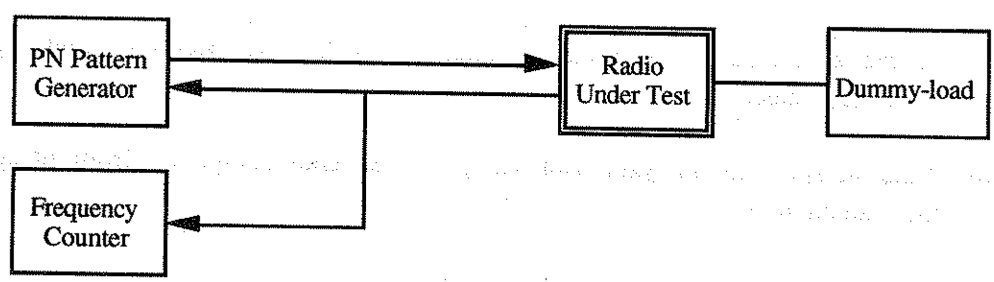
(n) Repeat steps (j) - (m) for all frequency components measured up to step (m).

(E) Computation of Results

Radiated spurious emission is the sum of the output levels of the RF signal generator as obtained in procedure (d), the gain of the reference antenna and the correction for the cable loss between the RF signal generator and the reference antenna.

(7) Accuracy of Data Transmission Rate

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

A frequency counter is to have the resolution one digit higher than the specification of the data transmission rate(clock frequency tolerance).

(C) State of Radio Under Test

Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

Measure the clock frequency of the radio under test.

(E) Computation of Results

Compute the deviation of the measurement in procedure (D) to the nominal value.

(8) Modulation Accuracy

(A) Definition of the modulation Accuracy

If the ideal transmitter output signal is passed through the ideal receive root roll-off filter, then each symbol of the signal is sampled at ideal timing, there is no symbol interference among symbols. However, in an actual transmitter output signal, symbol interference among symbols occurs because the transmission path deviates from the ideal characteristics. The modulation accuracy can be obtained by measuring symbol errors caused by symbol interference. Fig. 6.2-1 illustrates such symbol errors.

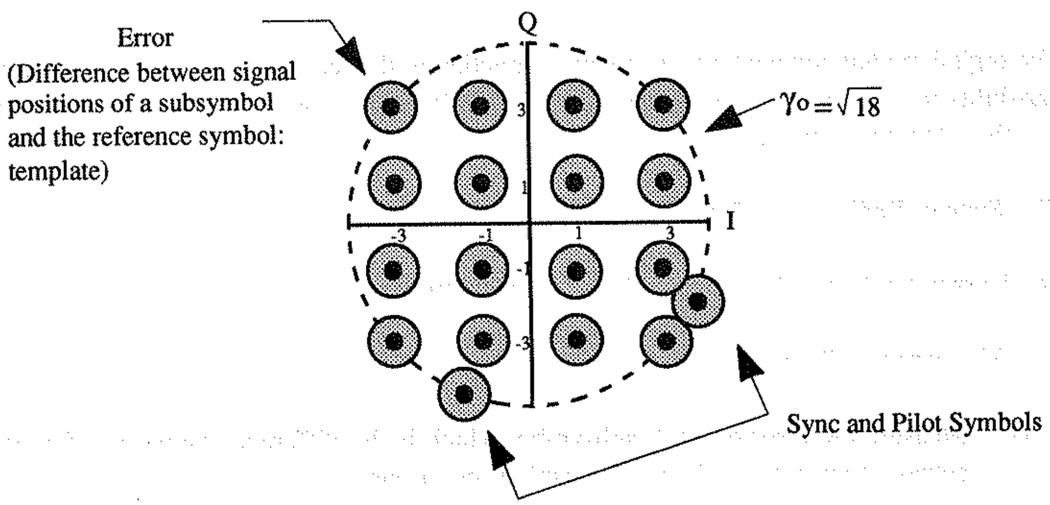


Fig. 6.2-1 Signal Constellation Diagram

The formula defining the modulation accuracy is shown below ;

$$\varepsilon = \frac{\sqrt{\frac{1}{N}\sum_{i=1}^{N}\left| V_{mi}\, \alpha \exp(j\phi) - V_i - V_o \right|^2}}{\gamma_o} \times 100\%$$

where ; i : Subsymbol number

N : Total number of subsymbol for the measurement

Vmi : Vector of i-th subsymbol

Vi : Reference Symbol vector determined by the i-th subsymbol

Vo : Origin offset level

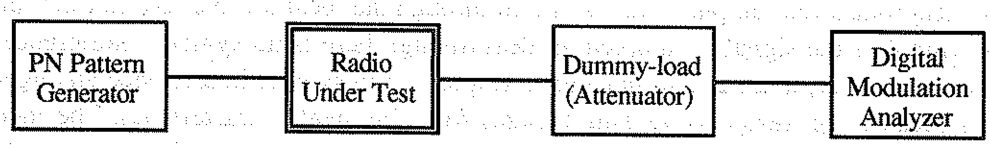
α : Gain parameter(scalar value)

ϕ : Phase parameter (scalar value)

γo : Maximum magnitude of the Signal Constellation Diagram ($\sqrt{18}$).

Unknown parameters Vo, α and ϕ are chosen for the minimum value of the modulation accuracy ε given by the above formula.

(B) Test set-up



(C) Test Equipment Requirements/Conditions

The digital modulation analyzer is to have a function of the receive root roll-off filter, and have capability to measure the root mean square of the difference between actually transmitted signal and the reference symbols.

(D) State of Radio Under Test

Set the radio under test for transmission at the test frequency.

(E) Measurement Procedures

(a) Measure the error on each subsymbol which is the difference between reference and actually transmitted subsymbol positions on the signal constellation plane.

(b) Sum up square of all errors obtained in (a), divide it by the number of subsymbols contained in four subchannels(or number of measured subsymbols), then get its square root. The total number of subsymbols is to be 240.

(9) Subcarrier Frequency Tolerance

I. Frequency Tolerance (Frequency Counter Method)

(A) Test Set-up

Same as (1) I. "Frequency Tolerance (Frequency Counter Method)".

(B) Test Equipment Requirements/Conditions

(a) A frequency counter is to be used as a frequency meter.

(b) The frequency counter has an accuracy to within one-tenth of the frequency tolerance specification by calibrating with a known frequency, or by mixing down the input signal with a known frequency.

(C) State of Radio Under Test

(a) Set the radio under test in a test mode which will output an unmodulated signal from only one of the four subcarriers at a time, but any of the four subcarriers can be selected.

(b) Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

Measure the frequency after warm-up time elapsed.

(E) Other Methods

The frequency of a reference oscillator output can be measured directly if a radio under test is designed such that the frequency accuracy of the reference oscillator is equal to the frequency accuracy of the transmitter output.

II. Frequency Tolerance (Phase Locus Method)

(A) Test Set-up

Same as (1) IV. "Frequency Tolerance (Phase Locus Method)".

(B) Test Equipment Requirements/Conditions

Same as (1) IV. "Frequency Tolerance (Phase Locus Method)".

(C) State of Radio Under Test

Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

Measure the four subcarrier frequencies of the output of the radio under test by the frequency meter.

(10) Subsymbol Timing Synchronization

(A) Test Set-up

Same as (8) "Modulation Accuracy".

(B) Test Equipment Requirements/Conditions

The digital modulation analyzer is to be have the function to detect the best symbol synchronization timing of four subcarriers independently, in addition to the functions for the modulation accuracy measurement.

(C) State of Radio Under Test

Set the radio under test for transmission at the test frequency.

(D) Measurement Procedures

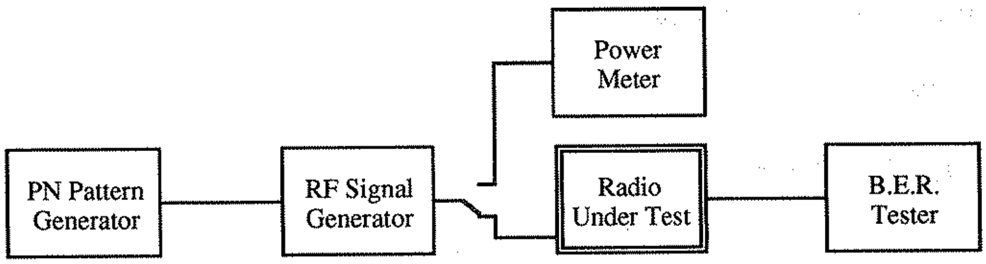
Compute the timing differences among the symbol synchronization timings detected on each subcarrier independently.

6.2.2 Receiver

(1) Receiver Sensitivity

I. Receiver Sensitivity (Static)

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) RF Signal Generator

• Frequency	Specified frequency range
• Stability	Within ±5 x 10^{-8}
• Modulation accuracy	Within 3% of RMS. vector error (recommended value)
• Modulation rate	4 kbaud

(b) Pattern Generator

• Clock accuracy	Within ±1 x 10^{-6}
• Generated pattern	To continuously generate the standard coded test signals (511-bit Binary Pseudo Random Noise Sequence based on CCITT V.52) in user specific channels. As well, must generate specified patterns as required for communication in other channels.

(C) State of Radio Under Test

(a) Set the radio under test for reception at the test frequency.

(b) Demodulation data is to be user specific channel portions (the standard coded test signal portions).

(D) Measurement Procedures

(a) Set the frequency of the RF signal generator to the test frequency.

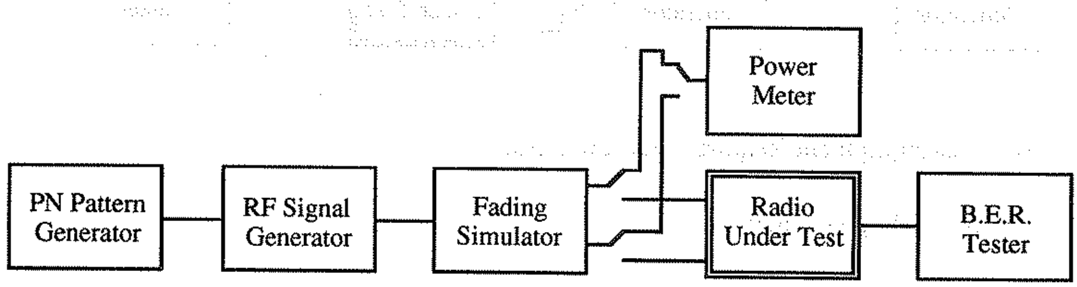
(b) RF signal generator is to transmit continuously or a burst. With the power meter, adjust the RF signal generator outputs to obtain a signal level equal to the standard sensitivity level (static). Then, change switches and apply the signal to the radio under test.

(c) With the BER(bit error rate) tester, accumulate the bit stream in the user specific channels and measure the bit error rate for at least 2556 bits.

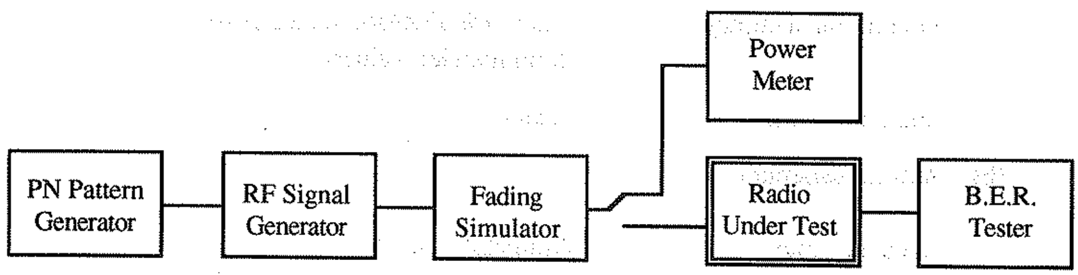
II. Receiver Sensitivity (Faded)

(A) Test Set-up

(a) With Diversity



(b) Without Diversity



(B) Test Equipment Requirements/Conditions

(a) RF Signal Generator

• Frequency	Specified frequency range
• Stability	Within $\pm 5 \times 10^{-8}$
• Modulation accuracy	Within 3% of RMS. vector error (recommended value)
• Modulation rate	4 kbaud

(b) Pattern Generator.

• Clock accuracy	Within $\pm 1 \times 10^{-6}$

- Generated pattern: To continuously generate the standard coded test signals (511-bit Binary Pseudo Random Noise Sequence based on CCITT V.52) in user specific channels. As well, must generate specified patterns as required for communication in other channels.

(c) Fading Simulator

In accordance with IEC Pub. 489-6 Annex C. Maximum Doppler frequency is to be 40 Hz (800 MHz band) and 70 Hz (1.5 GHz band) of Rayleigh fading

(C) State of Radio Under Test

(a) Set the radio under test for reception at the test frequency.

(b) Demodulation data is to be user specific channel portions (the standard coded test signal portions).

(D) Measurement Procedures

(a) Set the frequency of the RF signal generator to the test frequency.

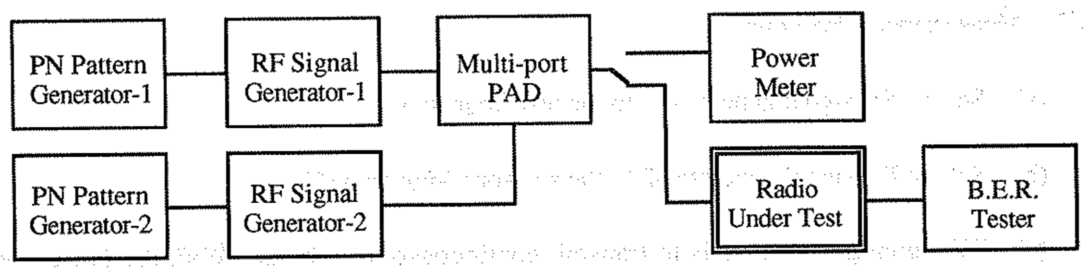
(b) RF signal generator is to transmit continuously or a burst. With the power meter, adjust the RF signal generator output to obtain a signal level equal to the standard sensitivity level (mean value with fading). Then, change switches and apply the signal to the radio under test.

(c) With the BER(bit error rate) tester, accumulate the bit strings in the user specific channels and measure the bit error rate at minimum for the larger of 2556 bits or :

$$\frac{43{,}200 \times \text{Bit Rate (bps)}}{\text{Vehicle Speed (km/h)} \times \text{Test Frequency (MHz)}} \qquad \text{Bit Rate(bps)} : 64{,}000$$

(2) Spurious Response

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) RF Signal Generator-1 and -2

• Frequency	Specified frequency range
• Stability	Within ±5 x 10^{-8}
• Modulation accuracy	Within 3% of RMS. vector error (recommended value)
• Modulation rate	4 kbaud
• Adjacent channel coupled power	86 dB or greater at ± 50 kHz off (recommended value) 87 dB or greater at ± 100 kHz off (recommended value)

(b) Pattern Generator-1

• Clock accuracy	Within ±1 x 10^{-6}
• Generated pattern	To continuously generate the standard coded test signals (511-bit Binary Pseudo Random Noise Sequence based on CCITT V.52) in user specific channels. As well, must generate specified patterns as required for communication in other channels.

(c) Pattern Generator-2

• Clock accuracy	Within ±1 x 10^{-6}
• Generated pattern	To continuously generate digital signals (32,767-bit Binary Pseudo Random Noise Sequence based on CCITT O.151).

(C) State of Radio Under Test

(a) Set the radio under test for reception at the test frequency.

(b) Demodulation data is to be user specific channel portions (standard coded test signal portions).

(D) Measurement Procedures

(a) Set the RF signal generator-1 to the test frequency.

(b) Set the RF signal generator-2 to the spurious frequency(*).

(c) RF signal generator-1 is to transmit continuously or a burst. With the power meter, adjust the output of RF signal generator-1 to obtain a signal level equal to [standard sensitivity + 3 dB].

(d) RF signal generator-2 is to transmit continuously or a burst. With the power meter, adjust the output of RF signal generator-2 to obtain a signal level equal to :

(standard sensitivity + 3 dB) + (spurious response specification) [dBμ]

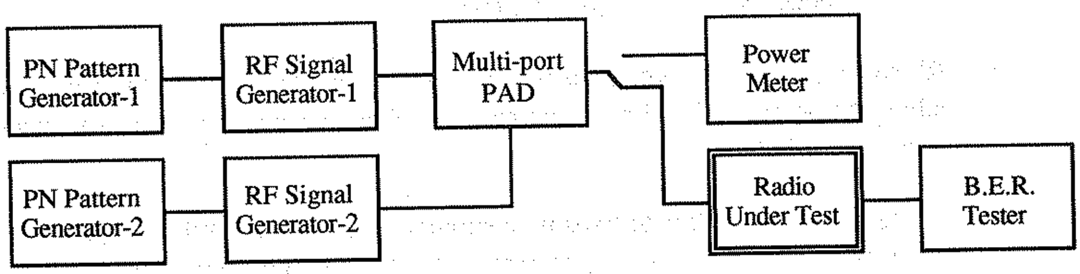
Then, change switches and apply the signal to the radio under test.

(e) With the BER(bit error rate) tester, accumulate the bit strings in the user specific channels and measure the bit error rate for at least 2556 bits.

(*) Spurious frequency is the frequency of undesired signals which degrade a bit error rate and must be ascertained. As one method of measuring this, use a receiver capable of receiving IF frequencies and specify the spurious frequency from the IF level of the radio under test.

(3) Adjacent Channel Selectivity

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) RF Signal Generator-1 and -2

• Frequency	Specified frequency range
• Stability	Within $\pm 5 \times 10^{-8}$
• Modulation accuracy	Within 3% of RMS. vector error (recommended value)
• Modulation rate	4 kbaud
• Adjacent channel coupled power	75 dB or greater at ± 25 kHz off (recommended value)

(b) Pattern Generator-1

• Clock accuracy	Within $\pm 1 \times 10^{-6}$
• Generated pattern	To continuously generate the standard coded test signals (511-bit Binary Pseudo Random Noise Sequence based on CCITT V.52) in user specific channels. As well, must generate specified patterns as required for communication in other channels.

(c) Pattern Generator-2

- Clock accuracy — Within $\pm 1 \times 10^{-6}$
- Generated pattern — To continuously generate digital signals (32,767 -bit Binary Pseudo Random Noise Sequence based on CCITT O.151).

(C) State of Radio Under Test

(a) Set the radio under test for reception at the test frequency.

(b) Demodulation data is to be user specific channel portions (standard coded test signal portions).

(D) Measurement Procedures

(a) Set the frequency of the RF signal generator-1 to the test frequency.

(b) Set the frequency of the RF signal generator-2 to the adjacent channel frequency of the test frequency [+25 kHz (or -25 kHz)].

(c) RF signal generator-1 is to transmit continuously or a burst. With the power meter, adjust the output of RF signal generator-1 to obtain a signal level equal to [standard sensitivity + 3 dB].

(d) RF signal generator-2 is to transmit continuously or a burst. With the power meter, adjust the output of RF signal generator-2 to obtain a signal level equal to :

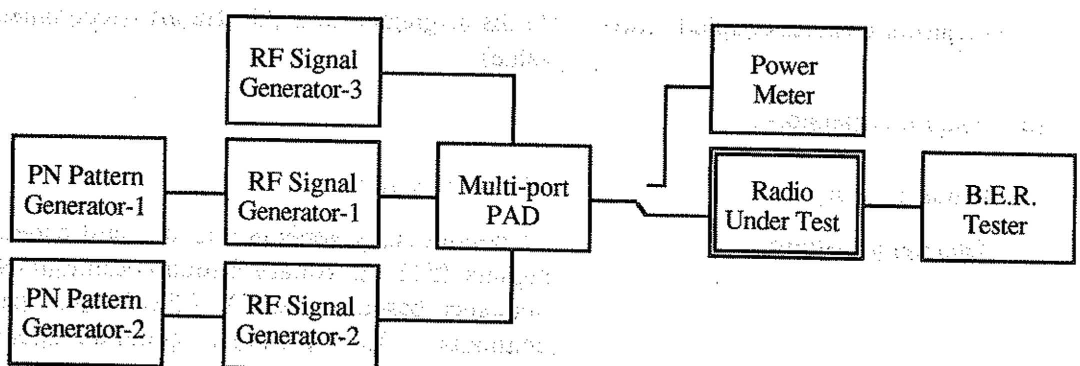
(standard sensitivity + 3 dB) + (adjacent channel selectivity specification) [dBμ]

Then, change switches and apply the signal to the radio under test.

(e) With the BER(bit error rate) tester, accumulate the bit strings in the user specific channels and measure the bit error rate for at least 2556 bits.

(4) Intermodulation characteristics

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) RF Signal Generator-1 and -2

• Frequency	Specified frequency range
• Stability	Within $\pm5 \times 10^{-8}$
• Modulation accuracy	Within 3% of RMS. vector error (recommended value)
• Modulation rate	4 kbaud
• Adjacent channel coupled power	87 dB or greater at ±100 kHz off (recommended value)

(b) RF Signal Generator-3

• Frequency	Specified frequency range
• Stability	Within $\pm5 \times 10^{-8}$
• Adjacent channel coupled power	93 dB or greater at ±50 kHz off (recommended value)

(c) Pattern Generator-1

• Clock accuracy	Within $\pm1 \times 10^{-6}$
• Generated pattern	To continuously generate the standard coded test signals (511-bit Binary Pseudo Random Noise Sequence based on CCITTV.52) in user specific channels. As well, must generate specified patterns as required for communication in other channels.

(d) Pattern Generator-2

• Clock accuracy	Within $\pm1 \times 10^{-6}$
• Generated pattern	To continuously generate digital signals (32,767 -bit Binary Pseudo Random Noise Sequence based on CCITT O.151).

(C) State of Radio Under Test

(a) Set the radio under test for reception at the test frequency.

(b) Demodulation data is to be user specific channel portions (standard coded test signal portions).

(D) Measurement Procedures

(a) Set the frequency of the RF signal generator-1 to the test frequency.

(b) Set the frequency of the RF signal generator-3 to the test frequency +50 kHz (or -50 kHz), and that of the RF signal generator-2 to the test frequency +100 kHz (or -100 kHz).

(c) RF signal generator-1 is to transmit continuously or a burst. With the power meter, adjust the output of RF signal generator-1 to the level equal to [standard sensitivity + 3 dB].

(d) RF signal generator-3 is to transmit continuously or a burst with unmodulated signal and RF signal generator-2 is to transmit continuously. With the power meter, adjust the outputs of RF signal generator-2 and -3 to the level equal to :

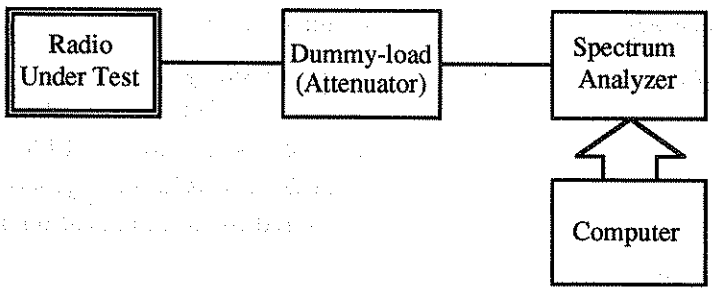
(standard sensitivity + 3 dB) + (intermodulation characteristic specification) [dBμ]

Then, change switches and apply the signal to the radio under test.

(e) With the BER(bit error rate) tester, accumulate the bit strings in the user specific channels and measure the bit error rate for at least 2556 bits.

(5) Conducted Spurious Emission

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

(a) Attenuation of the dummy load(attenuator) is to be approx. 20 dB.

(b) Setting of spectrum analyzer is as follows:

• Center frequency	Conducted spurious frequency
• Sweep frequency bandwidth	0 Hz
• Resolution bandwidth	Approx. 100 kHz
• Video bandwidth	Same as resolution bandwidth
• Y-axis scale	10 dB/div.
• Input level	70 ~ 90 % of full scale for the maximum amplitude; or as large as possible if the amplitude is small.
• Sweep mode	Single sweep

- Sweep time 27 ms or less
- Detect mode Sample mode

(C) State of Radio Under Test

Set the radio under test in reception mode and able to receive at the test frequency.

(D) Measurement Procedures

(a) Conducted Spurious Search

Set up the spectrum analyzer for search operation, ascertain the conducted spurious components within the specified frequency band, then save them.

(b) Center Frequency setting

Set up the spectrum analyzer for strength(power) measurement, then set the center frequency of the spectrum analyzer at the conducted spurious frequency.

(c) Measurement of Power Distribution

Measure the power distribution by the spectrum analyzer with single sweep.

(d) Data Reading

After sweep is finished, read the sampled data into the array variables of the computer. For burst emission, include all sampled data within a burst segment; for a continuous emission, include all sampled data within the sweep segment.

(e) Antilogarithm Conversion

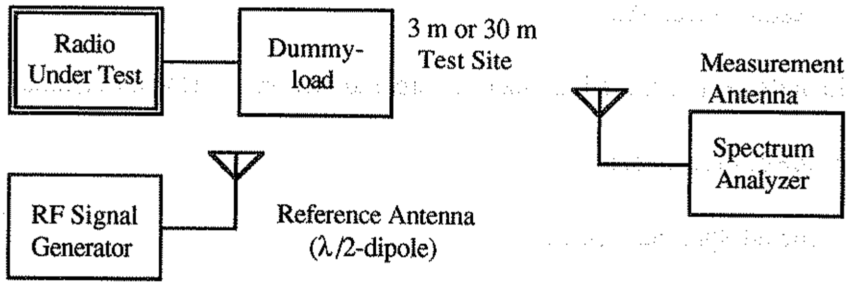
Convert the read data in dBm to the anti-log of power dimension(Watt)

(f) Averaging Power

Average the converted anti-log data to obtain average power values. For burst emission, data within bursts are averaged; for a continuous emission data within sweep segments are averaged. Sampling intervals are the reciprocal of twice of the frequency difference between outer subcarriers(36 kHz), or less.

(6) Radiated Spurious Emission

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

Same as 6.2.1 (6) "Radiated Spurious Emission(Transmitter) (B)."

(C) State of Radio Under Test

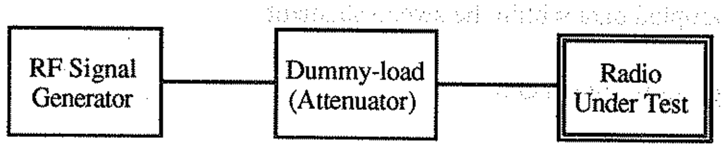
Set the radio under test for reception at the test frequency.

(D) Measurement Procedures

Same as 6.2.1 (6) "Radiated Spurious Emission(Transmitter) (D)."

(7) Burst Reception Timing

(A) Test Set-up



(B) Test Equipment Requirements/Conditions

The RF signal generator must be capable to simulate a mobile station to the radio under test. The RF signal generator is capable to generate a subslot burst signal and its timing can be changed with respect to the reference timing for the burst reception by changing particular parameters.

(C) State of Radio Under Test

Set the radio under test in normal operation.

(D) Measurement Procedures

The subslot burst signal generated with the RF signal generator is applied to the radio under test, then the burst timing is changed with respect to the reference timing for the burst reception. Ascertain the normal reception of the burst signal.

Chapter7 Glossary

511 bit Binary Pseudo Random Noise Sequence	A PN pattern whose pattern interval is $2^9 - 1 = 511$ bits long which can be generated by a 9 stage shift register.
ACCH	Associated Control Channel(ACCH) See page 11 and 42.
AGC	Automatic Gain Control (AGC)
AGC Preamble	See page 24 and page 25.
Basic Frame	A Frame is a collection of repeated digit time slots. In the digital MCA system, 90ms of frame length, is defined as a Basic Frame.
Basic Slot	See page 36 *Cf. Subslot (7.5ms slot)*
BCCH	Broadcast Control Channel (BCCH) See page 10 and 41.
Bit Interleave	To improve burst error correction capability, a series of transmitted data bits are re-arranged to change the transmission order; Bit Interleave refers to this re-arrangement of the bit series.
Burst (signal)	An inbound signal from a mobile or control station to the repeater station which is transmitted within a specifically assigned slot.
CAC	A Common Access Channel (CAC) See page 10 and 41.
Carrier	A Carrier is a wave carrying information or a signal.
CCCH	A Common Control Channel (CCCH) See page 10 and 41.
Channel	A Signal path used for information transmission. *Cf. Physical Channel , Logical Channel.*
Channel Coding	Process to perform error detection coding, error correction coding, etc. on the information codes to be transmitted.
Communication Carrier	See page 5 and 35.
Communication Channel	See page 5 and 36.

Control Carrier	See page 5 and 35.
Control Channel	See page 5 and 35.
CRC	Cyclic Redundancy Check (CRC) is one error detection code in which received data, expressed in polynomial format, is divided by a generated polynomial and the received error is judged depending on the remainder status of the quotient.
FACCH	Fast Associated Control Channel (FACCH) See page 11 and 42.
FILL	Bits added to make the number of bits within an inbound and outbound slot the same.
Fleet	See page 3.
Frame	See page 36
Functional Channel	See page 41
Guard Time	Guard Time is a time element at the edge of a slot defined to prevent the collision of burst signals from different sources in adjacent slots.
ID	See page 7.
Interleave	Bit Interleave
Link Channel	See Link Channel Number.
Link Channel Number	A Link Channel Number (LCN) is the logical channel number used by the repeater station for transmission control and management. The numbers ranging from 1 through 1023 are used for LCNs. The LCN is managed independently on a repeater station basis. When the call involves more then one repeater station (Inter-zone calls), different LCN can be used by individual repeater stations. The repeater station assigns a LCN to a call every time the call is initiated and releases the LCN when the call is terminated. The mobile stations involved in the call use the LCN to confirm link set-up and scrambling. Repeater stations must manage the LCN to avoid duplicate assignments.
Logical Channel	A Logical Channel is a conceptual channel associated with its function.
M16QAM	Multi Subcarrier 16 Quadrature Amplitude Modulation (M16QAM) is the modulation scheme using M subcarriers to make the symbol rate slower. The transmission characteristics are improved against

	delay spread, maintaining the high modulation efficiency of 16QAM.
Mapping	To specify the relation between transmit data bits and their symbol position (symbol and subcarrier numbers). Also, arranging information to be transmitted into a data series (the relation between functional channels and slot format).
Octet(8-bit word)	Transmission data bits are divided into 8 bit words, and each 8 bit word is referred to as an Octet (or an 8-bit word).
Physical Channel	A Channel in which basic items such as the transmission scheme of the electrical signal and the start up procedure at initialization, etc. are specified. It corresponds to the Layer-1.
Physical Slot	Each slot defined on a Radio Carrier. See page 25.
Pilot Symbol	See page 20.
PSDN	Packet Switched Data Network.
PSTN	Public Switched Telephone Network.
Radio Channel	In a TDM/TDMA system, the physical channel is specified by a pair of inbound and outbound Radio Carrier frequencies and a common slot number in the TDM (Outbound) and TDMA (Inbound) frames. In the Digital MCA system, the physical channel specified as above is called a Radio Channel distinguishing it from Logical Channels such as the CAC (Common Access Channel) and the USC (User Specific Channel).
RCCH	Radio Control Channel (RCCH) See page 11 and 42.
Repetitive transmission	Control signal transmission method in which the repeater station sends an outbound call CCCH message multiple times within a certain time periods.
Retry	Re-transmission of an Inbound signal in cases when the inbound signal did not reach the repeater station. The reception rate of inbound signals is therefore increased. *Cf. CCCH Repetition*
Roll-off Factor	A numerical value indicating Low Pass Filter (LPF) characteristics. The LPF provides a perfect characteristic (square in the frequency domain) when the Roll-off factor equals 0, and the LPF passes high frequency components most when it equals 1.

Root Nyquist Characteristic	Square root of Nyquist Characteristic.
SACCH	Slow Associated Control Channel (SACCH) See page 11 and 42.
Scramble	A method to randomize the code sequence using a PN code or other technique. It avoids energy concentration caused by a series of constant signal patterns or by a series of repetitive input data sequences, or by loss of the timing signal during data transmission. This also secures messages from hearing by unintended personnel. At the receiving end, the data sequence is recovered by de-scrambling the received data sequence by the inverse of the scrambling method.
Slot	See page 12, 35 and 36.
Slot Signal	M16QAM signal transmitted within a slot comprising Sync, Pilot and Data symbols. Slot signal means outbound signal unless otherwise specified.
Slot Synchronization	To find slot boundaries in a series of slot signals or the Sync Symbol sequence of a burst signal. At a mobile station, it implies being able to identify inbound slot/subslot timing based on outbound slot timing.
Subcarrier	Modulation carriers within a channel (transmission bandwidth) other than main carrier (Center frequency).
Subscriber Unit Code	See page 13. Cf. ID.
Subslot	See page 36.
Subsymbol	See page 20 and 23.
Super Frame	See page 36 and 46.
Symbol	See page 20.
Symbol Synchronization	Adjustment of sampling point of received signal which transmits 16 bits of information per symbol. More practically, each of four subsymbol frequency is adjusted for sampling, and then the signal is demodulated by sampling amplitude and phase elements.
Sync Symbols	See page 20.

System Parameters	The information which specifies system operating conditions of the repeater station. The system parameters are categorized into two types. One is channel information which comprises registered communication channel numbers, registered control channel numbers, acting control channel numbers. The other is system information which comprises registered Fleet IDs, System codes, Maximum busy-queue length, numbers and interval of control signal transmission.
TCH	Traffic Channel (TCH) is one of the Functional Channels. TCH is a bi-directional channel used for end-to-end transfer of user information.
TDM (system)	Time Division Multiplex.
TDMA (system)	Time Division Multiple Access.
Time Alignment Control	A control method in which a mobile or a control station advances transmission timing corresponding to the propagation delay when it transmits an inbound signal to the repeater station.
Total Operating Performance Test Equipment	Test equipment which comprises radio and control sections qualified to meet the standard specification which has the capability to simulate the functions of a repeater station for a mobile or control station under test. Various parameters (frequencies, control commands) can be programmed for the tests.
UPCH	A User Packet Channel (UPCH) See page 11 and 42.
USC	A User Specific Channel (USC) See page 10 and 42.
User Access Permitted Mode	User Access Permitted mode is one receive mode of the repeater station in which random access is permitted for the user (comprising one or more of mobile stations) in the Individually-assigned Slot which is assigned to the user. In this mode, only Subslots with guard time for propagation delay can be used.
Window Function	A mathematical function to control the envelope of the burst to make steep rising and falling edges of the burst smooth so that interference to the adjacent channels is avoided.

Annex-1

Application of AGC Preamble Signal for Phase Control of a Linearizer

As the digital MCA system adopts the large zone configuration, the interference by a mobile station locating near the repeater station to a mobile station locating far from the repeater station becomes more significant. Coping with these problems, this standard specification specified the adjacent channel coupled power as -55 dB or less. To meet this, it is necessary to set the design goal of the radio equipment design around -60 dB, accordingly a linearizer is considered to be required.

To achieve -60 dB of the adjacent channel power with current technology level, the Cartesian loop may be the common method to realize. The linearizer needs to operate over all power control range since non-linear distortion is caused at both large and small amplitude when a power amplifier with class A or class AB is used for a power ampifier stage.

The problems to implement the Cartecian loop are distortion removal of the detection subsystem and phase control of the feedback subsystem. Especially when phase control of the feedback subsystem is imperfect, instability of the linearizer operation due to cross-coupling of I and Q channels and / or degradation of the linearizer performance due to gain reduction may be resulted even if 6 dB/oct of the correction factor is applied.

As a mobile station of the digital MCA system transmits a burst, the transmission starts under the condition phase relation is not controlled, and the transmission signal must meet the adjacent channel coupled power specification during a burst. One effective method to meet this requirement is to transmit non-modulated carrier signal at the beginning of the transmission. Once the feedback phase is aligned while the non-modulated carrier signal is being transmitted, further phase control is considered not to be required during the successive 15 ms burst transmission.

Consequently, the AGC preamble signal of the mobile station can be used for phase control of such linearizer.

Compensation Method of Fading Distortion

On the radio channels of the land mobile communications like the digital MCA system, the envelop of the received signals varies significantly due to the fading so that the compensation of the fading distortion is required when applying the high efficiency multi-level modulation system transmitting information on the envelop of the signal like the M16QAM to the land mobile communications.

It is the common method to compensate the fading distortion by the followings. At the transmitting end, the signal is transmitted inserting the known symbols (pilot symbols) to measure the fading distortion into the information symbols periodically. At the receiving end, the pilot symbols are extracted from the series of the received symbols, measured the fading distortion at pilot symbol positions, then estimated and compensated the fading distortion at the information symbols based on the measured fading distortion.

In this system, the pilot symbols are to be inserted periodically to recover the reference phase. The accuracy of the reference phase signal directly affects the bit error rate so that the reference phase must be recovered precisely even under the environment the thermal noise and dynamic phase variation of fading exist. The symbol rate is 4 ksps (kilo symbol per second) and the pilot symbols are inserted every 8 symbols, accordingly the frequency of the pilot symbols is 500 Hz. By the sampling theorem, the fading distortion up to 250 Hz can be reproduced precisely if the ideal filter is used and there is no thermal noise.

There may be the following technical choices in implementing the compensation of the fading distortion.

1 Processing Order of the Compensation of the Fading Channel and the Matched Filter

The demodulation of the received signal under the faded environment is composed of the following processes in order ; detecting the frequency offset and the time domain variation of the reference vector, removing them from the received signal, then applying the matched filter. However, this method increases the number of operations, and the following three simplified methods may be considered as alternatives.

(1) All the signals(data and pilot symbols) are matched filtered first, so that the reference vectors are detected from the pilot symbols, then the fading channel is compensated and the received signal is demodulated.

(2) The pilot symbols are matched filtered first to detect the reference vectors (estimation of the fading channel), the fading channel on which the data symbols are sent is compensated, then the received signal is matched filtered and demodulated.

(3) In the method (2), following processes on the pilot symbols are repeated ; matched filtering, reference vector estimation, and fading channel compensation. Then the received signal is demodulated.

The method (1) requires the smallest number of operations so that the sampled data can be compressed with the real time matched filtering, consequently required memory size gets small.

The method (2) has the processing order of the matched filtering on the data symbols after the fading channel compensation so that the better bit error rate is expected, compared to the method (1). However, it requires to store all sampled data within a burst(or slot), accordingly the larger memory size is required.

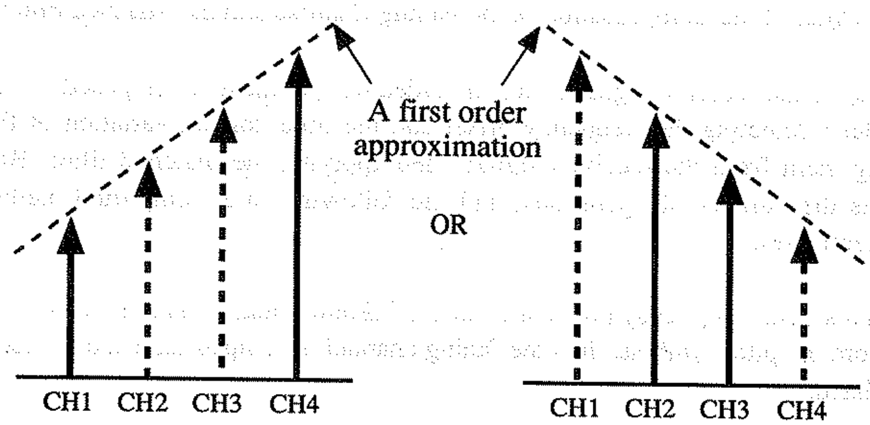
The method (3) requires the largest number of operations but the best performance can be obtained.

2 Pilot Signal Interpolation among Subcarriers

In case of the flat fading, the signal phase of each subcarrier is affected evenly. It is possible to obtain same effect as the pilot symbols are arranged with half of the interval, when transmitting the signal with the pilot symbols arranged as specified in Chapter 4 "Communication Control System" of this standard at the transmission end, and referring the pilot symbols on the adjacent subcarriers at the reception end. Consequently the demodulation performance under flat fading can be improved.

However, in case of the frequency selective fading, the phase correlation among subcarriers degrades from that of the flat fading. The demodulation performance (even at 2.5 μs of R.M.S. delay spread) deteriorates, when referring the pilot symbols on other subcarriers as it is.

One method avoiding this is to interpolate/extrapolate the other two subcarriers by the first order approximation using a pair of pilot symbols arranged on the outer or inner subcarriers of four subcarriers on the frequency domain. Consequently, the reference phase of the other two subcarriers can be presumed.



Pilot Signal Interpolation on the Frequency Domain

Bit Mapping Table

1 Outline

This annex supplements the description regarding the data bit mapping methods of each functional channel to physical channels prescribed in Section 4.2.6 “Channel Coding”.

2 Bit Mapping Table

The mapping methods into data bits of the common-use slots and the individually assigned slots of each functional channel are shown in Table 3-1 to 3-7.

Each attached table gives the number X1 ~ Xnnn to bit streams of each functional channel after the scrambling procedure and also expresses the bit mapping method of each bit to data bit streams D1 ~ Dnnn of each physical slot.

Table 3-1 Outbound Common Use Slot Data Bit Mapping (1/4)

D	Mapping	D	Mapping	D	Mapping	D	Mapping	D	Mapping
1	a001	41	a101	81	a091	121	b065	161	c041
2	a002	42	a102	82	a092	122	b066	162	c042
3	a017	43	a007	83	a107	123	b081	163	c057
4	a018	44	a008	84	a108	124	b082	164	c058
5	a033	45	a023	85	a013	125	b097	165	c073
6	a034	46	a024	86	a014	126	b098	166	c074
7	a049	47	a039	87	a029	127	b113	167	c089
8	a050	48	a040	88	a030	128	b114	168	c090
9	a065	49	a055	89	a045	129	b129	169	c105
10	a066	50	a056	90	a046	130	b130	170	c106
11	a081	51	a071	91	a061	131	b145	171	c121
12	a082	52	a072	92	a062	132	b146	172	c122
13	a097	53	a087	93	a077	133	b161	173	c137
14	a098	54	a088	94	a078	134	b162	174	c138
15	a003	55	a103	95	a093	135	b177	175	c153
16	a004	56	a104	96	a094	136	b178	176	c154
17	a019	57	a009	97	a109	137	b193	177	c169
18	a020	58	a010	98	a110	138	b194	178	c170
19	a035	59	a025	99	a015	139	b209	179	c185
20	a036	60	a026	100	a016	140	b210	180	c186
21	a051	61	a041	101	a031	141	b225	181	c201
22	a052	62	a042	102	a032	142	b226	182	c202
23	a067	63	a057	103	a047	143	b241	183	c217
24	a068	64	a058	104	a048	144	b242	184	c218
25	a083	65	a073	105	a063	145	b257	185	c233
26	a084	66	a074	106	a064	146	b258	186	c234
27	a099	67	a089	107	a079	147	b273	187	c249
28	a100	68	a090	108	a080	148	b274	188	c250
29	a005	69	a105	109	a095	149	b289	189	c265
30	a006	70	a106	110	a096	150	b290	190	c266
31	a021	71	a011	111	a111	151	b305	191	c281
32	a022	72	a012	112	a112	152	b306	192	c282
33	a037	73	a027	113	b001	153	b321	193	c297
34	a038	74	a028	114	b002	154	b322	194	c298
35	a053	75	a043	115	b017	155	b337	195	c313
36	a054	76	a044	116	b018	156	b338	196	c314
37	a069	77	a059	117	b033	157	c009	197	c329
38	a070	78	a060	118	b034	158	c010	198	c330
39	a085	79	a075	119	b049	159	c025	199	b003
40	a086	80	a076	120	b050	160	c026	200	b004

a:RCCH1, b:RCCH2+BCCH/CCCH/UPCH-F, c:RCCH2+BCCH/CCCH/UPCH-B

Table 3-1 Outbound Common Use Slot Data Bit Mapping (2/4)

D	Mapping	D	Mapping	D	Mapping	D	Mapping	D	Mapping
201	b019	241	b339	281	c315	321	b293	361	c269
202	b020	242	b340	282	c316	322	b294	362	c270
203	b035	243	c011	283	c331	323	b309	363	c285
204	b036	244	c012	284	c332	324	b310	364	c286
205	b051	245	c027	285	b005	325	b325	365	c301
206	b052	246	c028	286	b006	326	b326	366	c302
207	b067	247	c043	287	b021	327	b341	367	c317
208	b068	248	c044	288	b022	328	b342	368	c318
209	b083	249	c059	289	b037	329	c013	369	c333
210	b084	250	c060	290	b038	330	c014	370	c334
211	b099	251	c075	291	b053	331	c029	371	b007
212	b100	252	c076	292	b054	332	c030	372	b008
213	b115	253	c091	293	b069	333	c045	373	b023
214	b116	254	c092	294	b070	334	c046	374	b024
215	b131	255	c107	295	b085	335	c061	375	b039
216	b132	256	c108	296	b086	336	c062	376	b040
217	b147	257	c123	297	b101	337	c077	377	b055
218	b148	258	c124	298	b102	338	c078	378	b056
219	b163	259	c139	299	b117	339	c093	379	b071
220	b164	260	c140	300	b118	340	c094	380	b072
221	b179	261	c155	301	b133	341	c109	381	b087
222	b180	262	c156	302	b134	342	c110	382	b088
223	b195	263	c171	303	b149	343	c125	383	b103
224	b196	264	c172	304	b150	344	c126	384	b104
225	b211	265	c187	305	b165	345	c141	385	b119
226	b212	266	c188	306	b166	346	c142	386	b120
227	b227	267	c203	307	b181	347	c157	387	b135
228	b228	268	c204	308	b182	348	c158	388	b136
229	b243	269	c219	309	b197	349	c173	389	b151
230	b244	270	c220	310	b198	350	c174	390	b152
231	b259	271	c235	311	b213	351	c189	391	b167
232	b260	272	c236	312	b214	352	c190	392	b168
233	b275	273	c251	313	b229	353	c205	393	b183
234	b276	274	c252	314	b230	354	c206	394	b184
235	b291	275	c267	315	b245	355	c221	395	b199
236	b292	276	c268	316	b246	356	c222	396	b200
237	b307	277	c283	317	b261	357	c237	397	b215
238	b308	278	c284	318	b262	358	c238	398	b216
239	b323	279	c299	319	b277	359	c253	399	b231
240	b324	280	c300	320	b278	360	c254	400	b232

a:RCCH1, b:RCCH2+BCCH/CCCH/UPCH-F, c:RCCH2+BCCH/CCCH/UPCH-B

Table 3-1 Outbound Common Use Slot Data Bit Mapping (3/4)

D	Mapping	D	Mapping	D	Mapping	D	Mapping	D	Mapping
401	b247	441	c223	481	b201	521	c177	561	b155
402	b248	442	c224	482	b202	522	c178	562	b156
403	b263	443	c239	483	b217	523	c193	563	b171
404	b264	444	c240	484	b218	524	c194	564	b172
405	b279	445	c255	485	b233	525	c209	565	b187
406	b280	446	c256	486	b234	526	c210	566	b188
407	b295	447	c271	487	b249	527	c225	567	b203
408	b296	448	c272	488	b250	528	c226	568	b204
409	b311	449	c287	489	b265	529	c241	569	b219
410	b312	450	c288	490	b266	530	c242	570	b220
411	b327	451	c303	491	b281	531	c257	571	b235
412	b328	452	c304	492	b282	532	c258	572	b236
413	b343	453	c319	493	b297	533	c273	573	b251
414	b344	454	c320	494	b298	534	c274	574	b252
415	c015	455	c335	495	b313	535	c289	575	b267
416	c016	4564	c336	496	b314	536	c290	576	b268
417	c031	57	b009	497	b329	537	c305	577	b283
418	c032	458	b010	498	b330	538	c306	578	b284
419	c047	459	b025	499	c001	539	c321	579	b299
420	c048	460	b026	500	c002	540	c322	580	b300
421	c063	461	b041	501	c017	541	c337	581	b315
422	c064	462	b042	502	c018	542	c338	582	b316
423	c079	463	b057	503	c033	543	b011	583	b331
424	c080	464	b058	504	c034	544	b012	584	b332
425	c095	465	b073	505	c049	545	b027	585	c003
426	c096	466	b074	506	c050	546	b028	586	c004
427	c111	467	b089	507	c065	547	b043	587	c019
428	c112	468	b090	508	c066	548	b044	588	c020
429	c127	469	b105	509	c081	549	b059	589	c035
430	c128	470	b106	510	c082	550	b060	590	c036
431	c143	471	b121	511	c097	551	b075	591	c051
432	c144	472	b122	512	c098	552	b076	592	c052
433	c159	473	b137	513	c113	553	b091	593	c067
434	c160	474	b138	514	c114	554	b092	594	c068
435	c175	475	b153	515	c129	555	b107	595	c083
436	c176	476	b154	516	c130	556	b108	596	c084
437	c191	477	b169	517	c145	557	b123	597	c099
438	c192	478	b170	518	c146	558	b124	598	c100
439	c207	479	b185	519	c161	559	b139	599	c115
440	c208	480	b18	520	c162	560	b140	600	c116

a:RCCH1, b:RCCH2+BCCH/CCCH/UPCH-F, c:RCCH2+BCCH/CCCH/UPCH-B

Table 3-1 Outbound Common Use Slot Data Bit Mapping (4/4)

D	Mapping	D	Mapping	D	Mapping	D	Mapping	D	Mapping
601	c131	641	b109	681	c085	721	b063	761	c039
602	c132	642	b110	682	c086	722	b064	762	c040
603	c147	643	b125	683	c101	723	b079	763	c055
604	c148	644	b126	684	c102	724	b080	764	c056
605	c163	645	b141	685	c117	725	b095	765	c071
606	c164	646	b142	686	c118	726	b096	766	c072
607	c179	647	b157	687	c133	727	b111	767	c087
608	c180	648	b158	688	c134	728	b112	768	c088
609	c195	649	b173	689	c149	729	b127	769	c103
610	c196	650	b174	690	c150	730	b128	770	c104
611	c211	651	b189	691	c165	731	b143	771	c119
612	c212	652	b190	692	c166	732	b144	772	c120
613	c227	653	b205	693	c181	733	b159	773	c135
614	c228	654	b206	694	c182	734	b160	774	c136
615	c243	655	b221	695	c197	735	b175	775	c151
616	c244	656	b222	696	c198	736	b176	776	c152
617	c259	657	b237	697	c213	737	b191	777	c167
618	c260	658	b238	698	c214	738	b192	778	c168
619	c275	659	b253	699	c229	739	b207	779	c183
620	c276	660	b254	700	c230	740	b208	780	c184
621	c291	661	b269	701	c245	741	b223	781	c199
622	c292	662	b270	702	c246	742	b224	782	c200
623	c307	663	b285	703	c261	743	b239	783	c215
624	c308	664	b286	704	c262	744	b240	784	c216
625	c323	665	b301	705	c277	745	b255	785	c231
626	c324	666	b302	706	c278	746	b256	786	c232
627	c339	667	b317	707	c293	747	b271	787	c247
628	c340	668	b318	708	c294	748	b272	788	c248
629	b013	669	b333	709	c309	749	b287	789	c263
630	b014	670	b334	710	c310	750	b288	790	c264
631	b029	671	c005	711	c325	751	b303	791	c279
632	b030	672	c006	712	c326	752	b304	792	c280
633	b045	673	c021	713	c341	753	b319	793	c295
634	b046	674	c022	714	c342	754	b320	794	c296
635	b061	675	c037	715	b015	755	b335	795	c311
636	b062	676	c038	716	b016	756	b336	796	c312
637	b077	677	c053	717	b031	757	c007	797	c327
638	b078	678	c054	718	b032	758	c008	798	c328
639	b093	679	c069	719	b047	759	c023	799	c343
640	b094	680	c070	720	b048	760	c024	800	c344

a:RCCH1, b:RCCH2+BCCH/CCCH/UPCH-F, c:RCCH2+BCCH/CCCH/UPCH-B

Table 3-2 Inbound Common Use Slot Data Bit Mapping (1/2)

D	Mapping	D	Mapping	D	Mapping	D	Mapping	D	Mapping
1	a001	41	a099	81	a197	121	a073	161	a171
2	a002	42	a100	82	a198	122	a074	162	a172
3	a017	43	a115	83	a213	123	a089	163	a187
4	a018	44	a116	84	a214	124	a090	164	a188
5	a033	45	a131	85	a007	125	a105	165	a203
6	a034	46	a132	86	a008	126	a106	166	a204
7	a049	47	a147	87	a023	127	a121	167	a219
8	a050	48	a148	88	a024	128	a122	168	a220
9	a065	49	a163	89	a039	129	a137	169	a013
10	a066	50	a164	90	a040	130	a138	170	a014
11	a081	51	a179	91	a055	131	a153	171	a029
12	a082	52	a180	92	a056	132	a154	172	a030
13	a097	53	a195	93	a071	133	a169	173	a045
14	a098	54	a196	94	a072	134	a170	174	a046
15	a113	55	a211	95	a087	135	a185	175	a061
16	a114	56	a212	96	a088	136	a186	176	a062
17	a129	57	a005	97	a103	137	a201	177	a077
18	a130	58	a006	98	a104	138	a202	178	a078
19	a145	59	a021	99	a119	139	a217	179	a093
20	a146	60	a022	100	a120	140	a218	180	a094
21	a161	61	a037	101	a135	141	a011	181	a109
22	a162	62	a038	102	a136	142	a012	182	a110
23	a177	63	a053	103	a151	143	a027	183	a125
24	a178	64	a054	104	a152	144	a028	184	a126
25	a193	65	a069	105	a167	145	a043	185	a141
26	a194	66	a070	106	a168	146	a044	186	a142
27	a209	67	a085	107	a183	147	a059	187	a157
28	a210	68	a086	108	a184	148	a060	188	a158
29	a003	69	a101	109	a199	149	a075	189	a173
30	a004	70	a102	110	a200	150	a076	190	a174
31	a019	71	a117	111	a215	151	a091	191	a189
32	a020	72	a118	112	a216	152	a092	192	a190
33	a035	73	a133	113	a009	153	a107	193	a205
34	a036	74	a134	114	a010	154	a108	194	a206
35	a051	75	a149	115	a025	155	a123	195	a221
36	a052	76	a150	116	a026	156	a124	196	a222
37	a067	77	a165	117	a041	157	a139	197	a015
38	a068	78	a166	118	a042	158	a140	198	a016
39	a083	79	a181	119	a057	159	a155	199	a031
40	a084	80	a182	120	a058	160	a156	200	a032

a:CCCH/UPCH

Table 3-2 Inbound Common Use Slot Data Bit Mapping (2/2)

D	Mapping
201	a047
202	a048
203	a063
204	a064
205	a079
206	a080
207	a095
208	a096
209	a111
210	a112
211	a127
212	a128
213	a143
214	a144
215	a159
216	a160
217	a175
218	a176
219	a191
220	a192
221	a207
222	a208
223	a223
224	a224

a:CCCH/UPCH

Table 3-3 Outbound Individually Assigned Slot Data Bit Mapping (TCH Transmission Mode) (1/4)

D	Mapping	D	Mapping	D	Mapping	D	Mapping	D	Mapping
601	c131	641	b109	681	c085	721	b063	761	c039
602	c132	642	b110	682	c086	722	b064	762	c040
603	c147	643	b125	683	c101	723	b079	763	c055
604	c148	644	b126	684	c102	724	b080	764	c056
605	c163	645	b141	685	c117	725	b095	765	c071
606	c164	646	b142	686	c118	726	b096	766	c072
607	c179	647	b157	687	c133	727	b111	767	c087
608	c180	648	b158	688	c134	728	b112	768	c088
609	c195	649	b173	689	c149	729	b127	769	c103
610	c196	650	b174	690	c150	730	b128	770	c104
611	c211	651	b189	691	c165	731	b143	771	c119
612	c212	652	b190	692	c166	732	b144	772	c120
613	c227	653	b205	693	c181	733	b159	773	c135
614	c228	654	b206	694	c182	734	b160	774	c136
615	c243	655	b221	695	c197	735	b175	775	c151
616	c244	656	b222	696	c198	736	b176	776	c152
617	c259	657	b237	697	c213	737	b191	777	c167
618	c260	658	b238	698	c214	738	b192	778	c168
619	c275	659	b253	699	c229	739	b207	779	c183
620	c276	660	b254	700	c230	740	b208	780	c184
621	c291	661	b269	701	c245	741	b223	781	c199
622	c292	662	b270	702	c246	742	b224	782	c200
623	c307	663	b285	703	c261	743	b239	783	c215
624	c308	664	b286	704	c262	744	b240	784	c216
625	c323	665	b301	705	c277	745	b255	785	c231
626	c324	666	b302	706	c278	746	b256	786	c232
627	c339	667	b317	707	c293	747	b271	787	c247
628	c340	668	b318	708	c294	748	b272	788	c248
629	b013	669	b333	709	c309	749	b287	789	c263
630	b014	670	b334	710	c310	750	b288	790	c264
631	b029	671	c005	711	c325	751	b303	791	c279
632	b030	672	c006	712	c326	752	b304	792	c280
633	b045	673	c021	713	c341	753	b319	793	c295
634	b046	674	c022	714	c342	754	b320	794	c296
635	b061	675	c037	715	b015	755	b335	795	c311
636	b062	676	c038	716	b016	756	b336	796	c312
637	b077	677	c053	717	b031	757	c007	797	c327
638	b078	678	c054	718	b032	758	c008	798	c328
639	b093	679	c069	719	b047	759	c023	799	c343
640	b094	680	c070	720	b048	760	c024	800	c344

a:RCCH1, b:SACCH, c:FACCH1, d:TCH/FILL

Table 3-3 Outbound Individually Assigned Slot Data Bit Mapping (TCH Transmission Mode) (2/4)

D	Mapping	D	Mapping	D	Mapping	D	Mapping	D	Mapping
201	c003/d085	241	c323/d125	281	c643/d165	321	c277/d203	361	c597/d243
202	c004/d086	242	c324/d126	282	c644/d166	322	c278/d204	362	c598/d244
203	c019/d087	243	c339/d127	283	c659/d167	323	c293/d205	363	c613/d245
204	c020/d088	244	c340/d128	284	c660/d168	324	c294/d206	364	c614/d246
205	c035/d089	245	c355/d129	285	b005	325	c309/d207	365	c629/d247
206	c036/d090	246	c356/d130	286	b006	326	c310/d208	366	c630/d248
207	c051/d091	247	c371/d131	287	c005/d169	327	c325/d209	367	c645/d249
208	c052/d092	248	c372/d132	288	c006/d170	328	c326/d210	368	c646/d250
209	c067/d093	249	c387/d133	289	c021/d171	329	c341/d211	369	c661/d251
210	c068/d094	250	c388/d134	290	c022/d172	330	c342/d212	370	c662/d252
211	c083/d095	251	c403/d135	291	c037/d173	331	c357/d213	371	b007
212	c084/d096	252	c404/d136	292	c038/d174	332	c358/d214	372	b008
213	c099/d097	253	c419/d137	293	c053/d175	333	c373/d215	373	c007/d253
214	c100/d098	254	c420/d138	294	c054/d176	334	c374/d216	374	c008/d254
215	c115/d099	255	c435/d139	295	c069/d177	335	c389/d217	375	c023/d255
216	c116/d100	256	c436/d140	296	c070/d178	336	c390/d218	376	c024/d256
217	c131/d101	257	c451/d141	297	c085/d179	337	c405/d219	377	c039/d257
218	c132/d102	258	c452/d142	298	c086/d180	338	c406/d220	378	c040/d258
219	c147/d103	259	c467/d143	299	c101/d181	339	c421/d221	379	c055/d259
220	c148/d104	260	c468/d144	300	c102/d182	340	c422/d222	380	c056/d260
221	c163/d105	261	c483/d145	301	c117/d183	341	c437/d223	381	c071/d261
222	c164/d106	262	c484/d146	302	c118/d184	342	c438/d224	382	c072/d262
223	c179/d107	263	c499/d147	303	c133/d185	343	c453/d225	383	c087/d263
224	c180/d108	264	c500/d148	304	c134/d186	344	c454/d226	384	c088/d264
225	c195/d109	265	c515/d149	305	c149/d187	345	c469/d227	385	c103/d265
226	c196/d110	266	c516/d150	306	c150/d188	346	c470/d228	386	c104/d266
227	c211/d111	267	c531/d151	307	c165/d189	347	c485/d229	387	c119/d267
228	c212/d112	268	c532/d152	308	c166/d190	348	c486/d230	388	c120/d268
229	c227/d113	269	c547/d153	309	c181/d191	349	c501/d231	389	c135/d269
230	c228/d114	270	c548/d154	310	c182/d192	350	c502/d232	390	c136/d270
231	c243/d115	271	c563/d155	311	c197/d193	351	c517/d233	391	c151/d271
232	c244/d116	272	c564/d156	312	c198/d194	352	c518/d234	392	c152/d272
233	c259/d117	273	c579/d157	313	c213/d195	353	c533/d235	393	c167/d273
234	c260/d118	274	c580/d158	314	c214/d196	354	c534/d236	394	c168/d274
235	c275/d119	275	c595/d159	315	c229/d197	355	c549/d237	395	c183/d275
236	c276/d120	276	c596/d160	316	c230/d198	356	c550/d238	396	c184/d276
237	c291/d121	277	c611/d161	317	c245/d199	357	c565/d239	397	c199/d277
238	c292/d122	278	c612/d162	318	c246/d200	358	c566/d240	398	c200/d278
239	c307/d123	279	c627/d163	319	c261/d201	359	c581/d241	399	c215/d279
240	c308/d124	280	c628/d164	320	c262/d202	360	c582/d242	400	c216/d280

a:RCCH1, b:SACCH, c:FACCH1, d:TCH/FILL

Table 3-3 Outbound Individually Assigned Slot Data Bit Mapping (TCH Transmission Mode) (3/4)

D	Mapping	D	Mapping	D	Mapping	D	Mapping	D	Mapping
401	c231/d281	441	c551/d321	481	c185/d359	521	c505/d399	561	c139/d437
402	c232/d282	442	c552/d322	482	c186/d360	522	c506/d400	562	c140/d438
403	c247/d283	443	c567/d323	483	c201/d361	523	c521/d401	563	c155/d439
404	c248/d284	444	c568/d324	484	c202/d362	524	c522/d402	564	c156/d440
405	c263/d285	445	c583/d325	485	c217/d363	525	c537/d403	565	c171/d441
406	c264/d286	446	c584/d326	486	c218/d364	526	c538/d404	566	c172/d442
407	c279/d287	447	c599/d327	487	c233/d365	527	c553/d405	567	c187/d443
408	c280/d288	448	c600/d328	488	c234/d366	528	c554/d406	568	c188/d444
409	c295/d289	449	c615/d329	489	c249/d367	529	c569/d407	569	c203/d445
410	c296/d290	450	c616/d330	490	c250/d368	530	c570/d408	570	c204/d446
411	c311/d291	451	c631/d331	491	c265/d369	531	c585/d409	571	c219/d447
412	c312/d292	452	c632/d332	492	c266/d370	532	c586/d410	572	c220/d448
413	c327/d293	453	c647/d333	493	c281/d371	533	c601/d411	573	c235/d449
414	c328/d294	454	c648/d334	494	c282/d372	534	c602/d412	574	c236/d450
415	c343/d295	455	c663/d335	495	c297/d373	535	c617/d413	575	c251/d451
416	c344/d296	4564	c664/d336	496	c298/d374	536	c618/d414	576	c252/d452
417	c359/d297	57	b009	497	c313/d375	537	c633/d415	577	c267/d453
418	c360/d298	458	b010	498	c314/d376	538	c634/d416	578	c268/d454
419	c375/d299	459	c009/d337	499	c329/d377	539	c649/d417	579	c283/d455
420	c376/d300	460	c010/d338	500	c330/d378	540	c650/d418	580	c284/d456
421	c391/d301	461	c025/d339	501	c345/d379	541	c665/d419	581	c299/d457
422	c392/d302	462	c026/d340	502	c346/d380	542	c666/d420	582	c300/d458
423	c407/d303	463	c041/d341	503	c361/d381	543	b011	583	c315/d459
424	c408/d304	464	c042/d342	504	c362/d382	544	b012	584	c316/d460
425	c423/d305	465	c057/d343	505	c377/d383	545	c011/d421	585	c331/d461
426	c424/d306	466	c058/d344	506	c378/d384	546	c012/d422	586	c332/d462
427	c439/d307	467	c073/d345	507	c393/d385	547	c027/d423	587	c347/d463
428	c440/d308	468	c074/d346	508	c394/d386	548	c028/d424	588	c348/d464
429	c455/d309	469	c089/d347	509	c409/d387	549	c043/d425	589	c363/d465
430	c456/d310	470	c090/d348	510	c410/d388	550	c044/d426	590	c364/d466
431	c471/d311	471	c105/d349	511	c425/d389	551	c059/d427	591	c379/d467
432	c472/d312	472	c106/d350	512	c426/d390	552	c060/d428	592	c380/d468
433	c487/d313	473	c121/d351	513	c441/d391	553	c075/d429	593	c395/d469
434	c488/d314	474	c122/d352	514	c442/d392	554	c076/d430	594	c396/d470
435	c503/d315	475	c137/d353	515	c457/d393	555	c091/d431	595	c411/d471
436	c504/d316	476	c138/d354	516	c458/d394	556	c092/d432	596	c412/d472
437	c519/d317	477	c153/d355	517	c473/d395	557	c107/d433	597	c427/d473
438	c520/d318	478	c154/d356	518	c474/d396	558	c108/d434	598	c428/d474
439	c535/d319	479	c169/d357	519	c489/d397	559	c123/d435	599	c443/d475
440	c536/d320	480	c170/d358	520	c490/d398	560	c124/d436	600	c444/d476

a:RCCH1, b:SACCH, c:FACCH1, d:TCH/FILL

Table 3-3 Outbound Individually Assigned Slot Data Bit Mapping (TCH Transmission Mode) (4/4)

D	Mapping	D	Mapping	D	Mapping	D	Mapping	D	Mapping
601	c459/d477	641	c093/d515	681	c413/d555	721	c047/d593	761	c367/d633
602	c460/d478	642	c094/d516	682	c414/d556	722	c048/d594	762	c368/d634
603	c475/d479	643	c109/d517	683	c429/d557	723	c063/d595	763	c383/d635
604	c476/d480	644	c110/d518	684	c430/d558	724	c064/d596	764	c384/d636
605	c491/d481	645	c125/d519	685	c445/d559	725	c079/d597	765	c399/d637
606	c492/d482	646	c126/d520	686	c446/d560	726	c080/d598	766	c400/d638
607	c507/d483	647	c141/d521	687	c461/d561	727	c095/d599	767	c415/d639
608	c508/d484	648	c142/d522	688	c462/d562	728	c096/d600	768	c416/d640
609	c523/d485	649	c157/d523	689	c477/d563	729	c111/d601	769	c431/d641
610	c524/d486	650	c158/d524	690	c478/d564	730	c112/d602	770	c432/d642
611	c539/d487	651	c173/d525	691	c493/d565	731	c127/d603	771	c447/d643
612	c540/d488	652	c174/d526	692	c494/d566	732	c128/d604	772	c448/d644
613	c555/d489	653	c189/d527	693	c509/d567	733	c143/d605	773	c463/d645
614	c556/d490	654	c190/d528	694	c510/d568	734	c144/d606	774	c464/d646
615	c571/d491	655	c205/d529	695	c525/d569	735	c159/d607	775	c479/d647
616	c572/d492	656	c206/d530	696	c526/d570	736	c160/d608	776	c480/d648
617	c587/d493	657	c221/d531	697	c541/d571	737	c175/d609	777	c495/d649
618	c588/d494	658	c222/d532	698	c542/d572	738	c176/d610	778	c496/d650
619	c603/d495	659	c237/d533	699	c557/d573	739	c191/d611	779	c511/d651
620	c604/d496	660	c238/d534	700	c558/d574	740	c192/d612	780	c512/d652
621	c619/d497	661	c253/d535	701	c573/d575	741	c207/d613	781	c527/d653
622	c620/d498	662	c254/d536	702	c574/d576	742	c208/d614	782	c528/d654
623	c635/d499	663	c269/d537	703	c589/d577	743	c223/d615	783	c543/d655
624	c636/d500	664	c270/d538	704	c590/d578	744	c224/d616	784	c544/d656
625	c651/d501	665	c285/d539	705	c605/d579	745	c239/d617	785	c559/d657
626	c652/d502	666	c286/d540	706	c606/d580	746	c240/d618	786	c560/d658
627	c667/d503	667	c301/d541	707	c621/d581	747	c255/d619	787	c575/d659
628	c668/d504	668	c302/d542	708	c622/d582	748	c256/d620	788	c576/d660
629	b013	669	c317/d543	709	c637/d583	749	c271/d621	789	c591/d661
630	b014	670	c318/d544	710	c638/d584	750	c272/d622	790	c592/d662
631	c013/d505	671	c333/d545	711	c653/d585	751	c287/d623	791	c607/d663
632	c014/d506	672	c334/d546	712	c654/d586	752	c288/d624	792	c608/d664
633	c029/d507	673	c349/d547	713	c669/d587	753	c303/d625	793	c623/d665
634	c030/d508	674	c350/d548	714	c670/d588	754	c304/d626	794	c624/d666
635	c045/d509	675	c365/d549	715	b015	755	c319/d627	795	c639/d667
636	c046/d510	676	c366/d550	716	b016	756	c320/d628	796	c640/d668
637	c061/d511	677	c381/d551	717	c015/d589	757	c335/d629	797	c655/d669
638	c062/d512	678	c382/d552	718	c016/d590	758	c336/d630	798	c656/d670
639	c077/d513	679	c397/d553	719	c031/d591	759	c351/d631	799	c671/d671
640	c078/d514	680	c398/d554	720	c032/d592	760	c352/d632	800	c672/d672

a:RCCH1, b:SACCH, c:FACCH1, d:TCH/FILL

Table 3-4 Outbound Individually Assigned Slot Data Bit Mapping (UPCH Transmission Mode) (1/4)

D	Mapping	D	Mapping	D	Mapping	D	Mapping	D	Mapping
1	a001	41	a101	81	a091	121	c049/h007	161	c147/h045
2	a002	42	a102	82	a092	122	c050/h008	162	c148/h046
3	a017	43	a007	83	a107	123	c065/h009	163	c163/h047
4	a018	44	a008	84	a108	124	c066/h010	164	c164/h048
5	a033	45	a023	85	a013	125	c081/h011	165	c179/h049
6	a034	46	a024	86	a014	126	c082/h012	166	c180/h050
7	a049	47	a039	87	a029	127	c097/h013	167	c195/h051
8	a050	48	a040	88	a030	128	c098/h014	168	c196/h052
9	a065	49	a055	89	a045	129	c113/h015	169	b005
10	a066	50	a056	90	a046	130	c114/h016	170	b006
11	a081	51	a071	91	a061	131	c129/h017	171	c005/h053
12	a082	52	a072	92	a062	132	c130/h018	172	c006/h054
13	a097	53	a087	93	a077	133	c145/h019	173	c021/h055
14	a098	54	a088	94	a078	134	c146/h020	174	c022/h056
15	a003	55	a103	95	a093	135	c161/h021	175	c037/h057
16	a004	56	a104	96	a094	136	c162/h022	176	c038/h058
17	a019	57	a009	97	a109	137	c177/h023	177	c053/h059
18	a020	58	a010	98	a110	138	c178/h024	178	c054/h060
19	a035	59	a025	99	a015	139	c193/h025	179	c069/h061
20	a036	60	a026	100	a016	140	c194/h026	180	c070/h062
21	a051	61	a041	101	a031	141	b003	181	c085/h063
22	a052	62	a042	102	a032	142	b004	182	c086/h064
23	a067	63	a057	103	a047	143	c003/h027	183	c101/h065
24	a068	64	a058	104	a048	144	c004/h028	184	c102/h066
25	a083	65	a073	105	a063	145	c019/h029	185	c117/h067
26	a084	66	a074	106	a064	146	c020/h030	186	c118/h068
27	a099	67	a089	107	a079	147	c035/h031	187	c133/h069
28	a100	68	a090	108	a080	148	c036/h032	188	c134/h070
29	a005	69	a105	109	a095	149	c051/h033	189	c149/h071
30	a006	70	a106	110	a096	150	c052/h034	190	c150/h072
31	a021	71	a011	111	a111	151	c067/h035	191	c165/h073
32	a022	72	a012	112	a112	152	c068/h036	192	c166/h074
33	a037	73	a027	113	b001	153	c083/h037	193	c181/h075
34	a038	74	a028	114	b002	154	c084/h038	194	c182/h076
35	a053	75	a043	115	c001/h001	155	c099/h039	195	c197/h077
36	a054	76	a044	116	c002/h002	156	c100/h040	196	c198/h078
37	a069	77	a059	117	c017/h003	157	c115/h041	197	b007
38	a070	78	a060	118	c018/h004	158	c116/h042	198	b008
39	a085	79	a075	119	c033/h005	159	c131/h043	199	c007/h079
40	a086	80	a076	120	c034/h006	160	c132/h044	200	c008/h080

a:RCCH1, b:SACCH-F, c:FACCH2-F, d:FILL-F, e:SACCH-B
f:FACCH2-B, g:FILL-B, h:UPCH/FILL-F, i:UPCH/FILL-B

Table 3-4 Outbound Individually Assigned Slot Data Bit Mapping (UPCH Transmission Mode) (2/4)

D	Mapping	D	Mapping	D	Mapping	D	Mapping	D	Mapping
201	c023/h081	241	c121/h119	281	b013	321	c095/h193	361	d025
202	c024/h082	242	c122/h120	282	b014	322	c096/h194	362	d026
203	c039/h083	243	c137/h121	283	c013/h157	323	c111/h195	363	d027
204	c040/h084	244	c138/h122	284	c014/h158	324	c112/h196	364	d028
205	c055/h085	245	c153/h123	285	c029/h159	325	c127/h197	365	d029
206	c056/h086	246	c154/h124	286	c030/h160	326	c128/h198	366	d030
207	c071/h087	247	c169/h125	287	c045/h161	327	c143/h199	367	d031
208	c072/h088	248	c170/h126	288	c046/h162	328	c144/h200	368	d032
209	c087/h089	249	c185/h127	289	c061/h163	329	c159/h201	369	d033
210	c088/h090	250	c186/h128	290	c062/h164	330	c160/h202	370	d034
211	c103/h091	251	c201/h129	291	c077/h165	331	c175/h203	371	d035
212	c104/h092	252	c202/h130	292	c078/h166	332	c176/h204	372	d036
213	c119/h093	253	b011	293	c093/h167	333	c191/h205	373	d037
214	c120/h094	254	b012	294	c094/h168	334	c192/h206	374	d038
215	c135/h095	255	c011/h131	295	c109/h169	335	c207/h207	375	d039
216	c136/h096	256	c012/h132	296	c110/h170	336	c208/h208	376	d040
217	c151/h097	257	c027/h133	297	c125/h171	337	d001	377	d041
218	c152/h098	258	c028/h134	298	c126/h172	338	d002	378	d042
219	c167/h099	259	c043/h135	299	c141/h173	339	d003	379	d043
220	c168/h100	260	c044/h136	300	c142/h174	340	d004	380	d044
221	c183/h101	261	c059/h137	301	c157/h175	341	d005	381	d045
222	c184/h102	262	c060/h138	302	c158/h176	342	d006	382	d046
223	c199/h103	263	c075/h139	303	c173/h177	343	d007	383	d047
224	c200/h104	264	c076/h140	304	c174/h178	344	d008	384	d048
225	b009	265	c091/h141	305	c189/h179	345	d009	385	d049
226	b010	266	c092/h142	306	c190/h180	346	d010	386	d050
227	c009/h105	267	c107/h143	307	c205/h181	347	d011	387	d051
228	c010/h106	268	c108/h144	308	c206/h182	348	d012	388	d052
229	c025/h107	269	c123/h145	309	b015	349	d013	389	d053
230	c026/h108	270	c124/h146	310	b016	350	d014	390	d054
231	c041/h109	271	c139/h147	311	c015/h183	351	d015	391	d055
232	c042/h110	272	c140/h148	312	c016/h184	352	d016	392	d056
233	c057/h111	273	c155/h149	313	c031/h185	353	d017	393	d057
234	c058/h112	274	c156/h150	314	c032/h186	354	d018	394	d058
235	c073/h113	275	c171/h151	315	c047/h187	355	d019	395	d059
236	c074/h114	276	c172/h152	316	c048/h188	356	d020	396	d060
237	c089/h115	277	c187/h153	317	c063/h189	357	d021	397	d061
238	c090/h116	278	c188/h154	318	c064/h190	358	d022	398	d062
239	c105/h117	279	c203/h155	319	c079/h191	359	d023	399	d063
240	c106/h118	280	c204/h156	320	c080/h192	360	d024	400	d064

a:RCCH1, b:SACCH-F, c:FACCH2-F, d:FILL-F, e:SACCH-B
f:FACCH2-B, g:FILL-B, h:UPCH/FILL-F, i:UPCH/FILL-B

Table 3-4 Outbound Individually Assigned Slot Data Bit Mapping (UPCH Transmission Mode) (3/4)

D	Mapping	D	Mapping	D	Mapping	D	Mapping	D	Mapping
401	d065	441	d105	481	f177/i023	521	f053/i059	561	f151/i097
402	d066	442	d106	482	f178/i024	522	f054/i060	562	f152/i098
403	d067	443	d107	483	f193/i025	523	f069/i061	563	f167/i099
404	d068	444	d108	484	f194/i026	524	f070/i062	564	f168/i100
405	d069	445	d109	485	e003	525	f085/i063	565	f183/i101
406	d070	446	d110	486	e004	526	f086/i064	566	f184/i102
407	d071	447	d111	487	f003/i027	527	f101/i065	567	f199/i103
408	d072	448	d112	488	f004/i028	528	f102/i066	568	f200/i104
409	d073	449	d113	489	f019/i029	529	f117/i067	569	e009
410	d074	450	d114	490	f020/i030	530	f118/i068	570	e010
411	d075	451	d115	491	f035/i031	531	f133/i069	571	f009/i105
412	d076	452	d116	492	f036/i032	532	f134/i070	572	f010/i106
413	d077	453	d117	493	f051/i033	533	f149/i071	573	f025/i107
414	d078	454	d118	494	f052/i034	534	f150/i072	574	f026/i108
415	d079	455	d119	495	f067/i035	535	f165/i073	575	f041/i109
416	d080	4564	d120	496	f068/i036	536	f166/i074	576	f042/i110
417	d081	57	e001	497	f083/i037	537	f181/i075	577	f057/i111
418	d082	458	e002	498	f084/i038	538	f182/i076	578	f058/i112
419	d083	459	f001/i001	499	f099/i039	539	f197/i077	579	f073/i113
420	d084	460	f002/i002	500	f100/i040	540	f198/i078	580	f074/i114
421	d085	461	f017/i003	501	f115/i041	541	e007	581	f089/i115
422	d086	462	f018/i004	502	f116/i042	542	e008	582	f090/i116
423	d087	463	f033/i005	503	f131/i043	543	f007/i079	583	f105/i117
424	d088	464	f034/i006	504	f132/i044	544	f008/i080	584	f106/i118
425	d089	465	f049/i007	505	f147/i045	545	f023/i081	585	f121/i119
426	d090	466	f050/i008	506	f148/i046	546	f024/i082	586	f122/i120
427	d091	467	f065/i009	507	f163/i047	547	f039/i083	587	f137/i121
428	d092	468	f066/i010	508	f164/i048	548	f040/i084	588	f138/i122
429	d093	469	f081/i011	509	f179/i049	549	f055/i085	589	f153/i123
430	d094	470	f082/i012	510	f180/i050	550	f056/i086	590	f154/i124
431	d095	471	f097/i013	511	f195/i051	551	f071/i087	591	f169/i125
432	d096	472	f098/i014	512	f196/i052	552	f072/i088	592	f170/i126
433	d097	473	f113/i015	513	e005	553	f087/i089	593	f185/i127
434	d098	474	f114/i016	514	e006	554	f088/i090	594	f186/i128
435	d099	475	f129/i017	515	f005/i053	555	f103/i091	595	f201/i129
436	d100	476	f130/i018	516	f006/i054	556	f104/i092	596	f202/i130
437	d101	477	f145/i019	517	f021/i055	557	f119/i093	597	e011
438	d102	478	f146/i020	518	f022/i056	558	f120/i094	598	e012
439	d103	479	f161/i021	519	f037/i057	559	f135/i095	599	f011/i131
440	d104	480	f162/i022	520	f038/i058	560	f136/i096	600	f012/i132

a:RCCH1, b:SACCH-F, c:FACCH2-F, d:FILL-F, e:SACCH-B
f:FACCH2-B, g:FILL-B, h:UPCH/FILL-F, i:UPCH/FILL-B

Table 3-4 Outbound Individually Assigned Slot Data Bit Mapping (UPCH Transmission Mode) (4/4)

D	Mapping	D	Mapping	D	Mapping	D	Mapping	D	Mapping
601	f027/i133	641	f125/i171	681	g001	721	g041	761	g081
602	f028/i134	642	f126/i172	682	g002	722	g042	762	g082
603	f043/i135	643	f141/i173	683	g003	723	g043	763	g083
604	f044/i136	644	f142/i174	684	g004	724	g044	764	g084
605	f059/i137	645	f157/i175	685	g005	725	g045	765	g085
606	f060/i138	646	f158/i176	686	g006	726	g046	766	g086
607	f075/i139	647	f173/i177	687	g007	727	g047	767	g087
608	f076/i140	648	f174/i178	688	g008	728	g048	768	g088
609	f091/i141	649	f189/i179	689	g009	729	g049	769	g089
610	f092/i142	650	f190/i180	690	g010	730	g050	770	g090
611	f107/i143	651	f205/i181	691	g011	731	g051	771	g091
612	f108/i144	652	f206/i182	692	g012	732	g052	772	g092
613	f123/i145	653	e015	693	g013	733	g053	773	g093
614	f124/i146	654	e016	694	g014	734	g054	774	g094
615	f139/i147	655	f015/i183	695	g015	735	g055	775	g095
616	f140/i148	656	f016/i184	696	g016	736	g056	776	g096
617	f155/i149	657	f031/i185	697	g017	737	g057	777	g097
618	f156/i150	658	f032/i186	698	g018	738	g058	778	g098
619	f171/i151	659	f047/i187	699	g019	739	g059	779	g099
620	f172/i152	660	f048/i188	700	g020	740	g060	780	g100
621	f187/i153	661	f063/i189	701	g021	741	g061	781	g101
622	f188/i154	662	f064/i190	702	g022	742	g062	782	g102
623	f203/i155	663	f079/i191	703	g023	743	g063	783	g103
624	f204/i156	664	f080/i192	704	g024	744	g064	784	g104
625	e013	665	f095/i193	705	g025	745	g065	785	g105
626	e014	666	f096/i194	706	g026	746	g066	786	g106
627	f013/i157	667	f111/i195	707	g027	747	g067	787	g107
628	f014/i158	668	f112/i196	708	g028	748	g068	788	g108
629	f029/i159	669	f127/i197	709	g029	749	g069	789	g109
630	f030/i160	670	f128/i198	710	g030	750	g070	790	g110
631	f045/i161	671	f143/i199	711	g031	751	g071	791	g111
632	f046/i162	672	f144/i200	712	g032	752	g072	792	g112
633	f061/i163	673	f159/i201	713	g033	753	g073	793	g113
634	f062/i164	674	f160/i202	714	g034	754	g074	794	g114
635	f077/i165	675	f175/i203	715	g035	755	g075	795	g115
636	f078/i166	676	f176/i204	716	g036	756	g076	796	g116
637	f093/i167	677	f191/i205	717	g037	757	g077	797	g117
638	f094/i168	678	f192/i206	718	g038	758	g078	798	g118
639	f109/i169	679	f207/i207	719	g039	759	g079	799	g119
640	f110/i170	680	f208/i208	720	g040	760	g080	800	g120

a:RCCH1, b:SACCH-F, c:FACCH2-F, d:FILL-F, e:SACCH-B
f:FACCH2-B, g:FILL-B, h:UPCH/FILL-F, i:UPCH/FILL-B

Table 3-5 Inbound Individually Assigned Slot Data Bit Mapping (TCH / FACCH1) (1/4)

D	Mapping	D	Mapping	D	Mapping	D	Mapping	D	Mapping
1	a001	41	b305/c039	81	b625/c079	121	b259/c117	161	b579/c157
2	a002	42	b306/c040	82	b626/c080	122	b260/c118	162	b580/c158
3	b001/c001	43	b321/c041	83	b641/c081	123	b275/c119	163	b595/c159
4	b002/c002	44	b322/c042	84	b642/c082	124	b276/c120	164	b596/c160
5	b017/c003	45	b337/c043	85	b657/c083	125	b291/c121	165	b611/c161
6	b018/c004	46	b338/c044	86	b658/c084	126	b292/c122	166	b612/c162
7	b033/c005	47	b353/c045	87	a003	127	b307/c123	167	b627/c163
8	b034/c006	48	b354/c046	88	a004	128	b308/c124	168	b628/c164
9	b049/c007	49	b369/c047	89	b003/c085	129	b323/c125	169	b643/c165
10	b050/c008	50	b370/c048	90	b004/c086	130	b324/c126	170	b644/c166
11	b065/c009	51	b385/c049	91	b019/c087	131	b339/c127	171	b659/c167
12	b066/c010	52	b386/c050	92	b020/c088	132	b340/c128	172	b660/c168
13	b081/c011	53	b401/c051	93	b035/c089	133	b355/c129	173	a005
14	b082/c012	54	b402/c052	94	b036/c090	134	b356/c130	174	a006
15	b097/c013	55	b417/c053	95	b051/c091	135	b371/c131	175	b005/c169
16	b098/c014	56	b418/c054	96	b052/c092	136	b372/c132	176	b006/c170
17	b113/c015	57	b433/c055	97	b067/c093	137	b387/c133	177	b021/c171
18	b114/c016	58	b434/c056	98	b068/c094	138	b388/c134	178	b022/c172
19	b129/c017	59	b449/c057	99	b083/c095	139	b403/c135	179	b037/c173
20	b130/c018	60	b450/c058	100	b084/c096	140	b404/c136	180	b038/c174
21	b145/c019	61	b465/c059	101	b099/c097	141	b419/c137	181	b053/c175
22	b146/c020	62	b466/c060	102	b100/c098	142	b420/c138	182	b054/c176
23	b161/c021	63	b481/c061	103	b115/c099	143	b435/c139	183	b069/c177
24	b162/c022	64	b482/c062	104	b116/c100	144	b436/c140	184	b070/c178
25	b177/c023	65	b497/c063	105	b131/c101	145	b451/c141	185	b085/c179
26	b178/c024	66	b498/c064	106	b132/c102	146	b452/c142	186	b086/c180
27	b193/c025	67	b513/c065	107	b147/c103	147	b467/c143	187	b101/c181
28	b194/c026	68	b514/c066	108	b148/c104	148	b468/c144	188	b102/c182
29	b209/c027	69	b529/c067	109	b163/c105	149	b483/c145	189	b117/c183
30	b210/c028	70	b530/c068	110	b164/c106	150	b484/c146	190	b118/c184
31	b225/c029	71	b545/c069	111	b179/c107	151	b499/c147	191	b133/c185
32	b226/c030	72	b546/c070	112	b180/c108	152	b500/c148	192	b134/c186
33	b241/c031	73	b561/c071	113	b195/c109	153	b515/c149	193	b149/c187
34	b242/c032	74	b562/c072	114	b196/c110	154	b516/c150	194	b150/c188
35	b257/c033	75	b577/c073	115	b211/c111	155	b531/c151	195	b165/c189
36	b258/c034	76	b578/c074	116	b212/c112	156	b532/c152	196	b166/c190
37	b273/c035	77	b593/c075	117	b227/c113	157	b547/c153	197	b181/c191
38	b274/c036	78	b594/c076	118	b228/c114	158	b548/c154	198	b182/c192
39	b289/c037	79	b609/c077	119	b243/c115	159	b563/c155	199	b197/c193
40	b290/c038	80	b610/c078	120	b244/c116	160	b564/c156	200	b198/c194

a:SACCH, b:FACCH1, c:TCH

Table 3-5 Inbound Individually Assigned Slot Data Bit Mapping (TCH / FACCH1) (2/4)

D	Mapping	D	Mapping	D	Mapping	D	Mapping	D	Mapping
201	b213/c195	241	b533/c235	281	b167/c273	321	b487/c313	361	b121/c351
202	b214/c196	242	b534/c236	282	b168/c274	322	b488/c314	362	b122/c352
203	b229/c197	243	b549/c237	283	b183/c275	323	b503/c315	363	b137/c353
204	b230/c198	244	b550/c238	284	b184/c276	324	b504/c316	364	b138/c354
205	b245/c199	245	b565/c239	285	b199/c277	325	b519/c317	365	b153/c355
206	b246/c200	246	b566/c240	286	b200/c278	326	b520/c318	366	b154/c356
207	b261/c201	247	b581/c241	287	b215/c279	327	b535/c319	367	b169/c357
208	b262/c202	248	b582/c242	288	b216/c280	328	b536/c320	368	b170/c358
209	b277/c203	249	b597/c243	289	b231/c281	329	b551/c321	369	b185/c359
210	b278/c204	250	b598/c244	290	b232/c282	330	b552/c322	370	b186/c360
211	b293/c205	251	b613/c245	291	b247/c283	331	b567/c323	371	b201/c361
212	b294/c206	252	b614/c246	292	b248/c284	332	b568/c324	372	b202/c362
213	b309/c207	253	b629/c247	293	b263/c285	333	b583/c325	373	b217/c363
214	b310/c208	254	b630/c248	294	b264/c286	334	b584/c326	374	b218/c364
215	b325/c209	255	b645/c249	295	b279/c287	335	b599/c327	375	b233/c365
216	b326/c210	256	b646/c250	296	b280/c288	336	b600/c328	376	b234/c366
217	b341/c211	257	b661/c251	297	b295/c289	337	b615/c329	377	b249/c367
218	b342/c212	258	b662/c252	298	b296/c290	338	b616/c330	378	b250/c368
219	b357/c213	259	a007	299	b311/c291	339	b631/c331	379	b265/c369
220	b358/c214	260	a008	300	b312/c292	340	b632/c332	380	b266/c370
221	b373/c215	261	b007/c253	301	b327/c293	341	b647/c333	381	b281/c371
222	b374/c216	262	b008/c254	302	b328/c294	342	b648/c334	382	b282/c372
223	b389/c217	263	b023/c255	303	b343/c295	343	b663/c335	383	b297/c373
224	b390/c218	264	b024/c256	304	b344/c296	344	b664/c336	384	b298/c374
225	b405/c219	265	b039/c257	305	b359/c297	345	a009	385	b313/c375
226	b406/c220	266	b040/c258	306	b360/c298	346	a010	386	b314/c376
227	b421/c221	267	b055/c259	307	b375/c299	347	b009/c337	387	b329/c377
228	b422/c222	268	b056/c260	308	b376/c300	348	b010/c338	388	b330/c378
229	b437/c223	269	b071/c261	309	b391/c301	349	b025/c339	389	b345/c379
230	b438/c224	270	b072/c262	310	b392/c302	350	b026/c340	390	b346/c380
231	b453/c225	271	b087/c263	311	b407/c303	351	b041/c341	391	b361/c381
232	b454/c226	272	b088/c264	312	b408/c304	352	b042/c342	392	b362/c382
233	b469/c227	273	b103/c265	313	b423/c305	353	b057/c343	393	b377/c383
234	b470/c228	274	b104/c266	314	b424/c306	354	b058/c344	394	b378/c384
235	b485/c229	275	b119/c267	315	b439/c307	355	b073/c345	395	b393/c385
236	b486/c230	276	b120/c268	316	b440/c308	356	b074/c346	396	b394/c386
237	b501/c231	277	b135/c269	317	b455/c309	357	b089/c347	397	b409/c387
238	b502/c232	278	b136/c270	318	b456/c310	358	b090/c348	398	b410/c388
239	b517/c233	279	b151/c271	319	b471/c311	359	b105/c349	399	b425/c389
240	b518/c234	280	b152/c272	320	b472/c312	360	b106/c350	400	b426/c390

a:SACCH, b:FACCH1, c:TCH

Table 3-5 Inbound Individually Assigned Slot Data Bit Mapping (TCH / FACCH1) (3/4)

D	Mapping	D	Mapping	D	Mapping	D	Mapping	D	Mapping
401	b441/c391	441	b075/c429	481	b395/c469	521	b029/c507	561	b349/c547
402	b442/c392	442	b076/c430	482	b396/c470	522	b030/c508	562	b350/c548
403	b457/c393	443	b091/c431	483	b411/c471	523	b045/c509	563	b365/c549
404	b458/c394	444	b092/c432	484	b412/c472	524	b046/c510	564	b366/c550
405	b473/c395	445	b107/c433	485	b427/c473	525	b061/c511	565	b381/c551
406	b474/c396	446	b108/c434	486	b428/c474	526	b062/c512	566	b382/c552
407	b489/c397	447	b123/c435	487	b443/c475	527	b077/c513	567	b397/c553
408	b490/c398	448	b124/c436	488	b444/c476	528	b078/c514	568	b398/c554
409	b505/c399	449	b139/c437	489	b459/c477	529	b093/c515	569	b413/c555
410	b506/c400	450	b140/c438	490	b460/c478	530	b094/c516	570	b414/c556
411	b521/c401	451	b155/c439	491	b475/c479	531	b109/c517	571	b429/c557
412	b522/c402	452	b156/c440	492	b476/c480	532	b110/c518	572	b430/c558
413	b537/c403	453	b171/c441	493	b491/c481	533	b125/c519	573	b445/c559
414	b538/c404	454	b172/c442	494	b492/c482	534	b126/c520	574	b446/c560
415	b553/c405	455	b187/c443	495	b507/c483	535	b141/c521	575	b461/c561
416	b554/c406	4564	b188/c444	496	b508/c484	536	b142/c522	576	b462/c562
417	b569/c407	57	b203/c445	497	b523/c485	537	b157/c523	577	b477/c563
418	b570/c408	458	b204/c446	498	b524/c486	538	b158/c524	578	b478/c564
419	b585/c409	459	b219/c447	499	b539/c487	539	b173/c525	579	b493/c565
420	b586/c410	460	b220/c448	500	b540/c488	540	b174/c526	580	b494/c566
421	b601/c411	461	b235/c449	501	b555/c489	541	b189/c527	581	b509/c567
422	b602/c412	462	b236/c450	502	b556/c490	542	b190/c528	582	b510/c568
423	b617/c413	463	b251/c451	503	b571/c491	543	b205/c529	583	b525/c569
424	b618/c414	464	b252/c452	504	b572/c492	544	b206/c530	584	b526/c570
425	b633/c415	465	b267/c453	505	b587/c493	545	b221/c531	585	b541/c571
426	b634/c416	466	b268/c454	506	b588/c494	546	b222/c532	586	b542/c572
427	b649/c417	467	b283/c455	507	b603/c495	547	b237/c533	587	b557/c573
428	b650/c418	468	b284/c456	508	b604/c496	548	b238/c534	588	b558/c574
429	b665/c419	469	b299/c457	509	b619/c497	549	b253/c535	589	b573/c575
430	b666/c420	470	b300/c458	510	b620/c498	550	b254/c536	590	b574/c576
431	a011	471	b315/c459	511	b635/c499	551	b269/c537	591	b589/c577
432	a012	472	b316/c460	512	b636/c500	552	b270/c538	592	b590/c578
433	b011/c421	473	b331/c461	513	b651/c501	553	b285/c539	593	b605/c579
434	b012/c422	474	b332/c462	514	b652/c502	554	b286/c540	594	b606/c580
435	b027/c423	475	b347/c463	515	b667/c503	555	b301/c541	595	b621/c581
436	b028/c424	476	b348/c464	516	b668/c504	556	b302/c542	596	b622/c582
437	b043/c425	477	b363/c465	517	a013	557	b317/c543	597	b637/c583
438	b044/c426	478	b364/c466	518	a014	558	b318/c544	598	b638/c584
439	b059/c427	479	b379/c467	519	b013/c505	559	b333/c545	599	b653/c585
440	b060/c428	480	b380/c468	520	b014/c506	560	b334/c546	600	b654/c586

a:SACCH, b:FACCH1, c:TCH

Table 3-5 Inbound Individually Assigned Slot Data Bit Mapping (TCH / FACCH1) (4/4)

D	Mapping	D	Mapping	D	Mapping
601	b669/c587	641	b303/c625	681	b623/c665
602	b670/c588	642	b304/c626	682	b624/c666
603	a015	643	b319/c627	683	b639/c667
604	a016	644	b320/c628	684	b640/c668
605	b015/c589	645	b335/c629	685	b655/c669
606	b016/c590	646	b336/c630	686	b656/c670
607	b031/c591	647	b351/c631	687	b671/c671
608	b032/c592	648	b352/c632	688	b672/c672
609	b047/c593	649	b367/c633		
610	b048/c594	650	b368/c634		
611	b063/c595	651	b383/c635		
612	b064/c596	652	b384/c636		
613	b079/c597	653	b399/c637		
614	b080/c598	654	b400/c638		
615	b095/c599	655	b415/c639		
616	b096/c600	656	b416/c640		
617	b111/c601	657	b431/c641		
618	b112/c602	658	b432/c642		
619	b127/c603	659	b447/c643		
620	b128/c604	660	b448/c644		
621	b143/c605	661	b463/c645		
622	b144/c606	662	b464/c646		
623	b159/c607	663	b479/c647		
624	b160/c608	664	b480/c648		
625	b175/c609	665	b495/c649		
626	b176/c610	666	b496/c650		
627	b191/c611	667	b511/c651		
628	b192/c612	668	b512/c652		
629	b207/c613	669	b527/c653		
630	b208/c614	670	b528/c654		
631	b223/c615	671	b543/c655		
632	b224/c616	672	b544/c656		
633	b239/c617	673	b559/c657		
634	b240/c618	674	b560/c658		
635	b255/c619	675	b575/c659		
636	b256/c620	676	b576/c660		
637	b271/c621	677	b591/c661		
638	b272/c622	678	b592/c662		
639	b287/c623	679	b607/c663		
640	b288/c624	680	b608/c664		

a:SACCH, b:FACCH1, c:TCH

Table 3-6 Inbound Individually Assigned Slot (Basic Slot) Data Bit Mapping (RCCH3) (1/4)

D	Mapping	D	Mapping	D	Mapping	D	Mapping	D	Mapping
1	a001	41	b039	81	b079	121	b117	161	b157
2	a002	42	b040	82	b080	122	b118	162	b158
3	b001	43	b041	83	b081	123	b119	163	b159
4	b002	44	b042	84	b082	124	b120	164	b160
5	b003	45	b043	85	b083	125	b121	165	b161
6	b004	46	b044	86	b084	126	b122	166	b162
7	b005	47	b045	87	a003	127	b123	167	b163
8	b006	48	b046	88	a004	128	b124	168	b164
9	b007	49	b047	89	b085	129	b125	169	b165
10	b008	50	b048	90	b086	130	b126	170	b166
11	b009	51	b049	91	b087	131	b127	171	b167
12	b010	52	b050	92	b088	132	b128	172	b168
13	b011	53	b051	93	b089	133	b129	173	a005
14	b012	54	b052	94	b090	134	b130	174	a006
15	b013	55	b053	95	b091	135	b131	175	b169
16	b014	56	b054	96	b092	136	b132	176	b170
17	b015	57	b055	97	b093	137	b133	177	b171
18	b016	58	b056	98	b094	138	b134	178	b172
19	b017	59	b057	99	b095	139	b135	179	b173
20	b018	60	b058	100	b096	140	b136	180	b174
21	b019	61	b059	101	b097	141	b137	181	b175
22	b020	62	b060	102	b098	142	b138	182	b176
23	b021	63	b061	103	b099	143	b139	183	b177
24	b022	64	b062	104	b100	144	b140	184	b178
25	b023	65	b063	105	b101	145	b141	185	b179
26	b024	66	b064	106	b102	146	b142	186	b180
27	b025	67	b065	107	b103	147	b143	187	b181
28	b026	68	b066	108	b104	148	b144	188	b182
29	b027	69	b067	109	b105	149	b145	189	b183
30	b028	70	b068	110	b106	150	b146	190	b184
31	b029	71	b069	111	b107	151	b147	191	b185
32	b030	72	b070	112	b108	152	b148	192	b186
33	b031	73	b071	113	b109	153	b149	193	b187
34	b032	74	b072	114	b110	154	b150	194	b188
35	b033	75	b073	115	b111	155	b151	195	b189
36	b034	76	b074	116	b112	156	b152	196	b190
37	b035	77	b075	117	b113	157	b153	197	b191
38	b036	78	b076	118	b114	158	b154	198	b192
39	b037	79	b077	119	b115	159	b155	199	b193
40	b038	80	b078	120	b116	160	b156	200	b194

a:SACCH, b:FILL, c:RCCH3

Table 3-6 Inbound Individually Assigned Slot (Basic Slot) Data Bit Mapping (RCCH3) (2/4)

D	Mapping	D	Mapping	D	Mapping	D	Mapping	D	Mapping
201	b195	241	b235	281	b273	321	b313	361	b351
202	b196	242	b236	282	b274	322	b314	362	b352
203	b197	243	b237	283	b275	323	b315	363	b353
204	b198	244	b238	284	b276	324	b316	364	b354
205	b199	245	b239	285	b277	325	b317	365	b355
206	b200	246	b240	286	b278	326	b318	366	b356
207	b201	247	b241	287	b279	327	b319	367	b357
208	b202	248	b242	288	b280	328	b320	368	b358
209	b203	249	b243	289	b281	329	b321	369	b359
210	b204	250	b244	290	b282	330	b322	370	b360
211	b205	251	b245	291	b283	331	b323	371	b361
212	b206	252	b246	292	b284	332	b324	372	b362
213	b207	253	b247	293	b285	333	b325	373	b363
214	b208	254	b248	294	b286	334	b326	374	b364
215	b209	255	b249	295	b287	335	b327	375	b365
216	b210	256	b250	296	b288	336	b328	376	b366
217	b211	257	b251	297	b289	337	b329	377	b367
218	b212	258	b252	298	b290	338	b330	378	b368
219	b213	259	a007	299	b291	339	b331	379	b369
220	b214	260	a008	300	b292	340	b332	380	b370
221	b215	261	b253	301	b293	341	b333	381	b371
222	b216	262	b254	302	b294	342	b334	382	b372
223	b217	263	b255	303	b295	343	b335	383	b373
224	b218	264	b256	304	b296	344	b336	384	b374
225	b219	265	b257	305	b297	345	a009	385	b375
226	b220	266	b258	306	b298	346	a010	386	b376
227	b221	267	b259	307	b299	347	b337	387	b377
228	b222	268	b260	308	b300	348	b338	388	b378
229	b223	269	b261	309	b301	349	b339	389	b379
230	b224	270	b262	310	b302	350	b340	390	b380
231	b225	271	b263	311	b303	351	b341	391	b381
232	b226	272	b264	312	b304	352	b342	392	b382
233	b227	273	b265	313	b305	353	b343	393	b383
234	b228	274	b266	314	b306	354	b344	394	b384
235	b229	275	b267	315	b307	355	b345	395	b385
236	b230	276	b268	316	b308	356	b346	396	b386
237	b231	277	b269	317	b309	357	b347	397	b387
238	b232	278	b270	318	b310	358	b348	398	b388
239	b233	279	b271	319	b311	359	b349	399	b389
240	b234	280	b272	320	b312	360	b350	400	b390

a:SACCH, b:FILL, c:RCCH3

Table 3-6 Inbound Individually Assigned Slot (Basic Slot) Data Bit Mapping (RCCH3) (3/4)

D	Mapping	D	Mapping	D	Mapping	D	Mapping	D	Mapping
401	b391	441	b429	481	c033	521	c131	561	c039
402	b392	442	b430	482	c034	522	c132	562	c040
403	b393	443	b431	483	c049	523	c147	563	c055
404	b394	444	b432	484	c050	524	c148	564	c056
405	b395	445	b433	485	c065	525	c163	565	c071
406	b396	446	b434	486	c066	526	c164	566	c072
407	b397	447	b435	487	c081	527	c179	567	c087
408	b398	448	b436	488	c082	528	c180	568	c088
409	b399	449	b437	489	c097	529	c195	569	c103
410	b400	450	b438	490	c098	530	c196	570	c104
411	b401	451	b439	491	c113	531	c005	571	c119
412	b402	452	b440	492	c114	532	c006	572	c120
413	b403	453	b441	493	c129	533	c021	573	c135
414	b404	454	b442	494	c130	534	c022	574	c136
415	b405	455	b443	495	c145	535	c037	575	c151
416	b406	4564	b444	496	c146	536	c038	576	c152
417	b407	57	b445	497	c161	537	c053	577	c167
418	b408	458	b446	498	c162	538	c054	578	c168
419	b409	459	b447	499	c177	539	c069	579	c183
420	b410	460	b448	500	c178	540	c070	580	c184
421	b411	461	b449	501	c193	541	c085	581	c199
422	b412	462	b450	502	c194	542	c086	582	c200
423	b413	463	b451	503	c003	543	c101	583	c009
424	b414	464	b452	504	c004	544	c102	584	c010
425	b415	465	b453	505	c019	545	c117	585	c025
426	b416	466	b454	506	c020	546	c118	586	c026
427	b417	467	b455	507	c035	547	c133	587	c041
428	b418	468	b456	508	c036	548	c134	588	c042
429	b419	469	b457	509	c051	549	c149	589	c057
430	b420	470	b458	510	c052	550	c150	590	c058
431	a011	471	b459	511	c067	551	c165	591	c073
432	a012	472	b460	512	c068	552	c166	592	c074
433	b421	473	b461	513	c083	553	c181	593	c089
434	b422	474	b462	514	c084	554	c182	594	c090
435	b423	475	b463	515	c099	555	c197	595	c105
436	b424	476	b464	516	c100	556	c198	596	c106
437	b425	477	c001	517	a013	557	c007	597	c121
438	b426	478	c002	518	a014	558	c008	598	c122
439	b427	479	c017	519	c115	559	c023	599	c137
440	b428	480	c018	520	c116	560	c024	600	c138

a:SACCH, b:FILL, c:RCCH3

Table 3-6 Inbound Individually Assigned Slot (Basic Slot) Data Bit Mapping (RCCH3) (4/4)

D	Mapping	D	Mapping	D	Mapping
601	c153	641	c045	681	c159
602	c154	642	c046	682	c160
603	a015	643	c061	683	c175
604	a016	644	c062	684	c176
605	c169	645	c077	685	c191
606	c170	646	c078	686	c192
607	c185	647	c093	687	c207
608	c186	648	c094	688	c208
609	c201	649	c109		
610	c202	650	c110		
611	c011	651	c125		
612	c012	652	c126		
613	c027	653	c141		
614	c028	654	c142		
615	c043	655	c157		
616	c044	656	c158		
617	c059	657	c173		
618	c060	658	c174		
619	c075	659	c189		
620	c076	660	c190		
621	c091	661	c205		
622	c092	662	c206		
623	c107	663	c015		
624	c108	664	c016		
625	c123	665	c031		
626	c124	666	c032		
627	c139	667	c047		
628	c140	668	c048		
629	c155	669	c063		
630	c156	670	c064		
631	c171	671	c079		
632	c172	672	c080		
633	c187	673	c095		
634	c188	674	c096		
635	c203	675	c111		
636	c204	676	c112		
637	c013	677	c127		
638	c014	678	c128		
639	c029	679	c143		
640	c030	680	c144		

a:SACCH, b:FILL, c:RCCH3

Table 3-7 Inbound Individual Assigned Slot (Subslot) data bit mapping (1/2)

D	Mapping	D	Mapping	D	Mapping	D	Mapping	D	Mapping
1	a001	41	b083/c037	81	b181/c075	121	b057/c111	161	b155/c149
2	a002	42	b084/c038	82	b182/c076	122	b058/c112	162	b156/c150
3	b001/c001	43	b099/c039	83	b197/c077	123	b073/c113	163	b171/c151
4	b002/c002	44	b100/c040	84	b198/c078	124	b074/c114	164	b172/c152
5	b017/c003	45	b115/c041	85	a007	125	b089/c115	165	b187/c153
6	b018/c004	46	b116/c042	86	a008	126	b090/c116	166	b188/c154
7	b033/c005	47	b131/c043	87	b007/c079	127	b105/c117	167	b203/c155
8	b034/c006	48	b132/c044	88	b008/c080	128	b106/c118	168	b204/c156
9	b049/c007	49	b147/c045	89	b023/c081	129	b121/c119	169	a013
10	b050/c008	50	b148/c046	90	b024/c082	130	b122/c120	170	a014
11	b065/c009	51	b163/c047	91	b039/c083	131	b137/c121	171	b013/c157
12	b066/c010	52	b164/c048	92	b040/c084	132	b138/c122	172	b014/c158
13	b081/c011	53	b179/c049	93	b055/c085	133	b153/c123	173	b029/c159
14	b082/c012	54	b180/c050	94	b056/c086	134	b154/c124	174	b030/c160
15	b097/c013	55	b195/c051	95	b071/c087	135	b169/c125	175	b045/c161
16	b098/c014	56	b196/c052	96	b072/c088	136	b170/c126	176	b046/c162
17	b113/c015	57	a005	97	b087/c089	137	b185/c127	177	b061/c163
18	b114/c016	58	a006	98	b088/c090	138	b186/c128	178	b062/c164
19	b129/c017	59	b005/c053	99	b103/c091	139	b201/c129	179	b077/c165
20	b130/c018	60	b006/c054	100	b104/c092	140	b202/c130	180	b078/c166
21	b145/c019	61	b021/c055	101	b119/c093	141	a011	181	b093/c167
22	b146/c020	62	b022/c056	102	b120/c094	142	a012	182	b094/c168
23	b161/c021	63	b037/c057	103	b135/c095	143	b011/c131	183	b109/c169
24	b162/c022	64	b038/c058	104	b136/c096	144	b012/c132	184	b110/c170
25	b177/c023	65	b053/c059	105	b151/c097	145	b027/c133	185	b125/c171
26	b178/c024	66	b054/c060	106	b152/c098	146	b028/c134	186	b126/c172
27	b193/c025	67	b069/c061	107	b167/c099	147	b043/c135	187	b141/c173
28	b194/c026	68	b070/c062	108	b168/c100	148	b044/c136	188	b142/c174
29	a003	69	b085/c063	109	b183/c101	149	b059/c137	189	b157/c175
30	a004	70	b086/c064	110	b184/c102	150	b060/c138	190	b158/c176
31	b003/c027	71	b101/c065	111	b199/c103	151	b075/c139	191	b173/c177
32	b004/c028	72	b102/c066	112	b200/c104	152	b076/c140	192	b174/c178
33	b019/c029	73	b117/c067	113	a009	153	b091/c141	193	b189/c179
34	b020/c030	74	b118/c068	114	a010	154	b092/c142	194	b190/c180
35	b035/c031	75	b133/c069	115	b009/c105	155	b107/c143	195	b205/c181
36	b036/c032	76	b134/c070	116	b010/c106	156	b108/c144	196	b206/c182
37	b051/c033	77	b149/c071	117	b025/c107	157	b123/c145	197	a015
38	b052/c034	78	b150/c072	118	b026/c108	158	b124/c146	198	a016
39	b067/c035	79	b165/c073	119	b041/c109	159	b139/c147	199	b015/c183
40	b068/c036	80	b166/c074	120	b042/c110	160	b140/c148	200	b016/c184

a:SACCH, b:FACCH2/RCCH3, c:UPCH

Table 3-7 Inbound Individual Assigned Slot (Subslot) data bit mapping (2/2)

D	Mapping
201	b031/c185
202	b032/c186
203	b047/c187
204	b048/c188
205	b063/c189
206	b064/c190
207	b079/c191
208	b080/c192
209	b095/c193
210	b096/c194
211	b111/c195
212	b112/c196
213	b127/c197
214	b128/c198
215	b143/c199
216	b144/c200
217	b159/c201
218	b160/c202
219	b175/c203
220	b176/c204
221	b191/c205
222	b192/c206
223	b207/c207
224	b208/c208

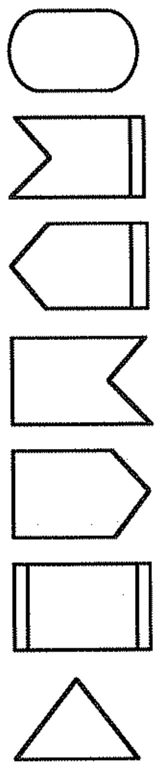
a:SACCH, b:FACCH2/RCCH3, c:UPCH

Mobile SDL Configuration

Contents

I Introduction

The symbols used at SDL configuration of Digital MCA system are shown as below.



: State

: Primitive from Management layer

: Primitive to Management layer

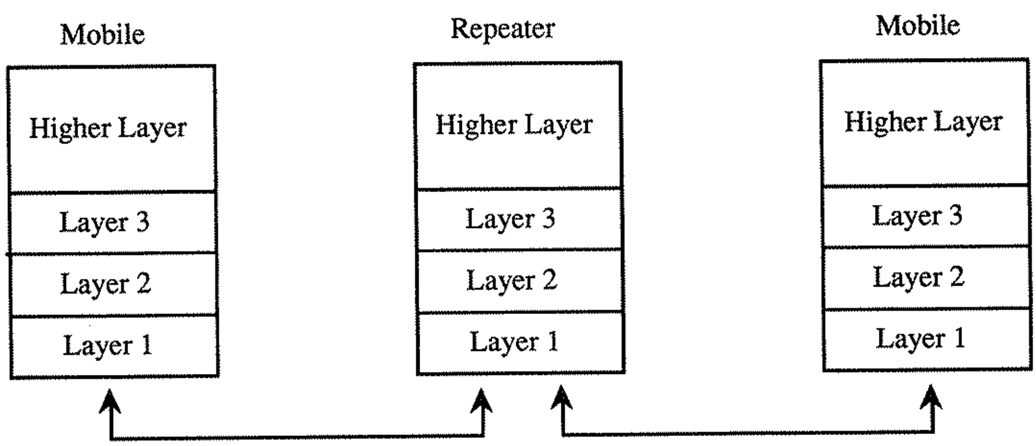
: Message from repeater station

: Message to repeater station

: Procedure Call

: Selection

[Primitive]
Req : Request
Ind : Indication
Res : Response
Con : Confirm



Layer Model

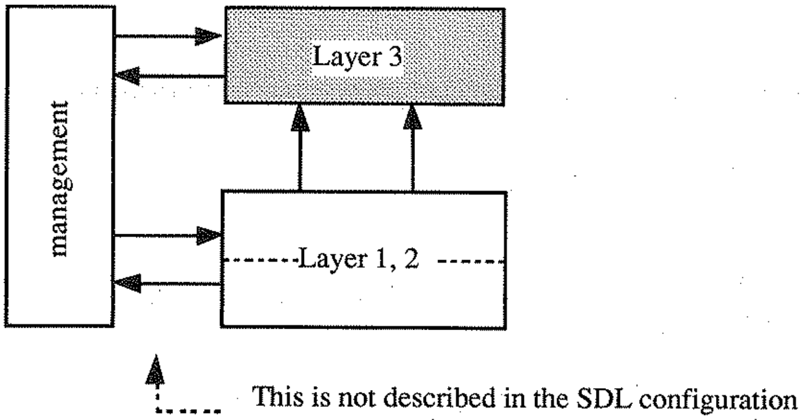


Fig A 4-1 Layer Configuration of Repeater Station (Layer3)

SDL configuration of mobile station is described on the basis of this figure.

Every entities required for the mobile station including resource management and control exists in.

II Call Connection Definition

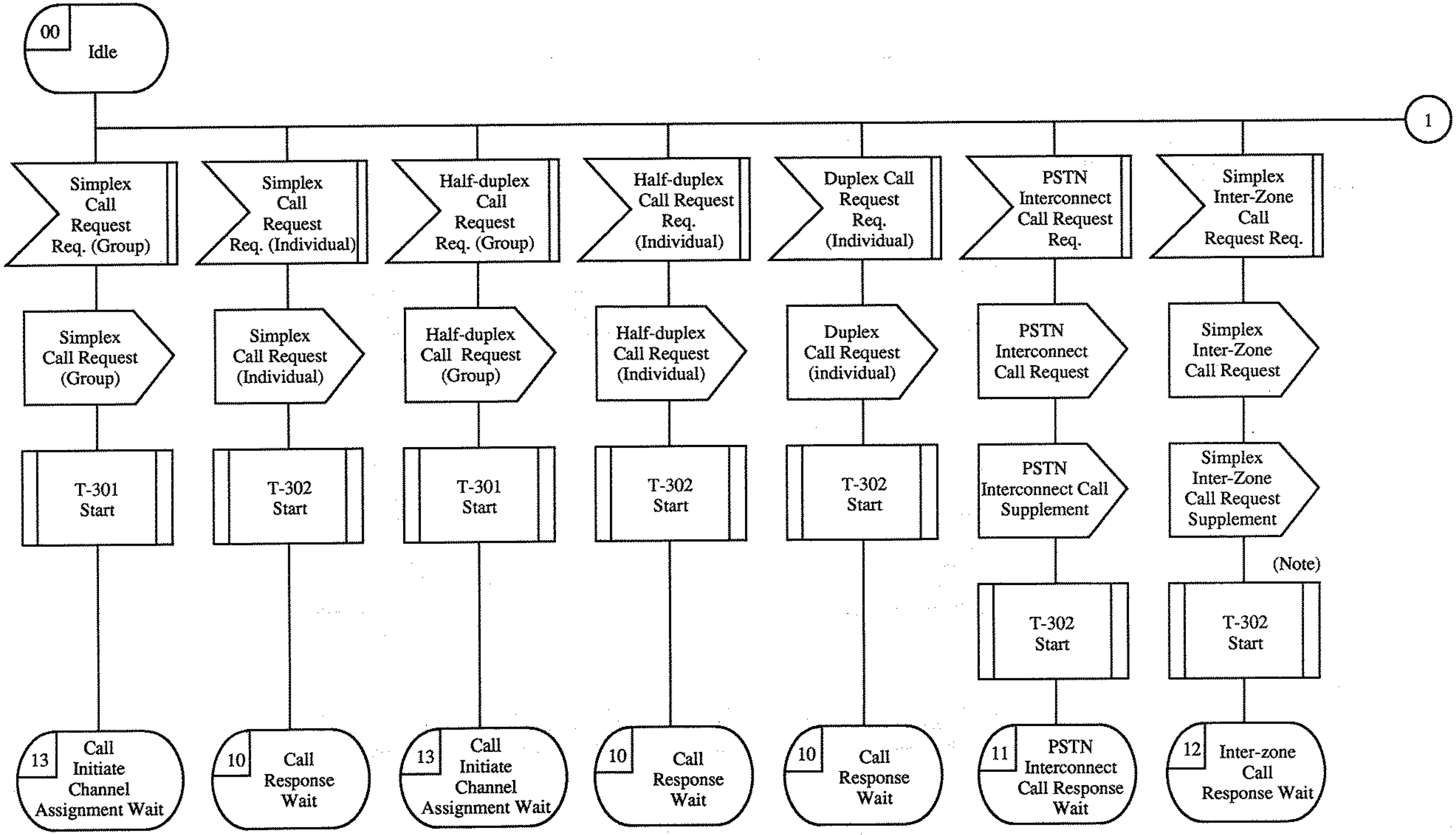
Call states of Mobile station are shown in the Table. A 4-1.

Table A4-1 Definition of Call States of Mobile Station (1/2)

Classifi-cation	State No.	State Name	Definition
Initial state	00	Idle	The state is when there is no Call
	10	Call Response Wait	The state which is waiting for Call Response from repeater station, after transmitting Call Response Request(Individual communication)
	11	PSTN Interconnect Call Response Wait	The state which is waiting for PSTN Interconnect Call Response from Repeater station, after transmitting PSTN Interconnect Call Request
	12	Inter-zone Call Response Wait	The state which is waiting for Inter-zone Call Response from Repeater station, after transmitting Inter-zone Call Request
	13	Call Initiation Channel Assignment Wait	The state which is waiting for Channel Assignment or Busy-queue, after transmitting Call Response Request (Group communication) or receiving Call Response (except for PSTN Interconnection)
	14	Call Initiation Channel Assignment Wait, Reserved	The state which is waiting for Channel Assignment from Repeater station, after receiving Busy-queue
	15	Call Initiation Channel Assignment Wait, PSTN	The state which is waiting for Channel Assignment or Busy-queue from Repeater station, after receiving PSTN Interconnection Call Response
	16	Call Initiation Channel Assignment Wait, Reserved, PSTN	The state which is waiting for Channel Assignment, after receiving Busy-queue
	17	PSTN Call Disconnect Indication Wait	The state which is waiting for PSTN Call Disconnect or Busy-queue from Repeater station, after transmitting PSTN Call Disconnect Request
	18	Fleet wide Call Wait	The state which is waiting for Fleet wide Call or Busy-queue from Repeater station, after transmitting Fleet wide Call Request
	19	Fleet wide Call Wait, Reserved	The state which is waiting for Fleet wide Call from Repeater station, after receiving Busy-queue
	20	Call Reception Channel Assignment Wait	The state which is waiting for Channel Assignment or Busy-queue
	21	Call Reception Channel Assignment Wait, Reserved	The state which is waiting for Channel Assignment from Repeater station, after receiving Busy-queue
	22	Call Reception Channel Assignment Wait, PSTN	The state which is waiting for Channel Assignment or Busy-queue from Repeater station. (At PSTN Interconnect Call)
	23	Call Reception Channel Assignment Wait, PSTN, Reserved	The state which is waiting for Channel Assignment from Repeater station, after receiving Busy-queue (At PSTN Interconnect Call)

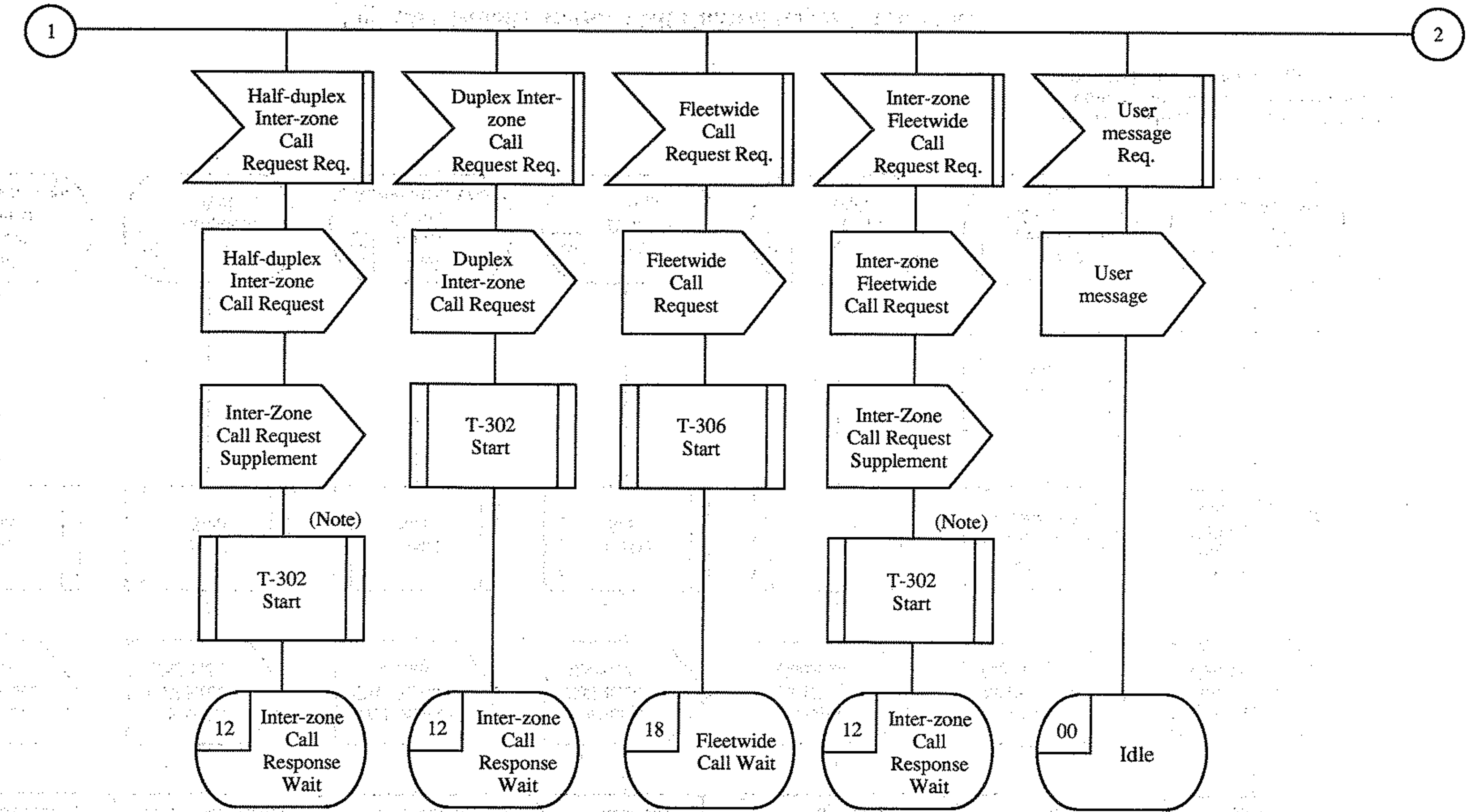
Table A4-1 Definition of Call States of Mobile Station (2/2)

	30	Busy	The state for which Channel was assigned from repeater station
	31	Call disconnect Wait	The state which is waiting for Call disconnect from Repeater station, after transmitting Call Disconnect Request
	32	Systemwide Call Message Busy	The state receiving Multi-Destination Delivery



(Note) There is no Inter-zone Call Supplement Message when the number of zone to be connected is one.

Fig. 1.00 Mobile Station Call Control (layer3) Idle (1/4)



(Note) There is no Inter-zone Call Supplement Message when the number of zone to be connected is one.

Fig. 1.00 Mobile Station Call Control (layer3) Idle (2/4)

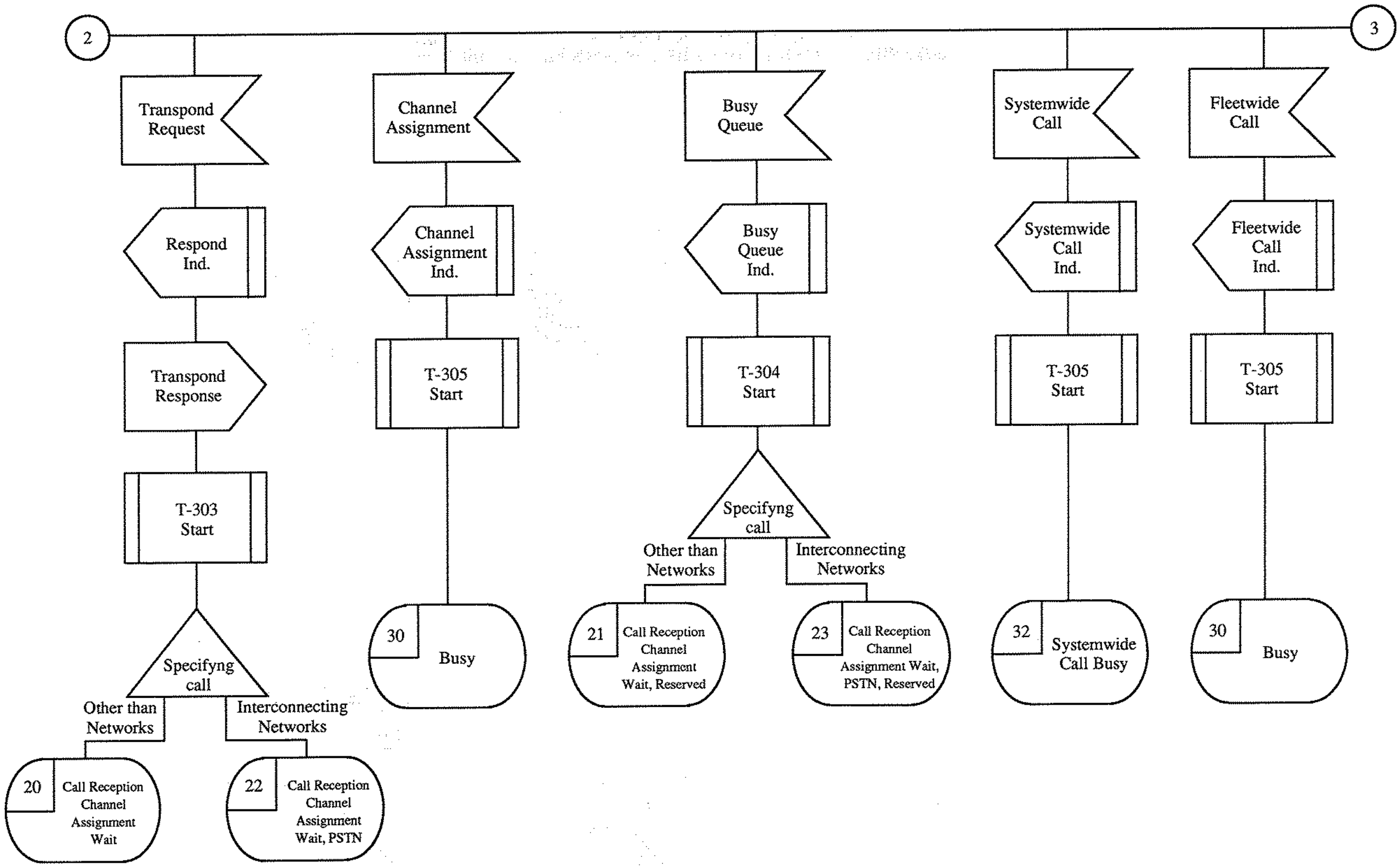


Fig. 1.00 Mobile Station Call Control (layer3) Idle (3/4)

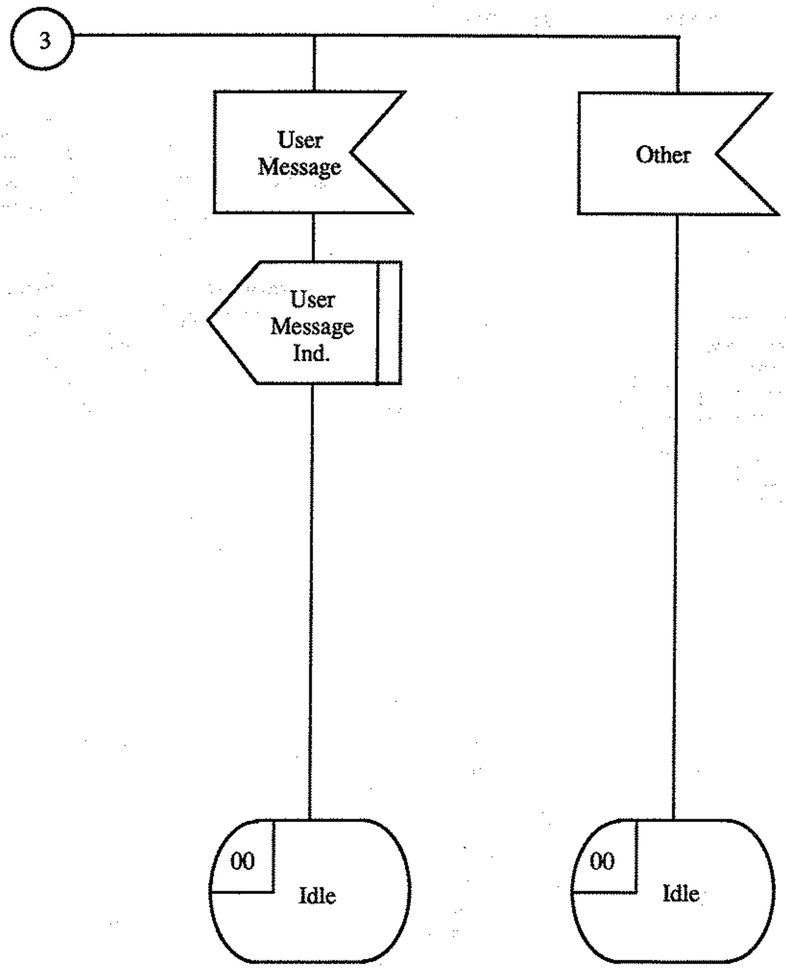
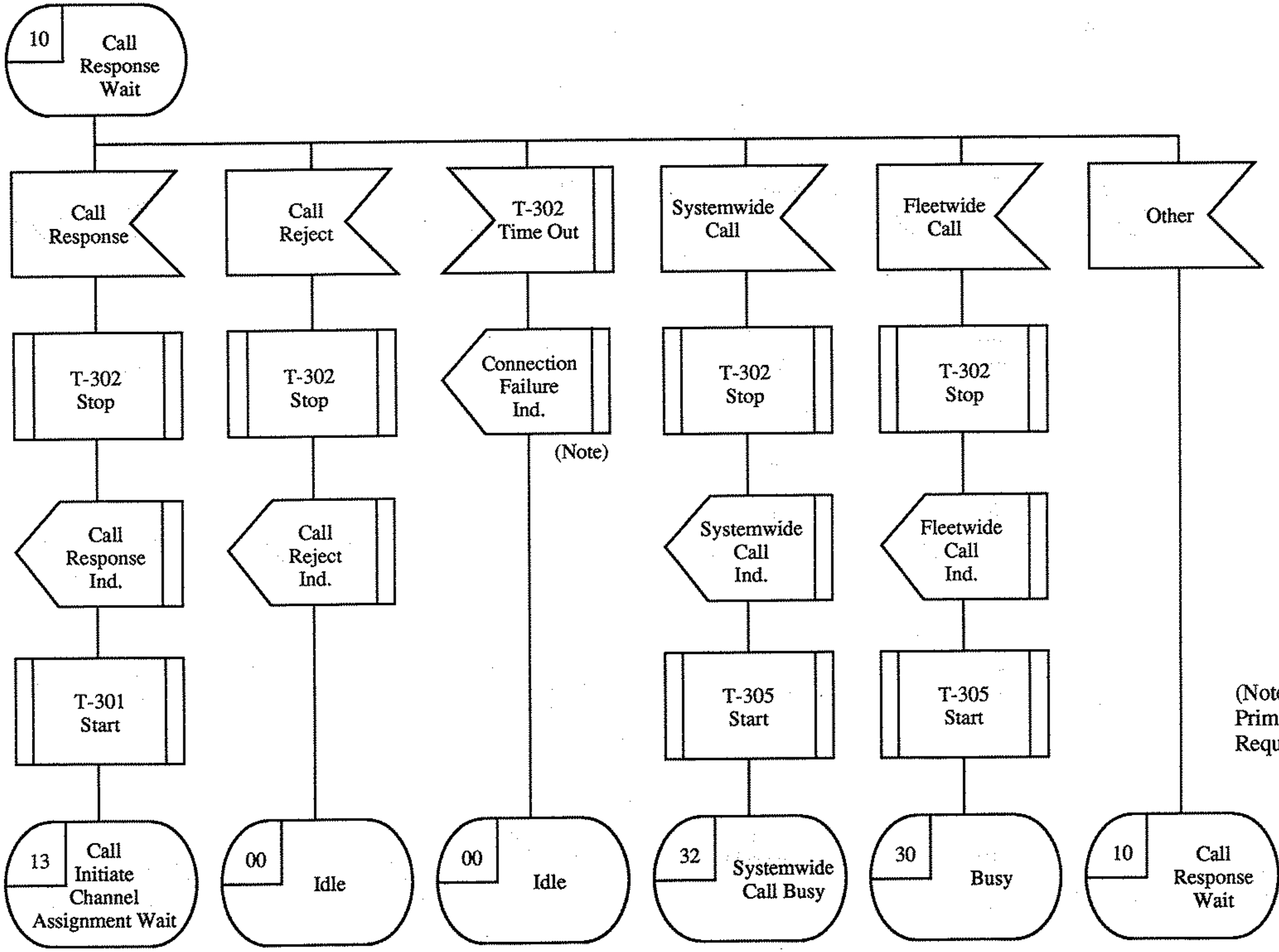
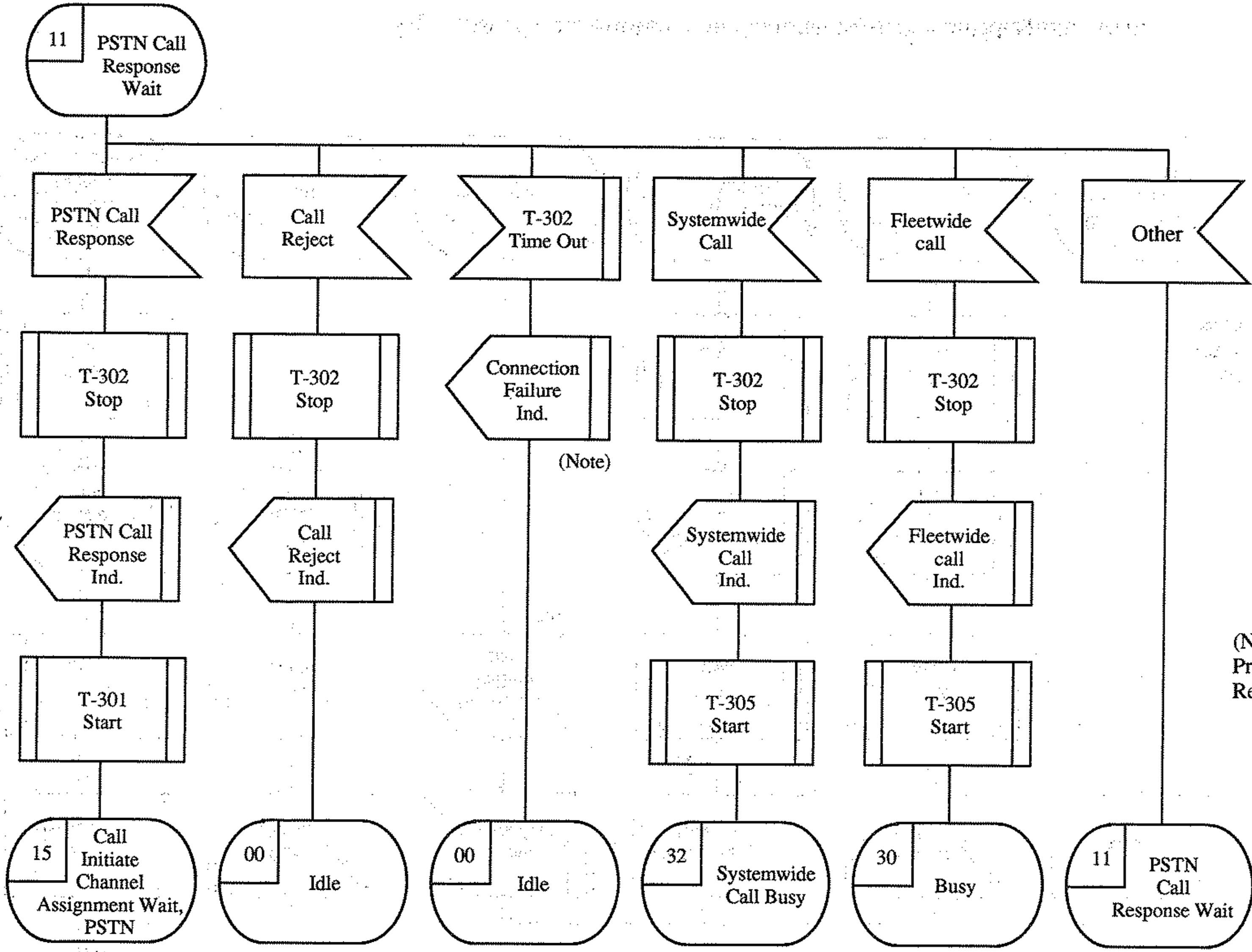


Fig. 1.00 Mobile Station Call Control (layer3) Idle (4/4)



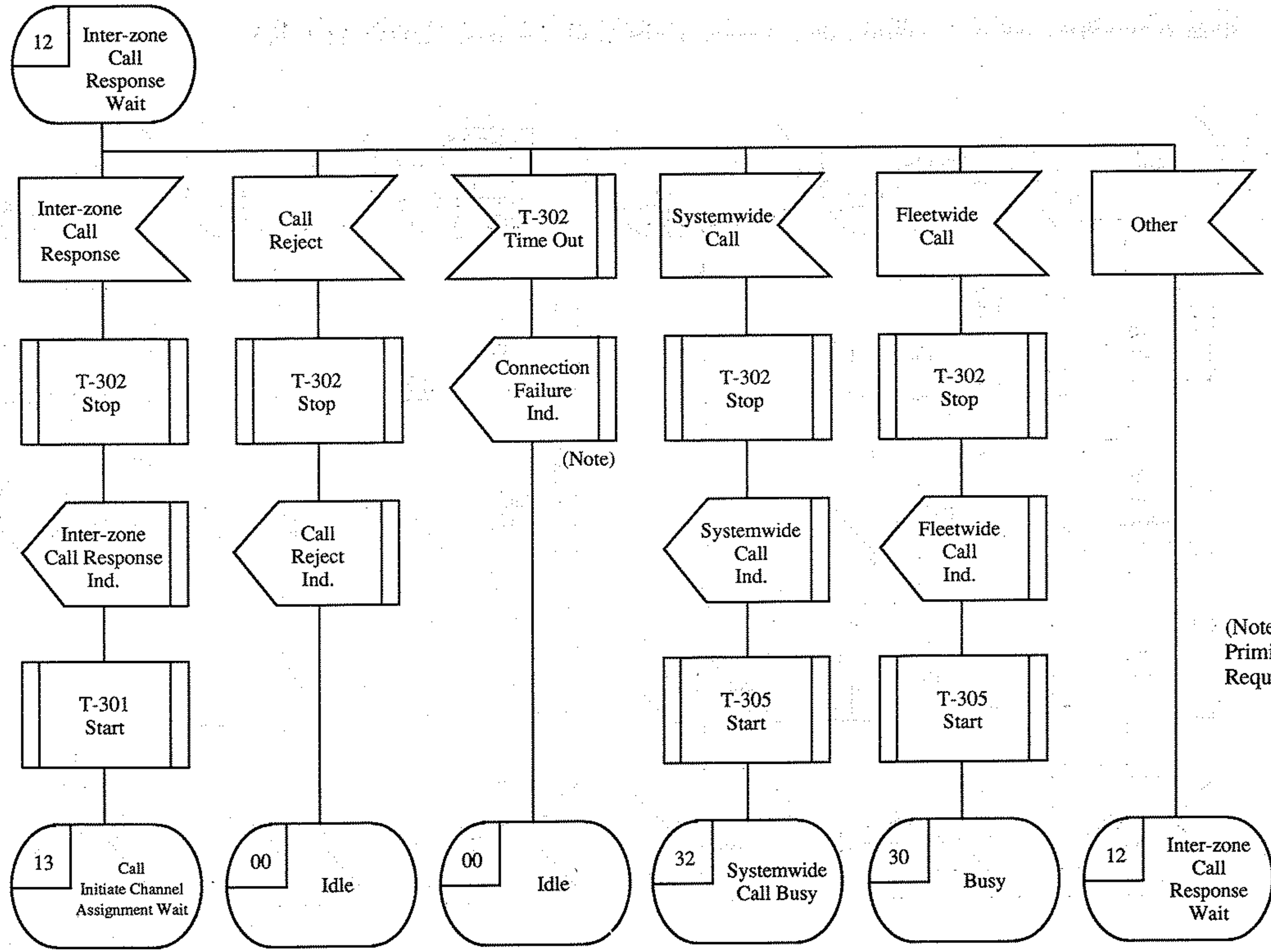
(Note) Management which received this Primitive doesn't issue Primitive of "Call Request Req" for 4 seconds.

Fig. 1.10 Mobile Station Call Control (layer3) Call Response Wait



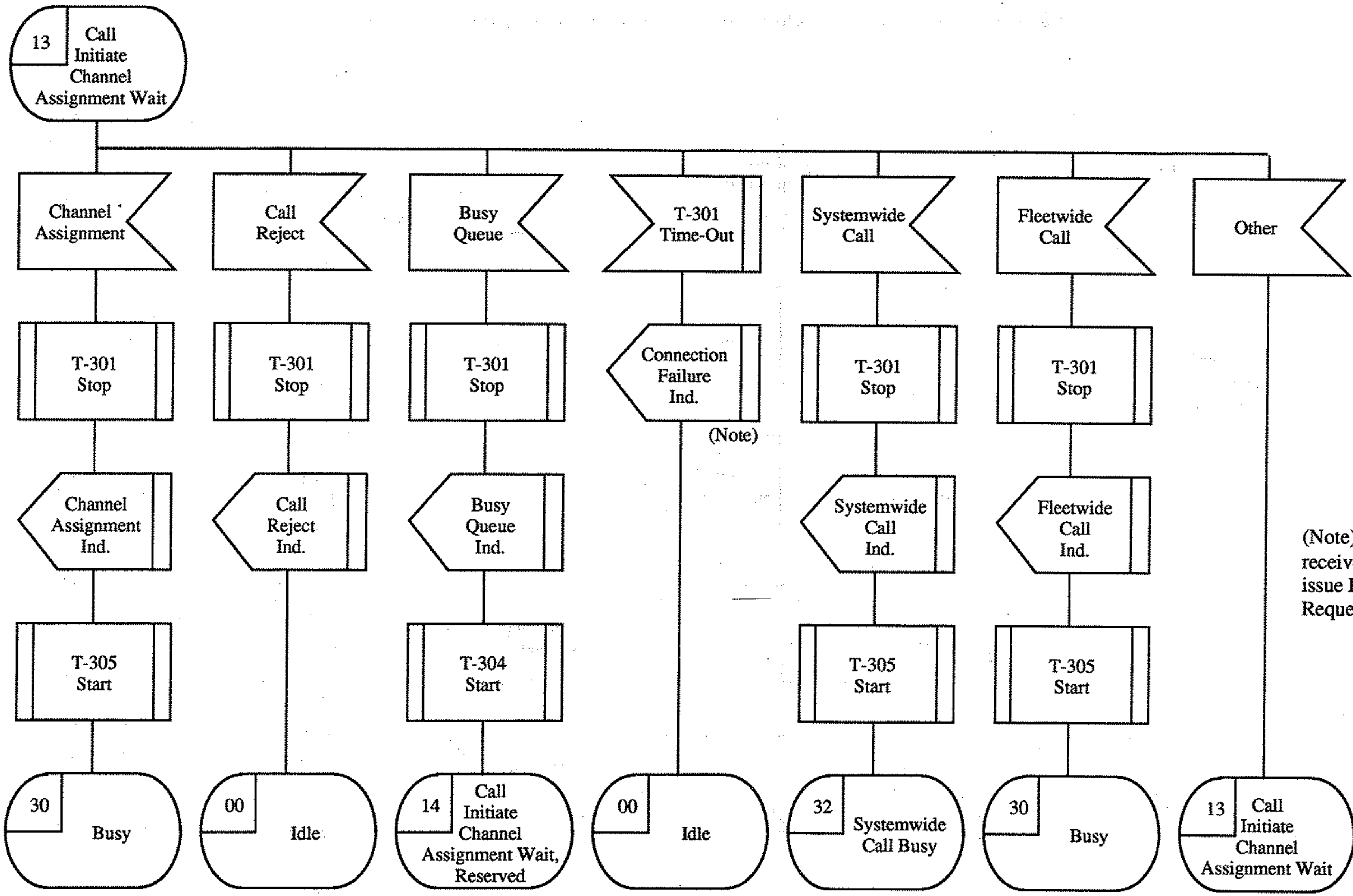
(Note) Management which received this Primitive doesn't issue Primitive of "Call Request Req" for 4 seconds.

Fig. 1.11 Mobile Station Call Control (layer3) PSTN Call Response Wait



(Note) Management which received this Primitive doesn't issue Primitive of "Call Request Req" for 4 seconds.

Fig. 1.12 Mobile Station Call Control (layer3) Inter-zone Call Response Wait



(Note) Management which received this Primitive doesn't issue Primitive of "Call Request Req" for 4 seconds.

Fig. 1.13 Mobile Station Call Control (layer3) Call Initiate Channel Assignment Wait

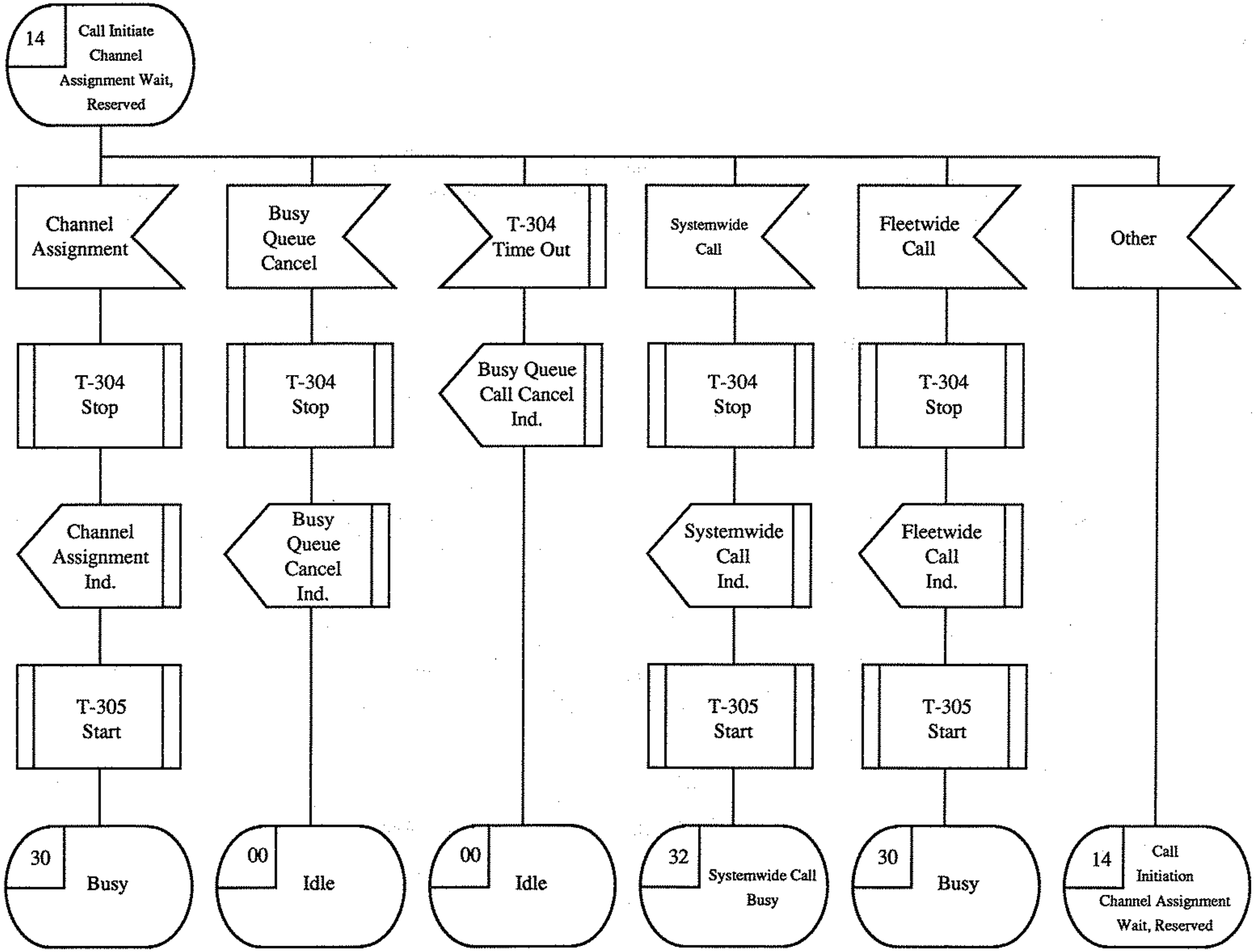
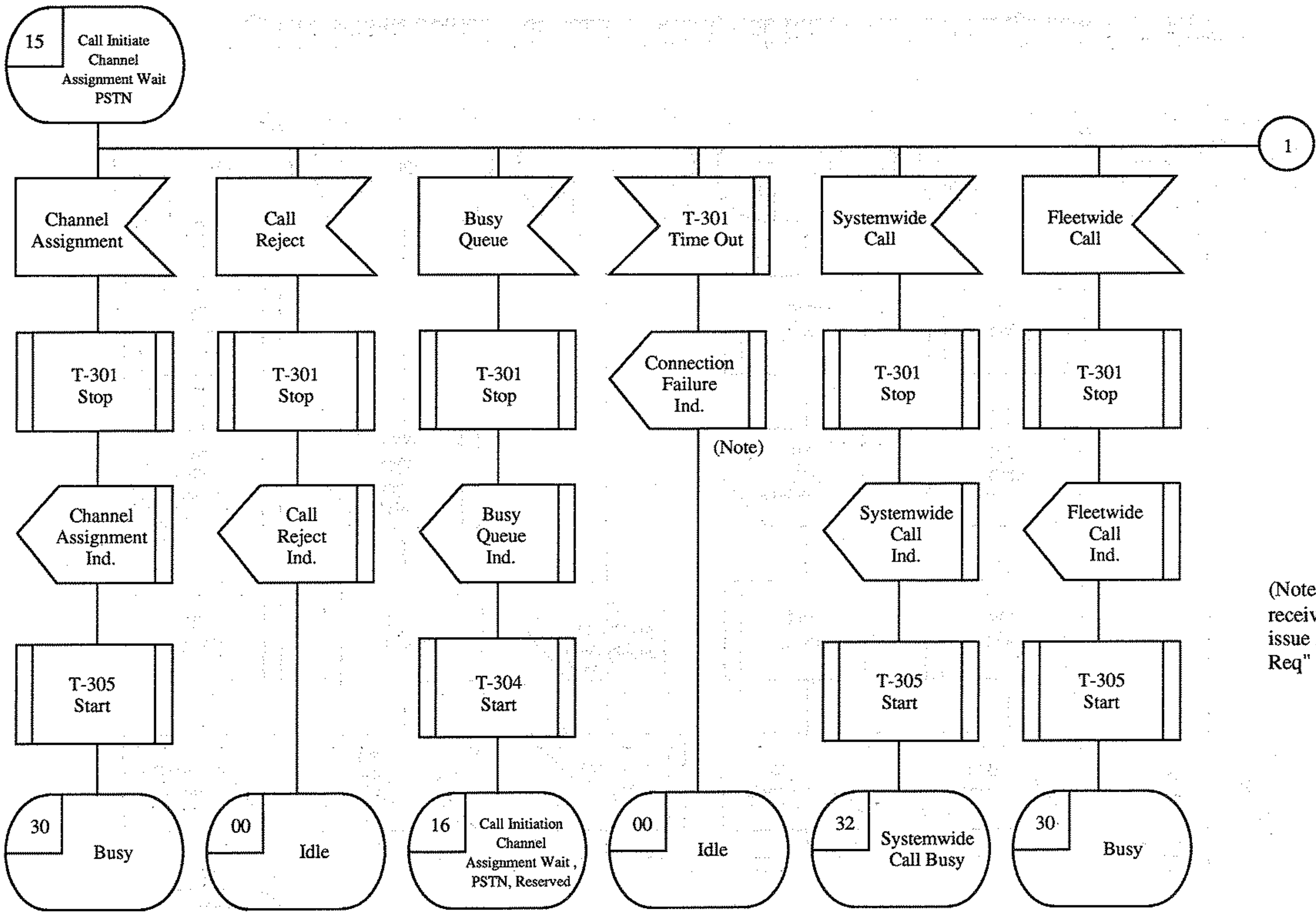


Fig. 1.14 Mobile Station Call Control (layer3) Call Initiate Channel Assignment Wait, Reserved



(Note) Management which received this Primitive doesn't issue Primitive of "Call Request Req" for 4 seconds.

Fig. 1.15 Mobile Station Call Control (layer3) Call Initiate Channel Assignment wait, PSTN, Reserved (1/2)

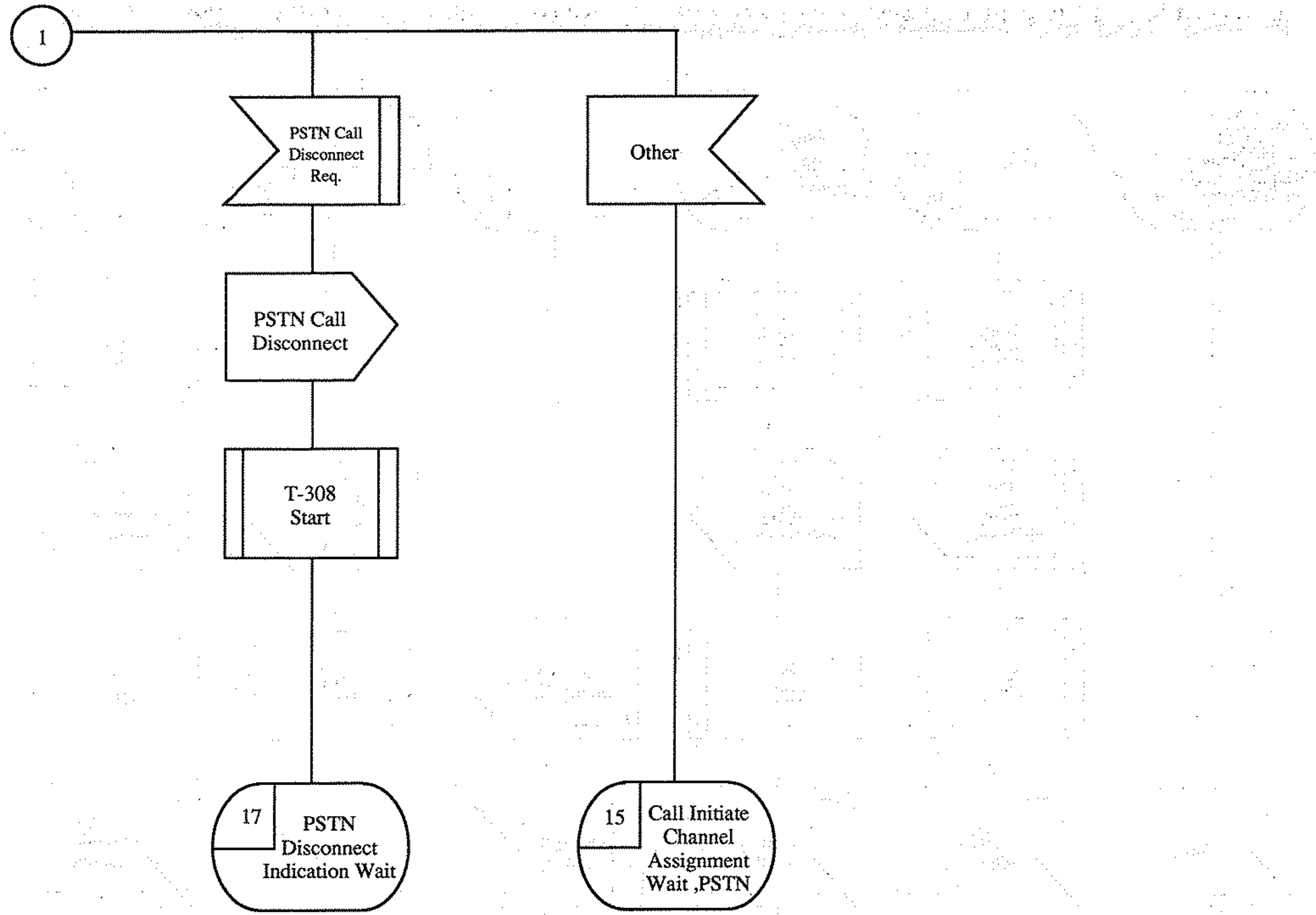


Fig. 1.15 Mobile Station Call Control (layer3) Call Initiate Channel Assignment Wait , PSTN (2/2)

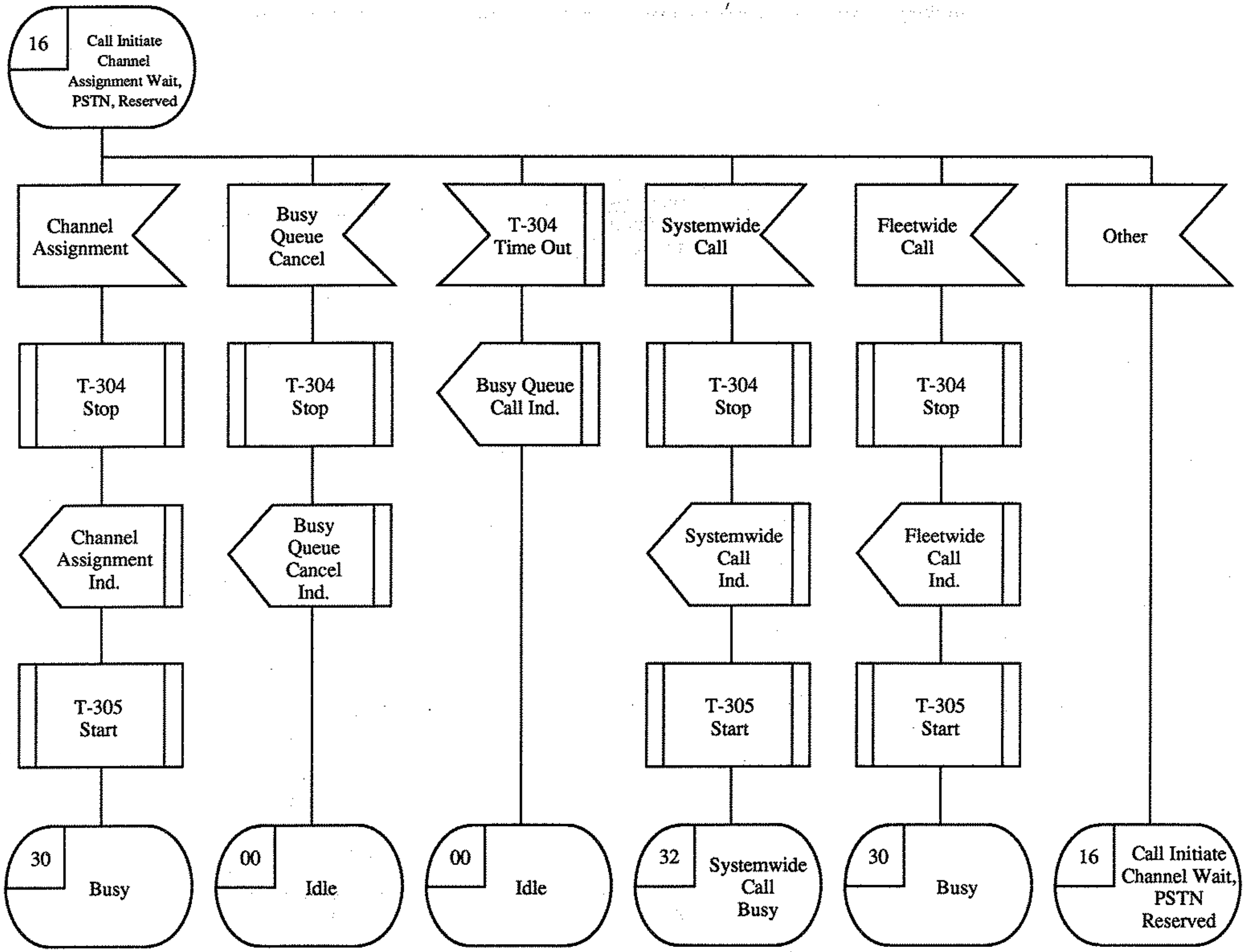


Fig. 1.16 Mobile Station Call Control (layer3) Call Initiate Channel Assignment Wait, PSTN, Reserved

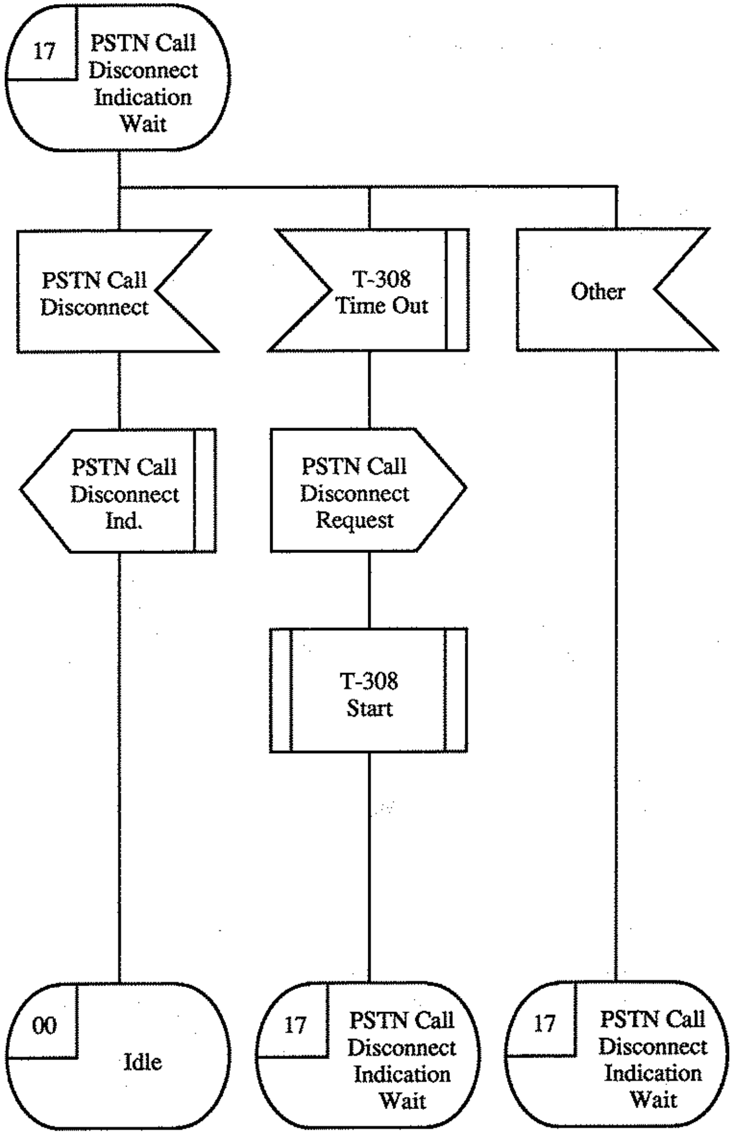
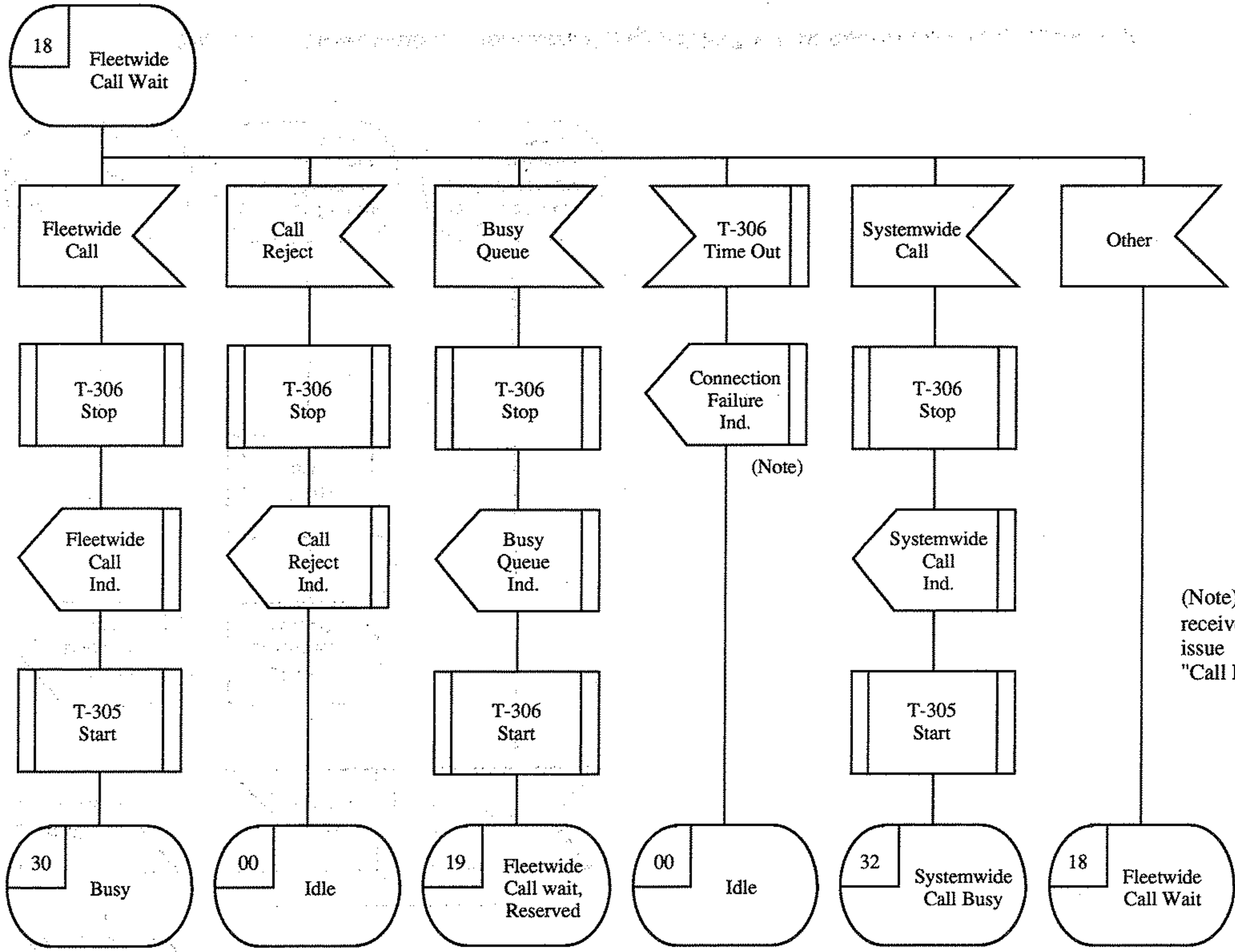


Fig. 1.17 Mobile Station Call Control (layer3) PSTN Call Disconnect Indications Wait



(Note) Management which received this Primitive doesn't issue Primitive of Interconnect "Call Request Req " for 4 seconds.

Fig. 1.18 Mobile Station Call Control (layer3) Fleetwide Call Wait

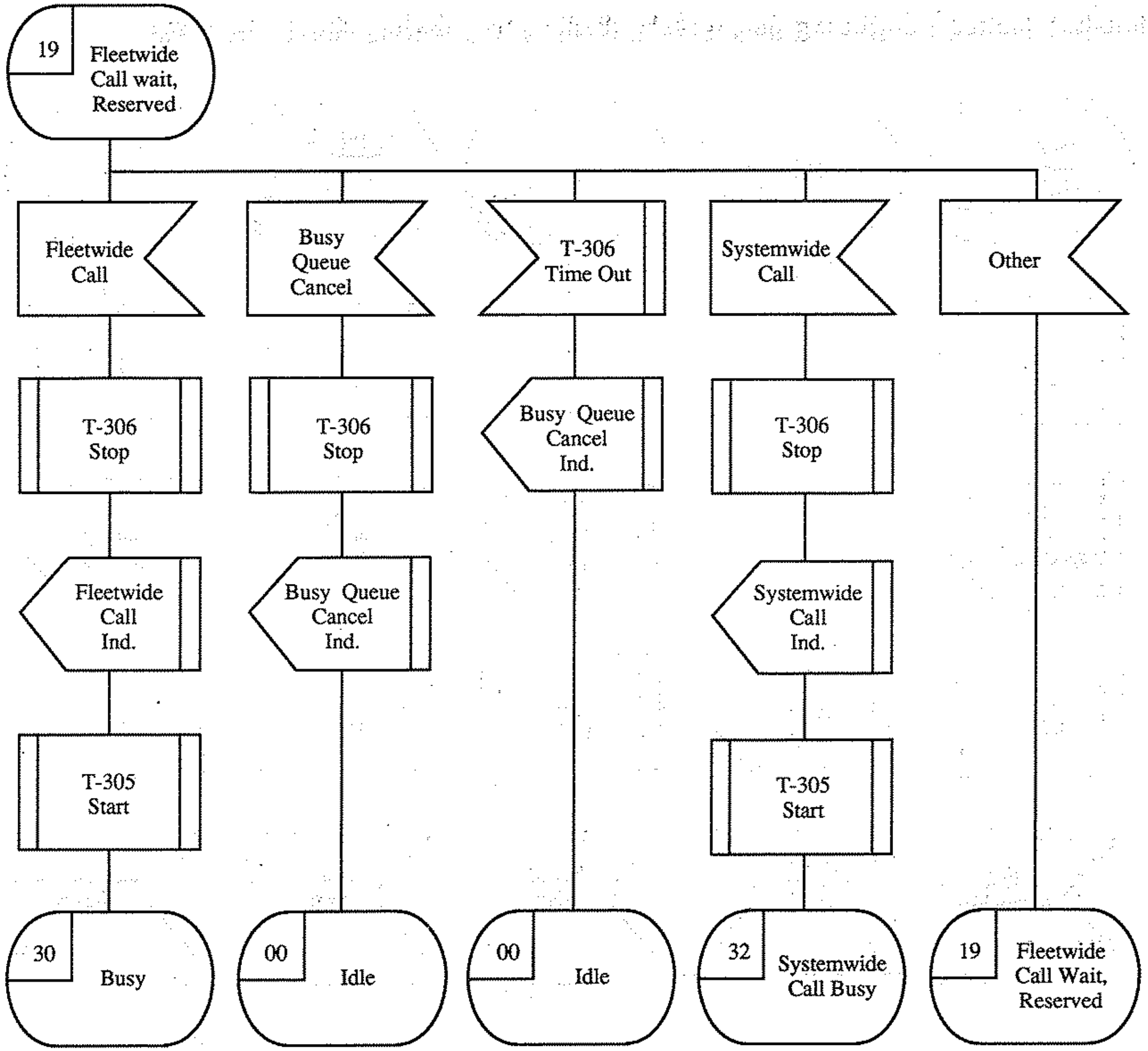


Fig. 1.19 Mobile Station Call Control (layer3) Fleetwide Call Wait, Reserved

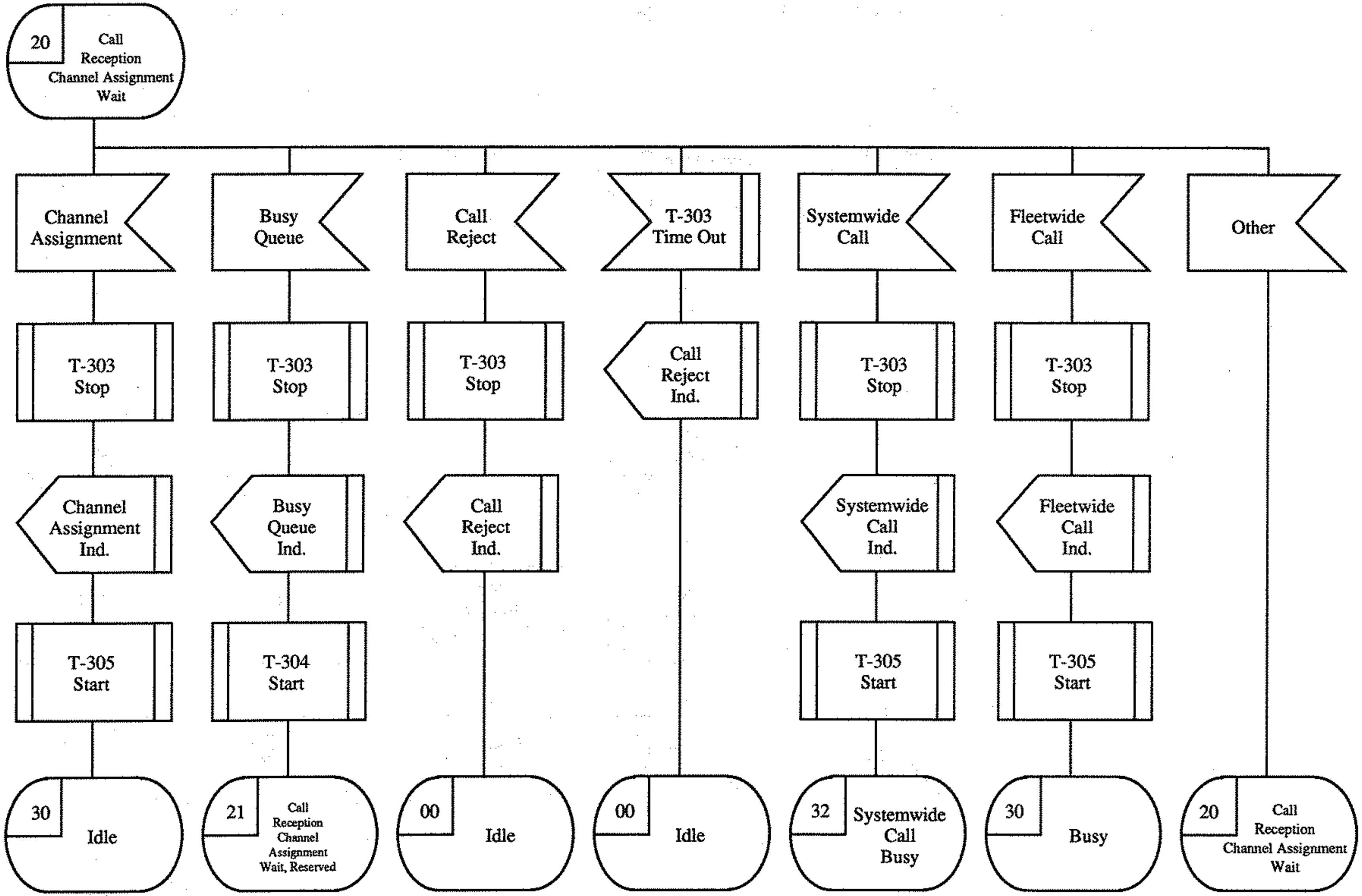


Fig. 1.20 Mobile Station Call Control (layer3) Call Reception Channel Assignment Wait

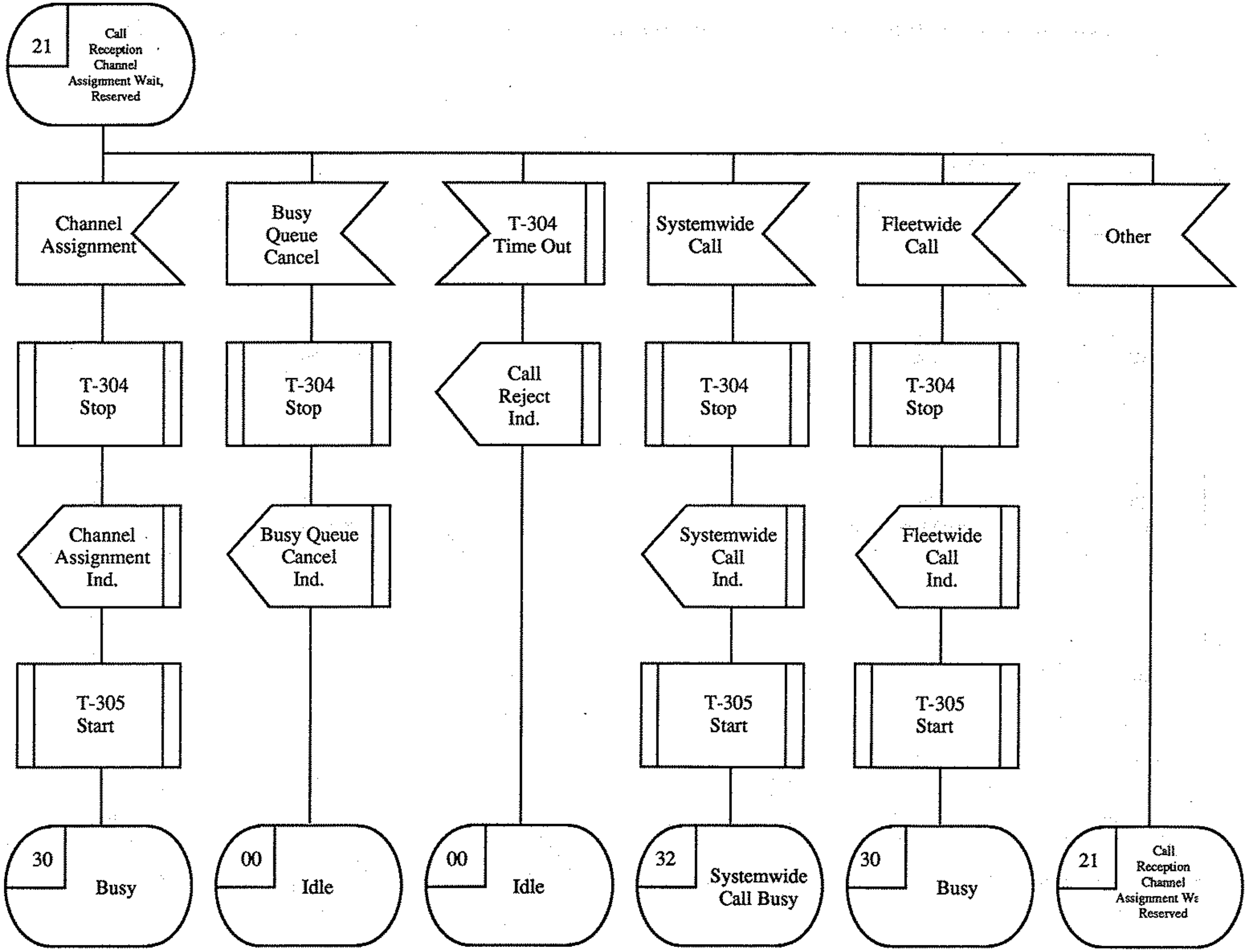


Fig. 1.21 Mobile Station Call Control (layer3) Call Reception channel Assignment Wait, Reserved

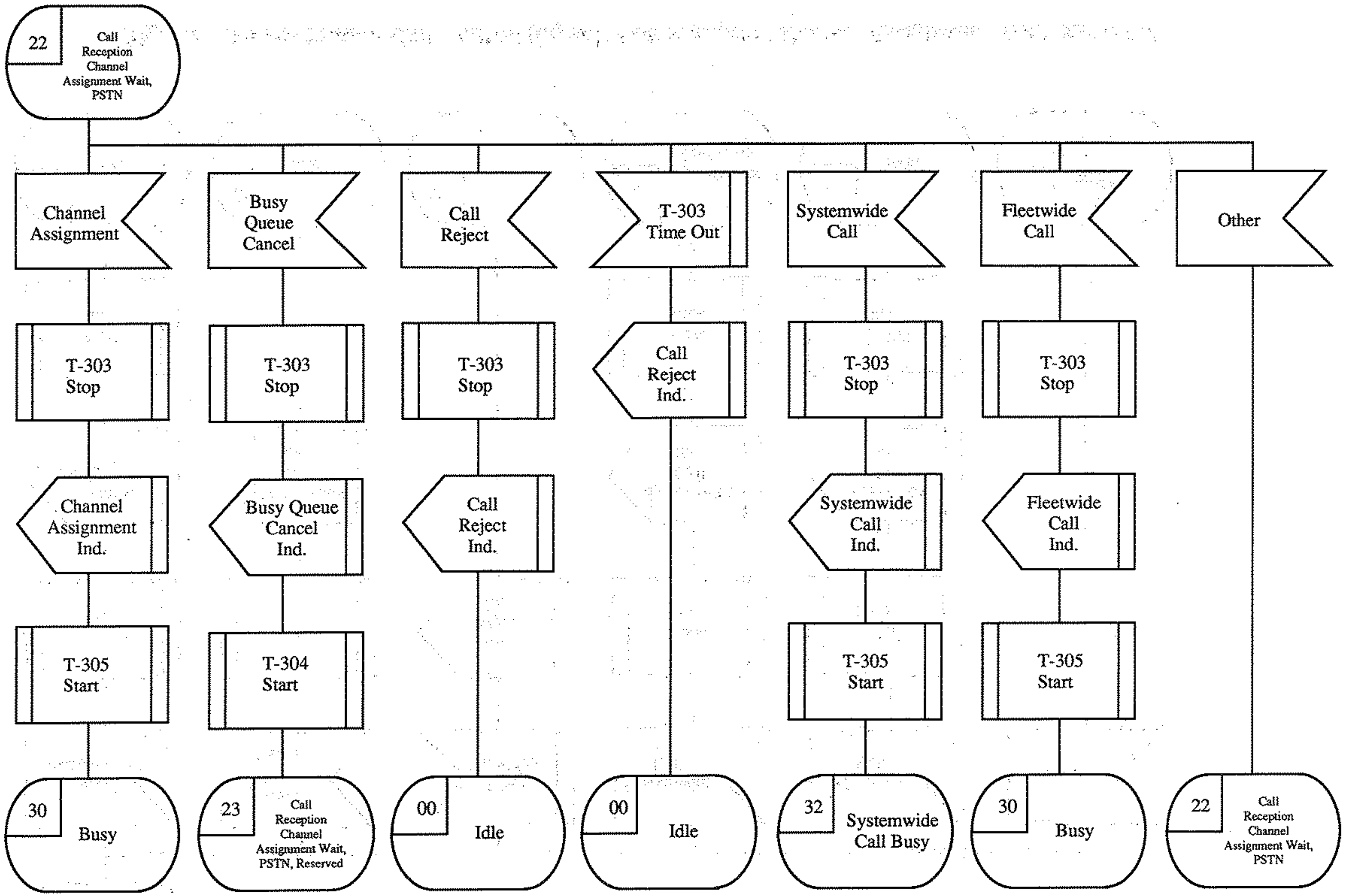


Fig. 1.22 Mobile Station Call Control (layer3) Call Reception Channel Assignment Wait, PSTN

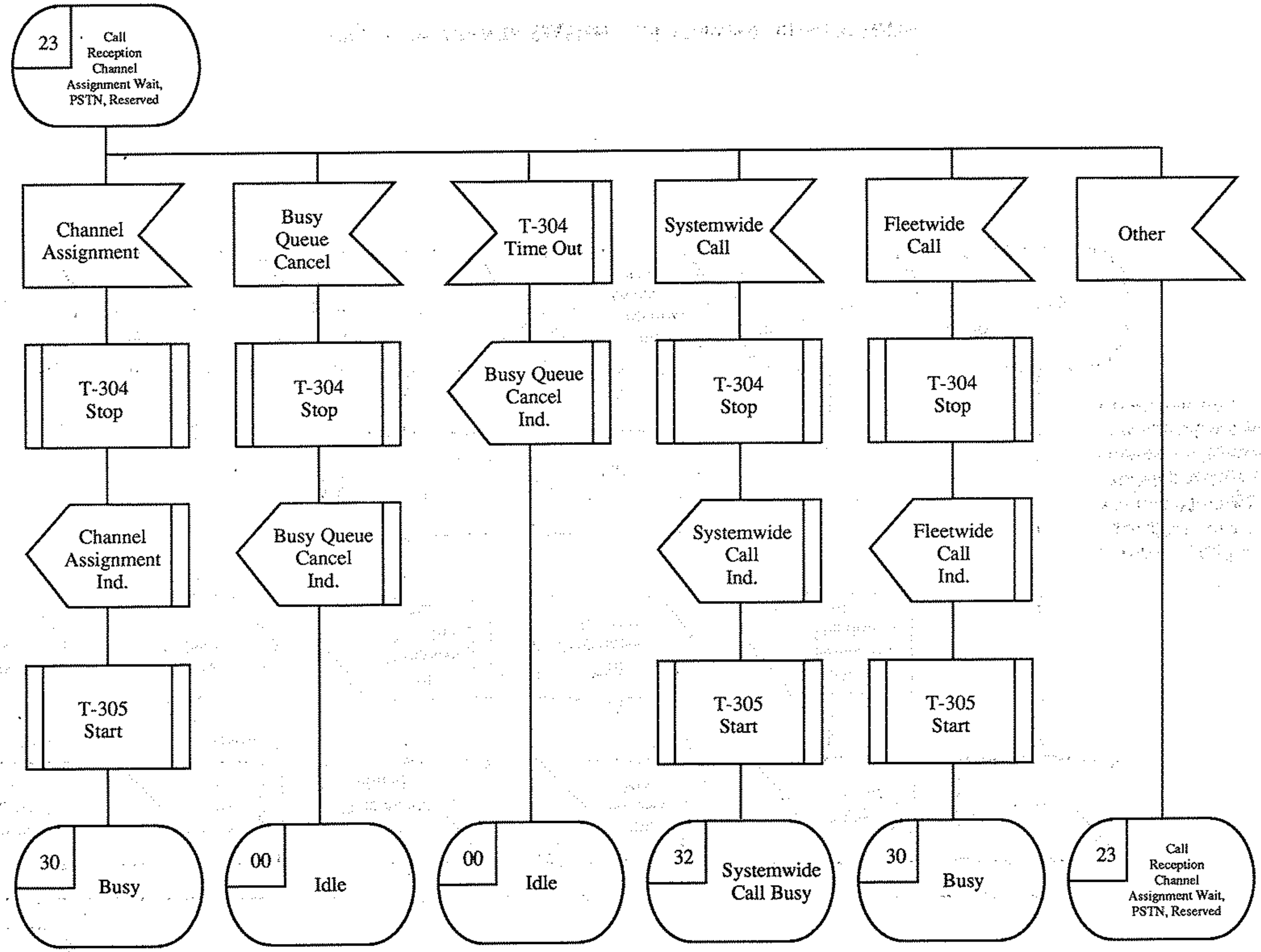
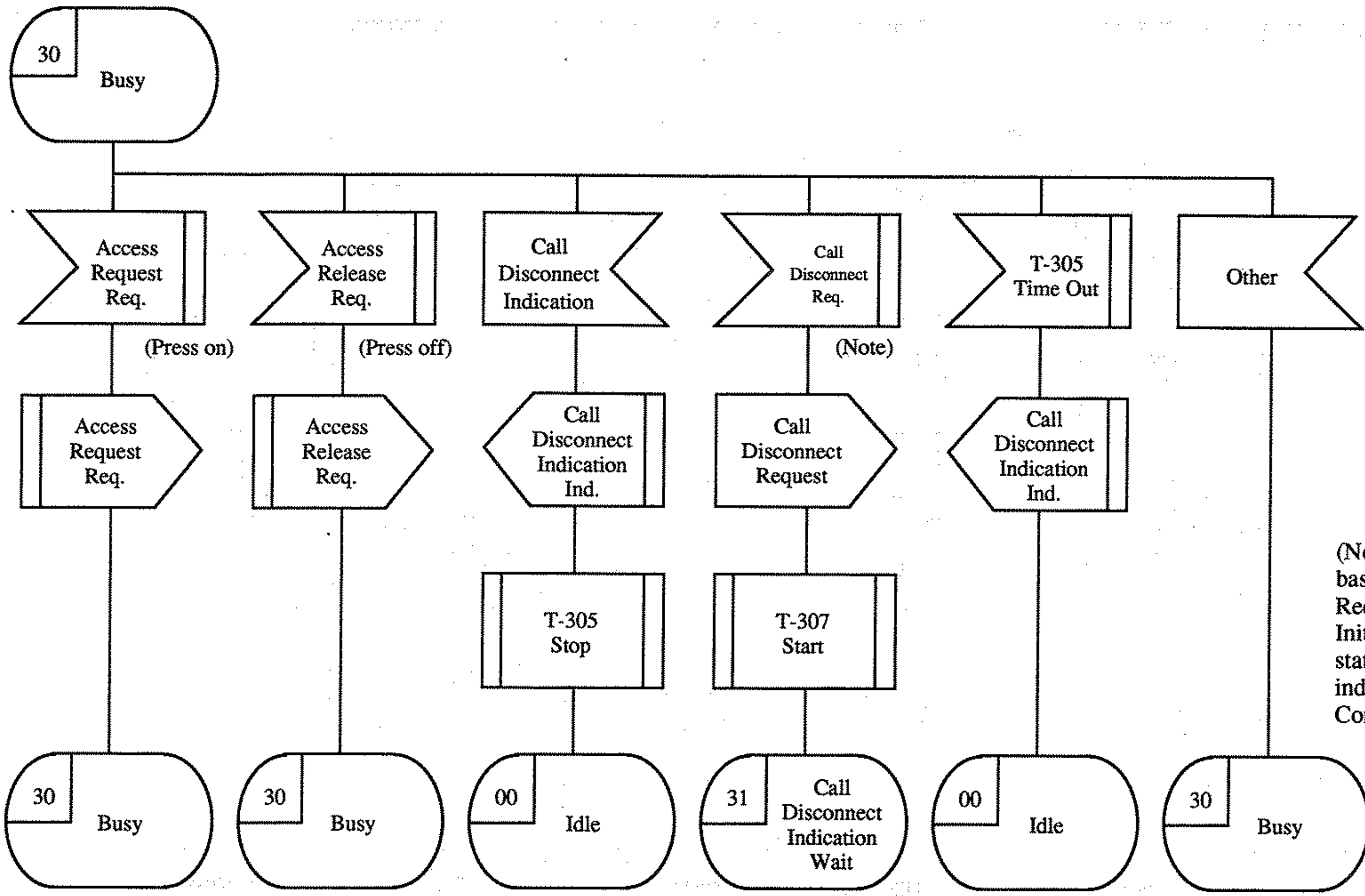


Fig. 1.23 Mobile Station Call Control (layer3) Call Reception Channel Assignment Wait , PSTN, Reserved



(Note) The Call Initiating station can basically transmit only "Call Disconnected Request Message", and either the Call Initiating station or the call receiving station can transmit "Call DRM" the individual Communication and the PSTN Communication.

Fig. 1.30 Mobile Station Call Control (layer3) Busy

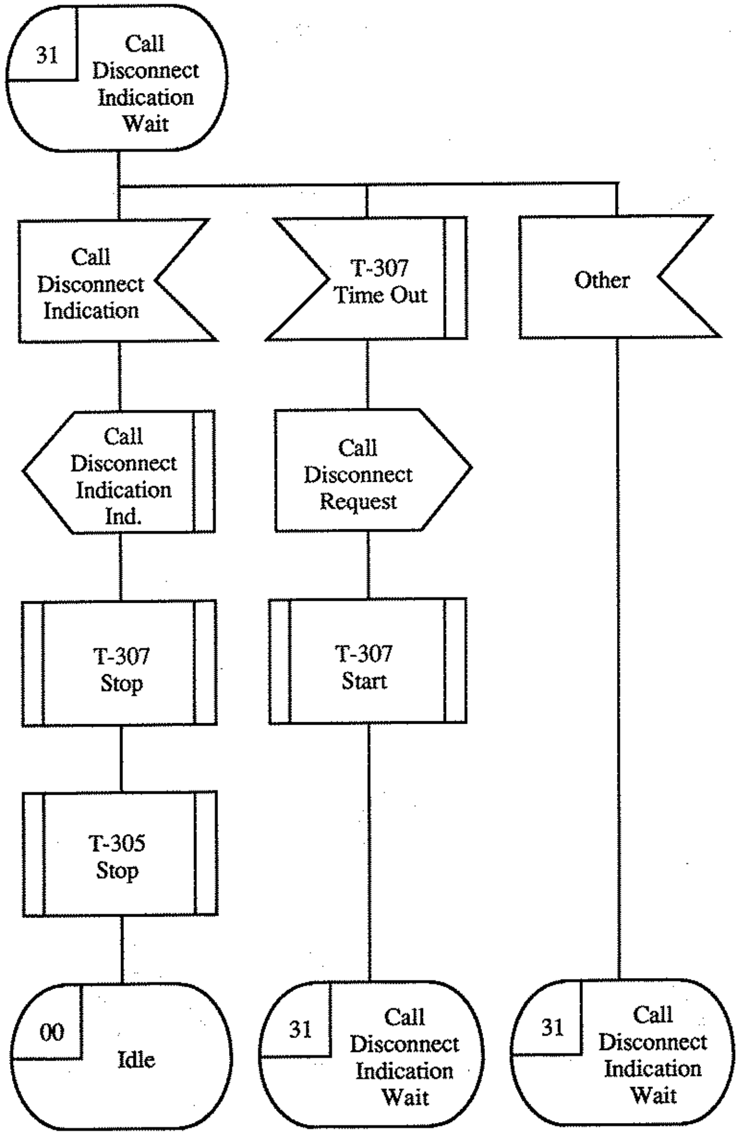


Fig. 1.31 Mobile Station Call Control (layer3) Call Disconnect Indication Wait

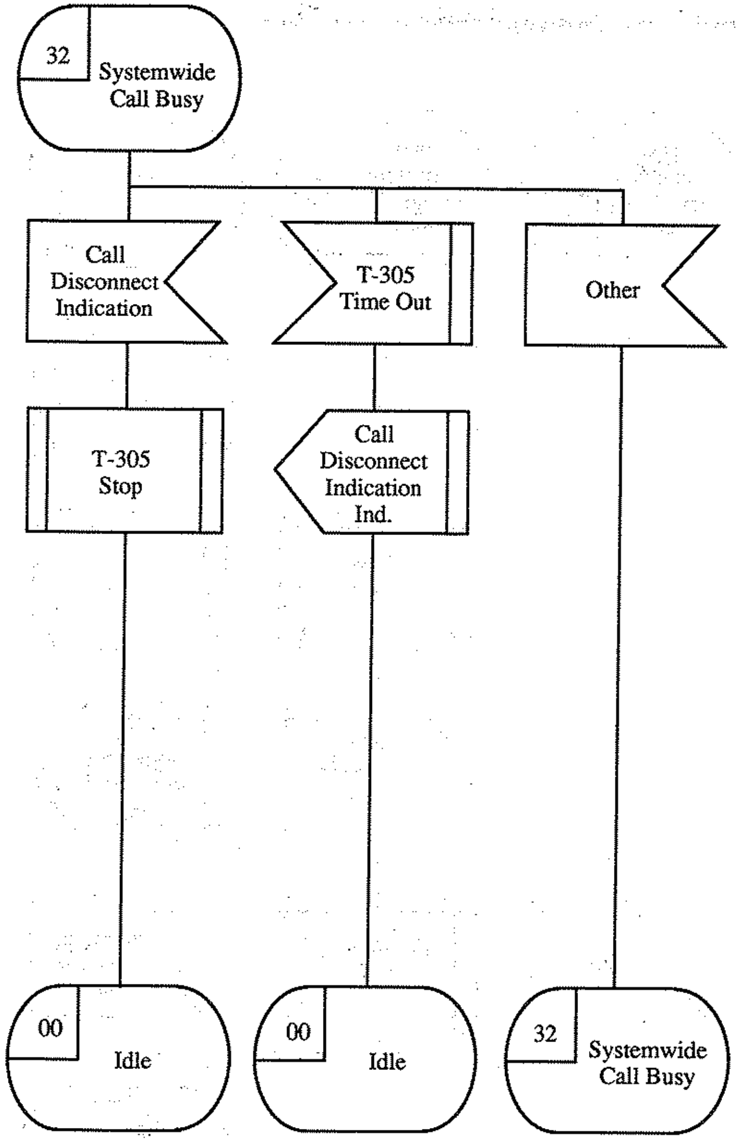


Fig. 1.32 Mobile Station Call Control (layer3) Systemwide Call Busy

IV Timer Table

Timer No.	Timer Name	Application	Timer Value	
T-301	Call Initiation Channel Assignment Wait Timer	Timer which receives. Channel Assignment Message or Busy Queue Message of initiation side. Timer values are respectively prescribed for Individual Group, Inter-zone and PSTN.	Individual	10 sec
			Group	4 sec.
			Inter-zone	10 sec.
			PSTN	30 sec.
T-302	Call Response Wait Timer	Timer which receives Call Response Message. Timer values are respectively prescribed for Individual, Inter-zone and PSTN.	Individual	4 sec.
			Inter-zone	4 sec.
			PSTN	4 sec.
T-303	Call Reception CH Wait Timer	Timer which receives Channel Assignment Message of reception side. It is prescribed for only Individual.	Individual	10 sec.
T-304	Busy Queue Cancel Timer	Timer which receives Channel Assignment Message, after receiving Busy Queue Message.	Individual	80 sec.
			Group	80 sec.
			Inter-zone	80 sec.
			PSTN	80 sec.
T-305	Please reconfirm the expression of "Message Tranked". Time-out Timer	Timer which restricts communication time for efficient use of frequency spectrum.	PSTN	CAC by Broad cast
			Other	CAC by Broad cast
T-306	Fleetwide Call Message Wait Timer	Timer which receives Fleetwide Call Message, after transmitting Fleetwide Call Request.	Group	300 sec.
			Inter-zone	300 sec.
T-307	Call Disconnect Message Wait Timer	Timer which receives Call Disconnect Message, after transmitting Call Disconnect Request.	Individual	1 sec.
			Group	1 sec.
			Inter-zone	1 sec.
			PSTN	1 sec.
T-308	PSTN Call Disconnect Message Wait Timer	Timer which receives PSTN Call Disconnect Message,after transmitting PSTN Call Disconnect Request.	PSTN	1 sec.

Annex-5

Repeater SDL Configuration

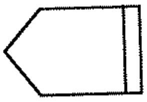
Contents

I Introduction

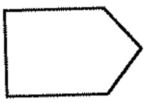
The symbols used at SDL configuration of Digital MCA system are shown as below.

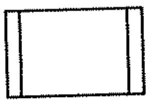

: State


: Primitive from Management layer


: Primitive to Management layer

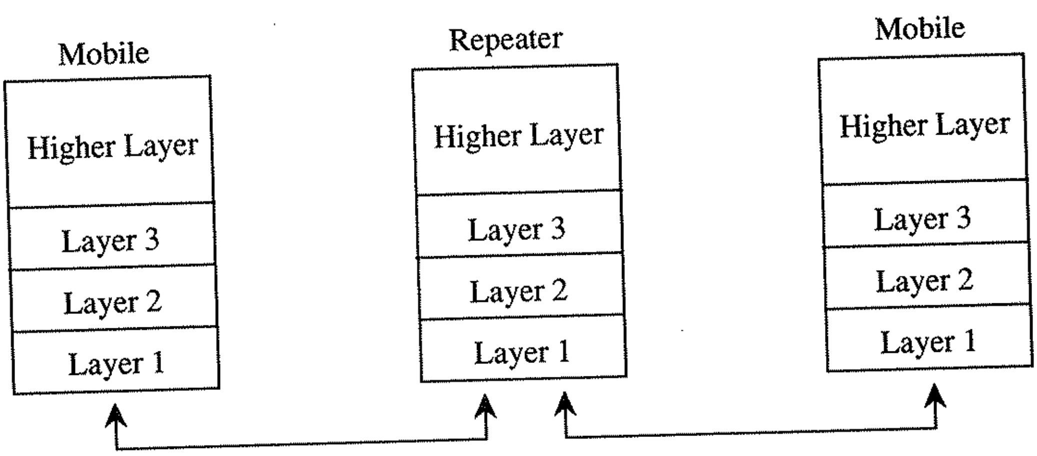

: Message from repeater station


: Message to repeater station


: Procedure Call

: Selection


[Primitive]
Req : Request
Ind : Indication
Res : Response
Con : Confirm



Layer Model

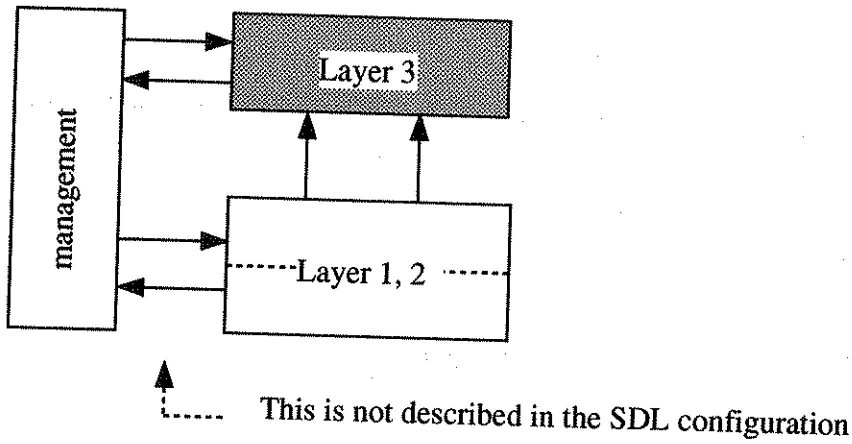


Fig A 5-1 Layer Configuration of Repeater Station (Layer3)

SDL configuration of Mobile station is described on the basis of this figure. Every entities required for the mobile station including resource management and control exists in.

II Difinistion of Call Connection State

Call states of Repeater station are shown in the Table A5-1

Table A5-1 Call States of Repeater Station (1/7)

Classification				State No.	State Name	Definition
Initial state				000	Idle	When there is no Call.
Single Zone	Group	General Comm. Call		111	Call Request Res. Wait	The state which is waiting for confirming the reasonability of the request, after notifying Management of Call Request from Mobile.
				112	CH Assignment Req. Wait	The state which is waiting for CH assignment from Management.
				113	Idle CH Generation Wait	The state which is waiting for CH assignment from Management which received Primitive.
				114	Busy	The state when CH is assigned to Mobile station.
		PSTN Inter-connect Call	Call Initiation from Mobile station	121	Call Request Res. Wait	The state which is waiting for confirming the reasonability of the request, after notifying Management of Call Request from Mobile.
				122	CH Assignment Req. Wait	The state which is waiting for CH assignment from Management.
				123	Idle CH Generation Wait	The state which is waiting for CH assignment from Management which received Primitive.
				124	Busy	The state when CH is assigned to Mobile station.
			Call Initiation from Phone	131	Idle CH Generation Wait	The state which is waiting for CH assignment from Management which received Primitive.
				132	Busy	The state when CH is assigned to Mobile station.

Table A5-1 Call States of Repeater Station (2/7)

Classification				State No.	State Name	Definition
	Initial state			000	Idle	When there is no Call.
Single Zone	Group	Multiple Slots Comm. (Simplex, Half-duplex)				after notifying Management of Call Request from Mobile.
				142	Multiple CH Assignment Req. Wait	The state which is waiting for Multiple CH assignment from Management.
				143	Multiple Idle CH Generation Wait	The state which is waiting for Multiple CH assignment from Management which received primiting.
				144	Busy	It is the state that Multiple CH is assigned to Mobile station.
	Individual	General Comm. Call		151	Call Request Res. Wait	The state which is waiting for confirming the reasonability of the request, after notifying Management of Call Request from Mobile.
				152	Transpond Response Wait	The state which is waiting for Transpond Response from Mobile station.
				153	CH Assignment Req. Wait	The state which is waiting CH assignment from Management.
				154	Idle CH Generation Wait	The state which is waiting for CH assignment from Management which received primiting.
				155	Busy	The state when CH is assigned to Mobile station.
		PSTN Inter-connect Call	Call Initiation from Mobile station	161	Call Request Res. Wait	The state which is waiting for confirming the reasonability of the request, after notifying Management of Call Request from Mobile.
				162	CH Assignment Req. Wait	The state which is waiting for CH assignment from Management.
				163	Idle CH Generation Wait	The state which is waiting for CH assignment from Management which received primiting.
				164	Busy	The state when CH is assigned to Mobile station.

Table A5-1 Call States of Repeater Station (3/7)

Classification				State No.	State Name	Definition
Single Zone	Individual	PSTN Inter-connect Call	Call Initiation from Phone	171	Transpond Response Wait	The state which is waiting for Transpond Response from Mobile station.
				172	CH Assignment Req. Wait	The state which is waiting for CH Assignment from Management.
				173	Idle CH Assignment Generation Wait	The state which is waiting for CH assignment from Management which received primitive.
				174	Busy	The state when CH is assigned to Mobile station.
		Multiple Slots Comm. (Simplex, Half-duplex Duplex)		181	Call Request Res. Wait	The state which is waiting for confirming the reasonability of the request, after notifying Management of Call Request from Mobile.
				182	Transpond Response Wait	The state which is waiting for Transpond response from Mobile station.
				183	Multiple CH Assignment Req. Wait	The state which is waiting for Multiple CH assignment from Management.
	Individual	Multiple Slots Comm. (Simplex, Half-duplex Duplex)		184	Multiple Idle CH Generation Wait	The state which is waiting for CH Multiple assignment from Management which received primitive.
				185	Busy	The state when Multiple CH is assigned to Mobile station.
	Fleetwide Call Communication			191	Fleetwide Call Req. Wait	The state which is waiting for confirming the reasonability of the request, after notifying Management of Call Request from Mobile.
				192	CH Assignment Req. Wait	The state which is waiting is CH assignment from Management
				193	Idle CH Generation Wait	The state which is waiting for CH assignment from Management which received primitive.
				194	Busy	The state when CH is assigned to Mobile station.

Table A5-1 Call States of Repeater Station (4/7)

Classification		State No.	State Name	Definition
	User Message Communication	1A1	User Message Res. Wait	The state which is waiting for confirming the reasonability of the request, after notifying Management of User Message from Mobile.

Table A5-1 Call States of Repeater Station (5/7)

Classification				State No.	State Name	Definition
Multiple Zone	Group	General Comm. Call	Repeater Station for Call Initiation	211	Call Request Res. Wait	The state which is waiting for confirming the reasonability of the request, after notifying Management of Call Request from Mobile.
				212	CH Assignment Req. Wait	The state which is waiting for response from other zone and CH assignment from Management.
				213	Idle CH Generation Wait	The state which is waiting for CH assignment from Management which received primitive.
				214	Busy	The state when CH is assigned to Mobile station.
			Repeater Station for Call Reception	221	Idle CH Generation wait	The state which is waiting for CH assignment from Management which received primitive.
				222	Busy	The state when CH is assigned to Mobile station.
		Multiple Slots Comm. (Simplex, Half-duplex) Call	Repeater Station For Call Initiation	231	Call Request Res. wait	The state which is waiting for confirming the reasonability of the request, after notifying Management of Call Request from Mobile.
				232	Multiple CH Assignment Req. wait	The state which is waiting for response from other zone and Multiple CH assignment from Management.
				233	Multiple Idle CH Generation Wait	The state which is waiting for Multiple CH assignment from Management which received primitive.
				234	Busy	The state when Multiple CH is assigned to Mobile station.
			Repeater Station For Call Initiation	241	Multiple Idle CH Generation Wait	The state which is waiting for Multiple CH assignment from Management which received primitive.
				242	Busy	The state when Multiple CH is assigned to Mobile station.

Table A5-1 Call States of Repeater Station (6/7)

Classification				State No.	State Name	Definition
Multiple Zone	Individual	General Comm. Call	Repeater Station For Call Initiation	251	Call Request Res. Wait	The state which is waiting for confirming the reasonability of the request, after notifying Management of Call Request from Mobile.
				252	CH Assignment Req. Wait	The state which is waiting response from other zone and CH assignment from Management.
				253	Idle CH Generation Wait	The state which is waiting for Multiple CH assignment from Management which received primitive.
				254	Busy	The state when Multiple CH is assigned to Mobile station.
			Repeater Station for Call Reception	261	Transpond Response	The state which is waiting for Transpond response from Mobile station of Call Initiation.
				262	CH Assignment Req. Wait	The state which is waiting for Multiple CH from Mobile station.
				263	Idle CH Generation Wait	The state which is waiting for Multiple CH assignment from Management which received primitive.
				264	Busy	The state when CH is assigned to Mobile station.
		Multiple Slots Comm. (Simplex) Call	Repeater Station for Call Initiatio n	271	Call Request Res. Wait	The state which is waiting for confirming the reasonability of the request, after notifying Management of Call Request from Mobile.
				272	Multiple CH Assignment Req. Wait	The state which is waiting response from other zone and Multiple CH assignment from Management.
				273	Multiple CH Generation Wait	The state which is waiting for Multiple CH assignment from Management which received primitive.
				274	Busy	The state when Multiple CH is assigned to Mobile station.

Table A5-1 Call States of Repeater Station (7/7)

Classification				State No.	State Name	Definition
Multiple Zone	Individual	Multiple Slots Comm. (Simplex) Call	Repeater Station for Call Reception	281	Call Request Res. Wait	The state which is waiting for Transpond response from Mobile station of Call Initiation.
				282	Multiple CH Assignment Req. Wait	The state which is waiting for Multiple CH assignment from Management.
				283	Multiple CH Generation Wait	The state which is waiting for Multiple CH assignment from Management which received primitive.
				284	Busy	The state when Multiple CH is assigned to Mobile station.
	Fleetwide Comm.		Repeater Station for Call Initiation	291	Inter-zone Fleetwide Call Res. Wait	The state which is waiting for confirming the reasonability of the request, after notifying Management of Call Request from Mobile.
				292	CH Assignment Req. Wait	The state which is waiting response from other zone and CH assignment from Management.
				293	Idle CH Generation Wait	The state which is waiting for CH assignment from Management which received primitive.
				294	Busy	The state when CH is assigned to Mobile station.
			Repeater Station for Call Reception	2A1	Idle CH Generation Wait	The state which is waiting for CH assignment from Management which received primitive.
				2A2	Busy	The state when CH is assigned to Mobile station.
Systemwide Communications				311	Busy	The state when CH is assigned for System Multi-Destination Delivery.

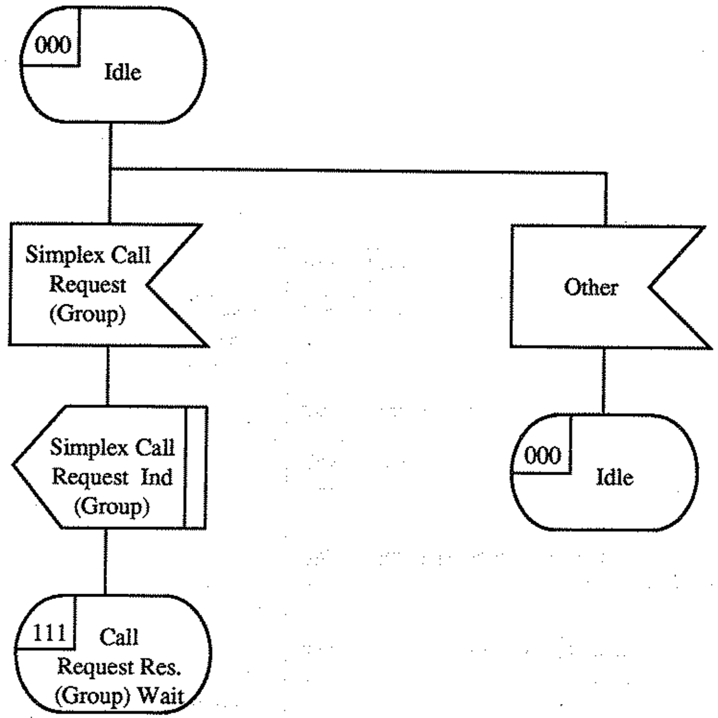


Fig. 2.1.1.0 Repeater Station Call Control (Layer3) Single Zone, Group (Subgroup), General Connection Call

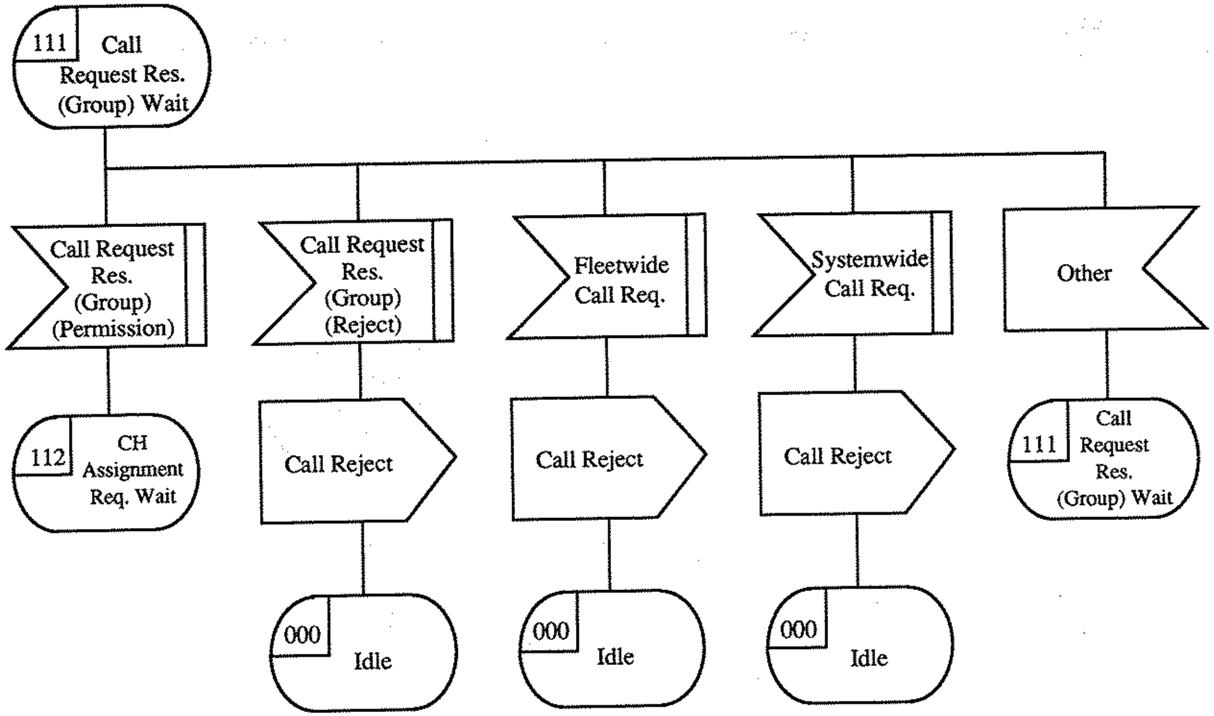


Fig. 2.1.1.1 Repeater Station Call Control (Layer3) Single Zone, Group (Subgroup), General Connection Call

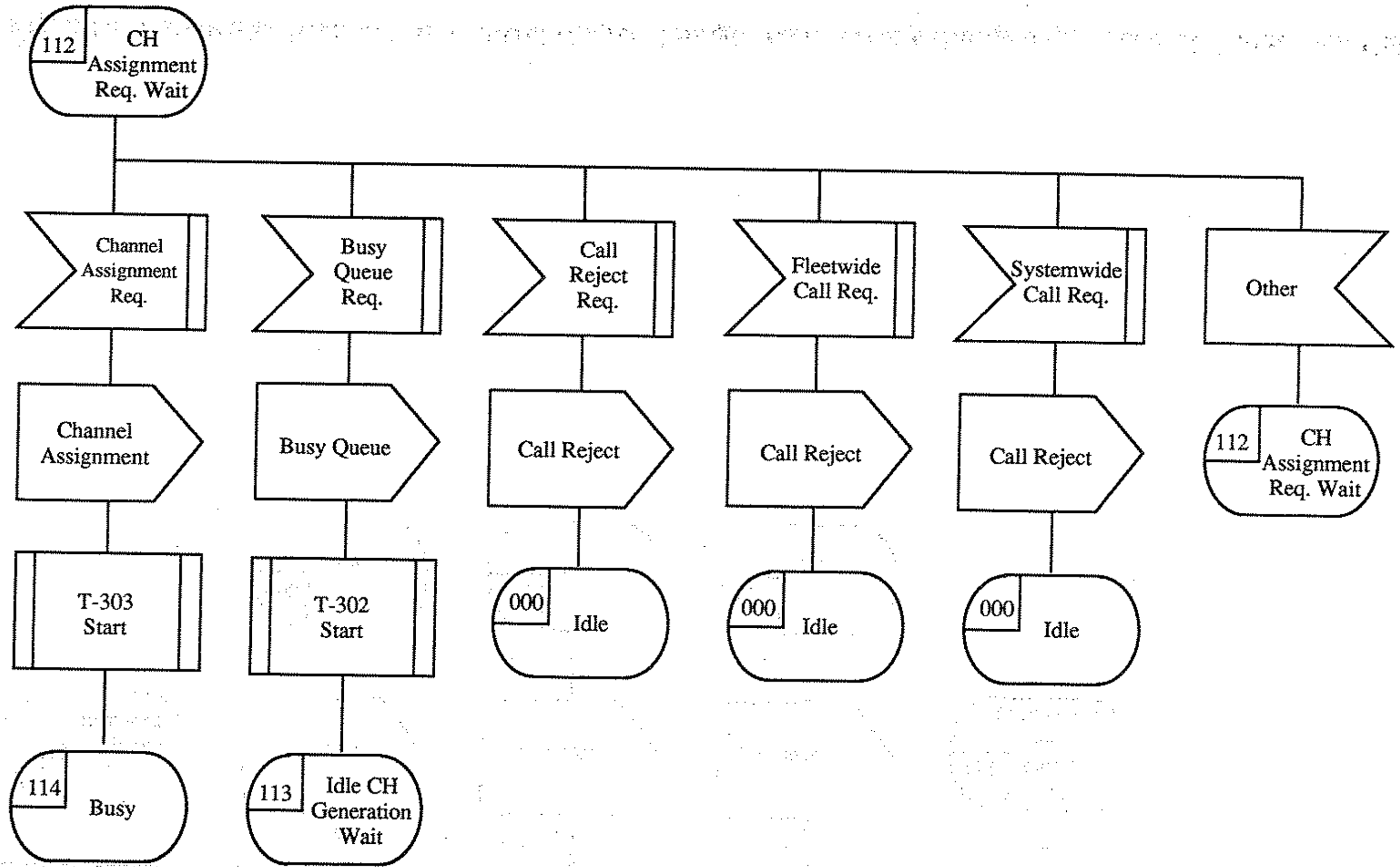


Fig. 2.1.1.2 Repeater Station Call Control (Layer3) Single Zone, Group (Subgroup), General Connection Call

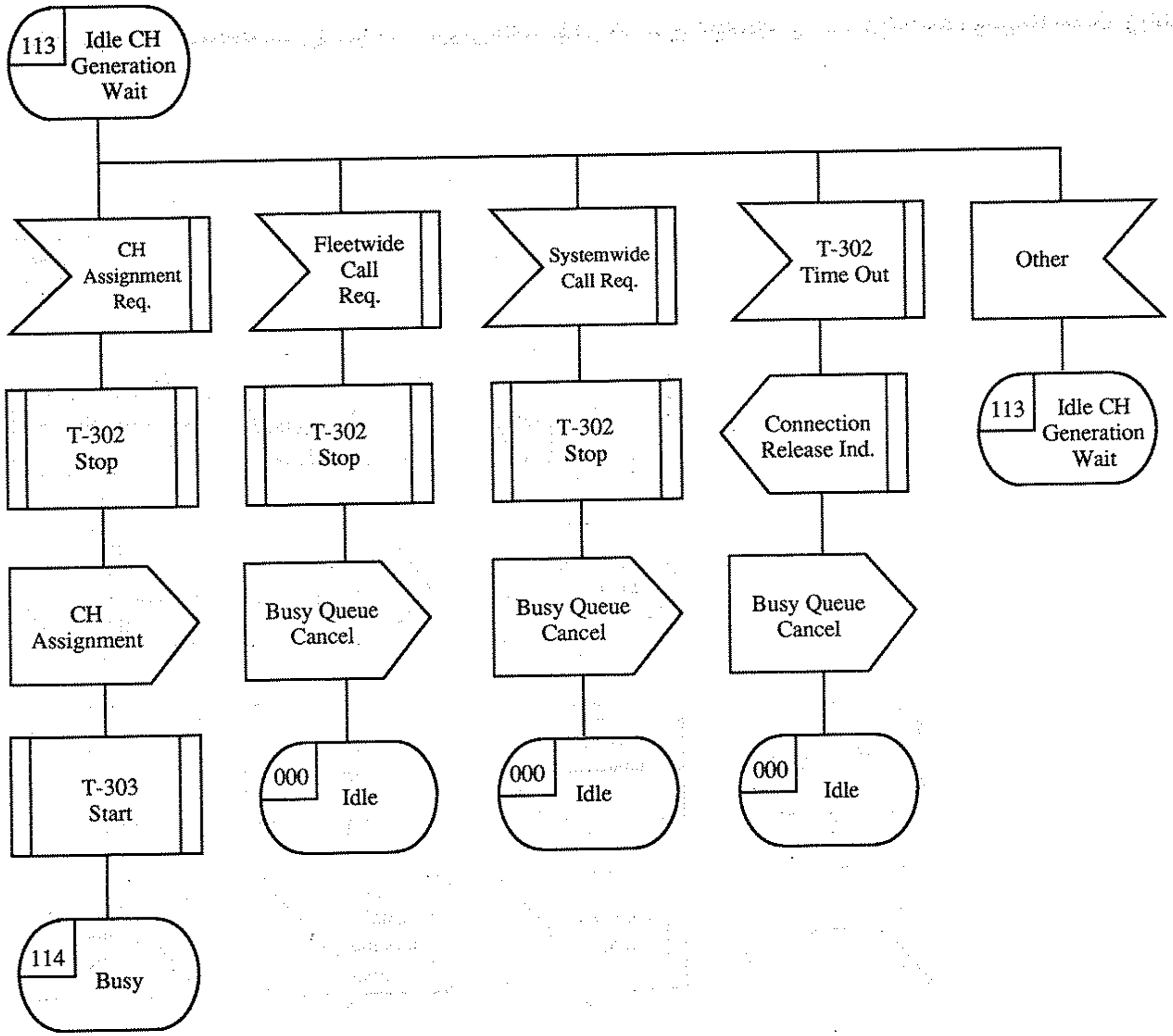


Fig. 2.1.1.3 Repeater Station Call Control (Layer3) Single Zone, Group (Subgroup), General Connection Call

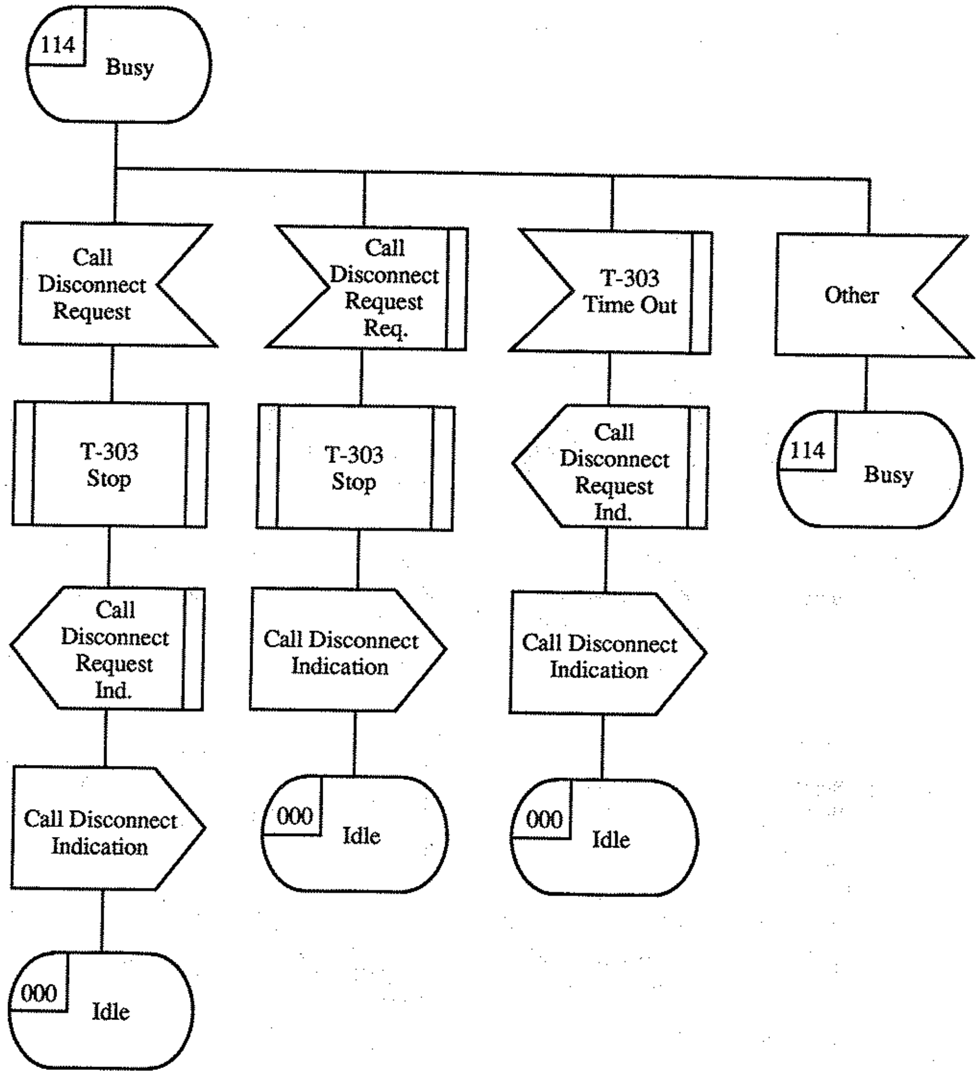


Fig. 2.1.1.4 Repeater Station Call Control (Layer3) Single Zone, Group (Subgroup), General Connection Call

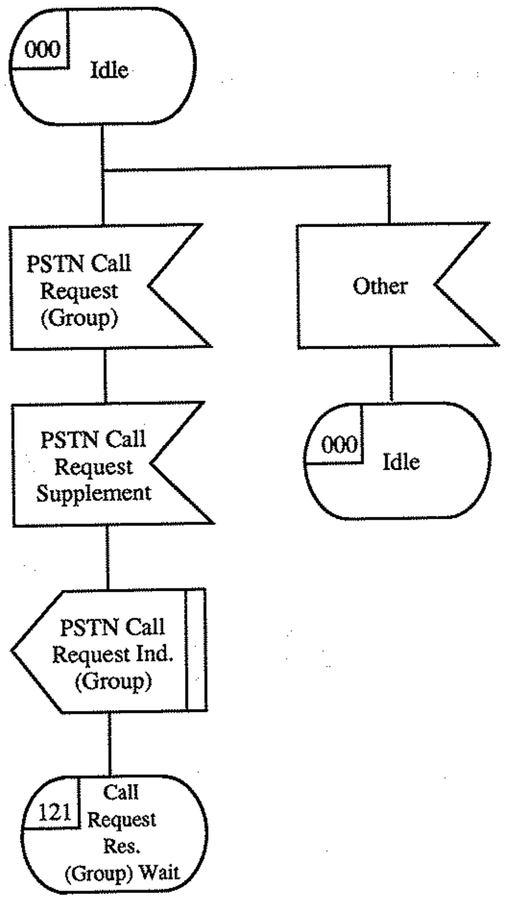


Fig. 2.1.2.0 Repeater Station Call Control (Layer3) Single Zone, Group (Subgroup), PSTN Connection Call (Call Initiate from Mobile Station)

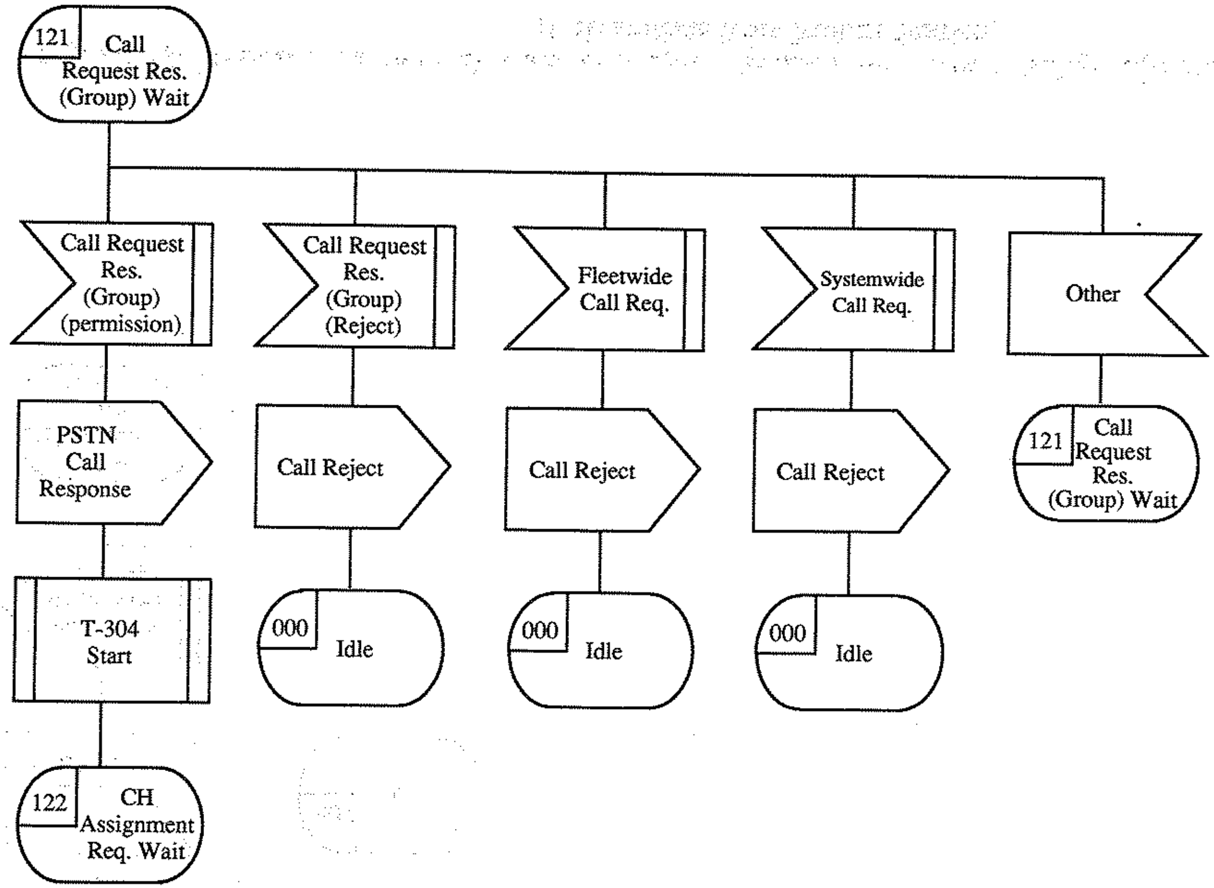


Fig. 2.1.2.1 Repeater Station Call Control (Layer3) Single Zone, Group (Subgroup), PSTN Connection Call (Call Initiate from Mobile Station)

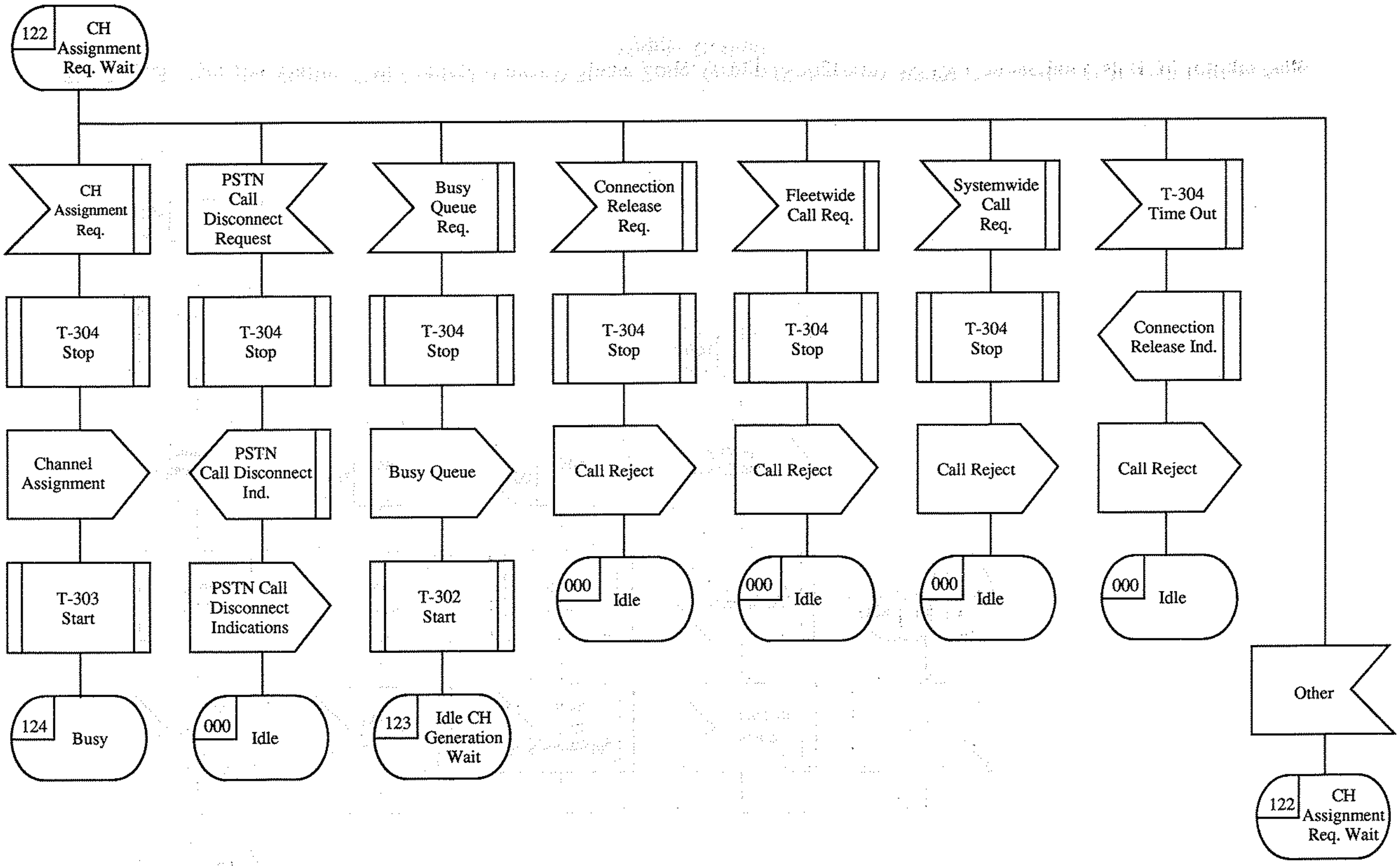


Fig. 2.1.2.2 Repeater Station Call Control (Layer3) Single Zone, Group (Subgroup), PSTN Connection Call (Call Initiate from Mobile Station)

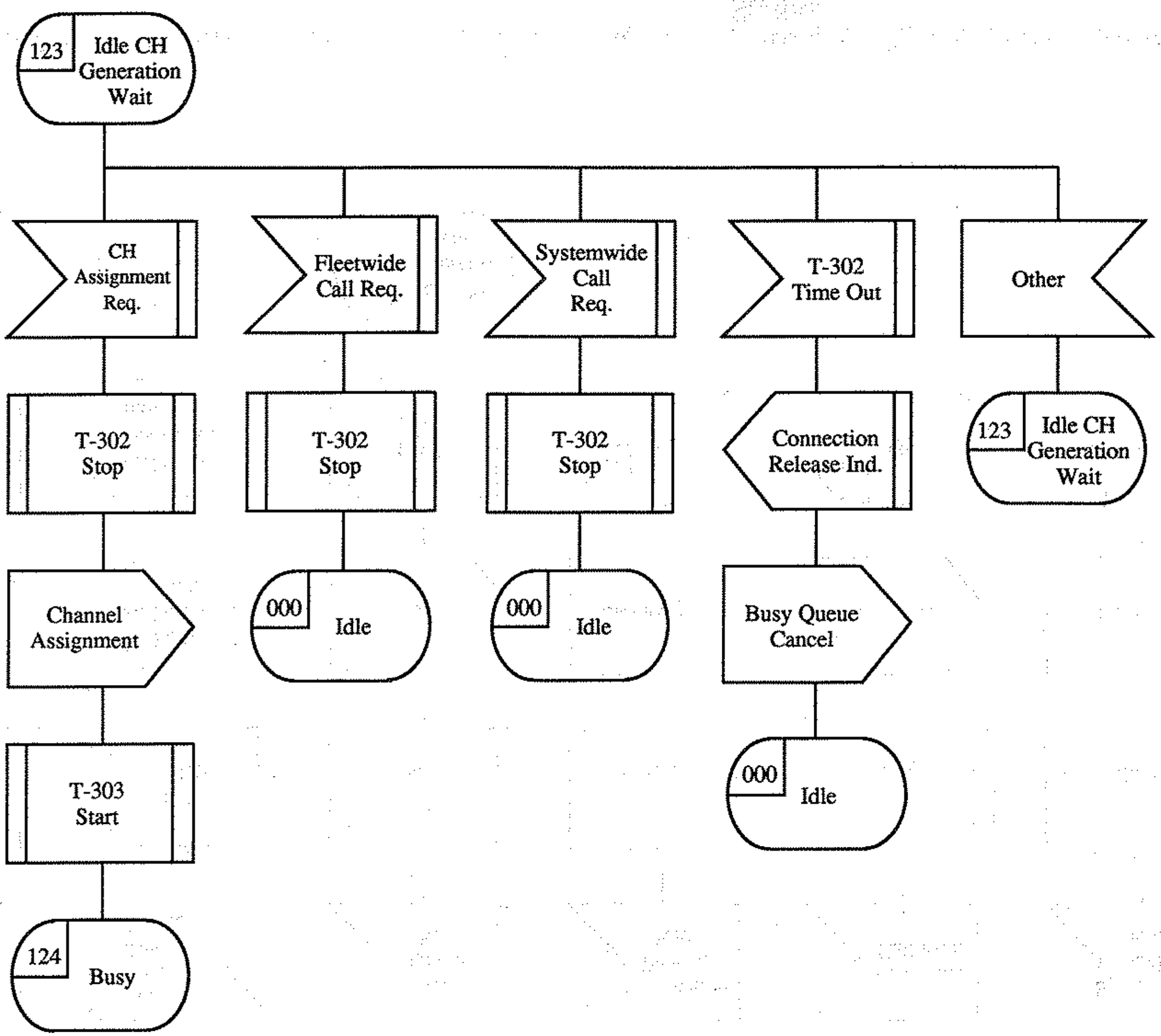


Fig. 2.1.2.3 Repeater Station Call Control (Layer3) Single Zone, Group (Subgroup), PSTN Connection Call (Call Initiate from Mobile Station)

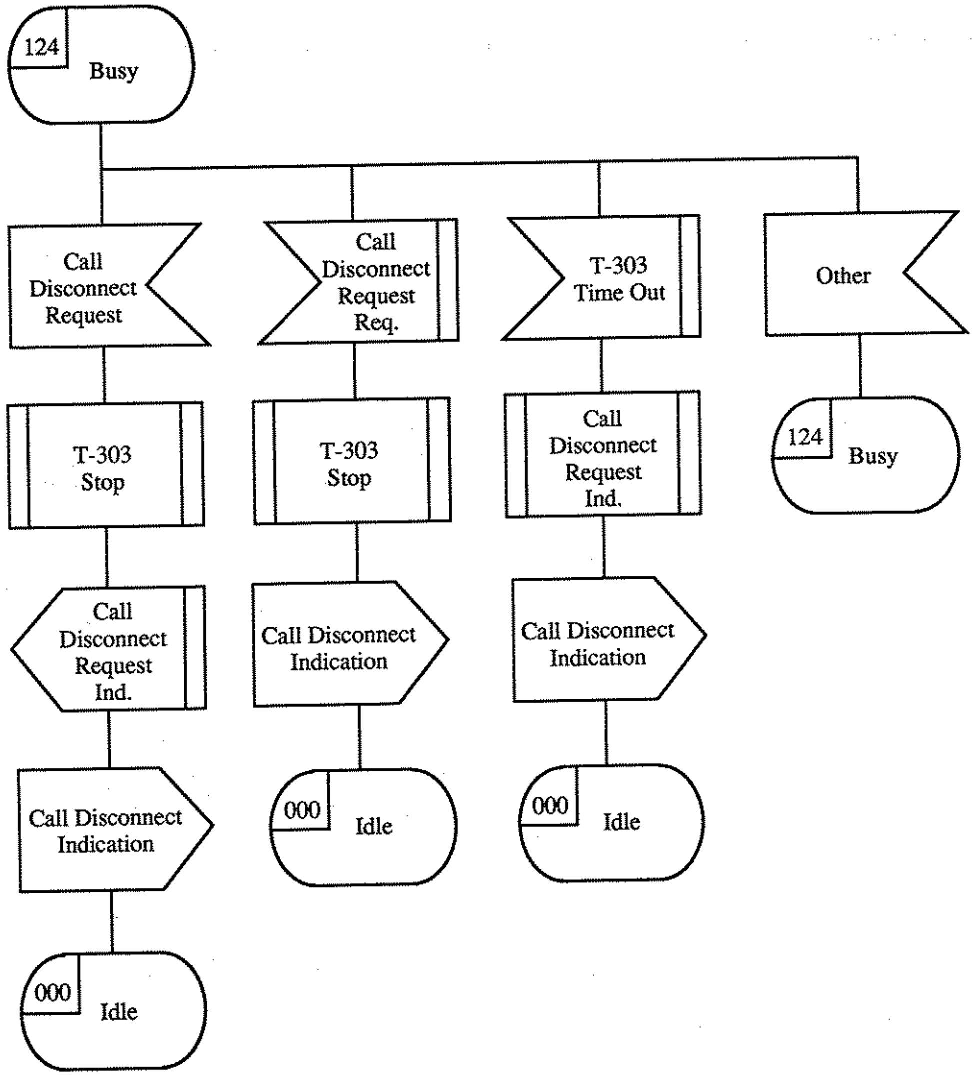


Fig. 2.1.2.4 Repeater Station Call Control (Layer3) Single Zone, Group (Subgroup), PSTN Connection Call (Call Initiation from Mobile Station)

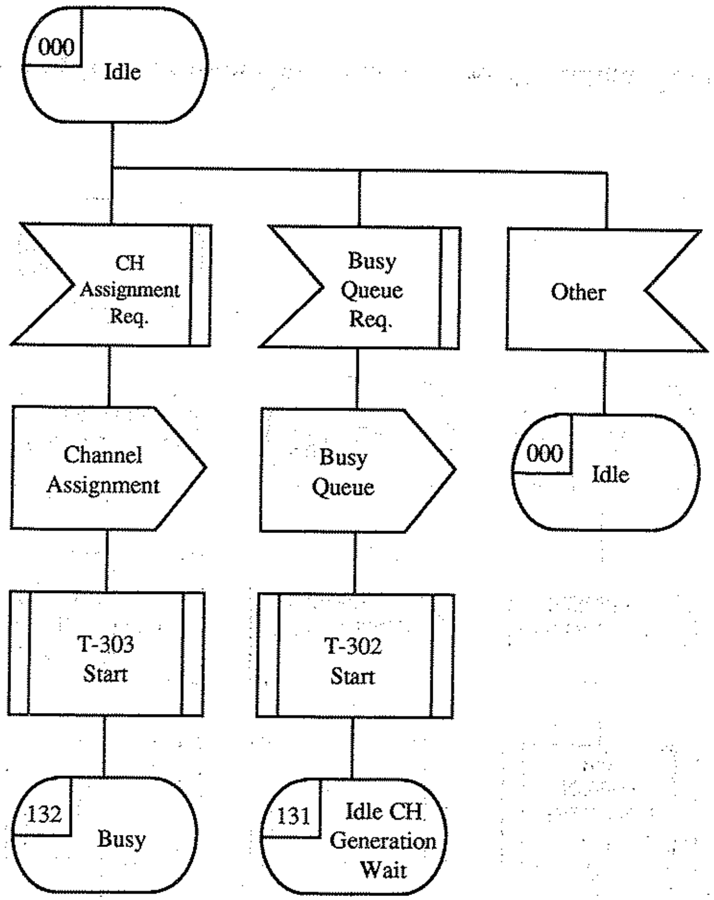


Fig. 2.1.3.0 Repeater Station Call Control (Layer3) Single Zone, Group (Subgroup), PSTN Connection Call (Call Initiate from Phone)

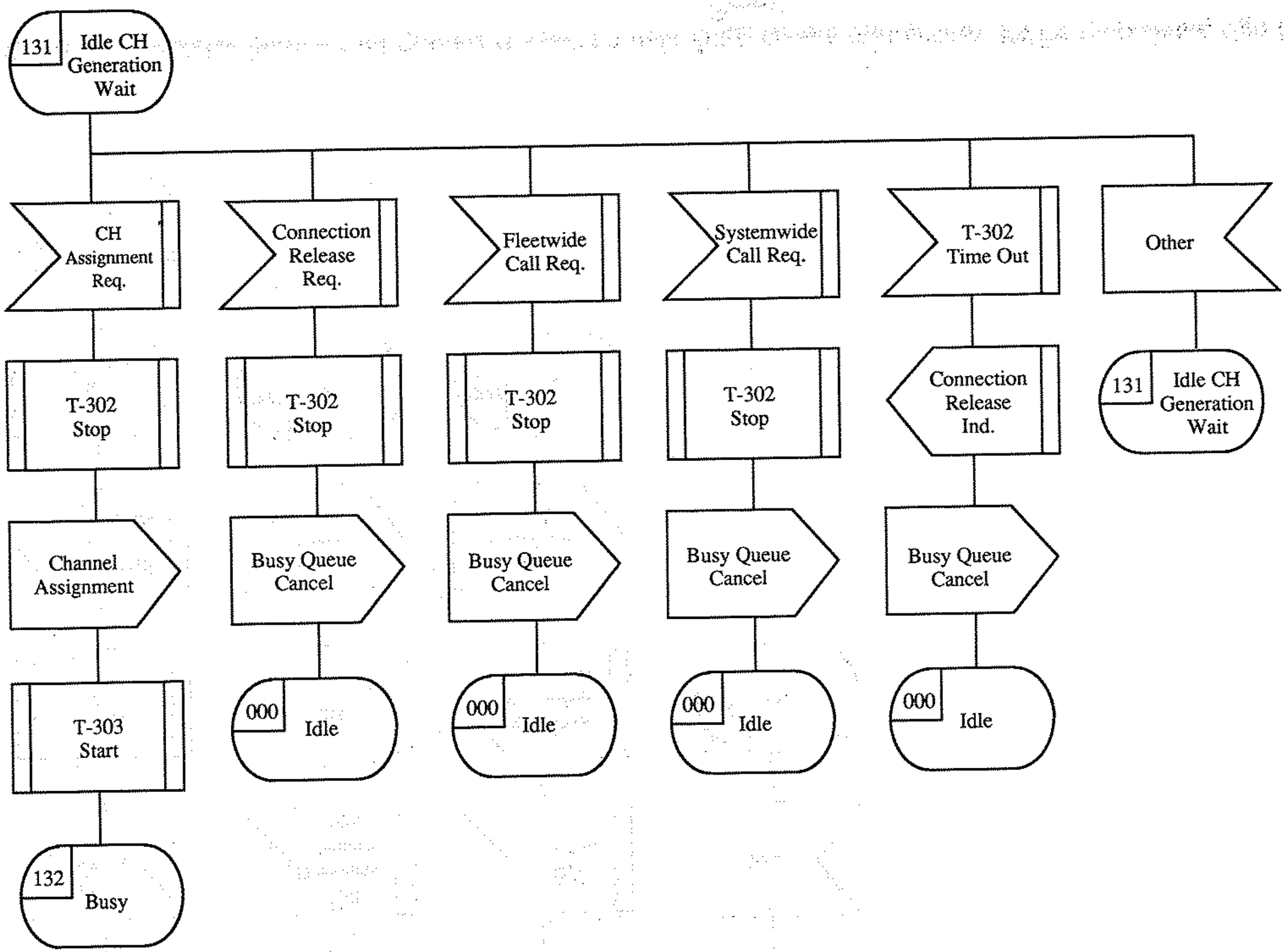


Fig. 2.1.3.1 Repeater Station Call Control (Layer3) Single Zone, Group (Subgroup), PSTN Connection Call (Call Initiate from Phone)

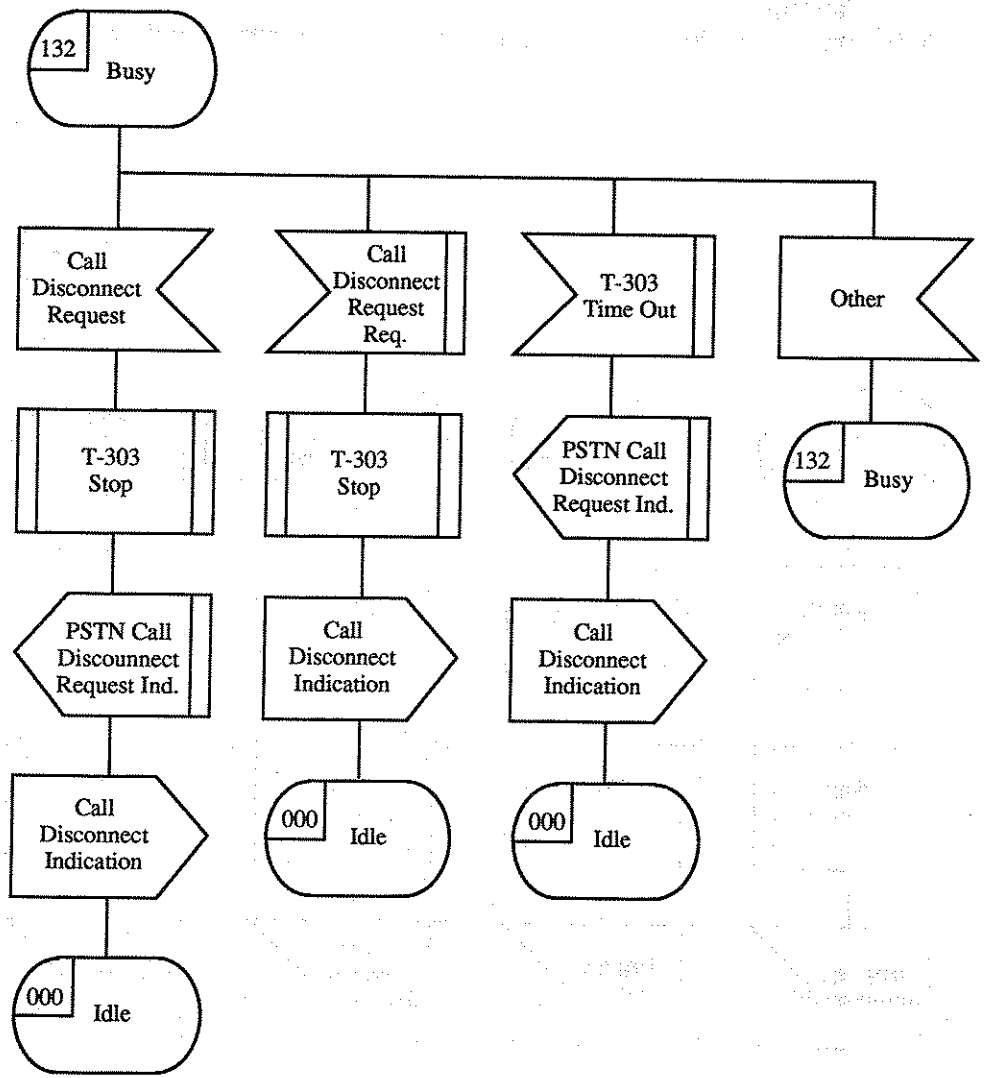


Fig. 2.1.3.2 Repeater Station Call Control (Layer3) Single Zone, Group (Subgroup), PSTN Connection Call (Call Initiate from Phone)

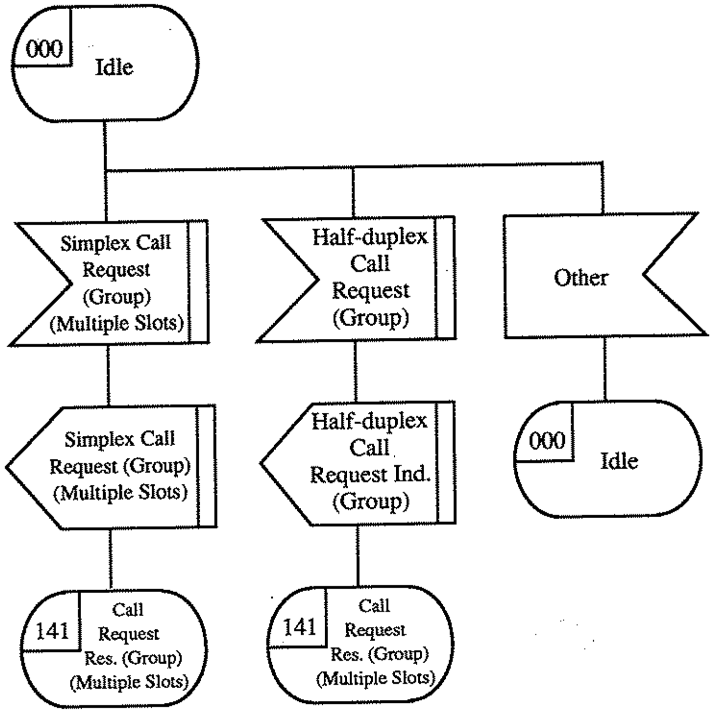


Fig. 2.1.4.0 Repeater Station Call Control (Layer3) Single Zone, Group (Subgroup), Multiple Slots Communications (Simplex / half-duplex)

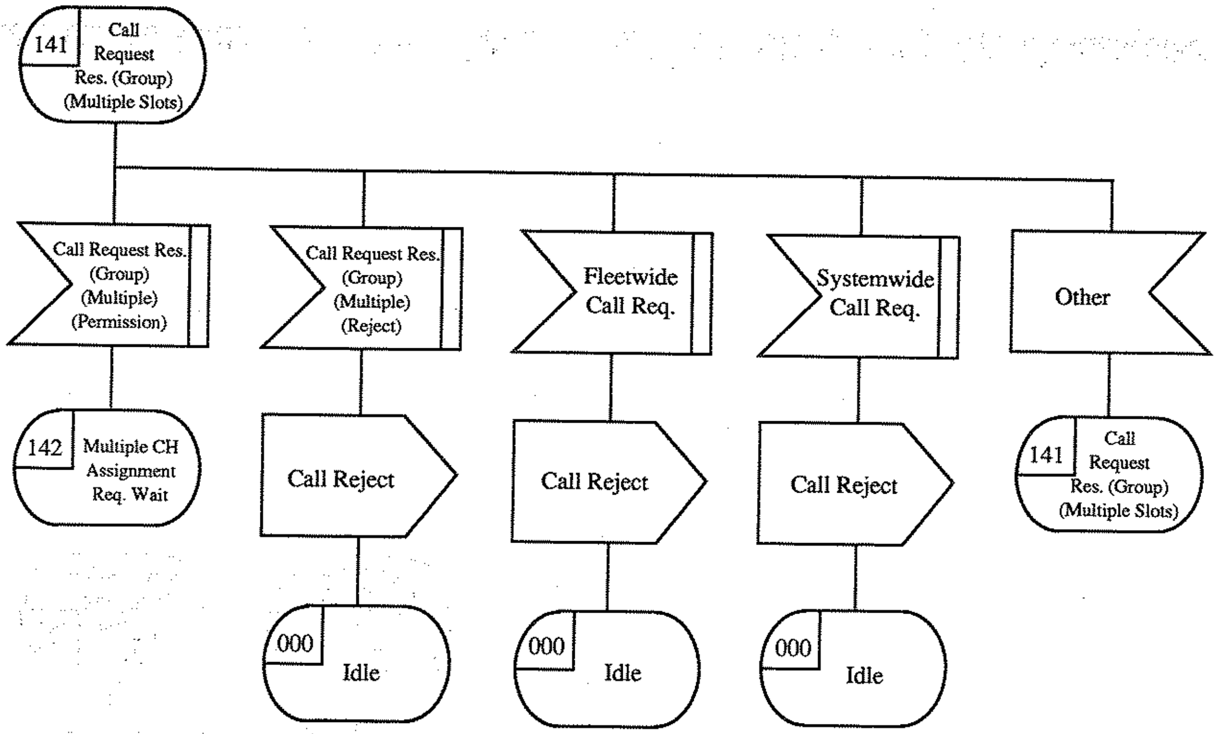


Fig. 2.1.4.1 Repeater Station Call Control (Layer3) Single Zone, Group (Subgroup), Multiple Slots Communications (Simplex / half-duplex)

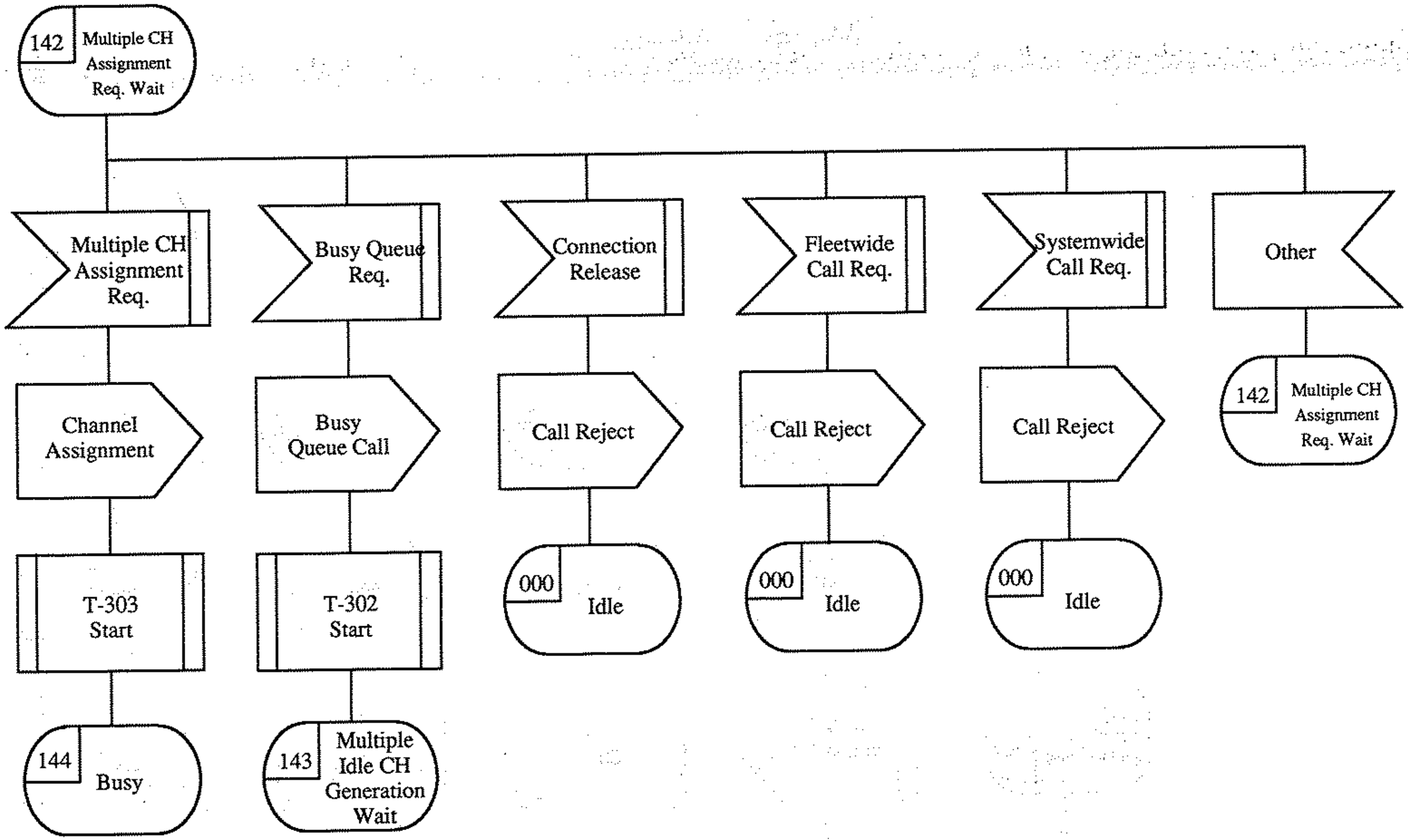


Fig. 2.1.4.2 Repeater Station Call Control (Layer3) Single Zone, Group (Subgroup), Multiple Slots Communication

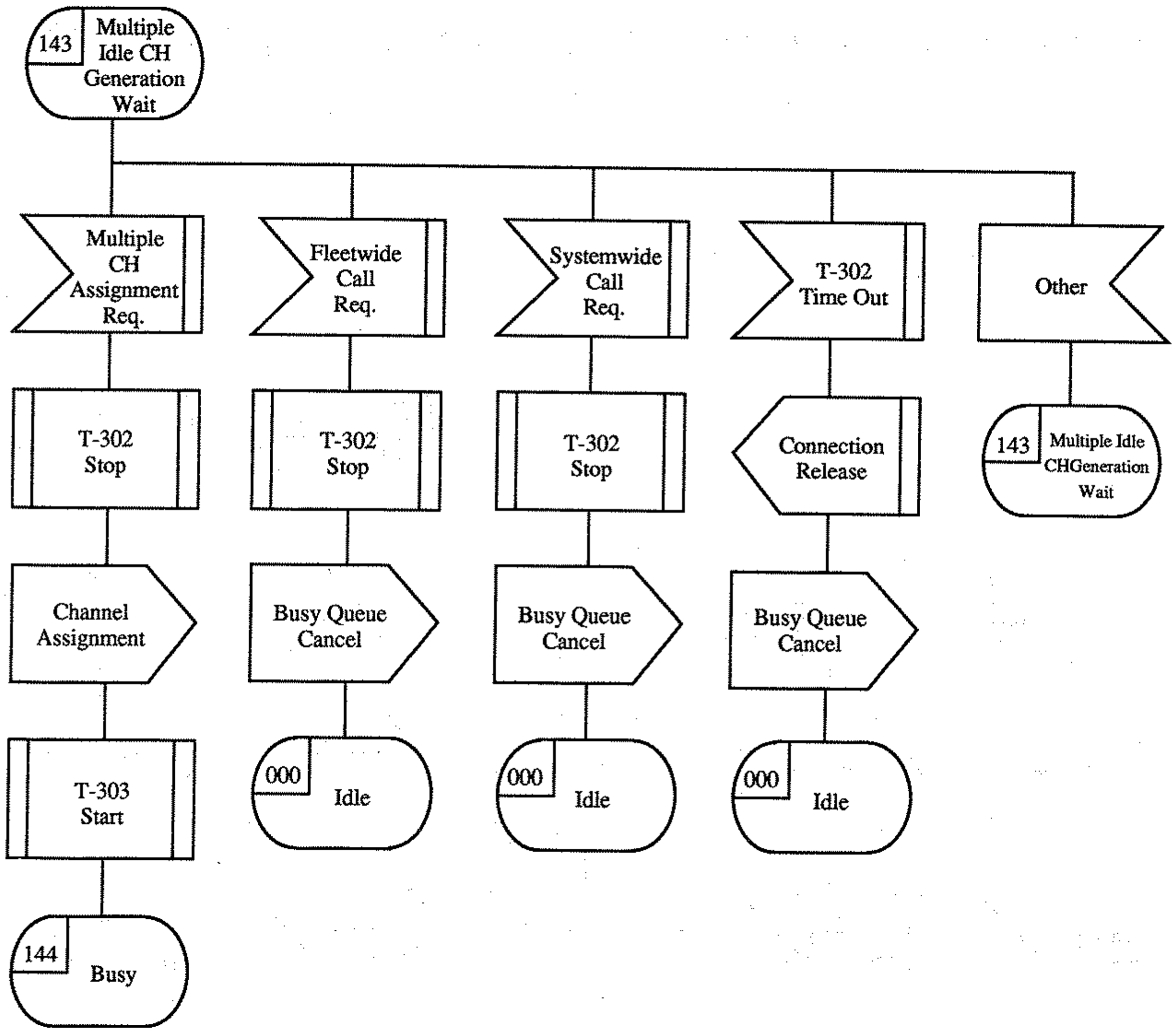


Fig. 2.1.4.3 Repeater Station Call Control (Layer3) Single Zone, Group (Subgroup), Multiple Slots Communications (Simplex / half-duplex)

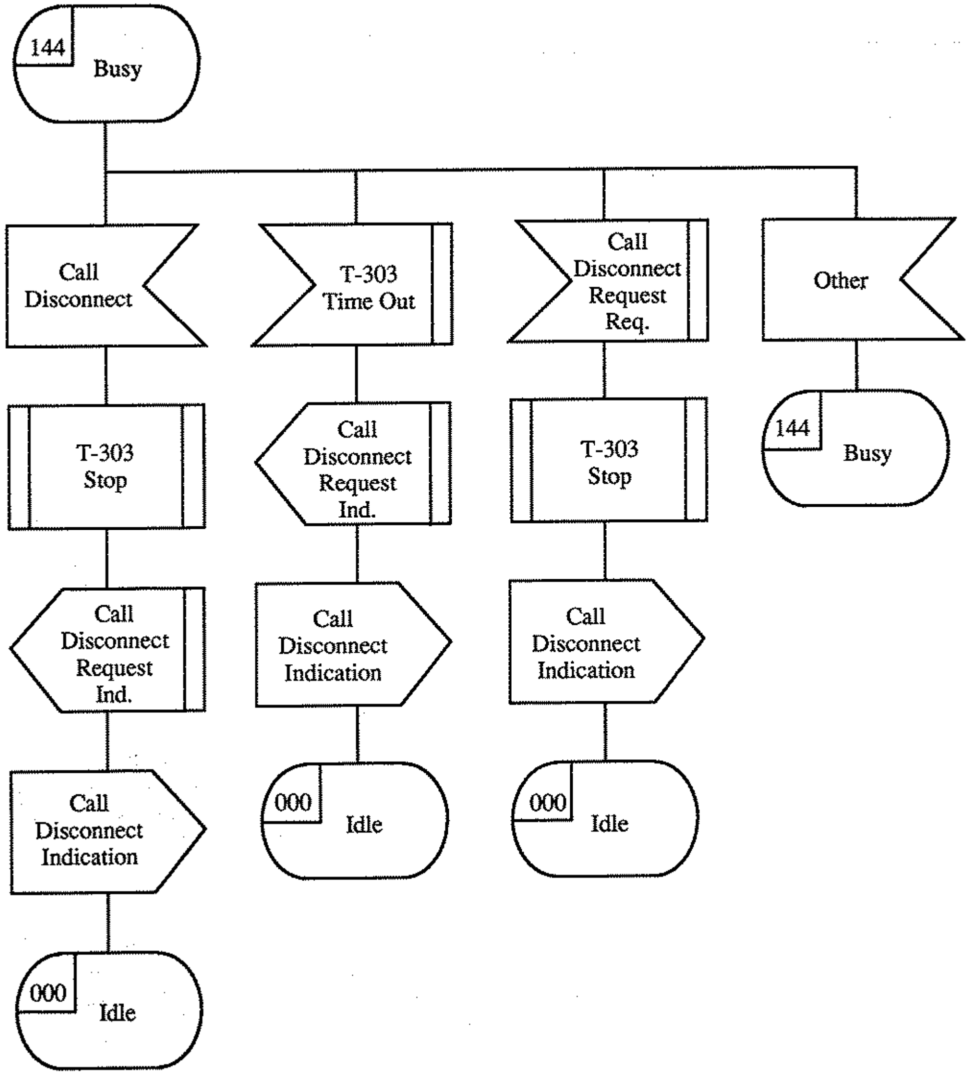


Fig. 2.1.4.4 Repeater Station Call Control (Layer3) Single Zone, Group (Subgroup), Multiple Slots Communications (Simplex / half-duplex)

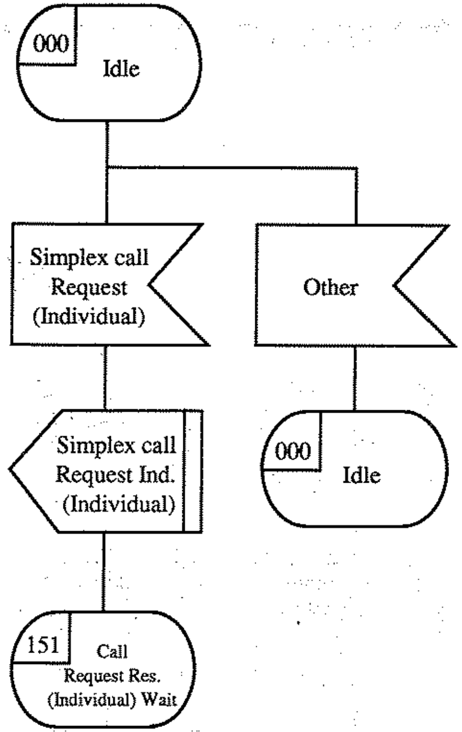


Fig. 2.1.5.0 Repeater Station Call Control (Layer3) Single Zone, Individual, General Connection Call

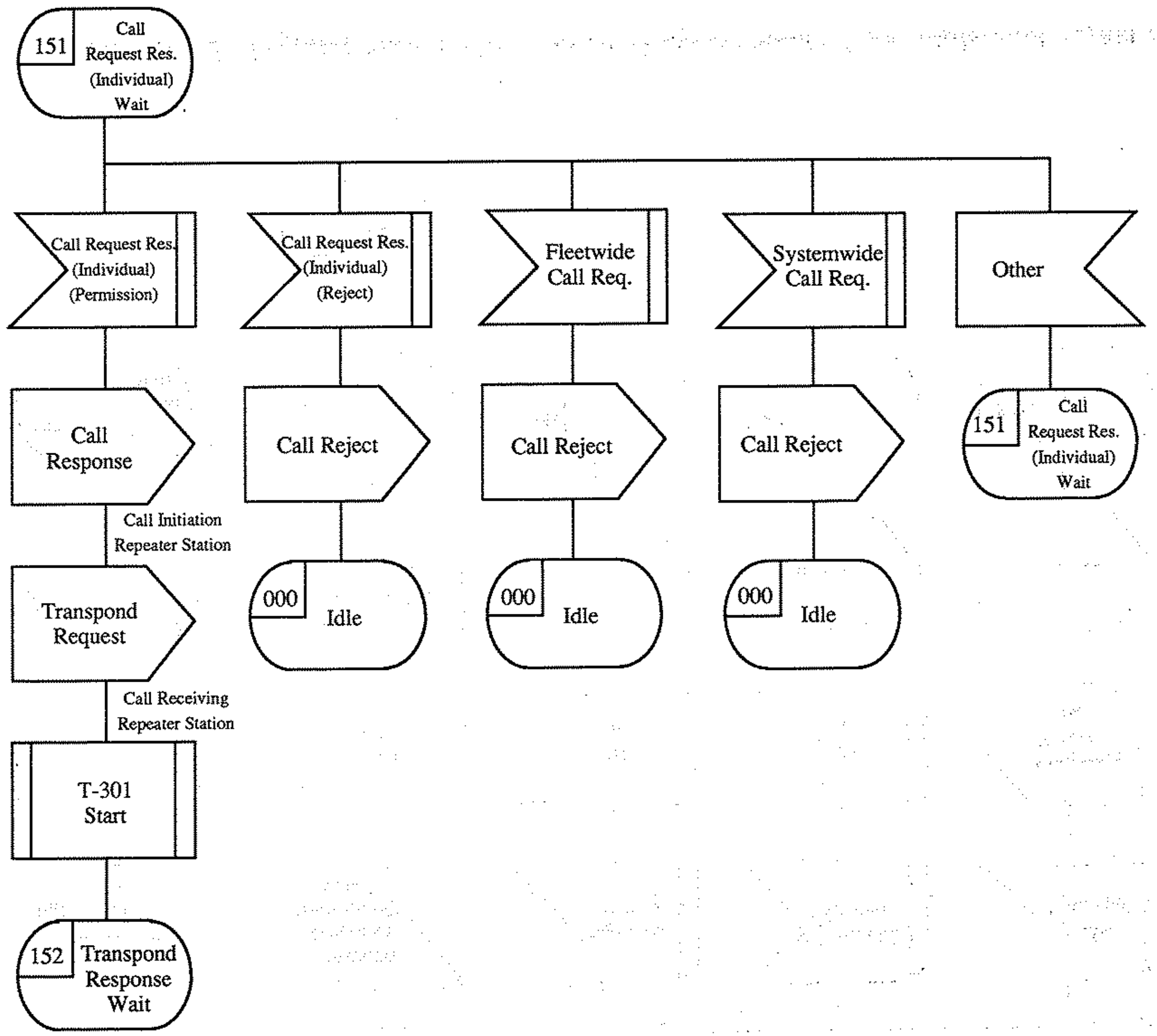


Fig. 2.1.5.1 Repeater Station Call Control (Layer3) Single Zone, Individual, General Connection Call

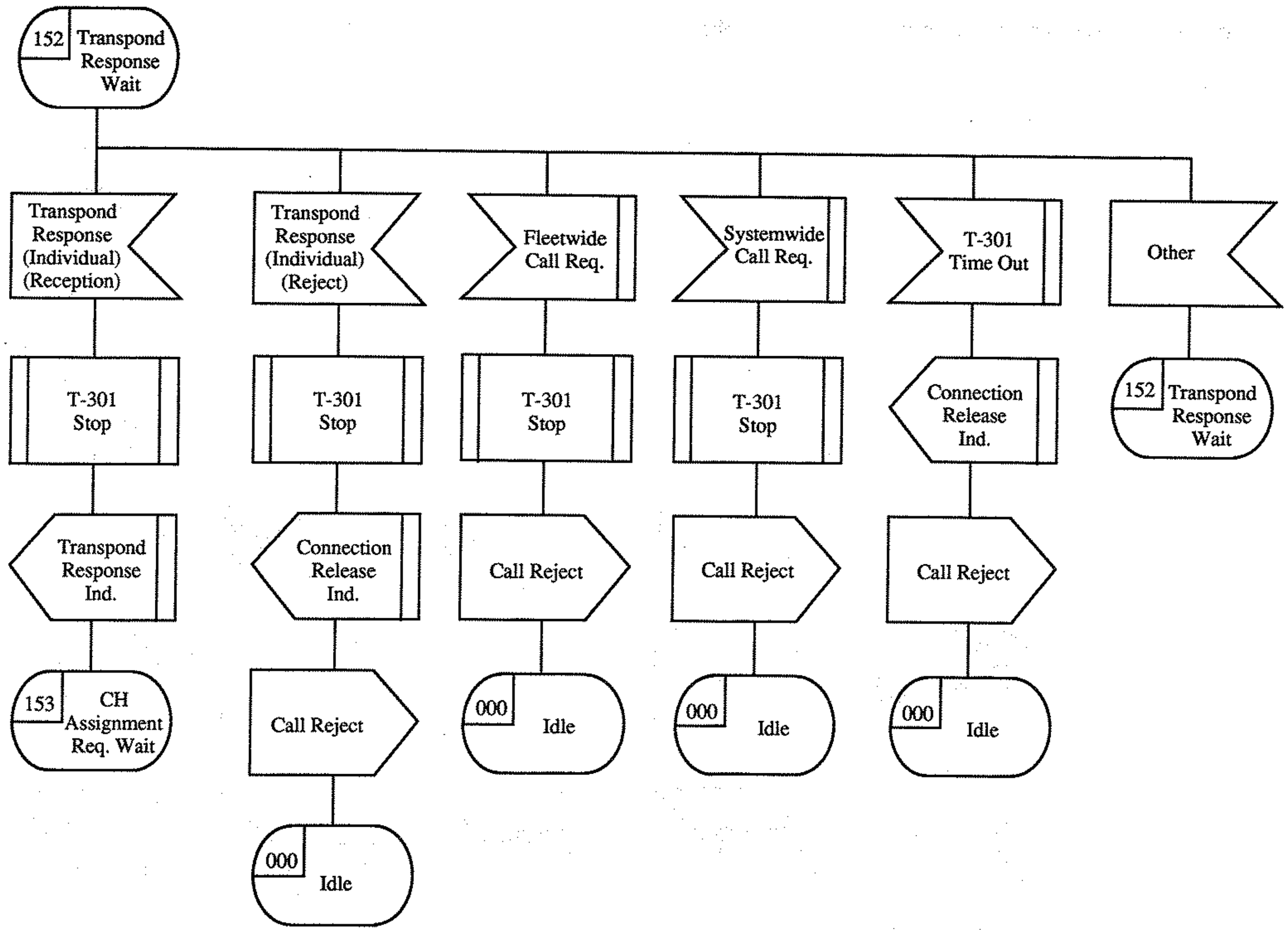


Fig. 2.1.5.2 Repeater Station Call Control (Layer3) Single Zone, Individual, General Connection Call

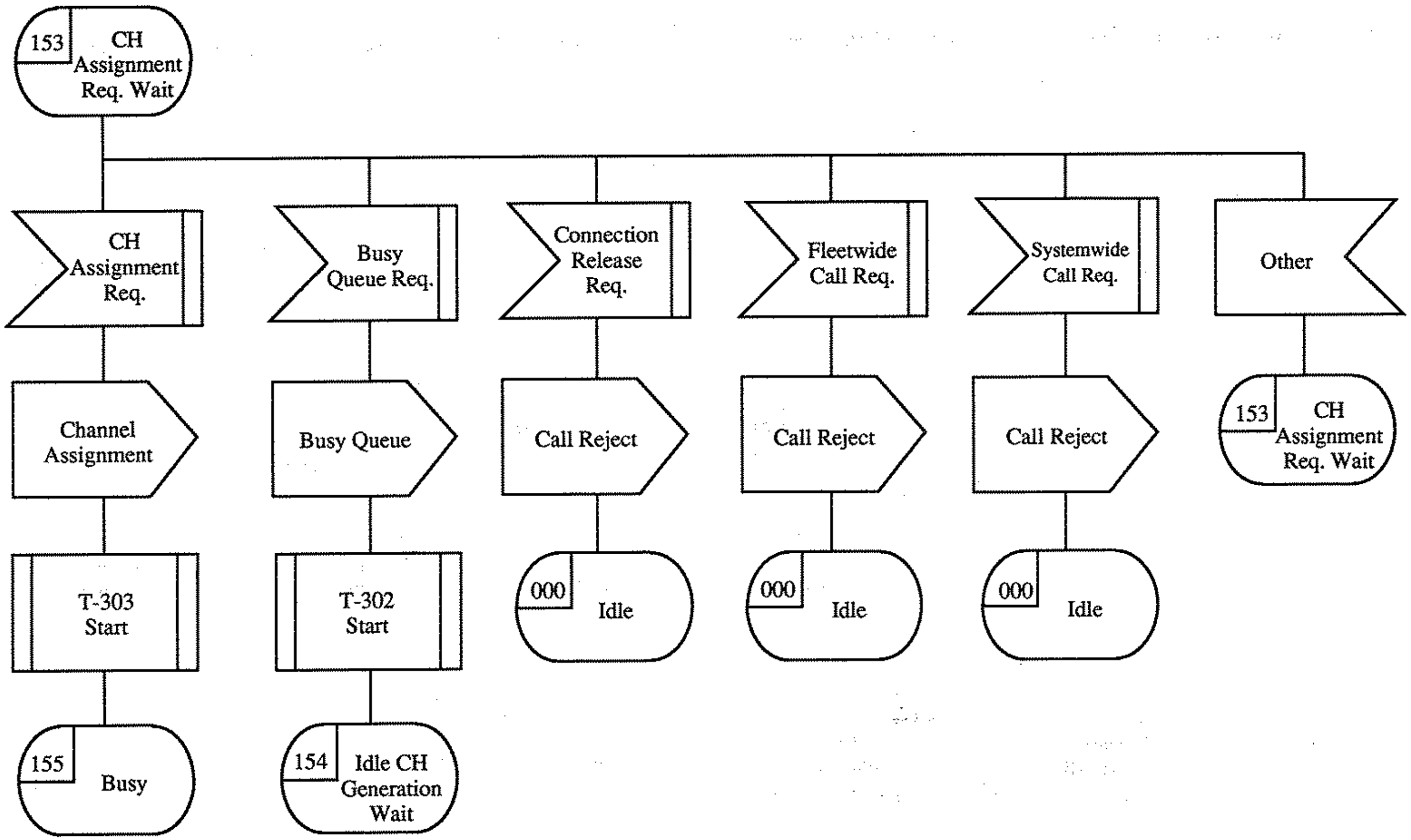


Fig. 2.1.5.3 Repeater Station Call Control (Layer3) Single Zone, Individual, General Connection Call

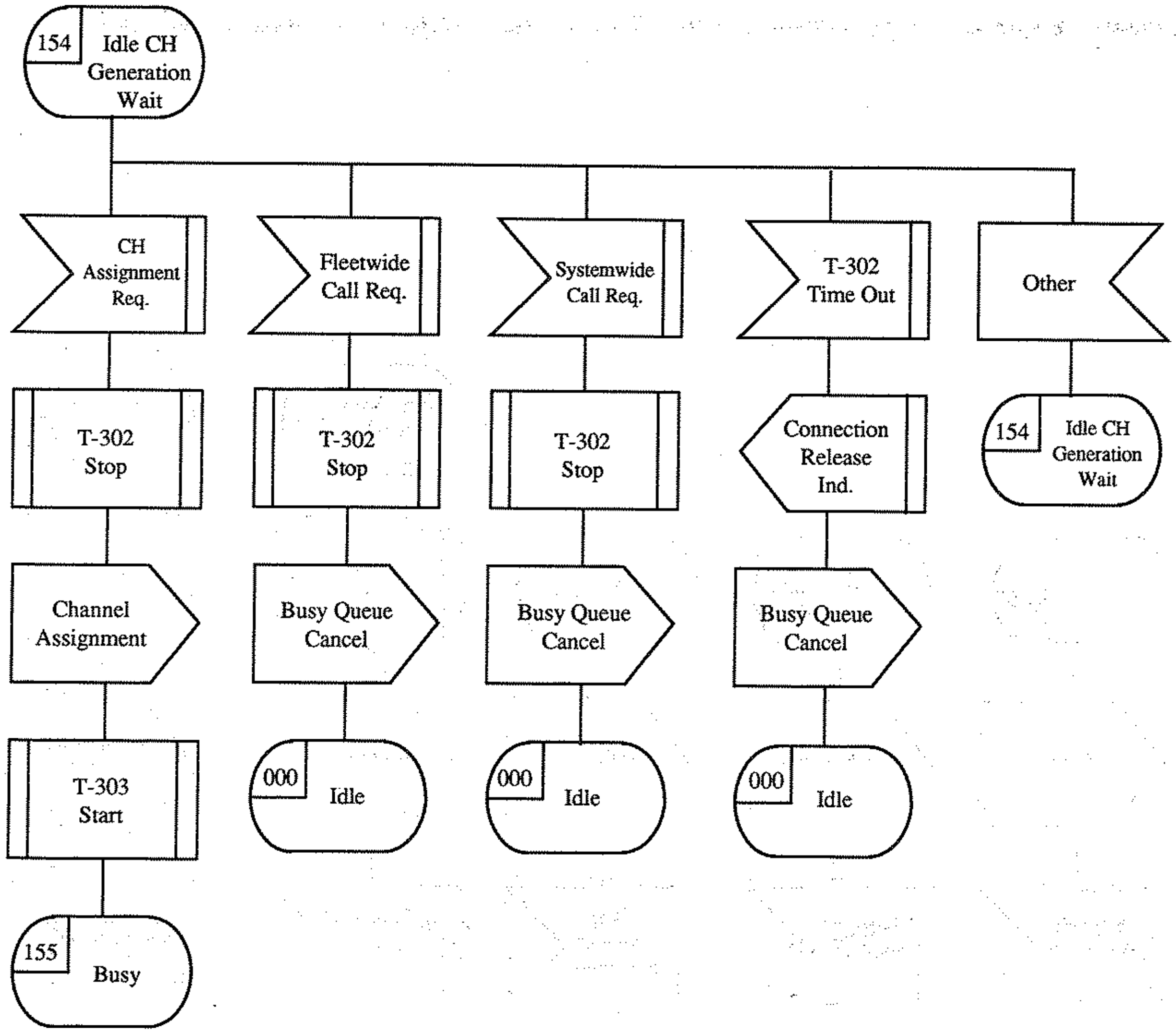


Fig. 2.1.5.4 Repeater Station Call Control (Layer3) Single Zone, Individual, General Connection Call

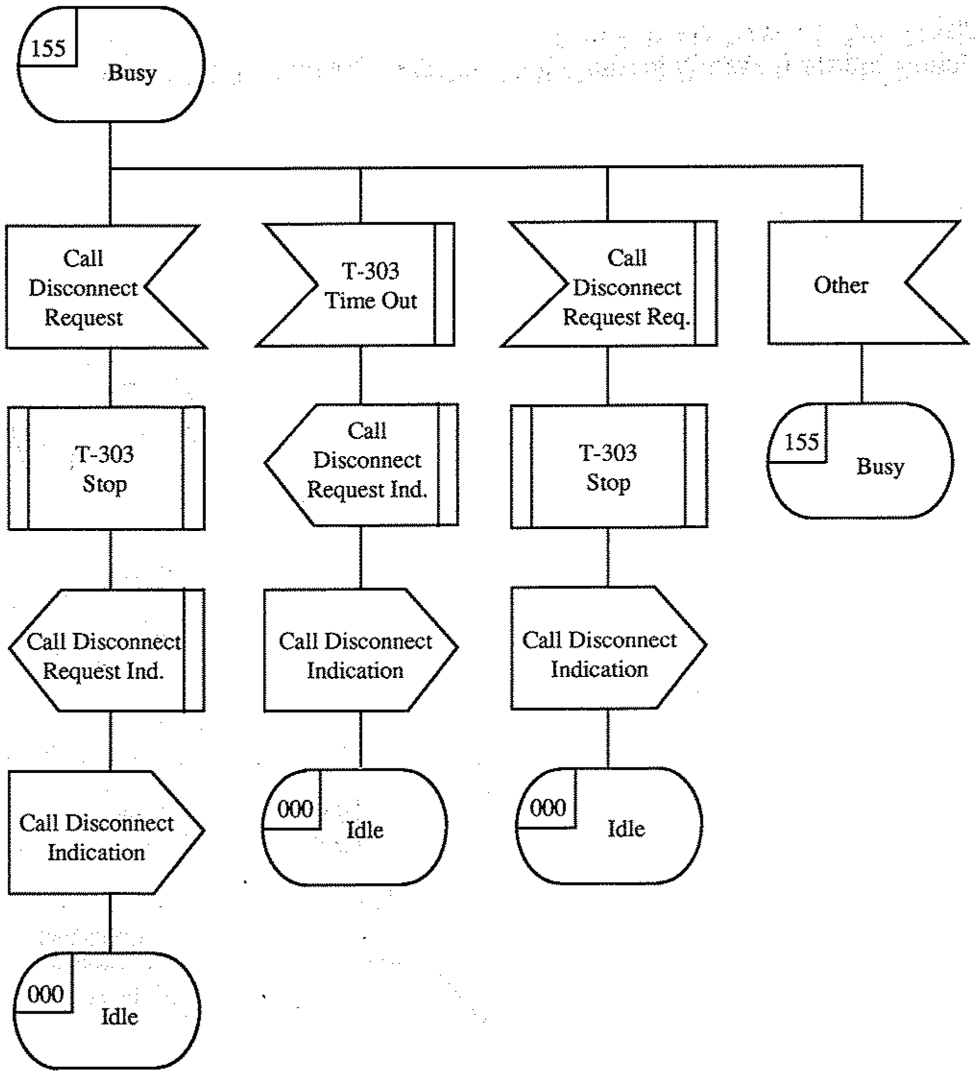


Fig. 2.1.5.5 Repeater Station Call Control (Layer3) Single Zone, Individual, General Connection Call

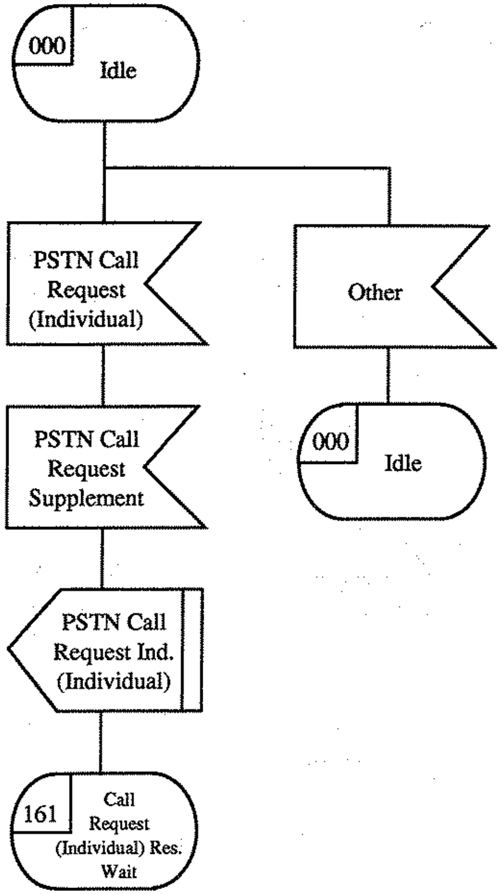


Fig. 2.1.6.0 Repeater Station Call Control (Layer3) Single Zone, Individual, PSTN Connection Call (Call Initiate from Mobile Station)

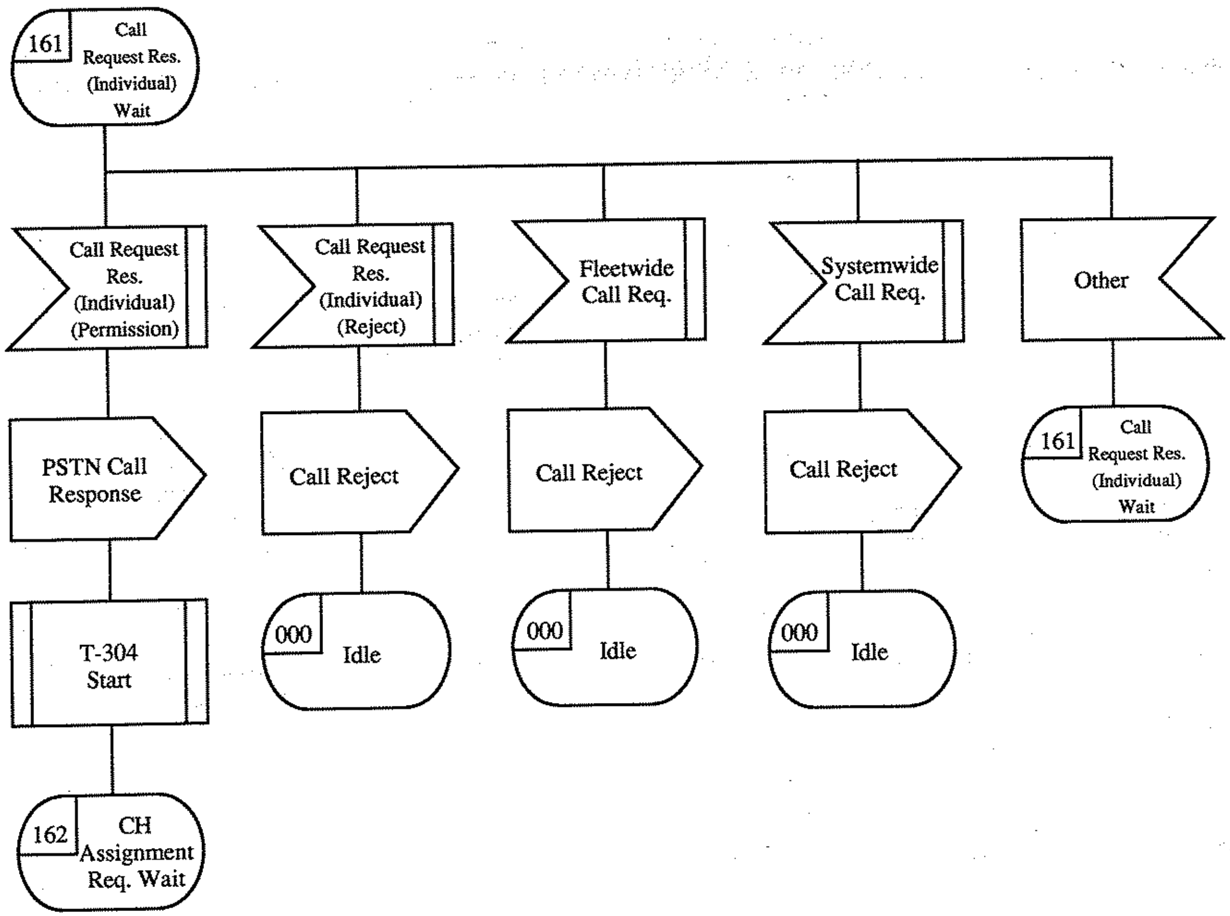


Fig. 2.1.6.1 Repeater Station Call Control (Layer3) Single Zone, Individual, PSTN Connection Call
(Call Initiate from Mobile Station)

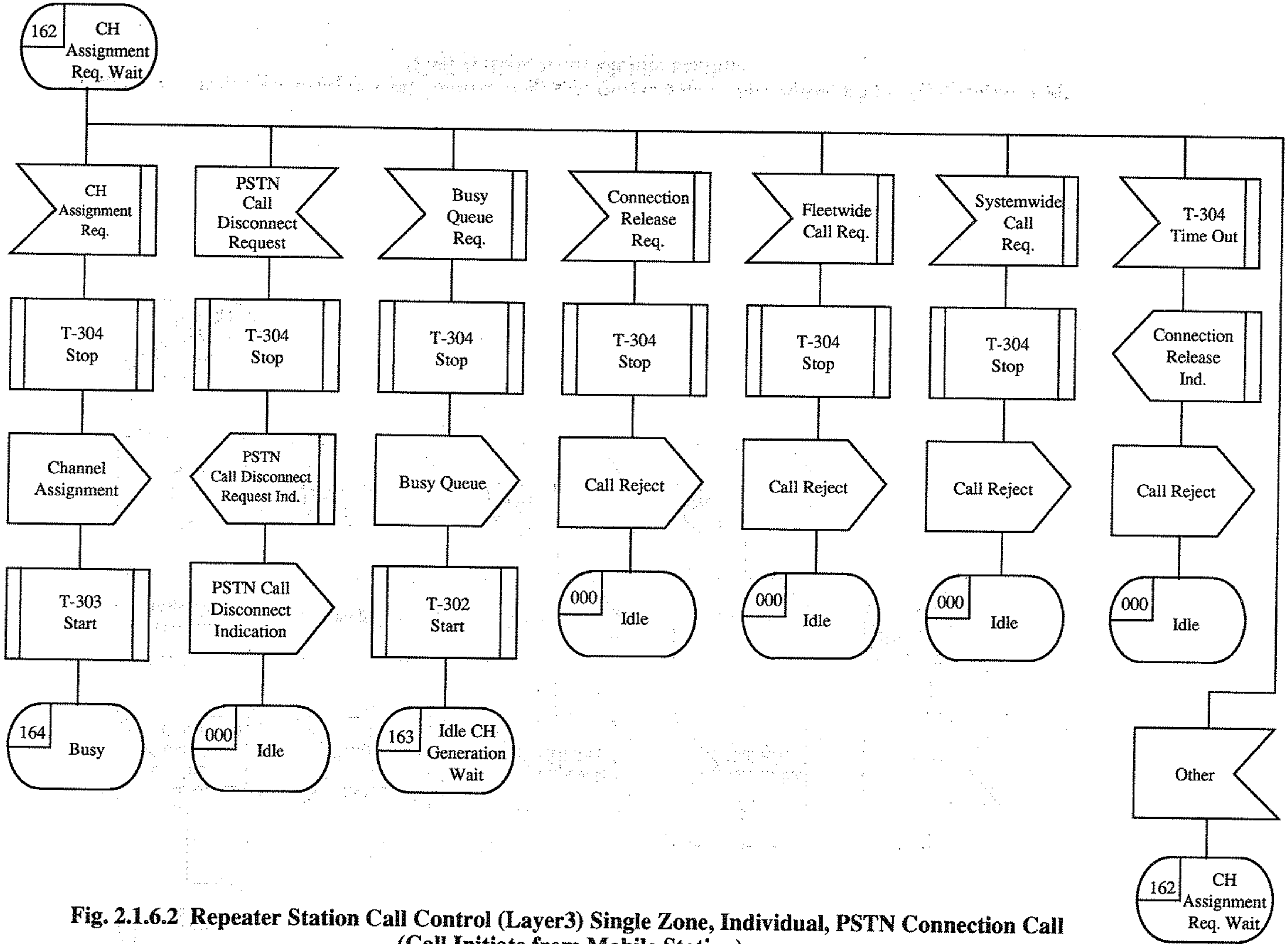


Fig. 2.1.6.2 Repeater Station Call Control (Layer3) Single Zone, Individual, PSTN Connection Call (Call Initiate from Mobile Station)

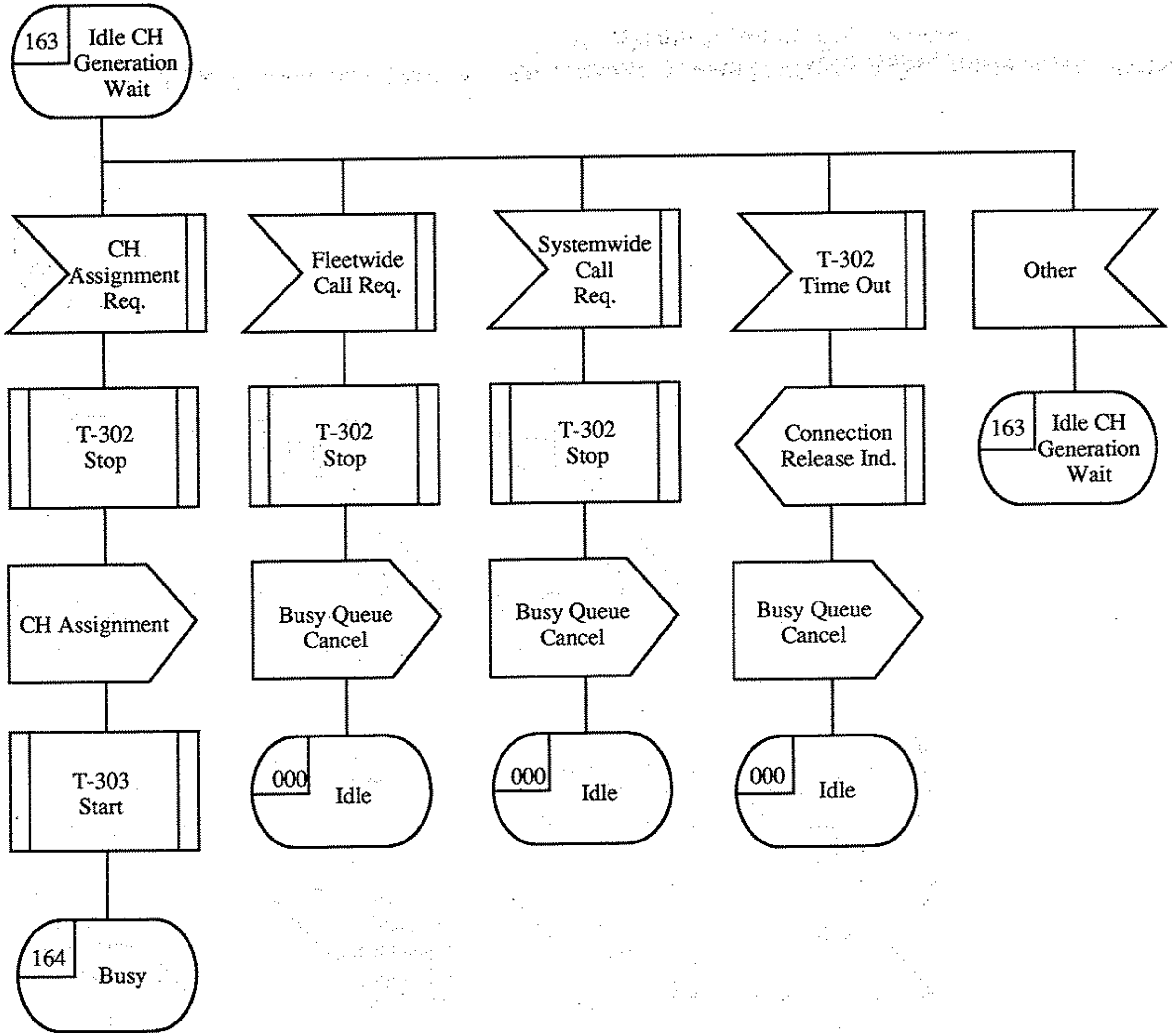


Fig. 2.1.6.3 Repeater Station Call Control (Layer3) Single Zone, Individual, PSTN Connection Call (Call Initiate from Mobile Station)

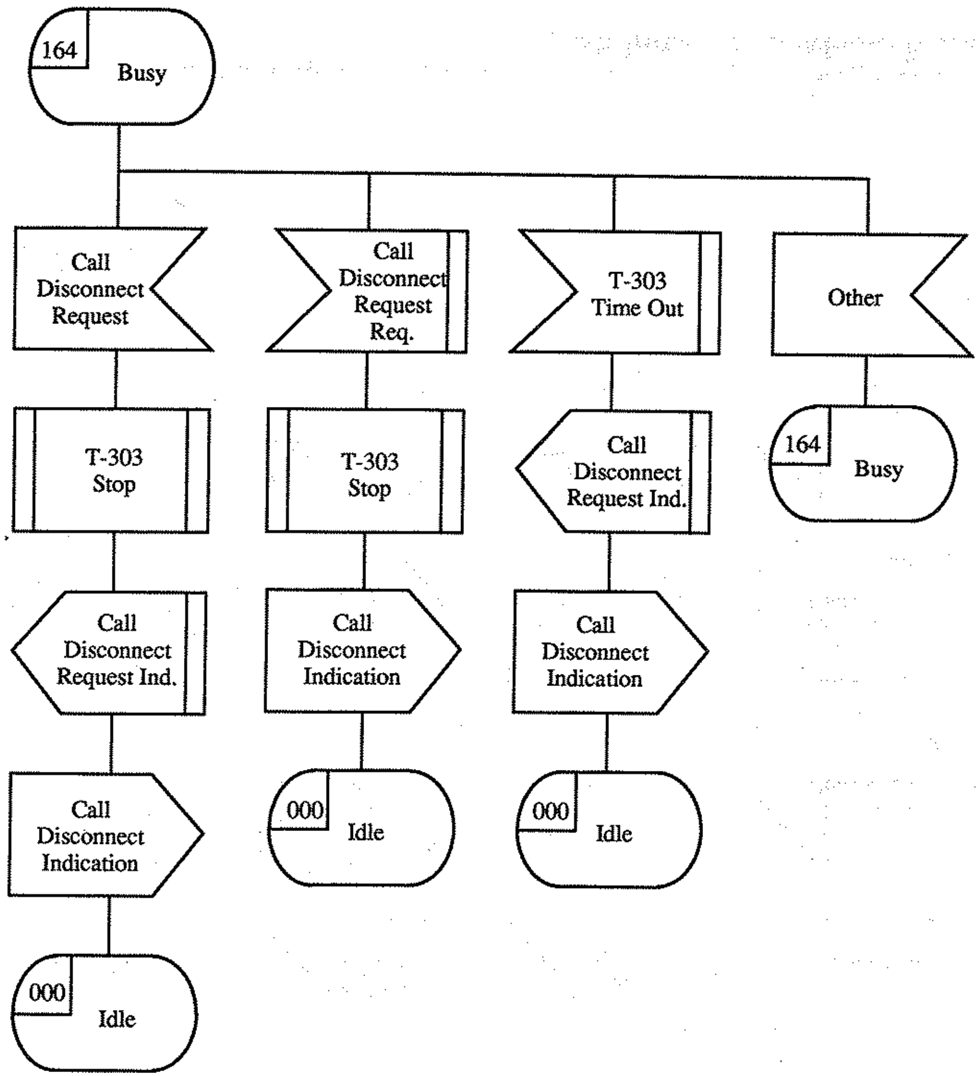


Fig. 2.1.6.4 Repeater Station Call Control (Layer3) Single Zone, Individual, PSTN Connection Call (Call Initiate from Mobile Station)

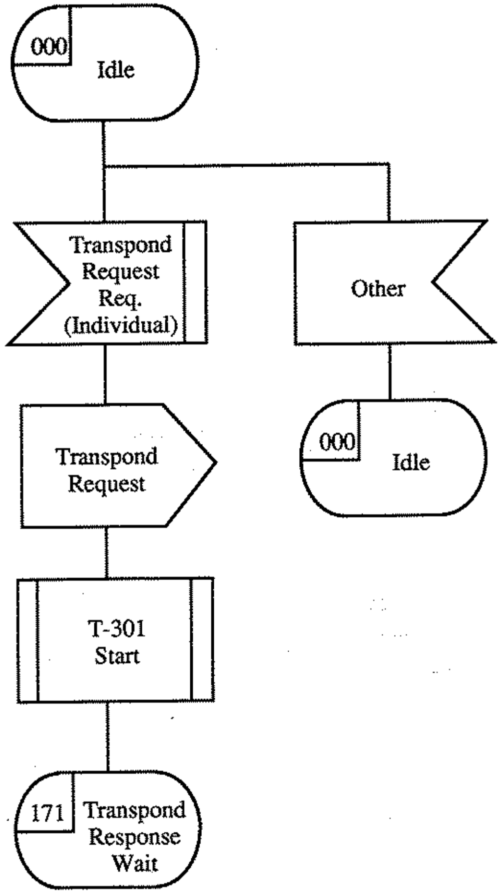


Fig. 2.1.7.0 Repeater Station Call Control (Layer3) Single Zone, Individual, PSTN Connection Call (Call Initiate from Phone)

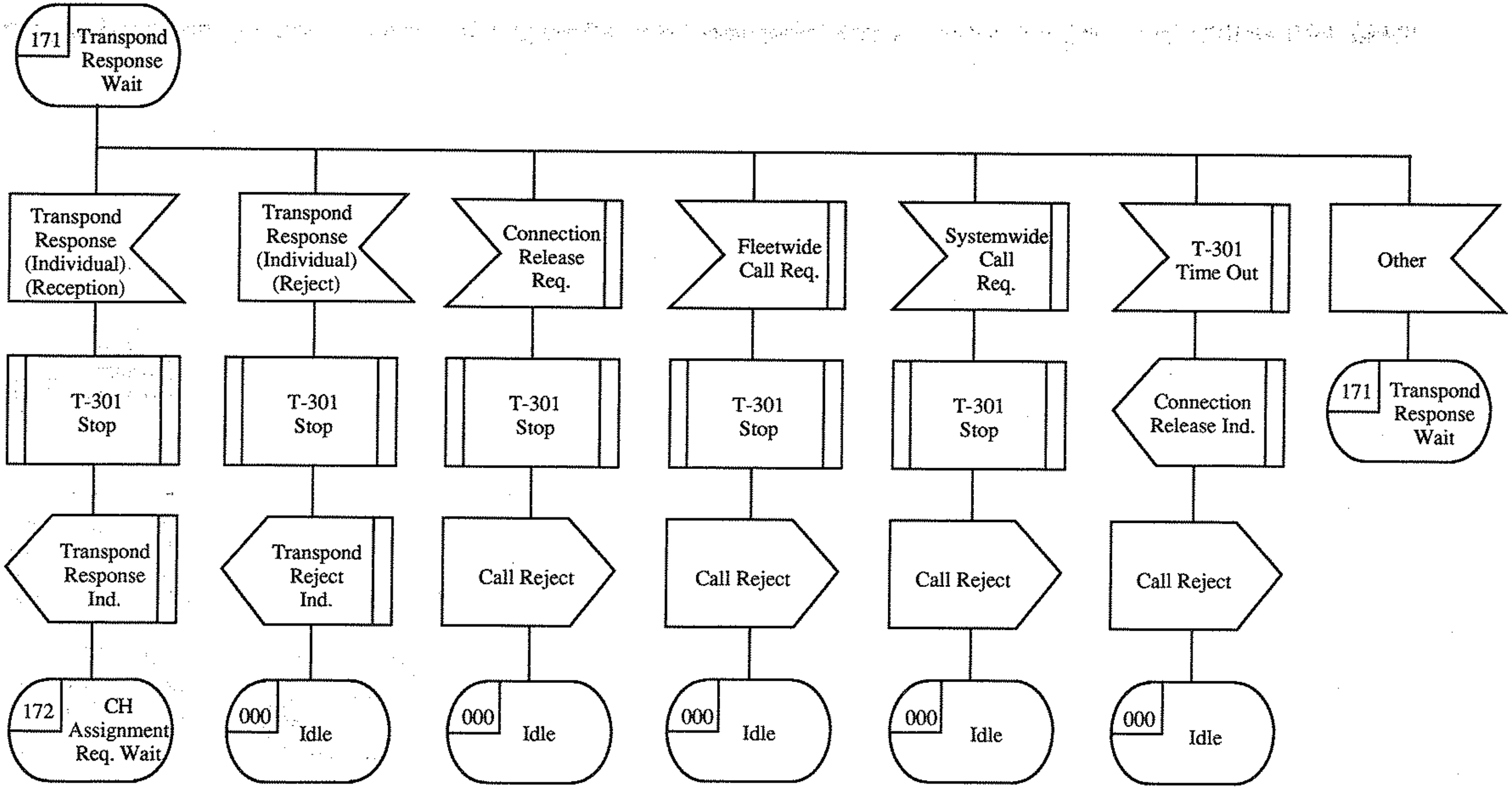


Fig. 2.1.7.1 Repeater Station Call Control (Layer3) Single Zone, Individual, PSTN Connection Call (Call Initiate from Phone)

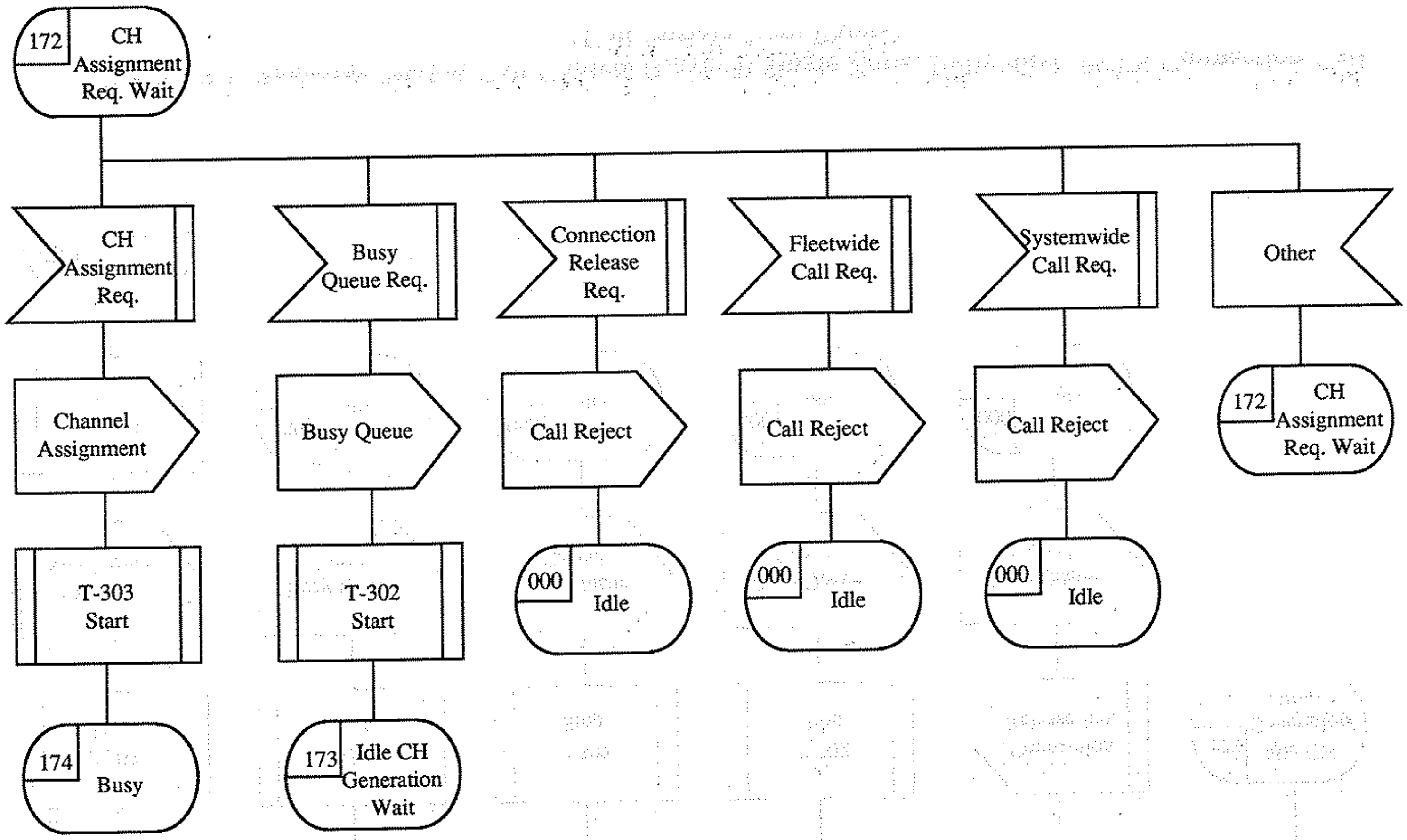


Fig. 2.1.7.2 Repeater Station Call Control (Layer3) Single Zone, Individual, PSTN Connection Call
(Call Initiate from Phone)

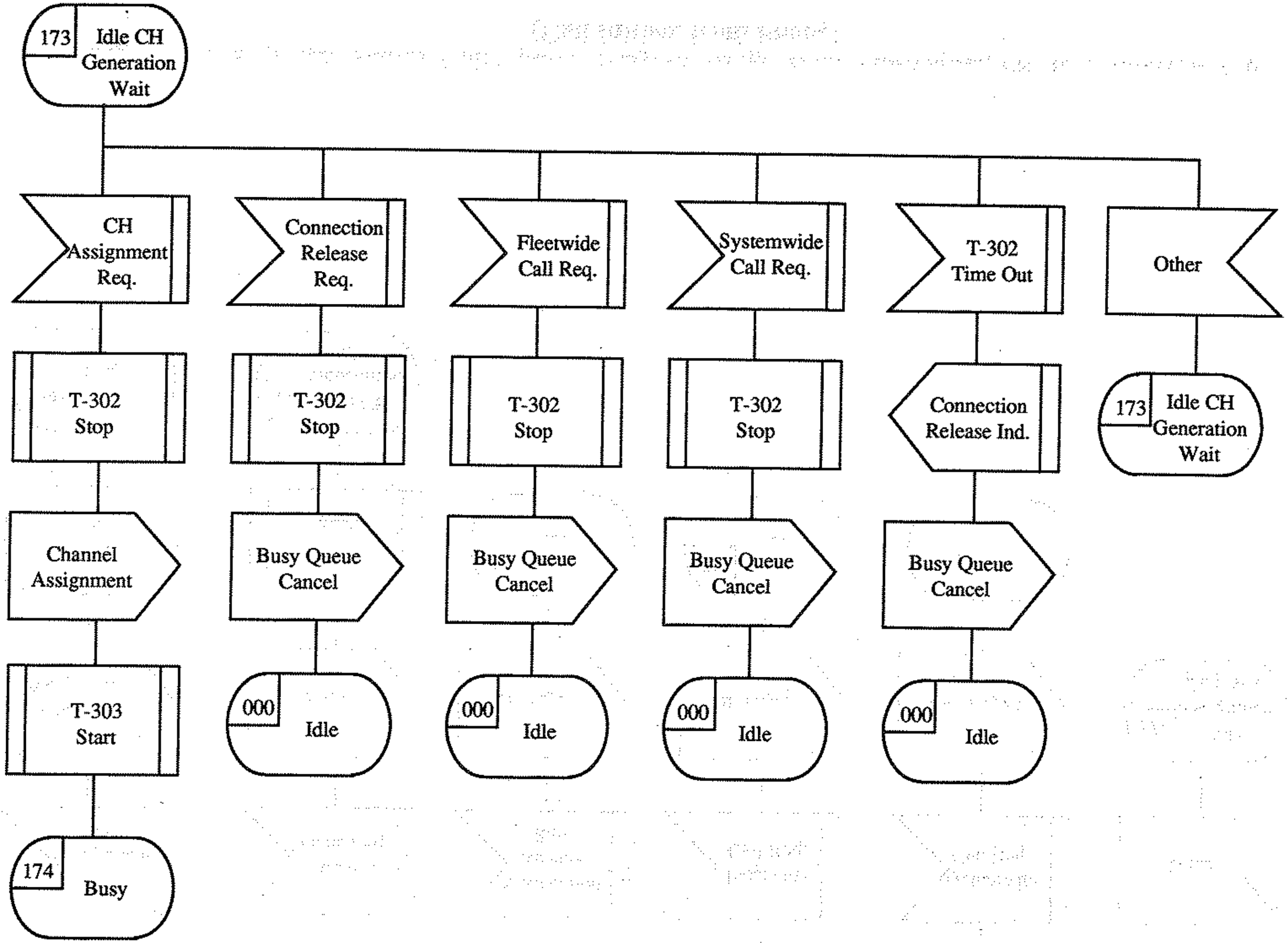


Fig. 2.1.7.3 Repeater Station Call Control (Layer3) Single Zone, Individual, PSTN Connection Call (Call Initiate from Phone)

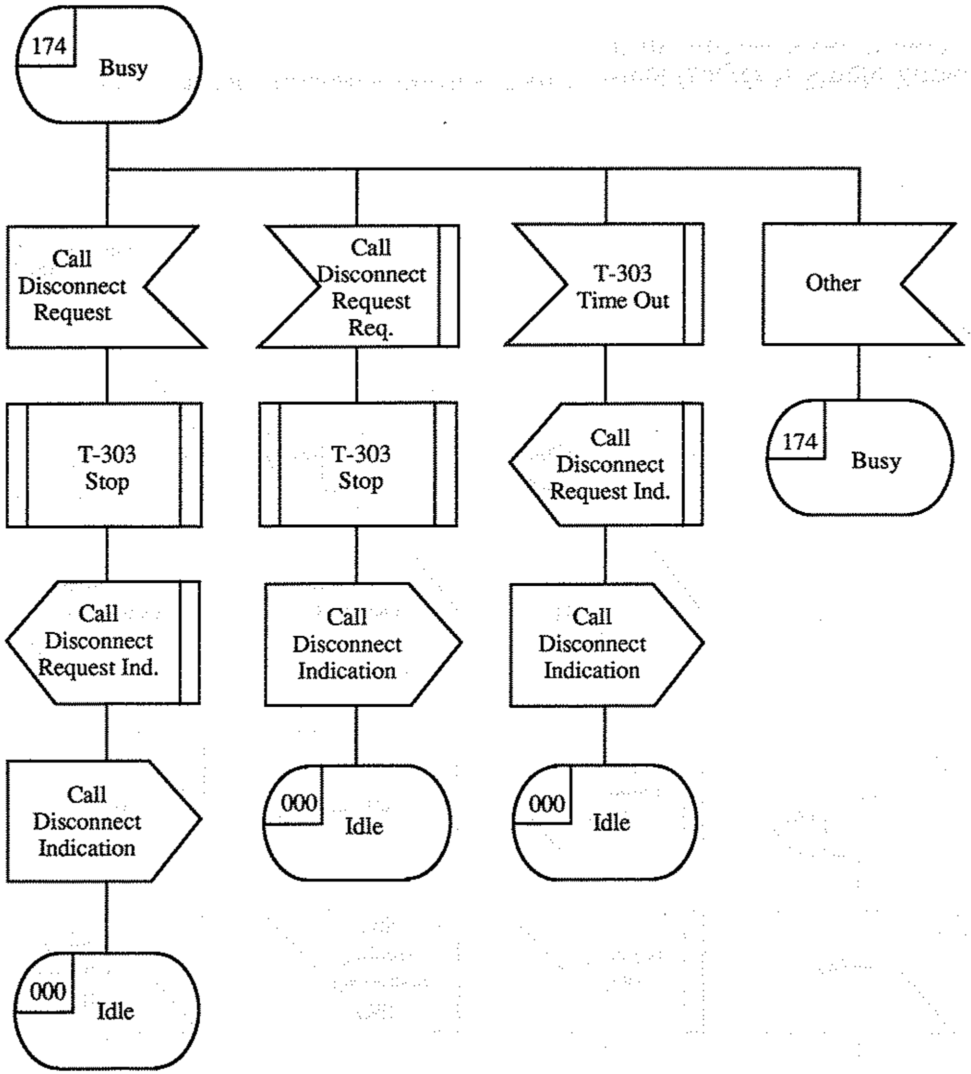


Fig. 2.1.7.4 Repeater Station Call Control (Layer3) Single Zone, Individual, PSTN Connection Call (Call Initiate from Phone)

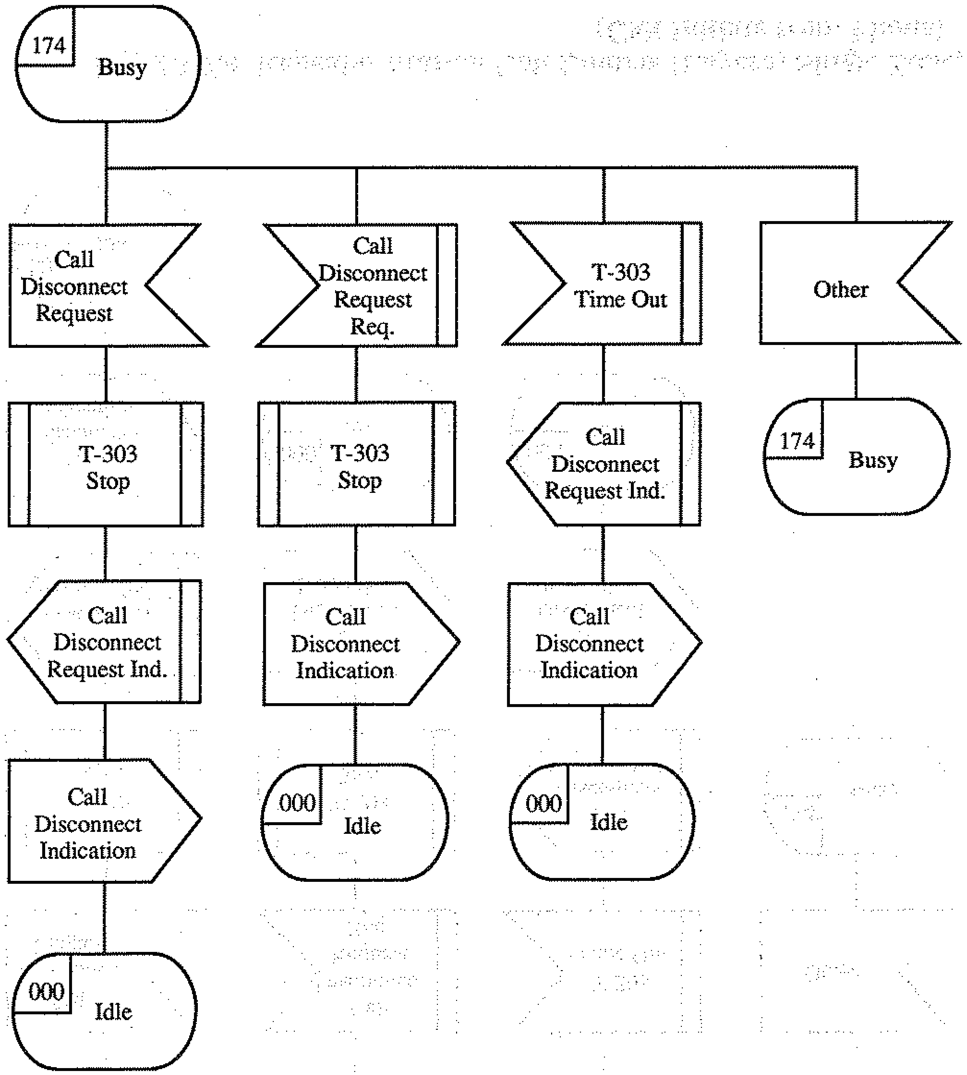


Fig. 2.1.7.4 Repeater Station Call Control (Layer3) Single Zone, Individual, PSTN Connection Call (Call Initiate from Phone)

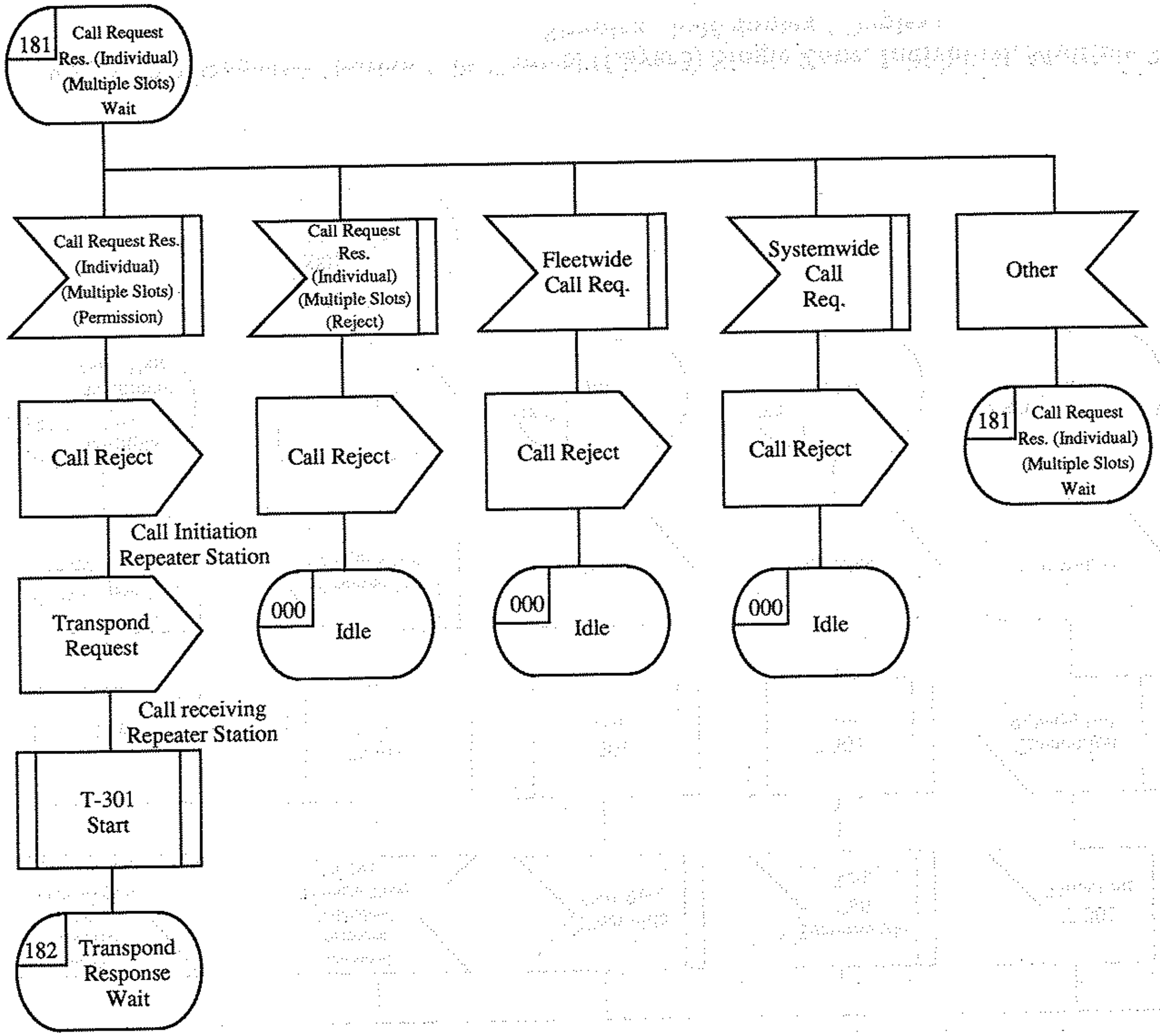


Fig. 2.1.8.1 Repeater Station Call Control (Layer3) Single Zone, Individual, Multiple Slots Communication (Simplex / half-duplex / Duplex)

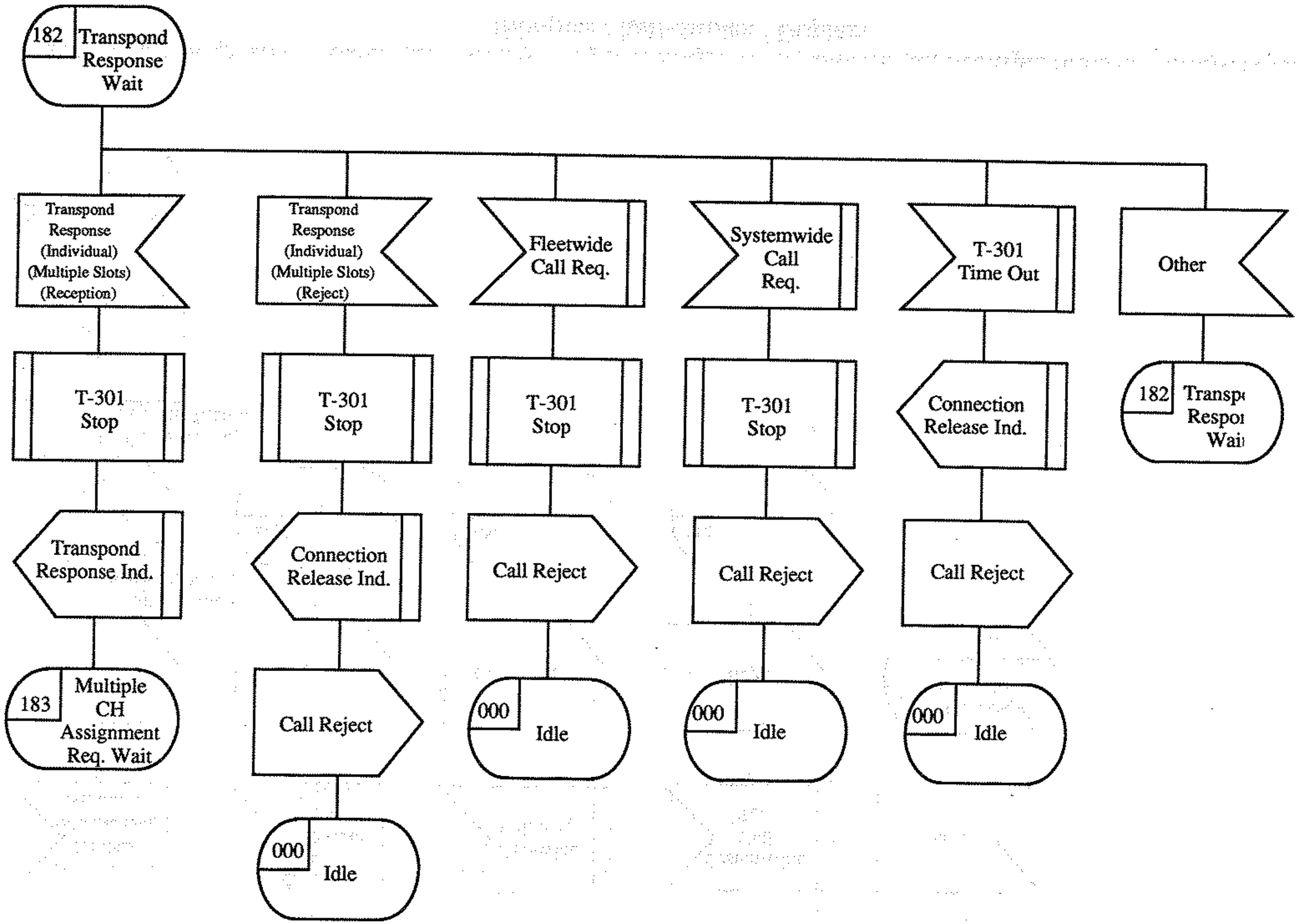


Fig. 2.1.8.2 Repeater Station Call Control (Layer3) Single Zone, Individual, Multiple Slots Communication (Simplex / half-duplex / Duplex)

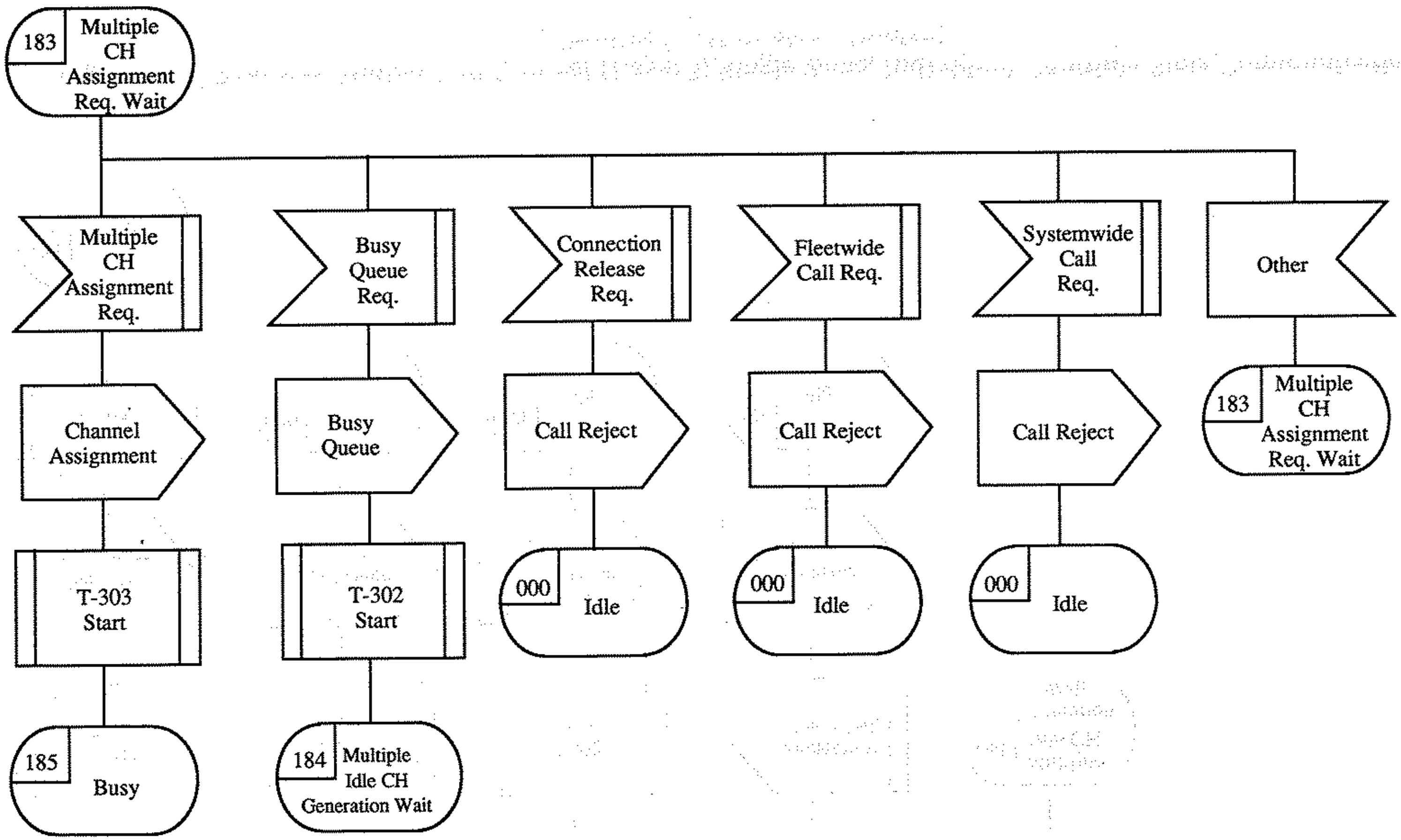


Fig. 2.1.8.3 Repeater Station Call Control (Layer3) Single Zone, Individual, Multiple Slots Communication (Simplex / half-duplex / Duplex)

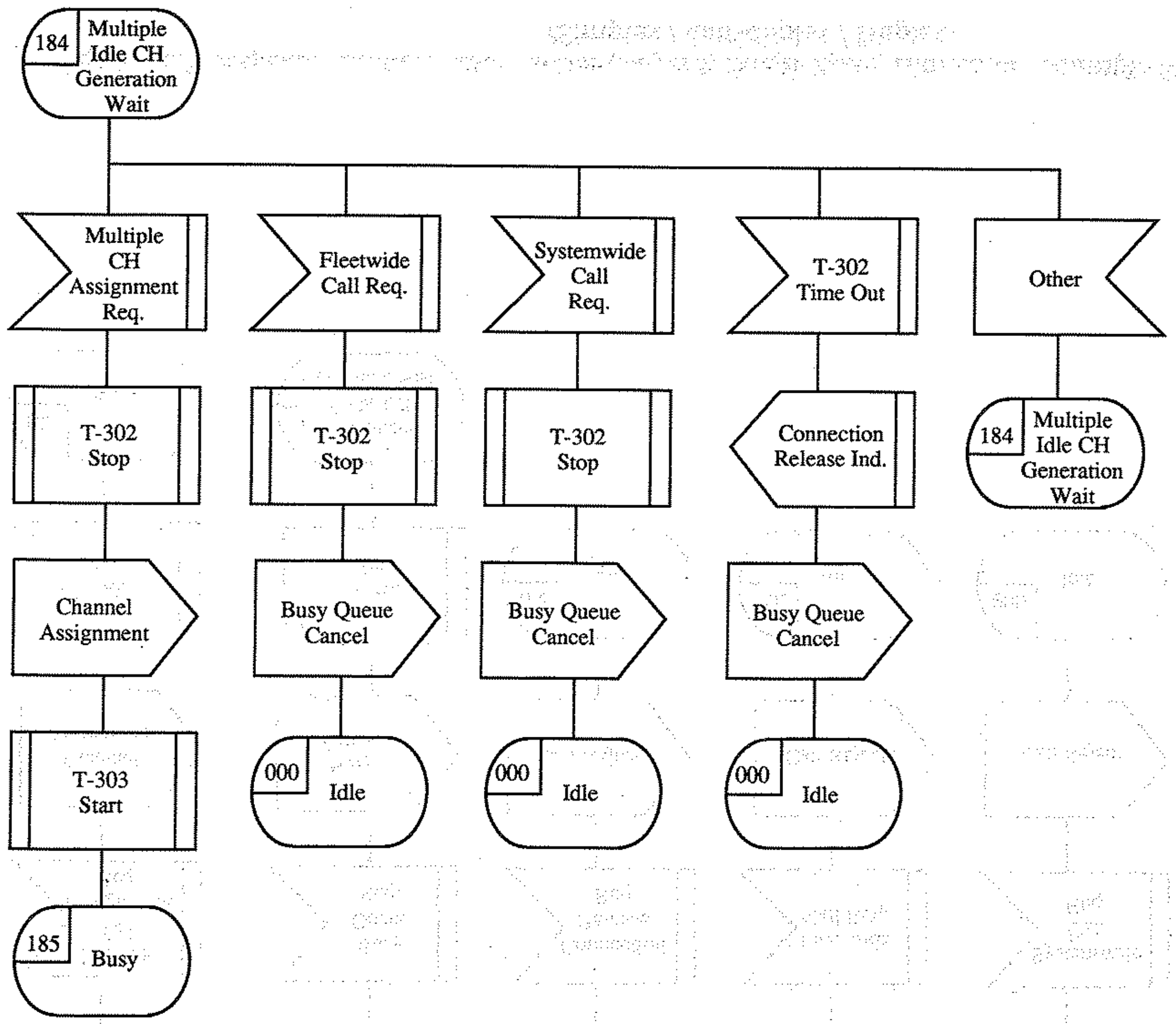


Fig. 2.1.8.4 Repeater Station Call Control (Layer3) Single Zone, Individual, Multiple Slots Communication (Simplex / half-duplex / Duplex)

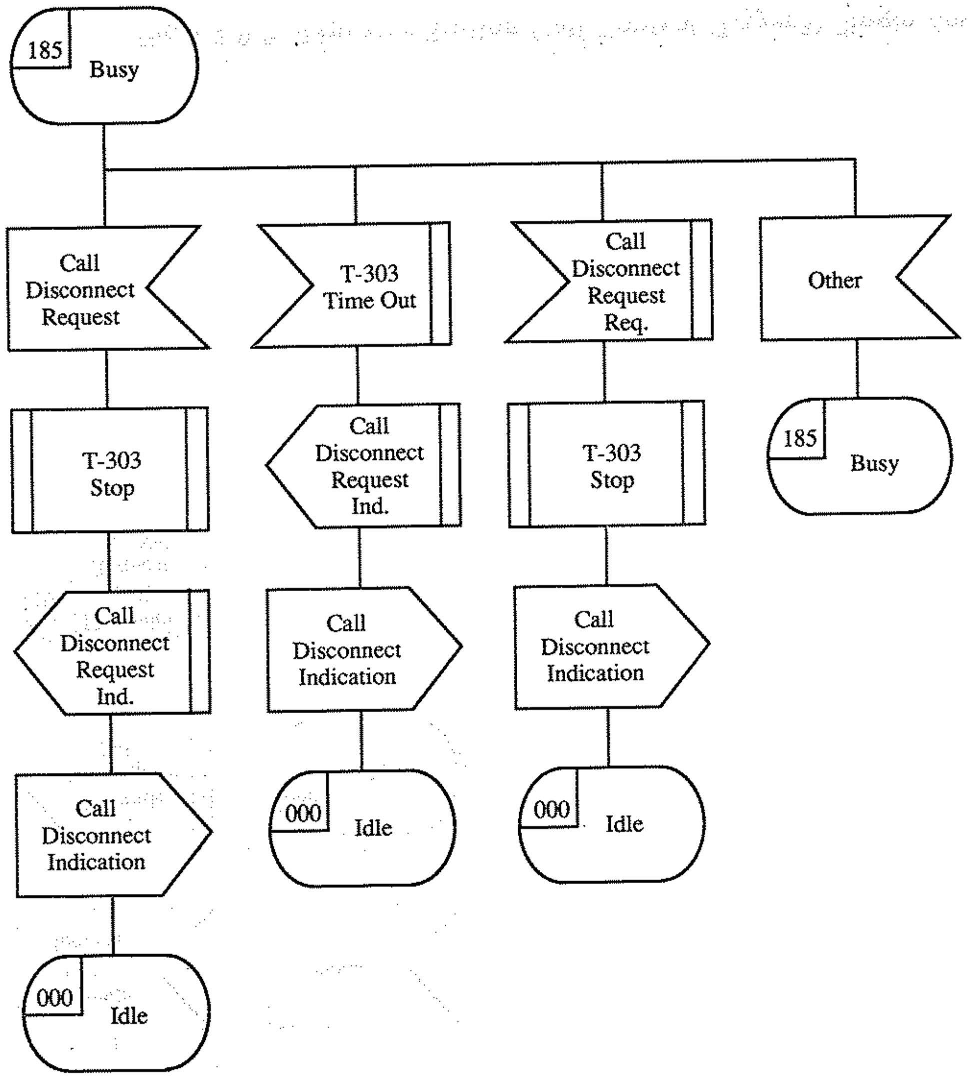


Fig. 2.1.8.5 Repeater Station Call Control (Layer3) Single Zone, Individual, Multiple Slots Communication (Simplex / half-duplex / Duplex)

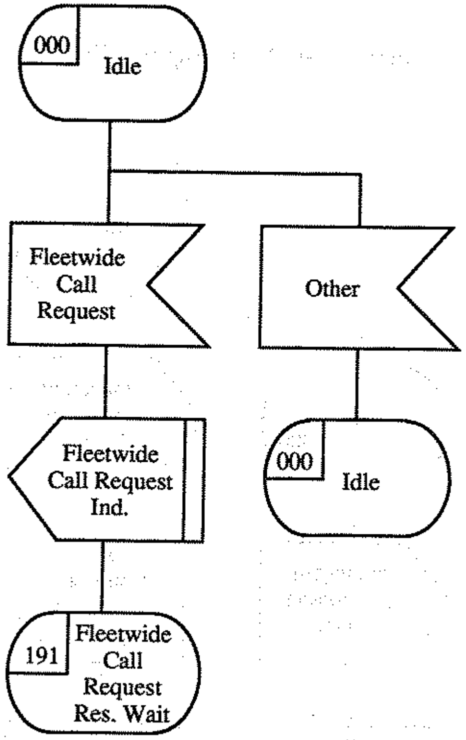


Fig. 2.1.9.0 Repeater Station Call Control (Layer3) Single Zone, Fleetwide Communication

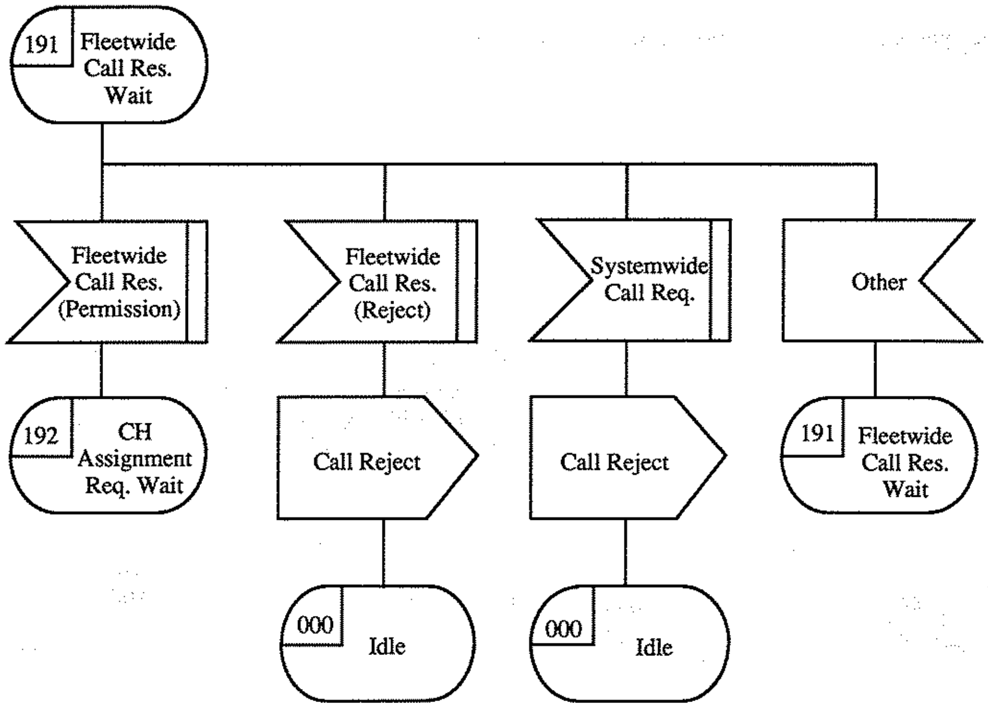
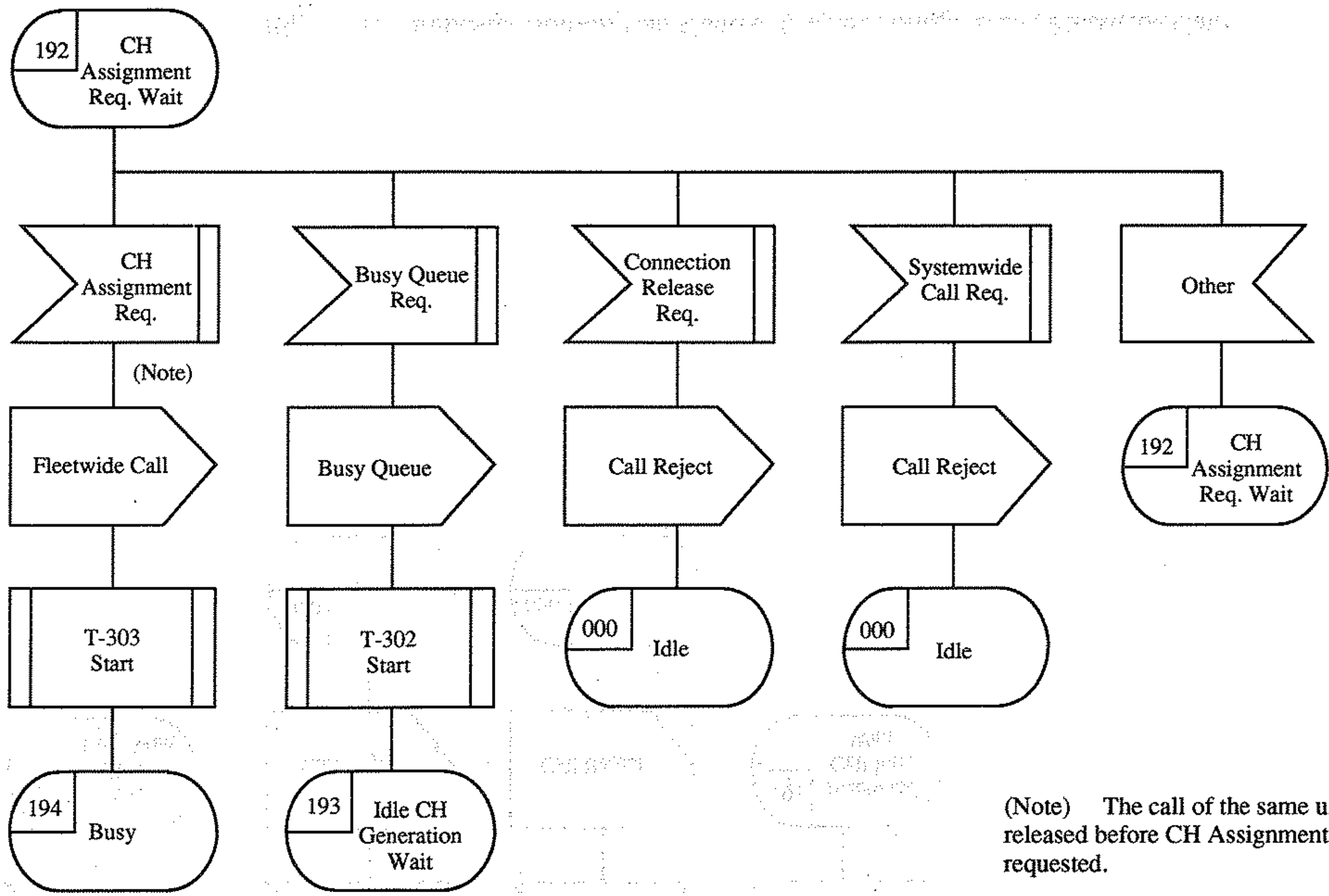
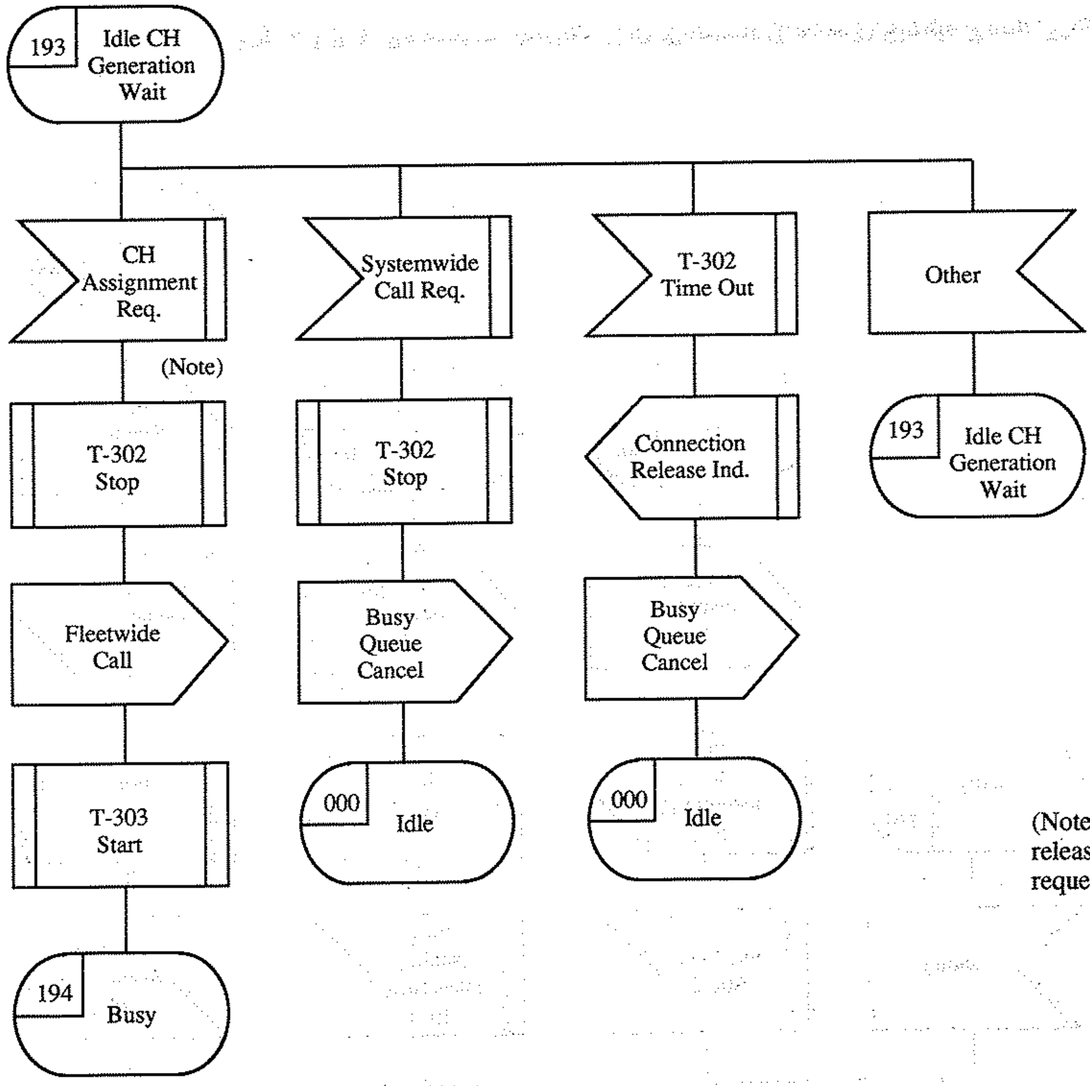


Fig. 2.1.9.1 Repeater Station Call Control (Layer3) Single Zone, Fleetwide Call



(Note) The call of the same user must be released before CH Assignment is requested.

Fig. 2.1.9.2 Repeater Station Call Control (Layer3) Single Zone, Fleetwide Communication



(Note) The call of the same user must be released before CH Assignment is requested.

Fig. 2.1.9.3 Repeater Station Call Control (Layer3) Single Zone, Fleetwide Communication

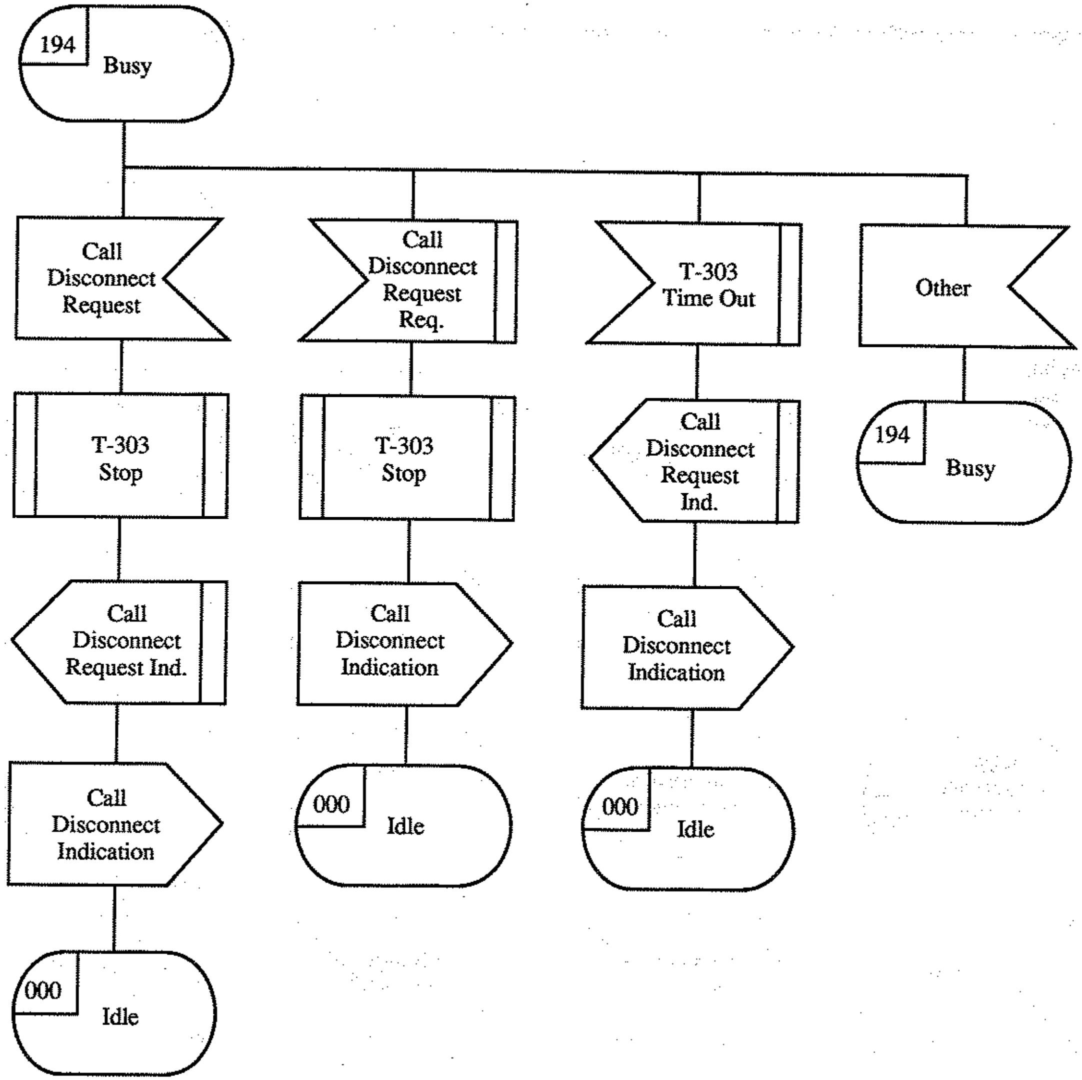


Fig. 2.1.9.4 Repeater Station Call Control (Layer3) Single Zone, Fleetwide Communication

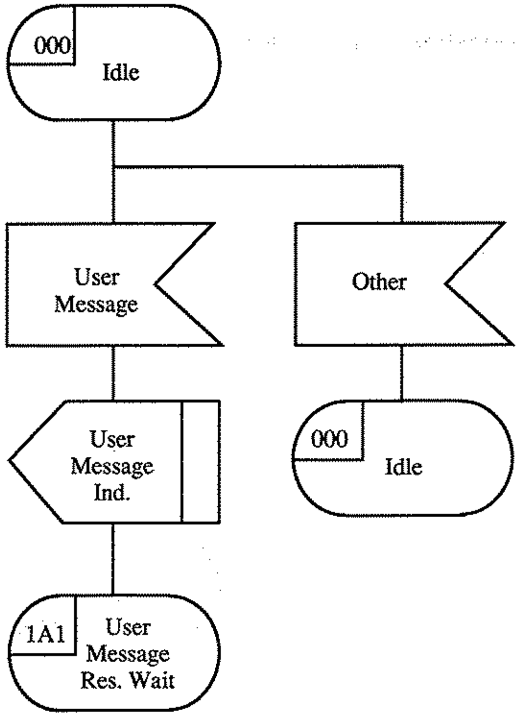


Fig. 2.1.10.0 Repeater Station Call Control (Layer3) User Message Communication

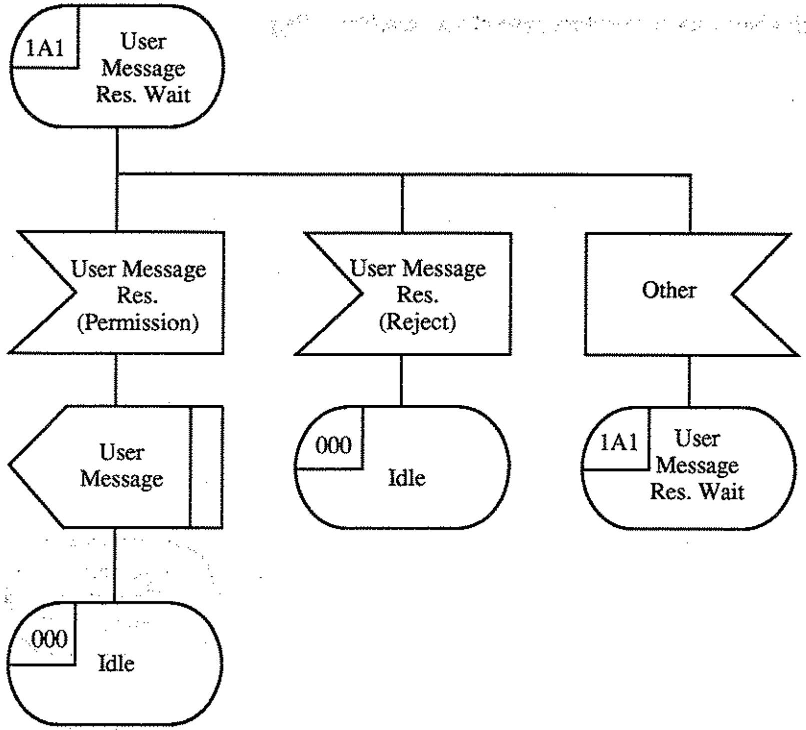
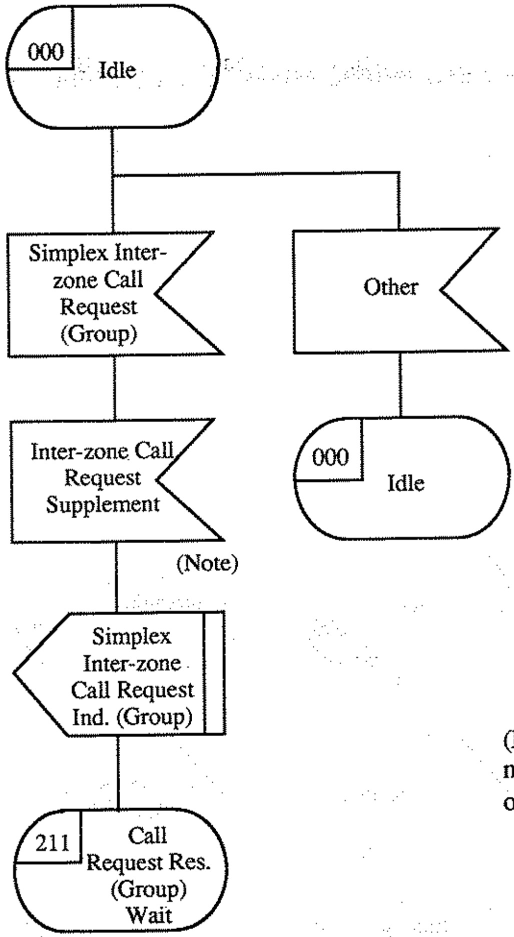


Fig. 2.1.10.1 Repeater Station Call Control (Layer3) User Message Communication



(Note) Inter-zone Call Supplement message is not received when the number of zone to be connected 1 zone.

Fig. 2.2.1.0 Repeater Station Call Control (Layer3) Multiple Zone, Group(Subgroup), General connection Call (The Repeater Station for Call Initiation)

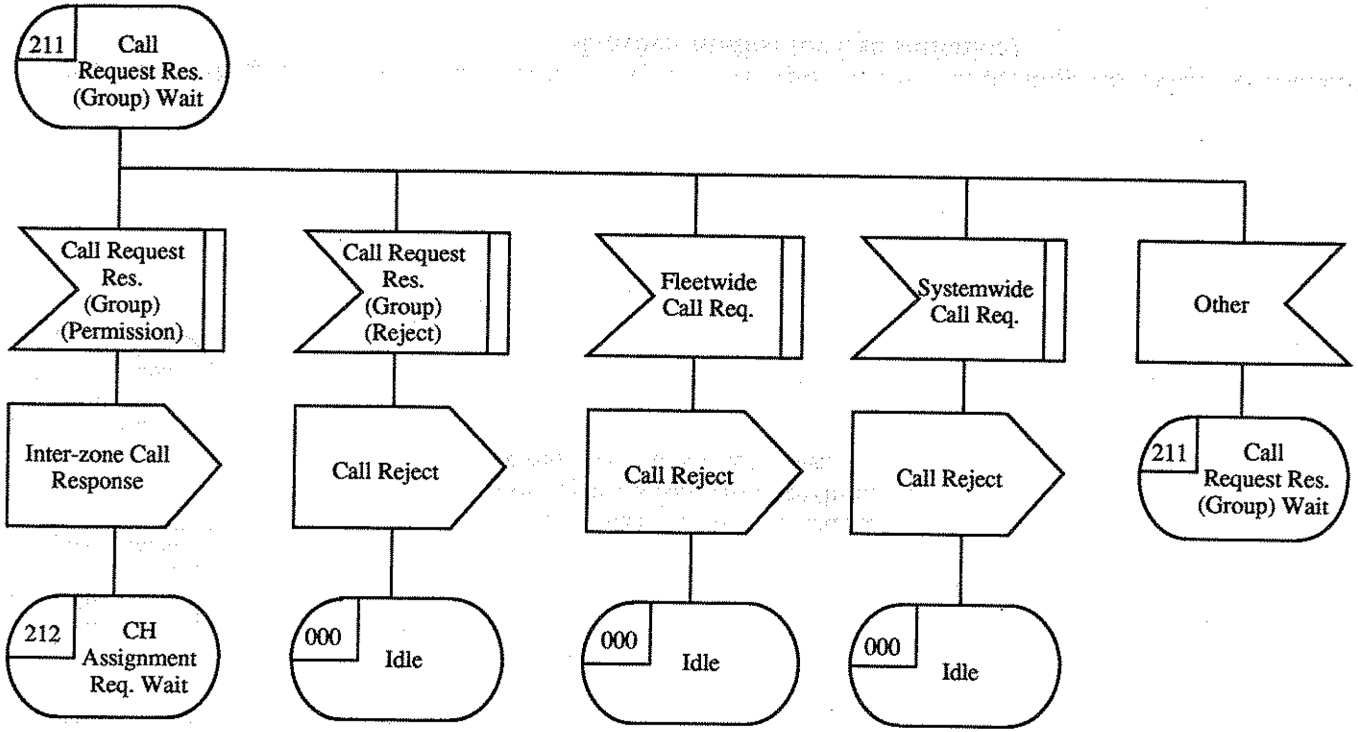


Fig. 2.2.1.1 Repeater Station Call Control (Layer3) Multiple Zone, Group(Subgroup), General connection Call (The Repeater Station for Call Initiation)

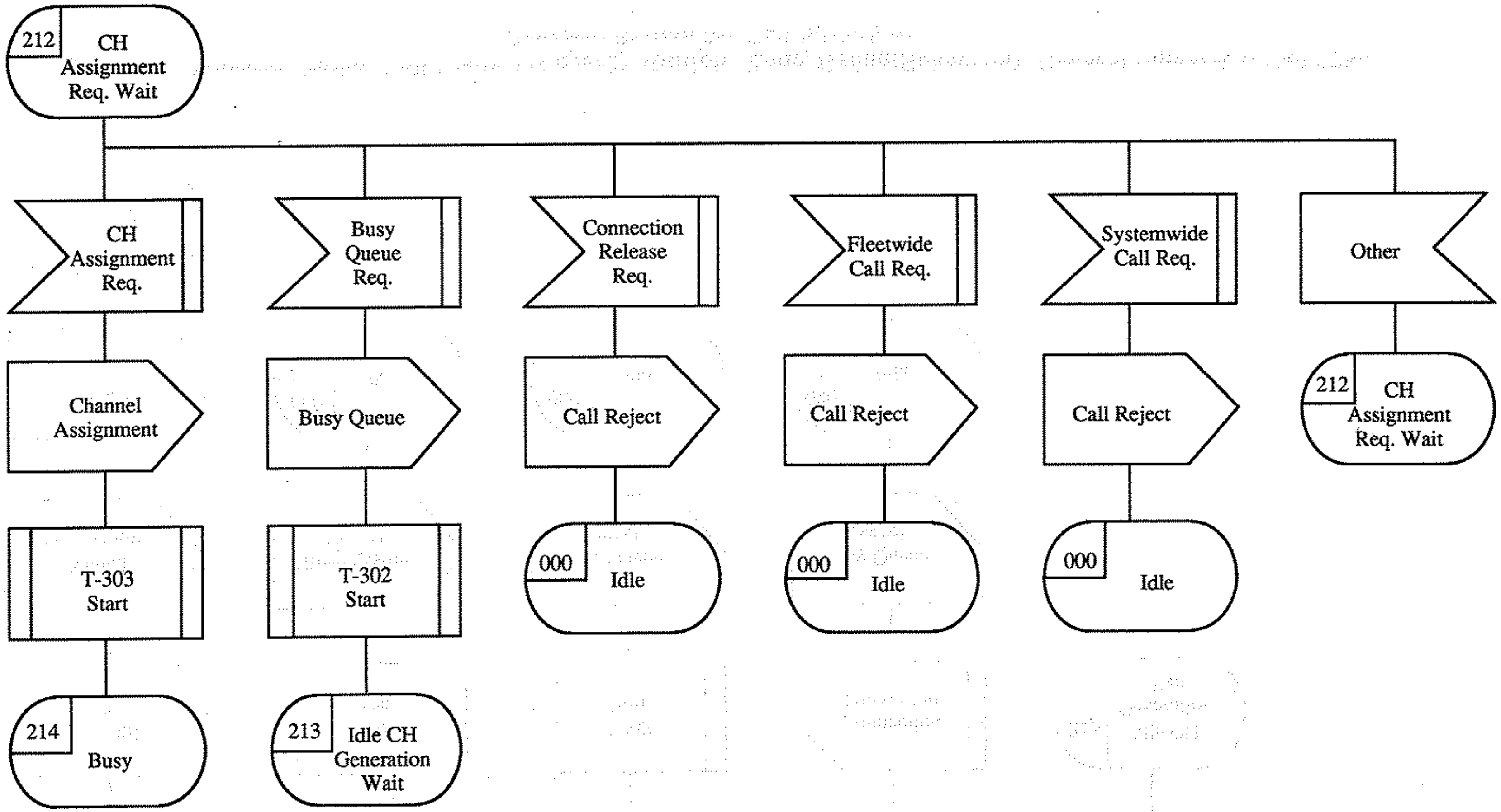


Fig. 2.2.1.2 Repeater Station Call Control (Layer3) Multiple Zone, Group(Subgroup), General connection Call (The Repeater Station for Call Initiation)

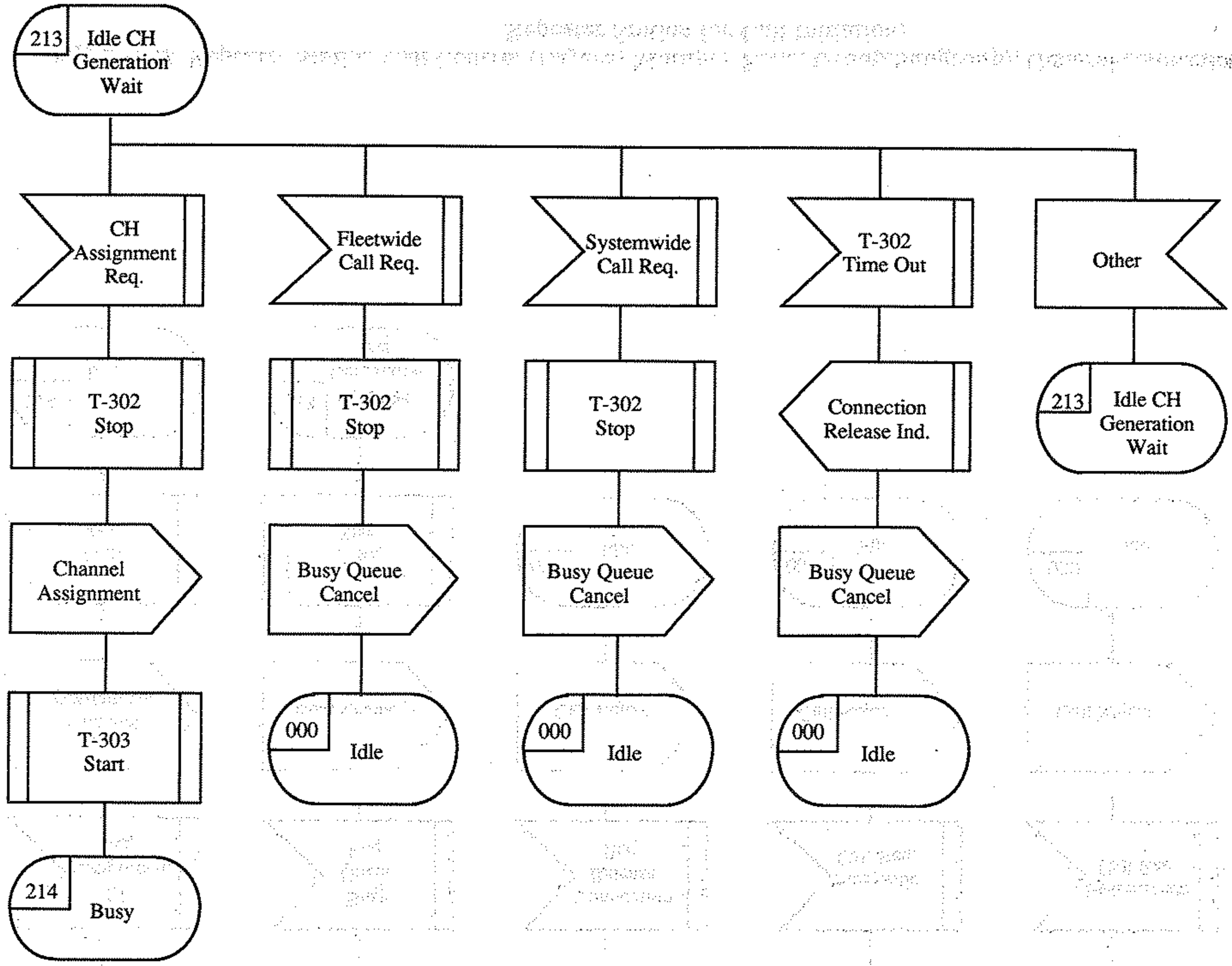


Fig. 2.2.1.3 Repeater Station Call Control (Layer3) Multiple Zone, Group(Subgroup), General connection Call (The Repeater Station for Call Initiation)

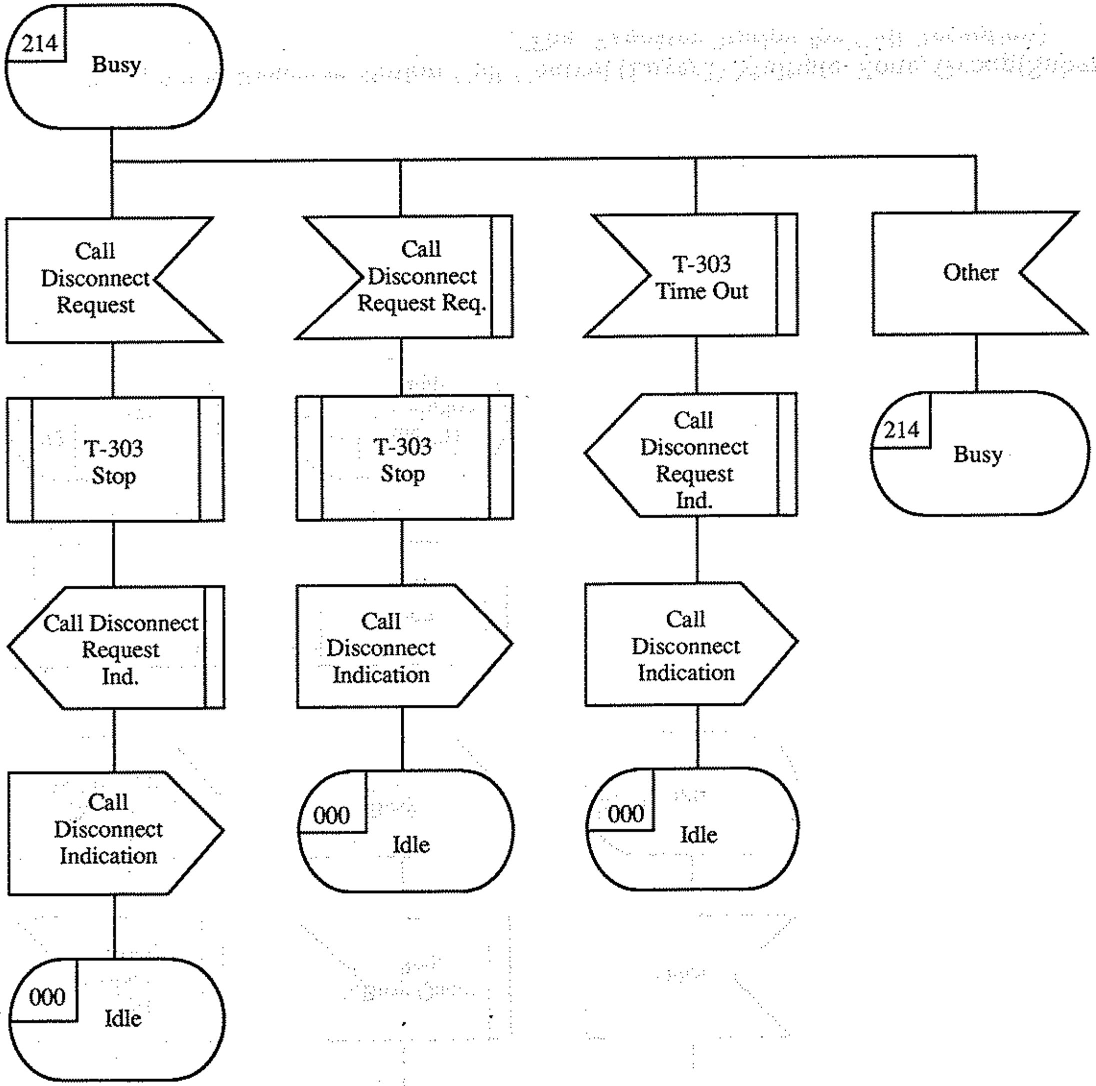


Fig. 2.2.1.4 Repeater Station Call Control (Layer3) Multiple Zone, Group(Subgroup), General connection Call (The Repeater Station for Call Initiation)

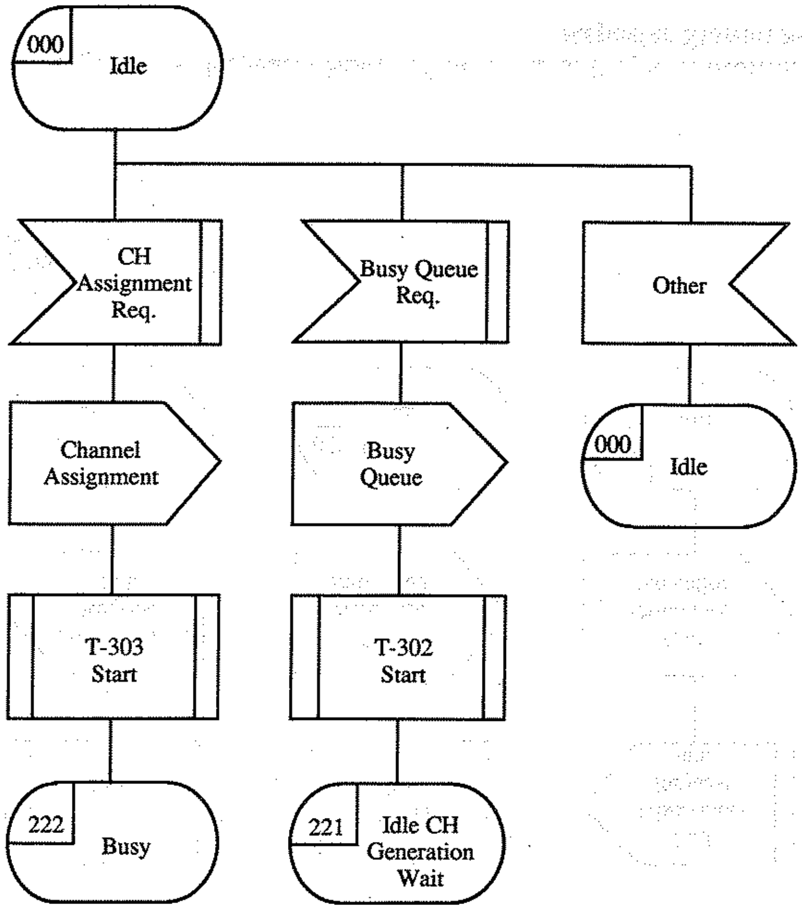


Fig. 2.2.2.0 Repeater Station Call Control (Layer3) Multiple Zone, Group(Subgroup), General connection Call (The Repeater Station for Call Reception)

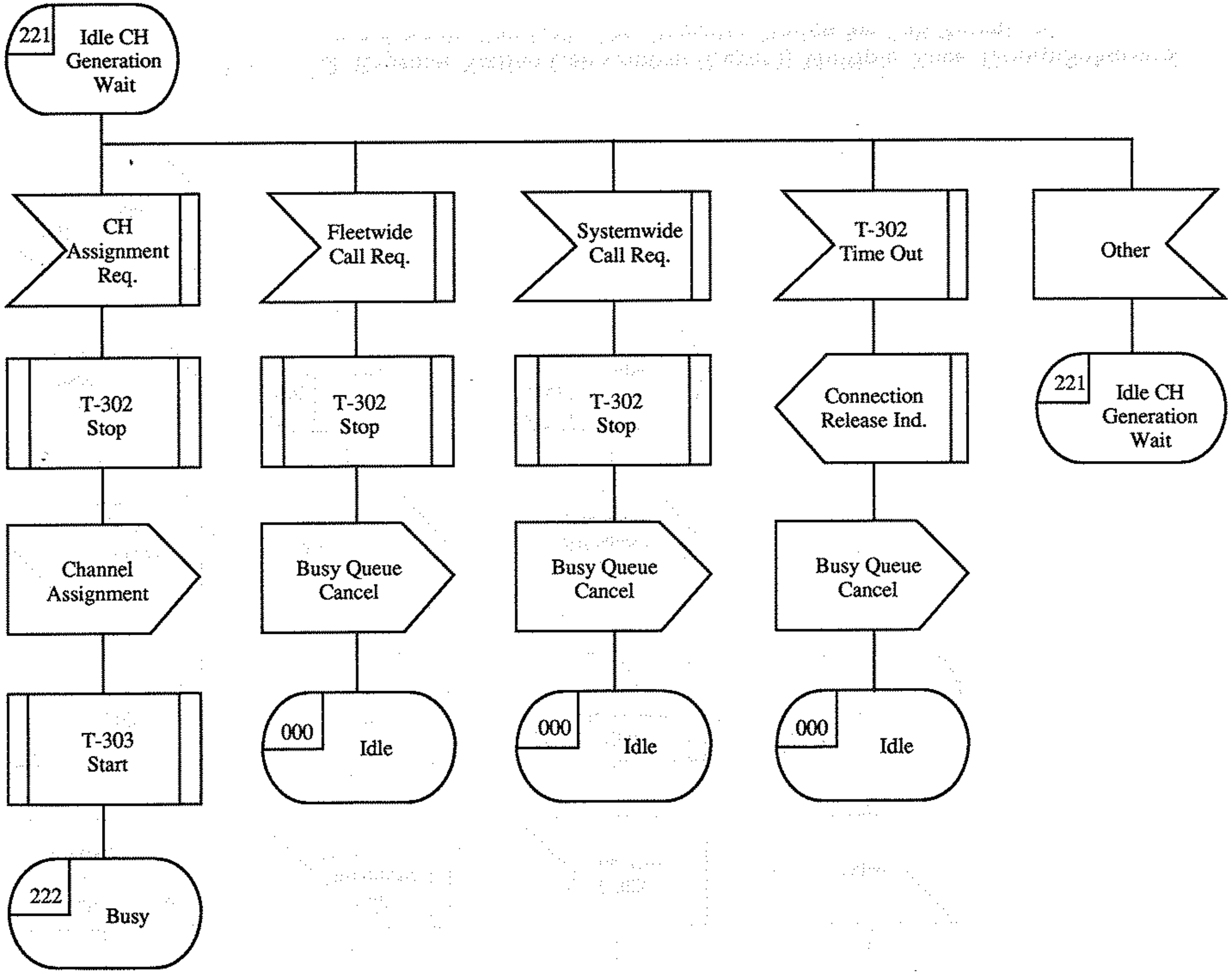


Fig. 2.2.2.1 Repeater Station Call Control (Layer3) Multiple Zone, Group(Subgroup), General connection Call (The Repeater Station for Call Reception)

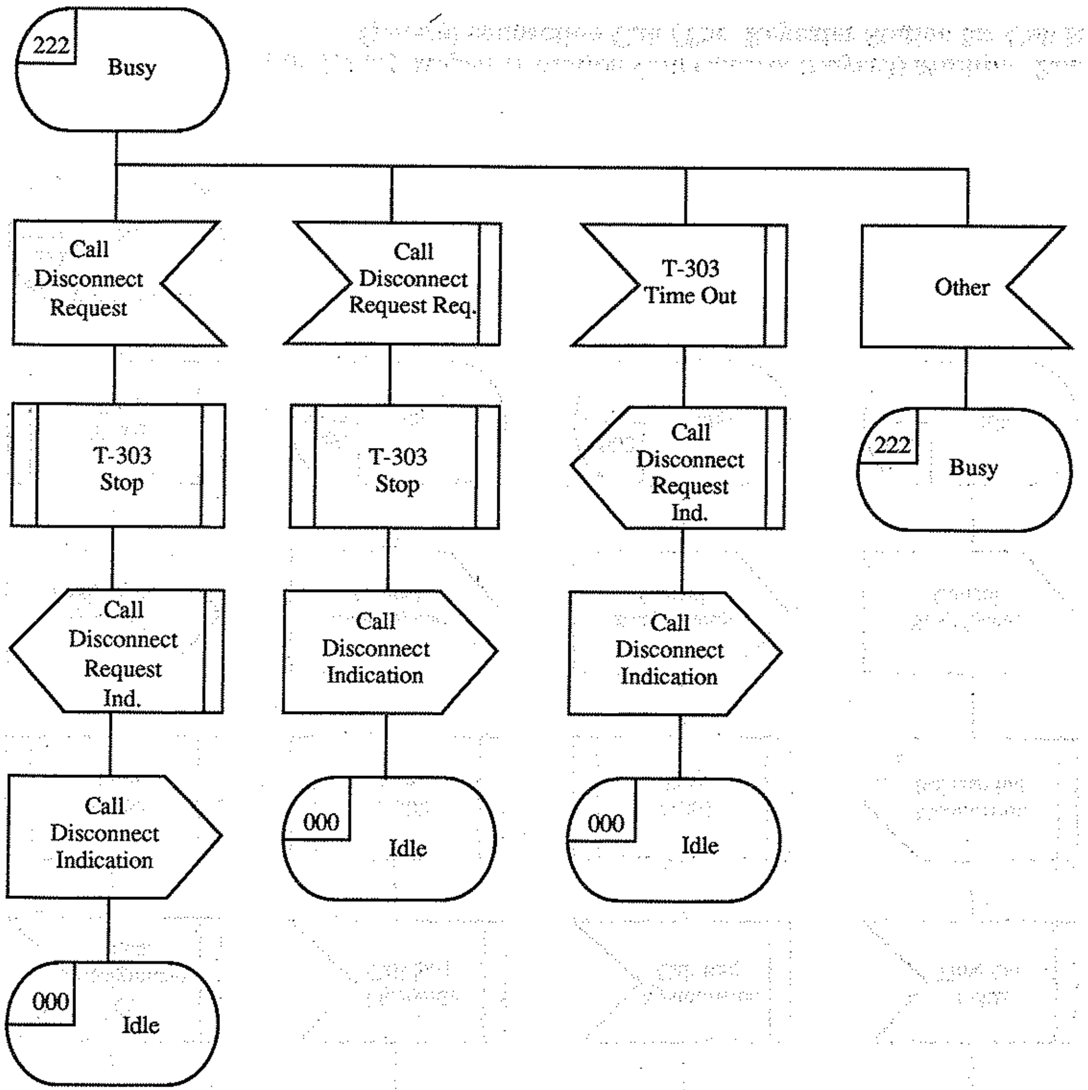
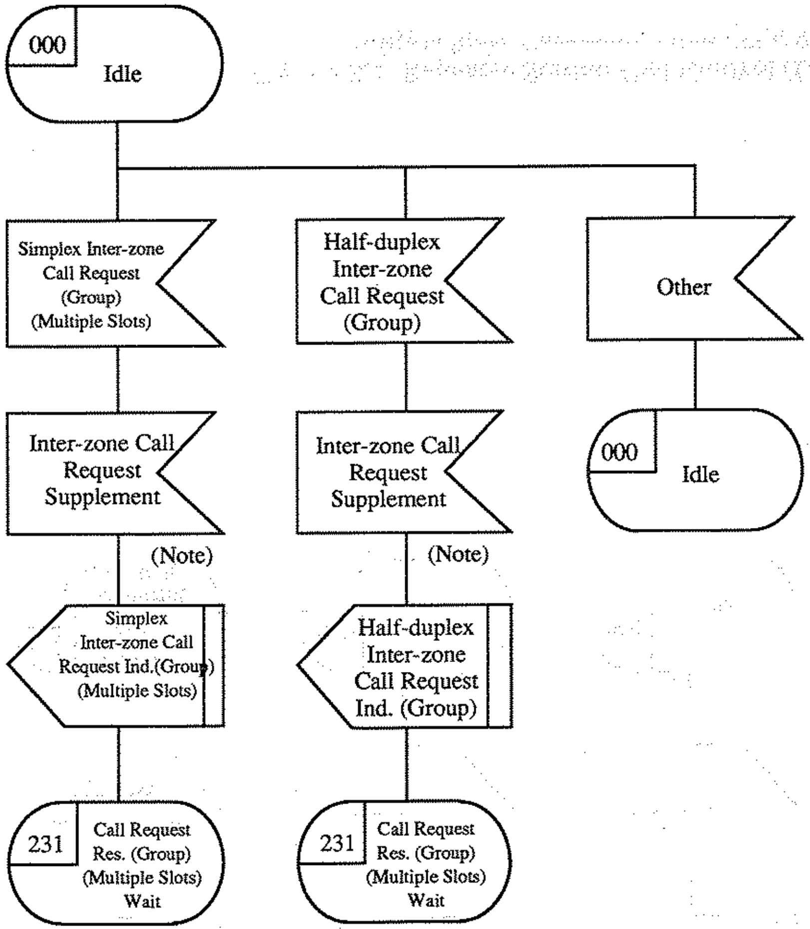


Fig. 2.2.2.2 Repeater Station Call Control (Layer3) Multiple Zone, Group(Subgroup), General connection Call (The Repeater Station for Call Reception)



(Note) Inter-zone Call Supplement message is not received when the number of zone to be connected 1 zone.

Fig. 2.2.3.0 Repeater Station Call Control (Layer3) Multiple Zone, Group(Subgroup), Multiple Slots Communication (The Repeater Station for Call Initiation)

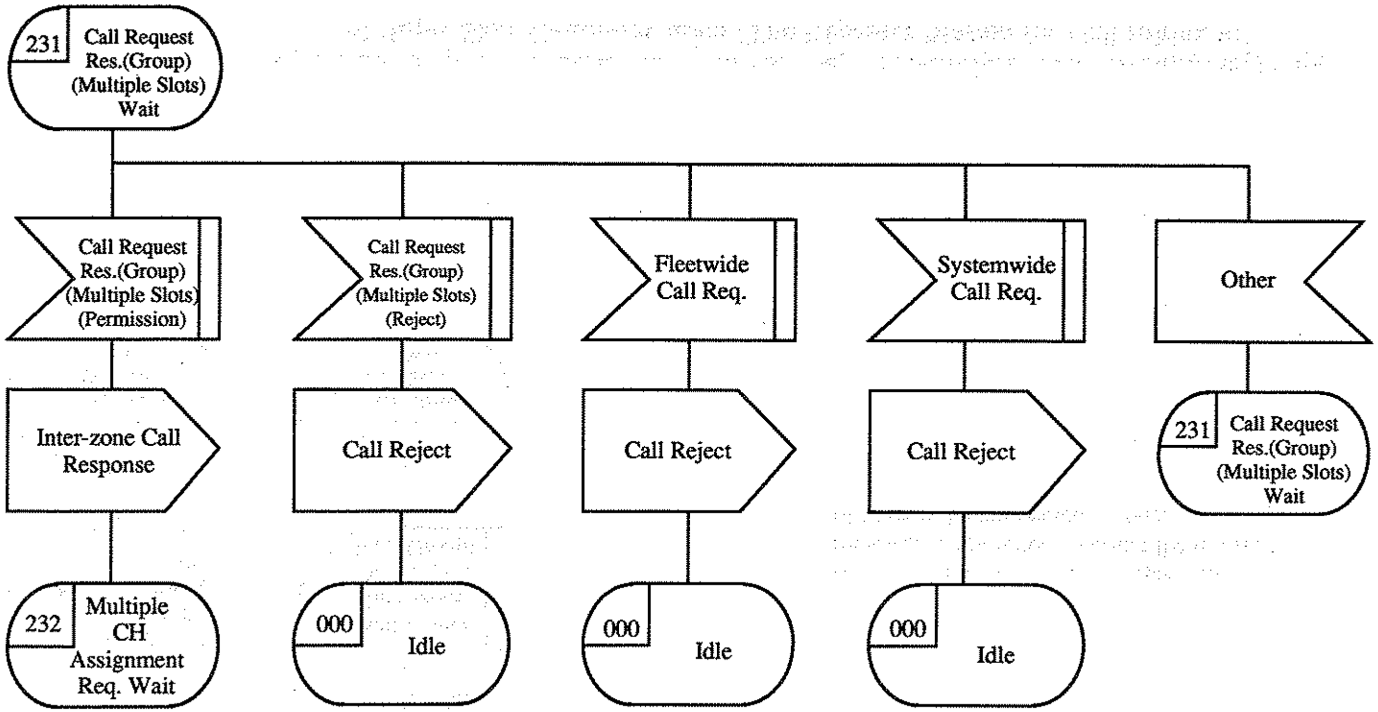


Fig. 2.2.3.1 Repeater Station Call Control (Layer3) Multiple Zone, Group(Subgroup), Multiple Slots Communication (The Repeater Station for Call Initiation)

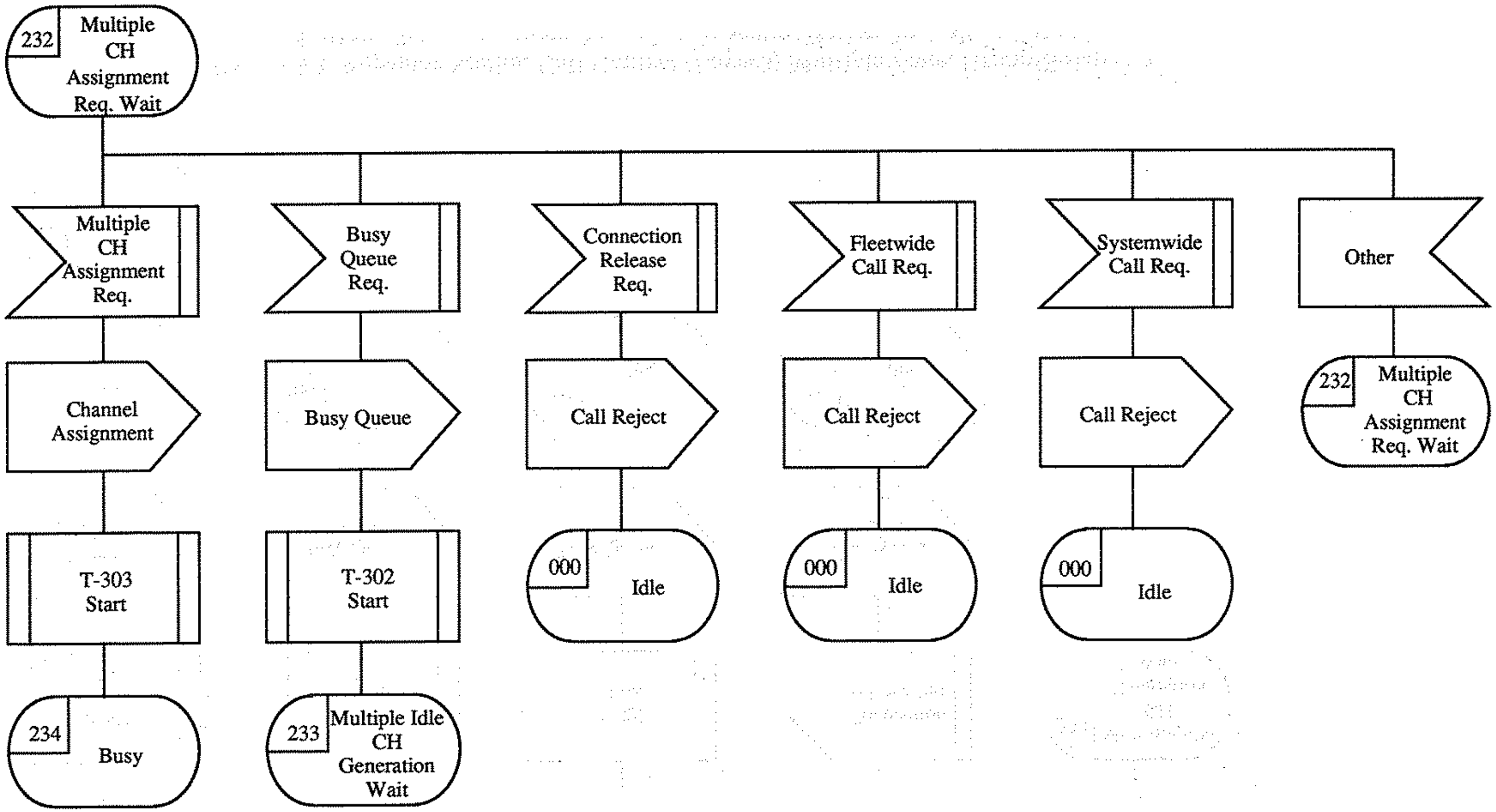


Fig. 2.2.3.2 Repeater Station Call Control (Layer3) Multiple Zone, Group(Subgroup), Multiple Slots Communication (The Repeater Station for Call Initiation)

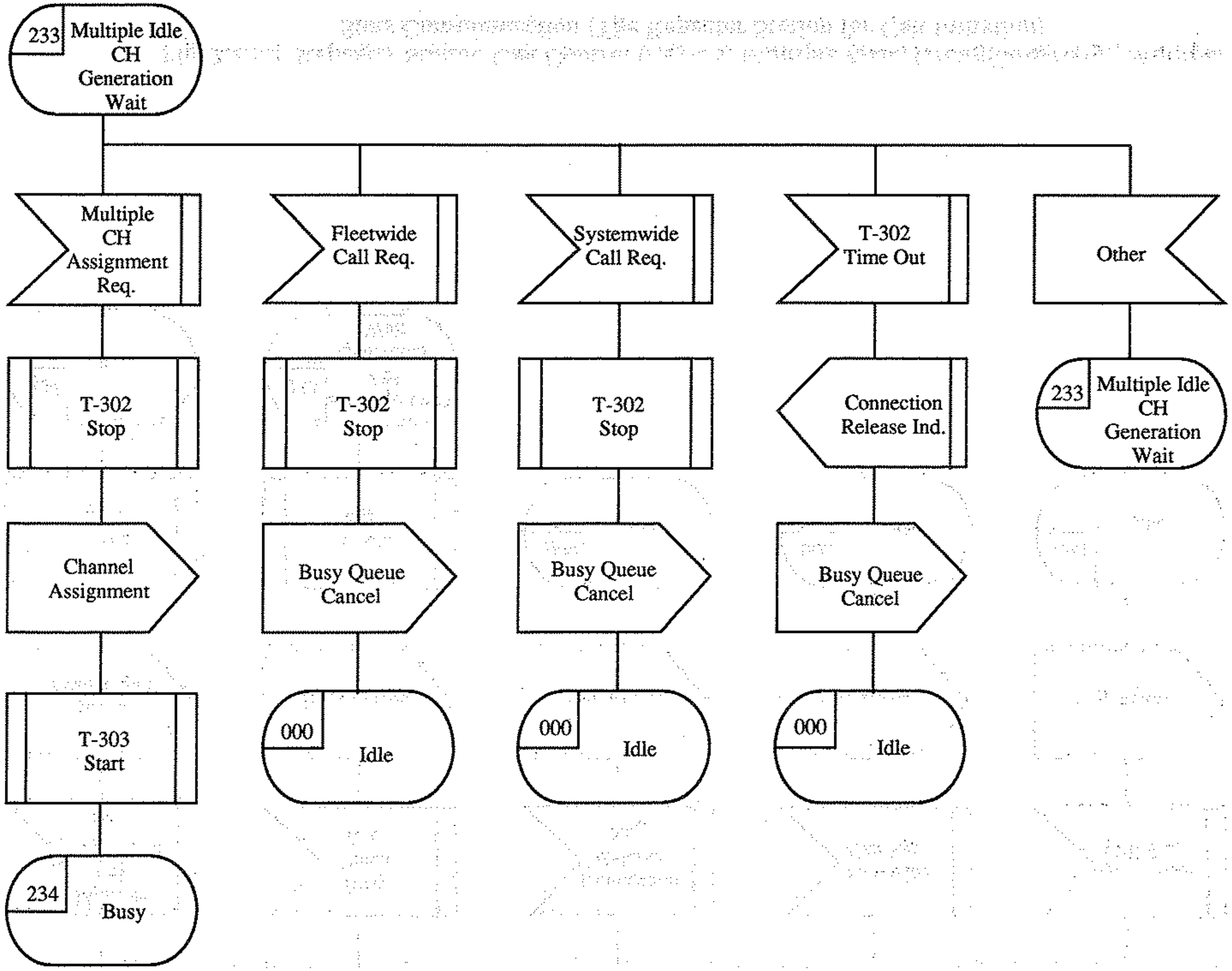


Fig. 2.2.3.3 Repeater Station Call Control (Layer3) Multiple Zone, Group(Subgroup), Multiple Slots Communication (The Repeater Station for Call Initiation)

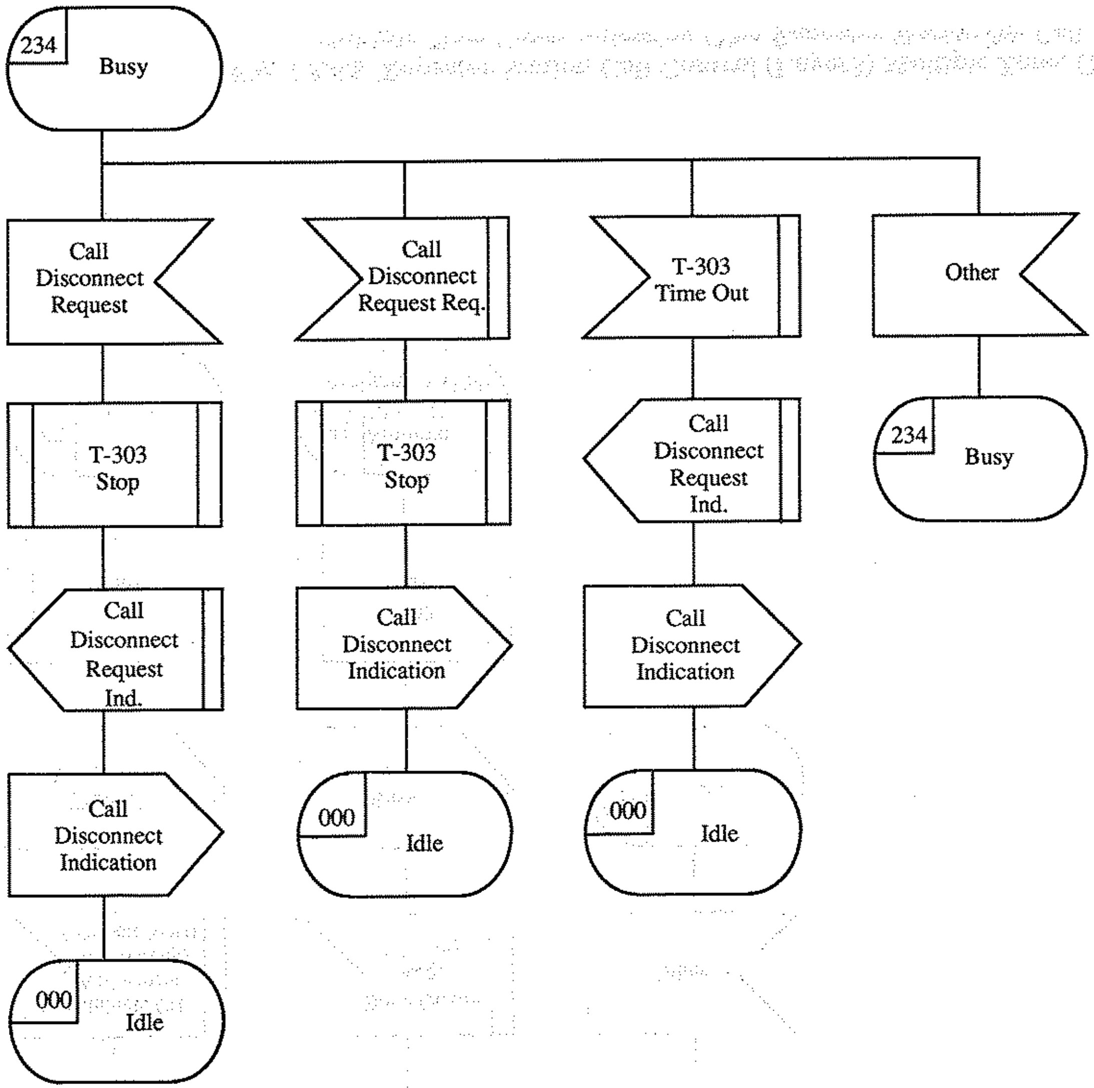


Fig. 2.2.3.4 Repeater Station Call Control (Layer3) Multiple Zone, Group(Subgroup), Multiple Slots Communication (The Repeater Station for Call Initiation)

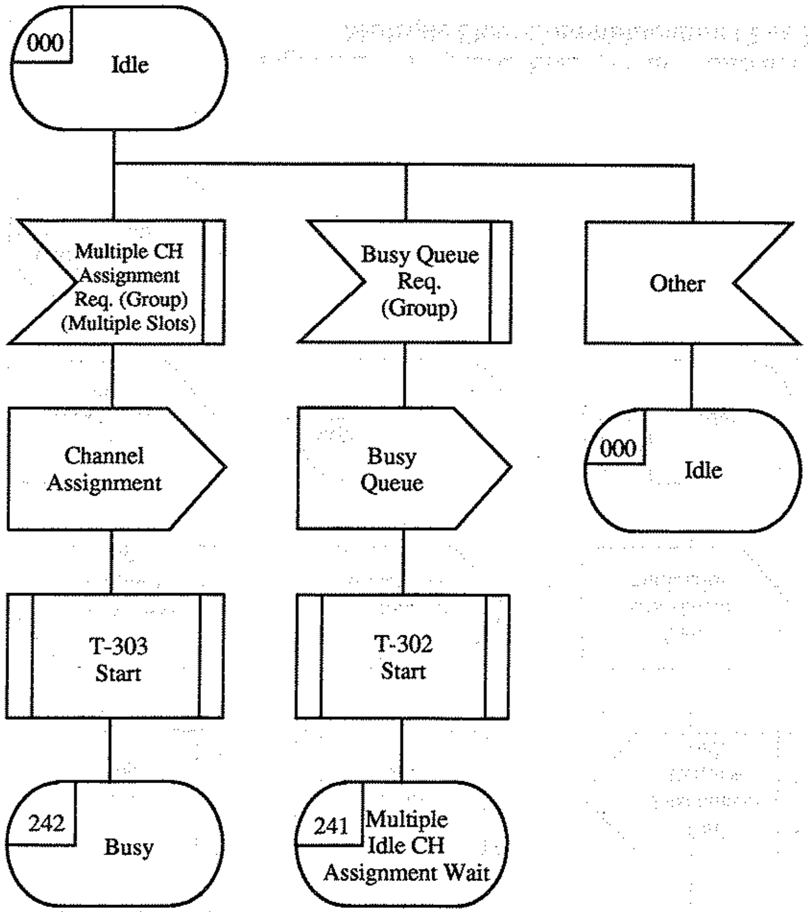


Fig. 2.2.4.0 Repeater Station Call Control (Layer3) Multiple Zone, Group(Subgroup), Multiple Slots Communication (The Repeater Station for Call Reception)

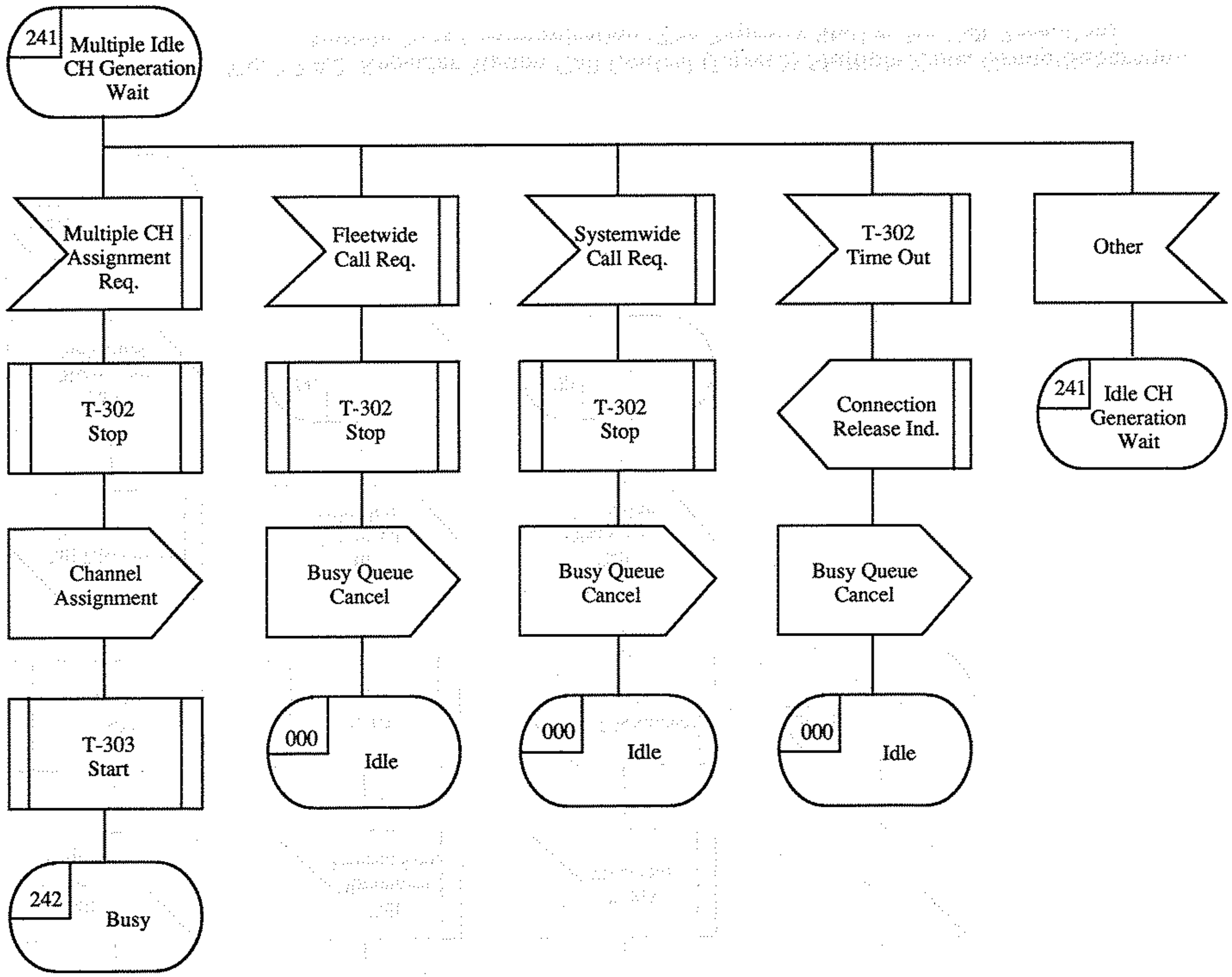


Fig. 2.2.4.1 Repeater Station Call Control (Layer3) Multiple Zone, Group(Subgroup), Multiple Slots Communication (The Repeater Station for Call Reception)

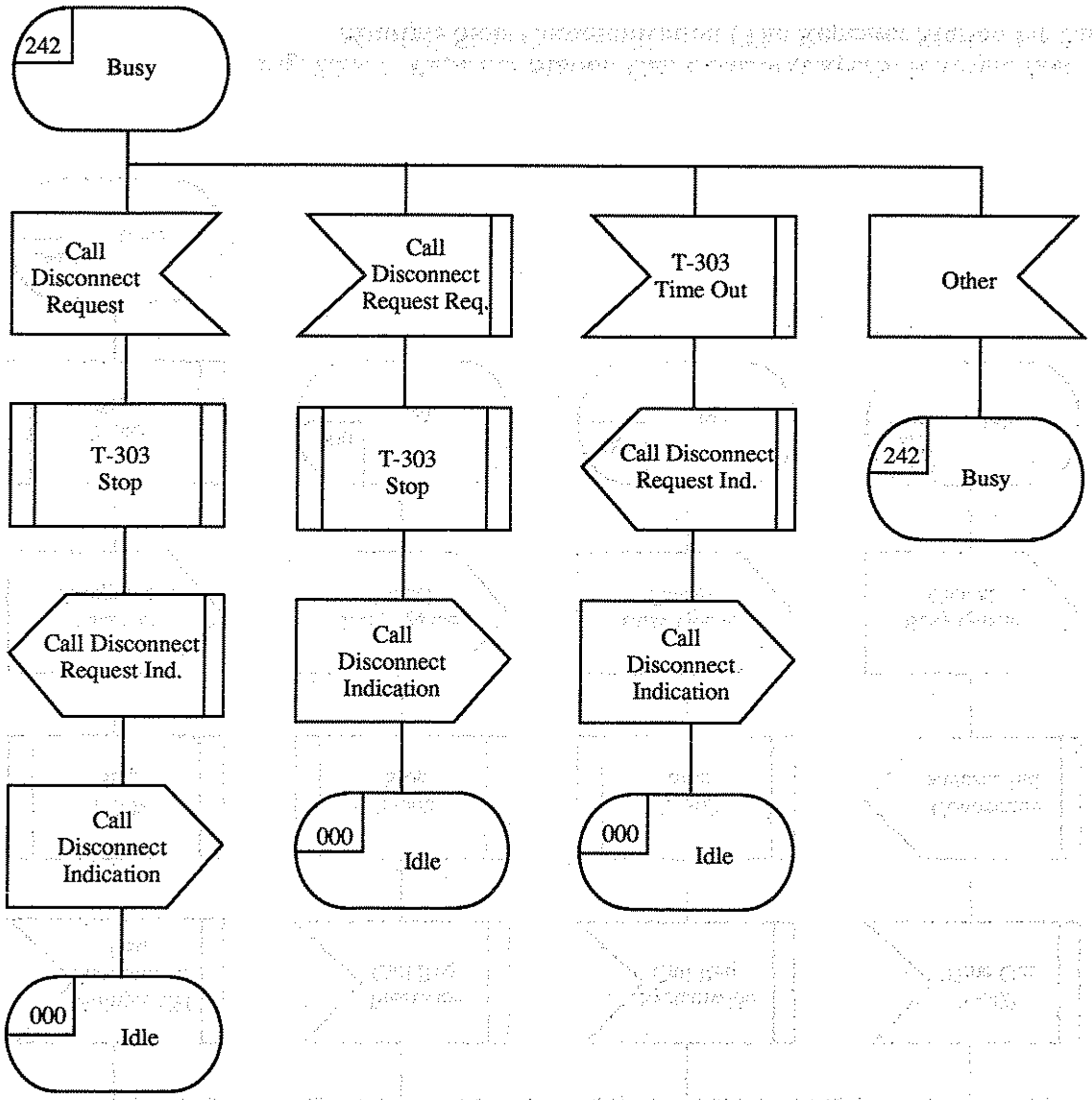


Fig. 2.2.4.2 Repeater Station Call Control (Layer3) Multiple Zone, Group(Subgroup), Multiple Slots Communication (The Repeater Station for Call Reception)

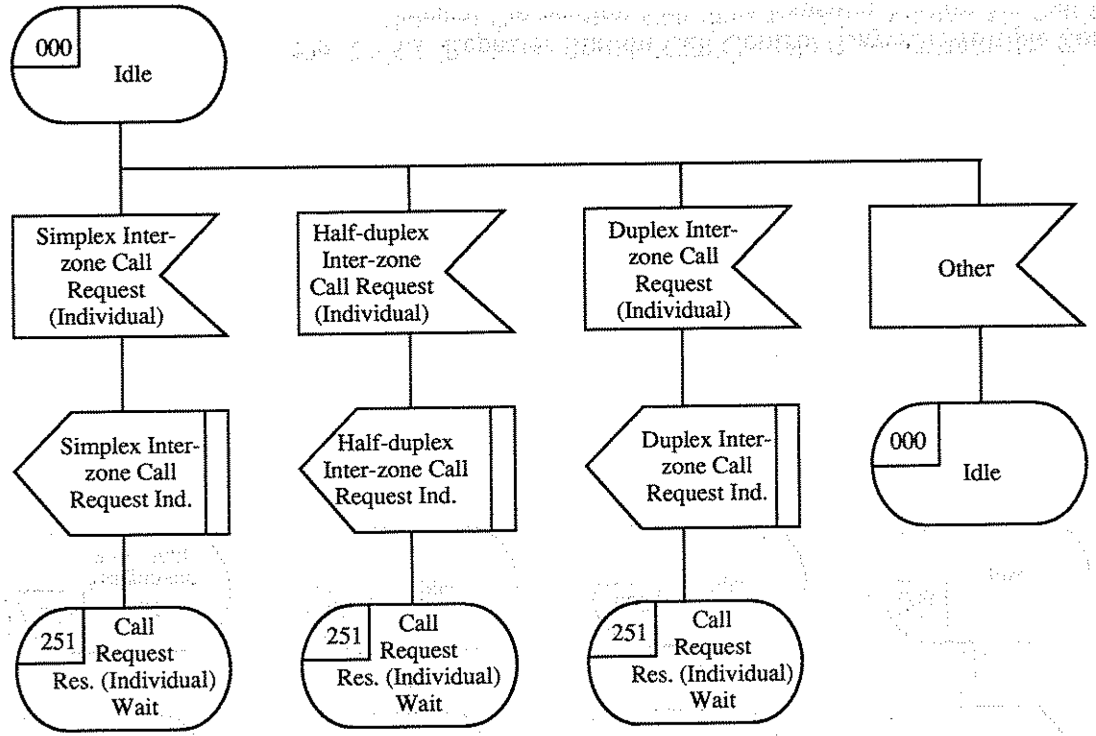


Fig. 2.2.5.0 Repeater Station Call Control (Layer3) Multiple Zone, Individual, General Connection Call (The Repeater Station for Call Initiation)

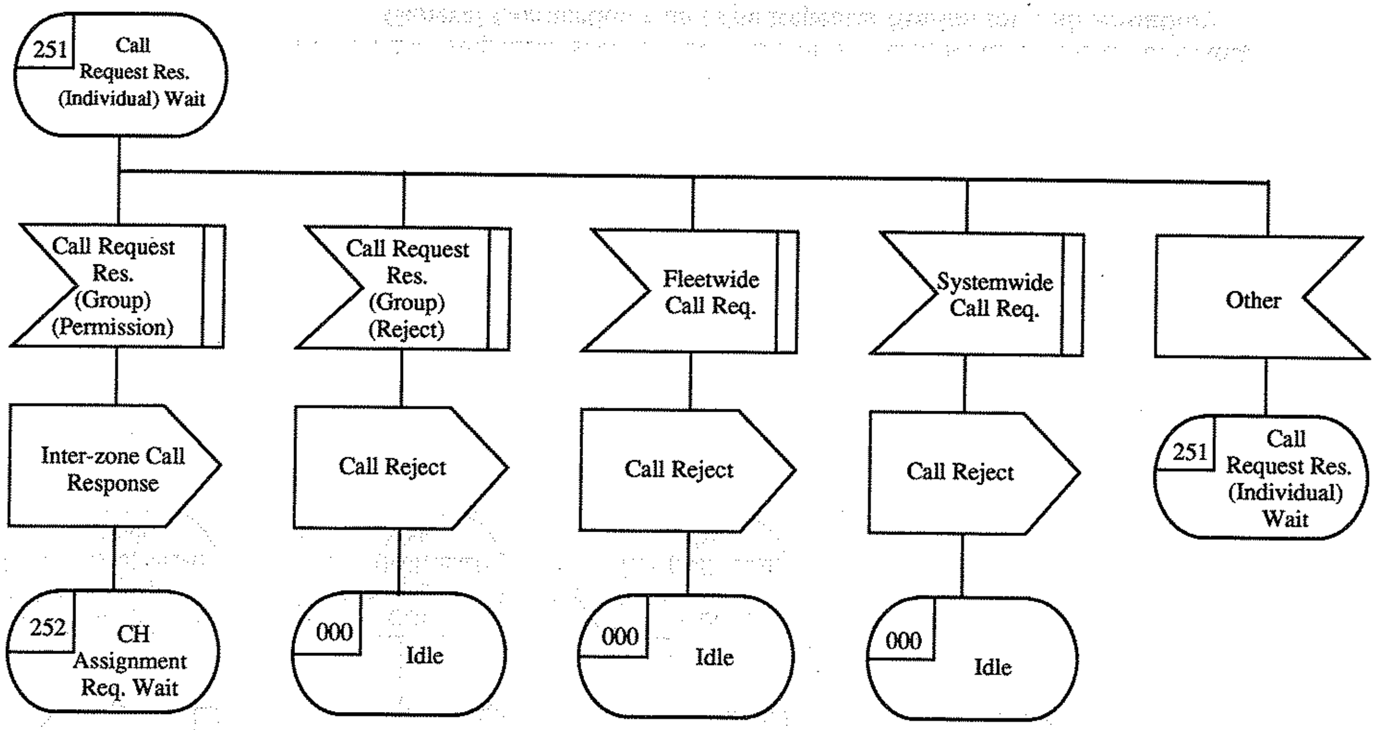


Fig. 2.2.5.1 Repeater Station Call Control (Layer3) Multiple Zone, Individual, General Connection Call (The Repeater Station for Call Initiation)

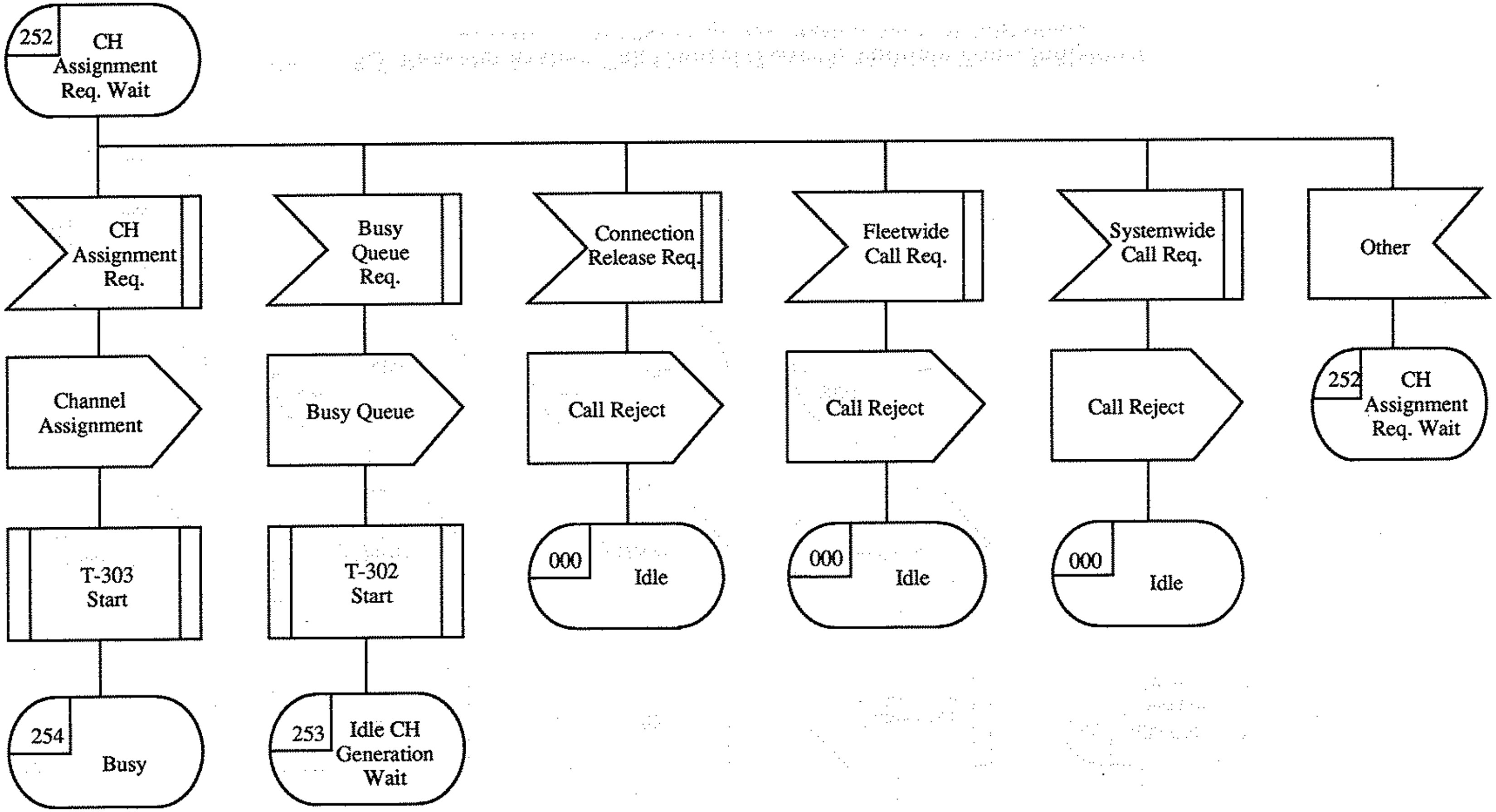


Fig. 2.2.5.2 Repeater Station Call Control (Layer3) Multiple Zone, Individual, General Connection Call (The Repeater Station for Call Initiation)

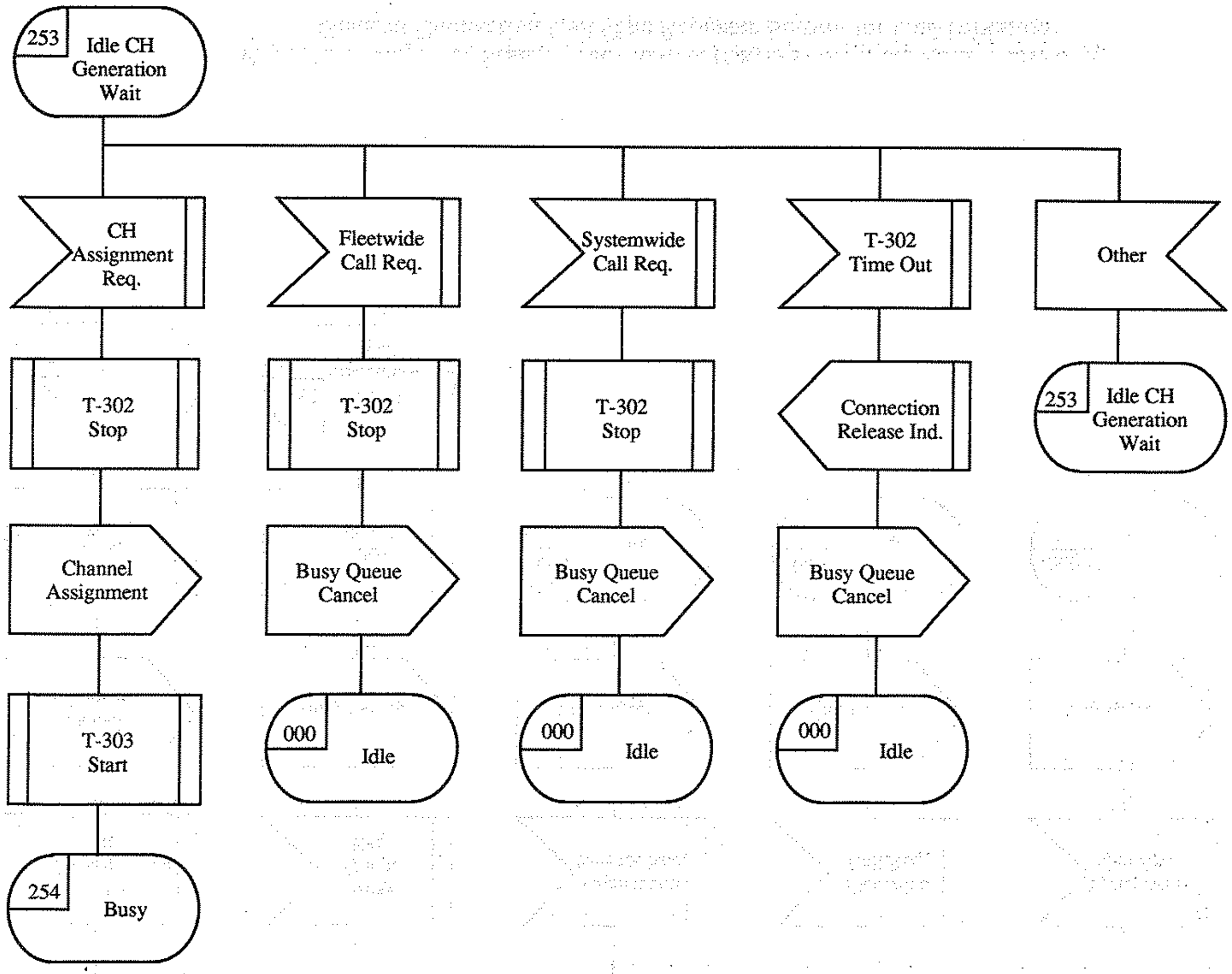


Fig. 2.2.5.3 Repeater Station Call Control (Layer3) Multiple Zone, Individual, General Connection Call (The Repeater Station for Call Initiation)

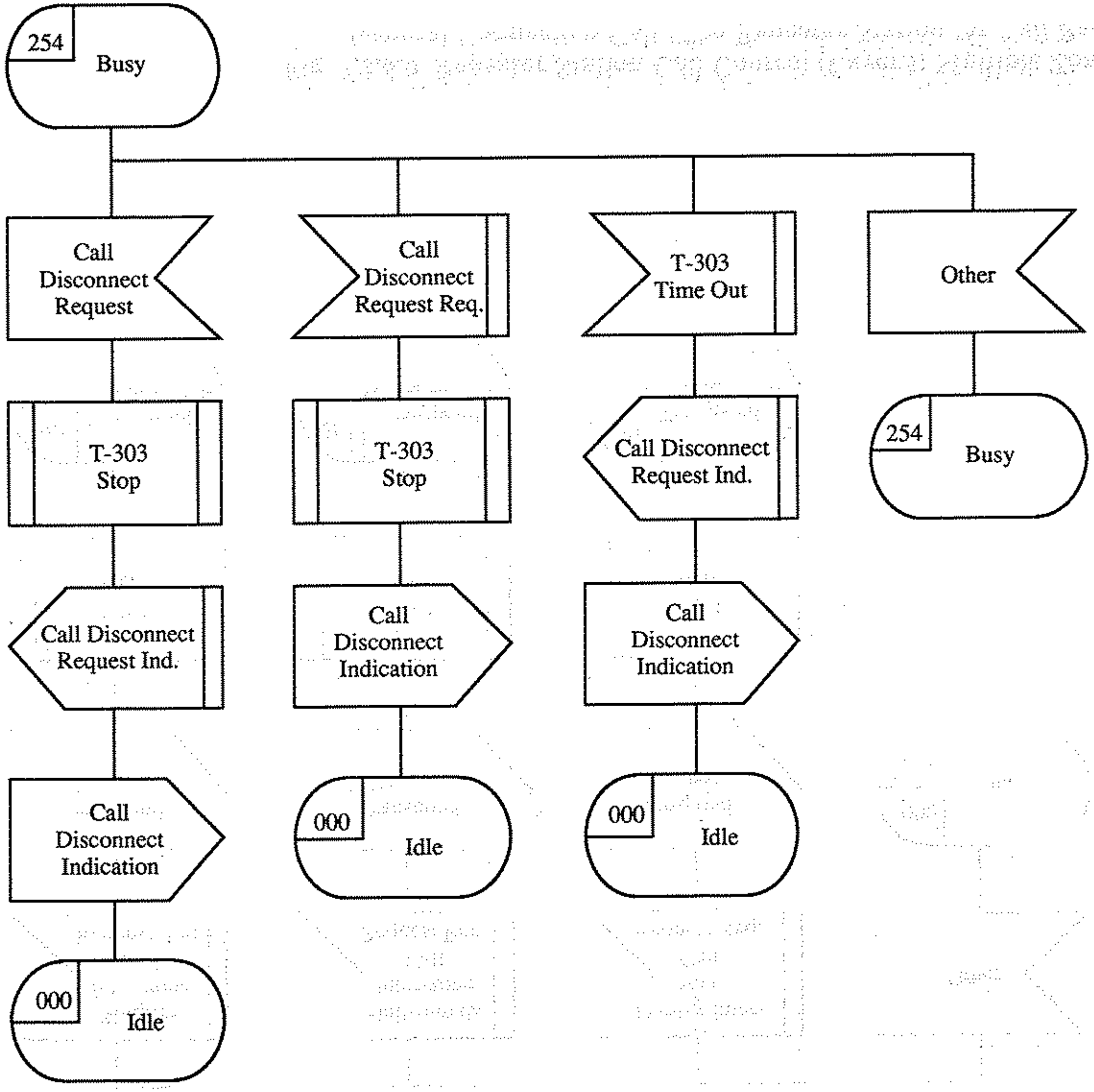


Fig. 2.2.5.4 Repeater Station Call Control (Layer3) Multiple Zone, Individual, General Connection Call (The Repeater Station for Call Initiation)

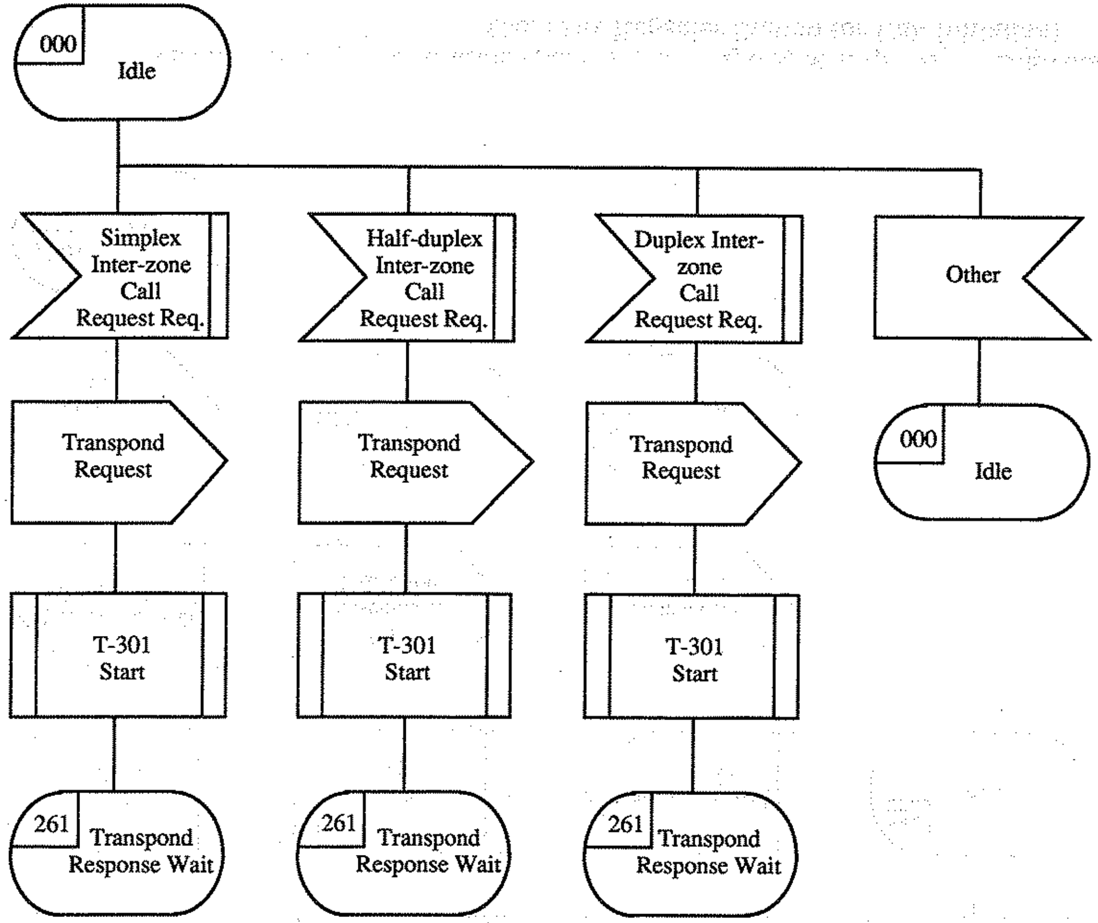


Fig. 2.2.6.0 Repeater Station Call Control (Layer3) Multiple Zone, Individual, General Connection Call (The Repeater Station for Call Reception)

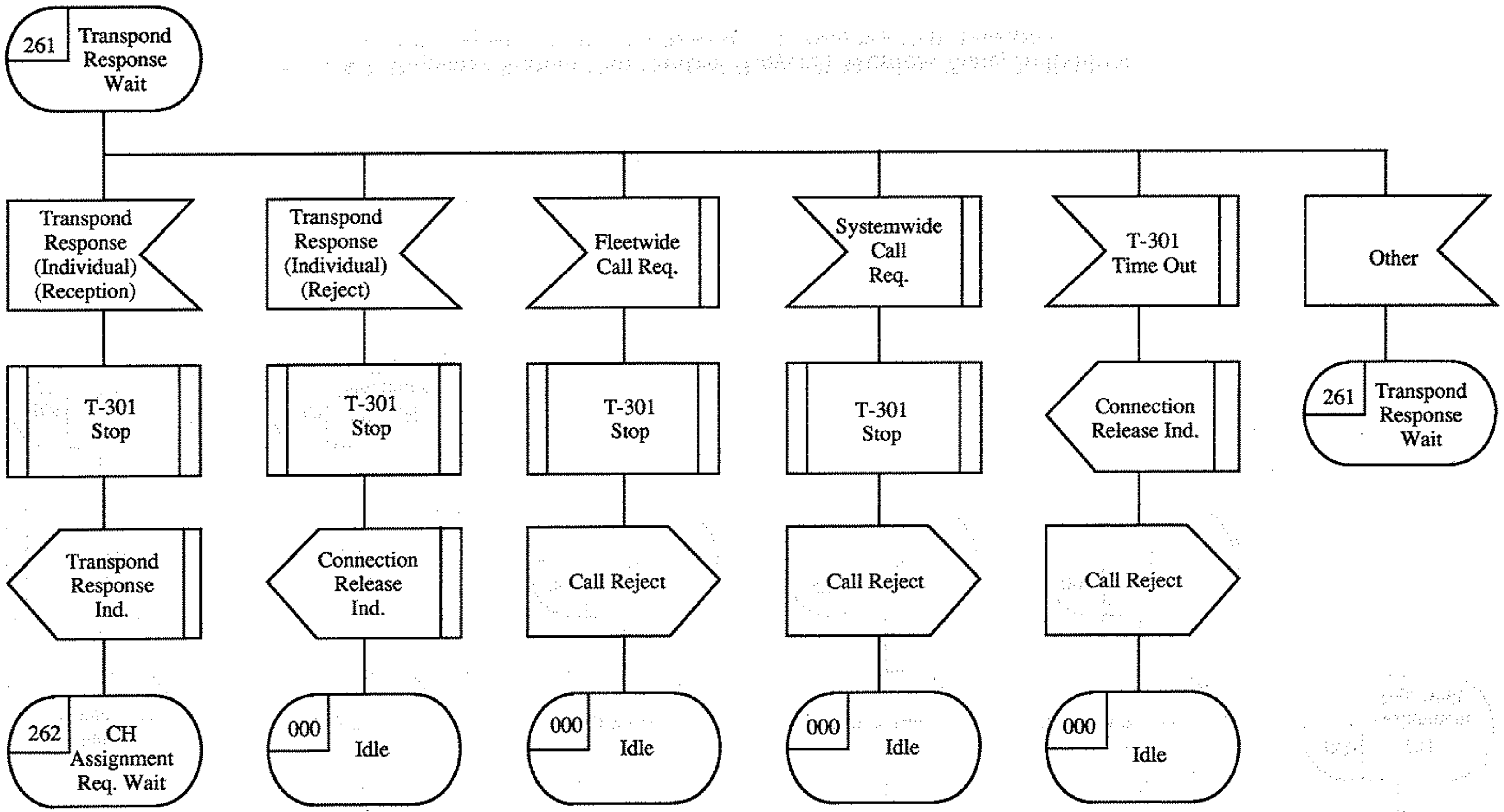


Fig. 2.2.6.1 Repeater Station Call Control (Layer3) Multiple Zone, Individual, General Connection Call (The Repeater Station for Call Reception)

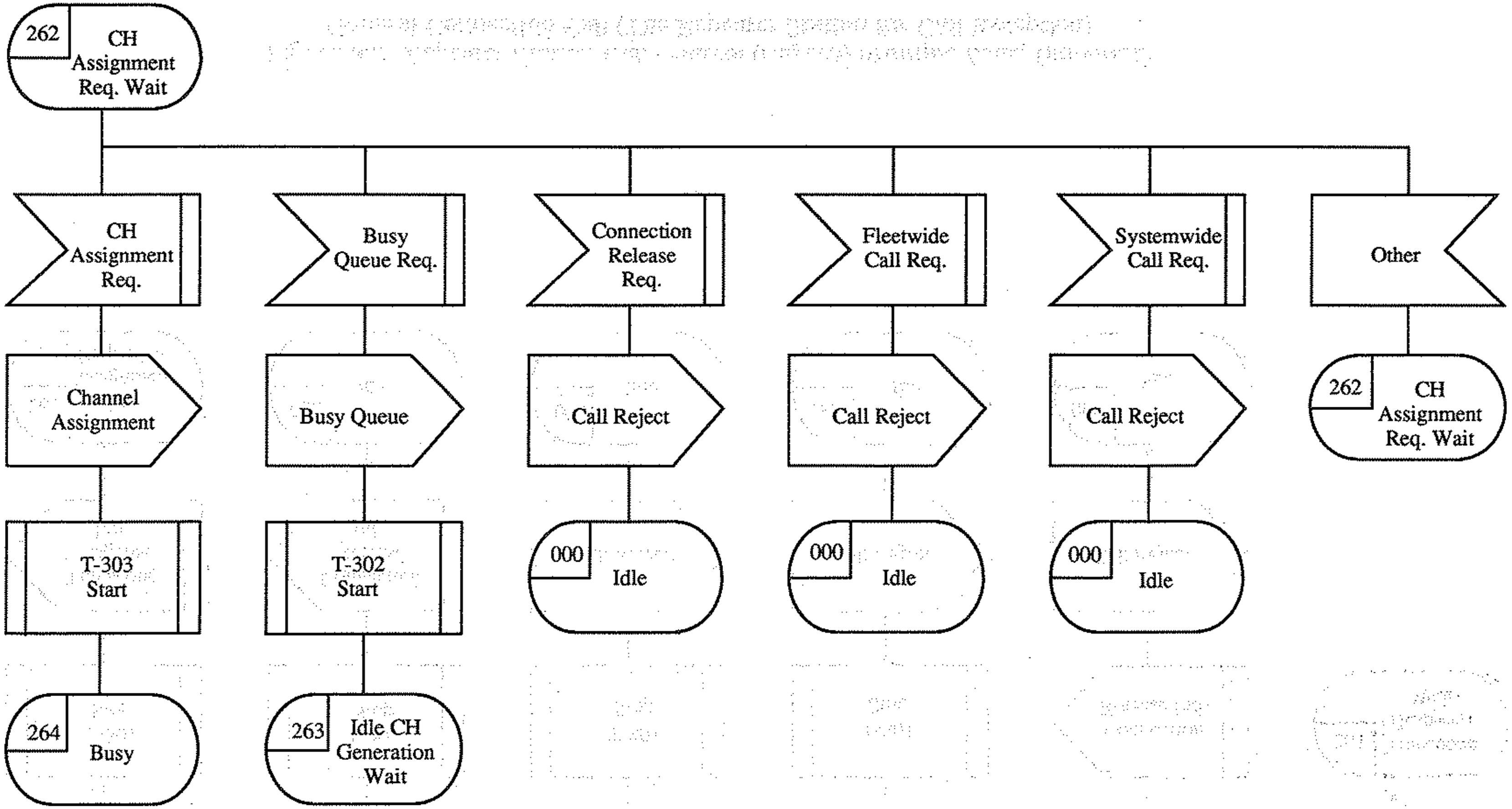


Fig. 2.2.6.2 Repeater Station Call Control (Layer3) Multiple Zone, Individual, General Connection Call (The Repeater Station for Call Reception)

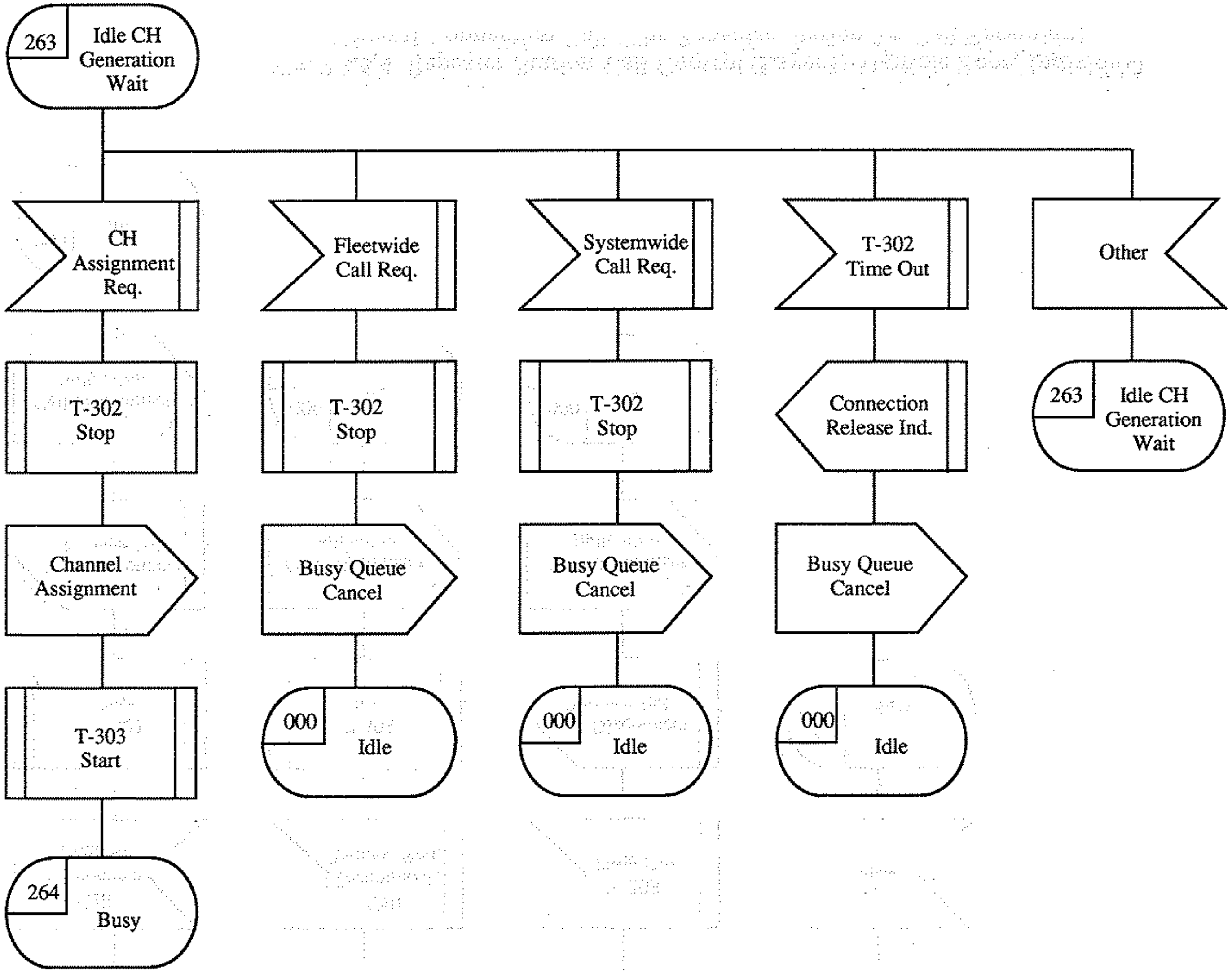


Fig. 2.2.6.3 Repeater Station Call Control (Layer3) Multiple Zone, Individual, General Connection Call (The Repeater Station for Call Reception)

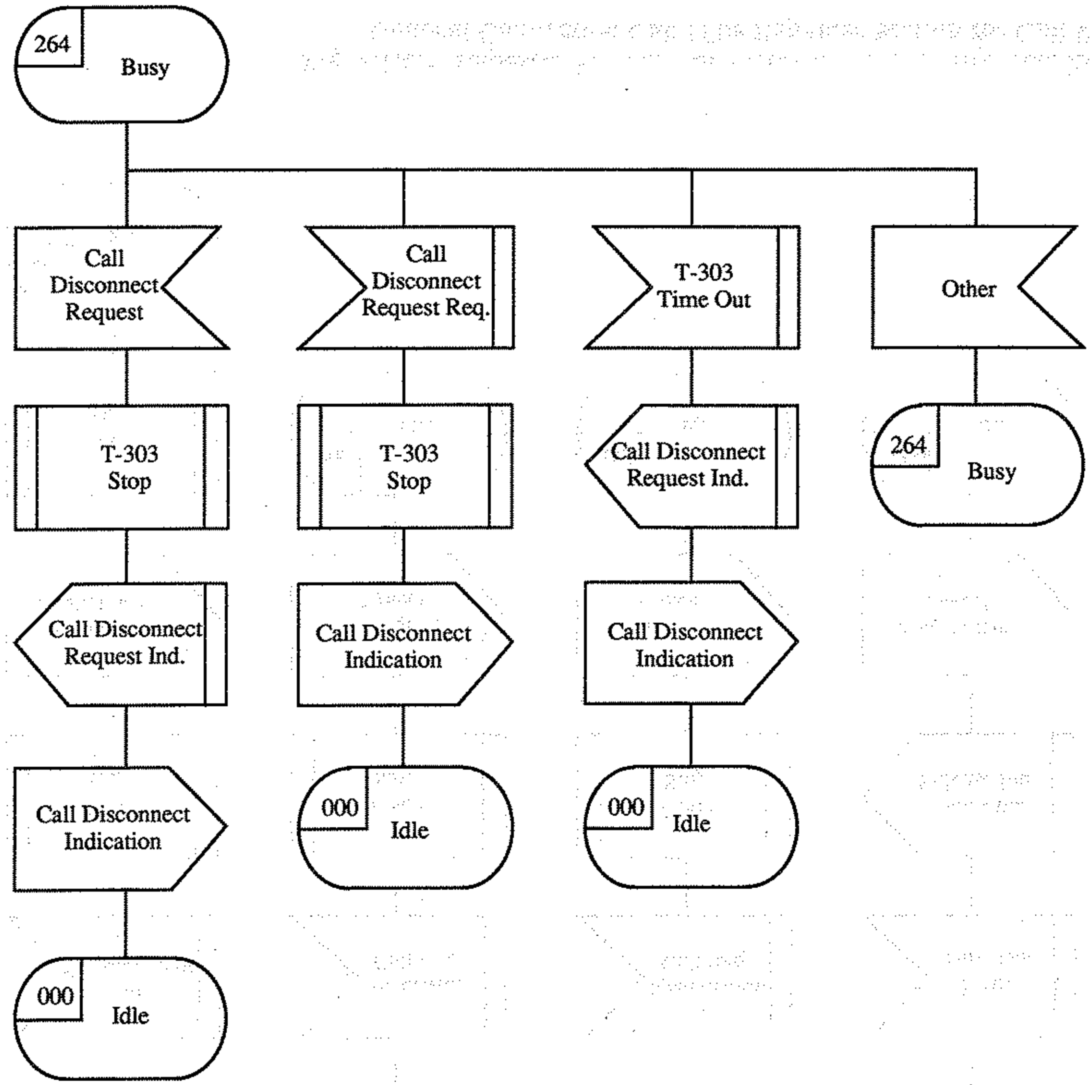


Fig. 2.2.6.4 Repeater Station Call Control (Layer3) Multiple Zone, Individual, General Connection Call (The Repeater Station for Call Reception)

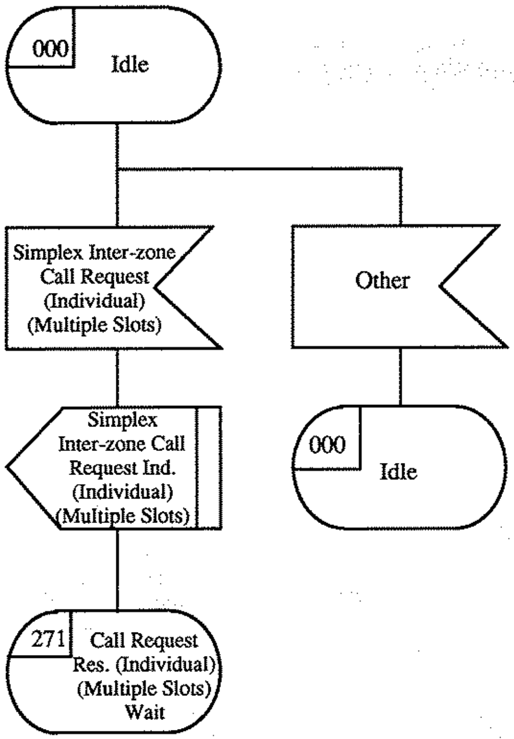


Fig. 2.2.7.0 Repeater Station Call Control (Layer3) Multiple Zone, Individual, Multiple Slots Communication (The Repeater Station for Call Initiation)

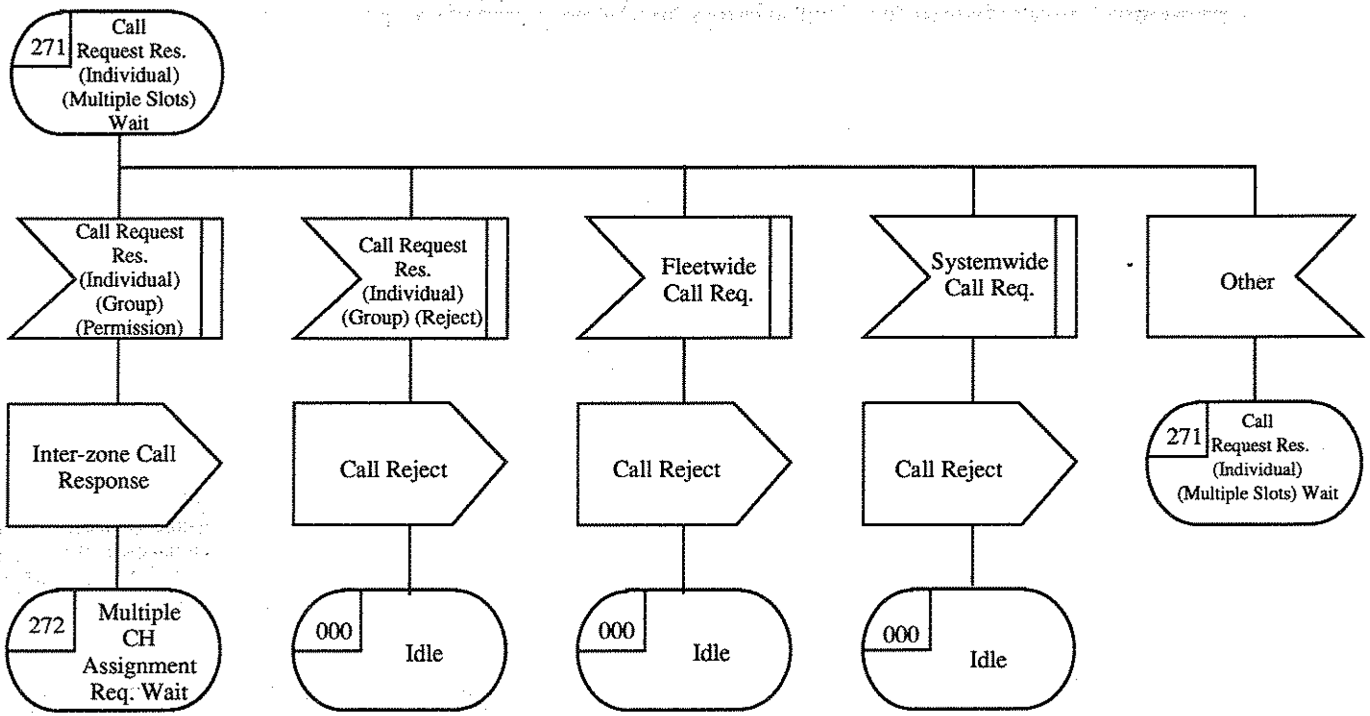


Fig. 2.2.7.1 Repeater Station Call Control (Layer3) Multiple Zone, Individual, Multiple Slots Communication (The Repeater Station for Call Initiation)

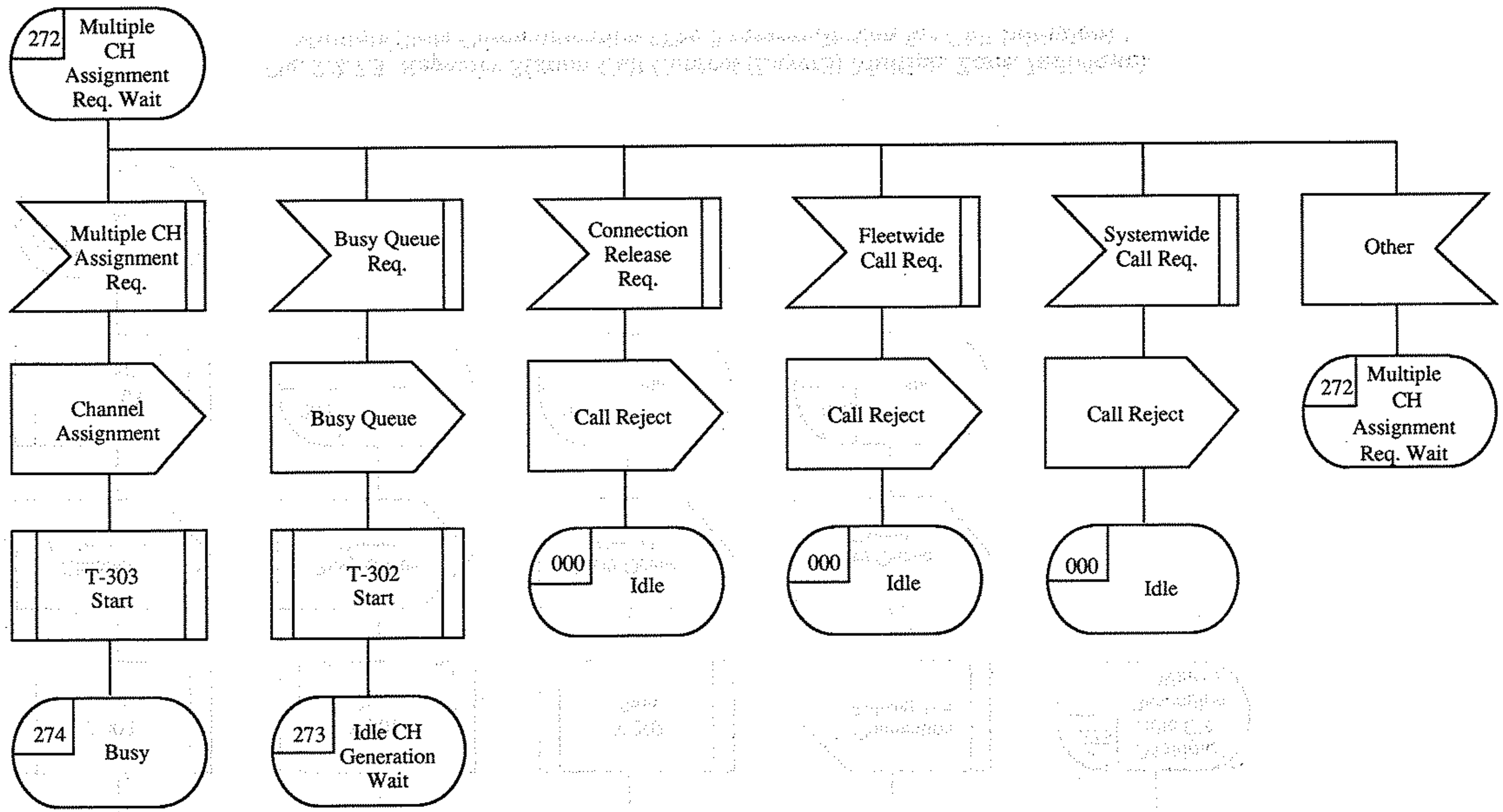


Fig. 2.2.7.2 Repeater Station Call Control (Layer3) Multiple Zone, Individual, Multiple Slots Communication (The Repeater Station for Call Initiation)

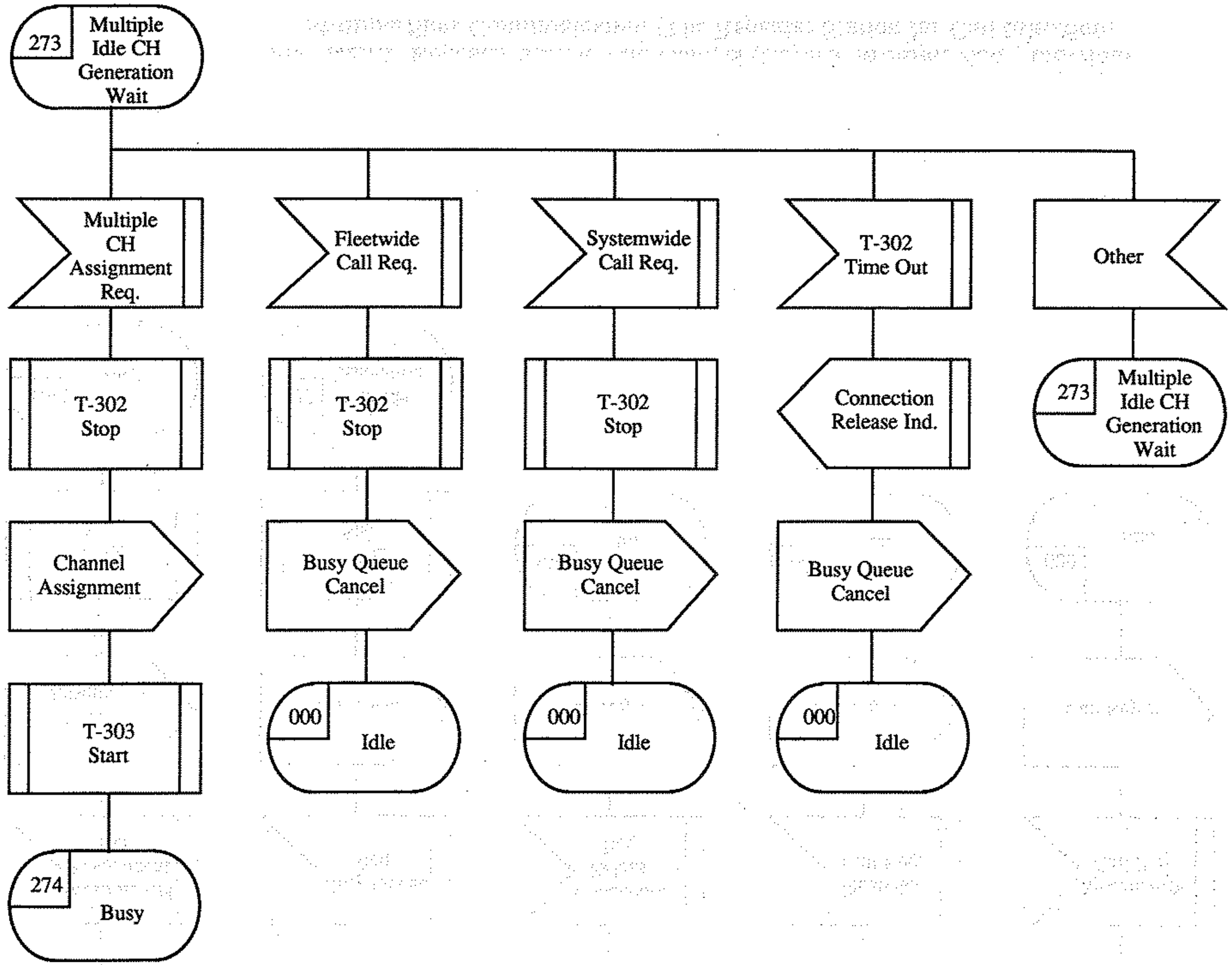


Fig. 2.2.7.3 Repeater Station Call Control (Layer3) Multiple Zone, Individual, Multiple Slots Communication (The Repeater Station for Call Initiation)

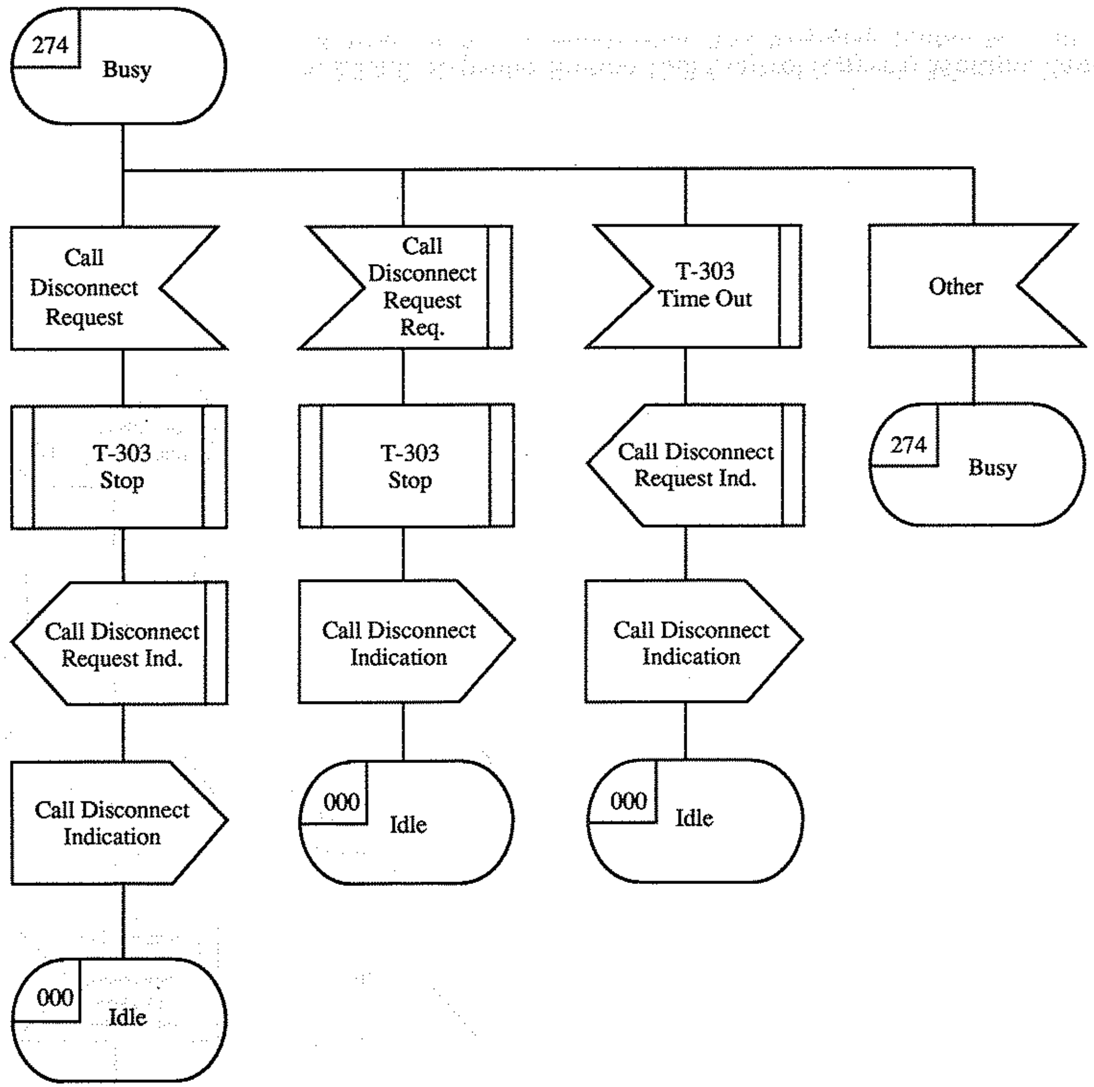


Fig. 2.2.7.4 Repeater Station Call Control (Layer3) Multiple Zone, Individual, Multiple Slots Communication (The Repeater Station for Call Initiation)

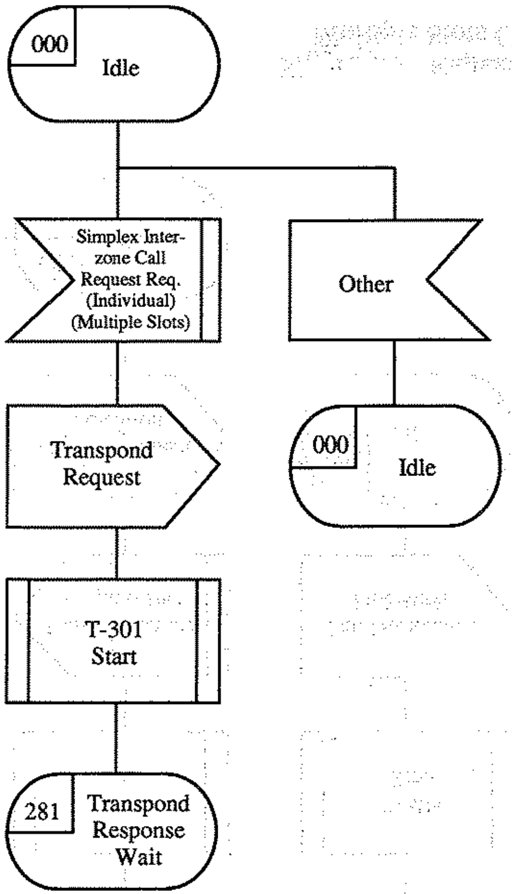


Fig. 2.2.8.0 Repeater Station Call Control (Layer3) Multiple Zone, Individual, Multiple Slots Communication (The Repeater Station for Call Reception)

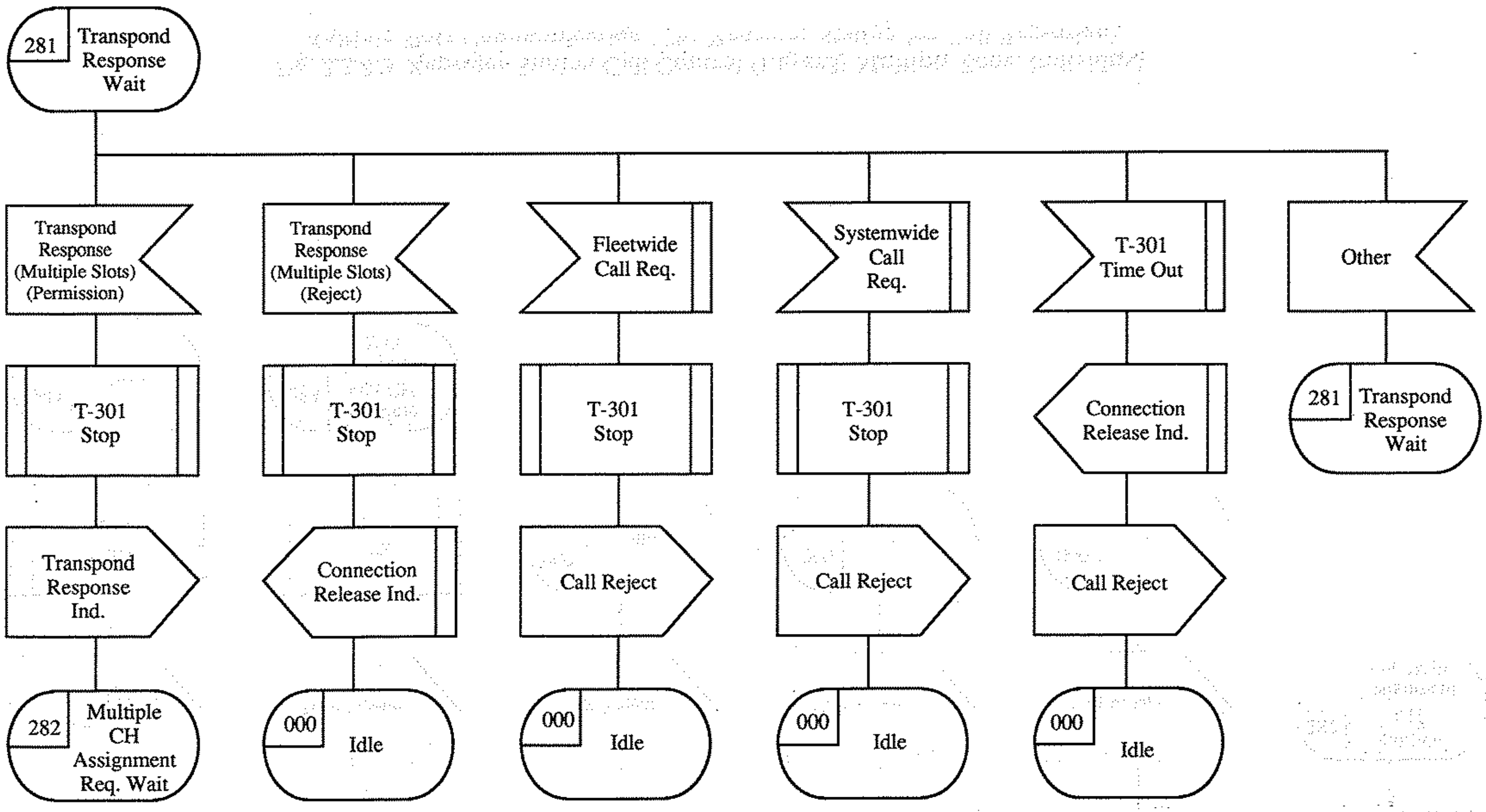


Fig. 2.2.8.1 Repeater Station Call Control (Layer3) Multiple Zone, Individual, Multiple Slots Communication (The Repeater Station for Call Reception)

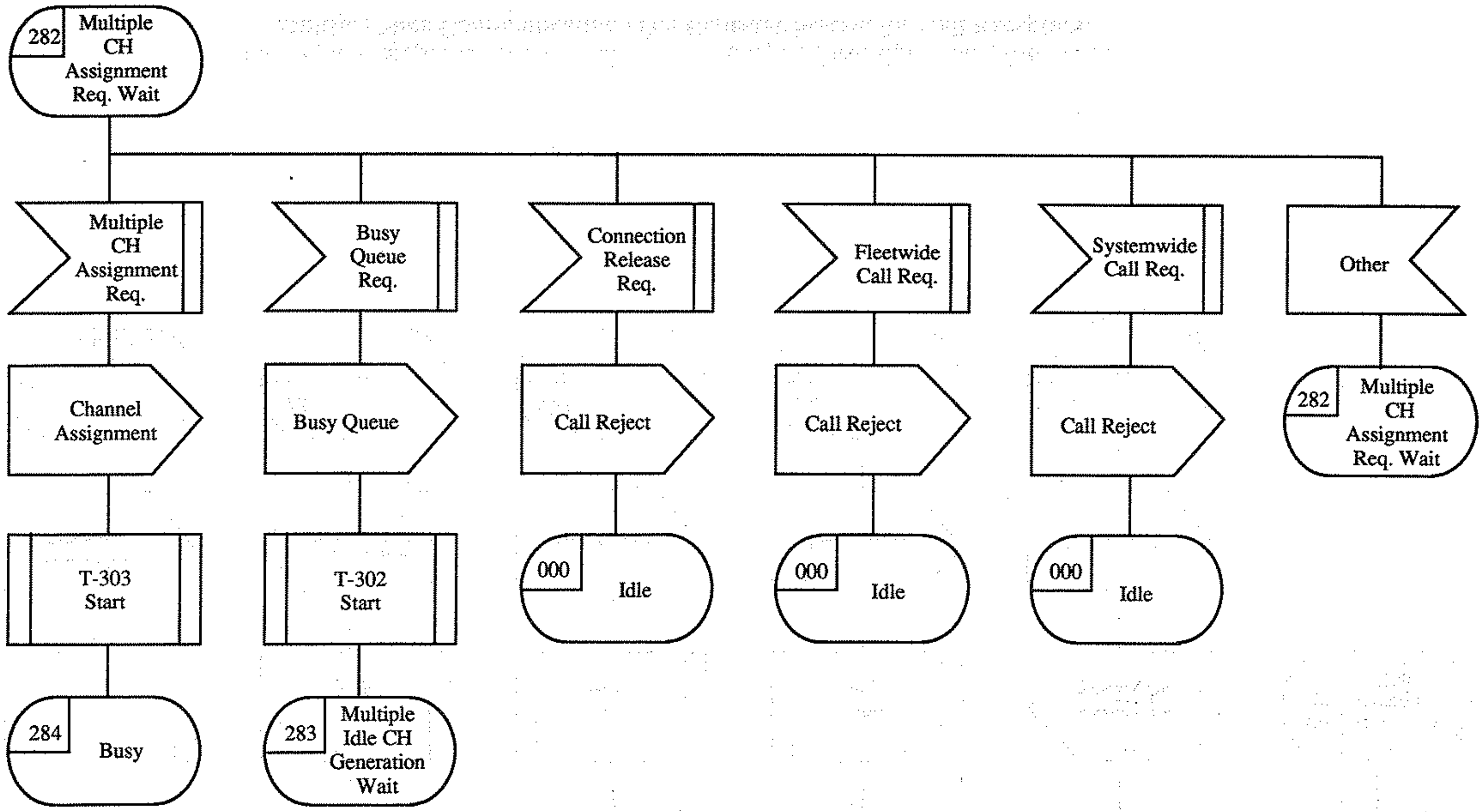


Fig. 2.2.8.2 Repeater Station Call Control (Layer3) Multiple Zone, Individual, Multiple Slots Communication (The Repeater Station for Call Reception)

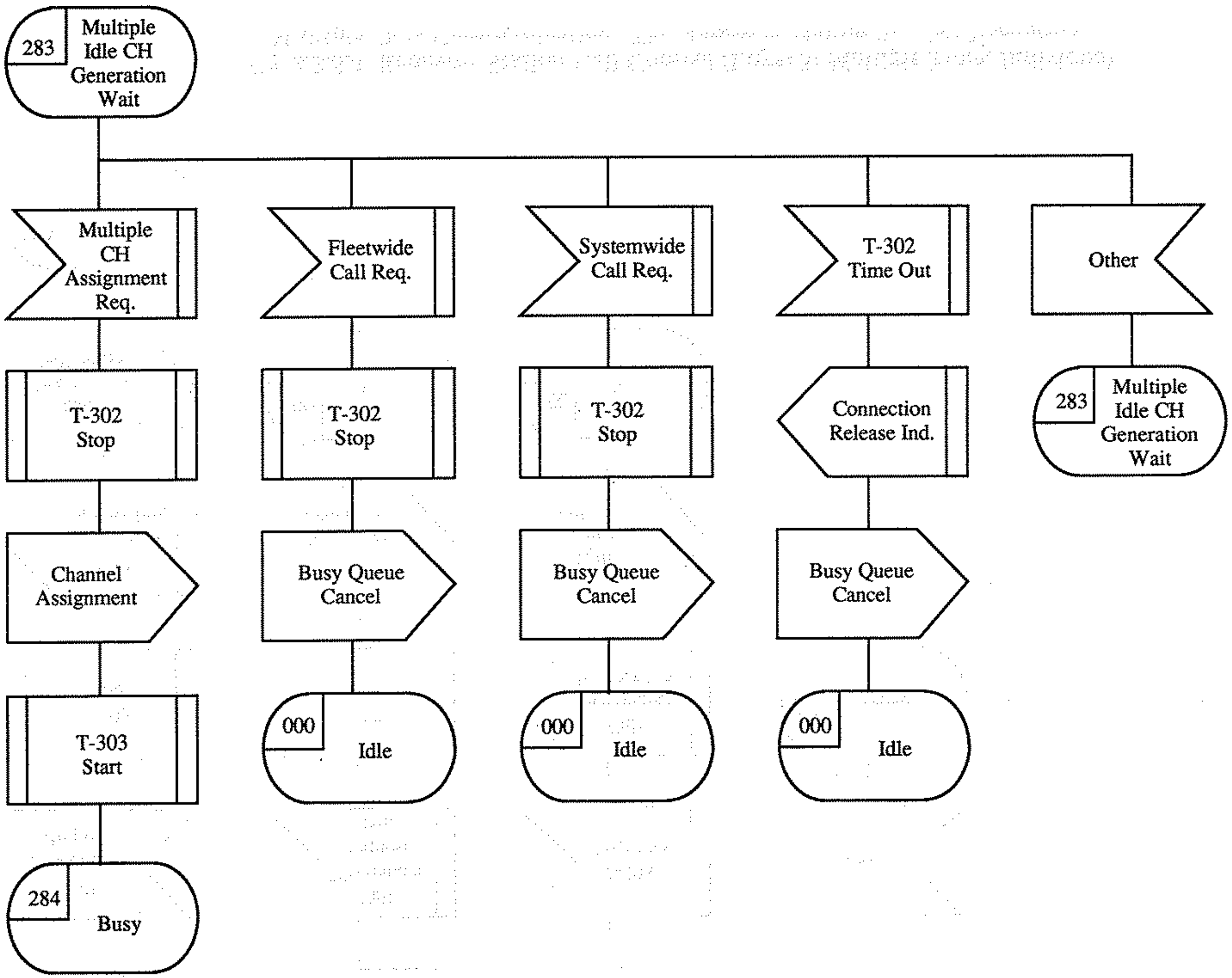


Fig. 2.2.8.3 Repeater Station Call Control (Layer3) Multiple Zone, Individual, Multiple Slots Communication (The Repeater Station for Call Reception)

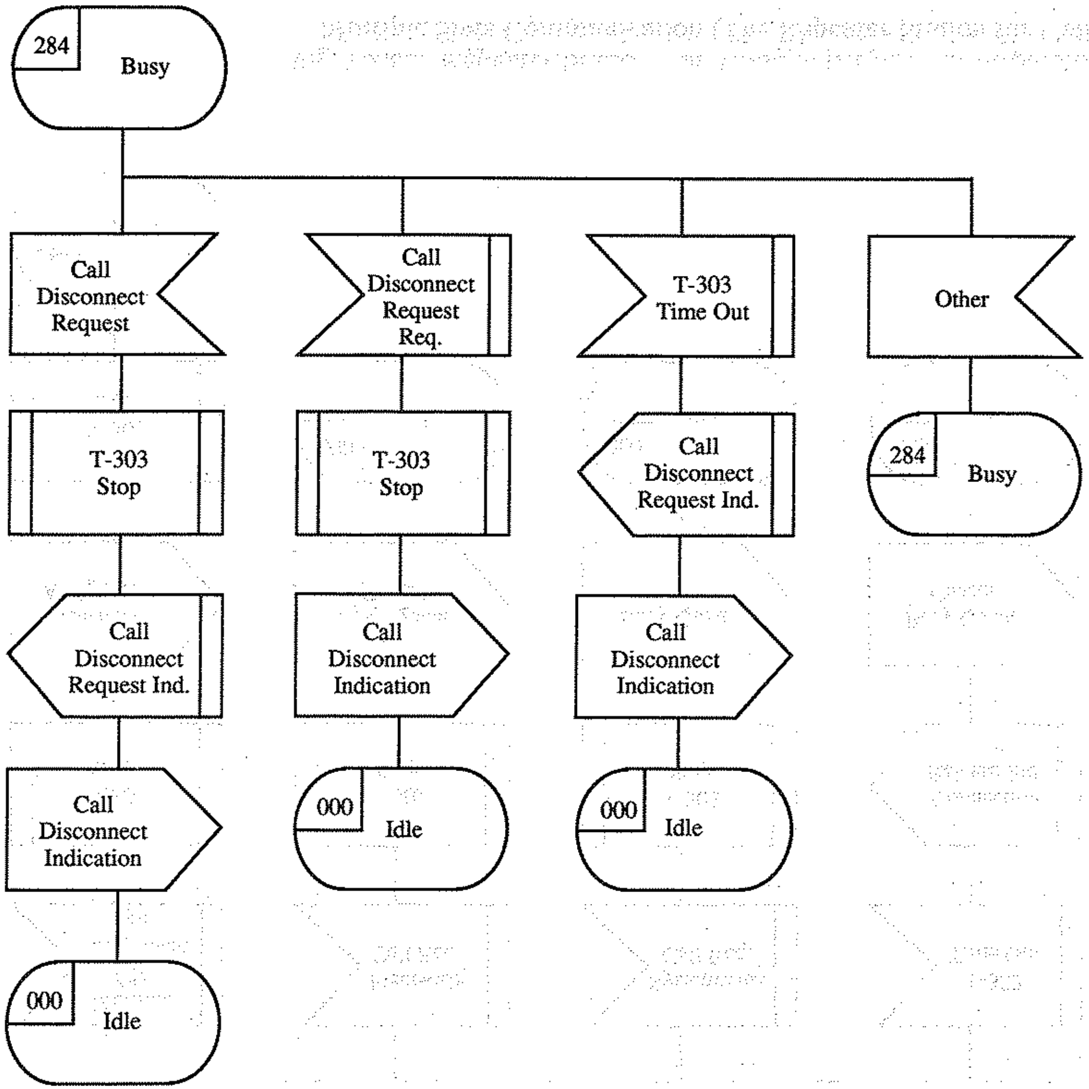
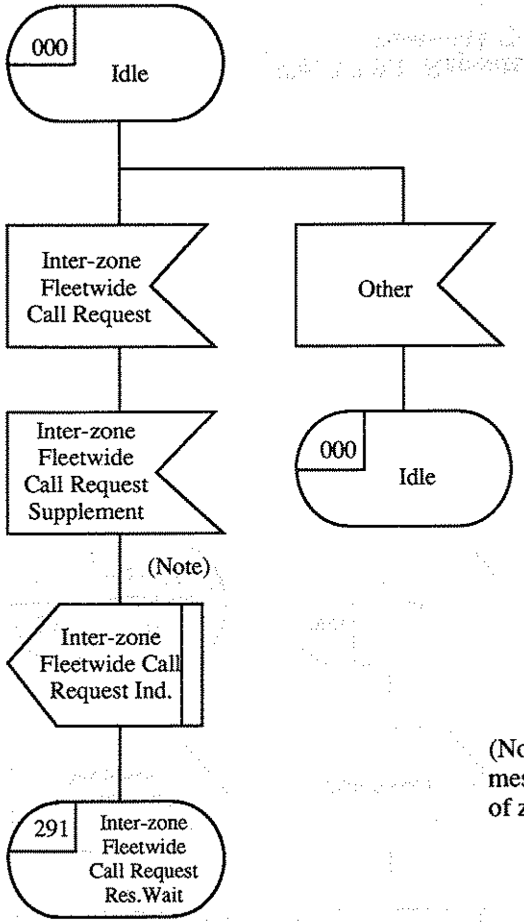


Fig. 2.2.8.4 Repeater Station Call Control (Layer3) Multiple Zone, Individual, Multiple Slots Communication (The Repeater Station for Call Reception)



(Note) Inter-zone Call Supplement message is not received when the number of zone to be connected 1 zone.

Fig. 2.2.9.0 Repeater Station Call Control (Layer3) Multiple Zone, Fleetwide Communication (The Repeater Station for Call Initiation)

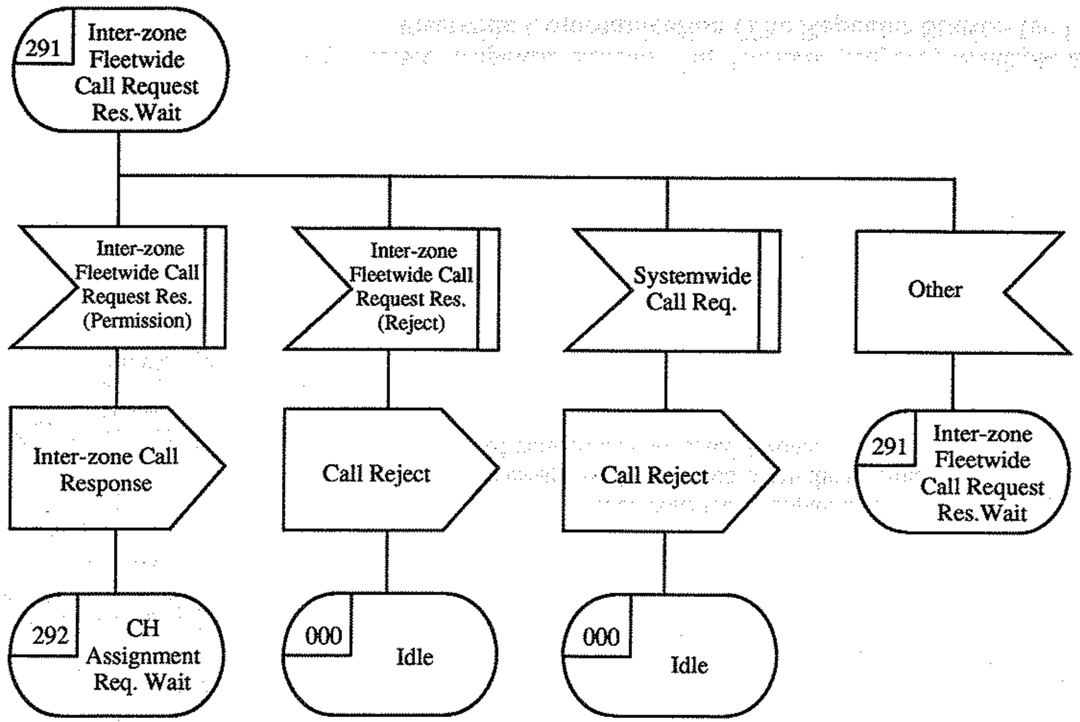
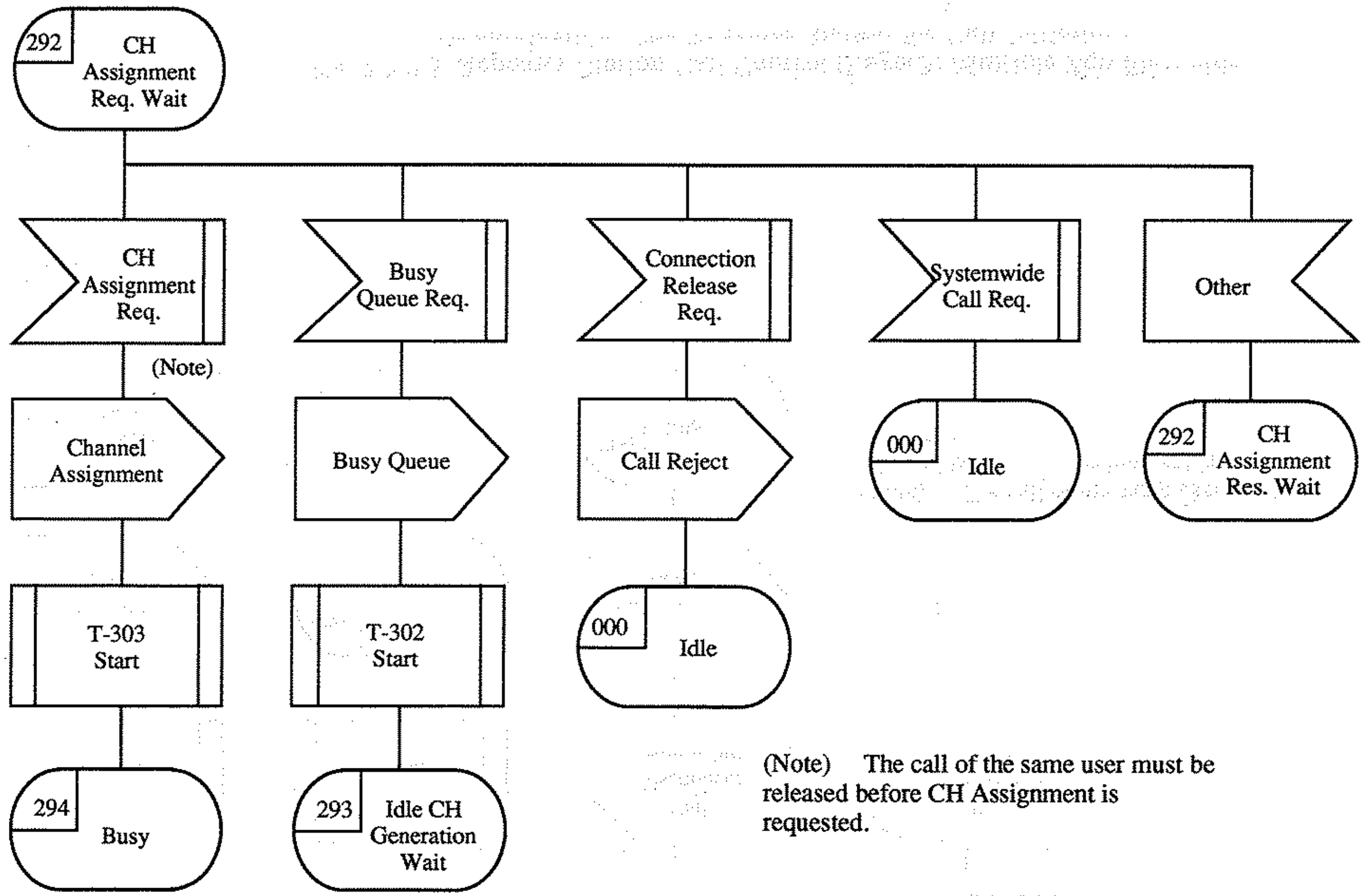
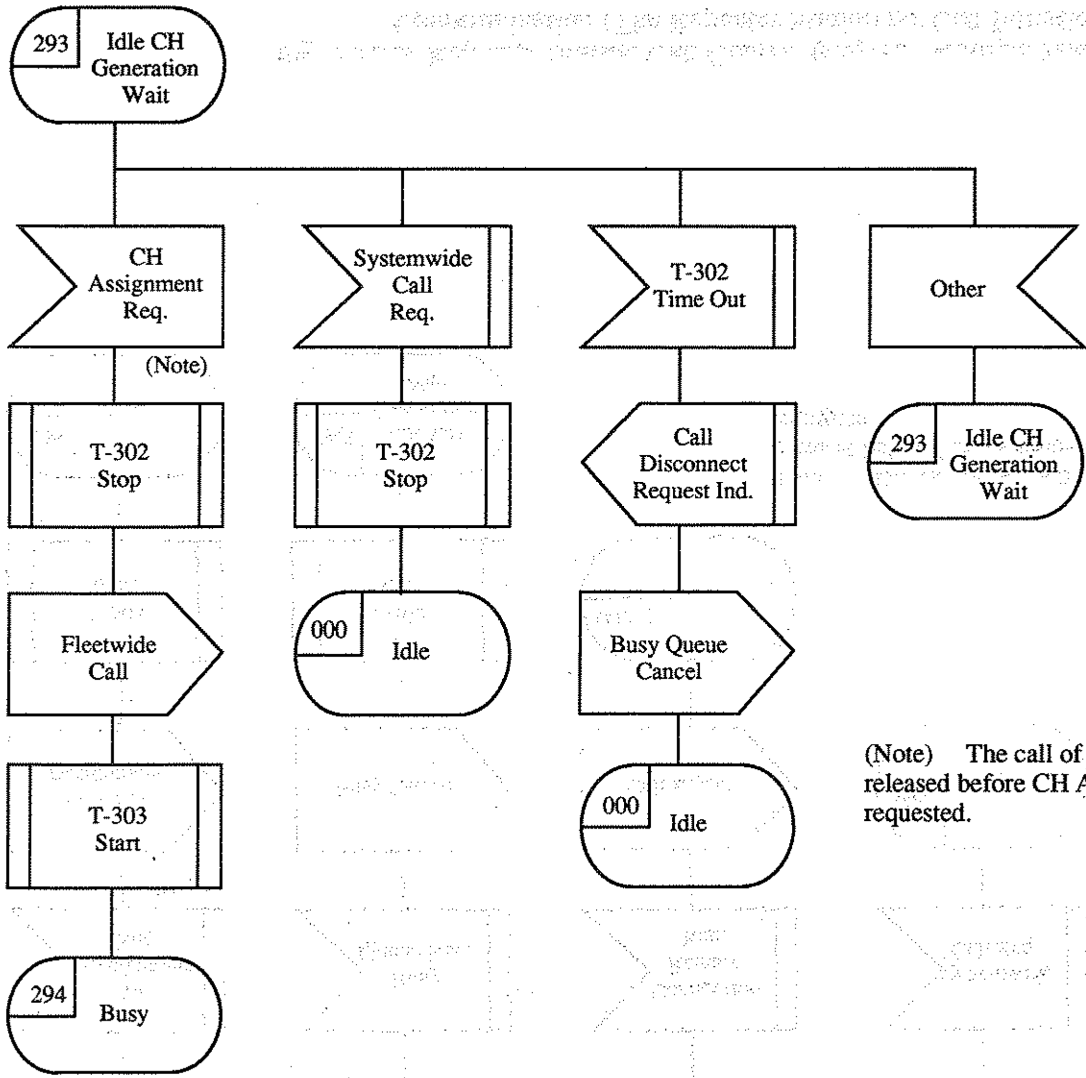


Fig. 2.2.9.1 Repeater Station Call Control (Layer3) Multiple Zone, Fleetwide Communication (The Repeater Station for Call Initiation)



(Note) The call of the same user must be released before CH Assignment is requested.

Fig. 2.2.9.2 Repeater Station Call Control (Layer3) Multiple Zone, Fleetwide Communication (The Repeater Station for Call Initiation)



(Note) The call of the same user must be released before CH Assignment is requested.

Fig. 2.2.9.3 Repeater Station Call Control (Layer3) Multiple Zon Fleetwide Communication (The Repeater Station for Call Initiation)

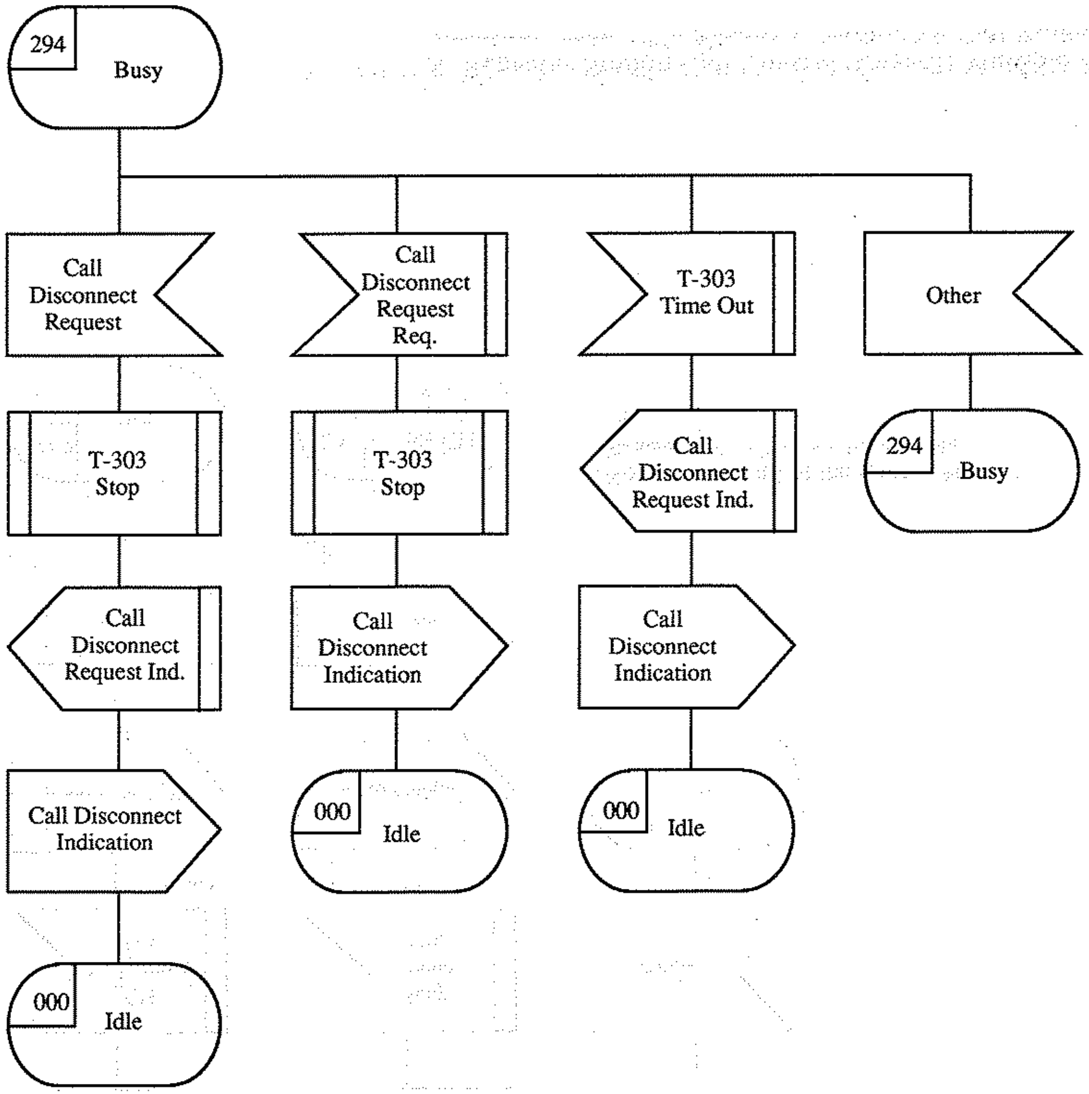
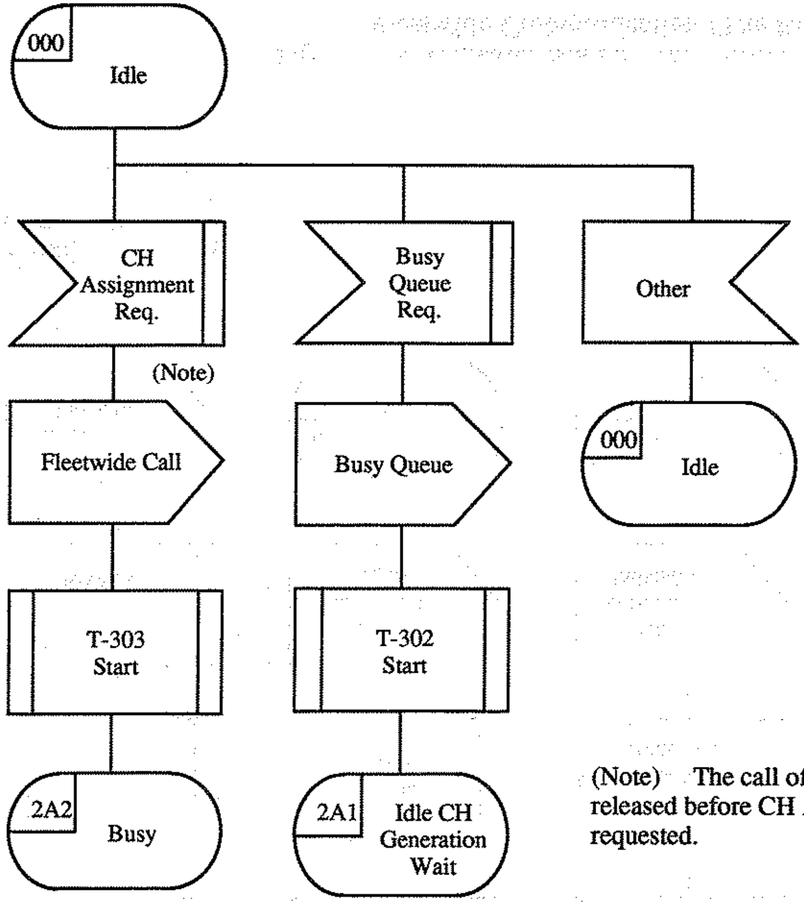
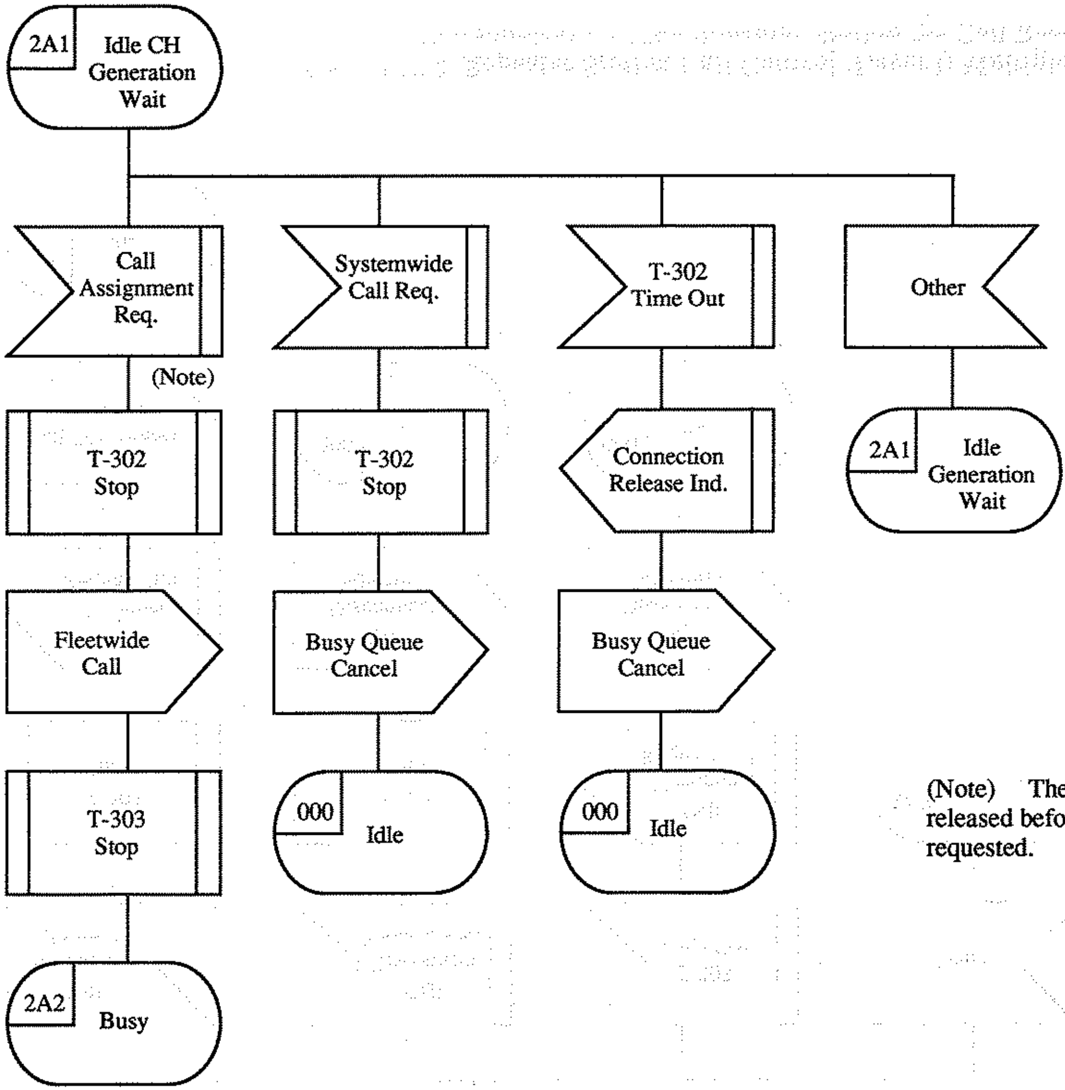


Fig. 2.2.9.4 Repeater Station Call Control (Layer3) Multiple Zone, Fleetwide Communication (The Repeater Station for Call Initiation)



(Note) The call of the same user must be released before CH Assignment is requested.

Fig. 2.2.10.0 Repeater Station Call Control (Layer3) Multiple Zone, Fleetwide Communication (The Repeater Station for Call Reception)



(Note) The call of the same user must be released before CH Assignment is requested.

Fig. 2.2.10.1 Repeater Station Call Control (Layer3) Multiple Zone, Fleetwide Communication (The Repeater Station for Call Reception)

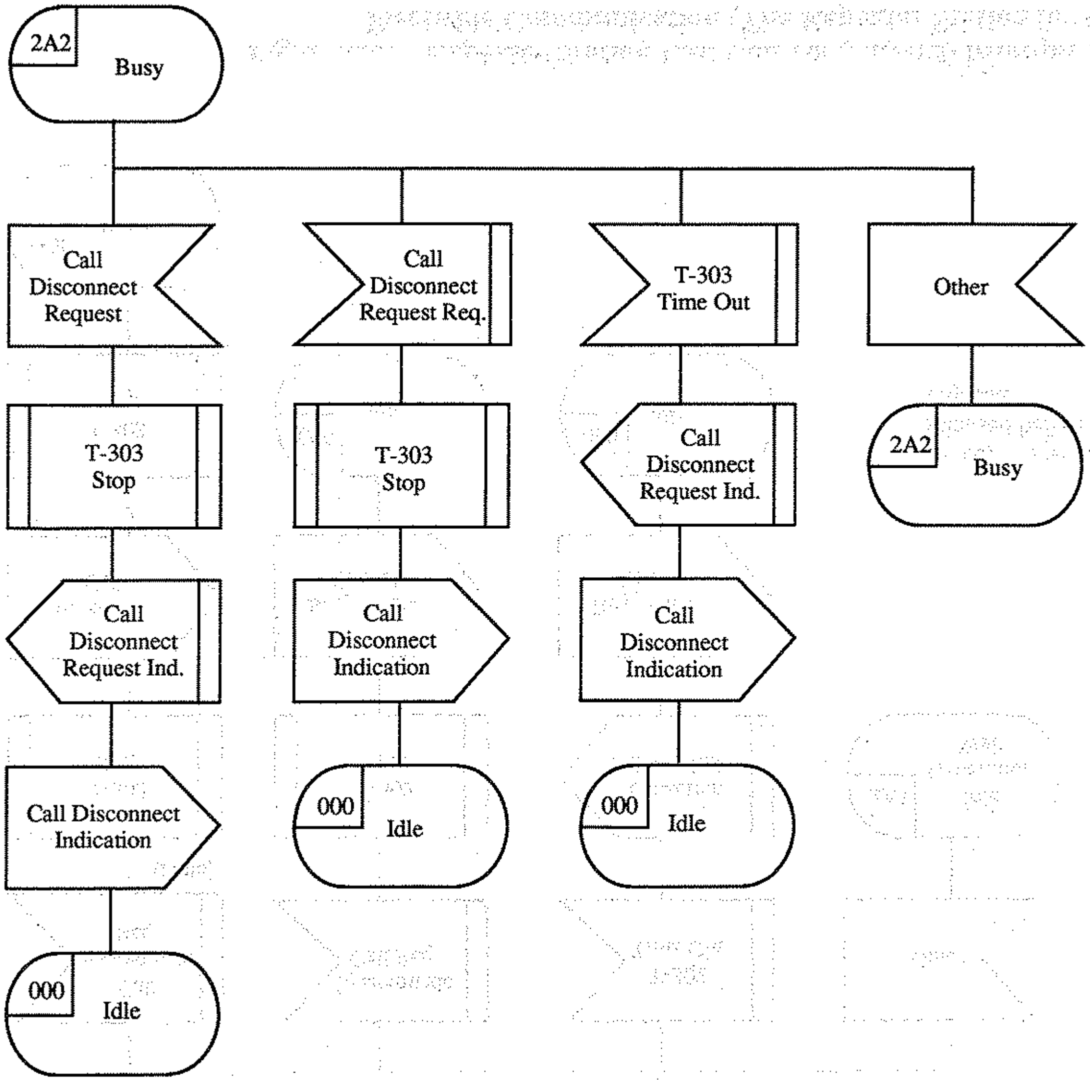
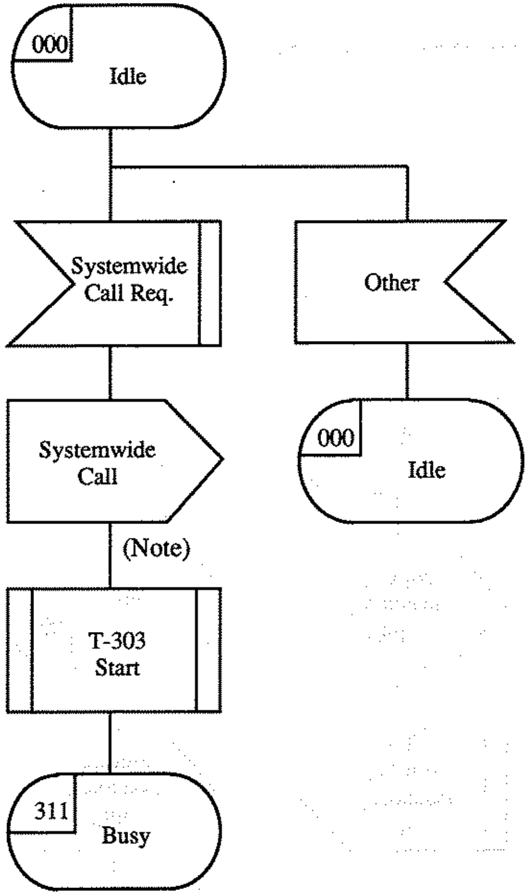


Fig. 2.2.10.2 Repeater Station Call Control (Layer3) Multiple Zone, Fleetwide Communication (The Repeater Station for Call Reception)



(Note) All calls must be released before Systemwide Call is requested.

Fig. 2.3.1.0 Repeater Station Call Control (Layer3) Systemwide Communication

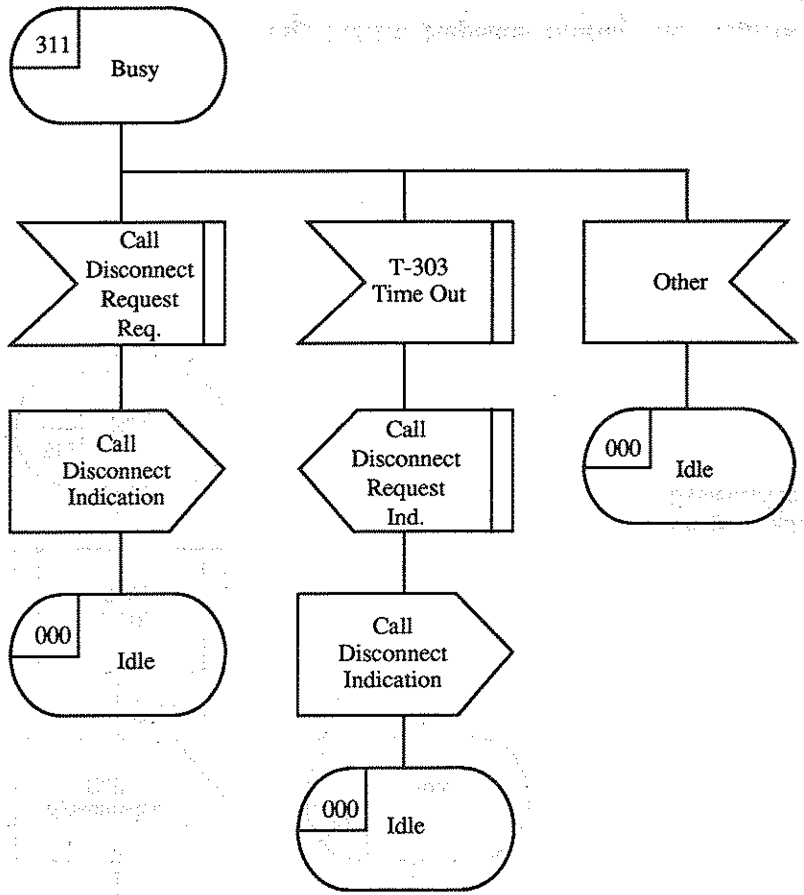


Fig. 2.3.1.1 Repeater Station Call Control (Layer3) Systemwide Communication

IV Timer Table

Timer No.	Timer Name	Application	Timer Value	
T-301	Transpond Response Wait Timer	Timer which receives Transpond Response, after transmitting Transpond Request. Timer is respectively prescribed for single zone individual connection, PSTN connection.	Individual	10 seconds
			Group	10 sec.
			Inter-zone	10 sec.
			PSTN	10 sec.
T-302	Idle CH Generation Wait Timer	Timer which transmits CH Assignment Message, after transmitting Busy Queue Message.	30 sec.	
T-303	Message Trunked Time-Out Timer	Timer which restricts communication time for efficient use of frequency spectrum.	PSTN	15~300 sec.
			Others	15~300 sec.
T-304	PSTN Interconnect	Timer which search for Idle channel and the primitive for reservation, after transmitting PSTN Interconnect Call Response.	30 sec.	

INTEGRATED DISPATCH RADIO SYSTEM

STANDARD

RCR STD-32A

Fascicle 1

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