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(71) Applicant: **QUALCOMM INCORPORATED** [US/US]; 5775 Morehouse Drive, San Diego, CA 92121-1714 (US).

(72) Inventors: **ATTAR, Rashid, A.**; 8520 Costa Verde Boulevard #3112, San Diego, CA 92122 (US). **VIJAYAN, Rajiv**; 9604 Babauta Road, San Diego, CA 92129 (US). **PADOVANI, Roberto**; 13593 Penfield Point, San Diego, CA 92130 (US). **SINDHUSHAYANA, Nagabhushana, T.**; 7794 Roan Road, San Diego, CA 92129 (US). **WU, Qiang**; 10189 Camino Ruiz #115, San Diego, CA 92126 (US). **BLACK, Peter, J.**; 2961 First Avenue, San Diego, CA 92103 (US). **ESTEVES, Eduardo, A., S.**; 12147 Corte Vicenza, San Diego, CA 92128 (US).

(74) Agents: **WADSWORTH, Philip, R.** et al.; Qualcomm Incorporated, 5775 Morehouse Drive, San Diego, CA 92121-1714 (US).

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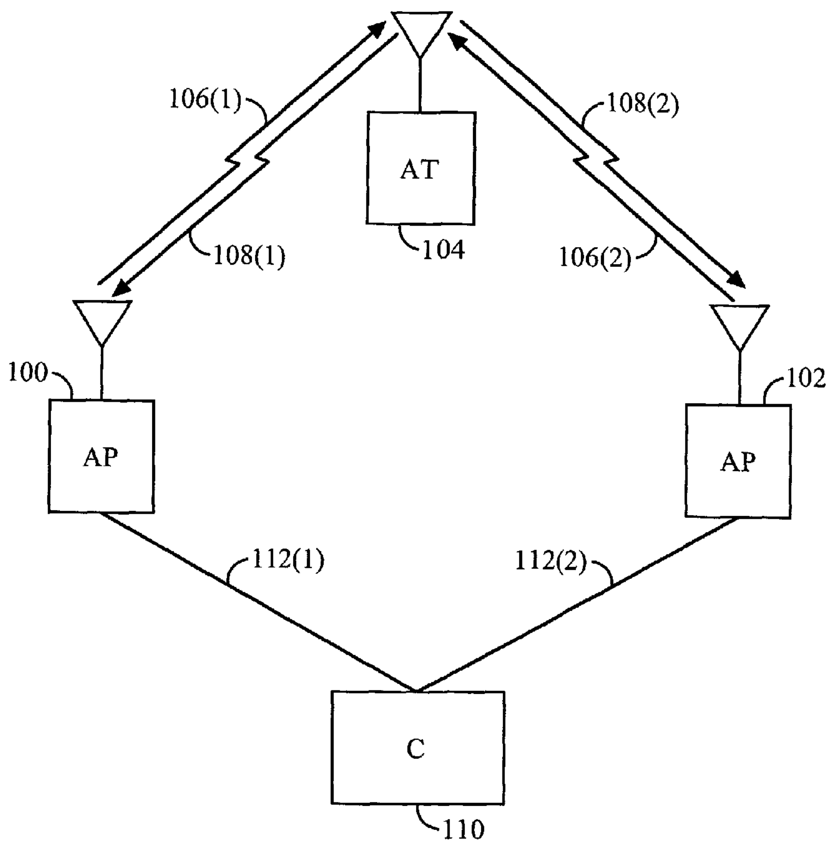

(57) Abstract: Methods and apparatus for selecting a serving sector in a high rate data (HDR) communication system are disclosed. An exemplary HDR communication system defines a set of data rates, at which a sector of an Access Point may send data packets to an Access Terminal. The sector is selected by the Access Terminal to achieve the highest data throughput while maintaining a targeted packet error rate. The Access Terminal employs various methods to evaluate quality metrics of forward and reverse links from and to different sectors, and uses the quality metrics to select the sector to send data packets to the Access Terminal.

WO 03/003784 A1

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METHOD AND APPARATUS FOR SELECTING A SERVING SECTOR IN A DATA COMMUNICATION SYSTEM

BACKGROUND

Field

[1001] The present invention relates generally to communication systems, and more specifically to a method and an apparatus for selecting a serving sector in a data communication system.

Background

[1002] Communication systems have been developed to allow transmission of information signals from an origination station to a physically distinct destination station. In transmitting information signal from the origination station over a communication channel, the information signal is first converted into a form suitable for efficient transmission over the communication channel. Conversion, or modulation, of the information signal involves varying a parameter of a carrier wave in accordance with the information signal in such a way that the spectrum of the resulting modulated carrier is confined within the communication channel bandwidth. At the destination station the original information signal is replicated from the modulated carrier wave received over the communication channel. Such a replication is generally achieved by using an inverse of the modulation process employed by the origination station.

[1003] Modulation also facilitates multiple-access, i.e., simultaneous transmission and/or reception, of several signals over a common communication channel. Multiple-access communication systems often include a plurality of remote subscriber units requiring intermittent service of relatively short duration rather than continuous access to the common communication channel. Several multiple-access techniques are known in the art, such as time division multiple-access (TDMA), frequency division multiple-access (FDMA), and amplitude modulation multiple-access (AM). Another type of a multiple-access technique is a code division multiple-access (CDMA) spread spectrum system that conforms to the "TIA/EIA/IS-95 Mobile Station-Base Station Compatibility Standard for Dual-Mode Wide-Band Spread Spectrum Cellular System," hereinafter referred to as the IS-95 standard. The use of CDMA techniques in a multiple-access communication system is disclosed in U.S. Patent No. 4,901,307, entitled "SPREAD SPECTRUM MULTIPLE-ACCESS COMMUNICATION SYSTEM USING SATELLITE OR TERRESTRIAL REPEATERS," and U.S. Patent No. 5,103,459, entitled "SYSTEM AND METHOD FOR GENERATING WAVEFORMS IN A CDMA CELLULAR TELEPHONE SYSTEM," both assigned to the assignee of the present invention.

[1004] A multiple-access communication system may be a wireless or wire-line and may carry voice and/or data. An example of a communication system carrying both voice and data is a system in accordance with the IS-95 standard, which specifies transmitting voice and data over the communication channel. A method for transmitting data in code channel frames of fixed size is described in detail in U.S. Patent No. 5,504,773, entitled "METHOD AND APPARATUS FOR THE FORMATTING OF DATA FOR TRANSMISSION", assigned to the assignee of the present invention. In accordance with the IS-95 standard, the data or voice is partitioned into code channel frames that are 20 milliseconds wide with data rates as high as 14.4 Kbps. Additional examples of a communication systems carrying both voice and data comprise communication systems conforming to the "3rd Generation Partnership Project" (3GPP), embodied in a set of documents including Document Nos. 3G TS 25.211, 3G TS 25.212, 3G TS 25.213, and 3G TS 25.214 (the W-CDMA standard), or "TR-45.5 Physical Layer Standard for cdma2000 Spread Spectrum Systems" (the IS-2000 standard).

[1005] In a multiple-access communication system, communications between users are conducted through one or more base stations. A first user on one subscriber station communicates to a second user on a second subscriber station by transmitting data on a reverse link to a base station. The base station receives the data and can route the data to another base station. The data is transmitted on a forward link of the same base station, or the other base station, to the second subscriber station. The forward link refers to transmission from a base station to a subscriber station and the reverse link refers to transmission from a subscriber station to a base station. Likewise, the communication can be conducted between a first user on one mobile subscriber station and a second user on a landline station. A base station receives the data from the user on a reverse link, and routes the data through a public switched telephone network (PSTN) to the second user. In many communication systems, e.g., IS-95, W-CDMA, IS-2000, the forward link and the reverse link are allocated separate frequencies.

[1006] An example of a data only communication system is a high data rate (HDR) communication system that conforms to the TIA/EIA/IS-856 industry standard, hereinafter referred to as the IS-856 standard. This HDR system is based on a communication system disclosed in co-pending application serial number 08/963,386, entitled "METHOD AND APPARATUS FOR HIGH RATE PACKET DATA TRANSMISSION," filed 11/3/1997, assigned to the assignee of the present invention. The HDR communication system defines a set of data rates, ranging from 38.4 kbps to 2.4 Mbps, at which an access point (AP) may send data to a subscriber station (access terminal, AT). Because the AP is analogous to a base station, the terminology with respect to cells and sectors is the same as with respect to voice systems.

[1007] A significant difference between voice services and data services is the fact that the former imposes stringent and fixed delay requirements. Typically, the overall one-way delay of speech frames must be less than 100 ms. In contrast, the data delay can become a variable parameter used to optimize the efficiency of the data communication system. Specifically, more efficient error correcting coding techniques which require significantly larger delays than those that can be tolerated by voice services can be utilized. An exemplary efficient coding scheme for data is disclosed in U.S. Patent Application Serial No. 08/743,688, entitled "SOFT DECISION OUTPUT DECODER FOR DECODING CONVOLUTIONALLY ENCODED CODEWORDS", filed November 6, 1996, assigned to the assignee of the present invention.

[1008] Another significant difference between voice services and data services is that the former requires a fixed and common grade of service (GOS) for all users. Typically, for digital systems providing voice services, this translates into a fixed and equal transmission rate for all users and a maximum tolerable value for the error rates of the speech frames. In contrast, for data services, the GOS can be different from user to user and can be a parameter optimized to increase the overall efficiency of the data communication system. The GOS of a data communication system is typically defined as the total delay incurred in the transfer of a predetermined amount of data, hereinafter referred to as a data packet.

[1009] Yet another significant difference between voice services and data services is that the former requires a reliable communication link. When a mobile station, communicating with a first base station, moves to the edge of the associated cell or sector, the mobile station initiates a simultaneous communication with a second base station. This simultaneous communication, when the mobile station receives a signal carrying equivalent information from two base stations, termed soft hand-off, is a process of establishing a communication link with the second base station while maintaining a communication link with the first base station. When the mobile station eventually leaves the cell or sector associated with the first base station, and breaks the communication link with the first base station, it continues the communication on the communication link established with the second base station. Because the soft hand-off is a "make before break" mechanism, the soft-handoff minimizes the probability of dropped calls. The method and system for providing a communication with a mobile station through more than one base station during the soft hand-off process are disclosed in U.S. Patent No. 5,267,261, entitled "MOBILE ASSISTED SOFT HAND-OFF IN A CDMA CELLULAR TELEPHONE SYSTEM," assigned to the assignee of the present invention. Softer hand-off is the process whereby the communication occurs over multiple sectors that are serviced by the same base station. The process of softer hand-off is described in detail in co-pending U.S. Patent Application Serial No. 08/763,498, entitled "METHOD AND APPARATUS FOR PERFORMING HAND-OFF BETWEEN SECTORS OF A COMMON BASE

STATION", filed December 11, 1996, assigned to the assignee of the present invention. Thus, both soft and softer hand-off for voice services result in redundant transmissions from two or more base stations to improve reliability.

[1010] This additional reliability is not required for data transmission because the data packets received in error can be retransmitted. For data services, the parameters, which measure the quality and effectiveness of a data communication system, are the transmission delay required to transfer a data packet and the average throughput rate of the system. Transmission delay does not have the same impact in data communication as in voice communication, but the transmission delay is an important metric for measuring the quality of the data communication system. The average throughput rate is a measure of the efficiency of the data transmission capability of the communication system. Consequently, the transmit power and resources used to support soft hand-off can be more efficiently used for transmission of additional data. To maximize the throughput, the transmitting sector should be chosen in a way that maximizes the forward link throughput as perceived by the AT.

[1011] There is, therefore, a need in the art for a method and an apparatus for selecting a sector in a data communication system that maximizes the forward link throughput as perceived by the AT.

SUMMARY

[1012] In one aspect of the invention, the above-stated needs are addressed by determining at the remote station a quality metric of a forward link for each sector in the remote station's list; determining a quality metric of a reverse link to each sector in the remote station's list; and directing communication between the remote station and one sector from the sectors in the remote station's list in accordance with said determined quality metric of a forward link and said determined quality metric of a reverse link. The quality metric of a forward link for each sector in the remote station's list may be determined by measuring a signal-to interference and-noise-ratio of the forward link. The quality metric of a reverse link to each sector in the remote station's list may be determined by processing at the remote station the forward link from each sector in the remote station's list. The signal processed may be obtained by measuring at each sector the quality metric of the reverse link; processing the quality metric to provide an indicator of the quality metric; and providing the indicator on a forward link. The communication between the remote station and one sector from the sectors in the remote station's list may be directed in accordance with said determined quality metric of a forward link and said determined quality metric of a reverse link by assigning credits to each sector in the remote station's list except a sector currently serving the remote station in accordance with said determined quality metric of a forward link and said determined quality metric of the reverse link; and directing communication between the remote station and one sector from the sectors in the remote station's list in accordance with said assigned credits.

[1013] In another aspect of the invention, the above-stated needs are addressed by determining at the remote station a quality metric of a forward link for each sector in the remote station's list; and directing communication between the remote station and one sector from the sectors in the remote station's list in accordance with said determined quality metric of a forward link. The quality metric of a forward link for each sector in the remote station's list may be determined by measuring a signal-to-interference and-noise-ratio of the forward link. The communication between the remote station and one sector from the sectors in the remote station's list may be directed in accordance with said determined quality metric of a forward link by assigning credits to each sector in the remote station's list except a sector currently serving the remote station in accordance with said determined quality metric of a forward link and directing communication between the remote station and one sector from the sectors in the remote station's list in accordance with said assigned credits.

BRIEF DESCRIPTION OF THE DRAWINGS

[1014] **FIG.1** illustrates a conceptual diagram of an HDR communication system;

[1015] **FIG. 2** illustrates an exemplary forward link waveform;

[1016] **FIG. 3** illustrates an Access Point processing of a data request (DRC) for a Message Based DRC Lock method;

[1017] **FIG. 4** illustrates an Initialization phase at an Access Terminal for the Message Based DRC Lock method;

[1018] **FIG. 5** illustrates a Credit Accumulation phase at the Access Terminal for the Message Based DRC Lock method;

[1019] **FIG. 6** illustrates a Decision phase at the Access Terminal for the Message Based DRC Lock method;

[1020] **FIGs. 7** and **8** illustrate the Decision phase for a sector selection when the DRC of a current serving sector is "in-lock" for the Message Based DRC Lock method.

[1021] **FIG. 9** illustrates the Decision phase for the sector selection when the DRC of the current serving sector is "out-of-lock" for the Message Based DRC Lock method.

[1022] **FIG. 10** illustrates the Credit Accumulation phase at the Access Terminal for the Message Based DRC Lock method in accordance with another embodiment;

[1023] **FIG. 11** illustrates the Decision phase for sector selection when the DRC from the current serving sector is "in-lock" for the Message Based DRC Lock method in accordance with another embodiment;

[1024] **FIG. 12** illustrates the Credit Accumulation phase at the Access Terminal for the Message Based DRC Lock method in accordance with yet another embodiment;

[1025] **FIG. 13** illustrates the Access Point processing of the DRC for a Punctured DRC Lock Bit method;

[1026] **FIG. 14** illustrates a Demodulation phase for the Punctured DRC Lock Bit method;

[1027] **FIG. 15** illustrates an Accreditation phase for the Punctured DRC Lock Bit method;

[1028] **FIG. 16** illustrates a Certification phase for the Punctured DRC Lock Bit method; and

[1029] **FIG. 17** illustrates a Decision phase for the Punctured DRC Lock Bit method;

DETAILED DESCRIPTION

Definitions

[1030] The word "exemplary" is used exclusively herein to mean "serving as an example, instance, or illustration." Any embodiment described herein as "exemplary" is not necessarily to be construed as preferred or advantageous over other embodiments.

[1031] The term packet is used exclusively herein to mean a group of bits, including data (payload) and control elements, arranged into a specific format. The control elements comprise, e.g., a preamble, a quality metric, and others known to one skilled in the art. Quality metric comprises, e.g., a cyclical redundancy check (CRC), a parity bit, and others known to one skilled in the art.

[1032] The term access network is used exclusively herein to mean a collection of access points (AP) and one or more access point controllers. The access network transports data packets between multiple access terminals (AT). The access network may be further connected to additional networks outside the access network, such as a corporate intranet or the Internet, and may transport data packets between each access terminal and such outside networks.

[1033] The term base station, referred to herein as an AP in the case of an HDR communication system, is used exclusively herein to mean the hardware with which subscriber stations communicate. Cell refers to the hardware or a geographic coverage area, depending on the context in which the term is used. A sector is a partition of a cell. Because a sector has the attributes of a cell, the teachings described in terms of cells are readily extended to sectors.

[1034] The term subscriber station, referred to herein as an AT in the case of an HDR communication system, is used exclusively herein to mean the hardware with which an access network communicates. An AT may be mobile or stationary. An AT may be any data device that communicates through a wireless channel or through a wired channel, for example using fiber optic or coaxial cables. An AT may further be any of a number of types of devices including but not limited to PC card, compact flash, external or internal modem, or wireless or wireline phone. An AT that is in the process of establishing an active traffic channel connection with an AP is said to be in a connection setup state. An AT that has established an active traffic channel connection with an AP is called an active AT, and is said to be in a traffic state.

[1035] The term communication channel/link is used exclusively herein to mean a single route over which a signal is transmitted described in terms of modulation characteristics and coding, or a single route within the protocol layers of either the AP or the AT.

[1036] The term reverse channel/link is used exclusively herein to mean a communication channel/link through which the AT sends signals to the AP.

[1037] A forward channel/link is used exclusively herein to mean a communication channel/link through which an AP sends signals to an AT.

[1038] The term soft hand-off is used exclusively herein to mean a communication between a subscriber station and two or more sectors, wherein each sector belongs to a different cell. In the context of IS-95 standard, the reverse link communication is received by both sectors, and the forward link communication is simultaneously carried on the two or more sectors' forward links. In the context of the IS-856 standard, data transmission on the forward link is non-simultaneously carried out between one of the two or more sectors and the AT.

[1039] The term softer hand-off is used exclusively herein to mean a communication between a subscriber station and two or more sectors, wherein each sector belongs to the same cell. In the context of the IS-95 standard, the reverse link communication is received by both sectors, and the forward link communication is simultaneously carried on one of the two or more sectors' forward links. In the context of the IS-856 standard, data transmission on the forward link is non-simultaneously carried out between one of the two or more sectors and the AT.

[1040] The term re-pointing is used exclusively herein to mean a selection of a sector that is a member of an ATs' active list, wherein the sector is different than a currently selected sector.

[1041] The term soft/softer hand-off delay is used exclusively herein to indicate the minimum interruption in service that a subscriber station would experience following a handoff to another sector. Soft/Softer handoff delay is determined based on whether the sector, (currently not serving the subscriber station), (non-serving sector) to which the subscriber station is re-pointing is part of the same cell as the current serving sector. If the non-serving sector is in the same cell as the serving sector then the softer handoff delay is used, and if the non-serving sector is in a cell different from the one that the serving sector is part of then the soft-handoff delay is used.

[1042] The term non-homogenous soft/softer hand-off delay is used exclusively herein to indicate that the soft/softer hand-off delays are sector specific and therefore may not uniform across the sectors of an Access Network.

[1043] The term credit is used exclusively herein to mean a dimensionless attribute indicating a quality metric of a reverse link, a quality metric of a forward link, or a composite quality metric of both forward and reverse links.

[1044] The term erasure is used exclusively herein to mean failure to recognize a message.

[1045] The term outage is used exclusively herein to mean a time interval during which the likelihood that a subscriber station will receive service is reduced.

[1046] The term fixed rate mode is used exclusively herein to mean that a particular sector transmits a Forward Traffic Channel to the AT at one particular rate.

Description

[1047] **FIG.1** illustrates a conceptual diagram of an HDR communication system capable of performing re-pointing in accordance with embodiments of the present invention, e.g., a communication system in accordance with the IS-856 standard. An AP **100** transmits data to an AT **104** over a forward link **106(1)**, and receives data from the AT **104** over a reverse link **108(1)**. Similarly, an AP **102** transmits data to the AT **104** over a forward link **106(2)**, and receives data from the AT **104** over a reverse link **108(2)**. In accordance with one embodiment, data transmission on the forward link occurs from one AP to one AT at or near the maximum data rate that can be supported by the forward link and the communication system. Other channels of the forward link, e.g., control channel, may be transmitted from multiple APs to one AT. Reverse link data communication may occur from one AT to one or more APs. The AP **100** and the AP **102** are connected to a controller **110** over backhauls **112(1)** and **112(2)**. The term backhaul is used to mean a communication link between a controller and an AP. Although only two AT's and one AP are shown in **FIG. 1**, one of ordinary skill in the art recognizes that this is for pedagogical purposes only, and the communication system can comprise plurality of AT's and AP's.

[1048] Initially, the AT **104** and one of the AP's, e.g., the AP **100**, establish a communication link using a predetermined access procedure. In this connected state, the AT **104** is able to receive data and control messages from the AP **100**, and is able to transmit data and control messages to the AP **100**. The AT **104** continually searches for other APs that could be added to the AT **104** active set. The active set comprises a list of the APs capable of communication with the AT **104**. When such an AP is found, the AT **104** calculates a quality metric of the AP's forward link, which in one embodiment comprises a signal-to-interference and-noise ratio (SINR). In one embodiment, the AT **104** searches for other APs and determines the AP's SINR in accordance with a pilot signal. Simultaneously, the AT **104** calculates the forward link quality metric for each AP in the AT **104** active set. If the forward link quality metric from a particular AP is above a predetermined add threshold or below a predetermined drop threshold for a predetermined period of time, the AT **104** reports this information to the AP **100**. Subsequent messages from the AP **100** direct the AT **104** to add to or to delete from the AT **104** active set the particular AP.

[1049] The AT **104** selects a serving AP from the active set based on a set of parameters. The term serving AP refers to an AP that a particular AT selected for data communication or an AP that is communicating data to the particular AT. The set of parameters can comprise present and previous SINR measurements, a bit-error-rate and/or a packet-error-rate, and other parameters known to one skilled in the art. In one embodiment, the serving AP is selected in accordance with the largest SINR measurement. The AT **104** then transmits to the selected AP a data request message (DRC message) on the data request channel (DRC channel). The DRC message can contain the requested data rate or, alternatively, an indication of the quality of the forward link, e.g., the measured SINR, the bit-error-rate, or the packet-error-rate. In one embodiment, the AT **104** can direct the transmission of the DRC message to a specific AP by the use of a Walsh code, which uniquely identifies the specific AP. The DRC message symbols are exclusively OR'ed (XOR) with the unique Walsh code. The XOR operation is referred to as Walsh covering of a signal. Since each AP in the active set of the AT **104** is identified by a unique Walsh code, only the selected AP which performs the identical XOR operation as that performed by the AT **104** with the correct Walsh code can correctly decode the DRC message.

[1050] The data to be transmitted to the AT **104** arrive at the controller **110**. In accordance with one embodiment, the controller **110** sends the data to all APs in AT **104** active set over the backhaul **112**. In another embodiment, the controller **110** first determines, which AP was selected by the AT **104** as the serving AP, and then sends the data to the serving AP. The data are stored in a queue at the AP(s). A paging message is then sent by one or more APs to the AT **104** on respective control channels. The AT **104** demodulates and decodes the signals on one or more control channels to obtain the paging messages.

[1051] At each time time-slot, the AP can schedule data transmission to any of the ATs that received the paging message. An exemplary method for scheduling transmission is described in U.S. Patent No. 6,229,795, entitled "SYSTEM FOR ALLOCATING RESOURCES IN A COMMUNICATION SYSTEM," assigned to the assignee of the present invention. The AP uses the rate control information received from each AT in the DRC message to efficiently transmit forward link data at the highest possible rate. In one embodiment, the AP determines the data rate at which to transmit the data to the AT **104** based on the most recent value of the DRC message received from the AT **104**. Additionally, the AP uniquely identifies a transmission to the AT **104** by using a spreading code which is unique to that mobile station. In the exemplary embodiment, this spreading code is the long pseudo noise (PN) code, which is defined by the IS-856 standard.

[1052] The AT **104**, for which the data packet is intended, receives the data transmission and decodes the data packet. In one embodiment, each data packet is associated with an identifier, e.g. a sequence number, which is used by the AT **104** to detect either missed or duplicate transmissions. In such an event, the AT **104** communicates via the reverse link data channel the sequence numbers of the missing data units. The controller **110**, which receives the data messages from the AT **104** via the AP communicating with the AT **104,** then indicates to the AP what data units were not received by the AT **104**. The AP then schedules a retransmission of such data units.

[1053] When the communication link between the AT **104** and the AP **100**, operating in the variable rate mode, deteriorates below required reliability level, the AT **104** first attempts to determine whether communication with another AP in the variable rate mode supporting an acceptable rate data is possible. If the AT **104** ascertains such an AP (e.g., the AP **102**), a re-pointing to the AP **102**, therefore, to a different communication link occurs, and the data transmissions continue from the AP **102** in the variable rate mode. The above-mentioned deterioration of the communication link can be caused by, e.g., the AT **104** moving from a coverage area of the AP **100** to the coverage area of the AP **102**, shadowing, fading, and other reasons known to one skilled in the art. Alternatively, when a communication link between the AT **104** and another AP (e.g., the AP **102**) that may achieve higher throughput rate that the currently used communication link becomes available, a re-pointing to the AP **102**, therefore, to a different communication link occurs, and the data transmissions continue from the AP **102** in the variable rate mode. If the AT **104** fails to detect an AP that can operate in the variable rate mode and support an acceptable data rate, the AT **104** transitions into a fixed rate mode.

[1054] In one embodiment, the AT **104** evaluates the communications links with all candidate APs for both variable rate data and fixed rate data modes, and selects the AP, which yields the highest throughput.

[1055] The AT **104** will switch from the fixed rate mode back to the variable rate mode if the sector is no longer a member of the AT **104** active set.

[1056] In the exemplary embodiment, the above described the fixed rate mode and associated methods for transition to and from the fixed mode are similar to those disclosed in detail in U.S. Patent No. 6,205,129, entitled " METHOD AND APPARATUS FOR VARIABLE AND FIXED FORWARD LINK RATE CONTROL IN A MOBILE RADIO COMMUNICATION SYSTEM ", assigned to the assignee of the present invention. Other fixed rate modes and associated methods for transition to and from the fixed mode can also be contemplated and are within the scope of the present invention.

[1057] One skilled in the art recognizes that an AP can comprise one or more sectors. In the description above, the term AP was used generically to allow clear explanation of basic concepts of the HDR communication system. However, one skilled in the art can extend the explained concepts to AP comprising any number of sectors. Consequently, the concept of sector will be used throughout the rest of the document.

Forward Link Structure

[1058] **FIG. 2** illustrates an exemplary forward link waveform **200**. For pedagogical reasons, the waveform **200** is modeled after a forward link waveform of the above-mentioned HDR system. However, one of ordinary skill in the art will understand that the teaching is applicable to different waveforms. Thus, for example, in one embodiment the waveform does not need to contain pilot signal bursts, and the pilot signal can be transmitted on a separate channel, which can be continuous or bursty. The forward link **200** is defined in terms of frames. A frame is a structure comprising 16 time-slots **202**, each time-slot **202** being 2048 chips long, corresponding to a 1.66. ms. time-slot duration, and, consequently, a 26.66. ms. frame duration. Each time-slot **202** is divided into two half-time-slots **202a**, **202b**, with pilot bursts **204a**, **204b** transmitted within each half-time-slot **202a**, **202b**. In the exemplary embodiment, each pilot burst **204a**, **204b** is 96 chips long, and is centered at the mid-point of its associated half-time-slot **202a**, **202b**. The pilot bursts **204a**, **204b** comprise a pilot channel signal covered by a Walsh cover with index 0. A forward medium access control channel (MAC) **206** forms two bursts, which are transmitted immediately before and immediately after the pilot burst **204** of each half-time-slot **202**. In the exemplary embodiment, the MAC is composed of up to 64 code channels, which are orthogonally covered by 64-ary Walsh codes. Each code channel is identified by a MAC index, which has a value between 1 and 64, and identifies a unique 64-ary Walsh cover. A reverse power control channel (RPC) is used to regulate the power of the reverse link signals for each subscriber station. The RPC is assigned to one of the available MACs with MAC index between 5 and 63. The MAC with MAC index 4 is used for a reverse activity channel (RA), which performs flow control on the reverse traffic channel. The forward link traffic channel and control channel payload is sent in the remaining portions **208a** of the first half-time-slot **202a** and the remaining portions **208b** of the second half-time-slot **202b**.

Re-pointing using a DRC Lock Indication – Introduction

[1059] A re-pointing decision is made by the AT **104** in accordance with a condition of a forward link, a condition of a reverse link, or a condition of both a forward link and a reverse link. As described above, the AT **104** determines a forward link quality metric directly, e.g., by measuring the forward link SINR. The quality metric of a reverse link may comprise a reverse link SINR, a DRC erasure rate, a filtered RPC mean, and other quality metrics known to one skilled in the art.

[1060] As discussed, the AT **104** identifies a serving sector of a particular AP and transmits a DRC message on a DRC channel on a reverse link. The reverse link carrying the DRC messages between the AT **104** and the serving sector is subject to various factors that change characteristics of the communication channel. In a wireless communications systems these factors comprise, but are not limited to: fading, noise, interference from other terminals, and other factors known to one skilled in the art. The DRC message is protected against the changing characteristics of the communication channel by various methods, e.g., message length selection, encoding, symbol repetition, interleaving, transmission power, and other methods known to one of ordinary skill in the art. However, these methods impose performance penalties, e.g., increased overhead, thus, decreased throughput, increased power consumption, increased peak-to-average power, increased power amplifier backoff, more expensive power amplifiers, and other penalties known to one skilled in the art. Therefore, an engineering compromise between a reliability of message delivery and an amount of overhead must be made. Consequently, even with the protection of information, the conditions of the communication channel can degrade to the point at which the serving sector possibly cannot decode (erases) some of the DRC messages. Therefore, the DRC erasure rate is directly related to the conditions of the reverse link, and the DRC erasure rate is a good quality metric of the reverse link.

[1061] However, the AT **104** can directly determine neither the reverse link SINR nor the DRC erasure rate. Both the reverse link SINR and the DRC erasure rate may be directly determined by the sectors in the AT **104**

active set. The sector(s) then supplies the AT **104** with the determined values of the reverse link SINR or the DRC erasure rate via a feedback loop. In order for a sector to transmit accurate information regarding the reverse link SINR or DRC erasure rate, the sector must use some forward link capacity. In order to minimize the impact on forward link capacity the reverse link SINR or the DRC erasure rate is sent with very low granularity. In one embodiment, the granularity is one bit. Furthermore, a consideration of a feedback loop speed versus a performance of the Reverse Link Traffic Channel performance must be made.

[1062] Therefore, in a Message Based DRC Lock embodiment, each sector in the AT **104** active set monitors the DRC channel and evaluates an erasure rate of the DRC messages. Each sector then sets a DRC Lock Bit for the AT **104** in accordance with the evaluated erasure rate. In one embodiment, the DRC Lock Bit set to one value, e.g., one ("in-lock"), indicates that the DRC erasure rate is acceptable; the DRC Lock Bit set to a second value, e.g., zero ("out-of-lock"), indicates that the DRC erasure rate is unacceptable. The serving sector then sends the DRC Lock Bit to the AT **104** in a message on a control channel. The control channel for a communication system in accordance with the IS-856 standard has a period of 426 ms.

[1063] In a Punctured DRC Lock embodiment, the DRC Lock Bit is updated at a rate different from the control channel period, and punctured into an RPC channel one or more times every frame. The term punctured is used herein to mean sending the DRC Lock Bit instead of a RPC bit.

[1064] The AT **104** then uses the reverse link quality metric together with the forward link quality metric to make a re-pointing decision.

Re-pointing with a Message Based DRC Lock

Access Point Processing

[1065] The processing method at the AP in accordance with one embodiment comprises there phases. In the first phase, mapping a DRC Erasure and/or a valid DRC to a binary form generates a DRC Erasure Bit. In the second phase, processing the DRC Erasure Bits generates a DRC erasure rate. In the third phase, sampling the processed DRC erasure rate every control channel period generates a DRC Lock Bit.

[1066] The above-described phases one and two are repeated every time-slot by every sector in the AT **104** active set, as illustrated in **FIG. 3** in accordance with an embodiment. The method starts in step **302**. The method continues in step **304**.

[1067] In step **304**, the AP receives an updated DRC. The method continues in step **306.**

[1068] In step **306**, the AP tests the updated DRC. If the DRC was erased, the method continues in step **308**, otherwise, the method continues in step **310.**

[1069] In step **308**, the DRC Erasure Bit is assigned a value of one. The method continues in step **312.**

[1070] In step **310**, the DRC Erasure Bit is assigned a value of zero. The method continues in step **312.**

[1071] In step **312**, the DRC Erasure Bit is processed to generate a DRC erasure rate. In one embodiment, the processing comprises filtering by a filter with a pre-determined time constant. In one embodiment, the filter is realized in a digital domain. The value of the pre-determined time constant may be established in accordance with system simulation, by experiment or via other engineering methods known to one of ordinary skills in the art as an optimum in accordance with:

reliability of an estimate ensuing from a choice of the time constant, and
latency of an estimate ensuing from the choice of the time constant.

[1072] The method continues in step **314.**

[1073] In step **314**, the system time is tested to establish the beginning of a control channel capsule. If the test is positive, the method continues in step **316**, otherwise the method returns to step **304.**

[1074] Steps **316** through **326** introduce hysteresis rules for generating the DRC Lock Bit. The hysteresis is introduced to avoid rapid re-pointing when the channel SINR varies rapidly. The hysteresis rules are as follows:

[1075] If the DRC Lock Bit is currently set to one, then the filtered DRC erasure rate must exceed first DRC erasure threshold (DRC_Erasure_Th2) for the DRC Lock Bit to be set to zero; and

[1076] If the DRC Lock Bit is currently set to zero, then the Filtered DRC Erasure rate has to be below a second pre-determined DRC erasure threshold (DRC_Erasure_Th1) for the DRC Lock to be set to one.

[1077] In one embodiment, the values DRC_Erasure_Th1 and DRC_Erasure_Th2 are pre-determined in accordance with the communication system simulation, by experiment or other engineering methods known to one of ordinary skills in the art. In another embodiment, the values DRC_Erasure_Th1 and DRC_Erasure_Th2 are changed in accordance with the change of the conditions of the communication link. In either embodiment, the values of DRC_Erasure_Th1 and DRC_Erasure_Th2 are selected to optimize the following requirements to:

minimize the dead-zone (when the DRC Lock Bit is not updated); and

transmit the most current reverse link channel state information to the AT.

[1078] In step **316**, the current DRC Lock Bit value is compared to 1. If the DRC Lock Bit value equals 1, the method continues in step **320**, otherwise, the method continues in step **318.**

[1079] In step **318,** the DRC erasure rate is compared to the DRC_Erasure_Th1. If the DRC erasure rate is less than the DRC_Erasure_Th1, the method continues in step **322**, otherwise, the method continues in step **324**.

[1080] In step **320,** the DRC erasure rate is compared to the DRC_Erasure_Th2. If the DRC erasure rate is less than the DRC_Erasure_Th2, the method continues in sep **324**, otherwise, the method continues in step **326**.

[1081] In step **322**, the DRC Lock Bit value is set to 0. The method continues in step **328**.

[1082] In step **324**, the DRC Lock Bit value is set to 1. The method continues in step **328**.

[1083] In step **326**, the DRC Lock Bit value is set to 0. The method continues in step **328**.

[1084] In step **328**, the DRC Lock Bit is set at the appropriate position of the control channel message. The method returns to step **304**.

Access Terminal Processing

[1085] As discussed, in one embodiment, the AT is assumed to be able to demodulate a control channel from only one sector in the AT's active set. The processing method at the AT in accordance with the embodiment comprises the phases of (i) Initialization, (ii) Credit Accumulation, and (iii) Decision.

Initialization

[1086] During the initialization stage, the AT **104** selects a sector with the best forward link quality metric, i.e., the highest SINR, as the serving sector. The AT **104** sets the DRC for the selected sector "in-lock" and initializes credits for all non-serving sectors to zero.

[1087] In one embodiment, two types of credits are defined - switching credits and monitoring credits. The credits are described in more details in the Credit Accumulation paragraph.

[1088] The initialization phase in accordance with one embodiment is illustrated in **FIG. 4**. The method starts in step **402**. The method continues in step **404.**

[1089] In step **404**, the AT selects a sector with the best forward link quality metric as the serving sector, and sets the sector's DRC "in-lock." The method continues in step **406.**

[1090] In step **406**, a variable count is set to one. The method continues in step **408.**

[1091] In step **408**, the variable count is tested against an active set size. If the variable count is greater than the active set size, the method continues in an accumulation phase, otherwise, the method continues in step **410.**

[1092] In step **410**, the inquiry is made whether the sector designated by the variable count is the current serving sector as selected in step **404**. If the test is positive, the method continues in step **414**, otherwise, the method continues in step **412.**

[1093] In step **412**, monitoring credits for a non-serving sector (CM_NS) and switching credits for a non-serving sector (CS_NS) are set to zero. The method continues in step **414.**

[1094] In step **414**, the variable count is incremented, and the method returns to step **408**.

Credit Accumulation

[1095] As discussed, two types of credits are defined - switching credits and monitoring credits in accordance with one embodiment. Switching credits are used to qualify a non-serving sector for re-pointing, if the DRC of the non-serving sector is “in lock” with a pre-determined probability. Thus, CS_NS are incremented if:

[1096] a forward link SINR of the non-serving sector (FL_NS) is greater than a forward link SINR of the current serving sector (FL_SS) modified by a pre-determined value (FL_SINR_Th); and

[1097] a filtered RPC mean for the non-serving sector (RL_NS) is below a pre-determined threshold (RPC_Th).

[1098] CS_NS are decremented if the above conditions are not satisfied.

[1099] The pre-determined value FL_SINR_Th is selected so that re-pointing to another sector results in an increase in forward link SINR and, consequently, in an increase in an average requested data rate.

[1100] The pre-determined threshold RPC_Th is chosen so that the AP’s DRC is “in-lock” with a probability P_{IL} when the filtered RPC mean is below the RPC_Th. The relationship between the probability P_{IL} and the threshold is determined in accordance with simulations, laboratory tests, field trails, and other engineering methods. The RPC_Th is chosen to be conservative to minimize the cost associated with re-pointing the DRC to a sector with the DRC "out-of-lock". If the AT did re-point to a sector with the

DRC "out-of-lock" not only would the AT experience degraded throughput, but also a higher outage probability. The method can afford to select the RPC_Th conservatively because the monitoring credits are used to re-point to sectors with filtered RPC mean greater than the threshold but with DRC "in-lock". In one embodiment, the RPC_Th is chosen such that there is a less than 1% probability that the DRC is "out-of-lock" when the filtered RPC Mean is below the RPC_Th for any given channel conditions.

[1101] In one embodiment, the minimum value for the credits (both switching and monitoring) is zero and the maximum for the credits is equal to a soft hand-off delay or a softer handoff delay. The delay used is determined based on whether or not the non-serving sector is in the same cell as the serving sector. If the non-serving sector is in the same cell as the serving sector then the softer handoff delay is used, and if the non-serving sector is in a cell different from the one that the serving sector is part of then the soft-handoff delay is used.

[1102] It is possible that a filtered RPC mean for the non-serving sector is above RPC_Th, and the DRC is "in-lock" for the non-serving sector. Considering the rules for incrementing the switching credits, the switching credits will not be incremented, although a forward link SINR of the non-serving sector is greater than a forward link SINR of the current serving sector by FL_SINR_Th. Consequently, a throughput of the system is not optimized. In such a scenario, the AT uses the monitoring credits to determine whether to monitor control channels of a non-serving sector to determine whether the DRC Lock for the non-serving sector is "in-lock". Therefore, the monitoring credits for a non-serving sector (CM_NS) are incremented if:

[1103] the forward link SINR of the non-serving sector (FL_NS) is greater than the forward link SINR of the current serving sector (FL_SS) by a FL_SINR_Th; and

[1104] the filtered RPC mean for the non-serving sector (RL_NS) is above the RPC_Th; and

[1105] the filtered RPC mean for the current serving sector (RL_SS) is below the RPC_Th

[1106] CM_NS are decremented if the above conditions are not satisfied.

[1107] The credits, initialized to zero in the Initialization phase are accumulated during the Credit Accumulation phase. The credit accumulation phase in accordance with one embodiment is illustrated in **FIG. 5**. In step **502**, a variable count is set to one. The method continues in step **504.**

[1108] In step **504**, the variable count is tested against an active set size. If the variable count is greater than the active set size, the method continues in decision phase, otherwise, the method continues in step **506.**

[1109] In step **506**, the inquiry is made whether a sector designated by the variable count is the current serving sector. If the test is positive, the method continues in step **518**, otherwise, the method continues in step **508.**

[1110] In step **508**, a forward link SINR of a sector designated by the variable count is compared against forward link SINR of the current serving sector modified by the FL_SINR_Th. If the forward link SINR of the sector designated by the variable count is greater than the forward link SINR of the current serving sector modified by the FL_SINR_Th, the method continues in step **510**, otherwise, the method continues in step **512.**

[1111] In step **510**, a reverse link filtered RPC mean of the sector designated by the variable count is compared against the RPC_Th. If the reverse link filtered RPC mean of the sector designated by the variable count is greater than the RPC_Th, the method continues in step **511** otherwise, the method continues in step **516.**

[1112] In step **511**, a reverse link filtered RPC mean for the current serving sector is compared against the RPC_Th. If the reverse link filtered RPC mean for the current serving sector is greater than the RPC_Th, the method continues in step **512** otherwise, the method continues in step **514.**

[1113] In step **512**, values of CS_NS and CM_NS identified by the variable count are decremented by one, and set to the maximum of 0 and the decremented value. The method continues in step **518.**

[1114] In step **514**, the values of CS_NS and CM_NS identified by the variable count are incremented by one, and set to the minimum of the soft (or softer) hand-off delay (NS_S_Th) and the incremented value. The method continues in step **518**.

[1115] In step **516**, the value of CS_NS identified by the variable count is incremented by one, and set to the minimum of the soft (or softer) hand-off delay (NS_S_Th) and the decremented value. The method continues in step **518.**

[1116] In step **518**, the variable count is incremented by one and the method returns to step **504**.

Decision

[1117] In one embodiment, the re-pointing decision rules depend on the DRC Lock Bit of the current serving sector. Consequently, referring to **FIG. 6**, in step **602**, a DRC Lock Bit of the current serving sector is tested. If the DRC Lock Bit of the current serving sector is "out-of-lock," the method continues in step **604**, otherwise, the method continues in step **606**.

[1118] In step **604**, the "out-of-lock" server selection method is initialized. The method is described in detail with reference to **FIG. 9**. The method returns to the credit accumulation phase.

[1119] In step **606**, the "in-lock" server selection method is initialized. The method is described in detail with reference to **FIGs. 7** and **8**. The method returns to the credit accumulation phase.

"In-Lock" Server Selection

[1120] If the DRC Lock Bit from the current serving sector is "in-lock", the decision to re-point to a non-serving sector is made if the non-serving sector provides higher FL_SINR and an "in-lock" DRC Lock Bit. To carry out the decision, the AT first ascertains if any of the non-serving sectors has switching credits greater than a threshold determined by the soft/softer delay. (This, threshold is the same for both the switching and monitoring credits.) If at least one of the non-serving sectors has switching credits greater than the threshold, the AT re-points its DRC to the sector with the highest switching credits. In one embodiment, if two or more non-serving sectors have equal switching credits, the sector with the highest quality reverse link is selected.

The quality of the reverse link is determined in accordance with the filtered RPC mean. Lower filtered RPC mean indicates a better quality of the reverse link. In another embodiment, if two or more non-serving sectors have equal switching credits, the sector with the highest quality forward link is selected.

[1121] If none of the non-serving sectors has sufficient switching credits to mandate re-pointing, the AT ascertains how many of the non-serving sectors have monitoring credits greater than the threshold. If at least one of the non-serving sectors has monitoring credits greater than the threshold, the AT monitors the control channel from those non-serving sectors during the next control channel cycle. In one embodiment, if two or more non-serving sectors have equal switching credits, a sector with the highest quality reverse link is selected for the monitoring. The quality of the reverse link is determined in accordance with the filtered RPC mean. In another embodiment, if two or more non-serving sectors have equal switching credits, a sector with the highest quality forward link is selected for the monitoring. If the DRC for the monitored sector is "in-lock," the AT re-points to the monitored sector. Following the re-pointing the AT resets all the switching and monitoring credits.

[1122] If none of the non-serving sectors has either sufficient switching credits or monitoring credits, the AT continues pointing its DRC to the current serving Access Point.

[1123] The decision phase in accordance with one embodiment is illustrated in **FIGs. 7** and **8**. In accordance with **FIG. 7**, a non-serving sector is made a candidate for re-pointing if the non-serving sector's switching credits are equal to the soft (or softer) hand-off delay (NS_S_Th) for the non-serving sector. A non-serving sector is made a candidate for a control channel monitoring if the non-serving sector's monitoring credits are equal to the soft (or softer) hand-off delay (NS_S_Th) for the non-serving sector and the filtered RPC mean of the non-serving sector is above RPC_Th. This ensures that the AT is in reliable communication with the current serving sector when it attempts to demodulate the synchronous control channel from a non-serving sector. These two requirements ensure that the DRC from the non-serving sector is "in-lock" with a probability PIL.

[1124] Furthermore, in one embodiment, a data packet may span two control channel cycles and, consequently, the data transmission from the current serving sector may collide with the control channel transmission from the sector to be monitored. Consequently, the AT further determines whether there is a potential for a collision between the data on the control channel to be monitored and the data form the current serving sector. If the AT determines that the data transmission from the current serving sector for would collide with the transmission of the control channel from the non serving sector to be monitored, then the AT does not monitor the control channel from the non-serving sector. Otherwise, the AT would monitor the control channel from the non-serving sector.

[1125] In step **702**, a variable count is set to one. The method continues in step **704.**

[1126] In step **704**, the variable count is tested against an active set size. If the variable count is greater than the active set size, the method continues in server selection of **FIG. 8**, otherwise, the method continues in step **706.**

[1127] In step **706**, an inquiry is made whether a sector designated by the variable count is the current serving sector. If the test is positive, the method continues in step **724**, otherwise, the method continues in step **708.**

[1128] In step **708**, a value of the variable CS_NS identified by the variable count is compared against the soft (or softer) hand-off delay (NS_S_Th) for the non-serving sector. If the value of the variable CS_NS is not equal to the NS_S_Th, the method continues in step **710**; otherwise, the method continues in step **712.**

[1129] In step **710**, a value of the variable Cand_S identified by the variable count is set to 0. The method continues in step **714.**

[1130] In step **712**, a value of the variable Cand_S identified by the variable count is set to 1. The method continues in step **714.**

[1131] In step **714**, a value of the variable CM_NS identified by the variable count is compared against the soft (or softer) hand-off delay (NS_S_Th) for the non-serving sector. If the value of the variable CS_NS is not equal to the NS_S_Th for the non-serving sector, the method continues in step **716**; otherwise, the method continues in step **720**.

[1132] In step **716**, the filtered RPC mean of the of the current serving sector (RPC_CS) identified by the variable count is compared against an RPC threshold (RPC_Th). If the RPC_CS is less than the RPC_Th, the method continues in step **718**; otherwise, the method continues in step **720**.

[1133] In step **718**, the AT determines whether the data on the control channel to be monitored and the data form the current serving sector collide. If the AT determines that the data transmission from the current serving sector for would collide with the transmission of the control channel from the non serving sector to be monitored, then the method continues in step **720**. Otherwise, the method continues in step **722**.

[1134] In step **720**, a value of the variable Cand_M identified by the variable count is set to 0. The method continues in step **724**.

[1135] In step **722**, a value of the variable Cand_M identified by the variable count is set to 1. The method continues in step **724**.

[1136] In step **724**, the variable count is incremented, and the method returns to step **704**.

[1137] Referring to **FIG. 8**, the "in-lock" selection from **FIG. 7** continues. In accordance with **FIG. 8**, the AT ascertains which sectors are candidates for re-pointing and/or monitoring, and carries out the re-pointing decision.

[1138] In step **802**, where a variable count is set to one. The method continues in step **804**, in which the variable count is tested against an active set size. If the variable count is greater than the active set size, the method continues in step **814**, otherwise, the method continues in step **806**.

[1139] In step **806**, an inquiry is made whether the sector designated by the variable count is the current serving sector. If the test is positive, the method continues in step **812**, otherwise, the method continues in step **808**.

[1140] In step **808**, a variable Cand_S identified by the variable count is compared to one. If the variable Cand_S identified by the variable count is equal to one, the method continues in step **810,** otherwise the method continues in step **812.**

[1141] In step **810**, a variable CS_NS_count is incremented by one. The method continues in step **812.**

[1142] In step **812**, the variable count is incremented, and the method returns to step **804**.

[1143] In step **814**, the value of the variable CS_NS_count is ascertained. If the value of the variable CS_NS_count is equal to 1, the method continues in step **816**. If the value of the variable CS_NS_count is greater that 1, the method continues in step **818.** Otherwise, the method continues in step **822**.

[1144] In step **816**, the AT re-points the DRC to the candidate sector identified by the variable count. The method continues in step **820.**

[1145] In step **818**, the AT re-points the DRC to the candidate sector identified by the variable count that has the highest quality reverse link in accordance with the sector's reverse link's filtered RPC mean. The method continues in step **820**.

[1146] In step **820**, the variables CS_NS and the variables CM_NS are set to zero. The method returns to the credit accumulation phase.

[1147] In step **822**, a variable count is set to one. The method continues in step **824.**

[1148] In step **824**, the variable count is tested against an active set size. If the variable count is greater than the active set size, the method continues in step **834**, otherwise, the method continues in step **826.**

[1149] In step **826**, an inquiry is made whether the sector designated by the variable count is the current serving sector. If the test is positive, the method continues in step **832**, otherwise, the method continues in step **828.**

[1150] In step **828**, a variable Cand_M identified by the variable count is compared to one. If the variable Cand_M identified by the variable count is equal to one, the method continues in step **830,** otherwise the method continues in step **832.**

[1151] In step **830**, a variable CM_NS_count is incremented. The method continues in step **832.**

[1152] In step **832**, the variable count is incremented, and the method returns to step **824**.

[1153] In step **834**, the value of the variable CM_NS_count is ascertained. If the value of the variable CM_NS_count is equal to 1, the method continues in step **836**. If the value of the variable CM_NS_count is greater that 1, the method continues in step **838.** If the value of the variable CM_NS_count is equal to 0, the method continues in step **840.**

[1154] In step **836**, the AT monitors the DRC from the candidate sector identified by the variable count. The method continues in step **842**.

[1155] In step **838**, the AT monitors the DRC from the candidate sector identified by the variable count that has the highest quality reverse link in accordance with the AP's reverse link's filtered RPC mean. The method continues in step **842**.

[1156] In step **840**, the AT makes the decision not to re-point to a different sector. The method returns to credit accumulation.

[1157] In step **842**, the DRC from the candidate sector is evaluated. If the DRC value is "in lock" the method continues in step **844**; otherwise, the method returns to credit accumulation.

[1158] In step **844**, the AT re-points the DRC to the candidate sector. The method continues in step **846**.

[1159] In step **846**, the variables CS_NS and the variables CM_NS are set to zero. The method returns to credit accumulation.

"Out-of-Lock" Server Selection

[1160] If the DRC from the current serving sector is "out-of-lock," the decision to re-point to a non-serving sector is made if the non-serving sector provides higher FL_SINR and better quality reverse link, as determined by the switching credits. To carry out the decision, the AT first ascertains those non-serving sectors that have switching credits greater than zero. If at least one of the non-serving sectors has switching credits greater than zero, the AT re-points the DRC to the sector with the highest switching credits. In one embodiment, if two or more non-serving sectors have equal switching credits, a sector with the highest quality reverse link is selected. The quality of the reverse link is determined in accordance with the reverse link's filtered RPC mean. In another embodiment, if two or more non-serving sectors have equal switching credits, a sector with the highest quality forward link is selected.

[1161] If none of the non-serving sectors has switching credits greater than zero, the AT ascertains those non-serving sectors that have monitoring credits greater than zero. If at least one of the non-serving sectors has monitoring credits greater than zero, the AT monitors the sector with the highest monitoring credits. In one embodiment, if two or more non-serving sectors have equal monitoring credits, the sector with the highest quality reverse link is selected for the monitoring. The quality of the reverse link is determined in accordance with the filtered RPC mean. In another embodiment, if two or more non-serving sectors have equal monitoring credits, the sector with the highest quality forward link is selected for the monitoring. If the DRC for the monitored sector is "in-lock," the AT re-points to the monitored sector. On re-pointing the DRC the AT resets all the switching and re-pointing credits.

[1162] If none of the non-serving sectors has either sufficient switching credits or monitoring credits, the AT continues pointing its DRC to the current serving sector.

[1163] The "out-of-lock" sector selection in accordance with one embodiment is illustrated in **FIG. 9**. In step **902**, a variable CM_NS_count is set to zero. The method continues in step **904.**

[1164] In step **904**, the variable count is set to one. The method continues in step **906.**

[1165] In step **906**, the variable count is tested against an active set size. If the variable count is greater than the active set size, the method continues in step **916**, otherwise, the method continues in step **908.**

[1166] In step **908**, an inquiry is made whether the sector designated by the variable count is the current serving sector. If the test is positive, the method continues in step **914**, otherwise, the method continues in step **910.**

[1167] In step **910**, a variable CS_NS identified by the variable count is compared to zero. If the variable CS_NS identified by the variable count is equal to zero, the method continues in step **912,** otherwise the method continues in step **914.**

[1168] In step **912**, a variable CS_NS_count is incremented. The method continues in step **914.**

[1169] In step **914**, the variable count is incremented, and the method returns to step **906**.

[1170] In step **916**, the value of the variable CS_NS_count is ascertained. If the value of the variable CS_NS_count is equal to 1, the method continues in step **918**. If the value of the variable CS_NS_count is greater that 1, the method continues in step **920.** Otherwise, the method continues in step **922**.

[1171] In step **918**, the AT re-points the DRC to the candidate sector identified by the variable count. The method continues in step **944.**

[1172] In step **920**, the AT re-points the DRC to the candidate sector identified by the variable count that has the highest quality reverse link in accordance with the AP's reverse link's filtered RPC mean. The method continues in step **944**.

[1173] In step **922**, a variable CM_NS_count is set to zero. The method continues in step **924.**

[1174] In step **924**, a variable count is set to one. The method continues in step **926.**

[1175] In step **926**, the variable count is tested against an active set size. If the variable count is greater than the active set size, the method continues in step **936**, otherwise, the method continues in step **928.**

[1176] In step **928**, an inquiry is made whether the sector designated by the variable count is the current serving sector. If the test is positive, the method continues in step **934**, otherwise, the method continues in step **930.**

[1177] In step **930**, a variable CM_NS identified by the variable count is compared to zero. If the variable CM_NS identified by the variable count is equal to zero, the method continues in step **934,** otherwise the method continues in step **932.**

[1178] In step **932**, a variable CM_NS_count is incremented. The method continues in step **934.**

[1179] In step **934**, the variable count is incremented, and the method returns to step **924**.

[1180] In step **936**, the value of the variable CM_NS_count is ascertained. If the value of the variable CM_NS_count is equal to 1, the method continues in step **938**. If the value of the variable CM_NS_count is greater that 1, the method continues in step **940.** If the value of the variable CM_NS_count is equal to 0, the method continues in step **942.**

[1181] In step **938**, the AT re-points the DRC to the candidate sector identified by the variable count. The method continues in step **944**.

[1182] In step **940**, the AT re-points the DRC to the candidate sector identified by the variable count that has the highest quality reverse link in accordance with the AP's reverse link's filtered RPC mean. The method continues in step **944**.

[1183] In step **942**, the AT makes the decision not to re-point to a different sector. The method returns to credit accumulation.

Access Terminal Processing

[1184] In another embodiment, the AT is assumed to be able to demodulate a control channel from each sector in the AT's active set. The processing method at the AT in accordance with the embodiment comprises the phases of (i) Initialization, (ii) Credit Accumulation, and (iii) Decision.

Initialization

[1185] During the initialization stage, the AT **104** selects the AP with the best forward link quality metric, i.e., the highest SINR. The AT **104** sets the DRC "in-lock," for the selected AP. The AT **104** then initializes credits for all non-serving sector s to zero.

[1186] Because the AT is able to demodulate a control channel from each sector in the AT's active set, thus determine the DRC Lock Bit value, there is no need for monitoring credits and only switching credits are defined. The switching credits are described in more details in the Credit Accumulation paragraph. Consequently, the initialization phase in accordance with the embodiment is carried out according to **FIG. 4** and accompanying text, except for step **412.** In step **412**, only the switching credits for a non-serving sector (CS_NS) are set to zero.

Credit Accumulation

[1187] As discussed, only switching credits are required in accordance with the embodiment. Switching credits are used to qualify the non-serving sector for re-pointing, if the DRC of the non-serving sector is "in lock". Consequently, CS_NS are incremented if:

[1188] a forward link SINR of the non-serving sector (FL_NS) is greater than a forward link SINR of the current serving sector by a pre-determined value (FL_SINR_Th); and

[1189] a DRC Lock Bit of the non-serving sector is "in-lock."

[1190] The pre-determined value FL_SINR_Th is selected so that re-pointing to a new sector results in an increase in forward link SINR and, consequently, in an increase in an average requested data rate. CS_NS are decremented if the above conditions are not satisfied.

[1191] In one embodiment, the switching credits minimum value is zero and the maximum value is equal to a soft hand-off delay if re-pointing to the particular sector would constitute a soft hand-off, or a softer handoff delay if re-pointing to the particular AP would constitute a softer hand-off.

[1192] The credits, initialized to zero in the Initialization phase are accumulated during the Credit Accumulation phase. The credit accumulation phase in accordance with one embodiment is illustrated in **FIG. 10**. In step **1002**, a variable count is set to one. The method continues in step **1004.**

[1193] In step **1004**, the variable count is tested against an active set size. If the variable count is greater than the active set size, the method continues in decision phase, otherwise, the method continues in step **1006.**

[1194] In step **1006**, the inquiry is made whether the sector designated by the variable count is the current serving sector. If the test is positive, the method continues in step **1016**, otherwise, the method continues in step **1008.**

[1195] In step **1008**, a forward link SINR of the sector designated by the variable count is compared against forward link SINR of the current serving sector modified by the FL_SINR_Th. If the forward link SINR of the sector designated by the variable count is greater than the forward link SINR of the current serving sector modified by the FL_SINR_Th, the method continues in step **1010**, otherwise, the method continues in step **1012.**

[1196] In step **1010**, a DRC Lock Bit of the sector designated by the variable count is compared against one. If the DRC Lock Bit of the sector designated by the variable count is equal to one, the method continues in step **1014**, otherwise, the method continues in step **1012.**

[1197] In step **1012**, the value of CS_NS identified by the variable count are decremented by one, and set to the maximum of 0 and the decremented value. The method continues in step **1016.**

[1198] In step **1014**, the value of CS_NS identified by the variable count are incremented by one, and set to the minimum of the soft (or softer) hand-off delay and the incremented value. The method continues in step **1016.**

[1199] In step **1016**, the variable count is incremented by one and the method returns to step **1004**.

Decision

[1200] In accordance with the embodiment, the re-pointing decision rules depend on the DRC Lock State of the current serving sector. Consequently, the decision phase in accordance with the embodiment is carried out according to **FIG. 6** and accompanying text.

"In-Lock" AP Selection

[1201] If the DRC from the current serving sector is "in-lock", the decision to re-point to a non-serving sector is made if the non-serving sector provides higher FL_SINR and an "in-lock" DRC. To carry out the decision, the AT first ascertains if any of the non-serving sectors has switching credits greater than a threshold determined by the soft/softer delay. If at least one of the non-serving sectors has switching credits greater than the threshold, the AT re-points its DRC to the AP with the highest switching credits. In one embodiment, if two or more non-serving sectors have equal switching credits, a sector with the highest quality reverse link is selected. The quality of the reverse link is determined in accordance with the filtered RPC mean. In another embodiment, if two or more non-serving sectors have equal switching credits, a sector with the highest quality forward link is selected.

[1202] To avoid limiting the re-pointing rate to a control channel interval (256 time-time-slots for IS-856), a non-serving sector is further made a candidate for re-pointing between control channel intervals according to the following rules:

[1203] the number of time-slots since the last control channel (CC) exceeds a threshold N_c; and

[1204] the filtered RPC mean for the non-serving sector (RL_NS) is less than the RPC_Th.

[1205] The RPC_Th is chosen such that the DRC for the non-serving sector is "in-lock" with a probability P_{IL} if the filtered RPC mean is below RPC_Th. In one embodiment, the N_c is equal to 64.

[1206] If none of the non-serving sectors has sufficient switching credits, the AT continues pointing its DRC to the current serving sector. On re-pointing the DRC the AT resets all the switching credits.

[1207] The candidate determination in accordance with the embodiment is illustrated in **FIG. 11**. In step **1102**, a variable count is set to one. The method continues in step **1104.**

[1208] In step **1104**, the variable count is tested against an active set size. If the variable count is greater than the active set size, the method continues in server selection as described below, otherwise, the method continues in step **1106.**

[1209] In step **1106**, an inquiry is made whether the sector designated by the variable count is the current serving sector. If the test is positive, the method continues in step **1118**, otherwise, the method continues in step **1108.**

[1210] In step **1108**, a value of the variable CS_NS identified by the variable count is compared against the soft (or softer) hand-off delay (NS_S_Th) for the non-serving sector. If the value of the variable CS_NS is not equal to the NS_S_Th for the non-serving sector, the method continues in step **1110**; otherwise, the method continues in step **1112**.

[1211] In step **1110**, a value of the variable identifying the number of time-slots since the last control channel (CC) is compared against the N_C. If the CC is greater than the N_c, the method continues in step **1114**; otherwise, the method continues in step **1116**.

[1212] In step **1112**, a value of the variable Cand_S identified by the variable count is set to zero. The method continues in step **1118**.

[1213] In step **1114**, a filtered RPC mean of the non-serving sector (RL_NS) identified by the variable count is compared against an RPC threshold (RPC_Th). If the RL_NS is greater than the RPC_Th, the method continues in step **1112**; otherwise, the method continues in step **1116**.

[1214] In step **1116**, a value of the variable Cand_S identified by the variable count is set to one. The method continues in step **1118.**

[1215] In step **1118**, the variable count is incremented, and the method returns to step **1104**.

[1216] In accordance with the decision rules, the AT ascertains which sectors are candidates for re-pointing, and carries out the re-pointing decision. The decision phase in accordance with the embodiment is carried out according to **FIG. 9** and accompanying text, with the following modifications. Because the embodiment does not use the monitoring credits, steps **922** through **946** are deleted. Consequently, in step **914**, if the value of the variable CS_NS_count is equal to zero, the method continues pointing to the current serving Access Point, and then returns to the Credit Accumulation phase.

"Out-of-Lock" AP Selection

[1217] If the DRC from the current serving sector is "out-of-lock" the decision to re-point to a non-serving sector is made if the non-serving sector provides higher FL_SINR and better quality reverse link, as determined by the switching credits. To carry out the decision, the AT first ascertains those non-serving sectors that have switching credits greater than zero. If at least one of the non-serving sectors has switching credits greater than zero, the AT re-points its DRC to the sector with the highest switching credits. In one embodiment, if two or more non-serving sectors have equal switching credits, a sector with the highest quality reverse link is selected. The quality of the reverse link is determined in accordance with the reverse link's filtered RPC mean. In another embodiment, if two ore more non-serving sectors have equal switching credits, a sector with the highest quality forward link is selected.

[1218] If none of the non-serving sectors has sufficient switching credits, the AT continues pointing its DRC to the current serving Access Point.

[1219] The decision phase in accordance with the embodiment is carried out according to **FIG. 9** and accompanying text, with the following modifications. Because the embodiment does not use the monitoring credits, steps **922** through **946** are deleted. Consequently, in step **914**, if the value of the variable CS_NS_count is equal to zero, the method continues pointing to the current serving Access Point, and then returns to the Credit Accumulation phase.

Further Extension

[1220] One skilled in the art recognizes that the concepts explained in the two above-described embodiments can be utilized to devise a hybrid method, in which the AT would be able to demodulate a control channel from at least two sector in the AT's active set. A modification to a Credit Accumulation phase as required in one embodiment is illustrated in **FIG. 12**. All other phases do not require any modifications.

[1221] In step **1210**, the sectors control channels of which are to be demodulated are determined. In one embodiment, the determination is carried out in accordance to the sector's filtered forward link SINR. Sectors are sorted based on their filtered forward link SINR. Then the AT selects the number of sectors it is able to demodulate as the sectors with the highest SINR.

[1222] In step **1212**, a variable count is set to one. The method continues in step **1214.**

[1223] In step **1214**, the variable count is tested against an active set size. If the variable count is greater than the active set size, the method continues in decision phase, otherwise, the method continues in step **1216.**

[1224] In step **1216**, the inquiry is made whether a sector designated by the variable count is the current serving sector. If the test is positive, the method continues in step **1236**, otherwise, the method continues in step **1218.**

[1225] In step **1218**, a forward link SINR of a sector designated by the variable count is compared against forward link SINR of the current serving sector modified by the FL_SINR_Th. If the forward link SINR of the sector designated by the variable count is greater than the forward link SINR of the current serving sector modified by the FL_SINR_Th, the method continues in step **1222**, otherwise, the method continues in step **1220.**

[1226] In step **1220**, a test whether a sector identified by the variable count was selected for demodulating is performed. If the test is negative, the method continues in step **1228**, otherwise the method continues in step **1234**.

[1227] In step **1222**, a test whether a sector identified by the variable count was selected for demodulating is performed. If the test is negative, the method continues in step **1224**, otherwise the method continues in step **1226**.

[1228] In step **1224**, a reverse link filtered RPC mean of the sector designated by the variable count is compared against the RPC_Th. If the reverse link filtered RPC mean of the sector designated by the variable count is greater than the RPC_Th, the method continues in step **1225** otherwise, the method continues in step **1232.**

[1229] In step **1225**, a reverse link filtered RPC mean for the current serving sector is compared against the RPC_Th. If the reverse link filtered RPC mean for the current serving sector is greater than the RPC_Th, the method continues in step **1228** otherwise, the method continues in step **1230.**

[1230] In step **1226**, a DRC Lock of the sector identified by the variable count is compared to one. If the DRC Lock of the sector identified by the variable count is equal to one, the method continues in step **1232**, otherwise the method continues in step **1234**.

[1231] In step **1228**, values of CS_NS and CM_NS identified by the variable count are decremented by one, and set to the maximum of 0 and the decremented value. The method continues in step **1236.**

[1232] In step **1230**, the values of CS_NS and CM_NS identified by the variable count are incremented by one, and set to the minimum of the soft (or softer) hand-off delay (NS_S_Th) and the incremented value. The method continues in step **1236.**

[1233] In step **1232**, the value of CM_NS identified by the variable count is incremented by one, and set to the minimum of the soft (or softer) hand-off delay (NS_S_Th) and the decremented value. The method continues in step **1236.**

[1234] In step **1234**, the value of CS_NS identified by the variable count is decremented by one, and set to the maximum of 0 and the decremented value. The method continues in step **1236.**

[1235] In step **1236**, the variable count is incremented by one and the method returns to step **1214.**

Re-pointing using a Punctured DRC Lock

[1236] Depending on an implementation of a communication system, a performance of the re-pointing method using a DRC Lock for indication of a reverse link condition may suffer due to the delay in the feedback loop. The update rate of the feedback loop may be too slow in handling sudden changes in reverse link quality. Such performance detriment may result in outages, which may be intolerable in certain application, e.g., real-time applications.

[1237] Therefore, in other embodiment, the DRC Lock Bit is updated at a higher rate and punctured into an RPC channel one or more times every frame. The term punctured is used herein to mean sending the DRC Lock Bit instead of a RPC bit. The DRC Lock Bit is sent by all the AP's in the AT **104** active set. In one embodiment, a transmission of the DRC Lock Bit to each AT is staggered; i.e. referenced off a frame offset assigned to the AT. This allows for allocating additional power to the RPC channel during the transmission of the DRC Lock Bit in order to provide an additional margin to reduce the DRC Lock Bit errors at the AT; therefore, preventing an erroneous handoffs and possible loss in forward link throughput. The AT **104** uses the DRC Lock Bit information to select the serving AP.

Access Point Processing

[1238] The method in accordance with one embodiment is illustrated in **FIG. 13**. The method starts in step **1302**. The method continues in step **1304.**

[1239] In step **1304**, the AP receives an updated DRC. The method continues in step **1306.**

[1240] In step **1306**, the AP tests the received DRC. If the DRC was erased, the method continues in step **1308**, otherwise, the method continues in step **1310.**

[1241] In step **1308**, the DRC erasure is assigned a value of 1. The method continues in step **1312.**

[1242] In step **1310**, the DRC erasure is assigned a value of 0. The method continues in step **1312.**

[1243] In step **1312**, the DRC Erasure Bit is processed to generate a DRC erasure rate. In one embodiment, the processing comprises filtering by a filter with a pre-determined time constant. In one embodiment, the filter is realized in a digital domain. The value of the pre-determined time constant is established in accordance with system simulation, by experiment or other engineering methods known to one of ordinary skills in the art as an optimum in accordance with:

[1244] reliability of an estimate ensuing from a choice of the time constant, and

[1245] latency of an estimate ensuing from a choice of the time constant.

[1246] In one embodiment, pre-determined time constant is 64 time-slots. The method continues in step **1314.**

[1247] In step **1314**, the system time is tested to establish whether the DRC Lock Bit is to be punctured into the RPC sub channel. In one embodiment, illustrated in step **1314**, the DRC Lock Bit is punctured into the RPC sub channel each eighth (mod 8) time instance. Because the aim of selecting the time instance is to achieve a pre determined bit error rate, one of ordinary skills in the art recognizes that other time instances can be selected. The values of the time instance is selected to optimize the following requirements:

[1248] Minimize the degradation of the reverse link resulting form loss of RPC bits due to puncturing; and

[1249] Providing the DRC Lock Bit at optimal spacing.

[1250] If the test is positive, the method continues in step **1330**, otherwise the method continues in step **1316**.

[1251] In step **1316**, the system time is tested to establish whether the DRC Lock Bit is to be updated. The time instance for the update is selected to ensure reliable delivery of the DRC Lock Bit. In one embodiment, illustrated in step **1316**, the DRC Lock Bit is updated every sixty-fourth (mod 64) time instance. If the test is positive, the method continues in step **1318**, otherwise the method returns to step **1304.**

[1252] Steps **1318** through **1328**, introduce hysteresis rules for generating the DRC Lock Bit. The hysteresis is introduced to avoid rapid re-pointing when the channel SINR varies rapidly. The hysteresis rules are as follows:

[1253] If the DRC Lock Bit is currently set to one, then the filtered DRC erasure rate must exceed first DRC erasure threshold (DRC_Erasure_Th2) for the DRC Lock Bit to be set to zero; and

[1254] If the DRC Lock Bit is currently set to zero, then the Filtered DRC Erasure rate has to be below a second pre-determined DRC erasure threshold (DRC_Erasure_Th1) for the DRC Lock to be set to one.

[1255] In one embodiment, the values DRC_Erasure_Th1 and DRC_Erasure_Th2 are pre-determined in accordance with the communication system simulation, by experiment or other engineering methods known to one of ordinary skills in the art. In another embodiment, the values DRC_Erasure_Th1 and DRC_Erasure_Th2 are changed in accordance with the change of the conditions of the communication link. In either embodiment, the values of DRC_Erasure_Th1 and DRC_Erasure_Th2 are selected to optimize the following requirements:

[1256] Minimize the dead-zone (when the DRC Lock Bit is not updated); and

[1257] transmit the most current reverse link channel state information to the AT.

[1258] In step **1318**, the DRC Lock Bit value is compared to 1. If the DRC Lock Bit value equals 1, the method continues in step **1322**, otherwise, the method continues in step **1320.**

[1259] In step **1320,** the DRC erasure rate is compared to the DRC_Erasure_Th1. If the DRC erasure rate is greater than the DRC_Erasure_Th1, the method continues in step **1324**, otherwise, the method continues in step **1326**.

[1260] In step **1322,** the DRC erasure rate is compared to the DRC_Erasure_Th2. If the DRC erasure rate is less than the DRC_Erasure_Th2, the method continues in sep **1326**, otherwise, the method continues in step **1328**.

[1261] In step **1324**, the DRC Lock Bit value is set to 0. The method continues in step **1330**.

[1262] In step **1326**, the DRC Lock Bit value is set to 1. The method continues in step **1330**.

[1263] In step **1328**, the DRC Lock Bit value is set to 0. The method continues in step **1330**.

[1264] In step **1330**, the DRC Lock Bit is punctured into the RPC channel in accordance with the timing signal obtained in step **1314**. The method returns to step **1304**.

Access Terminal Processing

[1265] The AT **104** receives and demodulates the RPC channel from all APs in the AT **104** active set. Consequently, the AT **104** recovers the DRC Lock Bits punctured into the RPC channel for every AP in the AT **104** active set. Furthermore, as discussed, the punctured DRC Lock Bits are updated with a higher frequency than the Message Based DRC Lock Bits. Consequently, in a Demodulation phase, the AT **104** can combine the energy of received DRC Lock Bits during one update interval, and comparing the combined DRC Lock Bits energy against a DRC Lock Bit threshold. If the combined DRC Lock Bit energy is greater than the DRC Lock Bit threshold, the AT **104** declares the DRC Lock Bit from the particular AP "in-lock". In the Decision phase, the AT **104** uses the DRC Lock Bit value to make a re-pointing decision.

Demodulation Phase

[1266] The Demodulation phase in accordance with one embodiment is illustrated in **FIG. 14.** The method starts in step **1402**, and continues in step **1404.**

[1267] In step **1404**, the system time is tested to establish whether the DRC Lock Bit was updated. In one embodiment, illustrated in step **1404**, the DRC Lock Bit is updated every sixty-fourth (mod 64) time instance. This time instance corresponds to the update rate at the AP. If the test is positive, the method continues in step **1410**, otherwise the method returns to step **1406.**

[1268] In step **1406**, the system time is tested to establish whether the DRC Lock Bit was punctured into the RPC sub channel. In one embodiment, illustrated in step **1404**, the DRC Lock Bit is punctured into the RPC sub channel each eighth (mod 8) time instance. This time instance corresponds to the puncture rate at the AP. If the test is positive, the method continues in step **1408**, otherwise the method returns to step **1404.**

[1269] In step **1408**, the punctured DRC Lock Bit is recovered from the RPC channel and the energy of the DRC Lock Bit is combined with the energy of DRC Lock Bits from the same update interval. The method returns to step **1406**.

[1270] In step **1410**, the combined DRC Lock Bit energy is tested against a DRC Lock Bit threshold (DRC_LB_TH). If the test is positive, the method continues in step **1412**, otherwise the method returns to step **1414.**

[1271] In step **1412**, the DRC Lock Bit value is set to 1. The method continues in step **1416.**

[1272] In step **1414**, the DRC Lock Bit value is set to 0. The method continues in step **1416.**

[1273] In step **1416**, the variable containing the combined DRC Lock Bit energy is set to zero for the next update.

Decision Phase

[1274] The AT uses the DRC Lock Bit value obtainer in the Demodulation phase to make a decision with respect to a re-pointing. In one embodiment, the decision phase comprises (i) Accreditation phase, (ii) Certification phase, and (iii) Decision phase. The respective phases are described below.

Accreditation Phase

[1275] In the accreditation phase, the forward link SINR of the non-serving sectors (FL_NS) are compared to the forward link SINR of the current serving sector modified by a pre-determined hysteresis margin (FL_HYST). If the forward link SINR of the non-serving sector is greater than the forward link SINR of the serving sector modified by a pre-determined hysteresis margin, then the temporary credits (TEMP_CREDIT) associated with that non-serving sector are incremented; otherwise, the temporary credits associated with that non- serving sector are decremented.

[1276] The Accreditation phase in accordance with one embodiment is illustrated in **FIG. 15.** The method starts in step **1502.** The method continues in step **1504**.

[1277] In step **1504,** a variable count is set to zero. The method continues in step **1506**.

[1278] In step **1506**, the variable count is tested against an active set size. If the variable count is greater than the active set size, the method continues in the Certification phase, otherwise, the method continues in step **1508.**

[1279] In step **1508**, an inquiry is made whether the forward link SINR of the sector designated by the variable count is greater than the forward link SINR of the current serving sector modified by a pre-determined hysteresis margin. If the test is positive, the method continues in step **1512**, otherwise, the method continues in step **1510.**

[1280] In step **1510**, the temporary credits for the sector identified by the variable count are decreased by one. The method continues in step **1514**.

[1281] In step **1512**, the temporary credits for the sector identified by the variable count are increased by one. The method continues in step **1514**.

[1282] In step **1514**, the variable count is increased by one. The method returns to step **1506**.

Certification Phase

[1283] In the certification phase, the credits of the sectors are certified. The term certification as used herein means a decision, which sectors' credits (CREDITS) will be increased by the temporary credits accumulated by the sector during the accreditation phase. In one embodiment, the certification decision is made in accordance with the following rules:

If the DRC Lock Bit of the current serving sector is "in-lock", and if the DRC Lock Bit on a non-serving sector is "in-lock," then the credits of the non-serving sector are incremented by the DRC Lock Interval. The term DRC Lock interval as used herein means a number of time-slots over which the DRC Lock Indication has been sent;

If the DRC Lock Bit of the current serving sector is "out-of-lock", and if the DRC Lock Bit on a non-serving sector is "in-lock" then the credits of the non-serving sector are incremented by the number of accumulated temporary credits;

otherwise the credits of the non-serving sector are set to zero.

[1284] The Certification phase in accordance with one embodiment is illustrated in **FIG. 16.** The method starts in step **1602,** in which a variable count is set to zero. The method continues in step **1604**.

[1285] In step **1604**, the variable count is tested against an active set size. If the variable count is greater than the active set size, the method continues in the Decision phase, otherwise, the method continues in step **1606.**

[1286] In step **1606**, the DRC_LOCK of the serving sector is compared to 1. If the DRC_LOCK is equal to 1, the method continues in step **1610**; otherwise, the method continues in step **1608**.

[1287] In step **1608**, the DRC_LOCK of the non-serving sector identified by the variable count is compared to 1. If the DRC_LOCK is equal to 1, the method continues in step **1612**; otherwise, the method continues in step **1610**.

[1288] In step **1612**, the credits of the non-serving sector identified by the variable count is set to the value of temporary credits.

[1289] In step **1614**, the credits of the non-serving sector identified by the variable count is set to 0.

[1290] In step **1610**, the DRC_LOCK of the non-serving sector identified by the variable count is compared to 1. If the DRC_LOCK is equal to 1, the method continues in step **1616**; otherwise, the method continues in step **1614**.

[1291] In step **1616**, the credits of the non-serving sector identified by the variable count is set to the value of DRC Lock Update Interval.

[1292] In step **1618**, the variable count is increased by one. The method returns to step **1606**.

Decision Phase

[1293] In the decision phase, the AT makes a re-pointing decision in accordance with the certified credits. In one embodiment, the AT determines the non-serving sectors the certified credits of which is greater than or equal to the soft/softer hand-off delay of the sector. The AT then re-points to the one of the determined sectors that has the highest credits. If multiple sectors have equal credits then the AT repoints the DRC to the sector with the best forward link.

[1294] The Decision phase in accordance with one embodiment is illustrated in **FIG. 17.** The method starts in step **1702,** in which a variable count is set to zero. The method continues in step **1704**.

[1295] In step **1704**, the variable count is tested against an active set size. If the variable count is greater than the active set size, the method continues in step **1716**, otherwise, the method continues in step **1706.**

[1296] In step **1706**, the temporary credits of the sector identified by the variable count is compared to the soft (or softer) hand-off delay for the non-serving sector (NS_S_Th) identified by the variable count. If the credits are less that the soft (or softer) hand-off delay for the non-serving sector (NS_S_Th) identified by the variable count, the method continues in step **1710**; otherwise, the method continues in step **1712**.

[1297] In step **1710**, the re-pointing flag is set to zero. The method continues in step **1714**.

[1298] In step **1712**, the re-pointing flag is set to one. The method continues in step **1714**.

[1299] In step **1714**, the variable count is incremented. The method returns to step **1704**.

[1300] In step **1716**, the sectors with a re-pointing flag set to 1 are sorted in accordance to the sectors' accumulated credits. The method continues in step **1718**.

[1301] In step **1718**, a test is made whether two or more sectors have equal value of the accumulated credits. If the test is positive, the method continues in step **1720**, otherwise the method continues in step **1722**.

[1302] In step **1720**, the AT re-points to the sector with the greatest value of a forward link SINR. The method continues in step **1724.**

[1303] In step **1722**, the AT re-points to the sector with the greatest value of the accumulated credit. The method continues in step **1724.**

[1304] In step **1724**, the accumulated credits of all sectors are initialized to zero. The method returns to the Demodulation phase.

Re-pointing Using Only Forward Link

[1305] In all previously described embodiments, the re-pointing decision was made by the AT **104** in accordance with a condition of both a forward and a reverse links. As discussed, the AT **104** can also make the re-pointing decision in accordance with a condition of a forward link or a condition on a reverse link. In accordance with another embodiment, the AT **104** makes the re-pointing decision in accordance with a condition of a forward link only. Because no feedback from a sector to an AT is provided, all processing is carried out at the AT.

Access Terminal Processing

[1306] The processing method at the AT in accordance with the embodiment comprises the phases of (i) Initialization, (ii) Credit Accumulation, and (iii) Decision, as described in reference to paragraph **1.2**, and associated **FIGs**, modified as follows.

Initialization

[1307] During the initialization stage, the AT **104** selects a sector with the best forward link quality metric, i.e., the highest SINR, as the serving sector. The AT **104** sets the DRC for the selected sector "in-lock" and initializes credits for all non-serving sectors to zero.

[1308] In one embodiment, only one type of credits - switching credits – are defined. Consequently, **FIG. 4**, and the accompanying text only the switching credits are initialized to zero in step **412**.

Credit Accumulation

[1309] The switching credits are used to qualify a non-serving sector for re-pointing. The switching credits (CS_NS) are incremented if a forward link SINR of the non-serving sector (FL_NS) is greater than a forward link SINR of the current serving sector (FL_SS) modified by a pre-determined value (FL_SINR_Th). The CS_NS are decremented if the above condition is not satisfied.

[1310] The pre-determined value FL_SINR_Th is selected so that re-pointing to another sector results in an increase in forward link SINR and, consequently, in an increase in an average requested data rate.

[1311] In one embodiment, the minimum value for the credits is zero and the maximum for the credits is equal to a soft hand-off delay or a softer handoff delay. The delay used is determined based on whether or not the non-serving sector is in the same cell as the serving sector. If the non-serving sector is in the same cell as the serving sector then the softer handoff delay is used, and if the non-serving sector is in a cell different from the one that the serving sector is part of then the soft-handoff delay is used.

[1312] The credits, initialized to zero in the Initialization phase are accumulated during the Credit Accumulation phase. Consequently, referring to **FIG. 5**, and the accompanying text, steps **510, 511,** and **514** are deleted. Furthermore, step 508 is modified as follows:

[1313] In step **508**, a forward link SINR of a sector designated by the variable count is compared against forward link SINR of the current serving sector modified by the FL_SINR_Th. If the forward link SINR of the sector designated by the variable count is greater than the forward link SINR of the current serving sector modified by the FL_SINR_Th, the method continues in step **516**, otherwise, the method continues in step **512.**

Decision

[1314] Because no feedback information about the reverse link is presented to the AT, the sector selection is carried out in accordance with the switching credits.

[1315] To carry out the decision, the AT first ascertains if any of the non-serving sectors has switching credits greater than a threshold determined by the soft/softer delay (NS_S_Th) for the non-serving sector. (This, threshold is the same for both the switching and monitoring credits.) If at least one of the non-serving sectors has switching credits greater than the threshold, the AT re-points its DRC to the sector with the highest switching credits. If two or more non-serving sectors have equal switching credits, the sector with the highest current quality forward link is selected.

[1316] If none of the non-serving sectors has sufficient switching credits to mandate re-pointing, the AT continues pointing its DRC to the current serving Access Point.

[1317] The decision phase in accordance with one embodiment is illustrated in reference to **FIGs. 7** and **8**, and accompanying text In reference with **FIG. 7**, steps **714** through **722** are deleted. Steps **710** and **712** are modified as follows:

[1318] In step **710**, a value of the variable Cand_S identified by the variable count is set to 0. The method continues in step **724**.

[1319] In step **712**, a value of the variable Cand_S identified by the variable count is set to 1. The method continues in step **724.**

[1320] Referring to **FIG. 8**, the sector selection from **FIG. 7** continues. In reference with **FIG. 8**, steps **822** through **838**, and **842** through **846** are deleted. Steps **814**, **818**, and **820** are modified as follows:

[1321] In step **814**, the value of the variable CS_NS_count is ascertained. If the value of the variable CS_NS_count is equal to 1, the method continues in step **816**. If the value of the variable CS_NS_count is greater that 1, the method continues in step **818.** Otherwise, the method continues in step **840**.

[1322] In step **818**, the AT re-points the DRC to the candidate sector identified by the variable count that has the highest quality forward link. The method continues in step **820**.

[1323] In step **820**, the variable CS_NS is set to zero. The method returns to the credit accumulation phase.

[1324] Those of ordinary skill in the art will recognize that although the various embodiments were described in terms of flowcharts and methods, such was done for pedagogical purposes only. The methods can be performed by an apparatus, which in one embodiment comprises a processor interfaced with a transmitter and a receiver or other appropriate blocks at the AT and/or AP.

[1325] Those of skill in the art would understand that information and signals may be represented using any of a variety of different technologies and techniques. For example, data, instructions, commands, information, signals, bits, symbols, and chips that may be referenced throughout the above description may be represented by voltages, currents, electromagnetic waves, magnetic fields or particles, optical fields or particles, or any combination thereof.

[1326] Those of skill would further appreciate that the various illustrative logical blocks, modules, circuits, and algorithm steps described in connection with the embodiments disclosed herein may be implemented as electronic hardware, computer software, or combinations of both. To clearly illustrate this interchangeability of hardware and software, various illustrative components, blocks, modules, circuits, and steps have been described above generally in terms of their functionality. Whether such functionality is implemented as hardware or software depends upon the particular application and design constraints imposed on the overall system. Skilled artisans may implement the described functionality in varying ways for each particular application, but such implementation decisions should not be interpreted as causing a departure from the scope of the present invention.

[1327] The various illustrative logical blocks, modules, and circuits described in connection with the embodiments disclosed herein may be implemented or performed with a general purpose processor, a digital signal processor (DSP), an application specific integrated circuit (ASIC), a field programmable gate array (FPGA) or other programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the functions described herein. A general purpose processor may be a microprocessor, but in the alternative, the processor may be any conventional processor, controller, microcontroller, or state machine. A processor may also be implemented as a combination of computing devices, e.g., a combination of a DSP and a microprocessor, a plurality of microprocessors, one or more microprocessors in conjunction with a DSP core, or any other such configuration.

[1328] The steps of a method or algorithm described in connection with the embodiments disclosed herein may be embodied directly in hardware, in a software module executed by a processor, or in a combination of the two. A software module may reside in RAM memory, flash memory, ROM memory, EPROM memory, EEPROM memory, registers, hard disk, a removable disk, a CD-ROM, or any other form of storage medium known in the art. An exemplary storage medium is coupled to the processor such the processor can read information from, and write information to, the storage medium. In the alternative, the storage medium may be integral to the processor. The processor and the storage medium may reside in an ASIC. The ASIC may reside in a user terminal. In the alternative, the processor and the storage medium may reside as discrete components in a user terminal.

[1329] The previous description of the disclosed embodiments is provided to enable any person skilled in the art to make or use the present invention. Various modifications to these embodiments will be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other embodiments without departing from the spirit or scope of the invention. Thus, the present invention is not intended to be limited to the embodiments shown herein but is to be accorded the widest scope consistent with the principles and novel features disclosed herein.

[1331] **WHAT IS CLAIMED IS:**

CLAIMS

1 A method for directing communication between a remote station and a plurality of sectors in a data communication system, the remote station including a list of eligible sectors, the method comprising:

determining at the remote station a quality metric of a forward link for each sector in the remote station's list;

determining a quality metric of a reverse link to each sector in the remote station's list; and

directing communication between the remote station and one sector from the sectors in the remote station's list in accordance with said determined quality metric of a forward link and said determined quality metric of a reverse link.

2 The method as claimed in claim 1, wherein said data communication system comprises:

a wireless data communication system.

3. The method as claimed in claim 1, wherein said determining at the remote station a quality metric of a forward link for each sector in the remote station's list comprises:

measuring a signal-to-noise-and-interference-ratio of the forward link.

4. The method as claimed in claim 3, wherein said measuring a signal-to-noise-and-interference-ratio of the forward link comprises:

measuring a signal-to-noise-and-interference-ratio of a pilot signal on the forward link.

5 The method as claimed in claim 4, wherein said measuring a signal-to-noise-and-interference-ratio of a pilot signal on the forward link comprises:

measuring a signal-to-noise-and-interference-ratio of a non-continuous pilot signal on the forward link.

6 The method as claimed in claim 1, wherein said determining a quality metric of a reverse link to each sector in the remote station's list comprises:

processing at the remote station the forward link from each sector in the remote station's list.

7 The method as claimed in claim 6, wherein said processing at the remote station a forward link from each sector in the remote station's list comprises:

combining energy at specific positions of the forward link; and

determining the quality metric in accordance with said combined energy.

8 The method as claimed in claim 7, wherein said combining energy at specific positions of the forward link comprises:

combining energy at specific , periodic positions of the forward link.

9 The method as claimed in claim 7, wherein said combining energy at specific positions of the forward link comprises:

combining energy at specific positions of the forward link, said specific positions being different for at least two of the sectors.

10 The method as claimed in claim 6, wherein said processing at the remote station the forward link from each sector in the remote station's list comprises:

ascertaining a first signal value at a position in a first channel of the forward link for at least one sector in the remote station's list;

determining the quality metric in accordance with said ascertained first signal value for the at least one sector in the remote station's list;

ascertaining a second signal value at a position in a second channel of the forward link for remaining sectors in the remote station's list; and

determining a second quality metric in accordance with said ascertained second signal value for the remaining sectors in the remote station's list.

11 The method as claimed in claim 6, wherein said determining a quality metric to a reverse link for each sector in the remote station's list further comprises:

measuring at each sector the quality metric of the reverse link;

processing the quality metric to provide an indicator of the quality metric; and

providing the indicator on a forward link.

12 The method as claimed in claim 11, wherein said providing the indicator on a forward link comprises:

puncturing the indicator into specific positions of the forward link.

13 The method as claimed in claim 11, wherein said providing the indicator into a forward link comprises:

inserting the indicator into a specific position of the forward link.

14 The method as claimed in claim 7, wherein said directing communication between the remote station and one sector from the sectors in the remote station's list in accordance with said determined quality metric of a forward link and said determined quality metric of a reverse link comprises:

assigning credits to each sector in the remote station's list except a sector currently serving the remote station in accordance with said determined quality metric of a forward link and said determined quality metric of the reverse link; and

directing communication between the remote station and one sector from the sectors in the remote station's list in accordance with said assigned credits.

15 The method as claimed in claim 14, wherein said directing communication between the remote station and one sector from the sectors in the remote station's list in accordance with said assigned credits comprises:

determining sectors with said assigned credits greater than a first threshold; and

directing communication to a sector from said determined sectors with the highest of said assigned credits.

16 The method as claimed in claim 15, further comprising:

directing communication to a sector from said determined sectors with the highest forward link quality metric when at least two of said determined sectors have equal highest assigned credits.

17 The method as claimed in claim 10, wherein said directing communication between the remote station and one sector from the sectors in the remote station's list in accordance with said determined quality metric of a forward link and said determined quality metric of a reverse link comprises:

assigning credits to each sector in the remote station's list except the sector currently serving the remote station in accordance with said determined quality metric of a forward link, said determined quality metric of the reverse link, and said determined second quality metric of the reverse link; and directing communication between the remote station and one sector from the sectors in the remote station's list in accordance with said assigned credits.

18 The method as claimed in claim 17, wherein said assigning credits to each sector in the remote station's list except the sector currently serving the remote station in accordance with said determined quality metric of a forward link, said determined quality metric of the reverse link, and said determined second quality metric of the reverse link comprises:

decreasing credits of a sector if:

said determined second quality metric of the reverse link for the sector and said determined second quality metric of the reverse link for a sector currently serving the remote station are greater than a second threshold; and

decreasing a first type of credits of a sector if:

said determined quality metric of the reverse link for the sector is insufficient; or if:

said quality metric of a forward link of the sector is less than the quality metric of the forward link of the sector currently serving the remote station; and

said first quality metric of the reverse link for a sector was not determined.

19 The method as claimed in claim 18, wherein said decreasing a first type of credits comprises:

decreasing switching credits of the sector.

20 The method as claimed in claim 18, further comprising:

increasing the first type of credits of a sector if:

the sector's quality metric of a forward link is greater than the quality metric of the forward link of the sector currently serving the remote station; and the sector's determined second quality metric of the reverse link is less than the second threshold; or if:

the sector's quality metric of a forward link is greater than the quality metric of the forward link of the sector currently serving the remote station; and

the sector's determined quality metric of the reverse link is sufficient; and

increasing a second type of credits of a sector if:

the sector's quality metric of a forward link is greater than the quality metric of the forward link of the sector currently serving the remote station;

said determined second quality metric of the reverse link of the sector's quality metric of a reverse link is greater than the second threshold; and

said determined second quality metric of the reverse link of the sector currently serving the remote station is less than the second threshold.

21 The method as claimed in claim 18, wherein said increasing a second type of credits comprises:

increasing monitoring credits of the sector.

22 The method as claimed in claim 17, wherein said directing communication between the remote station and one sector from the sectors in the remote station's list in accordance with said assigned credits comprises:

directing communication to a sector with the highest assigned first type of credits, when said determined quality metric of a reverse link for a sector currently serving the remote station is insufficient.

23 The method as claimed in claim 22, further comprising:

directing communication to a sector with the highest reverse link quality metric when at least two sectors have equal highest assigned first type of credits.

24 The method as claimed in claim 22, further comprising:

directing communication to a sector with the highest forward link quality metric when at least two sectors have equal highest assigned first type of credits.

25 The method as claimed in claim 22, further comprising:

directing communication to a sector with the highest assigned second type of credits, when all sectors have assigned first type of credits equal to zero.

26 The method as claimed in claim 25, further comprising:

directing communication to a sector with the highest reverse link quality metric when at least two sectors have equal highest assigned second type of credits.

27 The method as claimed in claim 25, further comprising:

directing communication to a sector with the highest forward link quality metric when at least two sectors have equal highest assigned second type of credits.

28 The method as claimed in claim 17, wherein said directing communication between the remote station and one sector from the sectors in the remote station's list in accordance with said assigned credits comprises:

determining sectors with said assigned first type of credits greater than a third threshold; and

directing communication to a determined sector with the highest assigned first type of credits, when said determined quality metric of a reverse link for a sector currently serving the remote station is sufficient.

29 The method as claimed in claim 28, further comprising:

directing communication to a determined sector with the highest reverse link quality metric when at least two determined sectors have equal highest assigned first type of credits.

30 The method as claimed in claim 28, further comprising:

directing communication to a determined sector with the highest forward link quality metric when at least two determined sectors have equal highest assigned first type of credits.

31 The method as claimed in claim 28, further comprising:

determining sectors with said assigned second type of credits above a fourth threshold; and

directing communication to said determined sector with the highest assigned second type of credits when none of the sectors has first type of credits above the third threshold.

32 The method as claimed in claim 31, further comprising:

directing communication to a determined sector with the highest reverse link quality metric when at least two determined sectors have equal highest assigned second type of credits.

33 The method as claimed in claim 31, further comprising:

directing communication to a determined sector with the highest forward link quality metric when at least two determined sectors have equal highest assigned second type of credits.

34 A method for directing communication between a remote station and a plurality of sectors in a data communication system, the remote station having a list of sectors eligible for communication, the method comprising:

determining at the remote station a quality metric of a forward link for each sector in the remote station's list; and directing communication between the remote station and one sector from the sectors in the remote station's list in accordance with said determined quality metric of a forward link.

35 The method as claimed in claim 34, wherein said data communication system comprises:

a wireless data communication system.

36 The method as claimed in claim 34, wherein said determining at the remote station a quality metric of a forward link for each sector in the remote station's list comprises:

measuring a signal-to-noise-and-interference-ratio of the forward link.

37 The method as claimed in claim 36, wherein said measuring a signal-to-noise-and-interference-ratio of the forward link comprises:

measuring a signal-to-noise-and-interference-ratio of a pilot signal on the forward link.

38 The method as claimed in claim 37, wherein said measuring a signal-to-noise-and-interference-ratio of a pilot signal on the forward link comprises:

measuring a signal-to-noise-and-interference-ratio of a non-continuous pilot signal on the forward link.

39 The method as claimed in claim 34, wherein said directing communication between the remote station and one sector from the sectors in the remote station's list in accordance with said determined quality metric of a forward link comprises:

assigning credits to each sector in the remote station's list except a sector currently serving the remote station in accordance with said determined quality metric of a forward link; and directing communication between the remote station and one sector from the sectors in the remote station's list in accordance with said assigned credits.

40 The method as claimed in claim 39, wherein said assigning credits to each sector in the remote station's list except a sector currently serving the remote station in accordance with said determined quality metric of a forward link comprises:

increasing credits of a sector if the sector's quality metric of a forward link is greater than said quality metric of the forward link of the sector currently serving the remote station modified by a pre-determined value.

41 The method as claimed in claim 39, wherein said assigning credits to each sector in the remote station's list except a sector currently serving the remote station in accordance with said determined quality metric of a forward link comprises:

decreasing credits of a sector if the sector's quality metric of a forward link is less than the quality metric of the forward link of the sector currently serving the remote station modified by a pre-determined value.

42 The method as claimed in claim 39, wherein said directing communication between the remote station and one sector from the sectors in the remote station's list in accordance with said assigned credits comprises:

determining sectors with assigned credits greater than a threshold; and

directing communication to a determined sector with the highest assigned credits.

43 The method as claimed in claim 42, further comprising:

directing communication to a determined sector with the highest current forward link quality metric when at least two determined sectors have equal highest assigned credits.

44 The method as claimed in claim 14, wherein said assigning credits to each sector in the remote station's list except a sector currently serving the remote station in accordance with said determined quality metric of a forward link and said determined quality metric of the reverse link comprises:

increasing temporary credits of a sector if the sector's quality metric of a forward link is greater than said quality metric of the forward link of the sector currently serving the remote station modified by a pre-determined value;

decreasing temporary credits of a sector if the sector's quality metric of a forward link is less than the quality metric of the forward link of the sector currently serving the remote station modified by a pre-determined value;

assigning credits equal to said temporary credits to a sector if:

said determined quality metric of a reverse link of a sector currently serving the sector is insufficient; and

said determined quality metric of a reverse link of the sector is sufficient; and

assigning credits equal to a value of the sector if:

said determined quality metric of a reverse link of a sector currently serving the sector is sufficient; and

said determined quality metric of a reverse link of the sector is sufficient; and

assigning credits equal to zero to the sector otherwise.

45. The method as claimed in claim 44, wherein said assigning credits equal to a value of the sector comprises:

assigning credits equal to an update interval of said determining the quality metric in accordance with said combined energy.

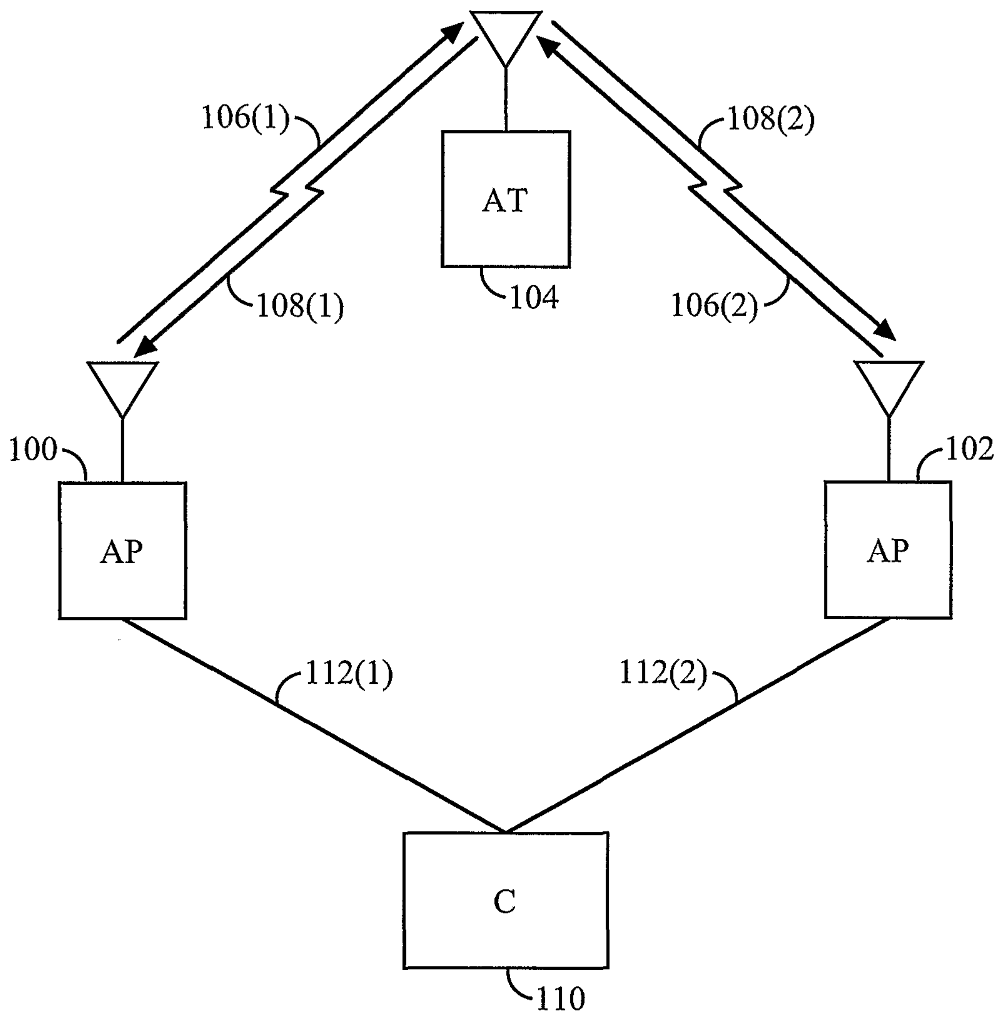


FIG. 1

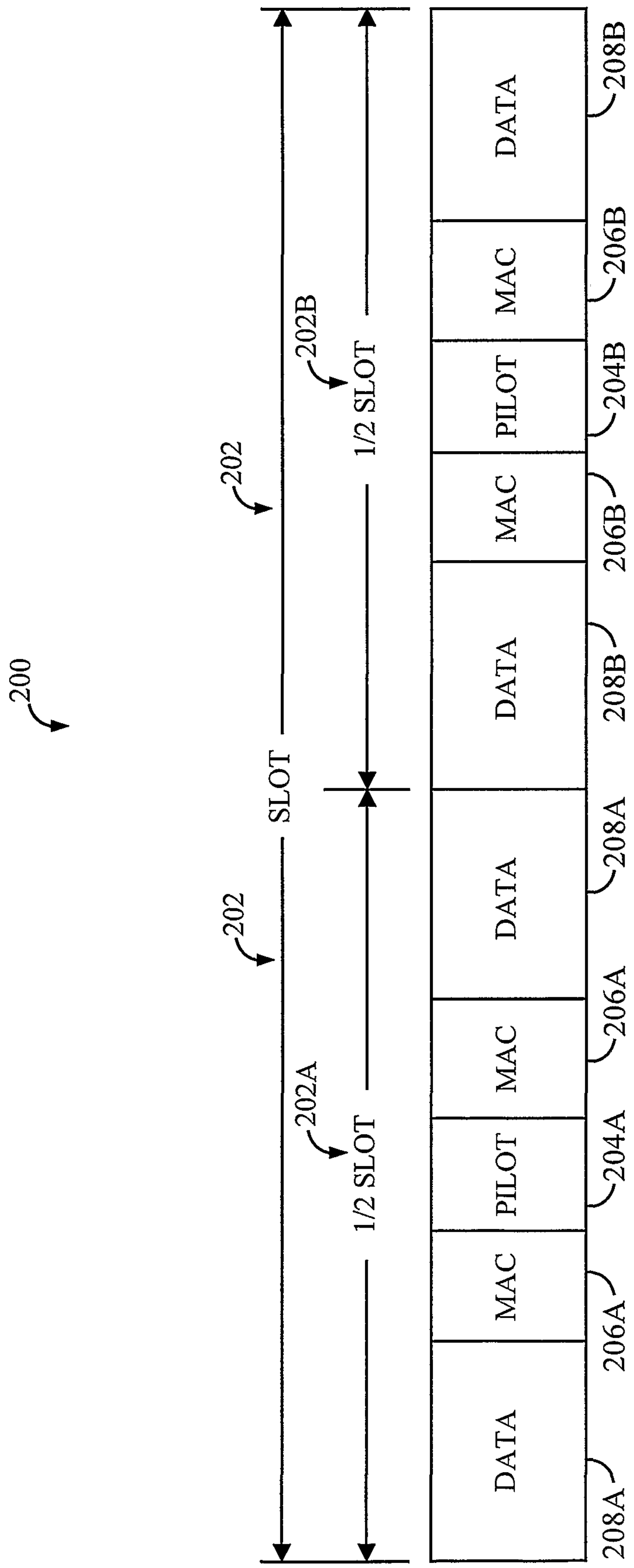

200
SLOT
202
202
1/2 SLOT
202A
1/2 SLOT
202B
DATA
MAC
PILOT
MAC
DATA
DATA
MAC
PILOT
MAC
DATA
208A
206A
204A
206A
208A
208B
206B
204B
206B
208B

FIG. 2

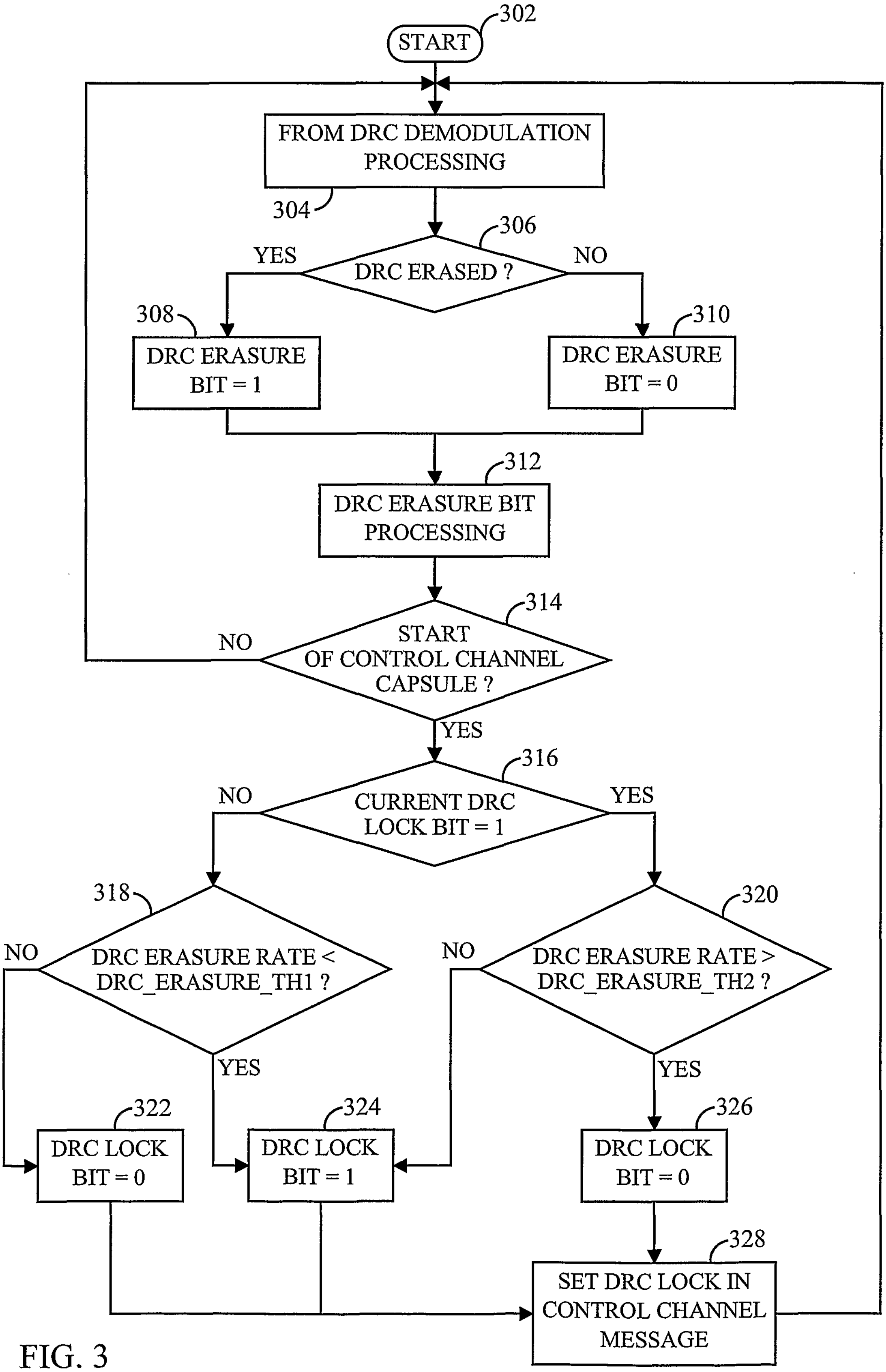

302
START
FROM DRC DEMODULATION PROCESSING
304
306
DRC ERASED ?
YES
NO
308
DRC ERASURE BIT = 1
310
DRC ERASURE BIT = 0
312
DRC ERASURE BIT PROCESSING
314
START OF CONTROL CHANNEL CAPSULE ?
NO
YES
316
CURRENT DRC LOCK BIT = 1
NO
YES
318
DRC ERASURE RATE < DRC_ERASURE_TH1 ?
NO
YES
320
DRC ERASURE RATE > DRC_ERASURE_TH2 ?
NO
YES
322
DRC LOCK BIT = 0
324
DRC LOCK BIT = 1
326
DRC LOCK BIT = 0
328
SET DRC LOCK IN CONTROL CHANNEL MESSAGE

FIG. 3

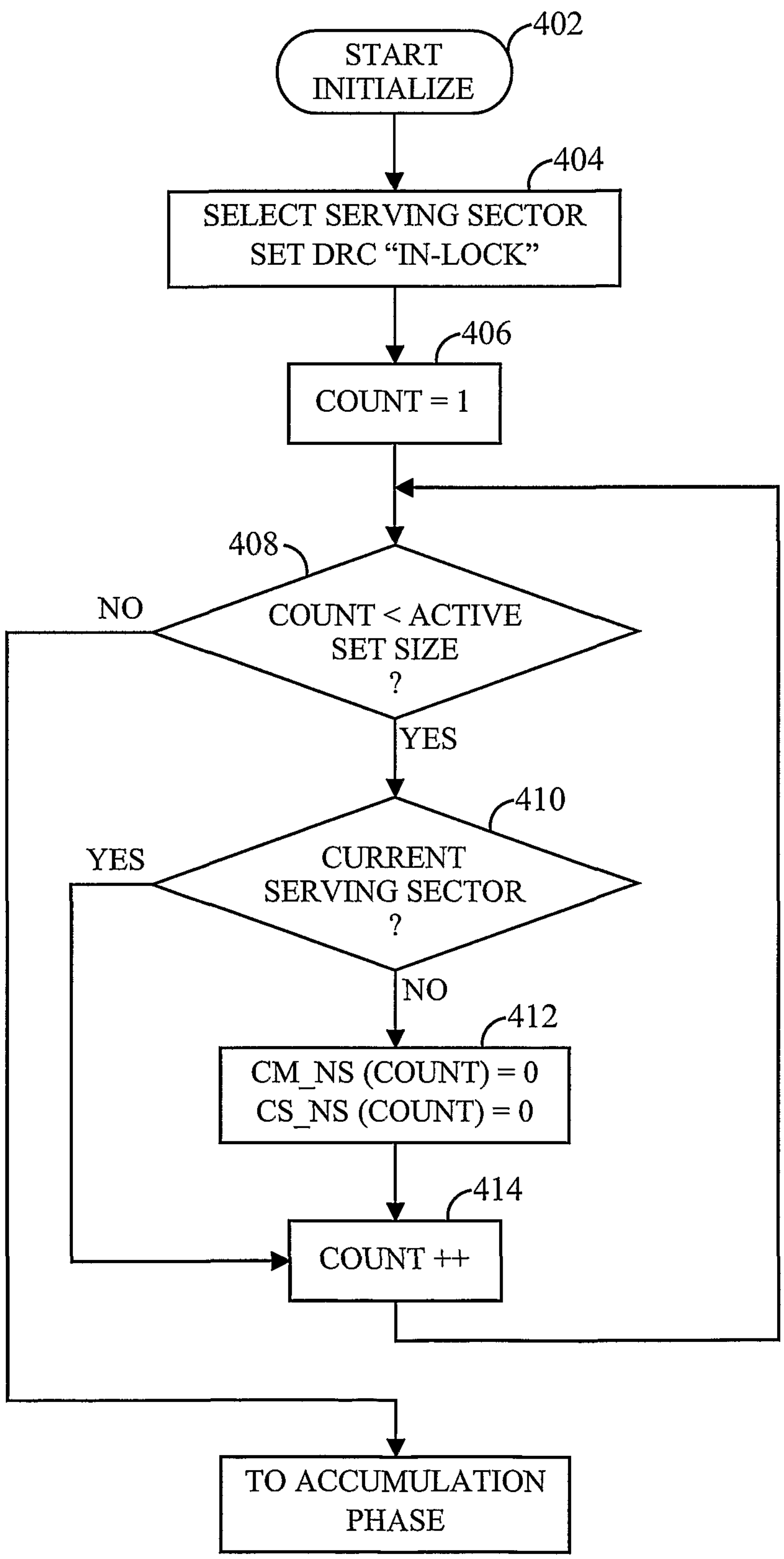

START
INITIALIZE
402
SELECT SERVING SECTOR
SET DRC "IN-LOCK"
404
COUNT = 1
406
408
COUNT < ACTIVE
SET SIZE
?
NO
YES
410
CURRENT
SERVING SECTOR
?
YES
NO
412
CM_NS (COUNT) = 0
CS_NS (COUNT) = 0
414
COUNT ++
TO ACCUMULATION
PHASE

FIG. 4

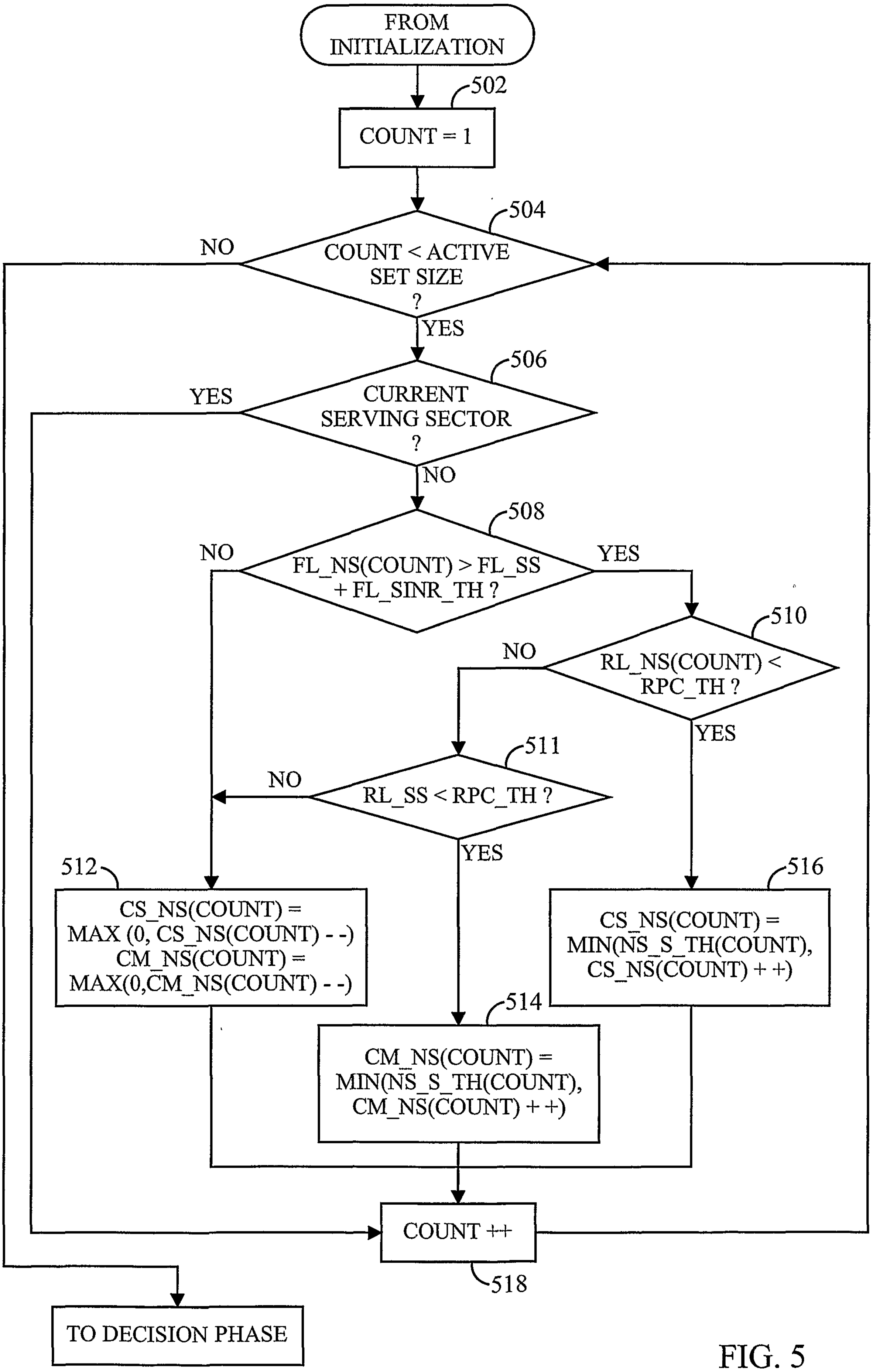

FROM INITIALIZATION
502
COUNT = 1
504
COUNT < ACTIVE SET SIZE ?
NO
YES
506
CURRENT SERVING SECTOR ?
YES
NO
508
FL_NS(COUNT) > FL_SS + FL_SINR_TH ?
NO
YES
510
RL_NS(COUNT) < RPC_TH ?
NO
YES
511
RL_SS < RPC_TH ?
NO
YES
512
CS_NS(COUNT) = MAX (0, CS_NS(COUNT) - -) CM_NS(COUNT) = MAX(0,CM_NS(COUNT) - -)
514
CM_NS(COUNT) = MIN(NS_S_TH(COUNT), CM_NS(COUNT) + +)
516
CS_NS(COUNT) = MIN(NS_S_TH(COUNT), CS_NS(COUNT) + +)
COUNT ++
518
TO DECISION PHASE

FIG. 5

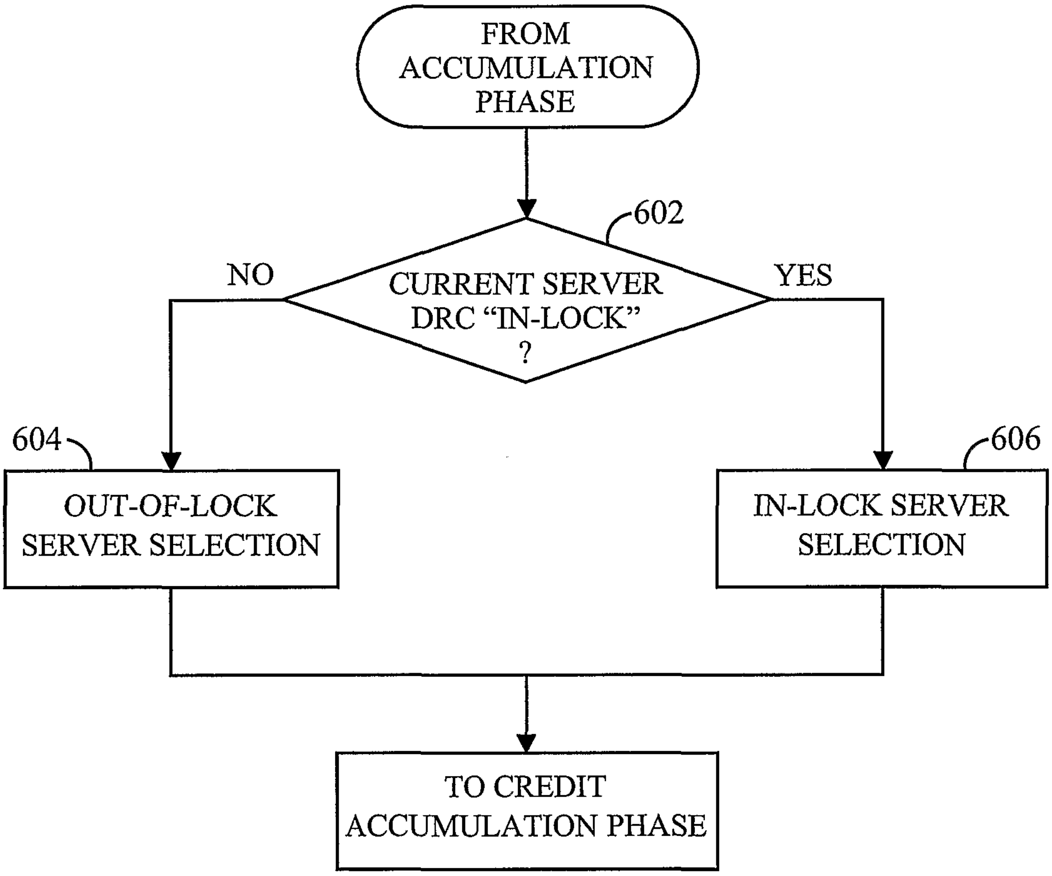

FROM ACCUMULATION PHASE
602
NO
YES
CURRENT SERVER DRC "IN-LOCK" ?
604
606
OUT-OF-LOCK SERVER SELECTION
IN-LOCK SERVER SELECTION
TO CREDIT ACCUMULATION PHASE

FIG. 6

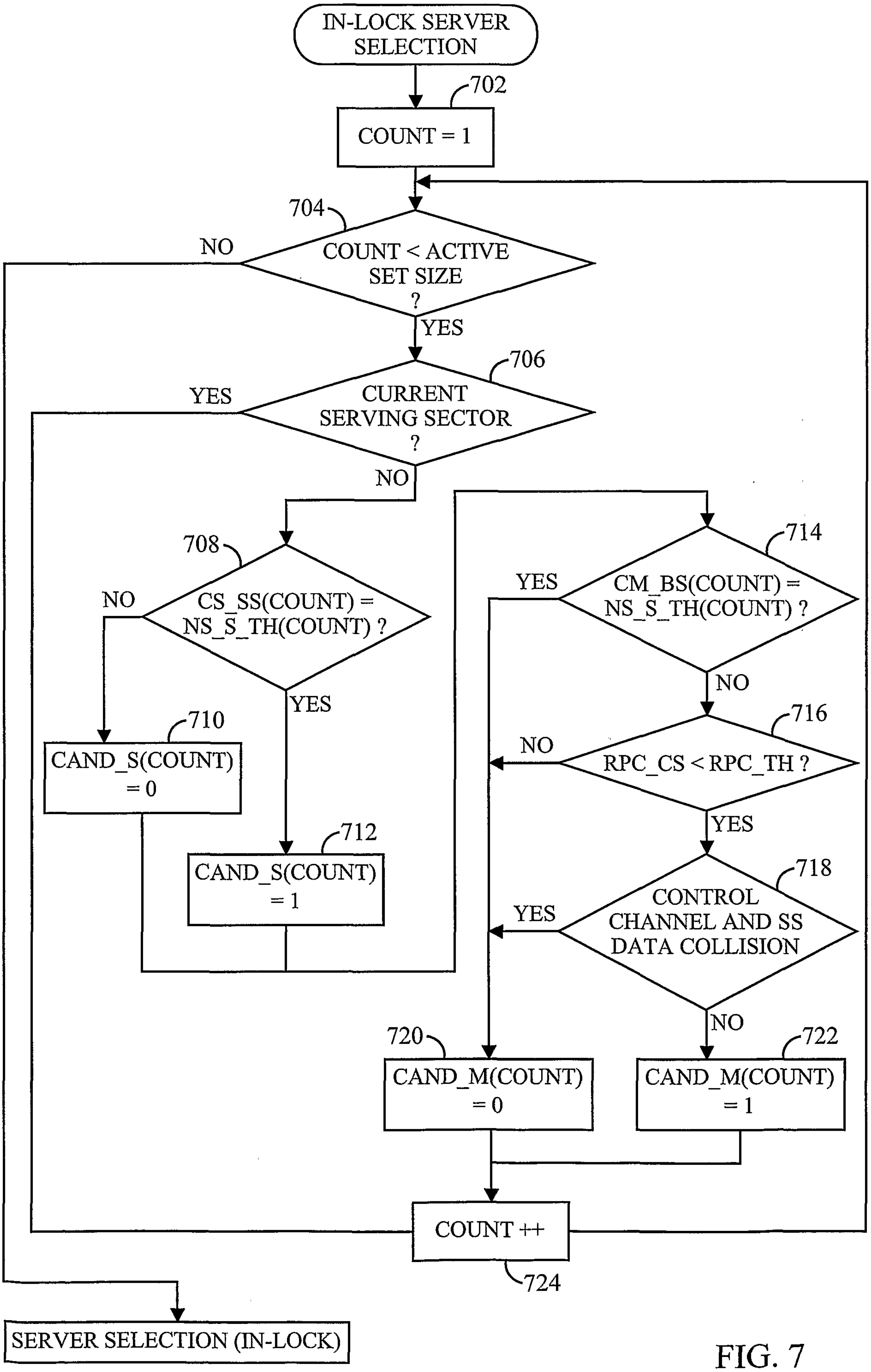

IN-LOCK SERVER SELECTION
702
COUNT = 1
704
COUNT < ACTIVE SET SIZE ?
NO
YES
706
CURRENT SERVING SECTOR ?
YES
NO
708
CS_SS(COUNT) = NS_S_TH(COUNT) ?
NO
YES
710
CAND_S(COUNT) = 0
712
CAND_S(COUNT) = 1
714
CM_BS(COUNT) = NS_S_TH(COUNT) ?
YES
NO
716
RPC_CS < RPC_TH ?
NO
YES
718
CONTROL CHANNEL AND SS DATA COLLISION
YES
NO
720
CAND_M(COUNT) = 0
722
CAND_M(COUNT) = 1
COUNT ++
724
SERVER SELECTION (IN-LOCK)

FIG. 7

FIG. 8

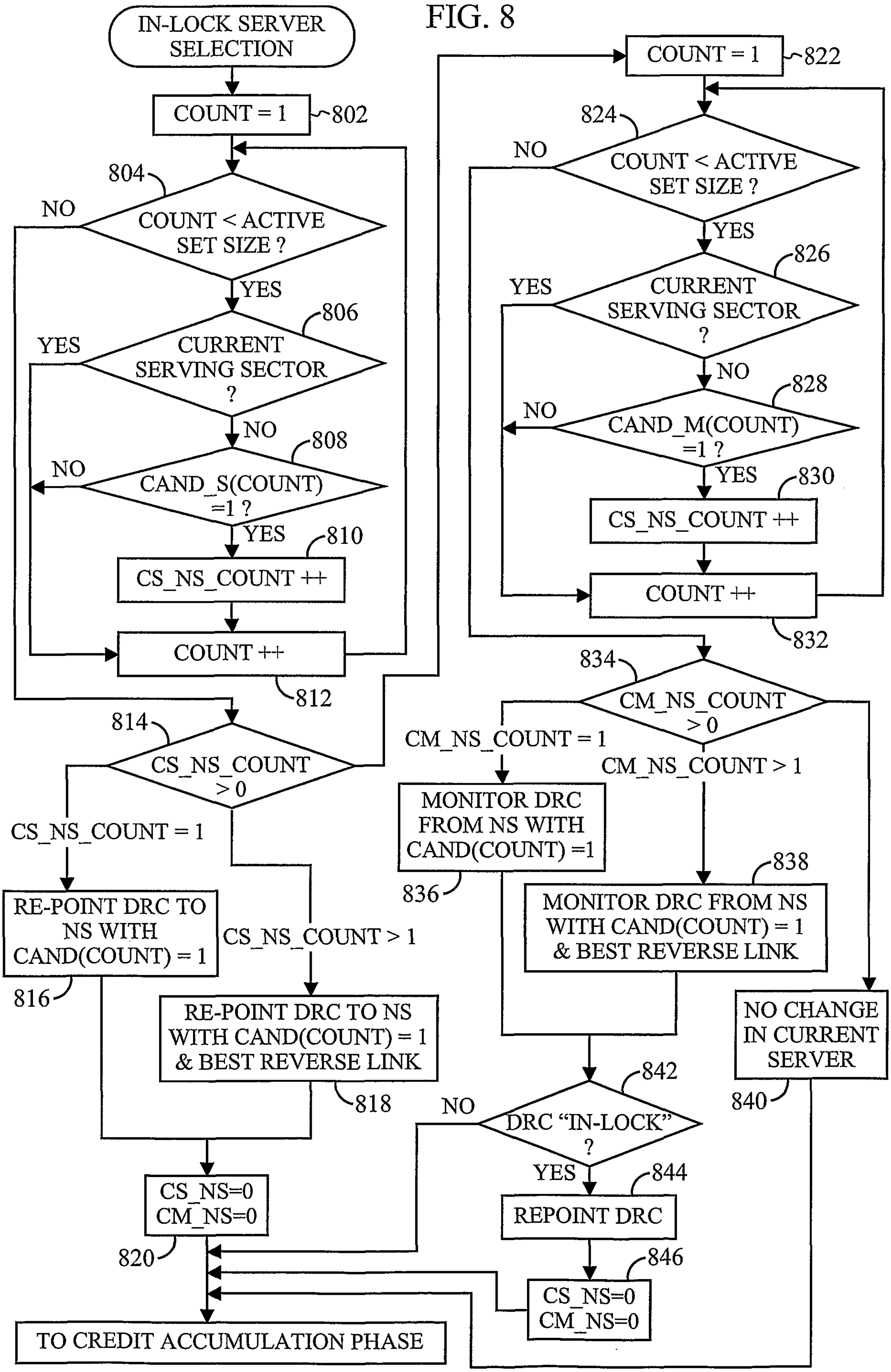
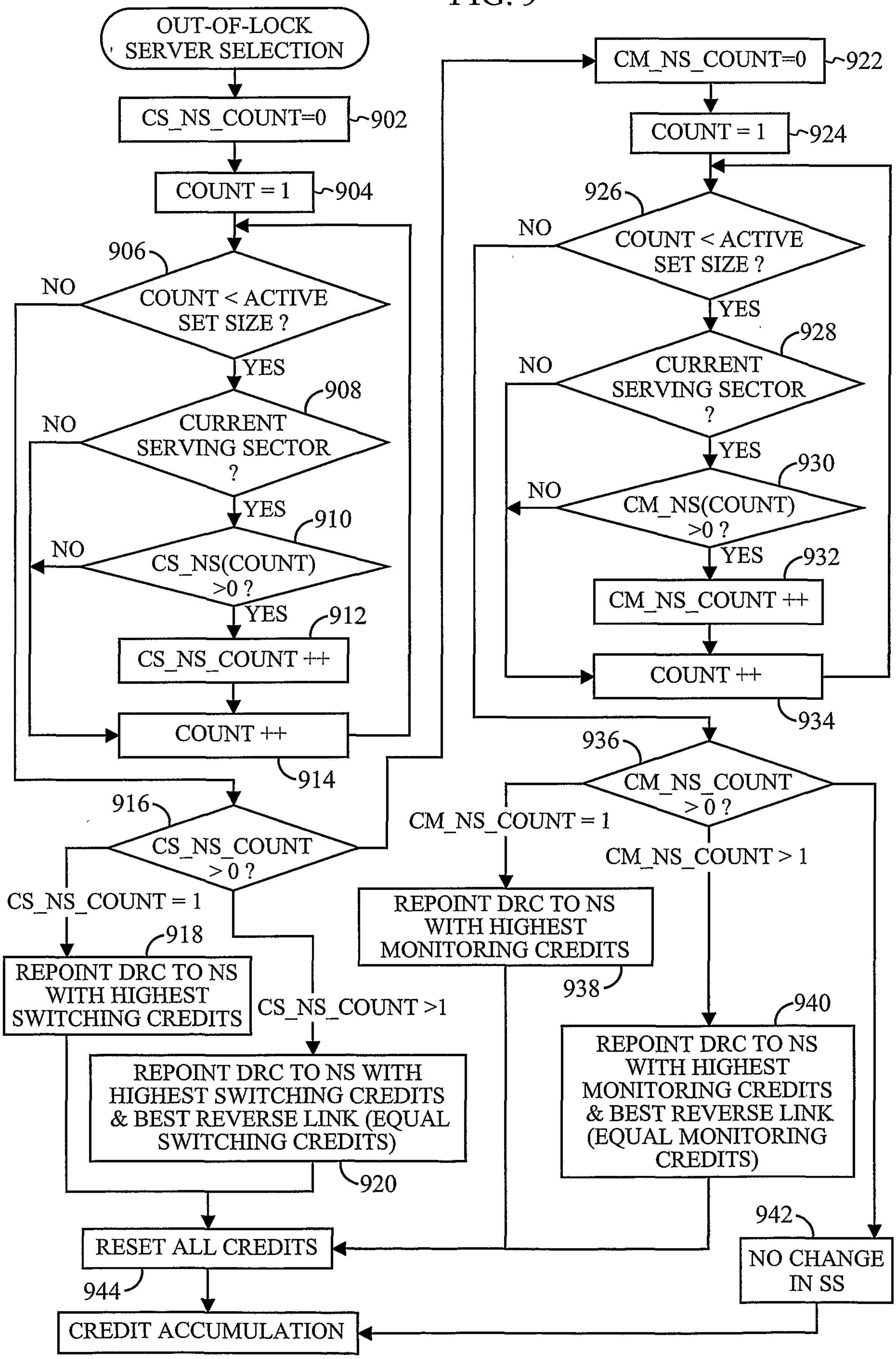

IN-LOCK SERVER SELECTION
COUNT = 1
802
804
COUNT < ACTIVE SET SIZE ?
NO
YES
806
CURRENT SERVING SECTOR ?
YES
NO
808
CAND_S(COUNT) =1 ?
NO
YES
810
CS_NS_COUNT ++
COUNT ++
812
814
CS_NS_COUNT > 0
CS_NS_COUNT = 1
RE-POINT DRC TO NS WITH CAND(COUNT) = 1
816
CS_NS_COUNT > 1
RE-POINT DRC TO NS WITH CAND(COUNT) = 1 & BEST REVERSE LINK
818
CS_NS=0 CM_NS=0
820
TO CREDIT ACCUMULATION PHASE
COUNT = 1
822
824
COUNT < ACTIVE SET SIZE ?
NO
YES
826
CURRENT SERVING SECTOR ?
YES
NO
828
CAND_M(COUNT) =1 ?
NO
YES
830
CS_NS_COUNT ++
COUNT ++
832
834
CM_NS_COUNT > 0
CM_NS_COUNT = 1
MONITOR DRC FROM NS WITH CAND(COUNT) =1
836
CM_NS_COUNT > 1
838
MONITOR DRC FROM NS WITH CAND(COUNT) = 1 & BEST REVERSE LINK
NO CHANGE IN CURRENT SERVER
840
842
DRC "IN-LOCK" ?
NO
YES
844
REPOINT DRC
846
CS_NS=0 CM_NS=0

FIG. 9


OUT-OF-LOCK SERVER SELECTION
CS_NS_COUNT=0
902
COUNT = 1
904
906
COUNT < ACTIVE SET SIZE ?
NO
YES
908
CURRENT SERVING SECTOR ?
NO
YES
910
CS_NS(COUNT) >0 ?
NO
YES
912
CS_NS_COUNT ++
COUNT ++
914
916
CS_NS_COUNT > 0 ?
CS_NS_COUNT = 1
918
REPOINT DRC TO NS WITH HIGHEST SWITCHING CREDITS
CS_NS_COUNT >1
REPOINT DRC TO NS WITH HIGHEST SWITCHING CREDITS & BEST REVERSE LINK (EQUAL SWITCHING CREDITS)
920
CM_NS_COUNT=0
922
COUNT = 1
924
926
COUNT < ACTIVE SET SIZE ?
NO
YES
928
CURRENT SERVING SECTOR ?
NO
YES
930
CM_NS(COUNT) >0 ?
NO
YES
932
CM_NS_COUNT ++
COUNT ++
934
936
CM_NS_COUNT > 0 ?
CM_NS_COUNT = 1
CM_NS_COUNT > 1
REPOINT DRC TO NS WITH HIGHEST MONITORING CREDITS
938
940
REPOINT DRC TO NS WITH HIGHEST MONITORING CREDITS & BEST REVERSE LINK (EQUAL MONITORING CREDITS)
942
NO CHANGE IN SS
RESET ALL CREDITS
944
CREDIT ACCUMULATION

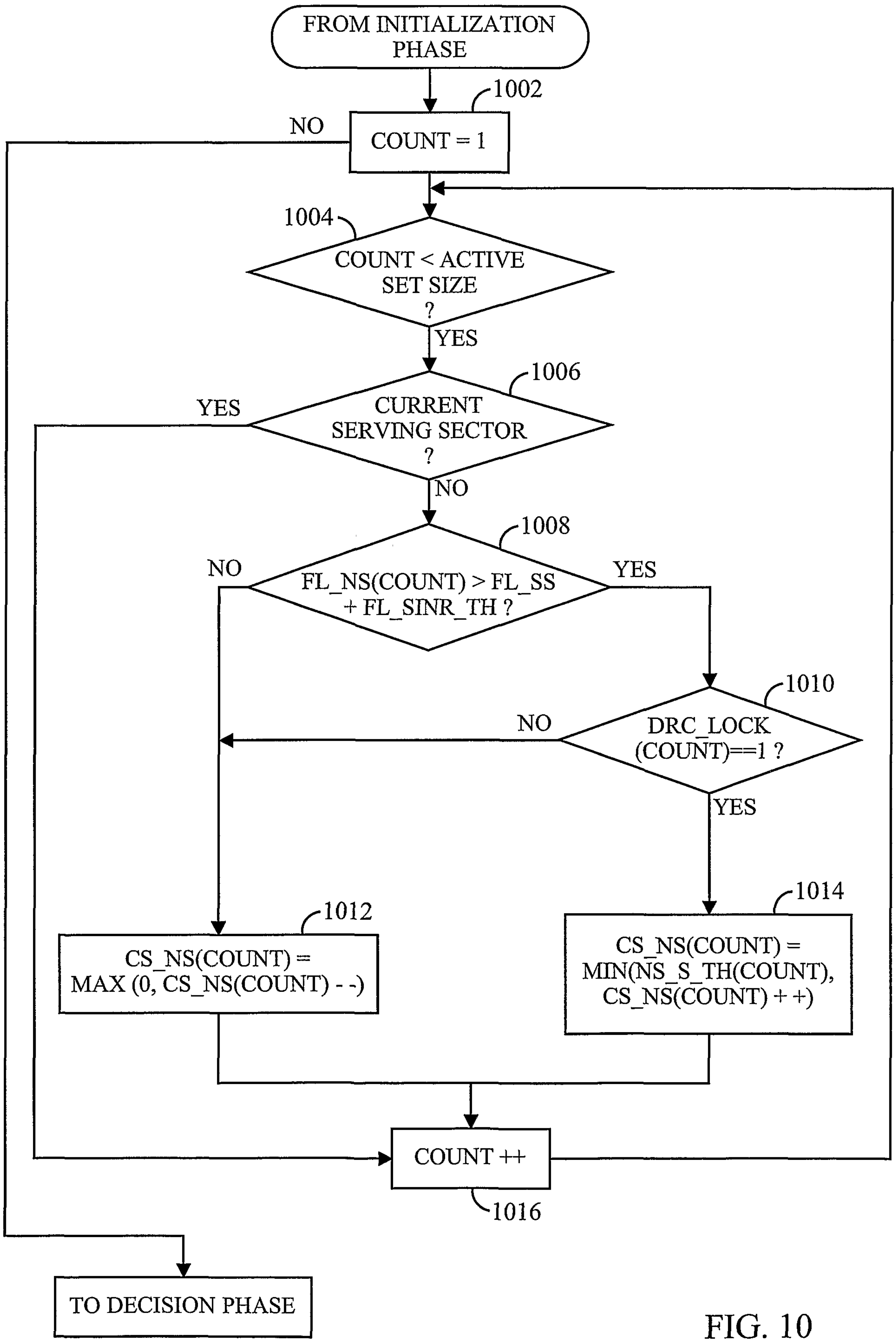

FROM INITIALIZATION PHASE
1002
COUNT = 1
NO
1004
COUNT < ACTIVE SET SIZE ?
YES
1006
CURRENT SERVING SECTOR ?
YES
NO
1008
FL_NS(COUNT) > FL_SS + FL_SINR_TH ?
NO
YES
1010
DRC_LOCK (COUNT)==1 ?
NO
YES
1012
CS_NS(COUNT) = MAX (0, CS_NS(COUNT) - -)
1014
CS_NS(COUNT) = MIN(NS_S_TH(COUNT), CS_NS(COUNT) + +)
COUNT ++
1016
TO DECISION PHASE

FIG. 10

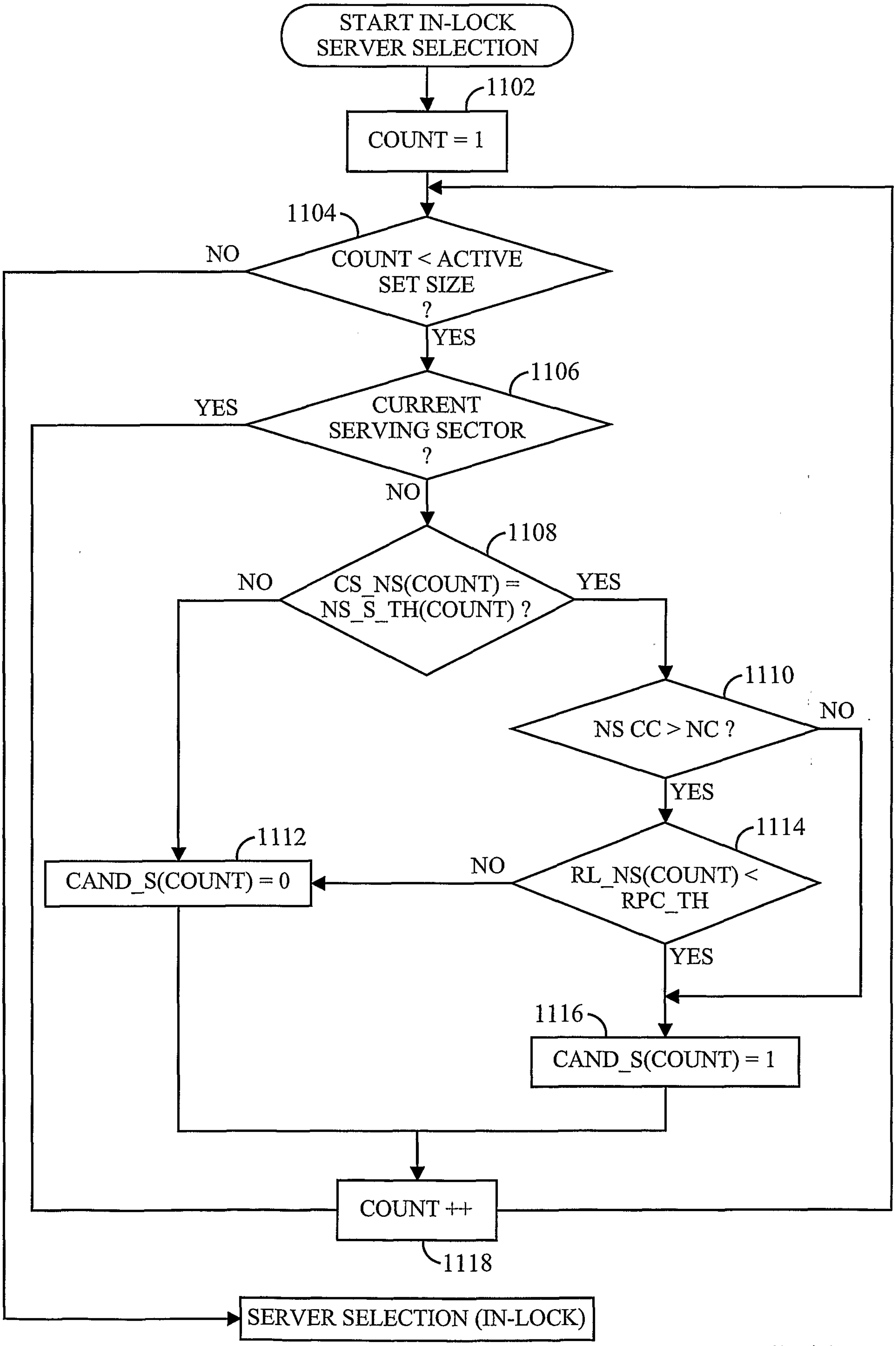
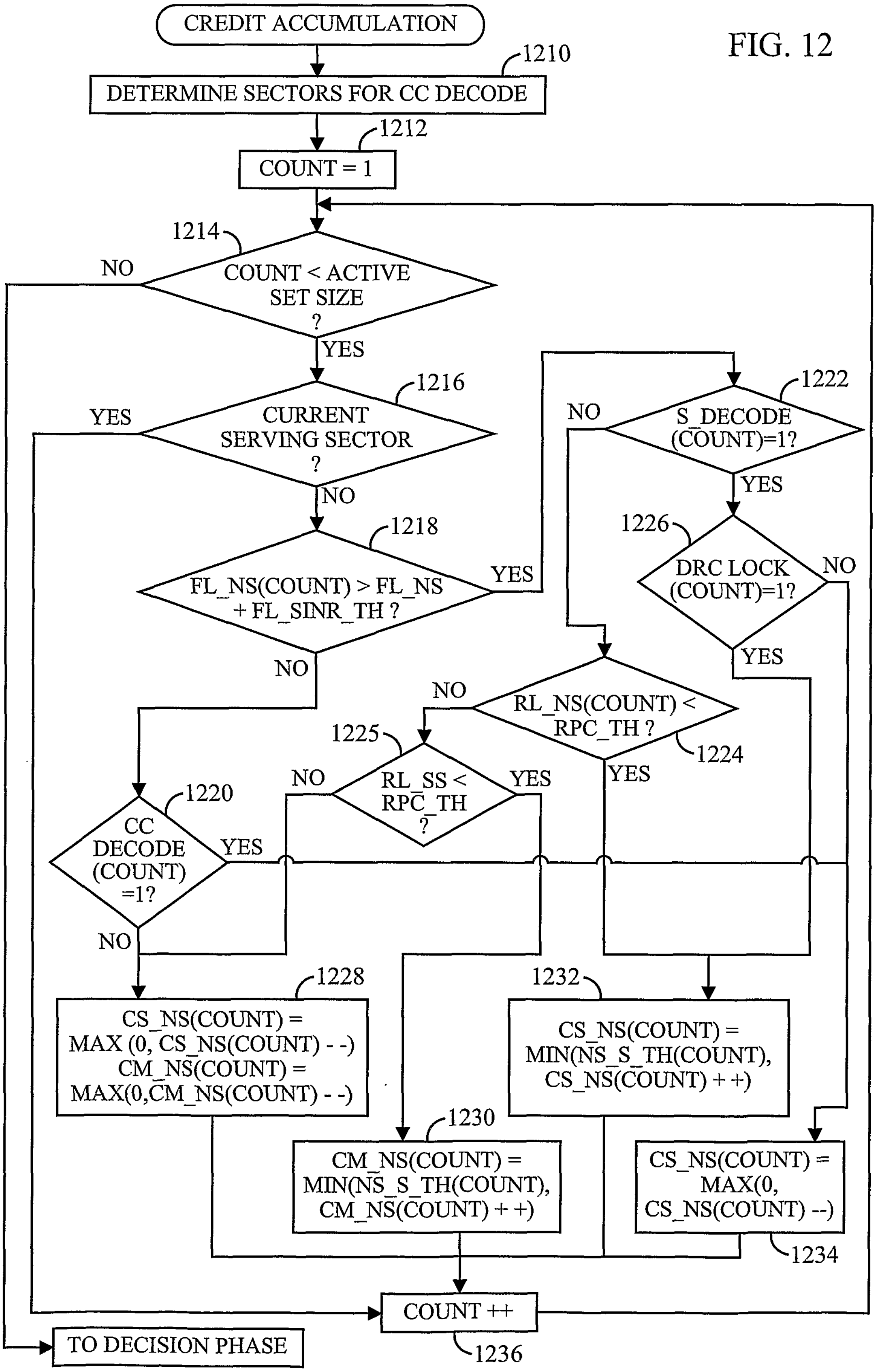

START IN-LOCK SERVER SELECTION
1102
COUNT = 1
1104
COUNT < ACTIVE SET SIZE ?
NO
YES
1106
CURRENT SERVING SECTOR ?
YES
NO
1108
CS_NS(COUNT) = NS_S_TH(COUNT) ?
NO
YES
1110
NS CC > NC ?
NO
YES
1112
CAND_S(COUNT) = 0
1114
RL_NS(COUNT) < RPC_TH
NO
YES
1116
CAND_S(COUNT) = 1
COUNT ++
1118
SERVER SELECTION (IN-LOCK)

FIG. 11

FIG. 12


CREDIT ACCUMULATION
1210
DETERMINE SECTORS FOR CC DECODE
1212
COUNT = 1
1214
COUNT < ACTIVE SET SIZE ?
NO
YES
1216
CURRENT SERVING SECTOR ?
YES
NO
1218
FL_NS(COUNT) > FL_NS + FL_SINR_TH ?
YES
NO
1222
S_DECODE (COUNT)=1?
NO
YES
1226
DRC LOCK (COUNT)=1?
NO
YES
1224
RL_NS(COUNT) < RPC_TH ?
NO
YES
1225
RL_SS < RPC_TH ?
NO
YES
1220
CC DECODE (COUNT) =1?
YES
NO
1228
CS_NS(COUNT) = MAX (0, CS_NS(COUNT) - -) CM_NS(COUNT) = MAX(0,CM_NS(COUNT) - -)
1232
CS_NS(COUNT) = MIN(NS_S_TH(COUNT), CS_NS(COUNT) + +)
1230
CM_NS(COUNT) = MIN(NS_S_TH(COUNT), CM_NS(COUNT) + +)
CS_NS(COUNT) = MAX(0, CS_NS(COUNT) --)
1234
COUNT ++
1236
TO DECISION PHASE

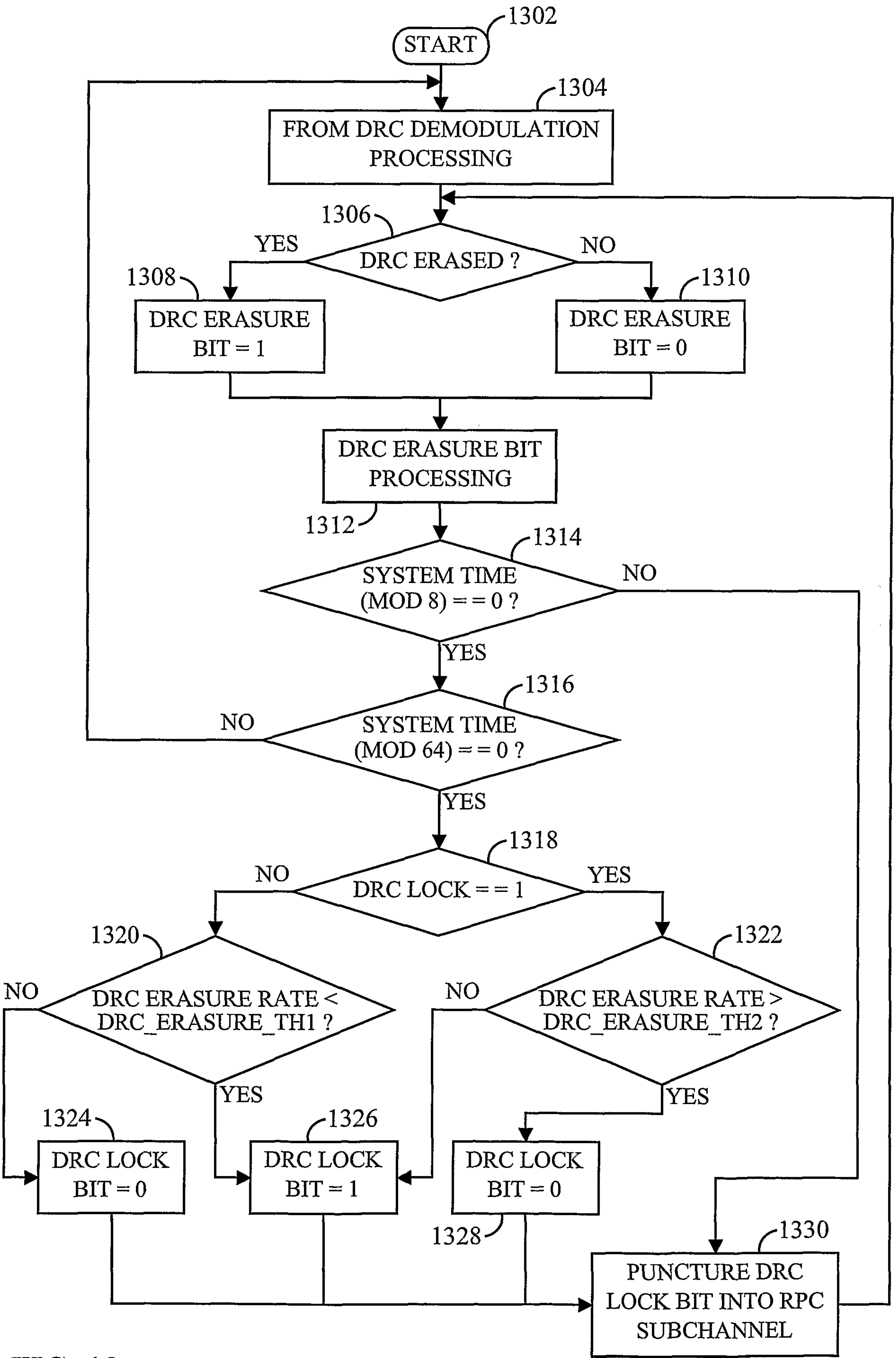

1302
START
1304
FROM DRC DEMODULATION PROCESSING
1306
DRC ERASED ?
YES
NO
1308
DRC ERASURE BIT = 1
1310
DRC ERASURE BIT = 0
DRC ERASURE BIT PROCESSING
1312
1314
SYSTEM TIME (MOD 8) = = 0 ?
NO
YES
1316
SYSTEM TIME (MOD 64) = = 0 ?
NO
YES
1318
DRC LOCK = = 1
NO
YES
1320
DRC ERASURE RATE < DRC_ERASURE_TH1 ?
1322
DRC ERASURE RATE > DRC_ERASURE_TH2 ?
NO
YES
NO
YES
1324
DRC LOCK BIT = 0
1326
DRC LOCK BIT = 1
DRC LOCK BIT = 0
1328
1330
PUNCTURE DRC LOCK BIT INTO RPC SUBCHANNEL

FIG. 13

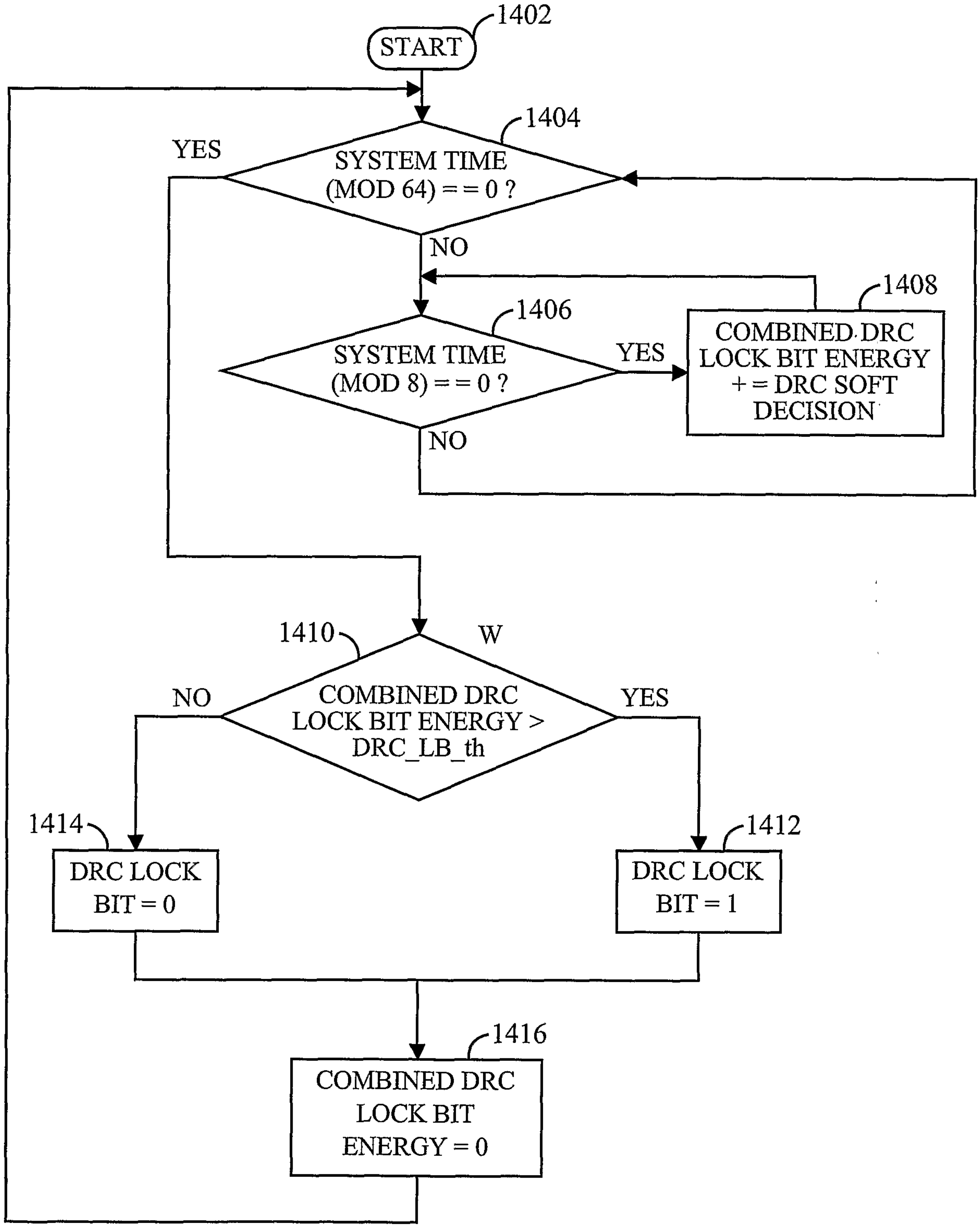

START
1402
1404
YES
SYSTEM TIME
(MOD 64) = = 0 ?
NO
1408
1406
SYSTEM TIME
(MOD 8) = = 0 ?
YES
COMBINED DRC
LOCK BIT ENERGY
+ = DRC SOFT
DECISION
NO
1410
W
NO
COMBINED DRC
LOCK BIT ENERGY >
DRC_LB_th
YES
1414
DRC LOCK
BIT = 0
1412
DRC LOCK
BIT = 1
1416
COMBINED DRC
LOCK BIT
ENERGY = 0

FIG. 14

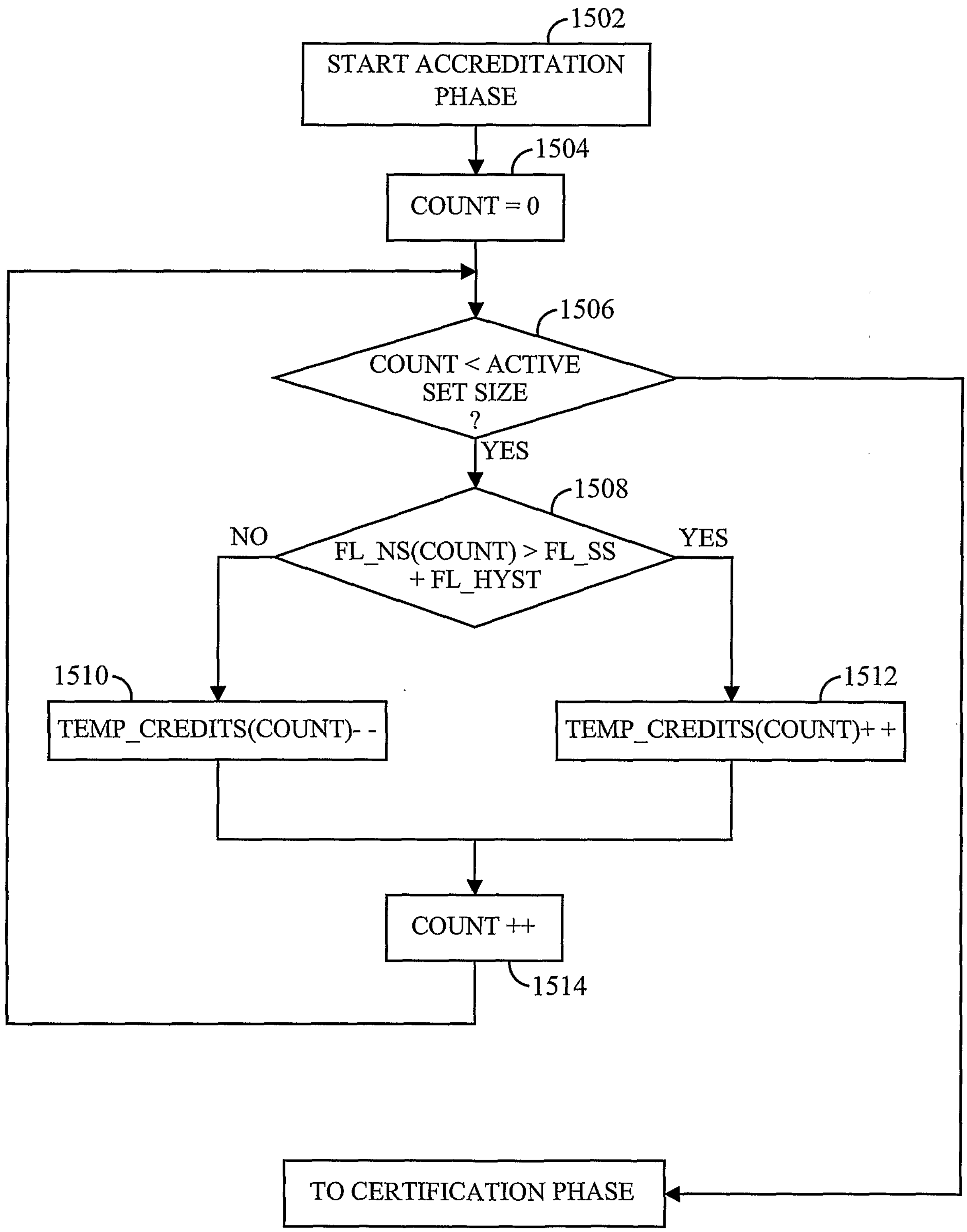

1502
START ACCREDITATION PHASE
1504
COUNT = 0
1506
COUNT < ACTIVE SET SIZE ?
YES
1508
NO
FL_NS(COUNT) > FL_SS + FL_HYST
YES
1510
TEMP_CREDITS(COUNT)- -
1512
TEMP_CREDITS(COUNT)+ +
COUNT ++
1514
TO CERTIFICATION PHASE

FIG. 15

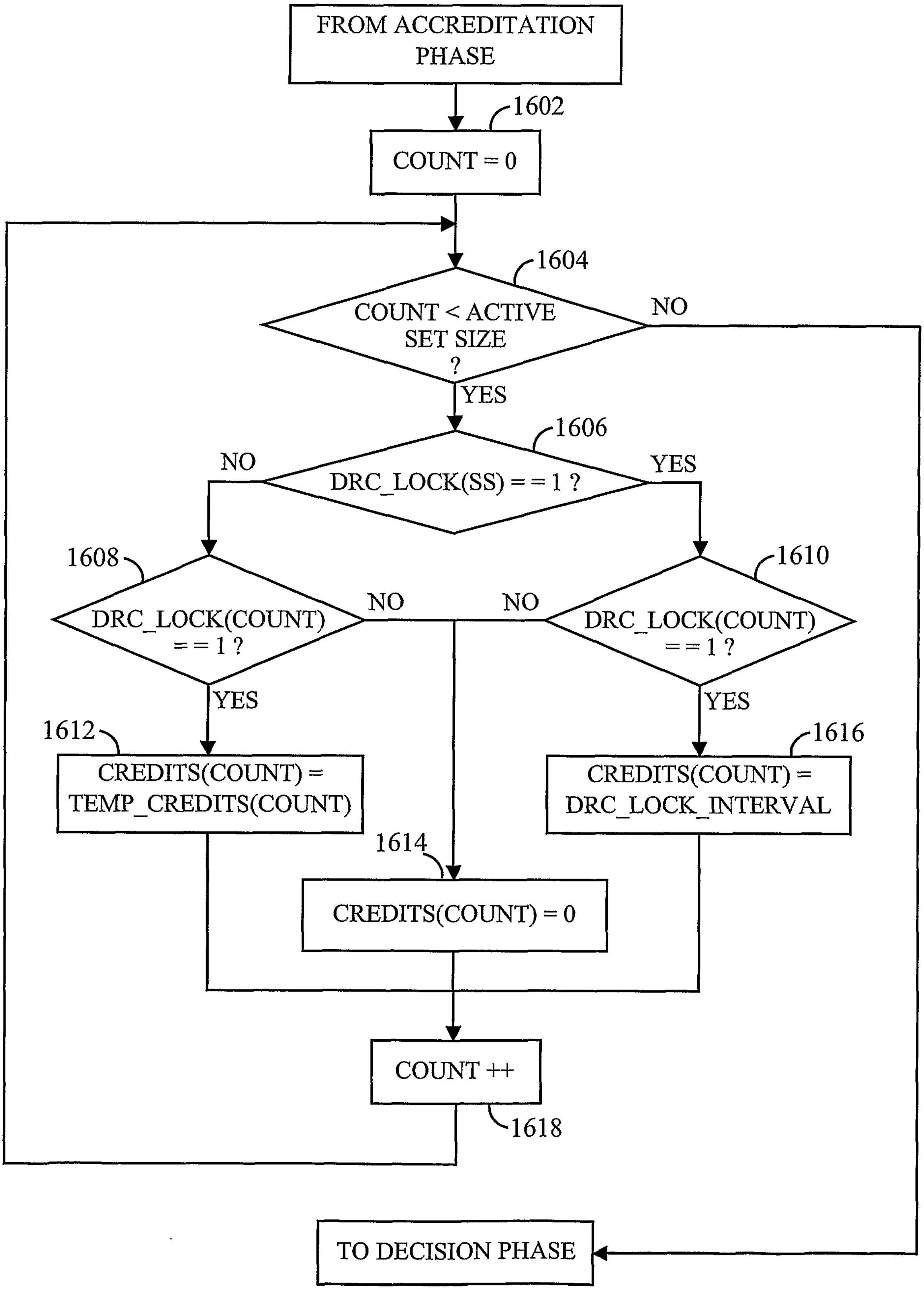

FROM ACCREDITATION PHASE
1602
COUNT = 0
1604
COUNT < ACTIVE SET SIZE ?
NO
YES
1606
DRC_LOCK(SS) = = 1 ?
NO
YES
1608
DRC_LOCK(COUNT) = = 1 ?
NO
NO
1610
DRC_LOCK(COUNT) = = 1 ?
YES
YES
1612
CREDITS(COUNT) = TEMP_CREDITS(COUNT)
1616
CREDITS(COUNT) = DRC_LOCK_INTERVAL
1614
CREDITS(COUNT) = 0
COUNT ++
1618
TO DECISION PHASE

FIG. 16

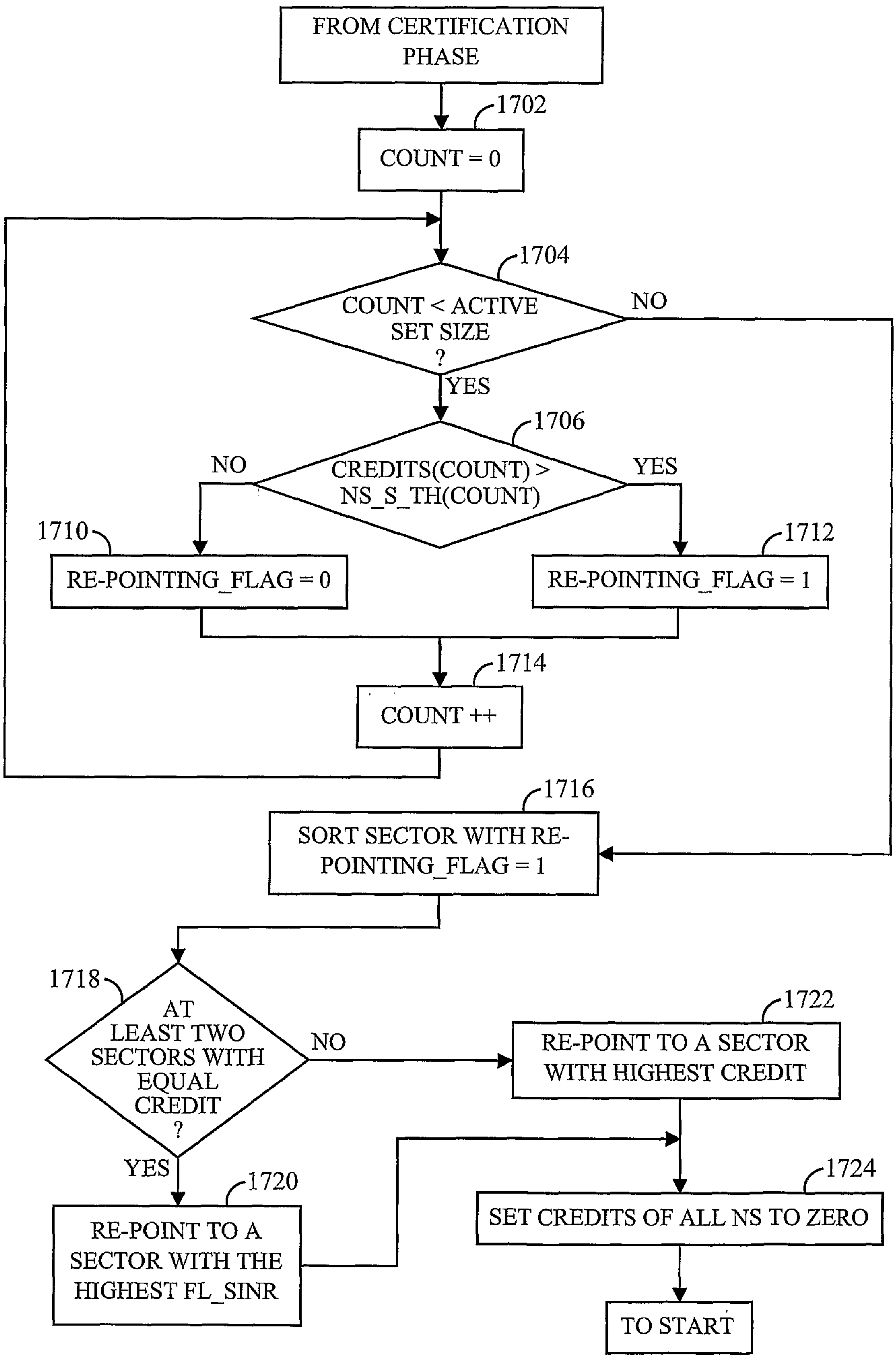

FROM CERTIFICATION PHASE
1702
COUNT = 0
1704
COUNT < ACTIVE SET SIZE ?
NO
YES
1706
CREDITS(COUNT) > NS_S_TH(COUNT)
NO
YES
1710
RE-POINTING_FLAG = 0
1712
RE-POINTING_FLAG = 1
1714
COUNT ++
1716
SORT SECTOR WITH RE-POINTING_FLAG = 1
1718
AT LEAST TWO SECTORS WITH EQUAL CREDIT ?
NO
1722
RE-POINT TO A SECTOR WITH HIGHEST CREDIT
YES
1720
RE-POINT TO A SECTOR WITH THE HIGHEST FL_SINR
1724
SET CREDITS OF ALL NS TO ZERO
TO START

FIG. 17

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 02/20160

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04Q7/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 99 23844 A (QUALCOMM INC) 14 May 1999 (1999-05-14)	1-13, 34-38
Y	abstract	14,15, 17,39,42
A	page 3, line 33 - line 35 page 5, line 33 -page 6, line 6 page 9, line 5 - line 19 page 10, line 6 - line 9 page 12, line 5 - line 11 page 15, line 13 - line 24 page 19, line 19 -page 21, line 22 page 25, line 19 - line 20 page 29, line 21 - line 28 page 31, line 4 - line 21 page 36, line 5 -page 38, line 3 ---	16, 18-33, 40,41, 43-45

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
9 October 2002	05/11/2002

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Rüschmann, F

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 02/20160

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
Y A	US 5 886 988 A (OTTERSTEN BJOERN E ET AL) 23 March 1999 (1999-03-23) column 4, line 65 -column 7, line 10	14,15, 17,39,42 1-13,16, 18-38, 40,41, 43-45
A	JALALI A ET AL: "DATA THROUGHPUT OF CDMA-HDR A HIGH EFFICIENCY-HIGH DATA RATE PERSONAL COMMUNICATION WIRELESS SYSTEM" VTC 2000-SPRING. 2000 IEEE 51ST. VEHICULAR TECHNOLOGY CONFERENCE PROCEEDINGS. TOKYO, JAPAN, MAY 15-18, 2000, IEEE VEHICULAR TECHNOLGY CONFERENCE, NEW YORK, NY: IEEE, US, vol. 3 OF 3. CONF. 51, 15 May 2000 (2000-05-15), pages 1854-1858, XP000968325 ISBN: 0-7803-5719-1 the whole document	1-45

INTERNATIONAL SEARCH REPORT

Information on patent family members

In[?]tional Application No
PCT/US 02/20160

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			CA	2306868	A1	14-05-1999
			CN	1286000	T	28-02-2001
			EP	1029419	A2	23-08-2000
			HU	0100629	A2	28-06-2001
			JP	2001522211	T	13-11-2001
			NO	20002228	A	03-07-2000
			PL	342656	A1	02-07-2001
			TR	200001200	T2	21-11-2000
			WO	9923844	A2	14-05-1999
			ZA	9810003	A	02-08-2000
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			BR	9714121	A	29-02-2000
			EP	0956716	A1	17-11-1999
			JP	2001507889	T	12-06-2001
			WO	9830047	A1	09-07-1998
			AU	5086498	A	15-05-1998
			BR	9712643	A	26-10-1999
			CN	1234947	A	10-11-1999
			EP	0932986	A1	04-08-1999
			JP	2001506431	T	15-05-2001
			WO	9818272	A1	30-04-1998