



METHOD AND APPARATUS FOR EXPANDING THE COVERAGE AREA OF A BEACON SIGNAL FROM A TELEPOINT BASE STATION

5

Field of the Invention

This invention relates in general to two-way telepoint communication systems, and in particular to a method and apparatus for expanding the
10 coverage area of a beacon signal from a telepoint base station to improve two-way communication services.

Background of the Invention

15

A conventional two-way public second generation cordless telephone (CT2) communication system comprises CT2 mobile communication units coupling through telepoint base stations for two-way communication services. A telepoint base station in the conventional two-way public CT2
20 communication system typically has more than one transceiver supporting its communication services. When combined together, transceivers within the telepoint base station form transceiver groups. Typically, an antenna specifically supports the communication services of each of these transceiver groups. Dividing the transceivers of the telepoint base station
25 into transceiver groups supported by different antennas, therefore, provides alternative communication paths to route communication calls within the telepoint base station.

Enabling two-way communication services for a CT2 mobile communication unit requires the conventional two-way public CT2
30 communication system to track the physical location of the CT2 mobile communication unit. In one method of tracking, each telepoint base station within the conventional two-way public CT2 communication system periodically broadcasts a beacon signal. Information within the beacon signal uniquely identifies a telepoint base station transmitting the beacon
35 signal. When the CT2 mobile communication unit successfully registers to the telepoint base station using its beacon signal, the two-way public CT2 communication system then knows the physical location of the CT2 mobile

communication unit. Thereafter, two-way communication services is enabled for the CT2 mobile communication unit as the two-way public CT2 communication system can now route a communication call to the CT2 mobile communication unit.

5 Currently, a specific transceiver within a telepoint base station is designated as a beacon transceiver for transmitting the beacon signal. When not transmitting the beacon signal, the beacon transceiver also serves as a transceiver for supporting two-way communication services of the telepoint base station. Designating the specific transceiver to operate
10 as the beacon transceiver limits the beacon signal to a coverage area served by an antenna for the specific transceiver. Furthermore, when either the specific transceiver or the antenna supporting it malfunctions, the telepoint base station ceases to support two-way communication services.

15 Thus, what is needed is a method and apparatus for expanding the coverage area of a beacon signal from a telepoint base station to thereby provide more reliable and effective two-way communication services for CT2 mobile communication units in a two-way public CT2 communication system.

20

Summary of the Invention

In carrying out the objects of the present invention in one form, there is provided a telepoint base station having a base coverage area in a two-
25 way public telepoint communication system, the telepoint base station comprising memory means for storing a beacon transceiver queue sequencing transceivers within the telepoint base station available to serve as a beacon transceiver transmitting a beacon signal and for storing a transceiver group pending list listing transceiver groups within the telepoint
30 base station awaiting an available transceiver to serve as the beacon transceiver. The telepoint base station further comprises a plurality of transceiver groups wherein each of the plurality of transceiver groups includes an antenna and at least one transceiver. The plurality of transceiver groups comprises a first transceiver group having a first
35 antenna with a first antenna coverage area and a second transceiver group having a second antenna with a second antenna coverage area. The telepoint base station additionally comprises a transceiver controller



for changing the beacon transceiver, after a predetermined time interval, from a first transceiver selected from the first transceiver group to a second transceiver from the second transceiver group based on the beacon transceiver queue and the transceiver group pending list.

5

Brief Description of the Drawings

FIG. 1 is a block diagram of a telepoint base station in accordance with a preferred embodiment of the present invention.

10

FIG. 2 is a flow diagram for assigning a beacon transceiver for the telepoint base station of FIG. 1 in accordance with the preferred embodiment of the present invention.

15

FIG. 3 is a flow diagram for updating a beacon transceiver queue within the telepoint base station of FIG. 1 in accordance with the preferred embodiment of the present invention.

20

Detailed Description of the Invention

In accordance with a preferred embodiment of the present invention, FIG. 1 shows a block diagram of a telepoint base station 100. The telepoint base station 100 includes a transceiver controller 102 and a plurality of transceiver groups including a first transceiver group 104, a second transceiver group 106, and a third transceiver group 108.

25

Each of the plurality of transceiver groups has at least one transceiver and is supported by an antenna. Shown in FIG. 1, in accordance with the preferred embodiment of the present invention, the first transceiver group 104 has three transceivers 110, 112, 114. A first antenna 116 supports communication services for the first transceiver group 104. Similarly, a second antenna 120 and a third antenna 122 support communication services for the second transceiver group 106 and the third transceiver group 108, respectively. Further shown in FIG. 1 are antenna coverage areas to indicate coverage areas for antennas coupled to the plurality of transceiver groups. A first antenna coverage area 118, a second antenna

30

35



coverage area 124, and a third antenna coverage area 126 are serviced by the first antenna 116, the second antenna 120, and the third antenna 126, respectively.

5 In accordance with the preferred embodiment of the present invention, the transceiver controller 102 maintains three factors: a transceiver group index, a beacon transceiver queue, and a transceiver group pending list. Stored in memory means 130 within the telepoint base station 100, such as Random Access Memory (RAM) or Read-Only-Memory (ROM), the three factors support implementation of the preferred embodiment in accordance
10 with the present invention.

First, numerically identifying each of the plurality of transceiver groups enables the transceiver controller 102 to systematically assign a beacon transceiver. Second, maintaining the beacon transceiver queue allows the transceiver controller 102 to store in the memory means 130 any free
15 transceiver of the at least one transceiver within the each of the plurality of transceiver groups not currently needed to serve as the beacon transceiver. Specifically, when the beacon transceiver is already assigned to a specific transceiver, any other transceivers available to serve as the beacon transceiver are placed in the beacon transceiver queue to await
20 serving as the beacon transceiver. Finally, when no free transceiver is available from the each of the plurality of transceiver groups to serve as the beacon transceiver, the transceiver controller 102 places the each of the plurality of transceiver group in a transceiver group pending list. Hence, the transceiver group pending list ensures that every transceiver group will
25 need to provide a transceiver to serve as the beacon transceiver.

Using the three factors, the transceiver controller 102 advantageously assigns the beacon transceiver to the each of the plurality of transceiver groups supported by a different antenna. Thus, a beacon signal transmitted from the different antenna expands the coverage area of the telepoint base station 100. Otherwise, with a fixed beacon transceiver, only one antenna
30 coverage area is covered by the fixed beacon transceiver. For example, after setting a first transceiver from the first transceiver group 104 supported by the first antenna 116 with the first antenna coverage area 118 to serve as the beacon transceiver, the transceiver controller 102, after a
35 predetermined time interval, changes the beacon transceiver to a second transceiver from the second transceiver group 106 supported by the second antenna 120 with the second antenna coverage area 124.



FIG. 2 shows a flow diagram for assigning the beacon transceiver, in accordance with the preferred embodiment of the present invention. Starting at step 202, the transceiver controller 102 sets the transceiver group index, G, to a value of one at step 204. Within a transceiver group indexed as one, a free transceiver is set as the first transceiver to serve as the beacon transceiver in step 206. Upon the lapse of the predetermined time interval after step 208, the transceiver controller 102 checks the beacon transceiver queue in step 210 for the second transceiver to serve as the beacon transceiver. Priority to serve as the beacon transceiver is given to any transceiver within the beacon transceiver queue. Otherwise, the transceiver controller 102 increases the transceiver group index by a numerical value of one in step 212 to select any free transceiver in a first subsequent transceiver group in step 214. The method returns to step 206 when the beacon transceiver is selected from within the first subsequent transceiver group. Otherwise, at step 216, the transceiver controller 102 checks the transceiver group pending list to note whether the first subsequent transceiver group has been determined not to have any free transceiver earlier. For the subsequent transceiver group already in the transceiver group pending list, the method goes back to step 212 wherein the transceiver controller 102 increases the transceiver group index by a numerical value of one, thus skipping to a second subsequent transceiver group, according to the transceiver group index, for selecting the second transceiver. When the subsequent transceiver group is not in the transceiver group pending list, the transceiver controller 102 adds the first subsequent transceiver group to the transceiver group pending list in step 218 before going to step 212 to increase the transceiver group index by the numerical value of one.

With the method of assigning the beacon transceiver, the transceiver controller 102 needs to set up the beacon transceiver queue for entries of any free transceiver awaiting to serve as the beacon transceiver. In accordance with the preferred embodiment of the present invention, FIG. 3 shows a flow diagram for updating the beacon transceiver queue. Starting at step 302, the transceiver controller 102 checks at step 304 for any transceiver not in use by any transceiver group within the telepoint base station 100. When a transceiver becomes available after use by the telepoint base station 100 at step 306, the transceiver controller 102 notes the transceiver and its transceiver group and checks the transceiver group



pending list. For a transceiver group with an available transceiver that is in the transceiver group pending list, the available transceiver is added to the transceiver beacon queue and the transceiver group pending list is updated to delete this transceiver group at step 310. At step 308, the
5 transceiver controller 102 will ignore an available transceiver when it belongs to a transceiver group not in the transceiver group pending list.

An advantage of the present invention using the beacon transceiver queue and the transceiver group pending list is that the beacon signal will be rotated systematically among all the transceiver groups within the
10 telepoint base station 100. Hence, each of the plurality of transceiver groups will not transmit the beacon signal for two consecutive predetermined time interval. The present invention, therefore, ensures that the beacon signal reaches a larger coverage area compared with a prior art beacon signal transmitted from a specific and unchanging beacon
15 transceiver.

By now it should be appreciated that there has been provided a method and apparatus for expanding the coverage area of the beacon signal from the telepoint base station 100 to thereby provide more reliable and effective two-way communication services for CT2 mobile
20 communication units in a two-way public CT2 communication system.

We claim:

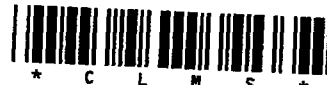
This Sheet Has Been Replaced





CLAIMS

1. A method for expanding a base coverage area of a beacon
signal transmitted by a beacon transceiver not in use for two-way
5 communication services by a telepoint base station wherein the telepoint
base station includes a transceiver controller and a plurality of transceiver
groups and further wherein each of the plurality of transceiver groups
includes at least one transceiver and an antenna, the method comprising
the steps of:
10 setting, by the transceiver controller, a first transceiver to operate
as the beacon transceiver wherein the first transceiver is from a first
transceiver group of the plurality of transceiver groups and is
supported by a first antenna with a first antenna coverage area; and
changing, by the transceiver controller after a predetermined
15 time interval, the beacon transceiver to a second transceiver wherein
the second transceiver is from a second transceiver group of the
plurality of transceiver groups and is supported by a second antenna
with a second antenna coverage area.
- 20 2. The method of Claim 1 wherein the step of changing comprises
the step of selecting the second transceiver from a beacon transceiver
queue.
3. The method of Claim 2 further comprising the step of disabling
25 transceivers from supporting two-way communication services for the
telepoint base station when the transceivers are in the beacon transceiver
queue.
4. The method of Claim 2 wherein the step of selecting the second
30 transceiver comprises the step of setting a first queued transceiver in the
beacon transceiver queue to serve as the beacon transceiver.
5. The method of Claim 2 further comprising the step of selecting
the second transceiver, when not available from the beacon transceiver
35 queue, from the second transceiver group wherein the second transceiver
group is a first subsequent transceiver group based on a transceiver group
index identifying each of the plurality of transceiver groups.



6. The method of Claim 5 further comprising the step of skipping to a second subsequent transceiver group, according to the transceiver group index, for selecting the second transceiver when the first subsequent transceiver group is in a transceiver group pending list indicating
5 transceiver groups of the plurality of transceiver groups awaiting to provide a transceiver available to serve as the beacon transceiver.

7. The method of Claim 6 further comprising the step of adding the first subsequent transceiver group to the transceiver group pending list
10 when the first subsequent transceiver group is not in the transceiver group pending list and does not have the transceiver available to serve as the beacon transceiver.

8. A telepoint base station having a base coverage area in a two-
15 way public telepoint communication system, the telepoint base station comprising:

memory means for storing a beacon transceiver queue
sequencing transceivers within the telepoint base station available to
serve as a beacon transceiver transmitting a beacon signal and for
20 storing a transceiver group pending list listing transceiver groups within the telepoint base station awaiting an available transceiver to serve as the beacon transceiver;

a plurality of transceiver groups wherein each of the plurality of transceiver groups includes an antenna and at least one transceiver,
25 the plurality of transceiver groups comprising:

a first transceiver group having a first antenna with a first antenna coverage area; and

a second transceiver group having a second antenna with a second antenna coverage area;

30 and

a transceiver controller for changing the beacon transceiver, after a predetermined time interval, from a first transceiver selected from the first transceiver group to a second transceiver from the second transceiver group based on the beacon transceiver queue
35 and the transceiver group pending list.