Abstract Title: USE OF CTCSS IN A TRUNKED RADIO SYSTEM

A trunked radio system comprises a controller and a plurality of radio units. The controller is operable as a repeater providing a plurality of channels for communication between the radio units. The controller also has the task of allocating channels as traffic channels 136 for traffic between radio units. In the process of allocating a traffic channel, the controller identifies a CTCSS tone on the allocated channel. Preferably the controller identifies a CTCSS tone to the radio units for use during the call by transmitting the tone on the traffic channel 144. At least some of the radio units may comprise a non-predictive CTCSS decoder.
CALLER
Send Call Request
130

CONTROL
Check availability of Called Party
132
Identify free Traffic Channel
134
Send GTC message
136
Open Traffic Channel
138

Switch to Traffic Channel

CALLED
Switch to Traffic Channel
140

Transmit CTCSS tone on Traffic Channel
144

Detect CTCSS tone on Traffic Channel
146
Set CTCSS tone
148
Send / receive on Traffic Channel with CTCSS tone
150

Detect CTCSS tone on Traffic Channel
146
Set CTCSS tone
148
Send / receive on Traffic Channel with CTCSS tone
150

FIG. 7
Improvements in or Relating to Trunked Radio

The present invention is directed to improvements in or relating to trunked radio.

Examples of the invention provide a trunked radio system comprising:

a controller, operable as a repeater providing a plurality of channels;

a plurality of radio units in radio contact with the controller, and

operable to initiate a call to at least one other radio unit by sending a call request to the controller,

the controller being operable, in response to the call request, to allocate one of the plurality of channels as a traffic channel to be used for the call, and to identify the traffic channel to the radio units required to participate in the call;

and wherein:

the controller is operable in further response to the request, to identify a CTCSS tone to the participating radio units for use by the participating radio units during the call.

The CTCSS tone may be identified to the participating radio units by a transmission on the traffic channel. The CTCSS tone may be identified by transmitting the CTCSS tone.

At least some of the radio units may comprise a non-predictive CTCSS decoder operable to detect the CTCSS tone transmitted to identify the CTCSS tone to the participating radio units, and further operable to use the detected tone as the CTCSS tone for the duration of the call.
Examples of the present invention also provide a controller for a
trunked radio system, the controller being operable as a repeater providing a
plurality of channels for calls between radio units in radio contact with the
controller, and operable in response to a call request from a radio unit, to
allocate one of the plurality of channels as a traffic channel to be used for the
call, and to identify the traffic channel to the radio units required to participate
in the call;

and wherein the controller is operable in further response to a call
request, to identify a CTCSS tone to the participating radio units for use by the
participating radio units during the call.

The controller may be operable to identify the CTCSS tone to the
participating radio units by a transmission on the traffic channel. The
controller may identify the CTCSS tone to the participating radio units by
transmitting the CTCSS tone.

Examples of the invention also provide a radio unit for use in a trunked
radio system comprising a controller operable as a repeater providing a
plurality of channels,

the radio unit being, in use, in radio contact with the controller and
operable to initiate a call to at least one other radio unit by sending a call
request to the controller, and being operable to receive from the controller an
identification of one of the plurality of channels to be used as a traffic channel
for the call, and to use the traffic channel for the duration of the call;

and wherein the radio unit is operable to receive from the controller an
identification of a CTCSS tone for use by the radio unit during the call.

The radio unit may be operable to receive the identification of the
CTCSS tone as a transmission on the traffic channel. The identification of the
CTCSS tone may be a transmission of the CTCSS tone. The radio unit may
comprise a non-predictive CTCSS decoder operable to detect the CTCSS
tone transmitted to identify the CTCSS tone to the participating radio units,
and further operable to use the detected tone as the CTCSS tone for the duration of the call.

Examples of the invention also provide computer software which, when installed for execution in a controller or radio unit, is operable to cause the controller or radio unit to be operable as defined above. Examples of the invention also provide a carrier medium carrying computer software as defined in the previous sentence. The carrier medium may be a recording medium.

Examples of the invention provide a CTCSS module for use in a radio unit of a trunked radio system, the module comprising means operable to receive an identification of a CTCSS tone from a controller of the trunked radio system and being further operable to cause the detected tone to be used as the CTCSS tone for the duration of the call.

The identification may be received by identifying a received CTCSS tone.

Examples of the invention also provide a method in which a controller is provided and is operated as a repeater to provide a plurality of channels for a trunked radio system;

a plurality of radio units are provided in radio contact with the controller;
a radio unit is used to initiate a call to at least one other radio unit by sending a call request to the controller;

the controller responds to the call request by allocating one of the plurality of channels as a traffic channel to be used for the call, and by identifying the traffic channel to the radio units required to participate in the call;

and wherein the controller further responds to the call request by identifying a CTCSS tone to the participating radio units for use by the participating radio units during the call.
The controller may identify the CTCSS tone to the participating radio units by means of a transmission on the traffic channel. The controller may identify the CTCSS tone by transmitting the CTCSS tone. At least some of the radio units may detect the CTCSS tone transmitted to identify the CTCSS tone to the participating radio units, and use the detected tone as the CTCSS tone for the duration of the call.

Examples of the present invention also provide a method for a trunked radio system, in which one of a plurality of channels for calls is allocated in response to a call request from a radio unit, to allocate the channel as a traffic channel to be used for the call, and to identify the traffic channel to the radio units required to participate in the call;

and wherein, in further response to a call request, a CTCSS tone is identified to the participating radio units for use by the participating radio units during the call.

The CTCSS tone may be identified to the participating radio units by a transmission on the traffic channel. The CTCSS tone may be identified to the participating radio units by transmitting the CTCSS tone.

Examples of the invention also provide a method for a trunked radio system providing a plurality of channels, in which a radio unit is provided and operable to initiate a call to at least one other radio unit by sending a call request, and is operable to receive an identification of one of the plurality of channels to be used as a traffic channel for the call, and to use the traffic channel for the duration of the call;

and wherein the radio unit receives an identification of a CTCSS tone for use by the radio unit during the call.

The identification of the CTCSS tone may be received as a transmission on the traffic channel. The identification of the CTCSS tone may
be received as a transmission of the CTCSS tone. The CTCSS tone transmitted to identify the CTCSS tone to the participating radio units may be detected and used as the CTCSS tone for the duration of the call.

Examples of the present invention will now be described in more detail, by way of example only, and with reference to the accompanying drawings, in which:

Fig. 1 is a highly simplified schematic diagram of a trunked radio system;

Fig. 2 is a highly simplified timing diagram illustrating the basic principle of operation of the trunked radio system of Fig. 1;

Fig. 3 is a simple block diagram of a controller for the system of Fig. 1;

Fig. 4 is a simple block diagram of a radio unit for the system of Fig. 1;

Fig. 5 is a simplified spectrum illustration, including a CTCSS tone;

Fig. 6 is a block diagram of an alternative CTCSS arrangement for the radio unit of Fig. 4; and

Fig. 7 is a flow diagram illustrating the steps taken within the system of Fig. 1, to execute a call.

Fig. 1 illustrates a trunked radio system 10 which comprises a controller 12 and a plurality of radio units 14. Fig. 1 illustrates five radio units 14a to 14e. In a practical implementation, there may be fewer units in the system 10, but there are likely to be many more than five units 14 in the system 10.
The controller 12 is operable as a repeater providing a plurality of channels. The channels are illustrated in Fig. 1 as separate antennas 16, each antenna representing one channel of the system 10, but it will be readily understood by the skilled reader that other arrangements are possible, such as multi-frequency antennas handling a plurality of channels. Each channel is defined by a different operating frequency and has a defined bandwidth. These and other parameters will be set by agreed protocols, licensing regulations and other constraints. One example of a protocol for a trunked radio system is known as MPT1327 and is widely used within the United Kingdom.

During a call, transmissions from radio units 14 are received at the controller 12 on the appropriate channel, and forwarded (repeated) by retransmission to the or each other radio unit involved in the same call. In addition to providing this function of a repeater, the controller 12 has the task of allocating channels as traffic channels for use during calls, in a manner and for reasons which will be described in more detail below.

Thus, for example, in Fig. 1, two radio units 14a, 14b are engaged in a call using a channel illustrated as the left hand channel antenna 16. Other units 14 are not participating in that call. Two units 14d, 14e are engaged in a call on a different channel, using the right hand most channel antenna 16. Other units are not involved in that call. A fifth unit 14c is not currently engaged in any call. The illustration and reference to channels as “left hand” and “right hand” is purely schematic.

Fig. 2 illustrates the manner in which the controller 10 can allocate and re-allocate channels for use during calls, and the consequential benefits. In Fig. 2, time is represented on the horizontal axis, running from left to right. Each of the channels available to the controller 12 is illustrated as a horizontal band across the drawing, these being stacked one above the other, in Fig. 2. The channel illustrated at the bottom of Fig. 2, identified as channel C, is a
control channel. In this example, this is dedicated for control use, including the transmission of call requests from radio units 14 to the controller 12, when a call is to be initiated, commands from the controller 12 to the radio units 14, including commands for initiating a call, and other management and control transmissions. The control channel C may be a dedicated channel, or the channel used for control transmissions may change from time to time, according to the protocol in use.

The other channels, identified as channels T1, T2, T3 and T4 are traffic channels used for the transmission of the traffic of a call, once the call has been initiated.

At the beginning of the time line in Fig. 2, a call 18 is already underway on channel T1. Channel T1 is therefore unavailable for use by any units 14 other than those involved in the call 18. The first new event arising in Fig. 2 is a call request 20 received on channel C from a radio unit 14 wishing to initiate a call. The call request 20 is indicated as a short horizontal line on channel C, representing an exchange of instructions and information between the controller 12 and the radio unit 14 which issued the call request. In response to the call request 20, the controller 12 allocates one of the channels T as a traffic channel to be used for the call being initiated. The allocated traffic channel T is identified to the radio units 14 required to participate in the call, for example by instructions sent as part of the call request routine 20. In this example, the controller 12 allocates channel T2 for the newly initiated call, which then begins as indicated at 22. This begins a period during which channels T1 and T2 are occupied by calls 18, 22. A further call request routine is illustrated at 24, again received on channel C from another radio unit 14, and resulting in a further call 26. The call 26 is allocated to traffic channel T4, so that a period begins in which traffic channels T1, T2 and T4 are all in use, while traffic channel T3 is still available.
The call 22 then finishes, which may require a call end routine 28 on the control channel C, so that traffic channels T1 and T4 remain allocated, but traffic channels T2 and T3 are available. Consequently, when the next call request routine 30 is received, the controller 12 is able to allocate a new call 32 to traffic channel T2, newly vacated by the ending of call 22. Once again, traffic channels T1, T2 and T4 are in use, with traffic channel T3 available. Consequently, the next call request 34 initiates a call 36 which is allocated to traffic channel T3, the only currently available channel.

Further to the right in Fig. 2, call 18 and then call 32 are illustrated as ending, while calls 26 and 36 continue.

It can thus be seen from the simple example illustrated in Fig. 2 that the capacity of the available channels is increased by the ability of the controller 12 to allocate any call to any available channel, so that the occupancy of each channel is maximised.

Fig. 3 illustrates the controller 12 in more detail. The controller 12 is based around a device 40 which incorporates software controlled control processes 42, and transmitter/receiver functions 44. The functions 44 are in connection with the channel antennas 16, for example by means of a bus 46. The control processes 42 are in communication with main (RAM) memory 48 and auxiliary memory 50. The memory 50 may contain software to be executed by the device 40 to effect the processes 42. This software, when required, is loaded from the memory 50 to the RAM 48, prior to execution. Fig. 3 illustrates the RAM 48 containing an appropriate operating system 52 for the device 40, and controller application or application's 54 for execution to result in the operation to be described. Other applications (not shown) may also be loaded into the RAM 48 for execution. For example, some or all of the transmitter/receiver functions 44 may be provided by software, in similar manner. Others may be provided by hardware. The application 54 may
reach the controller 12 by the medium of a data carrier 56 and an appropriate reader 58, or by the medium of a transmission link 60.

The purpose of the controller application 54 is to cause the device 40 to execute the steps required of the controller 12, in accordance with the method which will be described more fully below.

Each channel antenna 16 of the controller 12 has an associated CTCSS (continuous tone controlled signalling system) arrangement 62. Briefly, each CTCSS arrangement 62 includes a CTCSS encoder and a CTCSS decoder. The encoder serves to superimpose a sub-audible tone on any transmission. The decoder serves to reject any transmission on that channel, unless accompanied by the required sub-audible tone. These operations will be described in more detail with reference to the operation of the radio units 14, which also include CTCSS encoders and decoders.

Fig. 4 illustrates one of the radio devices 14 in more detail. The device 14 is based around a device 70 which incorporates software controlled control processes 72, and transmitter/receiver functions 74. The functions 74 are in connection with an antenna 75 at 76. The control processes 72 are in communication with main (RAM) memory 78 and auxiliary memory 80. The memory 80 may contain software to be executed by the device 70 to effect the processes 72. This software, when required, is loaded from the memory 80 to the RAM 78, prior to execution. Fig. 4 illustrates the RAM 78 containing an appropriate operating system 82 for the device 70, and device applications 84 for execution to result in the operation to be described. Other applications (not shown) may also be loaded into the RAM 78 for execution. For example, some or all of the transmitter/receiver functions 74 may be provided by software, in similar manner. Others may be provided by hardware. The application 84 may reach the device 14 by the medium of a data carrier 86 and an appropriate reader 88, or by the medium of a transmission link 90.
The purpose of the controller application 84 is to cause the device 70 to execute the steps required of the device 14, in accordance with the method which will be described more fully below.

The antenna 75 of the device 14 has an associated CTCSS (continuous tone controlled signalling system) arrangement 92. Briefly, the CTCSS arrangement 92 includes a CTCSS encoder 93 and a CTCSS decoder 94. The encoder 93 serves to superimpose a sub-audible tone on any transmission. The decoder 94 serves to reject any transmission on the channel to which the device 14 is tuned, unless accompanied by the required sub-audible tone. These operations will be described in more detail below.

The CTCSS arrangement 92 acts as a non-predictive CTCSS encoder and includes a low pass filter 100. The filter 100 is set to pass only the sub-audible tone (if any) received on an incoming transmission. The output of the filter 100 is passed at 102 to the control processes 72 of the device 70, allowing the frequency of any detected sub-audible tone to be identified by the control process 72. The purpose of this is illustrated in Fig. 5. Fig. 5 illustrates the spectrum of a received transmission, during a call. Frequency is illustrated on the horizontal axis, and amplitude is illustrated on the vertical axis. The main peak 104 represents the traffic which forms the call. The minor peak 106 represents the sub-audible tone superimposed on the traffic at the time of transmission. The upper and lower limits of audible frequencies are indicated at 108 in Fig. 5.

Returning to Fig. 4, the filter 100 is set to reject the main peak 104 and pass any CTCSS tone 106 to the control process 72. If the control process 72 recognises the received CTCSS tone as having the expected frequency, the receiver functions at 74 are authorised and the traffic peak 104 is processed normally, for receipt by the user. If the CTCSS tone is not at the expected frequency, operation of the receiver functions 74 is not authorised, so that the main traffic peak 104 is rejected.
This form of CTCSS decoding is called non-predictive, because the filter 100 passes any received CTCSS tone, and is not tuned to any particular available CTCSS tone frequency.

In the arrangement of Fig. 4, any outgoing transmission from the unit 14 is augmented by a CTCSS tone generated by the CTCSS encoder 93, prior to transmission from the unit 14.

An advantage of non-predictive CTCSS decoding is that the CTCSS tone used during a call is dependent on the operation of the control process 72, rather than the hardware of the filter 100, so that the CTCSS tone in use is a soft parameter rather than a hard parameter.

The filter 100 and encoder 93 together form a CTCSS module 92 which can be fitted to an existing radio unit (without CTCSS), if appropriate provision is made for the connection 102 and for updating of the control processes 72, to make use of the CTCSS facility.

The CTCSS tone set by the encoder 110 is instructed at 111 by the control process 72.

Fig. 6 illustrates an alternative CTCSS module 120 which can be fitted to a radio unit designed for predictive CTCSS operation. In conventional predictive CTCSS operation, a band pass filter is set to a particular CTCSS tone in order to pass an enable signal in the presence of the required tone, or otherwise to disable reception. In the example of Fig. 6, the module 120 includes the same low pass filter 100 as described above, with a dedicated processor 122, which receives the CTCSS tone reported by the filter 100. In the event that the correct CTCSS tone is reported, an output 124 is switched to enable reception. If the correct CTCSS tone is not reported, the output 124 disables reception. Thus, the output 124 is a simple enable/disable output as
would be expected by a predictive CTCSS system, but the CTCSS tone being
detected can be changed in a soft manner by changing the operation of the
processor 122, for example by sending an instruction at 126 to identify the
CTCSS tone required.

Fig. 7 illustrates the manner in which a call is initiated in the system 10
which has been described. Fig. 7 assumes that the call involves two radio
units 14, and the controller 12, acting as a repeater. Consequently, Fig. 7
illustrates three columns of operations, for the radio unit 14 which initiates the
call (headed CALLER), for the operations of the controller (headed
CONTROL) and for the operation of the radio unit 14 which is called (headed
CALLED). It is to be understood that the operations in the CALLED column
could be implemented simultaneously by a group of called radio units 14, in
the event that the call requires a group of radio units to participate.

The process begins at 130 by a call request being sent by the Caller to
the controller 12. The call request corresponds with those described above,
particularly in relation to Fig. 2. The call request may be transmitted with a
CTCSS tone previously allocated permanently or temporarily to the call
channel C.

On receipt of the call request 130, the controller 12 checks the
availability of the or each called party, at 132. If all of the radio units required
to participate in the call are available (not already engaged in a call), the
controller 12 identifies a free traffic channel T, at 134. At step 136, the
controller 12 sends a Go To Channel message (GTC message) on the control
channel C and addressed to the radio units required to participate in the call.
Addressing may be by identifying the group to which radio units belong, or by
individually addressing radio units. The GTC message identifies the traffic
channel T which has been allocated to the call. At steps 138, 140, the Caller
and all Called radio units switch to the traffic channel identified by the GTC
message 136. The controller 12 also opens the traffic channel at 142,
allowing it to be used as a repeater. As part of this process, the CTCSS arrangement 62 of the corresponding channel is activated. This may result in the CTCSS arrangement 62 using a predetermined (fixed) CTCSS tone for transmission and receipt, or the controller 12 may allocate a CTCSS tone at the time (dynamically). At step 144, the controller commences transmission on the traffic channel T, thereby using the required CTCSS tone.

Thus, the transmission 144 results in the required CTCSS tone being transmitted from the controller 12 on the traffic channel. Thus, the required CTCSS tone is transmitted to each of the Caller and Called radio units 14. The Caller and Called units 14 detect the CTCSS tone from the transmission 144, at 146 and, as part of their processes for commencing a call. This notifies the CTCSS tone to the units 14. The units note this CTCSS tone as being the CTCSS tone to be used for the call which is beginning. Accordingly, the Caller and Called units 14 set their respective CTCSS arrangements 62, 92 to the CTCSS tone detected at 146. This is steps 148. In the arrangement of Fig. 4, the control process 72 notes the CTCSS tone received at 102 from the filter 100, as a result of the transmission 144 and then, for the duration of the call, rejects any transmission which is not accompanied by that notified CTCSS tone. The CTCSS encoder 93 is instructed at 111 to use the notified CTCSS tone for all transmissions. Accordingly, the unit 14 is able to use the correct CTCSS tone for the duration of the call, without requiring any knowledge of which tone is required, prior to receipt of the transmission 144.

The call can then take place in the normal way, with the Caller and Called units 14 sending and receiving on the allocated traffic channel T, with the CTCSS tone set at 148. This is steps 150.

The arrangements described above allow the CTCSS tone to be used to reject interference signals on the traffic channel. In particular, interference will be rejected from a corresponding channel of a geographically neighbouring system if no CTCSS tone, or a different CTCSS tone are in use.
in the other system. It is to be noted that the radio unit 14 does not require prior knowledge of the CTCSS tone to be used for a call. Accordingly, it is not necessary for the radio unit 14 to contain a table of CTCSS tones for each channel. This allows CTCSS tone allocation to be set, selected or changed relatively easily, at the controller 12. The correct CTCSS tone will then immediately be implemented by radio units 14, during calls, by recognising the CTCSS tone identified by the controller 12, at the time the call is initiated. Consequently, changes in CTCSS tone allocation to the channels, or the addition of a CTCSS tone to additional channels, can be implemented without any requirement to update or upgrade existing radio units within the system.

It is expected to be particularly convenient to notify the allocated CTCSS tone by a transmission (of the tone or of data identifying the tone) on the traffic channel, but a transmission on the control channel could be used, or an alternative means of communicating the notification from the controller to the radio units.

The dynamic allocation of CTCSS codes, described above, may be implemented in respect of all available traffic channels, or may be used in respect of only some of them. For example, radio units 14 may contain a table of CTCSS code allocations for all available channels at the time the system 10 is first set up, with the dynamic allocation technique of the present invention being used for any additional traffic channels which are subsequently authorised for use within the system.

The system described above may be used in conjunction with voice calls, data calls or both. The radio units may be mobile or static, or there may be some mobile and some static units. The principles may be applied to many different bands of radio frequencies and are not restricted to the frequencies or channel frequencies associated with the MPT1327 protocol mentioned above.
Whilst endeavouring in the foregoing specification to draw attention to those features of the invention believed to be of particular importance it should be understood that the Applicant claims protection in respect of any patentable feature or combination of features hereinbefore referred to and/or shown in the drawings whether or not particular emphasis has been placed thereon.
CLAIMS

1. A trunked radio system comprising:

   a controller, operable as a repeater providing a plurality of channels;
   a plurality of radio units in radio contact with the controller, and
   operable to initiate a call to at least one other radio unit by sending a call
   request to the controller,

   the controller being operable, in response to the call request, to
   allocate one of the plurality of channels as a traffic channel to be used for the
   call, and to identify the traffic channel to the radio units required to participate
   in the call;

   and wherein:

   the controller is operable in further response to the request, to identify
   a CTCSS tone to the participating radio units for use by the participating radio
   units during the call.

2. A system according to claim 1, wherein the CTCSS tone is identified to
   the participating radio units by a transmission on the traffic channel.

3. A system according to claim 1 or 2, wherein the CTCSS tone is
   identified by transmitting the CTCSS tone.

4. A system according to claim 3, wherein at least some of the radio units
   comprise a non-predictive CTCSS decoder operable to detect the CTCSS
   tone transmitted to identify the CTCSS tone to the participating radio units,
   and further operable to use the detected tone as the CTCSS tone for the
   duration of the call.
5. A controller for a trunked radio system, the controller being operable as a repeater providing a plurality of channels for calls between radio units in radio contact with the controller, and operable in response to a call request from a radio unit, to allocate one of the plurality of channels as a traffic channel to be used for the call, and to identify the traffic channel to the radio units required to participate in the call;

    and wherein the controller is operable in further response to a call request, to identify a CTCSS tone to the participating radio units for use by the participating radio units during the call.

6. A controller according to claim 5, wherein the controller is operable to identify the CTCSS tone to the participating radio units by a transmission on the traffic channel.

7. A controller according to claim 5 or 6, wherein the controller identifies the CTCSS tone to the participating radio units by transmitting the CTCSS tone.

8. A radio unit for use in a trunked radio system comprising a controller operable as a repeater providing a plurality of channels,

    the radio unit being, in use, in radio contact with the controller and operable to initiate a call to at least one other radio unit by sending a call request to the controller, and being operable to receive from the controller an identification of one of the plurality of channels to be used as a traffic channel for the call, and to use the traffic channel for the duration of the call;

    and wherein the radio unit is operable to receive from the controller an identification of a CTCSS tone for use by the radio unit during the call.

9. A radio unit according to claim 8, operable to receive the identification of the CTCSS tone as a transmission on the traffic channel.
10. A radio unit according to claim 8 or 9, wherein the identification of the CTCSS tone is a transmission of the CTCSS tone.

11. A radio unit according to claim 8, 9 or 10, further comprising a non-predictive CTCSS decoder operable to detect the CTCSS tone transmitted to identify the CTCSS tone to the participating radio units, and further operable to use the detected tone as the CTCSS tone for the duration of the call.

12. Computer software which, when installed for execution in a controller or radio unit, is operable to cause the controller or radio unit to be operable as defined in any preceding claim.

13. A carrier medium carrying computer software as defined in claim 12.

14. A medium according to claim 13, wherein the medium is a recording medium.

15. A CTCSS module for use in a radio unit of a trunked radio system, the module comprising means operable to receive an identification of a CTCSS tone from a controller of the trunked radio system and being further operable to cause the detected tone to be used as the CTCSS tone for the duration of the call.

16. A module according to claim 15, wherein the identification is received by identifying a received CTCSS tone.

17. A method in which a controller is provided and is operated as a repeater to provide a plurality of channels for a trunked radio system; a plurality of radio units are provided in radio contact with the controller; a radio unit is used to initiate a call to at least one other radio unit by sending a call request to the controller;
the controller responds to the call request by allocating one of the plurality of channels as a traffic channel to be used for the call, and by identifying the traffic channel to the radio units required to participate in the call;

and wherein the controller further responds to the call request by identifying a CTCSS tone to the participating radio units for use by the participating radio units during the call.

18. A method according to claim 17, wherein the controller identifies the CTCSS tone to the participating radio units by means of a transmission on the traffic channel.

19. A method according to claim 17 or 18, wherein the controller identifies the CTCSS tone by transmitting the CTCSS tone.

20. A method according to claim 17, 18 or 19, wherein at least some of the radio units detect the CTCSS tone transmitted to identify the CTCSS tone to the participating radio units, and use the detected tone as the CTCSS tone for the duration of the call.

21. A method for a trunked radio system, in which one of a plurality of channels for calls is allocated in response to a call request from a radio unit, to allocate the channel as a traffic channel to be used for the call, and to identify the traffic channel to the radio units required to participate in the call;

and wherein, in further response to a call request, a CTCSS tone is identified to the participating radio units for use by the participating radio units during the call.

22. A method according to claim 21, wherein the CTCSS tone is identified to the participating radio units by a transmission on the traffic channel.
23. A method according to claim 21 or 22, wherein the CTCSS tone is identified to the participating radio units by transmitting the CTCSS tone.

24. A method for a trunked radio system providing a plurality of channels, in which

a radio unit is provided and operable to initiate a call to at least one other radio unit by sending a call request, and is operable to receive an identification of one of the plurality of channels to be used as a traffic channel for the call, and to use the traffic channel for the duration of the call;

and wherein the radio unit receives an identification of a CTCSS tone for use by the radio unit during the call.

25. A method according to claim 24, wherein the identification of the CTCSS tone is received as a transmission on the traffic channel.

26. A method according to claim 24 or 25, wherein the identification of the CTCSS tone is received as a transmission of the CTCSS tone.

27. A method according to claim 24, 25 or 26, wherein the CTCSS tone transmitted to identify the CTCSS tone to the participating radio units is detected and used as the CTCSS tone for the duration of the call.

28. Apparatus substantially as described above, with reference to the accompanying drawings.

29. A method substantially as described above, with reference to the accompanying drawings.

30. Any novel subject matter or combination including novel subject matter disclosed herein, whether or not within the scope of or relating to the same invention as any of the preceding claims.
Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

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H03G; H04L; H04Q; H04W

The following online and other databases have been used in the preparation of this search report
EPODOC, WPI.

International Classification:

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