

3 digit:  $GN = \text{Group identity} - \text{GBI} + 900$

Numbering range: 900 to 998 (999 reserved for emergency service).

Block Size: The size of the block allocation to a fleet of users for each form of Base Ident used by the members of the fleet. The unit shall store either block size or the maximum value of dialled number in some form to avoid placing calls outside the block.

Numbers shall be written in the form:

	NP	FIN	UN	
eg	<u>245</u> <u>201</u>	<u>3456</u> <u>3578</u>	<u>23</u> <u>467</u>	for individual numbers

	NP	FGN	GN	
eg	<u>245</u> <u>201</u>	<u>5456</u> <u>5578</u>	<u>93</u> <u>967</u>	for group numbers

Numbers are dialled commencing at the most significant block of numbers which differs from the unit's own number.

### 8.2.3.2 Storage Requirements

#### 8.2.3.2.1 Mandatory Storage Requirements

In order to follow the procedures specified in this section, the radio unit shall provide the following storage requirements (in read-only memory) which are appropriate to the selected network if the unit is equipped with a means of accepting called party numbers from the user:

- i. The individual base identity for the fleet of which the unit is a member (own fleet).
- ii. The group base identity for the unit's own fleet.
- iii. A flag to indicate the choice of own fleet individual number string length, ie 2 or 3 digit strings.
- iv. A flag to indicate the choice of own fleet group number string length, ie 2 or 3 digit strings.
- v. The highest permitted own fleet individual identity or dialled number.
- vi. The highest permitted own fleet group identity or dialled number.

- vii. A flag to bar inter-fleet group calls.

#### 8.2.3.2.2 Optional Storage Requirements in read-only memory

- i. Ten actual called party identities or numbers for translation. Each is associated with an entry of one of the single digit dialled strings.
- ii. A multiplicity of i) to vi) in 8.2.3.2.1 above per fleet, each stored against the two or three leading digits of the five digit calls to units in other fleets.
- iii. An address or number to complete call details for the \*0# string.
- iv. An address or number to complete call details for the \*0nn# string.
- v. An address or number to complete call details for the \*9# string.

#### 8.2.4 Radio Unit and Line Unit Numbering

##### 8.2.4.1 Single Digit Dialled Strings (Optional)

The translation between single digit dialled strings and corresponding identities is not specified. It is recommended that 0 be used either for calls to a despatcher or to a PABX operator (see 8.2.5).

##### 8.2.4.2 Two Digit Dialled Strings (Mandatory)

Two digit dialled strings in the range 20 to 89 inclusive shall be used to call units within the same fleet. The unit shall refer to its individual base ident (IBI) and shall generate the called party identity by the following algorithm from the dialled Unit Number (UN):

$$\text{Called individual ident} = \text{IBI} + \text{UN} - 20$$

Two digit dialled strings in the range 90 to 99 inclusive shall be used to call groups of units within the same fleet. The unit shall refer to its group base ident (GBI) and shall generate the called group identity by the following algorithm from the dialled Group Number (GN):

$$\text{Called group ident} = \text{GBI} + \text{GN} - 90$$

Two digit group numbers and three digit unit numbers may be used within the same fleet.

The unit shall verify that the dialled UN or GN is not greater than the highest value assigned during network personalisation.

Note: Numbers 00 to 02, 07 to 09 and 10 to 19 are not specified. For use of 03 to 06, see section 8.2.5.



#### 8.2.4.3 Three Digit Dialed Strings (Mandatory)

Three digit dialed strings in the range 200 to 899 inclusive shall be used to call units within the same fleet. The unit shall refer to its individual base ident (IBI) and shall generate the called party identity by the following algorithm from the dialed Unit Number (UN):

$$\text{Called individual ident} = \text{IBI} + \text{UN} - 200$$

Three digit dialed strings in the range 900 to 998 inclusive shall be used to call groups of units within the same fleet. The unit shall refer to its group base ident (GBI) and shall generate the called group identity by the following algorithm from the dialed Group Number (GN):

$$\text{Called group ident} = \text{GBI} + \text{GN} - 900$$

Three digit group numbers and two digit unit numbers may be used within the same fleet.

The unit shall verify that the dialed UN or GN is not greater than the highest value assigned during network personalisation.

Note: Numbers 000 to 099 are not specified. Certain numbers in the range 100 to 199 and also 999 are used for calls to assistance operators (optional - see section 8.2.7).

#### 8.2.4.4 Four Digit Dialed Strings (Optional)

Four digit dialed strings in the range 1000 to 8999 are used for PABX access, see 8.2.5. Other four digit dialed strings are not specified.

#### 8.2.4.5 Five Digit Dialed Strings. Leading Digit 2 or 9 (Optional)

Five digit dialed strings with leading 2 or 9 may be used to make inter-fleet calls to individual units or groups of units. If both types of call are to be made then the convention of using 2 for individual calls and 9 for group calls shall be adopted wherever possible. Dialed string manipulation depends upon the length of the called party unit number. The first part of the dialed string forms a "routing code" which identifies the fleet of which the called unit is a member. If the called unit number is 2 digits in length then the code is 3 digits in length. If the called unit number is 3 digits in length then the code is 2 digits in length. The unit shall contain a look-up table (translation field) in which the "routing code" is converted to the FN (or its equivalent address) which is appropriate to the called unit. The table shall also contain data on the partition point between the "routing code" and the unit number and whether the call is to a group address. This latter data shall be used before accepting a command to set RQS or RQE, FLAG1 = '1' in a group call.

eg for a call to an individual unit (RC UN): 28 789#

28 is translated by the unit, for example, to fleet Base Address: 34/936

The prefix is used directly and the called IDENT, 1525, is calculated by using the algorithm:

$$ID = IBI - 200 + \underline{UN}$$

$$1525 = 936 - 200 + \underline{789}$$

Either a common prefix call or an extended addressing call follows appropriately.

For a call to a group (RC GN): 984 98#

984 is translated, for example, to Fleet Group Base Address: 34/5936

The prefix is used directly and the called IDENT, 5944, is calculated by using the algorithm:

$$ID = GBI - 90 + \underline{GN}$$

$$5944 = 5936 - 90 + \underline{98}$$

Either a common prefix call or an extended addressing call follows appropriately.

Note: Dialed strings of this length commencing with 1 are not specified. Dialed strings commencing with digits 3, 4, 5, 6, 7, 8 and 0 are used for PABX calls.

#### 8.2.4.6 Six Digit Dialed Strings. Leading Digit 2 to 6 (Mandatory)

A six digit dialed string with a leading digit in the range 2 to 6 shall be used for inter-fleet calls where the call is between units having a common prefix. The first four digits are the called party fleet number (FN) from which the unit shall create a base identity.

$$BI = 2(\underline{FN} - 2000)$$

Using the created base identity and the rest of the dialed string as a unit number (UN) the unit creates a common prefix call using the procedures specified in 8.2.4.2.

$$\text{Called individual ident} = BI + \underline{UN} - 20$$

Group calls, which are identifiable by 9 in the fifth digit, are handled similarly.

$$\text{Called group ident} = BI + \underline{GN} - 90$$

It shall be possible to suppress inter-fleet group calls by unit personalisation.

Note: Dialed strings of this length commencing with 0, 7 and 8 are used for PABX calls. Those commencing with 1 are not specified.



8.2.4.7 Seven Digit Dialed String. Leading Digit 2 to 6 (Mandatory)

A seven digit dialed string with a leading digit in the range 2 to 6 shall be used for inter-fleet calls where the call is between units having a common prefix. The first four digits are the called party fleet number (FN) from which the unit shall create a base identity.

$$BI = 2 (\underline{FN} - 2000)$$

Using the created base identity and the rest of the dialed string as a unit number (UN) the unit creates a common prefix call using the procedures specified in 8.2.4.3.

$$\text{Called individual ident} = BI + \underline{UN} - 200$$

Group calls, which are identifiable by 9 in the fifth digit, are handled similarly.

$$\text{Called group ident} = BI + \underline{GN} - 900$$

It shall be possible to suppress inter-fleet group calls by unit personalisation.

Note: Dialed strings of this length commencing with 0, 7 and 8 are used for PABX calls. Those commencing with 1 are not specified.

8.2.4.8 Eight Digit Dialed Strings. Leading Digit 1 (Technician facility - Optional)

When the technician facility is enabled then 8 digit dialed strings with a leading 1, digits 2 to 4 in the range 000 to 127 and digits 5 to 8 in the range 0001 to 8100, shall set up a call to an address of which the last seven digits in the dialed string are the decimal representation.

The dialed string shall be of the form:

eg  $\underline{1} \underline{PFX} \underline{IDENT}$   
 $\underline{1} \underline{012} \underline{0246}$

The unit shall translate the dialed decimal representations of the prefix and identity into their binary equivalents and use these to transmit a single address codeword or extended addressing call request, whichever is appropriate to the radio unit's own address.

Note that although addresses are written in the form 12/246, the leading zeros shall be dialed thus: 012 0246. Idents above 8100 shall be blocked to prevent calls to gateway addresses which may cause potential fault conditions.

Note: Dialed strings of this length commencing with 0 are used for PSTN calls. Dialed strings with other leading digits are not specified.

#### 8.2.4.9 Nine Digit Dialed Strings. Leading Digit 2 or 3 (Mandatory)

A nine digit dialed string with leading digits 2 or 3 shall be used for inter-fleet calls where the call is between units having different prefixes. the first three digits are the called party's Number Prefix (NP), from which the unit shall create a prefix (PFIX).

$$\text{PFIX} = \text{NP} - 200$$

The rest of the dialed string shall be manipulated as specified in 8.2.4.6. An extended addressing call shall be made to IPFIXI and the unit shall respond to an AHYC with a SAMIS containing the called party's address (!!9.2.2.1!!). The unit shall trap the Number Prefix if it corresponds to the unit's own Number Prefix and shall resort to a common prefix, single address codeword call.

Note: Dialed strings of this length commencing with 0 are used for PSTN calls. Dialed strings with other leading digits are not specified.

#### 8.2.4.10 Ten Digit Dialed Strings. Leading Digit 2 or 3 (Mandatory)

A ten digit dialed string with leading digits 2 or 3 shall be used for inter-fleet calls where the call is between units having different prefixes. The first three digits are the called party's Number Prefix (NP), from which the unit shall create a prefix (PFIX).

$$\text{PFIX} = \text{NP} - 200$$

The rest of the dialed string shall be manipulated as specified in 8.2.4.7. An extended addressing call shall be made to IPFIXI and the unit shall respond to an AHYC with a SAMIS containing the called party's address (!!9.2.2.1!!). The unit shall trap the Number Prefix if it corresponds to the unit's own Number Prefix and shall resort to a common prefix, single address codeword call.

Note: Dialed strings of this length commencing with 0 are used for PSTN calls. Dialed strings with other leading digits are not specified.

#### 8.2.5 PABX Numbering (Optional)

MPT 1327 allows the radio unit to transmit numbers between 0 and 8191 with EXT = '1' in an RQS or RQE single address codeword call, in order to indicate that the called identity is an extension number of a PABX which is associated with the radio unit caller (!!5.5.3.1.1!!). FLAG1 and FLAG2 are used to select one from a maximum of four PABXs. The TSC forwards the dialed number to the selected PABX. Extended addressing procedures are required via the PABXI gateway for calls to extensions on exchanges employing five or more digits, or to larger PABX networks.

Most PABXs use fixed length dialed strings whose leading digit is equal to or greater than 1. Thus the largest range of numbers which may be encountered and which can be accommodated in a single address codeword call is 1000 to 8999. However this range may only be accommodated by interposing an off-set in the transmitted request from the calling



unit. This off-set is removed by the TSC. The off-set is 1000; thus for dialled extension numbers (EXTN) in the range 1000 to 8999 the unit sends 0 to 7999 in IDENT1.

$$\text{IDENT1} = \text{EXTN} - 1000$$

Calls to PABXs with dialled strings shorter than four digits shall have dummy digits inserted in the leading digit positions (to be described as a dialling code in the user's directory) to make up the length of the dialled string to four digits. Recommended values are 7, 77, etc. Different codes may be used to route calls to different branch exchanges by arrangement between the network operator and the PABX user. Shorter dialled strings on PABXs with mixed length numbering shall be dealt with in a similar manner.

If access is required to a small group of branch exchanges (a maximum of four), then FLAG1 and FLAG2 in the RQS or RQE address codeword shall be set to indicate to which exchange the required extension is connected. The flags are set in the radio unit by the use of a leading digit before the extension number, which thus requires the user to dial a five digit string.

Access to larger PABX networks uses extended addressing routines. These are set up by dialled string lengths of five to eight digits and with particular leading digits.

#### 8.2.5.1 Single digit Dialled Strings

To call a PABX operator the unit may be set up to call identity 8000 with EXT = '1', FLAG = '0' and FLAG2 = '0' when 0 is dialled.

#### 8.2.5.2 Two Digit Dialled Strings

A two digit dialled string in the range 03 to 06 shall be used to select one of four different branch exchange operators. The radio unit shall be set up to call identity 8000 with EXT = '1', and FLAG1 and FLAG2 set according to the following table:

	FLAG1	FLAG2
<u>03</u>	'0'	'0'
<u>04</u>	'0'	'1'
<u>05</u>	'1'	'0'
<u>06</u>	'1'	'1'

#### 8.2.5.3 Three Digit Dialled Strings

Three digit dialled strings are not used for PABX calls.

#### 8.2.5.4 Four Digit Dialled Strings

The radio unit shall accept any four digit dialled string as a call to a PABX and shall set the EXT flag to '1'. FLAG1 and FLAG2 shall be set to '0'. The dialled extension number (EXTN) shall be decremented by 1000 and the resultant shall be transmitted as the called

identity (see 8.2.5).

IDENT = EXTN - 1000

8.2.5.5 Five Digit Dialed Strings. Leading Digit 3 to 6

Five digit dialed strings with a leading digit from 3 to 6 function similarly to four digit dialed strings, but the radio unit shall set FLAG1 and FLAG2 in RQS or RQE, or EXCHANGE in SAMIS, according to the following table:

Leading Digit	FLAG1	FLAG2	EXCHANGE (SAMIS)
	!!5.5.3.1.1!!		!!5.6.1.2.2!!
<u>3</u>	'0'	'0'	'00'
<u>4</u>	'0'	'1'	'01'
<u>5</u>	'1'	'0'	'10'
<u>6</u>	'1'	'1'	'11'

Having used the leading digit in the five digit dialed string to set FLAG1 and FLAG2, the radio unit shall process the remaining four digits as described in 8.2.5.4.

8.2.5.6 Five to Seven Digit Dialed Strings. Leading Digits 0, 7 or 8

Dialed strings of five to seven digits with leading digits 0, 7 or 8 shall be used to send a call to the PABXI gateway. On receipt of a Mode 1 AHYC with IDENT1 = PABXI and DESC = '010', the radio unit shall respond with a SAMIS containing DESC = '010', and with the full dialed string occupying BCD blocks commencing with BCD1. Unused blocks shall be filled with NULL.

Note: Five digit dialed strings with leading 2 or 9 are used for inter-fleet calls and leading digit 1 is not specified.,

8.2.5.7 Eight or Nine Digit Dialed Strings. Leading Digits 7 or 8

Dialed strings of eight or nine digits with leading digits 7 or 8 shall cause the radio unit to send a call to the PABXI gateway. On receipt of a Mode 1 AHYC with IDENT1 = PABXI and DESC = '010', the radio unit shall respond with a SAMIS containing DESC = '010' and with the full dialed string occupying BCD blocks commencing with BCD1. When the dialed string length is 8 digits the unused block shall be filled with NULL.

8.2.6 PSTN Numbering (Optional)

8.2.6.1 PSTN Abbreviated Dialling

Single address codeword calls and diversions may be made to 15 pre-arranged numbers by using the special idents PSTNSIj. The procedures are defined in section 8.2.8.1.



### 8.2.6.2 Calls to PSTN Subscribers

Dialled strings of eight or more digits with leading digit 0 shall cause the radio unit to send an RQS or RQE call to the PSTNGI gateway with FLAG1 set to '0' to indicate a dialled string length of 10 or less digits, or set to '1' to indicate 11 to 32 digits. On receipt of a Mode 1 AHYC with IDENT1 = PSTNGI, DESC = '001' and SLOTS = '01' or '10' as appropriate, the radio unit shall respond with SAMIS, DESC = '001' with the full dialled string, less the leading 0, occupying BCD blocks commencing with BCD1. If SLOTS = '10' and the dialled string has a length of 11 to 21 digits inclusively then the accompanying SAMIS shall have L set to '01' and the radio unit shall append one data codeword which shall contain the digits that cannot be accommodated in the SAMIS. If SLOTS = '10' and the dialled string length is greater than 21 digits then the accompanying SAMIS shall have L set to '10' and the radio unit shall append two data codewords which shall contain the digits that cannot be contained in the SAMIS. Unused BCD groups shall be filled with NULL.

### 8.2.7 Network Operator Services (3 digit calls) (Optional)

Three digit dialled strings in the table below shall be used to call network services. The table lists dialling strings and the special identities into which they shall be translated by the unit.

Dialled String	Special Ident	Dialled String	Special Ident
<u>100</u>	8170	<u>161</u>	8176
<u>111</u>	8171	<u>171</u>	8177
<u>121</u>	8172	<u>181</u>	8178
<u>131</u>	8173	<u>191</u>	8179
<u>141</u>	8174	<u>999</u>	8180
<u>151</u>	8175		

Figure 8.5 Table of Special Idents for Operator Services

999# shall initiate an RQE call request message.

### 8.2.8 Call Modifiers and Radio Unit Control

Calls are modified from speech calls to other types of call, and the radio unit functions are controlled by, dialled strings commencing with \* or #. This section defines codes which directly affect MPT 1327 address codewords. Other functions which the unit is required to perform may use codes of a similar type but the unit manufacturer has choice of code and implementation.

Codes which modify a call precede the dialled number and are separated from the number by use of the \* key. Generally, codes which change a function between two states initiate the state by commencing the code with \*, and re-set the state by the same code commencing with #.

The # key is always used to signal the end of dialling activity, with the exception of when the unit is alerting for an incoming call.

- eg - To make a priority call to a unit dial \*8 \*234#
- To make a non-prescribed data call to an abbreviated PSTN destination dial \*31 \*\*12#
- To make a conference group call dial \*1 \*923#

As well as the keypad functions, any of the function codes may also be assigned to special function keys which carry out the same action as a code but in a single keystroke.

### 8.2.8.1 Call Initiation

#### 8.2.8.1.1 Abbreviated Dialling (Optional)

Codes for TSC translation of special idents shall be of the form:

\*\*nn#

nn shall be in the range 1 to an upper limit specified by the network operator, but not greater than 49. nn shall be translated by the radio unit into a special ident by the following algorithm:

$$\text{Ident} = 8120 + \text{nn}$$

#### 8.2.8.1.2 Call ALLI: Code \*1987# (Optional)

The entry of any of the codes \*1981# to \*1987# may be used to cause the radio unit to send RQS, RQE or RQC (as specified below) with IDENT1 set to the special ident 8191 (the system-wide ident - refer to !!4!!). The type of request message to be sent and the values of certain fields within that message shall depend upon the value of the code entered, as specified below:

<u>Code</u>	<u>Type of System-wide Call</u>	<u>Request Message Type</u>	<u>Specified Field Value</u>
<u>*1981#</u>	Priority voice	RQS	DT='0' LEVEL='0'
<u>*1982#</u>	Emergency voice	RQE	DT='0'
<u>*1893#</u>	Priority np data	RQS	DT='1' LEVEL='0'
<u>*1984#</u>	Emergency np data	RQE	DT='1'
<u>*1985#</u>	Short data	RQC	
<u>*1987#</u>	Standard voice	RQS	DT='0' LEVEL='1'

The above codes may not be used in conjunction with any additional digits (eg other call modifiers or destination digit strings).



## 8.2.8.2 Call Modifiers (Optional)

### 8.2.8.2.1 Despatcher and Status calls

Enter Despatcher Queue: Code \*0

The radio unit shall set up an RQQ (STATUS = 0) call to the dialled number. The radio unit may default to a pre-arranged number if a number is not dialled, ie the unit may set up an RQQ call to an address which is programmed within the unit if the # key is depressed immediately after the code (!!5.5.3.1.7!!).

Leave Despatcher Queue: Code #0

The radio unit shall set up an RQQ (STATUS = '31') call to the dialled number. The radio unit may default to the last despatcher queue which had been entered if no number is dialled (!!5.5.3.1.7!!).

Send Status: Code \*0nn

The radio unit shall set up an RQQ (STATUS = 'nn') call to the dialled number. The radio unit may default to a pre-arranged number if a number is not dialled, ie the unit may set up an RQQ call to an address which is programmed within the unit if the # key is depressed immediately after the code. nn is a single or two digit code without a leading zero and shall be in the range 1 to 30 (!!5.5.3.1.7!!).

### 8.2.8.2.2 Conference/Broadcast Group Facility

Units which receive group calls may allow the user to reply to the calling party (conference) or the unit may inhibit replies (broadcast) on receipt of a maintenance message on the traffic channel. The unit originating the call sends RQS (FLAG1 = '1') or RQE (FLAG1 = '1') to disable the called units' ability to reply. The calling unit shall only set FLAG1 to '1' if the called address is a group address (!!5.5.3.1.1!!).

Conference and broadcast calls may be specifically requested using the call modifiers described in 8.2.8.2.2.1 and 8.2.8.2.2.2. No default is prescribed for cases where neither call modifier is used; however it is recommended that the default is conference call.

#### 8.2.8.2.2.1 Conference Call Code \*1

\*1 sets RQS or RQE, FLAG1 to '0'

#### 8.2.8.2.2.2 Broadcast Call Code \*11

\*11 sets RQS or RQE, FLAG1 to '1'

### 8.2.8.2.3 Data Facilities

\*2 initiates a section 14 Control Channel Short Data Message. Paragraph 8.2.8.2.3.2 specifies

the use of the code. Codes of the format "\*2n" where "n" is any length string commencing with 1 or 2 are reserved for future definition. Codes where the string commences with any digit from 3 to 9 or 0 are available for customisation.

\*31 is specified in this section. Codes of the format "\*3n" where "n" is any length string commencing with 2 are reserved for future definition. Codes where the string commences with any digit from 3 to 9 or 0 are available for customisation.

#### 8.2.8.2.3.1 Non-prescribed Data. Code \*31

\*31 sets RQS (DT = '1') or RQE (D = '1') as appropriate (!!5.5.3.1.1!!). This code requests that a transparent end to end audio path be set up by the network. The user supplies the data communications equipment (DCE) to terminate the audio path. The radio unit's acoustic transducers are inhibited and the audio connection to the DCE is enabled on receipt of GTC. Call maintenance messages are inhibited unless required by the network operator.

#### 8.2.8.2.3.2 Short Data on the Control Channel. Code \*2

\*2 causes the radio unit to initiate an RQC message. The dialled format is \*2\* <data> \* <called party number> #. The radio unit shall respond to the associated AHYC from the TSC with the data field of the dialled string in accordance with section 14. The STF field, and MESS field if applicable, may be set in any appropriate manner for the input data.

\*2# shall cause the radio unit to send data from an external device to a pre-arranged address.

\*2\* <data> # shall cause the radio unit to send data from the keyboard to a pre-arranged address.

\*2\*\* <called party number> # shall cause the radio unit to send data from an external device to the called party number.

##### 8.2.8.2.3.2.1 Use of the data field

If the data field contains no input the radio unit shall substitute data from an external data input device. Any format prescribed in section 14 may be implemented and the GFI field shall be set appropriately. The external device may also originate short data messages without the need for the user to make an entry on the radio unit keyboard. The protocol between the radio unit and the external device is not defined.

##### 8.2.8.2.3.2.2 Use of the number field

Any number defined in section 8.2.4 to 8.2.7 may be dialled.

#### 8.2.8.2.4 Priority Call Code \*8

The radio unit shall set up an RQS (LEVEL = '0') call to the dialled number (!!5.5.3.1.5!!). The user may dial, and the unit shall accept, any further suitable modifier which sets other



#### 8.2.8.3.1 Divert Own Calls: Code \*41n (!!12.2!!)

\*41 shall cause the radio unit to send RQT (DIV = '0', FLAG1 = '0', FLAG2 = '0') (unless FLAG1 is set to '1' by PSTN number string length) to the TSC (!!5.5.3.1.4!!). The RQT instructs the TSC to offer the number which has been dialled after the code to any caller who is attempting to make a call to the originating radio unit as an alternative destination for the call. The number to which calls are to be diverted, and which follows the code, shall be any number which the user is able to dial for a normal speech call (RQS). If no number is dialled after the code then the unit shall not transmit a diversion request.

If n is not dialled, all call types are diverted.  
RQT, SD shall be set to '00'.

If n = 1, only speech calls are diverted.  
RQT, SD shall be set to '01'.

If n = 2, only data calls are diverted.  
RQT, SD shall be set to '10'

eg \*41 \*234# diverts all types of call to unit 234 in the same fleet as the originator of the diversion.

\*411 \*3456# diverts speech calls to extension 3456 in the PABX which is associated with the diversion originator's fleet.

When unit numbers which would normally result in a single address codeword call are entered as a call diversion request, they shall be sent as IDENT1 in an RQT.

When unit numbers which would normally result in an extended addressing call are entered as a call diversion request, they shall be sent in an RQT with IPFIXI in IDENT1. The dialled number shall be sent in a SAMIS (DESC = '000') in PARAMETERS1 in response to an AHYC with the same address information as contained in the originating RQT.

When calls to PABX extension numbers which would normally result in a single address codeword call are entered as a call diversion request, they shall be sent as an RQT with PABXI in IDENT1 and the dialled number shall be sent in a SAMIS (DESC = '010', SP = '1'). EXCHANGE shall be set to '00' for four digit calls and shall be set as listed in the table in 8.2.5.5 for five digit calls. The dialled number is manipulated by the algorithm used for creating IDENT1 in an RQS or RQE and is transmitted in Number. The SAMIS is sent in response to an AHYC with the same address information as contained in the originating RQT.

When called extension numbers which would normally result in an extended addressing call are entered as a call diversion request, they shall be sent as an RQT with PABXI in IDENT1 and the dialled number shall be sent in a SAMIS (DESC = '010', SP = '0'), with the BCD blocks filled in the same manner as for a normal call (8.2.5.7). The SAMIS is sent in response to an AHYC with the same address information as contained in the originating RTQ.



bits in the RQS address codeword. The further modifier shall be dialled with its leading \* character, eg \*1, \*11, \*32. The code shall also function with abbreviated dialling codes commencing with \*\*.

8.2.8.2.5 Emergency Call Code \*9 (!!10.2!!)

The radio unit shall set up an RQE call to the dialled number (!!5.5.3.1.5!!). The radio unit may default to a pre-arranged number if a number is not dialled, ie the unit may set up an RQE call to an address which is programmed within the unit if the # key is depressed immediately after the code. The user may dial, and the unit shall accept, any further modifier which sets other bits in the RQE address codeword. The further modifier shall be dialled with its leading \* character, eg \*1, \*11, \*32. The code shall also function with abbreviated dialling codes commencing with \*\*.

The special Emergency mode (FLAG2 = '1') (!!10.2!!) is entered by dialling an additional string after \*9. If the first digit in the additional string is in the range 1 to 4 then FLAG1 and D are set according to the following table:

Digit	FLAG1	D
<u>1</u>	'0'	'0'
<u>2</u>	'0'	'1'
<u>3</u>	'1'	'0'
<u>4</u>	'1'	'1'

The remaining digits are the decimal representation of the 13 bit number which is sent in IDENT1. Leading zeros which result from the binary to decimal conversion are not dialled.

If the first and only digit in the additional string is 9 then the unit expects to receive an input from an external unit to set FLAG1, D and IDENT1.

eg \*91# sets all bits to '0'  
\*923# sets D to '1', FLAG1 to '0', and IDENT1 to '0000000000011'

The TSC handles the received RQE by agreement with the user or service provider. No other call modifiers or called party number shall be accepted by the unit in conjunction with this facility.

999# shall set up an RQE call without the need to dial \*9.

8.2.8.3 Radio Unit or Network Control (Optional)

The radio unit may incorporate one or more routines to allow calls to be controlled fully and to modify unit action on receipt of incoming calls etc. MPT 1327 related functions include call diversion, rejection of incoming call interrogations etc.



When abbreviated calls to PSTN numbers which would normally result in a single address codeword call are entered as a call diversion request, they shall be sent as an RQT with the correct PSTNSIj in IDENT1.

When calls to PSTN numbers which would normally result in an extended addressing call are entered as a call diversion request, they shall be sent as an RQT with PSTNGI in IDENT1. If the dialled string (including the leading 0) is equal to or greater than 11 digits, FLAG1 = '1'. The dialled number shall be sent in a SAMIS (DESC = '001') with the BCD blocks filled in the same manner as for a normal call (See 8.2.6.2). The appended codeword shall also be sent when necessary. The SAMIS is sent in response to an AHYC with the same address information as contained in the originating RQT.

#### 8.2.8.3.2 Cancel Own Diversion: Code #41n#

Upon being dialled the radio unit shall send RQT to the TSC to instruct it to cancel the divert state.

If n is not dialled, all call types shall cease to be diverted.  
RQT (SD = '00')

If n = 1, only speech calls shall cease to be diverted.  
RQT (SD = '01')

If n = 2, only data calls shall cease to be diverted.  
RQT (SD = '10')

Cancellation of divert condition causes the radio unit to transmit RQT (DIV = '1', FLAG1 = FLAG2 = '0') with IDENT1 = IDENT2 (the originating unit's own address).

#### 8.2.8.3.3 Divert Third Party Calls: Code \*44n

\*44n is followed by the number of the third party whose calls are to be diverted, and then by the diversion destination.

\*44 shall cause the radio unit to send RQT (DIV = '0', FLAG1 = '0', FLAG2 = '1') (unless FLAG1 is set to '1' by PSTN number string length) to the TSC. The RQT instructs the TSC to offer the call destination to any caller who is attempting to make a call to the third party number as an alternative destination for the call. The number to which calls are to be diverted shall be any number which the user is able to dial for a normal speech call (RQS). If less than two numbers are dialled after the code then the unit shall not transmit a call diversion request.

If n is not dialled, all call types are diverted.  
RQT, SD shall be set to '00'

If n = 1, only speech calls shall be diverted.  
RQT, SD shall be set to '01'

If n = 2, only data calls shall be diverted.  
RQT, SD shall be set to '10'

eg \*442 \*234 \*432# Data calls directed to unit 234 in the same fleet as the diversion originator shall be re-directed to unit 432 in the same fleet.

\*441 \*234 \*3456# Speech calls to unit 234 in the same fleet as the diversion originator shall be re-directed to extension 3456 in the PABX which is associated with the diversion originator's fleet.

Methods of sending the diversion data are specified in 8.2.8.3.1. In addition, the blocked third party address is sent in response to an AHYC with IDENT1 = DIVERTI, PFI/IDENT2 = requesting unit's address, DESC = '000', SLOTS = '01'. The order in which the two AHYCs are sent is not defined.

#### 8.2.8.3.4 Cancel Third Party Diversions: Code #44n

This code is followed by the number of the third party whose calls are presently diverted.

The radio unit shall send RQT to the TSC to instruct it to cancel the divert state for the nominated third party. If a number is not dialled after the code then the unit shall not transmit a diversion cancellation request.

If n is not dialled, all call types cease to be diverted.  
RQT, SD shall be set to '00'

If n = 1, only speech calls cease to be diverted.  
RQT, SD shall be set to '01'

If n = 2, only data calls cease to be diverted.  
RQT, SD shall be set to '10'

eg #441 \*234# allows unit 234 in the same fleet as the call request originator to receive speech calls directed to the unit.

Cancellation of the divert condition causes the radio unit to transmit RQT (DIV = '1', FLAG1 = FLAG2 = '0') with IDENT1 = third party identity, or IPFIXI and IDENT2 = the requesting unit's own address. If IDENT1 = IPFIXI, the full address of the third party unit is transmitted in a SAMIS (DESC = '000') in PARAMETERS1, in response to an AHYC with IDENT1 = IPFIXI.

#### 8.2.8.3.5 Cancel Incoming diversions: Code #45n#

This code causes the radio unit to send RQT to the TSC to instruct it to cancel any divert state which may be directing calls to the originating radio unit. Cancellation of incoming diversions causes the radio unit to transmit RQT (DIV = '1', FLAG1 = FLAG2 = '0') with IDENT1 = DIVERTI.



If n is not dialled, all call types cease to be diverted.  
RQT, SD shall be set to '00'

If n = 1, only speech calls cease to be diverted.  
RQT, SD shall be set to '01'

If n = 2, only data calls cease to be diverted.  
RQT, SD shall be set to '10'

8.2.8.3.6 Queue Incoming Calls: Code \*48#

This code causes the radio unit to respond to AHY (D='0') messages with ACKB (QUAL = '0') (!!9.1.1.5!!) and place the call details in a call queue. Selection of this state shall cancel any previously entered "Don't Disturb" (8.2.8.3.8) in respect of AHY (D='0') message.

8.2.8.3.7 Cancel Queueing of Incoming Calls: Code #48#

This code causes the radio unit to cease queueing calls and resort to acknowledging all AHY (D='0') messages with any acknowledgement which is appropriate for the radio unit state (!!9.1.1.5!!).

8.2.8.3.8 Don't Disturb: Code \*49n#

This code causes the radio unit to acknowledge all appropriate AHY messages with ACKV (QUAL = '1'), thus blocking the call (!!9.1.1.5!!).

If n is not dialled, the unit shall respond ACKV (QUAL = '1') to all appropriate AHYs to the unit. D may be either '0' or '1'.

If n = 1, the unit shall respond ACKV (QUAL = '1') to appropriate AHYs to the unit when D is set to '0' (speech calls).

If n = 2, the unit shall respond ACKV (QUAL = '1') to appropriate AHYs to the unit when D is set to '1' (data calls).

8.2.8.3.9 Cancel Don't Disturb: Code #49n#

This code causes the radio unit to acknowledge all appropriate AHY messages with any acknowledgement which is appropriate for the radio unit state (!!9.1.1.5!!).

If n is not dialled, the unit shall cease to respond ACKV (QUAL = '1') to any appropriate AHYs to the unit. D may be either '0' or '1'.

If n = 1, the unit shall cease to respond ACKV (QUAL = '1') to appropriate AHYs to the unit when D is set to '0' (speech calls).

If n = 2, the unit shall cease to respond ACKV (QUAL = '1') to appropriate

AHYs to the unit when D is set to '1' (data calls).

#### 8.2.8.4 Radio Unit Control (Mandatory)

The unit shall incorporate keyboard routines to allow the unit to abandon call attempts, clear calls and accept incoming calls (see section 8.3.3.).

##### 8.2.8.4.1 Call Set-Up Abandon: Call Complete: Code \*#

\*# may be dialled after digits and a terminator have been entered on the keyboard. If the radio unit has not transmitted a call request, it shall abandon the call and resume an idle state on the control channel.

If the radio unit has started to set up a call, it shall transmit a call cancel request (RQX) (!!9.1.1.8!!).

If \*# is dialled whilst the unit is on a traffic channel, the radio unit shall terminate the call by transmitting MAINT (OPER = '011') where appropriate to its call condition (!!9.2.3.5!!).

If \*# is dialled whilst the radio unit is indicating call failure or termination by a continuing confidence indication, then the radio unit shall cancel that indication.

Notes:

1. \*# may also be used to abandon erroneous keyboard entries.
2. If \*# is dialled after an "off-hook" indication has been sent to the TSC to accept an incoming call, but before the radio unit receives GTC, the radio unit shall transmit an "on-hook" indication RQQ (STATUS = 31) to TSCI (!!5.5.3.1.7!!).

##### 8.2.8.4.2 Accept Incoming Call: Code # (Alerting State only)

If # is dialled when the radio unit is alerting the user for an incoming call, the radio unit shall send RQQ (STATUS = 0) to TSCI. In the alerting state the # key is not used as a dialled string terminator. An incoming call shall cause abandonment of a dialling attempt which has not been terminated by the string terminator (!!5.5.3.1.7!!).

#### 8.2.9 Summary of Numbering Convention Notes)

Single digit dialled strings (Z). Not defined. Proposed use:

Z	0	Associated PABX Operator	(Ident 8000)
Z	1 - 9	Dispatcher	(Ident looked up in unit)

Two digit dialled strings (YZ)

Y	0	PABX operator in exchange group, EXT = '1'
Z	3 - 6	PABX access number for exchange as defined in five digit numbers below (Ident 8000 with FLAGS 1 and 2 set appropriately)



YZ	20 - 89	Individual number
YZ	90 - 99	Group number

Three digit dialled strings (XYZ)

X	1	Network operator services	
YZ	00		(Ident 8170)
	11		(Ident 8171)
	21		(Ident 8172)
	31		(Ident 8173)
	41		(Ident 8174)
	51		(Ident 8175)
	61		(Ident 8176)
	71		(Ident 8177)
	81		(Ident 8178)
	91		(Ident 8179)
XYZ	200 - 899	Individual calls in fleet	
	999	Emergency Operator	(Ident 8180)
X	9	Group call	
YZ	00 - 98	Group number	

Four digit dialled strings (WXYZ)

WXYZ	1000 - 8999	Single addressword calls to single, associated PABX. EXT = '1'. Flags 1 and 2 default to '0'.
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Five digit dialled strings (VWXYZ)

V	2, 9	Large fleet short form access
W	0 - 9	Routing code
XYZ	200 - 99	Individual or group number
WX	00 - 99	Routing code
YZ	20 - 99	Individual or group number
V	3 - 6	PABX access number for single addressword calls (value sets FLAGS 1 and 2), EXT = '1'
WXYZ	1000 - 8999	PABX extension number
V	0, 7 or 8	PABX network access number (extended addressing protocol) (PABXI)
WXYZ	NNNN	Exchange routing digits and extension number

Six digit dialled strings (UVWXYZ)

UVWX	2001 - 6050	Fleet number
YZ	20 - 99	Individual or group number
U	0, 7 or 8	PABX network access number (PABXI)
VWXYZ	NNNNN	PABX routing digits and extension number

Seven digit dialled strings (TUVWXYZ)

TUVW	2001 - 6050	Fleet number
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XYZ	200 - 998	Individual or group number	
T	0, 7 or 8	PABX network access number	(PABXI)
UVWXYZ	NNNNNN	PABX routing digits and extension number	

Eight digit dialled strings (STUVWXYZ)

S	1	Service technician's access only	
TUV	000 - 127	Transpose keyboard entry to binary and send in PFI	
		as part of inter-prefix call	
WXYZ	0001 - 8100	Transpose keyboard entry to binary and send in IDENT1	
		as part of inter-prefix call	
S	0	PSTN access number	(PSTNGI)
TUVWXYZ	NNNNNNN	PSTN routing digits and subscriber number	
S	7 or 8	PABX network access number	(PABXI)
TUVWXYZ	NNNNNNN	PABX routing digits and extension number	

Nine digit dialled strings (RSTUVWXYZ)

RST	200 - 327	Number prefix	
UVWXYZ	-	For details see six digit numbers, inter-fleet numbers	
R	0	PSTN access number	(PSTNGI)
STUVWXYZ	NNNNNNNN	PSTN routing digits and subscriber number	
R	7 or 8	PABX network access number	(PABXI)
STUVWXYZ	NNNNNNNN	PABX routing digits and extension number	

Ten digit dialled strings (PRSTUVWXYZ)

PRS	200 - 327	Number prefix	
TUVWXYZ	-	For details see seven digit numbers, fleet numbers	
P	0	PSTN access number (PSTNGI)	
RSTUVWXYZ	NNNNNNNN	PSTN routing digits and subscriber number	

Eleven or more digit dialled strings (NPRSTUVWXYZ)

N	0	PSTN access number	
PRSTUVWXYZ	NNNNNNNNN	Routing digits and subscriber number	

8.2.10 Summary of Control Codes

\*\*nn Abbreviated dialling codes  
nn = 1 to 15. PSTN abbreviated numbers prescribed method  
nn = 16 to 49. Network operator specified abbreviated dialling

\*# Call set-up abandoned, call complete

\*0 Despatcher queue

\*0nn Status 'nn' to despatcher



- \*1 Conference call
- \*11 Broadcast call
- \*1981# Priority voice system-wide call
- \*1982# Emergency voice system-wide call
- \*1983# Priority np data system-wide call
- \*1984# Emergency np data system-wide call
- \*1985# Short data system-wide call
- \*1987# Standard voice system-wide call
- \*2 Short Data on the Control Channel.
- \*3 \*31 is prescribed. other codes are either reserved for future definition or are available for customisation.
- \*31 Non-prescribed data call

If "n" is dialled in the following codes, the function is restricted to speech calls if n = 1, or data calls if n = 2.

- \*41n Divert own calls, ie calls directed to originator of diversion
- \*44n Divert third party calls, ie calls directed to a nominated party
- \*48 Queue incoming calls (speech calls only)
- \*49n Don't disturb
- \*8 Priority call
- \*9 Emergency call, RQE
- \*9xxx# Special emergency facility by arrangement with network operator
- # End dialled string, accept call if radio unit is alerting
- #0 Leave despatcher queue
- #41n Cancel own diversions, ie allow calls to a unit for which previously a call diversion was in force
- #44n Cancel third party diversions, ie allow calls to a nominated third party for

which previously a call diversion was in force

#45n Cancel incoming diversions

#48 Cancel queueing of incoming calls (speech calls only)

#49n Cancel Don't Disturb.

8.2.11 Glossary of Terms Specified to Section 8.2

Base Ident: The lowest value of ident allocated to a "fleet" of units

Block: An allocation of contiguous idents to a user "fleet"

Dialled String: The numbers dialled by a caller on the keypad of his radio unit to call any other party. Pre-origination dialling is employed and the end of the dialled string is indicated by the user dialling #

Fleet: All or a sub-set of a user's vehicles which are equipped with radio units, and which require direct communication between users by means of two or three digit dialling

Fleet Number: The dialled digits which identify the identity "block" for the fleet containing the called unit (digits 4 to 7 of the "Network Number"). Directly related to the "Fleet Base Ident"

Fleet Individual Number: A "Fleet Number" via which calls to individual units may be made

Fleet Group Number: A "Fleet Number" via which calls to groups of units may be made

Group Base Ident: The lowest value of ident allocated to a "fleet" of units for group addresses

Group Ident: An ident used to call a group of users

Group Number: The last group of digits in the "Network Group Number" which identifies the group of unit within the "fleet". Related to the "Group Ident" via the "Group Base Ident".

Individual Ident: An ident used to call an individual user

Network Number: The number by which a unit or group may be identified in a directory, all or part of which is dialled by a caller wishing to communicate with the identified party or parties. It consists of the "Number Prefix", the "Fleet Number" and the "Unit Number"



Network Individual Number:	The number which identifies an individual unit in a "fleet"
Network Group Number:	The number which identifies a group of units in a "fleet"
Number Prefix:	The three leading digits of the "Network Number". Directly related to the prefix
Unit Number:	The last group of digits in the "Network Individual Number" which identifies the unit within the "fleet". Related to the "Individual Ident" via the "Fleet Base Ident"

### 8.3 Ready for Communication Control

#### 8.3.1 Readiness for Communication

In the signalling standard MPT 1327 the terms "off-hook" and "on-hook" are used to designate the state of user readiness for communication. These terms have been used to reflect a parallel with the fixed telephone network where removal of the telephone handset from the switch cradle indicates a readiness for communication (off-hook). When the handset is resting in the switch cradle the user is assumed to be not ready for communication.

An indication of the state of readiness of a party to a call is necessary to enable the following functions, applicable to commercial networks in Band III:

- (a) To enable the user to instruct the radio unit to attempt to transmit a call request for a called party address indicated by pre-origination dialling or other appropriate method (calling party off-hook).
- (b) In systems which employ full off-air call set up, to enable the user to indicate to the radio unit readiness to accept an incoming call (called party off-hook). This function is not applicable to group calls.
- (c) To enable the user to instruct the radio unit to attempt to cancel a previously made request during the call set up phase or to request clear-down of a call in progress (calling party on-hook).
- (d) To enable the user to instruct the radio unit to attempt to cancel a called party off-hook instruction during the call set up phase or to request clear-down of a call in progress (called party on-hook).
- (e) To enable the user to cancel any confidence indication generated by the radio unit for a failed call attempt (calling or called party on-hook).

For convenience these functions are regarded as being fulfilled by a single control that shall be able to be activated on all radio units, although it is permissible to use more than one control for these purposes. This control, or group of controls, is designated the "Ready for

## Communication Control" (RFCC).

The RFCC must be capable of providing a real indication of the state of user readiness to the radio unit in order to support these functions. Accordingly, deliberate arrangements which allow the RFCC to be set by the user in an off-hook mode, and which do not reflect the true state of user readiness, shall not be permitted.

### 8.3.2 The Form of the Ready for Communications Control

It is not the intention of this specification to restrict unduly the scope for individual design of radio units. Consequently no requirements for the physical form that the RFCC shall take are prescribed. However, the following general comments are offered to assist the designer of radio units.

Failure to request traffic channel clear-down at the end of communication is a potentially serious cause of wasted air-time. RFCC devices which do not solely rely on user discipline in this matter are to be preferred to those, such as an ordinary switch-hook, which do.

RFCC devices which are designed to allow a means of acceptance of incoming full off-air call set up calls even when the user did not take the correct action to clear down the previous calls are to be preferred (eg, a unit left off-hook from a previous call shall be capable of signalling an on-hook to off-hook transition for a new incoming call).

A switch-hook type design is generally not applicable to hand portables and may not be the most suitable design in many other applications.

The design of the RFCC control shall take due account of the effects of normal operation upon road safety.

### 8.3.3 Control Requirements

The RFCC control, or group of controls, shall permit the user to signal the following to the radio unit, which shall then initiate the appropriate action prescribed elsewhere in the specification:

- an instruction for a call request to a called party address indicated by pre-origination dialling, or other appropriate method; "call request initiate",
- a called party answer instruction following receipt of AHY(CHECK='1'); "called party answer" (see MPT 1327 section 13.1.2.1),
- a call clear-down instruction for an individual call to which the user is a party; "call end request" (see MPT 1327 section 9.2.3.5),
- a calling party call cancellation instruction at any time prior to the receipt of a GTC message for the requested call; "call set-up abort" (see MPT 1327 section 9.2.1.7),



- an instruction to a radio unit, which is indicating call failure or termination by a continuing confidence indication, to cancel that indication; "cancel indication" (see 8.1).

The RFCC controls, or group of controls, may in addition permit the user to signal the following to the radio unit:

- an instruction to reject an incoming call; "incoming call reject" (see MPT 1327 section 13.1.2.1),
- an instruction to cancel a previously signalled called party off-hook state; "cancel called party answer" (see MPT 1327 section 13.1.2.6).

## 9. CONTROL CHANNEL ACQUISITION AND RETENTION

### 9.1 Introduction

When not assigned to a traffic channel (including immediately after switch-on), the radio unit shall attempt to find a control channel appropriate to the selected network. This requirement, the discipline for radio units whilst on a control channel and the circumstances which result in a search for a new control channel are the subjects of !!6.2.1!! of MPT 1327. However the protocol standard therein designates areas where system-dependent requirements may be specified, in particular:

- the method by which the radio unit searches for an appropriate control channel,
- the criteria which a control channel must satisfy to be considered appropriate by the radio unit,
- additional rules, other than those specified in !!6.2.1.2!!, for returning to the control channel acquisition procedures.

Accordingly, this section of the air-interface specification covers these system-dependent requirements.

The methods specified in this section recognise that designers of commercial trunked networks operating in Band III sub-bands 1 and 2 may choose from a variety of control channel strategies, including:

- dedicated control channels,
- dedicated control channels with load sharing,
- time-shared control channels,
- non-dedicated control channels.

These methods may result in the radio unit encountering a variety of control channel situations, including:

- receiving a control channel which suffers short-term interruptions (time-shared control channels),
- suffering long-term interruptions to control channel reception during which no appropriate control channel can be received by the radio unit (non-dedicated control channels, or moving out of range of the network),
- being in a location where it is possible for more than one control channel to be received from the selected network, involving the unit in a choice,
- being instructed to leave a control channel to enable that channel to be used as a traffic channel (non-dedicated control channels),



- being instructed to leave or being barred from access to, a control channel as a result of a network load sharing arrangement.

The procedures specified in this section have been devised as far as possible to cater for this range of situations, although the diversity of operational requirements represented by these situations necessitates some restriction on the tolerance to achieve efficient operation. In particular it should be noted that a non-dedicated control channel strategy may be inefficient in a multi-site situation where the radio unit is required to hunt through more than a small number of channels, but that this technique may be appropriate for small networks using only a few channels.

The mandatory procedures have also been devised to bias radio unit to retain their current control channel for as long as possible, consistent with the requirement for a satisfactory quality of service for the user of the radio unit. In addition a radio unit searching for a new control channel is biased towards systems which will not result in a need to register. These two qualities of the procedures are designed to minimise control channel loading.

Notwithstanding this bias, optional procedures have been included which will allow a radio unit to leave the current control channel when an alternative, preferred control channel is available. These options are intended to improve spectral efficiency, increase the availability of radio units for a group call and give improved quality of service to the user.

Radio units may employ proprietary control channel hunting procedures which do not conform with the requirements of this section provided that:

- The proprietary scheme shall only be enabled when selected by radio unit personalisation. When the proprietary scheme is not enabled, the radio unit shall default to the use of the procedures in this section.
- The documentation describing the algorithms and procedures used in the proprietary scheme have been provided by the radio unit Manufacturer to the Network Operator. The standard of the documentation shall be at least to the same depth as this section.
- The proprietary scheme has been authorised by the Network Operator.

## 9.2 Radio Unit Storage Requirements

### 9.2.1 Mandatory Storage Requirements

In order to follow the procedures specified in this section the radio unit shall provide the following storage requirements appropriate to the selected network:

- (a) In read-only memory:
  - i the control category of the radio unit for the selected network (see 9.5.2). Only one control category shall be stored per network;



- ii. the channel numbers (CHAN) applicable to a "normal hunt sequence" for the selected network (see 9.3.3.4). The radio unit shall have the capability to enable up to 32 values of channel number defining the scope of the "normal hunt sequence" to be stored, and shall provide for the scope of the "normal hunt sequence" to be set to any value from 1 to 32 channel numbers, depending on the number of channel numbers held in read-only memory (this may be achieved by storing, as a separate parameter, the number of channels in the "normal hunt sequence" or by using channel number zero as a null value in unused locations in the 32 value store). For each of the channel numbers stored the radio unit shall carry a record of whether or not it should expect to encounter a time-shared control channel on that channel number;
  - iii. the lowest and highest channel number (CHAN) which may be used by the selected network;
  - iv. acquisition authorisation data for the selected network (see 9.3.4.2.3);
  - v. a flag which shall indicate whether the "comprehensive hunt sequence" shall be suppressed for the selected network (see 9.3.3.5).
- (b) In Type B memory (see section 6.2):
- i. One value of the AREA sub-field of a received system identity code (or a NULL value) relating to the most recent registration attempt on the selected network in accordance with the registration procedures specified in section 10.

Note: It is permissible for data to be held in unprotected read/write memory whilst operational and transferred to protected memory on power down or equivalent.

The radio unit shall discard any data held in protected read/write memory, unless its validity is reasonably assured.

- (c) In read/ write memory:
- i. the channel number (CHAN) of the control channel on which the radio unit is currently confirmed or, if the radio unit is not currently confirmed on a control channel but has been confirmed on a control channel since switch on, the channel number of the control channel on which it was most recently confirmed;
  - ii. (NA-1) values of the AREA sub-field of received system identity codes (or NULL values) relating to registration attempts and a minimum of 8 records of denied registrations in accordance with the registration procedures specified in section 10.

#### 9.2.2 Optional Storage Requirements

In addition the radio unit may provide the following storage requirements:



- (a) In read/write memory:
- i. the channel number (CHAN), time-shared indicator (TSI) and system identity code (SYS) contained in any BCAST(SYSDEF = '00000') messages (announce control channel) received from the selected network (see 9.3.3.4);
  - ii. the channel number (CHAN) and system identity code (SYS) contained in any BCAST(SYSDEF = '00001') messages (withdraw control channel) received from the selected network (see 9.3.3.4);
  - iii. the channel number (CHAN), time-shared indicator (TSI) and adjacent site serial number (ADJSITE), optionally also with system identity code (SYS), contained in any BCAST(SYSDEF = '00100') messages (broadcast adjacent site control channel number) and BCAST (SYSDEF = '00101') messages (vote now advice) received from the selected network. If the announced channels have been examined by the radio unit, the signal strength of the new channel may also be recorded (see 9.3.3.3 and 9.3.3.6);

Note: since data relevant to the selected network stored under (a)i to iii above may be varied by subsequent BCAST messages it is recommended that this data is discarded at sometime between the radio unit being switched off and being made ready for service after being switched on subsequently. For these purposes a user initiated change of selected network should be regarded as being equivalent to switching-off the radio unit.

- iv. the channel number (CHAN) of the control channel on which the radio unit was last confirmed for each registration area for which a successful registration is recorded in the radio unit's read/write memory. If the radio unit is currently confirmed on a control channel then it is that channel which is regarded as the one on which it was last confirmed;
  - v. the channel number (CHAN), system identity code (SYS) and signal strength parameter of prospective control channels gleaned from the optional "background search sequence" (see 9.3.3.7).
- (b) In read-only memory:
- i. the channel number (CHAN) of an unspecified number of channels which are not used by the selected network and may therefore be omitted from the "comprehensive hunt sequence" (see 9.3.3.5);
  - ii. NDD preference data for the selected network (see 9.3.4.2.3);
  - iii. a parameter TH to set the maximum time a radio unit, which implements the optional "background search sequence", is permitted to leave the currently confirmed control channel when sampling alternative control channels on which it may prefer to operate (see 9.3.3.7.3);



- iv. a parameter TL to set the minimum time interval between successive departures from the currently confirmed control channel by a radio unit, which implements the optional "background search sequence", when sampling alternative control channels on which it may prefer to operate (see 9.3.3.7.1);
- v. three parameters LM1, LM2 and LM3 to define the margin between the level of a sampled control channel, and the level of either the confirmed control channel or L.O., which must be exceeded before a radio unit, which implements the optional "background search sequence", may identify it as a prospective control channel (see 9.3.3.7.6);
- vi. a parameter NS to define the number of consecutive sampling activities, carried out by a radio unit which implements the "background search sequence", over which the criteria relating to signal strength measurement should be satisfied for a particular channel before that channel may be identified as a prospective control channel (see 9.3.3.7.6).

### 9.3 Control Channel Acquisition Procedures

#### 9.3.1 Entry into Control Channel Acquisition Procedures

The control channel acquisition procedures enable a radio unit which is not assigned to a traffic channel to attempt to select a control channel. Control channel acquisition is a procedure which consists of hunting for candidate control channels and attempting to confirm that any candidate channels are appropriate to acquire.

The radio unit shall enter into the control channel acquisition procedures specified in this section under the following circumstances:

- immediately after switch-on or a user-initiated change of selected network;
- when it has relinquished the current control channel under the mandatory procedures specified in section 9.4;
- when it has received a CLEAR message on a traffic channel (see !!9.2.3.8!!);
- when it has sent disconnect messages (MAINT (OPER = '011')) or timed-out on a traffic channel (see !!9.2.3.5!! and !!9.2.3.6!!);
- when it has received a call maintenance message MAINT (OPER = '110') on a traffic channel which requires it to vacate that channel (see !!9.2.3.7!!).

Also a radio unit which implements the optional "background search sequence" shall enter into the control channel acquisition procedures described in this section:

- when it has identified one or more prospective control channels during a "background search sequence" which meet the parameters LM1, LM2 and LM3 as applicable.



In addition the radio unit may enter the control channel acquisition procedures under the following circumstances:

- when the radio unit has timed-out on a random access attempt due to NR or NE being reached or TC being exceeded (see 7.3.8!!);
- when the radio unit has received "system overload" (ACKX(QUAL='1')) as a result of sending a random access request message, except RQR;
- at any time whilst the radio unit is in fall-back mode to enable the radio unit to search for an alternative control channel. The procedures to be adopted by a radio unit exercising this option, including the points of entry and exit from the hunting procedures, are not specified and are, accordingly, not included in the procedural descriptions of the hunting sequences in 9.3.3.

At all times during the control channel acquisition procedures the radio unit shall mute its received audio and refrain from transmission.

### 9.3.2 Receiver Sensitivity During Control Channel Acquisition

The radio unit shall not attempt to become active on any channel for which the received signal level is less than the specified acquisition threshold.

The acquisition threshold L.2. shall be set to a signal level within the range -88 dBm to -106 dBm at the input of the receiver. The level within this range shall be determined by the manufacturer and shall be set at the lowest value possible consistent with achievable manufacturing tolerances and stability of adjustment under service conditions. When the radio unit is set to an acquisition threshold of L.2., or above, it shall not confirm the channel until the threshold L.2. is exceeded continuously for a minimum of 100ms. The time period shall be concurrent with receiving a decodable control channel system codeword with the value of SYS field selected for verification (see 9.3.4.2.1).

L.O. shall be set at a level determined by the radio unit manufacturer which enables the hunt to be successfully completed as quickly as possible, for example by rejecting channels on which the received signal is inadequate for data to be detected.

Portable radio units may operate with a single acquisition threshold L.1. which shall be set to a signal level of -98 dBm  $\pm$  6 dBm at the input of the receiver. The radio unit shall not confirm the channel until the threshold L.1. is exceeded continuously for a minimum of 100 ms. The time period shall be concurrent with receiving a decodable control system codeword with the value of SYS field selected for verification (see 9.3.4.2.1).

### 9.3.3 Control Channel Hunting Procedures

#### 9.3.3.1 Introduction

In order to find and acquire a control channel emanated by the selected network it is necessary for the radio unit to hunt through candidate forward control channel frequencies



until an appropriate control channel is located and confirmed. This control channel hunting may involve a variety of hunting sequences depending on the circumstances of the hunt.

The Control Channel Hunting Procedure stages described are:

- (a) "Resuming a Control Channel Sequence" or "Single Channel Hunt Sequence". These are both mandatory hunts limited to a single channel number.

The "resuming a control channel sequence" allows a radio unit, after a period of activity on a traffic channel, to resume the control channel on which it was last confirmed prior to the traffic channel activity.

The "single channel hunt sequence" is employed when a radio unit is directed by the TSC to a particular control channel (indicated by a CONT field value in a MOVE or CLEAR message) or seeks to regain a control channel after a period of inactivity on the selected network (due to being switched off or a user-initiated change of selected network when details of the last confirmed control channel number have been retained by the radio unit in accordance with 9.2.1).

- b) "Preferential Hunt Sequence". A hunting sequence, with one mandatory stage, two optional stages and optional procedures, which cover all channel numbers likely to be employed as control channels by the selected network. This sequence only allows the radio unit to acquire a control channel for which a preference exists.

The mandatory stage serves to ensure that a radio unit will not acquire a control channel which will result in a need to register.

The optional stages, which have precedence over the mandatory stage, serve to ensure that the radio unit will, wherever possible acquire, either:

- a control channel where the system identity code corresponds to one of a set of preferred NDD sub-sets held in its network personalisation;

or

- a control channel which satisfies the signal strength parameters LM1, LM2 or LM3 as applicable.

The optional procedures are mainly designed to increase the efficiency of the hunting sequence by allowing the radio unit initially to sample channels on which it has recorded a successful and current registration, followed by control channels radiated by base station sites within the vicinity (as gleaned from broadcast messages received from the selected network). In addition, the optional procedures allow the scope of the hunting sequence to be increased or decreased on the basis of broadcast messages received from the selected network or as a result of a radio unit implementing a "background search sequence" (see 9.3.3.7).

- (c) "Normal Hunt Sequence". A mandatory hunting sequence, with optional



procedures, which covers all channel numbers likely to be employed as control channels by the selected network and allows the radio unit to acquire a control channel, even if a need to register will result. The optional procedures allow the scope of the hunting sequence to be increased or decreased on the basis of broadcast messages received from the selected network.

(d) "Comprehensive Hunt Sequence". A mandatory hunting sequence, which may be suppressed for the selected network by radio unit personalisation. It covers all possible channel numbers in use by the network, including those normally only used for traffic channels. This hunting sequence provides a contingency to allow control channels to be acquired even when channel numbers not normally employed for this purpose are in use (in emergency reconfiguration situations, for example). An optional procedure allows the "comprehensive hunt sequence" to be temporarily suspended in favour of the "normal hunt sequence".

When "resuming a control channel" or carrying out a "single channel hunt sequence" the hunting sequence shall be considered complete when the radio unit has tuned directly to the radio channel and has carried out the appropriate confirmation procedures specified in 9.3.4.

Other hunting sequences involve hunting through channel numbers appropriate to the hunting sequence. Hunting is carried out in one or more stages. For each hunt stage the radio unit shall set its receiver acquisition threshold to a particular level and examine any signals received on the sampled channels which exceed that threshold. The radio unit shall then apply the control channel confirmation tests specified in 9.3.4 (the "control channel confirmation procedure"). The hunting sequence may be considered complete when either:

- a channel is found which satisfies the control channel confirmation tests specified in 9.3.4. The hunting sequence is successfully complete;
- all channel numbers within the scope of the hunting sequence have been tested, at all appropriate acquisition threshold levels, without a channel being found which satisfies the control channel confirmation tests specified in 9.3.4. The hunting sequence is unsuccessfully complete.

The radio unit shall carry out the hunting sequences in the order described in this section. If a hunting sequence is unsuccessfully complete, then the radio shall start the next hunting sequence. The final hunting sequence is the "comprehensive hunt sequence". This hunting sequence cannot be unsuccessfully completed. The radio shall stay in this hunting sequence until a control channel is confirmed. However, the foregoing provisions of this paragraph may be relaxed in the following circumstances:

- the "comprehensive hunt sequence" may be suppressed by radio unit personalisation for a network (see 9.3.3.5);
- a radio unit in a "comprehensive hunt sequence" may elect to perform complete hunting sequences of any other type, returning to the "comprehensive hunt sequence" in the event of failure to confirm an appropriate control channel (see 9.3.3.5);



- a radio unit in the fall-back mode, searching for an alternative control channel immediately after receiving ALHF on its last confirmed control channel, and which fails to find and confirm a normal operation mode control channel whilst hunting (all prescribed hunt sequences shall be completed), shall return to its fall-back channel and attempt to confirm the fall-back channel;
- a radio unit which is in the fall-back mode and is on a fall-back channel and elects to undertake control channel hunting may do so in a non-prescribed manner (see 13.5).

Where a hunting stage involves more than one channel the order in which channels are sampled is generally not specified. However, in order to guard against bias towards certain channels, radio units shall, in the absence of any requirements of this specification which prescribe otherwise, ensure a degree of randomness in the order in which channels are sampled by one of the following:

- hunting channel numbers sequentially (eg, from lowest to highest number) but beginning the hunting stage at a random position in the sequence of channel numbers;
- hunting channel numbers in a random fashion;
- any other suitable randoming method.

The mandatory procedures as defined in this specification are intended to provide a comprehensive range of methods which shall be used as a basis for the design of radio units.

The mandatory procedures specified are a minimum requirement for radio units. The use of additional procedures is not prohibited provided that they are compatible with the mandatory procedures. Note that, for example, a radio unit finding a channel which satisfies the control channel confirmation tests specified in 9.3.4 may continue the hunt in the hope that an alternative control channel may be found with a higher received signal level. Also, radio units need not limit the hunting procedures to the receiver sensitivity threshold levels specified and may conduct additional hunts at other levels.

Whilst employing the hunting procedures specified in this section, radio units are permitted to sample any received signal obtained by tuning to any frequency required by the application of the procedures. It is conceivable that this may involve sampling of private-user channels or channels in use by commercial networks in Band III other than the selected network. Accordingly, it an express condition of this permission to sample any channel that the radio unit shall not permit any intelligence received during hunting procedures to be made available to the user, nor shall it transmit at any time during hunting procedures.

#### 9.3.3.2 Direction to a Control Channel

In certain circumstances the radio unit may receive direction from a TSC regarding the control channel number on which the radio unit should seek to confirm, or the direction may be implicit in the protocol. Two procedures are specified. The procedure which the radio



unit shall employ is dependent upon the circumstances of the direction to a control channel number.

#### 9.3.3.2.1 Resuming a Control Channel Sequence

When "resuming a control channel" the radio unit shall retune to the channel number of the control channel on which it was last confirmed, irrespective of registration area, as recorded in its read/write memory (see 9.2). The radio unit shall be capable of receiving on the forward control channel which it is resuming within 34ms of the following instants:

- the end of any CLEAR message which, in accordance with the provisions of section 11.9.2.3.8, requires the radio unit to cease activity on the channel to which it is currently tuned, provided that the value of the CONT field in the CLEAR message is 0;
- the end of the last disconnect message (MAINT (OPER='011')) sent by the radio unit on a traffic channel, or the expiry of time-out TN;
- the end of the last pressel off message (MAINT (OPER='001')) sent by the radio unit on a traffic channel following the expiry of time out TT or the maximum call duration timer, where no disconnect messages (MAINT (OPER='011')) are to be sent by the radio unit (see !!9.2.3.5!!, !!9.2.3.6!! and 11.9.2.3.6);
- the end of any call maintenance message (MAINT (OPER='110')) received on a traffic channel which satisfies the criteria given in !!9.2.3.7!!;
- the operation of the RFCC control "call end request" by the user (8.3.3) during a group call when the radio unit is not the call originating unit (see !!9.2.3.5!!).

Before confirming the control channel the radio unit shall verify any system identity code received on the channel in accordance with the procedures of 9.3.4.2. In the event of the system identity code not meeting the verification procedures the hunting sequence shall be considered unsuccessfully completed. Upon unsuccessful completion of the "resuming a control channel sequence" the radio unit shall enter the "preferential hunt sequence".

#### 9.3.3.2.2 Single Channel Hunt Sequence

A "single channel hunt" shall apply when the radio unit is directed by the TSC to a control channel other than the one on which it was last confirmed, irrespective of registration area, or when it is switched on whilst still retaining valid information from previous activity on the selected network or the user initiates a change of selected network and the radio unit still retains valid information of previous activity on the new selected network. The receiver shall be tuned to receive the nominated channel within 35ms of the following instants:

- the end of any CLEAR message which, in accordance with the provisions of section 11.9.2.3.8 requires the radio unit to cease activity on the channel to



which it is currently tuned, provided that the value of the CONT field in the CLEAR message is not 0;

- the end of any MOVE message that is applicable to the radio unit and in which the value of the CONT field is not 0 (see !!7.4.2!!).

The receiver shall tune immediately to the nominated channel after the following events, but need not be on channel within 35ms:

- the radio unit being switched on, provided that the unit holds a valid record of the channel number on which the radio unit was most recently confirmed and the radio unit does not implement the optional "preferential NDD sub-set hunt stage";
- a change of selected network being initiated by the user, provided that the radio unit holds a valid record of the channel number on which the radio unit was most recently confirmed on the new selected network and the radio unit does not implement the optional "preferential NDD sub-set hunt stage".

The nominated channel shall be:

- the channel number indicated in the CONT field of the CLEAR message, when CONT is not equal to 0 (see !!5.5.4.3!!);
- or
- the channel number indicated in the CONT field of the MOVE message, when CONT is not equal to 0 (see !!5.5.4.4!!);
- or
- the channel number held in the radio unit's read/write memory as the control channel on which the unit was most recently confirmed on the selected network.

The radio unit shall not make any transmissions on a control channel until it has confirmed the channel in accordance with the procedure specified in 9.3.4 (including the error checking procedure specified in 9.3.4.4). In the event of a failure of the control channel to meet the channel confirmation criteria the hunting sequence shall be considered unsuccessfully completed. Upon unsuccessful completion of the "single channel hunt sequence" the radio unit shall enter the "preferential hunt sequence".

#### 9.3.3.3 Preferential Hunt Sequence

The "preferential hunt sequence" encompasses three hunt stages which are intended to ensure that the radio unit acquires a control channel which is preferred against selected criteria. These are the "preferential area hunt stage", which is a mandatory stage, and two optional stages, the "preferential NDD sub-set hunt stage" and the "preferential sampled hunt stage".



The mandatory "preferential area hunt stage" is intended to ensure that a hunting radio unit acquires, wherever possible, a control channel bearing an AREA sub-field in the SYS field which relates to a currently valid successful registration record held by the radio unit. Accordingly, the "preferential area hunt stage" should assist in reducing the overall registration message load on the network.

The optional "preferential NDD sub-set hunt stage" is designed to bias the radio unit to a control channel where the relevant portion of the system identity code matches a value of the PREFERRED NDD sub-field held in the radio unit's personalisation data. This hunting stage, if employed, is designed to improve spectral efficiency and increase the availability of radio units for a group call.

The optional "preferential sampled hunt stage" enables radio units implementing the optional "background search sequence" to acquire a control channel on the basis of the PREFERRED NDD sub-field or, where this is not applicable, acquire a control channel on the basis of signal strength from a pre-sampled list of channels.

Either or both of the optional hunt stages may be implemented. In any one "preferential hunt sequence" only one of the optional hunt stages may be carried out (depending upon the reason for entry into the sequence) and shall be completed in advance of the "preferential area hunt stage".

Each hunting stage, except the "preferential sampled hunt stage", shall encompass the control channels held in the radio unit's read-only memory as being applicable to a "normal hunt sequence". The radio unit may modify the compass of the hunting sequence from information held in its read/write memory as follows:

- by adding to the compass of the hunting sequence channel numbers received in BCAST (SYSDEF = '00000') messages from the selected network,
- by removing from the compass of the hunting sequence channel numbers received in BCAST (SYSDEF = '00001') messages from the selected network,
- by adding to the compass of the hunting sequence channel numbers received in BCAST (SYSDEF = '00100') messages from the selected network,
- by adding to the compass of the hunting sequence channel numbers received in BCAST (SYSDEF = '00101') messages from the selected network,
- by adding to the compass of the hunting sequence the channel numbers on which the radio unit was last confirmed on a control channel of the selected network for each registration area for which a successful registration is recorded in the radio unit's read/write memory (see 9.2).

Channel numbers which are covered by more than one of the above categories need only be added once to the compass of the hunting sequence.



In the case of the "preferential sampled hunt stage" the compass of the stage shall consist of all the prospective control channels identified during the "background search sequence" completed immediately prior to entering into the control channel hunting procedures (see 9.3.3.7).

The radio unit shall not make any transmissions on a control channel located during the "preferential hunt sequence" until it has confirmed the channel in accordance with the procedures specified in 9.3.4 (including the AREA sub-field check specified in 9.3.4.2.6 or the NDD sub-field check specified in 9.3.4.2.7, as appropriate).

A radio unit may implement the optional "background search sequence" (see 9.3.3.7) in which case it must also implement the "preferential sampled hunt stage" in the "preferential hunt sequence".

The radio unit may independently implement the optional "preferential NDD sub-set hunt stage" in the "preferential hunt sequence".

If the radio unit is carrying out the "background search sequence" and finds one or more prospective control channels it enters the "preferential hunt sequence" via the "preferential sampled hunt stage". If the radio unit enters the "preferential hunt sequence" for any other reason and implements the "preferential NDD sub-set hunt stage" it shall commence the "preferential hunt sequence" with the "preferential NDD sub-set hunt stage" provided that at least one of the preferred NDD sub-sets held in its network personalisation data has a length greater than zero.

In all other cases the radio unit commences the "preferential hunt sequence" with the "preferential area hunt stage".

#### 9.3.3.3.1 Preferential NDD Sub-set Hunt Stage

The "preferential NDD sub-set hunt stage" is an optional hunting stage which allows a radio unit to acquire, wherever possible, a control channel bearing a sub-set of the NDD sub-field in the SYS field equal to the highest priority preferred sub-set held by the radio unit. The bit positions from the PREFERRED NDD sub-field which are utilized in each preferred NDD sub-set and the priority of that preferred NDD sub-set are determined by network personalisation (see 9.3.4.2).

Accordingly, the "preferential NDD sub-set hunt stage" should assist, for instance, in availability of a radio unit for group calls and optimisation of spectral efficiency.

A radio unit which implements the optional procedures described in this section shall enter the "preferential NDD sub-set hunt stage" when any of the conditions of entry listed below have been satisfied, providing that the length of at least one of the values of PREFERRED NDD sub-field held in its network personalisation data is non-zero (see 9.3.4.2).

- A "resuming a control channel sequence" has been unsuccessfully completed.
- A "single channel hunt sequence" has been unsuccessfully completed.



- The radio unit is switched on.
- The user initiates a change of selected network.
- The radio unit has left its current control channel due to failure to receive a valid system identity code (SYS) in accordance with the provisions of 9.4.1 b) and c).
- An Aloha, or, additionally in the case of radio units which are equipped to employ the MARK message, a MARK message is received in which CHAN4 does not match the least significant four bits of the channel number of the control channel on which the message was received and there is no match also in the next decodable Aloha or MARK message (see !!6.2.1.1!!).
- The radio unit has left its current control channel due to application of the codeword error criteria in 9.3.4.3 and 9.4.
- A MOVE message is received that is applicable to the radio unit and in which the value of the CONT field is 0 (see !!7.4.2!! and 11.5.5.4.4).
- A control channel system codeword is received on the current control channel in which the value of the LAB sub-field in the system identity code indicates that the control category of the radio unit for the selected network is not permitted access on that control channel and this condition is repeated in the next decodable control channel codeword.
- A GTC message with CHAN = current channel is received which is not applicable to the unit when the radio unit is not in the fallback mode.
- An ALHF message is received on the current control channel and the radio unit is not in the fall-back mode (see 13.3).
- An ACKX (QUAL = '0') message is received as a result of a registration attempt by the radio unit following a demand from the TSC for the radio unit to attempt registration (see !!8.3.2.2!!).
- The radio unit has timed-out after a random access registration (RQR) attempt due to NR being reached or TC being exceeded (see !!7.3.8!!) at any time other than prior to a successful registration being achieved on a newly-confirmed control channel.
- The radio unit has timed-out due to TJ being exceeded whilst waiting for signalling relevant to the transmission of an RQR message at any time other than prior to a successful registration being achieved on a newly-confirmed control channel.

In addition, radio units may enter the "preferential hunt sequence" at the "preferential NDD sub-set hunt stage" when any of the following conditions of entry are satisfied provided that



the length of at least one of the values of PREFERRED NDD sub-field held in its network personalisation data is non-zero (see 9.3.4.2):

- At any time during the "comprehensive hunt sequence", at the radio unit's discretion.
- When the radio unit has timed out after a random access attempt, except RQR, due to NR or NE being reached or TC being exceeded (see !!7.3.8!!).
- When the radio unit has received ACKX (QUAL = '1') as a result of sending a random access message, except RQR.

One "preferential NDD sub-set hunt stage" shall be carried out, at least, with the receiver acquisition threshold set to a level of L.O. (L.1. for a single acquisition threshold portable).

Whilst engaged in a "preferential NDD sub-set hunt stage", a radio unit shall sample all channels within the compass of the hunt for the purposes of subsequent confirmation, and rank them in order of preferred NDD sub-set with the highest priority first before seeking to confirm any channel. The radio unit shall seek to confirm the control channel bearing the highest priority preferred NDD sub-set first. If it fails to confirm this channel it shall seek to confirm the channel bearing the next highest priority preferred NDD sub-set and so on in descending order of priority. Where channels bear preferred NDD sub-sets of equal priority then the radio unit may seek to confirm any of these channels before other channels of lower priority, provided that the above requirements are satisfied.

The radio unit shall not make any transmissions on a control channel located during the "preferential NDD sub-set hunt stage" until it has confirmed the channel in accordance with the procedures specified in 9.3.4 (including the NDD sub-field check specified in 9.3.4.2.7).

In the event that a "preferential NDD sub-set hunt stage" at level L.O. (L.1. for a single acquisition threshold portable) is completed without a channel being found which satisfies the control channel confirmation tests specified in 9.3.4 (including the NDD sub-field check specified in 9.3.4.2.7), or if no relevant NDD preference data exists (see 9.3.4.2.2), then the "preferential NDD sub-set hunt stage" shall be considered unsuccessfully completed and the radio unit shall enter the "preferential area hunt stage" (see 9.3.3.3.3).

#### 9.3.3.3.2 Preferential Sampled Hunt Stage

The "preferential sampled hunt stage" is an optional hunting stage which allows a radio unit, wherever possible, to acquire a pre-sampled control channel bearing a sub-set of the NDD sub-field in the SYS field equal to the highest priority preferred sub-set held by the radio unit. The bit positions from the PREFERRED NDD sub-field which are utilized in each preferred NDD sub-set and the priority of that preferred NDD sub-set are determined by network personalization (see 9.3.4.2). If the lengths of the values of PREFERRED NDD sub-field held in its network personalization data are zero or if no pre-sampled control channels bearing a preferred NDD sub-set are available the "preferential sampled hunt stage" allows a radio unit to acquire a pre-sampled control channel of increased signal strength. Accordingly, the "preferential sampled hunt stage" should assist, for instance, in the



optimisation of spectral efficiency or the increase of call quality.

A radio unit which implements the optional procedures described in this section shall enter the "preferential sampled hunt stage" when

- it has entered the "preferential hunt sequence" as a result of leaving its current control channel having identified one or more prospective control channels (see 9.4.1 (q)).

Whilst engaged in a "preferential sampled hunt stage", a radio unit shall sample all channels identified as prospective control channels during the preceding "background search sequence" (see 9.3.3.7.6). Additionally the radio unit shall obey the requirement to sample and seek to confirm any channel numbers recorded as a result of the "background search sequence" in the radio unit's read/write memory in the following specified order. Firstly, in order of priority, highest priority first, those control channels bearing a preferred NDD sub-set and secondly, in order of signal level, highest signal level first, those control channels not bearing a preferred NDD sub-set.

Prior to confirmation the radio unit shall check that the control channel bears the same system identity code which was recorded against the channel at identification during the "background search sequence" (see 9.3.3.7.6). The radio unit shall not seek to confirm any control channel where this check is not satisfied.

The radio unit shall not make any transmissions on a control channel located during the "preferential sampled hunt stage" until it has confirmed the channel in accordance with the procedure specified in 9.3.4. Note that in the case of a pre-sampled control channel which does not bear a preferred NDD sub-set, the check specified in 9.3.4.2.7 is not carried out.

In the event that a "preferential sampled hunt stage" at level L.O. (L.1. for a single acquisition threshold portable) is completed without a channel being found which satisfies the control channel confirmation tests specified in 9.3.4 then the "preferential sampled hunt stage" shall be considered unsuccessfully completed and the radio unit shall enter the "preferential area hunt stage" (see 9.3.3.3.3).

#### 9.3.3.3.3 Preferential Area Hunt Stage

The "preferential area hunt stage" is a mandatory stage which is intended to ensure that a hunting radio unit acquires, wherever possible, a control channel bearing an AREA sub-field in the SYS field which relates to a currently valid successful registration record held by the radio unit. Accordingly, the "preferential area hunt stage" should assist in reducing the overall registration message load on networks.

A radio unit shall enter the "preferential area hunt stage" when

- a "preferential NDD sub-set hunt stage" has been unsuccessfully completed;
- a "preferential sampled hunt stage" has been unsuccessfully completed.



In addition a radio unit which does not implement the "preferential NDD sub-set hunt stage" or holds only zero-length values of PREFERRED NDD sub-field in its network personalisation data (see 9.3.4.2.2) shall enter the "preferential area hunt stage" when:

- a "resuming a control channel sequence" has been unsuccessfully completed;
- a "single channel hunt sequence" has been unsuccessfully completed;
- the radio unit is switched on and valid information of previous activity on the selected network is still retained in the radio unit's read/write memory, but the information does not include the channel number on which the radio unit was last confirmed on the selected network (see 9.2.1);
- the user initiates a change of selected network and valid information of previous activity on the selected network is still retained in the radio unit's read/write memory, but the information does not include the channel number on which the radio unit was last confirmed on the selected network (see 9.2.1);
- the radio unit has left its current control channel due to failure to receive a valid system identity code (SYS) in accordance with the provisions of 9.4.1.b) and c);
- an Aloha, or, additionally in the case of radio units which are equipped to employ the MARK message, a MARK message is received in which CHAN4 does not match the least significant four bits of the channel number of the control channel on which the message was received and there is not match also in the next decodable Aloha or MARK message (see !!6.2.1.1!!);
- the radio unit has left its current control channel due to application of the codeword error criteria in 9.3.4.3 and 9.4;
- a MOVE message is received that is applicable to the radio unit and in which the value of the CONT field is 0 (see !!7.4.2!! and 11.5.5.4.4);
- a control channel system codeword is received on the current control channel in which the value of the LAB sub-field in the system identity code indicates that the control category of the radio unit for the selected network is not permitted access on that control channel and this condition is repeated in the next decodable control channel codeword;
- a GTC message with CHAN = current channel is received which is not applicable to the unit when the radio unit is not in the fallback mode;
- an ALHF message is received on the current control channel and the radio unit is not in the fall-back mode (see 13.3);
- an ACKX (QUAL = '0') message is received as a result of a registration



attempt by the radio unit following a demand from the TSC for the radio unit to attempt registration (see !!8.3.2.2!!);

- the radio unit has timed-out after a random access registration (RQR) attempt due to NR being reached or TC being exceeded (see !!7.3.8!!) at any time other than prior to a successful registration being achieved on a newly-confirmed control channel;
- the radio unit has timed-out due to TJ being exceeded whilst waiting for signalling relevant to the transmission of an RQR message at any time other than prior to a successful registration being achieved on a newly-confirmed control channel.

In addition, the radio unit may enter the "preferential area hunt stage":

- at any time during the "comprehensive hunt sequence", at the radio unit's discretion;
- when the radio unit has timed out after a random access attempt, except RQR, due to NR or NE being reached or TC being exceeded (see !!7.3.8!!);
- when the radio unit has received ACKX (QUAL = '1') as a result of sending a random access message, except RQR.

One "preferential area hunt stage " shall be carried out, at least, with the receiver acquisition threshold set to a level of L.0. (L.1. for a single acquisition threshold portable).

Whilst engaged in a "preferential area hunt stage" a radio unit shall obey the requirement to sample channels in a random manner as specified in 9.3.3.1, save that it may implement either or both of the following optional procedures to allow selected channels to be sampled prior to a random sampling of the remainder:

- Sample before all other channels any channel numbers recorded in its read/write memory as a control channel of the selected network for registration areas for which successful registrations are recorded (see 9.2). The order in which these channels are sampled is not specified.
- Sample before all other channels any channel numbers recorded in the radio unit's read/write memory which have been gleaned from BCAST (SYSDEF = '00100') or BCAST (SYSDEF = '00101') messages received from the selected network (see 9.2 and 9.3.3.6). The order in which these channels are sampled is not specified.

When both of these optional procedures are implemented the radio unit should sample all channels recorded in registration data before sampling any other channels gleaned from BCAST messages.

The radio unit shall not make any transmissions on a control channel located during the



"preferential area hunt stage" until it has confirmed the channel in accordance with the procedures specified in 9.3.4 (including the AREA sub-field check specified in 9.3.4.2.6).

In the event that no valid AREA sub-field data relevant to the selected network is held in the radio unit's read/write memory or in the event of a "preferential area hunt stage" at level L.0. (L.1. for a single acquisition threshold portable) being completed without a channel being found which satisfies the control channel confirmation tests specified in 9.3.4 (including the AREA sub-field check specified in 9.3.4.2.6) then the "preferential hunt sequence" shall be considered unsuccessfully completed. Upon unsuccessful completion of the "preferential hunt sequence" the radio unit shall enter the "normal hunt sequence", unless the "preferential hunt sequence" was entered from the "comprehensive hunt sequence" in which case the radio unit shall return to the "comprehensive hunt sequence".

#### 9.3.3.4 Normal Hunt Sequence

The initial stage of the "normal hunt sequence" shall be carried out with the receiver acquisition threshold set to a level of L.2 (L.1. for a single acquisition threshold portable), or above, and shall encompass the control channels held in the radio unit's read-only memory as being applicable to a "normal hunt sequence". The radio unit may modify the compass of the hunting sequence from information held in its read/write memory as follows:

- by adding to the compass of the hunting sequence channel numbers received in BCAST (SYSDEF = '00000') message from the selected network;
- by removing from the compass of the hunting sequence channel numbers received in BCAST (SYSDEF = '00001') messages from the selected network.

A radio unit shall enter the "normal hunt sequence":

- when a "preferential hunt sequence" has been unsuccessfully completed;
- immediately after switch-on, provided that the radio unit holds no valid information of previous activity on the selected network in its memory and, in addition, that the memory contains no value of NDD preference data with a field length which is greater than zero;
- when the user indicates a change of selected network, provided that the radio unit holds no valid information of previous activity on the selected network in its memory and, in addition, that the memory contains no value of NDD preference data with a field length which is greater than zero.

The radio unit may enter the "normal hunt sequence"

- at any time during the "comprehensive hunt sequence", at the radio unit's discretion.

The radio unit shall not make any transmissions on a control channel located during the



"normal hunt sequence" until it has confirmed the channel in accordance with the procedures specified in 9.3.4.

In the event that a "normal hunt stage" at level L.2. or above is completed without a channel being found which satisfies the control channel confirmation tests specified in 9.3.4, then a "normal hunt stage" may be repeated at other levels. However, before the "normal hunt sequence" may be unsuccessfully completed, a "normal hunt stage" shall have been completed at least twice; once with the receiver acquisition threshold set to L.2. and once with the threshold set to L.O. (This does not apply for a single acquisition threshold portable).

Upon unsuccessful completion of the "normal hunt sequence" the radio unit shall enter the "comprehensive hunt sequence", except when the "comprehensive hunt sequence" has been suppressed by radio unit personalisation for a network (see 9.3.3.5).

#### 9.3.3.5 Comprehensive Hunt Sequence

The initial stage of the "comprehensive hunt sequence" shall be carried out with the receiver acquisition threshold set to a level of L.2. (L.1. for a single acquisition threshold portable) or above and shall normally encompass every channel within the range set by the lowest and highest channel numbers set by the network operator, held in the radio unit's read-only memory. However, it is permissible for radio units to be configured to omit channel numbers within the range of the "comprehensive hunt" by arrangement with the operator of the selected network and by network personalisation.

A radio unit shall enter the "comprehensive hunt sequence" when

- a "normal hunt sequence" has been unsuccessfully completed.

In the event that a "comprehensive hunt stage" at level L.2, or above, is completed without a channel being found which satisfies the control channel confirmation tests specified in 9.3.4, then a "comprehensive hunt stage" may be repeated at other levels. In the event that no channels are found which satisfy the control channel confirmation tests during subsequent hunts and, providing that a comprehensive hunt stage has been completed with the receiver acquisition threshold set to a level L.2, then the radio unit shall revert to a "comprehensive hunt stage" with the receiver acquisition threshold set to a level L.O. and shall repeat the "comprehensive hunt stage" until such a time as a channel which satisfies the control channel confirmation tests specified in 9.3.4 is found, except when the radio unit entered the "comprehensive hunt sequence" via the "preferential hunt sequence" as a result of receiving ALHF, and the radio unit is in the fall-back mode, when the action taken in the "comprehensive hunt sequence" is prescribed in section 13.

For a single acquisition threshold portable completing a "comprehensive hunt stage" without a channel being found which satisfies the control channel confirmation tests specified in 9.3.4, then the portable radio unit shall repeat the "comprehensive hunt stage" until such a time as a channel which satisfies the control channel confirmation tests specified in 9.3.4 is found except when the radio unit entered the "comprehensive hunt sequence" via the "preferential hunt sequence" as a result of receiving ALHF, and the radio unit is in the fall-



back mode, when the action taken in the "comprehensive hunt sequence" is prescribed in section 13.

The radio unit shall not make any transmissions on a control channel located during the "comprehensive hunt sequence" until it has confirmed the channel in accordance with the procedures specified in 9.3.4.

At any time during the "comprehensive hunt sequence" a radio unit may undertake a "preferential hunt sequence" or "normal hunt sequence", returning to the "comprehensive hunt sequence" in the event that the "preferential hunt sequence" or "normal hunt sequence" is unsuccessfully completed. It shall be possible to suppress the "comprehensive hunt sequence" by radio unit personalisation for a network. In this case the radio unit shall remain in the "normal hunt sequence" with the acquisition threshold set to a level L.O. (L.1. for a single acquisition threshold portable) until such time as a channel which satisfies the control channel confirmation tests specified in 9.3.4 is found, unless the radio unit is in the fall-back mode, when the action taken in the "normal hunt sequence" is prescribed in section 13.

#### 9.3.3.6 The Use of Adjacent Site Data

When confirmed on a control channel a radio unit may make use of information gleaned from BCAST (SYSDEF = '00100') and BCAST (SYSDEF = '00101') messages. These messages may be transmitted by the selected network and contain information on the control channels in use by sites in the vicinity of the transmitting site (adjacent site data) to assist radio units to acquire an appropriate control channel after leaving the current control channel.

The broadcast message contains both the channel number and SYS code which is being transmitted by the announced site and may also have a local serial number allocated (ADJSITE) to specify site location irrespective of control channel number and SYS code. The way in which ADJSITE information may be used by the radio unit is not prescribed in this specification.

The action to be taken by the radio unit upon receipt of any BCAST (SYSDEF = '00101') message or any BCAST (SYSDEF = '00100') message is not prescribed by this specification but the following comments are offered for the benefit of designers implementing schemes which utilise these facilities.

In storing the data received in the broadcast messages the unit may pre-filter the data for suitability of use by examining the SYS code contained in the announcement. In the case of BCAST (SYSDEF='00101') the unit may use the next slot to examine the announced channel and make a record of the received signal strength without incurring the risk of losing relevant call data on the control channel on which it is confirmed.

The unit constructs a 15 position table which contains relevant data on each announced site. This data may include any signal strength information which might be gathered by examination of the announced channel. The data is used to modify each of the control channel searches in favour of channels which are more likely to provide a satisfactory service than other channels which the search parameters may require. As the ADJSITE field is



peculiar to the transmitting site any table using ADJSITE may only be refreshed with data received from the same site. A new table should be started when a new control channel is acquired. According to the unit design the old table may be stored, its data may be used by reference to the SYS code, or the table may be destroyed when the unit acquires a new control channel.

#### 9.3.3.7 Background Search Sequence

The "background search sequence" is an optional hunting sequence which is intended to allow the radio unit, while confirmed on a control channel, to gain information about alternative control channels. Where the "background search sequence" indicates that one or more alternative control channels are available which may offer greater spectral efficiency (by virtue of bearing a preferred NDD sub-set) or may offer a stronger signal giving improved quality of service to the user, the radio unit leaves the current control channel and enters the control channel hunting procedures (providing that certain criteria are satisfied).

The "background search sequence", if implemented, shall be carried out as a background activity whilst the radio unit is confirmed on a control channel and is in the idle state. At all other times the "background search sequence" shall be suspended.

The sampling of control channels within the "background search sequence" takes place during discrete periods, each such period being referred to as either a "timed sampling activity" or an "elected sampling activity" (see 9.3.3.7.3).

The maximum duration of a "timed sampling activity" and the minimum time between successive timed sampling activities are set by network personalisation (see 9.3.3.7.1 and 9.3.3.7.3).

The signal strength criteria, by which alternative control channels are identified, must be satisfied for a number of consecutive timed sampling activities, set by network personalisation, immediately preceding confirmation.

The methods employed to sample channels during either sampling activity are not prescribed by this specification save that the purpose of sampling is to determine for each sampled channel whether it is a prospective control channel and to record, for all such prospective control channels, the received signal level of the channel (see 9.3.3.7.6) and a value of system identity code received in a control channel system codeword.

These techniques are most appropriate for systems using continuous control channels because of difficulties in reliably determining the signal strength of time-shared control channels, although their use on such systems is not disallowed.

#### 9.3.3.7.1 Performing a Sampling Activity

Sampling activities are carried out whilst confirmed on a control channel. The radio unit may leave the confirmed control channel to perform a sampling activity to search for alternative control channels subject to the following conditions.



For the "timed sampling activity":

- a) The radio unit shall have been confirmed on the channel for at least a period TL, where TL is network dependent;
- b) The radio unit shall not carry out a further sampling activity until timer TL has expired since the completion of any previous sampling activity.

For the "elected sampling activity":

- c) The radio unit shall have decoded an address codeword from the forward control channel which is not addressed to it (ie PFI/IDENT 1 does not match any of its designated addresses for the system and is not the system-wide, all-call ident ALLI) and which indicates that one or more following forward control channel slots will be occupied by the message of which the address codeword is the first codeword. If the radio unit exercises this option the maximum duration of the sampling activity shall not be TH (see 9.3.3.7.3) but shall be the number of slots following the address codeword which that codeword indicates will be occupied by the message.

For both sampling activities:

- d) The radio unit shall suspend all sampling activity whilst waiting for signalling or whilst tuned to a traffic channel and shall resume when it returns to the idle state;
- e) Whilst preparing to leave the control channel as a result of 9.4.1 (b), (c), (d), or (g) the radio unit shall suspend all sampling activity;
- f) Both of TL and TH (see 9.3.3.7.3) are non-zero. If either or both TL and TH are zero the radio unit shall not perform any sampling activities.

#### 9.3.3.7.2 Actions Prior to Performing a Sampling Activity

Prior to leaving the currently confirmed control channel for the purposes of performing a sampling activity the radio unit shall suspend any codeword error count in progress and retain any error counts to allow error checking to resume when the sampling activity is completed (see 9.3.3.7.5).

#### 9.3.3.7.3 Actions During a Sampling Activity

Whilst carrying out any sampling activities the radio unit shall continue to indicate service to the user where this option is implemented.

Provided that the conditions of 9.3.3.7.1 are met, the radio unit may commence a "timed sampling activity" at any time after a decodable address codeword has been received.

For the purposes of counting NS samples, where NS is network dependent (see 9.3.3.7.6), the radio unit shall not sample any channel more than once during a single "timed sampling activity".



The radio unit shall complete the "timed sampling activity" and return to receiving the confirmed forward control channel in sufficient time to be capable of decoding an address codeword in the next slot after TH continuous slots (where TH is network dependent) following the one in which the last address codeword was received prior to the "timed sampling activity" being commenced.

The number of channels sampled during each sampling activity will be dependent on the radio unit design.

#### 9.3.3.7.4 Scope of the Background Search Sequence

The "background search sequence" shall encompass all control channels held in the radio unit's read-only memory as being applicable to a "normal hunt sequence". The radio unit may modify the compass of the "background search sequence" from information held in its read/write memory as follows:

- by adding to the compass of the search sequence channel numbers received in BCAST (SYSDEF = '00000') messages from the selected network;
- by removing from the compass of the search sequence channel numbers received in BCAST (SYSDEF = '00001') messages from the selected network;
- by adding to the compass of the search sequence channel numbers received in BCAST (SYSDEF = '00100') messages from the selected network;
- by adding to the compass of the search sequence channel numbers received in BCAST (SYSDEF = '00101') messages from the selected network;
- by adding to the compass of the search sequence the channels numbers on which the radio unit was last confirmed on a control channel of the selected network for each registration area for which a successful registration is recorded in the radio unit's read/write memory (see 9.2).

#### 9.3.3.7.5 Actions Following a Sampling Activity

After completing a sampling activity, the radio unit shall resume any codeword error count in progress prior to the sampling activity at the values of the retained results, unless the requirements of 9.4.1(q) have been met. Note that a sampling activity shall only be considered complete when the radio unit has entered a "preferential sampled hunt stage" in accordance with the provisions of 9.4.1 (q) or has returned to the confirmed control channel and is capable of decoding forward control channel address codewords.

#### 9.3.3.7.6 Criteria for Identification of Prospective Control Channels

The radio unit shall not identify any channels as prospective control channels until it has sampled all the channels detailed in 9.3.3.7.4 at least once since the current control channel



was confirmed.

Note that during the last "timed sampling activity" immediately prior to identification of prospective control channels, the radio unit may sample more than one channel for subsequent identification, as shown below, providing the requirements of 9.3.3.7.3 are met.

Those which satisfy criteria (a) and one of (b), (c), (d) and (e) as shown below, shall be identified as prospective control channels.

- a) The sampled channel bears a system identity code for the selected network which the radio unit is authorised to acquire (see 9.3.4.2.4 and 9.3.4.2.5).
- b) The confirmed control channel bears a preferred NDD sub-set in the PREFERRED NDD sub-field of the system identity code, and the sampled channel bears a higher priority preferred NDD sub-set and exceeds L.0.
- c) The confirmed control channel bears a preferred NDD sub-set in the PREFERRED NDD sub-field and is less than or equal to L.2. and the sampled channel bears an equal priority preferred NDD sub-set and exceeds the confirmed control channel by a level margin LM2, where LM2 is network dependent.
- d) The confirmed control channel does not bear a preferred NDD sub-set in the PREFERRED NDD sub-field of the system identity code, but the sampled channel bears a preferred NDD sub-set and exceeds L.0. by a level margin LM3, where LM3 is network dependant.
- e) The confirmed control channel does not bear a preferred NDD sub-set in the PREFERRED NDD sub-field and is less than or equal to L.2., and the sampled channel does not bear a preferred NDD sub-set but exceeds the confirmed control channel by a level margin LM1, where LM1 is network dependent.

See table 9-1.

All criteria relating to signal strength, ie. level margin parameters LM1-LM3, shall be satisfied for NS consecutive timed sampling activities immediately prior to the relevant channel being identified as a prospective control channel. Note that any signal strength measurements carried out during an "elected sampling activity" shall not be treated as one of the NS samples.

The channel number, system identity code and signal strength (if appropriate) of each prospective control channel shall be stored once identified. Following any completion of the confirmation procedures in 9.3.4, the radio unit shall discard all information obtained from sampling activities.



TABLE 9-1 CRITERIA FOR IDENTIFICATION OF PROSPECTIVE CONTROL CHANNELS

Criteria for prospective control channel identification		CONFIRMED CONTROL CHANNEL	
		Has SYS field with preferred NDD sub-set	Has SYS field with non-preferred NDD sub-set
SAMPLED CONTROL CHANNEL	Has SYS field with preferred NDD sub-set	<u>Sampled has lower priority</u> Prospective control channel is not identified	Sampled signal strength > (L.O. + LM3)
		<u>Sampled has equal priority</u> (sampled signal strength - confirmed signal strength) > LM2 and confirmed signal strength ≤ L.2.	
		<u>Sampled has higher priority</u> Sampled signal strength > L.O.	
	Has SYS field with non-preferred NDD sub-set	Prospective control channel is not identified	(Sampled signal strength - confirmed signal strength) > LM1 and confirmed signal strength ≤ L.2.

### 9.3.4 Control Channel Confirmation

#### 9.3.4.1 Identifying a Candidate Control Channel

During any of the hunting procedures specified in section 9.3.3 the radio unit shall examine any signal detected for conformity with control channel structure. The radio unit shall accept as a candidate control channel any channel on which a control channel codeword synchronisation sequence is detected.

The method by which the radio unit identifies candidate control channels during hunting is not detailed in this specification. In particular no maximum time allowance for this procedure is specified, although attention is drawn to the necessity of completing tests as quickly as possible, notably on channels which can be easily rejected as control channel candidates (eg, no FFSK data is detected), since the overall speed of the hunt (and thus efficiency of service to the user) depends on the rapidity with which these tests can be carried out. However, if the channel number of the channels being sampled is identified as one on which a time-shared control channel may be expected in the store of channel numbers held in the radio unit's read-only memory as applicable to a "normal hunting sequence" (see 9.2.1) or in the store of data received from BCAST messages held in read/write memory (see 9.2.2) or in the TSI field of a received MOVE or CLEAR message, then the radio unit shall sample the channel for at least a period TS before rejecting the channel on the grounds of failure to detect a control channel codeword synchronisation sequence.

#### 9.3.4.2 Checking the System Identity Code

##### 9.3.4.2.1 Requirement to Verify System Identity Code

When the radio unit has identified a candidate control channel in accordance with section 9.3.4.1, it shall examine the values of the system identity code fields (SYS) of the control channel system codewords received on the channel.

When NV control channel system codewords have been received consecutively with the same value of SYS field, the radio unit shall attempt to verify that value.

The radio unit shall hold two alternative values of NV as follows:

- one value of NV shall be utilised when monitoring a channel for the purpose of selecting a value of SYS field for verification when the channel number is identified as one on which time-shared control channels may be expected in the store of channel numbers held on the radio unit's read-only memory as applicable to a "normal hunting sequence" (see section 9.2.1), or in the store of data received from BCAST messages held in read/write memory (see section 9.2.2), or in the TSI field of a received MOVE or CLEAR message;
- the other value of NV shall be utilised when monitoring a channel for the purpose of selecting a value of SYS field for verification when the channel number is not identified in the data stores or fields specified above as one on which time-shared control channels may be expected.



If the channel number is identified, as above, as one on which a time-shared control channel may be expected, and the radio unit fails to select a value of SYS field for verification before a period TS from the instant of first receiving the channel has expired, the radio unit shall reject the channel as a candidate control channel and resume the hunting sequence.

If the channel number is not identified, as above, as one on which a time-shared control channel may be expected, the time which the radio unit may continue to search for a value of SYS field for verification is not specified. However attention is drawn to the necessity to ensure that this period is as short as possible to be consistent with the requirement to minimise hunting time in 9.3.4.1, but that it is long enough to allow the possibility of receiving NV consecutive control channel system codewords.

When the radio unit has selected a value of SYS field for verification, it shall decide if it is authorised to acquire the control channel (see 9.3.4.2.3 to 9.3.4.2.6). If acquisition is permitted then the radio unit shall become active on the control channel. Additionally, if the hunting stage is being undertaken at an acquisition threshold level less than L2, the radio unit shall start the error checking procedure specified in 9.3.4.4 immediately after verification.

Note that in the case of a "resuming a control channel sequence", the error checking procedure specified in 9.3.4.4 is not carried out.

Whilst active on a control channel, after verification but prior to confirmation, the radio unit shall not transmit any random access messages, but it shall obey any applicable messages received, as required, provided that to do so does not involve transmitting on the control channel.

#### 9.3.4.2.2 Structure of the System Identity Code

In order to assist radio units to check acquisition authorisation for system identity codes and to facilitate the geographical sub-division of subscription service offered by network operators, the use of the system identity field within commercial trunked networks operating in Band III sub-bands 1 and 2 shall be structured as follows:

With bit 1 of the SYS field set to '0':

SYS bit no.	1	2-8	9-12	13-15
	0	OPID	NDD	LAB

OPID - Network operator identity  
To be allocated by the Radiocommunications Agency (RA)

NDD - Network dependent data  
(see below)

LAB - Label for multiple control channels  
(see 9.5.3)