



TECHNICAL NOTE TN-1124

MPT Radio Terminal Network Parameters and Meanings

23rd November 2005

Applicability

This Technical Note applies to any Tait MPT 1327 Trunked Radio Terminal but the majority of the content has been developed from information and operational characteristics of the TM8255 Trunked Mobile.

1. Introduction

All MPT1327 Trunked Radio products that Tait Electronics Ltd have produced require their "Network Parameters" set to the most appropriate configuration for the MPT Network the radios are destined to operate on.

"Network Parameters" is the general term given to the settings that cover the following interface aspects between the MPT Radio Terminal and MPT Network Infrastructure:

- Acquisition and Retention of a Control Channel
- Background Hunting Parameters
- Timing Parameters
- Signalling Parameters

All of these aspects are defined in detail in the MPT 1343 and MPT 1327 Protocols.

This Technical Note is designed to provide some basic information on the various parameters and how they can affect the operation of the MPT Trunked radio on a Trunked Network.

The Tait implementation of the MPT protocol may differ in some areas. This Technical Note will highlight these areas and also aim to address some of the more common questions that are asked by customers when they want to know how a particular function works (e.g. Vote Now and Background Hunt relationship).

2. Acquisition and Retention of a Control Channel

Acquisition Parameters

Refer to Table 1

Name	Description
NV	<p>Sets the number of consecutive CCSC's (control channel synchronisation codewords) that must be received with the same system identity code, before that code is verified. Enter a value from 1 to 16 for both continuous and time-shared channels.</p> <p>NV only runs when the radio is first trying to acquire a control channel, or when service has been completely lost and the radio is background hunting.</p> <p>NOTE: Set this value in association with TS. If the value of NV is large, then TS must be set so the radio has time to receive multiple codewords before verification. (For Time Shared Control Channels Only)</p>
NC1	<p>Sets the size of the error check sample for a prospective control channel (prior to confirmation). Enter a number of codewords between 0 and 255, for both continuous and time-shared channels.</p>
NX1	<p>Sets the number of errored codewords that must be exceeded within a sample (NC1), to consider the sample erroneous for a prospective control channel. Enter a number of codewords from 0 to the value of the corresponding NC1 parameter for continuous and time-shared channels.</p>
NZ1	<p>Sets an acceptable error rate for a prospective control channel. If the radio receives this number of adjacent samples (NC1), with no errors, then the control channel may be confirmed. Enter a number of samples from 1 to 255.</p>

Retention Parameters

Refer to Table 1

Name	Description
NC2	<p>Sets the size of the error check sample during continuous monitoring of a confirmed control channel. Enter a number of codewords between 0 and 255, for both continuous and time-shared channels.</p>
NX2	<p>Sets the number of errored codewords that must be exceeded within a sample (NC2), to consider the sample erroneous for a confirmed control channel. Enter a number of codewords from 0 to the value of the corresponding NC2 parameter for continuous and time-shared channels.</p>
NZ2	<p>Sets an unacceptable error rate for a confirmed control channel. If the radio receives this number of adjacent samples (NC2), that are considered erroneous according to NX2, the radio will relinquish the control channel and begin another hunting sequence. Enter a number of samples from 1 to 255.</p>

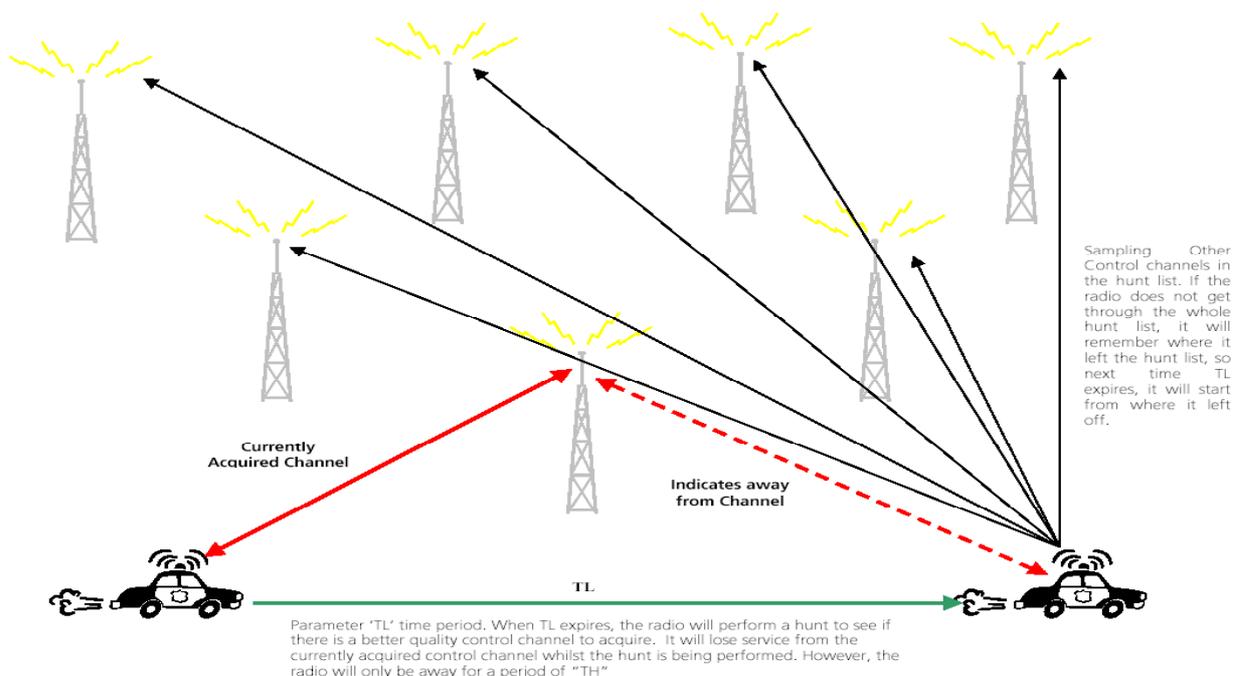
3. Background Hunting Parameters

Background Hunt Parameters

Refer to Figure 1

Name	Description
TL	Sets the minimum interval between successive departures from the confirmed control channel. If the value of TL is low and/or the value of TH is high, new control channels will be identified more rapidly. However, because the radio will spend less time listening to the confirmed control channel, it is more likely that important messages will be missed. These fields are only available when the Background Hunt check box is selected. Enter a time between 10 seconds and 30 minutes.
TH	Sets the amount of time the radio spends sampling other control channels. If the value of TL (min and secs) is low and/or the value of TH is high, new control channels will be identified more rapidly. However, because the radio will spend less time listening to the confirmed control channel, it is more likely that important messages will be missed. Enter a number of slots between 1 and 99.
NS	Sets the number of consecutive samples of a channel that must be taken before it is identified as a candidate for acquisition as a control channel. The lower the value of NS, the fewer the samples that need to be taken and so the more rapidly a new control channel will be identified. However, the identification will be less accurate than if NS is set higher. Setting NS higher will mean that identifying a new control channel will take longer, but identification will be more accurate since the radio will tend to ignore temporary fading effects. Enter a number between 1 and 10.

Figure 1



Note: The parameter 'NS' is the required count of sample a control channel must have for it to be considered a channel worth acquiring. When a new control channel is acquired or none of the sampled control channels are worth acquiring, all control channels with an 'NS' count have their 'NS' counts reset to zero. Sampling a control channel can take between 35ms and 350ms depending on the information received from the sampling process.

		Name	Description
Bottom Right Quadrant of Table 2 Top Left Quadrant of Table 2 Top Right Quadrant of Table 2 Top Left Quadrant of Table 2		LM1	Sets how much stronger the signal on a sampled control channel must be than the current control channel, for it to be identified as a prospective control channel. LM1 applies when neither channel contains preference information. Enter a value between 0 and 40dB. NOTE: Enter a lower value to potentially migrate to the sampled control channel more often. Enter a higher value to only migrate if the channel's signal strength is significantly higher. (also see Figure 2)
		LM2	Sets how much stronger the signal on a sampled control channel must be than the current control channel, for it to be identified as a prospective control channel. LM2 applies when both channels have equal preference. Enter a value between 0 and 40dB.
		LM3	Sets how much stronger the signal on a sampled control channel must be than the radio's L0 threshold, for it to be identified as a prospective control channel. LM3 applies when the confirmed channel does not have preference information, but the sampled channel does. (Linked to L0 and L2 thresholds). Enter a value between 0 and 40dB
		LM4	Sets how much stronger the signal on a sampled control channel must be than the radio's L0 RSSI threshold, for it to be identified as a prospective control channel. LM4 applies when the sampled control channel is preferred over the current control channel. (Linked to L0 and L2 thresholds). Enter a value between 0 and 40dB. NOTE: A lower value is recommended, as the sampled channel will have preference, even if slightly stronger.

Table 2: From Page 9-25 of the MPT1343 Manual (Table 9.1)

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	<p><u>Sampled has lower priority.</u> Prospective control channel is not identified.</p> <hr/> <p>(sampled signal strength - confirmed signal strength) > LM.2 and confirmed signal strength ≥ L.2</p> <p><u>Sampled has higher priority.</u> Sampled signal strength > (L.0. + LM4)</p>	Sampled signal strength > (L.0. + LM.3)
	Has SYS field with non-preferred NDD sub-set	Prospective control channel is not identified	

Figure 2: LM1

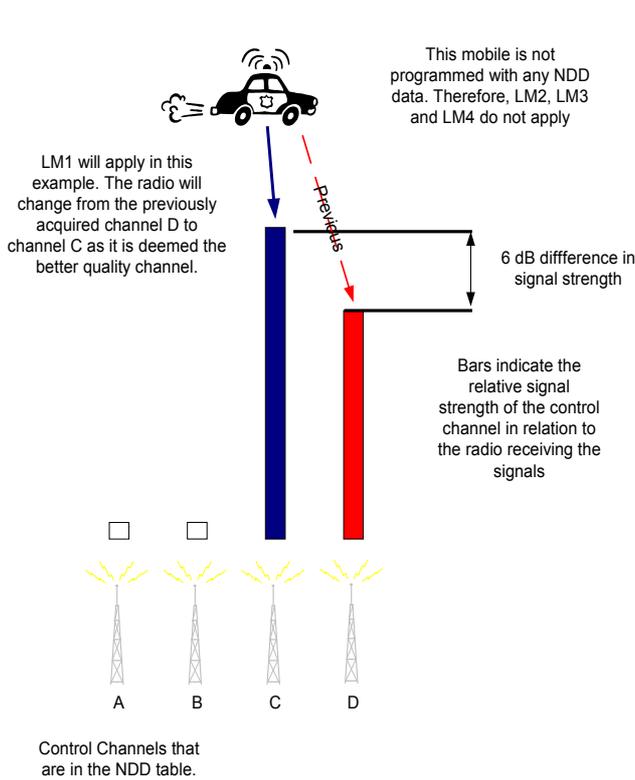


Figure 3: LM2

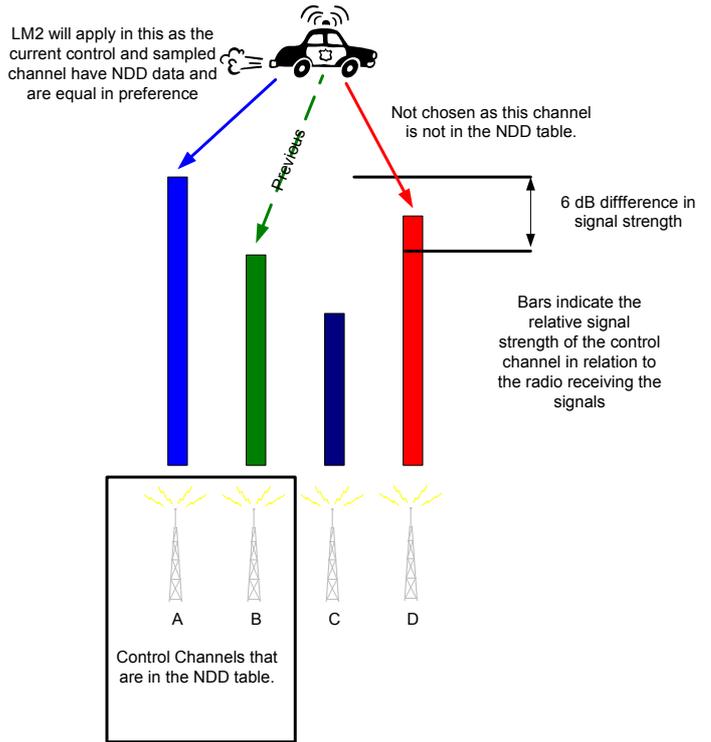


Figure 4: LM3

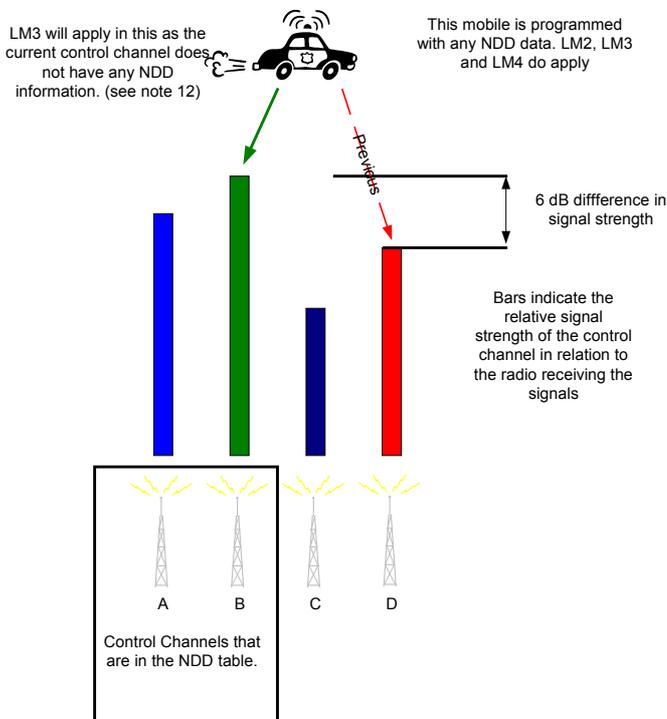
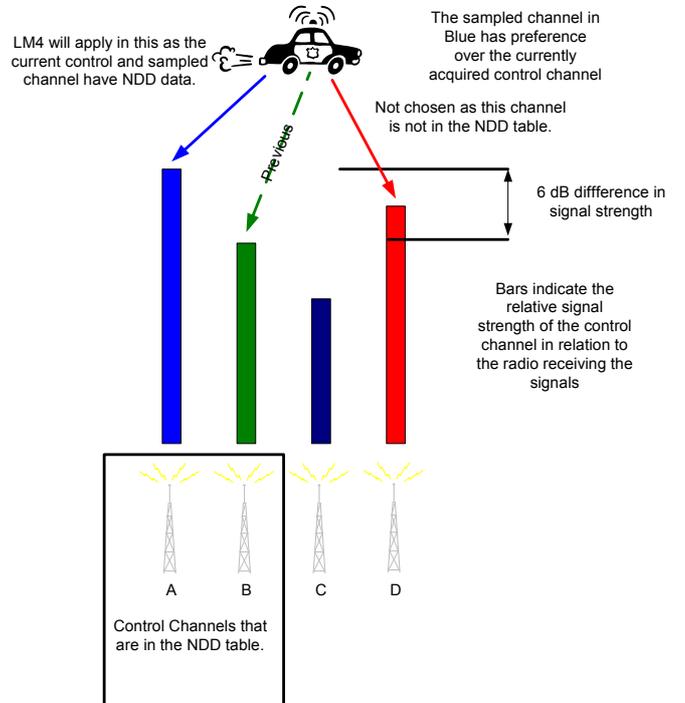
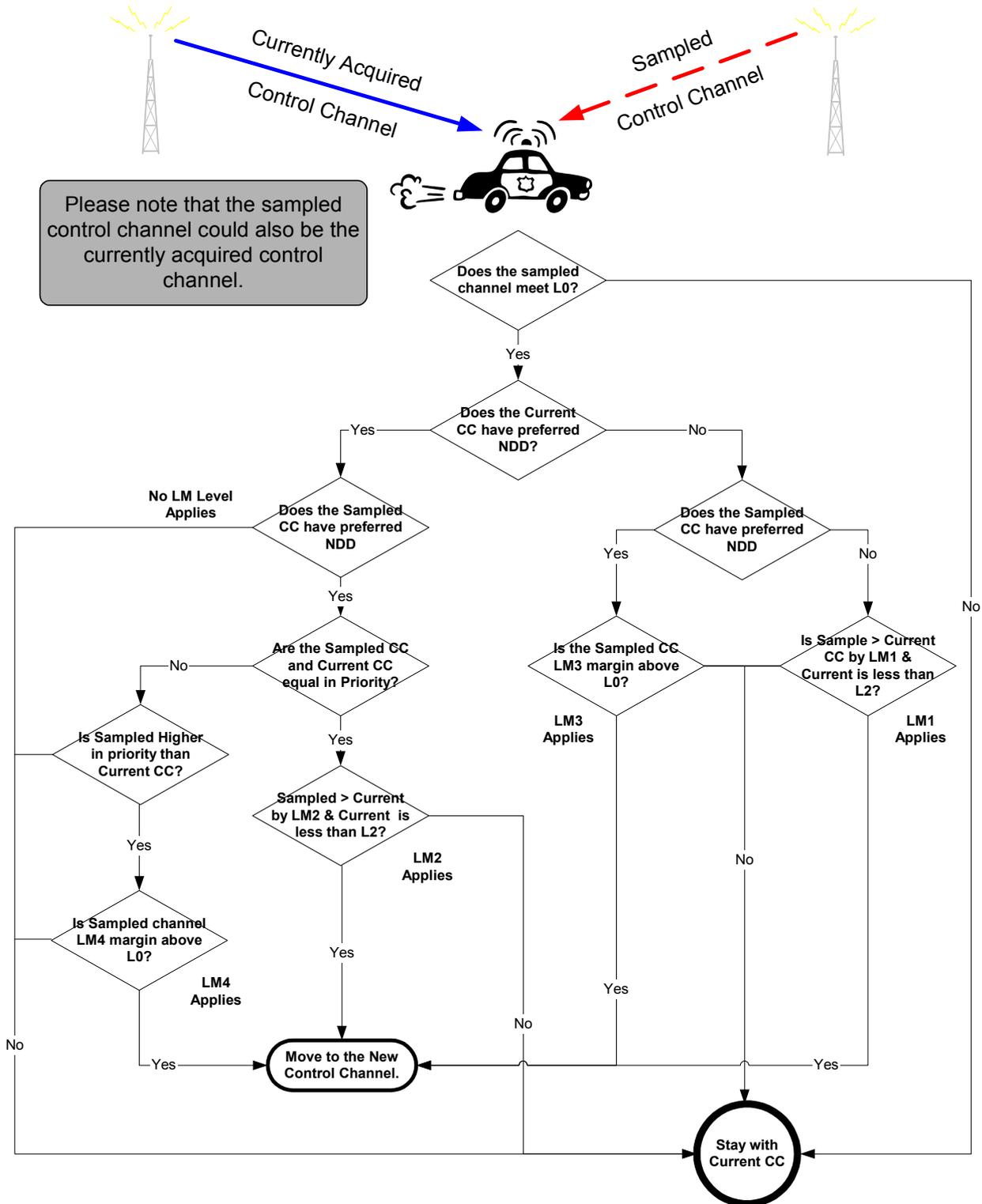


Figure 5: LM4



Flow Chart 1: Hunting Process

Derived from Table 2 above (derived from Table 9-1 in the MPT1343 Manual)



4. Timing Parameters

	Name	Description
(refer to Figure 7)	TC	Sets a timeout for random access transmission requests (both emergency and non-emergency). If this time (or the maximum NE or NR) is reached with no valid response, the radio will abandon its access attempt. Enter a value from 10 to 120 seconds, in steps of 10. 60 seconds is recommended.
(refer to Figure 10)	TD	Sets the registration record timeout used when Multiple Registration is enabled. The timer begins as soon as a record is displaced from being a prime registration record. When the timer expires, the record will be deleted. Enter from 5 to 70 minutes, in steps of 5. 60 minutes is recommended.
(refer to Figure 8)	TJ	Sets the timeout for radio unit communication with the TSC for incoming calls, and some types of outgoing calls (such as after a registration attempt or a diversion request). This timer begins as soon as the message is sent. If the timer expires with no response, the radio will return to an idle state or hunting state, and indicate the request as failed. Compare with TW. Enter a value from 10 to 60 seconds, in steps of 10. 60 seconds is recommended.
(refer to Figure 9)	TN	Sets the traffic channel inactivity timeout. If no activity is detected on the forward traffic channel for this time, then the radio unit will assume that the call is terminated, and mute the audio and return to the control channel acquisition procedures (without signalling), and will indicate to the user that the call has ended. Enter a value from 1 to 10 seconds. 7 seconds is recommended.
(refer to Figure 9)	TT	Sets the maximum transmit duration. The timer begins at the start of a transmission. If the timer ends, the radio will return to idle, first clearing down the call in the case of an individual call. Enter from 10 to 60 seconds, in steps of 10. 60 seconds is recommended.
(refer to Figure 6)	TA	Sets the timeout for the radio unit after receiving an AHY (availability check message) from the TSC. The timer will begin as soon as the radio has responded with an ACK or ACKI message. If the timer expires with no channel allocation signalling back from the TSC, then the radio will indicate that the call will not take place. Enter from 1 to 255 seconds. 60 seconds is recommended.
(refer to Figure 11)	TB	Determines a time from which the radio is barred from calling an ident, or any idents, after receiving an acknowledgement message from the Trunking system controller. The radio will not be able to send a call to the same ident during this time if it is a general acknowledgement (ACK), the message is rejected (ACKX), or the called unit is unavailable (ACKV). The radio will not be able to call any ident during this time the call is diverted (ACKT), or will be called-back (ACKB). Enter from 1 to 255 seconds. 2 seconds is recommended.
	TP	Determines the maximum interval between periodic messages (within speech items) to be assumed at switch-on. The radio will use this interval until a special parameters message (BCAST SYSDEF='00010') is received from the Trunking system controller. Enter from 1 to 255 seconds. 5 seconds is recommended. (in reality, this timer is never activated)
(refer to Figure 8)	TW	Sets the timeout for radio unit communication while making an outgoing speech or emergency call. This timer begins as soon as the call is sent. If the timer expires and there is no appropriate response, the radio will return to an idle or hunting state, and will indicate the call as failed. Compare with TJ. Enter from 1 to 255 seconds. 60 seconds is recommended.

Figure 6

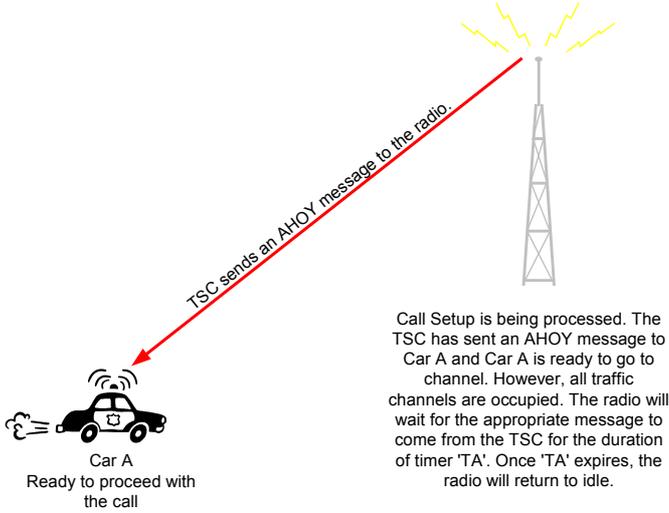


Figure 7

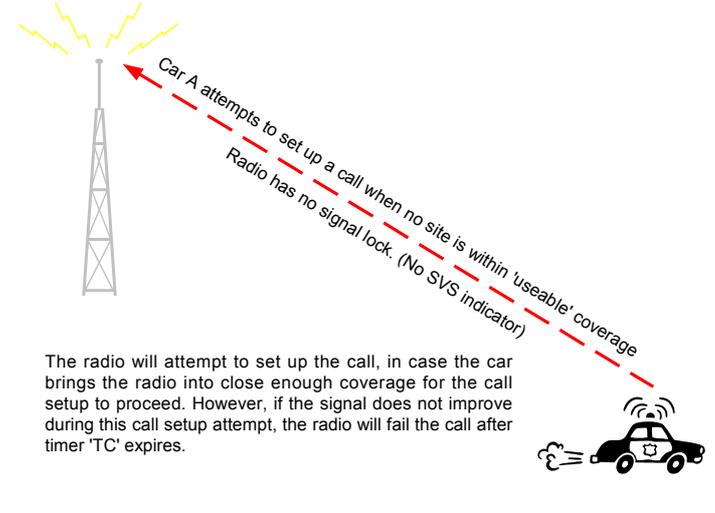


Figure 8

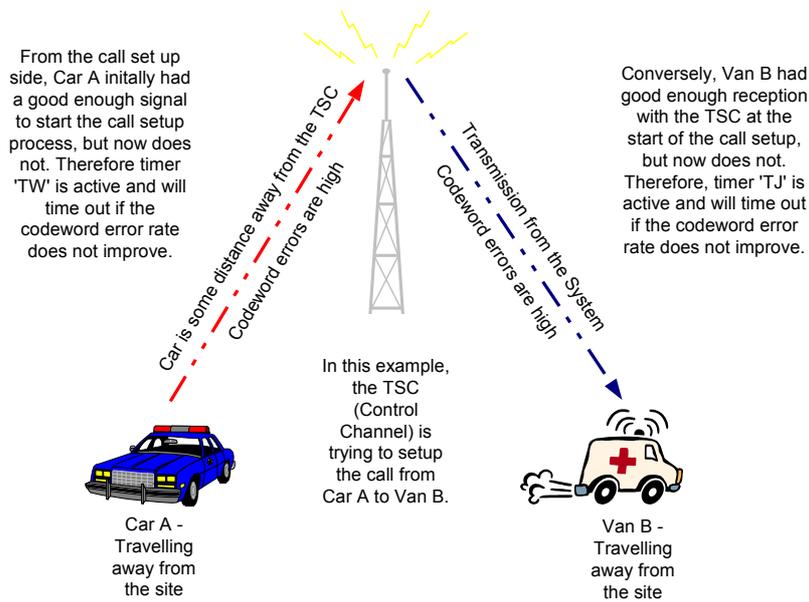


Figure 9

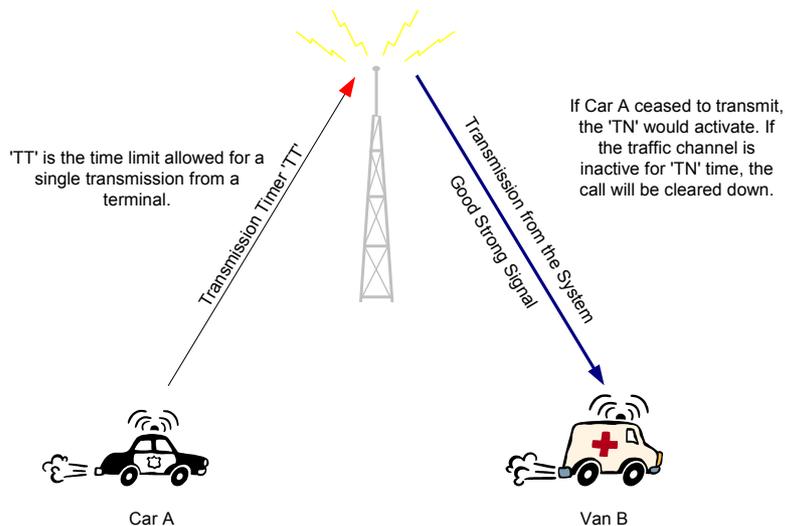
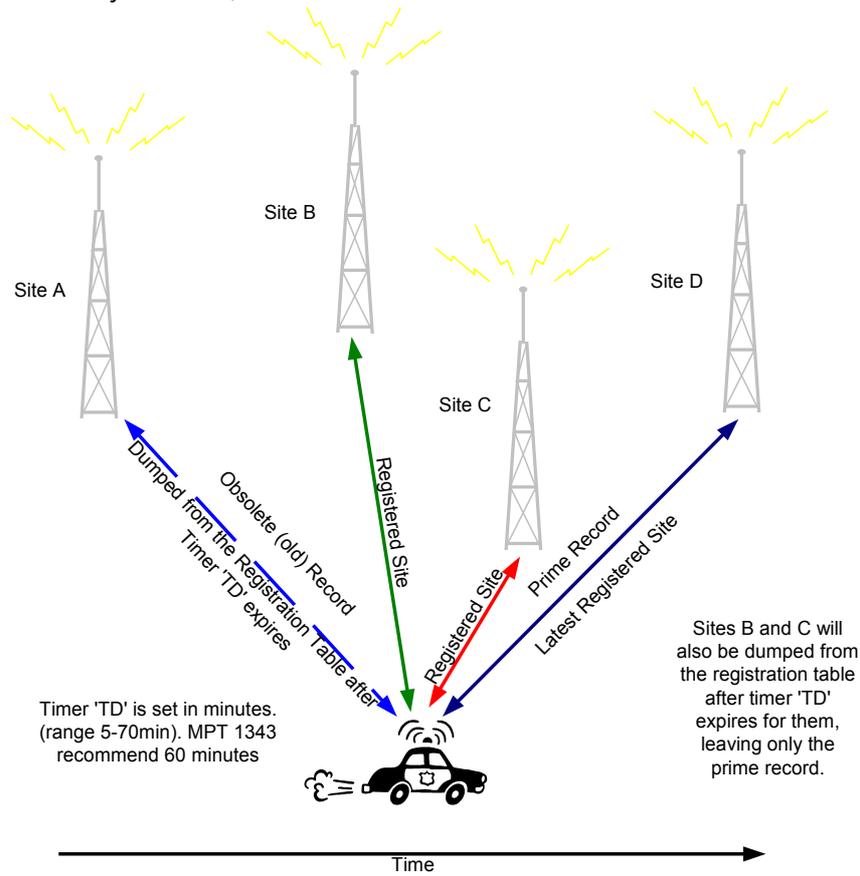
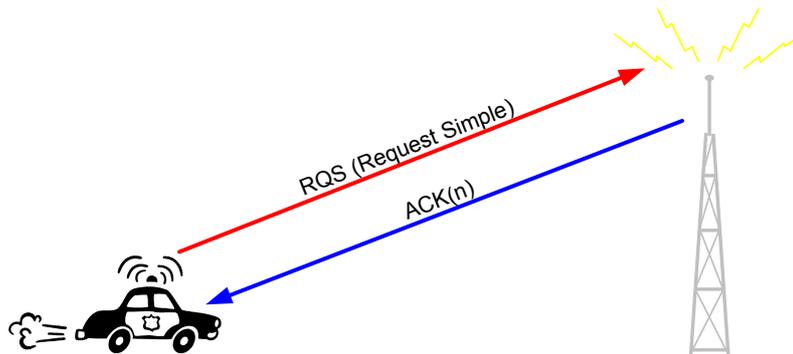


Figure 10 (not supported by TaitNet)



Multiple Registration: The radio can store up to three registration records and thereby be simultaneously registered on up to three control channels. It can then roam between those control channels and acquire any of them without re-registering. The oldest registration records expire and are deleted after a period 'TD' following registration. The most recent record is known as the prime record and does not expire. The trunking system announces how many registration records (either 1, 2 or 3) a radio maintains via the BCAST SYSDEF 3 message.

Figure 11



Only applicable to outgoing calls. The (n) can be an I,Q,X,V,B or T (descriptions in section 9.2.1.4 of the MPT1327 Manual).

Depending on the ACK type will depend on whether the radio returns to Idle or WAITs for further signalling. In either case, the radio will be prevented from calling that same IDENT for period TB (except for an emergency call RQE which will be processed as soon as possible by the Control Channel)

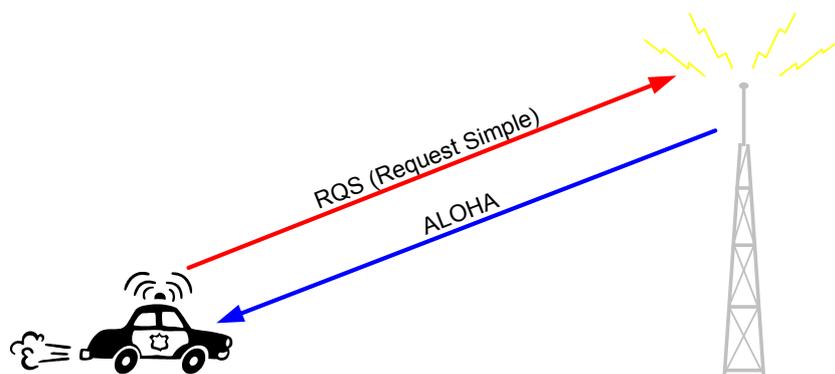
5. Signalling Parameters

(see figure 12)

Name	Description
NW	Sets the value of WAIT (the response delay) assumed at the start of a session, until a Aloha message is received. Enter a number between 1 to 15 slots. 4 is recommended.
ND1	Sets the number of disconnect messages sent by an individually called radio unit, when requested (such as when the call is cleared down, or the transmit duration timer TT expires). Enter from 1 to 5 disconnect messages. 3 is recommended.
ND2	Sets the number of disconnect messages sent by a calling radio unit, when requested during an active group call (such as when the call is cleared down by a radio unit in the group, or the transmit duration timer TT expires). Enter from 1 to 5 disconnect messages. 5 is recommended.
NE	Determines the maximum number of random access transmissions of emergency call requests. If this number, or the timeout TC is reached with no valid response, the radio unit will abandon its access attempt. Enter from 1 to 255 transmissions. 16 is recommended.
NR	Determines the maximum number of random access transmissions of non-emergency call requests. This includes call, cancel, diversion, registration, and status requests. If this number, or the timeout TC, is reached with no valid response, the radio unit will abandon its access attempt. Enter from 1 to 255 transmissions. 8 is recommended.
NT	Sets a maximum delay for the Trunking system controller (TSC) to respond to unsolicited traffic channel messages (such as include requests, pressel on messages, or disconnect messages). Enter from 103 to 1236 bit periods, in steps of 103. 103 is recommended. (NOTE: This setting has never been used in Tait products. It will be removed from the TM8200 Trunked Parameters.

(see figure 7 above)

Figure 12



Simple Voice Call used in this example. The radio displays "WAIT" indicators until the ALOHA message is received. If the ALOHA message is not received before the timer 'NW' expires, the call will fail and the radio will go back to idle.

6. Field Proven Network Settings

Below is a list of Network Parameters settings from systems that have been in use in New Zealand and Australia for some time (at least 10 years). The Network operators make it mandatory that any subscribing radio has to use these settings.

		Network Name								
Settings		Fleetcoms UHF	FleetcomsVHF	Telstra SMR	Norfolk Telecom	Biscom VHF	Biscom UHF Qld	Fleetcoms UHF	TeamTalk / ActionNet	MPT Recommended
Hunt Parameters										
	Nokia TS_Channel_Support	Disabled	Disabled	Disabled	Disabled	Disabled	Disabled	Disabled	Disabled	?????
	Background Hunt	Enabled	Enabled	Enabled	Enabled	Enabled	Enabled	Enabled	Enabled	?????
	Hunt upon expiry of NE or NR	Preferential	Preferential	Preferential	Preferential	Preferential	Preferential	Preferential	Preferential	?????
	Comprehensive Hunt	Enabled	Enabled	Enabled	Enabled	Enabled	Enabled	Enabled	Enabled	?????
	Act on Vote Now	Enabled	Enabled	Enabled	Enabled	Enabled	Enabled	Enabled	Enabled	?????
	Vote Now Advice Margin	6dB	6dB	6dB	6dB	6dB	6dB	6dB	6dB	?????
Network Parameters										
Control Control Channel Acquisition & Retention										
	NC1_Continuous	20	20	20	20	20	20	20	20	?????
	Time Shared	5	5	5	6	6	6	5	20	?????
	NC2_Continuous	15	15	15	15	15	15	15	15	?????
	Time Shared	50	50	50	54	54	54	50	15	?????
	NV_Continuous	2	2	2	1	1	1	2	1	?????
	Time Shared	2	2	2	1	1	1	2	1	?????
	NX1_Continuous	5	5	5	5	5	5	5	4	?????
	Time Shared	2	2	2	2	2	2	2	4	?????
	NX2_Continuous	5	5	5	5	5	5	5	4	?????
	Time Shared	3	3	3	3	3	3	3	4	?????
	NZ1	2	2	2	1	1	1	2	1	?????
	NZ2	2	2	2	3	3	3	2	2	?????
	TS	5 sec	5 sec	5 sec	10 sec	10 sec	10 sec	10 sec	5 sec	5 sec
Signalling Parameters										
	NW	4	4	4	4	4	4	4	4	4
	ND1	3	3	3	3	3	3	3	3	2
	ND2	5	5	5	5	5	5	5	5	4
	NE	16	16	16	16	16	16	16	16	16
	NR	8	8	8	8	8	8	8	8	8
	NT	?	?	?	?	?	?	?	?	?
	TC	10 sec	10 sec	10 sec	10 sec	60 sec	60 sec	10 sec	60 sec	60 sec
	TD	10 min	10 min	10 min	10 min	60 min	60 min	10 min	10 min	60 min
	TJ	20 sec	20 sec	20 sec	20 sec	60 sec	60 sec	20 sec	20 sec	20 sec
	TN	7 sec	7 sec	7 sec	7 sec	7 sec	7 sec	7 sec	7 sec	7 sec
	TI	60 sec	60 sec	60 sec	60 sec	60 sec	60 sec	60 sec	60 sec	60 sec
	TA	60 sec	60 sec	60 sec	60 sec	60 sec	60 sec	60 sec	30 sec	60 sec
	TB	2 sec	2 sec	2 sec	2 sec	2 sec	2 sec	2 sec	2 sec	2 sec
	TP	5 sec	5 sec	5 sec	5 sec	5 sec	5 sec	5 sec	5 sec	5 sec
	TW	60 sec	60 sec	60 sec	60 sec	60 sec	60 sec	60 sec	60 sec	60 sec
Background Search Sequences Parameters										
	TL	120 sec	120 sec	120 sec	120 sec	120 sec	120 sec	120 sec	60 sec	?????
	TH	4	4	4	4	4	4	4	2	?????
	NS	2	2	2	2	2	2	2	2	?????
	LM1	6dB	6dB	6dB	6dB	6dB	6dB	6dB	6dB	?????
	LM2	6dB	6dB	6dB	6dB	6dB	6dB	6dB	6dB	?????
	LM3	6dB	6dB	6dB	6dB	6dB	6dB	6dB	6dB	?????
	LM4	?	?	?	?	?	?	?	3dB	?????
Multiple Registration										
	Multiple Registration	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

7. Frequently Asked Questions

Should Vote Now and Background Hunt be enabled at the same time?

It depends on the circumstances. For example, if the customer owns the MPT system and it is for use on a Bus system that has predefined bus routes that do not change, then Vote Now alone would be suitable.

However, for a Taxi company who is using a Network Provider for their MPT system and have random taxi routes, having Vote Now and background hunt enabled would be safer. The reason being is if the radio misses a Vote Now broadcast or is on the fringes of coverage (e.g. in a long tunnel), background hunt will ensure the radio keeps looking for a channel.

Do the background hunt timers still run when Vote Now is enabled as well?

Yes – but from Release 3 TM8200 firmware onwards, the Background Hunt timers will be reset upon receiving a Vote Now broadcast. Prior to Release 3, the background hunt timers did not reset on reception of a Vote Now broadcast.

The T2000 trunked radios work correctly, as do the trunked Tait Orca portables.

Do all Tait trunked radios use LM4?

The TM8200 and the Tait Orca portables use the LM4 setting, the T2000 trunked radios do not. The reason for this is that the LM4 setting was a late addition to the MPT1343 standard. The T2000 trunked radios had already been developed and were in use prior to LM4 being introduced.

Why are the 'L' levels different between a trunked portable and trunked mobile?

The levels programmed into trunking radios help with the control channel hunting process and also guide the signal strength indicator (for products with LCD's only) and the service lock (SVC) on the display of the radios.

The main difference between the portables and the mobiles is the transmit output power. A mobile is generally 25W and a portable is between 4W and 5W.

Whilst the receiver designs are similar between the products and they can listen to the messages coming from the control channel equally well, they can not communicate back to the control channel equally as well some distance from a site (low RSSI). Therefore, it is recommended that the 'L' levels be changed to make the SVC indicator flash earlier on a portable so the user knows earlier that they are out of coverage, even though the receiver can still hear the control channel.

Recommended 'L' Levels for a portable are -88dBm for L2 and -116dBm for L0. This is the default Factory setting on the Tait Orca Portables. Comparatively, the mobile 'L' levels are -94dBm for L2 and -116 for L0.

Compliance Issues

None – However, if you do not own the system your radio is operating on (you subscribe to the system), please consult your Network Provider before altering any of these parameters.

CSO Instruction

Please pass this information onto all Technicians and Engineers. **Please also note the “Network Parameters” should not be changed by any staff or dealers who are not familiar with the impact of those changes, or if the radios are being used on a subscriber MPT Network.**

8. Issuing Authority**Name and Position of Issuing Officer**

Barry Crates
Technical Support Team Leader

Confidentiality

Confidential – This message or document contains proprietary information intended only for the person(s) or organisation(s) to whom it is addressed. All Recipients are legally obliged to not disclose Tait technological or business information to any persons or organisations without the written permission of Tait.

Distribution Level

Associate

Document History

Original Release

30 January 2006

BLC