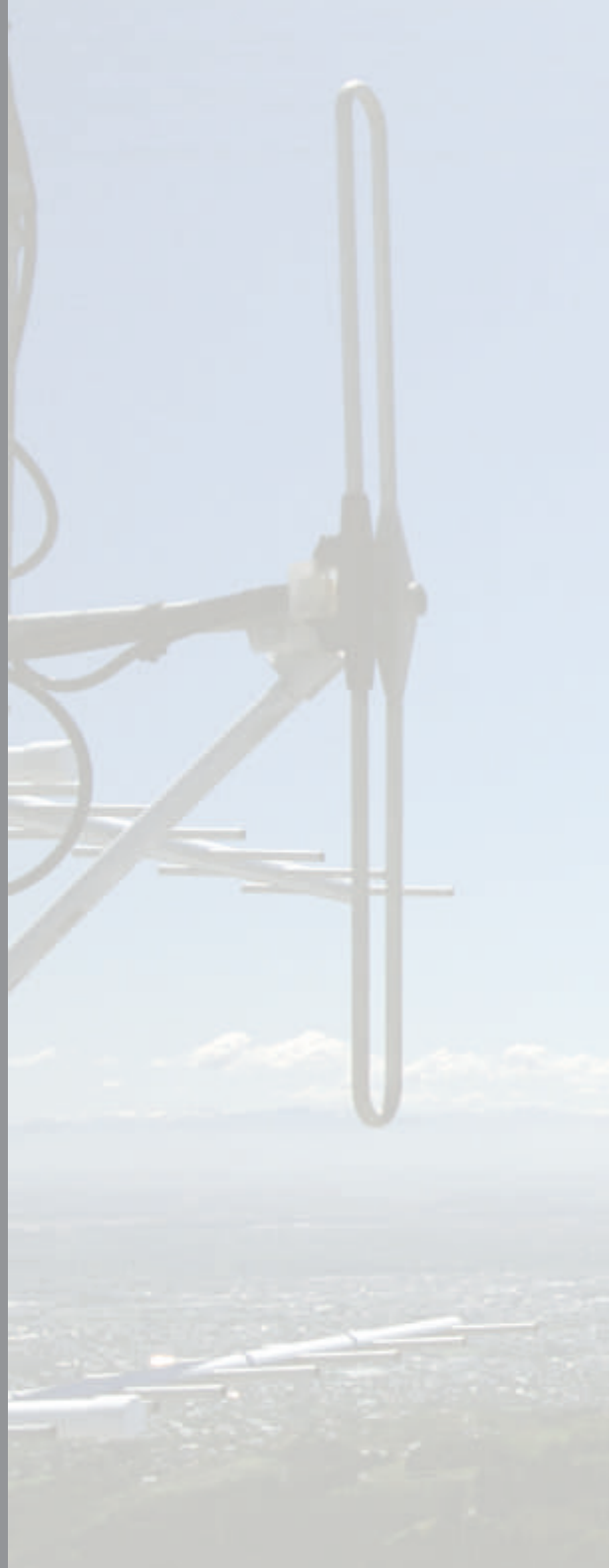
[PIB 5, Issue 1, June 1996]

LAND MOBILE & FIXED SERVICES

Your Guide To Better

TRANSMISSION

MINISTRY OF COMMERCE
Te Manatū Tauhokohoko



Issued by:

The Radio Operations Group
Communications Division
Ministry of Commerce
Wellington, New Zealand, June 1996

The information in this brochure is derived from the Radiocommunications Act 1989, the Radiocommunications (Radio) Regulations 1993, and the International Radio Regulations.

Because of the continually changing nature of relevant technology, this information is subject to change without notice. The Ministry of Commerce does not accept any liability for damage or loss arising from reliance on any information in this brochure.

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INTRODUCTION

The radio frequency spectrum is a natural resource which, when utilised through the application of radiocommunications technology, can provide significant benefits to individuals and society. The radio frequency spectrum is put to many different uses. The sometimes conflicting demands for this limited resource mean that some form of management framework is necessary.

Responsibility for management of the radio frequency spectrum falls with the Secretary of Commerce. The Radio Operations Group, part of the Communications Division of the Ministry of Commerce, is responsible for the management and enforcement of the Radiocommunications Act 1989.

The Communications Division manages New Zealand's radio frequency spectrum through the application of two basic goals.

1 To promote improved efficiency and competitiveness in the telecommunications sector of the New Zealand economy

2 To carry out the operational aspects of granting licences to use radio frequencies, including providing advice to clients, and managing compliance, certification, testing and interference protection.

This booklet deals primarily with the second of these goals and is intended as a guide to service suppliers, sales staff, radio engineers, technicians, and end users of land mobile and fixed radiocommunications services below 1 GHz.

Radio Operations has staff available throughout New Zealand to give advice and assistance to users of the land mobile and fixed radiocommunications services. A list of Radio Operations field offices is printed on the back cover of this booklet.

THE LICENSING SYSTEM

Land mobile and fixed radiocommunications services are currently licensed by the Secretary of Commerce under Part XIII of the Radiocommunications Act 1989. At some time in the future all or some of these frequencies may be transferred to a management rights regime under Part II of the Act.

A management right to a range of frequencies, or a frequency band, entitles the owner of that right, known as the manager, to issue licences authorising users to transmit radio waves and to ensure that specified levels of interference are not exceeded. To date, management rights have been created for frequencies used for radio and television broadcasting with the management right retained by the Crown and managed by the Ministry. For cellular mobile radio and Microwave Distribution Systems (MDS) the management rights have been sold and are now managed by private entities.

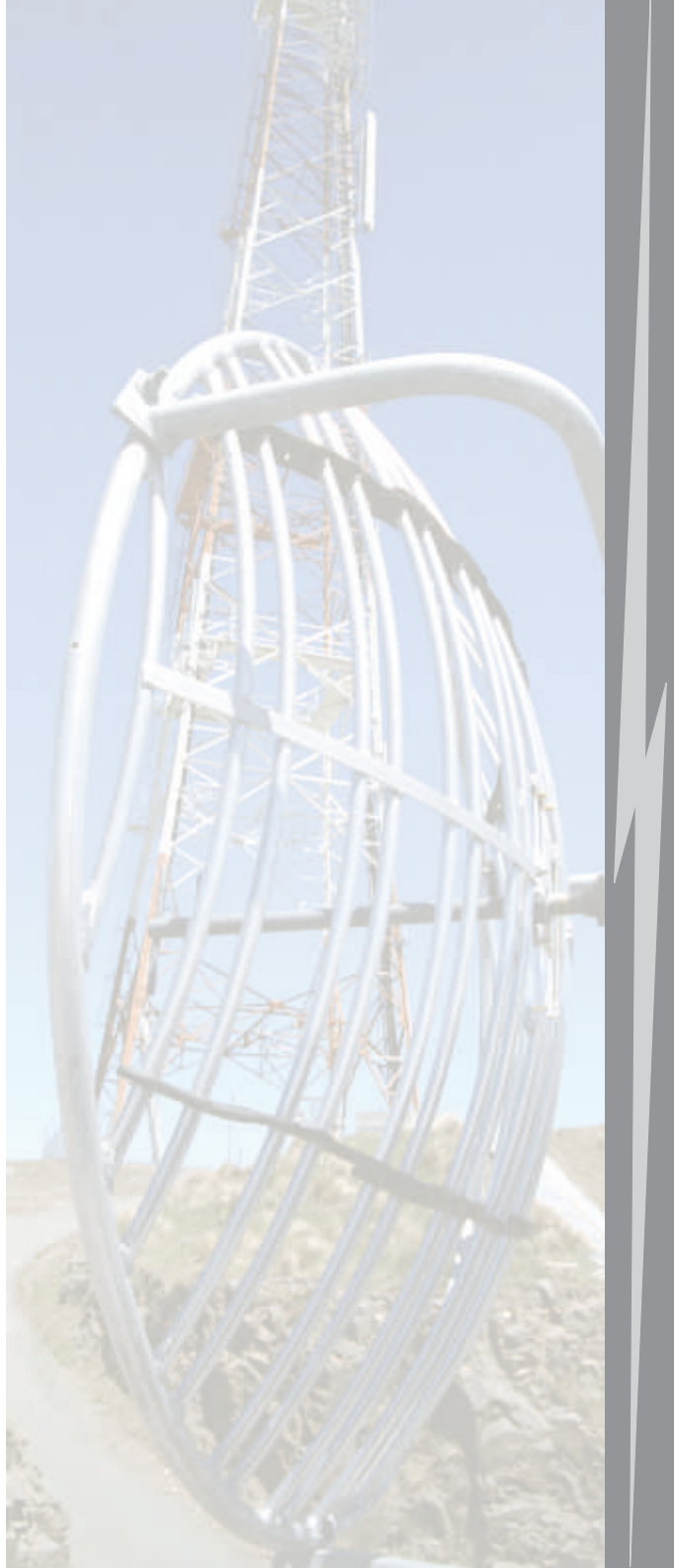
When granting a licence, Radiocommunications (Radio) Regulation 15 requires the Secretary of Commerce to have regard to:

- agreements with other countries
- the public interest in achieving maximum benefits from the radio spectrum
- technical compatibility of apparatus
- Government policies.

This gives the Secretary of Commerce discretion in the setting of criteria for the maximum utilisation and equitable access to all bands.

Applying for a licence

Applications for licences can be made on a Radio 2 form available from any Radio Operations field office.



Directions for completing the application are found on page 2 of the form. In general, the licence applicant should complete:

- Panel A (all questions); and
- Panel C (if wishing to authorise an agent to act as a technical adviser).

The licence applicant and/or agent should complete:

- Panel B and page 3 (technical particulars).

When completing the form it is vital that all available information is supplied. It is recommended that after completing the form, you check through it again to ensure that all appropriate questions have been completed.

Licence applications are initially assessed by Radio Operations field staff, who may contact you to confirm or provide further details and assist with the application process.

Timing

Licence applications will either be handled locally or, when additional coordination and engineering assessment is required, by Engineering Services in Head Office. Locally processed applications are normally completed within two working days, and applications referred to Head Office, within 20 working days. Applications which cover multiple licences or complex arrangements will usually take longer to process. Every endeavour will be made to meet clients' expectations with regard to timing.

Applicants are advised in writing when the application has been processed. If successful, a licence and invoice for the initial licence fee will be attached.

Fees

Local staff will advise if any fees are payable at the time the application is submitted. These fees, along with annual renewal fees, are listed in the Third Schedule of the Radiocommunications (Radio) Regulations 1993. The fees enable the Communications Division to recover the costs of managing the radio spectrum.

RADIOCOMMUNICATIONS SERVICES

The frequency bands used by land mobile and fixed radiocommunications services are in particular sections of the MF/HF, VHF, UHF and SHF radio spectrum.

Land mobile services

The land mobile service is a mobile service between base stations and land mobile stations, or between more two or more land mobile stations. The principal land mobile frequency bands have been chosen to allow both two-frequency and single-frequency operation, and are designated as shown in the table opposite. The publication *VHF and UHF Mobile Bands in New Zealand* (PIB 23), which can be purchased from any Radio Operations field office, gives a full band description.

** B Band is presently under review. The Ministry of Commerce is consulting directly with current users of B Band on relocation to alternative spectrum. The Secretary of Commerce is therefore declining to grant new licences in this band.*

Fixed services

The fixed service is a radiocommunications service between specified fixed points.

For a full description of fixed services, the publication *Fixed Services Bands Available in New Zealand* (PIB 22) can be purchased from any Radio Operations field office.

The *Table of Existing and Planned Radio Spectrum Usage in New Zealand* (PIB 21) is another useful publication which is available for purchase.

The Communications Division of the Ministry of Commerce issues technical specifications and other publications on many communications services. For a complete and up-to-date list of these publications, the *Index of Specifications and Publications Issued by Communications Division* (RFS50) can be obtained from the nearest Radio Operations field office, or on the Internet on the Radio Spectrum Management page (http://www.govt.nz/ps/min/com/rsp/). This information details the publications available, the current issue and issue date and, where applicable, the cost.

MF Medium Frequency (300 to 3,000 kHz)

HF High Frequency (3 to 30 MHz)

VHF Very High Frequency (30 to 300 MHz)

UHF Ultra High Frequency (300 to 3,000 MHz)

SHF Super High Frequency (3,000 MHz to 300 GHz)

MF/HF		2.0 to 10 MHz
VHF	A Band	81 to 88 MHz
	B Band	101 to 108 MHz*
	E Band	150 to 156 MHz
UHF	C, D, F Bands	450 to 494 MHz
	TD Band	406 to 418 MHz
	TS	806 to 864 MHz

I Band	404 to 430 MHz
J Band	450 to 470 MHz
KK Band	806 to 812/851 to 857 MHz
K Band	915 to 935 MHz

VHF, UHF, HF - A guide to coverage

The frequencies used in the land mobile VHF and UHF bands generally operate over line-of-sight distances. VHF usually has greater coverage because of lower propagation losses and diffraction (which may extend coverage over and around obstacles and into sheltered pockets), and is preferred for rural areas. UHF penetrates into buildings and enclosed spaces better than VHF, and is less affected by electrical interference. For these reasons and because UHF is accessible via smaller aerials in hand-held units, UHF is often preferred in cities with high rise buildings.

Single frequency VHF and UHF simplex systems operate over a restricted coverage area, around the site of a base station. The coverage area can be extended by use of two-frequency repeaters. Repeaters are mostly situated at strategic sites on hills and mountains or on high rise buildings to allow wide coverage of specific geographical areas. There are a number of principal high-use sites sufficiently separated by distance to have separate coverage areas, but many coverage areas overlap. Some repeaters are linked together to provide extended coverage.

The major VHF and UHF repeater sites have large numbers of channels in various land mobile frequency bands. These sites are often shared with transmitters and receivers of other radio services.

Land mobile radio systems may operate locally, or through wide-area regional and national networks of linked channels. Channels may be either shared or exclusive to one user.

Coverage maps for existing VHF and UHF sites are generally available from the service provider and should be used to assess communication coverage.

HF simplex systems give long-distance coverage, but their quality is variable (because of the different propagation characteristics of the frequencies used), and they are particularly susceptible to interference. HF systems are recommended for use only over extremely long ranges where VHF/UHF systems cannot satisfy coverage needs.

Radio apparatus and specifications

Land mobile radio apparatus generally use one of two classes of modulation, either AM (A3E) or FM (F3E).

AM (amplitude modulation) is where the amplitude of a constant frequency carrier is varied at the same rate as, and in accordance with, the amplitude of the information to be transmitted.

FM (frequency modulation) is where the amplitude of the transmitted wave remains constant while the frequency is varied in accordance with the information to be transmitted.

In New Zealand and internationally, FM is the most common form of modulation used in the VHF and UHF land mobile frequency bands.

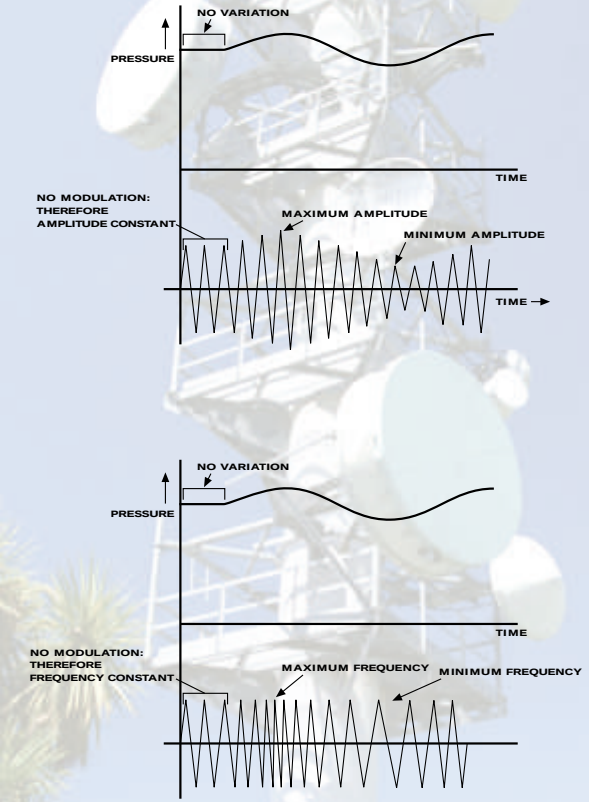
Only FM is permitted in the UHF bands. In most other bands a choice of either AM or FM is available. However, with a decline in the manufacture of AM equipment, FM is increasingly predominant.

Single Sideband (SSB) is a variant of AM which must be used for HF systems.

Channelling

In the MF/HF SSB bands the channel spacing is 3.0 kHz. In the VHF and UHF bands the channel spacing is either 12.5 kHz or 25 kHz, however no new 25 kHz licences are being issued for repeaters. This defined separation of channels in the respective bands is required to achieve good speech and data transmission using current analogue technology.

Performance of radio apparatus is an important factor in radio spectrum planning. The Communications Division publishes specifications and procedures relating to the type approval or type acceptance of radio apparatus used in land mobile radio systems. These specifications and procedures define limits for transmitter emissions (including transmitter time limiting), and establish performance criteria for receivers to ensure that the radio equipment used will operate satisfactorily in the presence of transmissions from other radio users.



Land mobile radio systems use relatively low powered transmitters with very sensitive receivers to achieve good quality voice and/or data communications. Speech or data may be carried subject to current policies.

Privacy of Communications

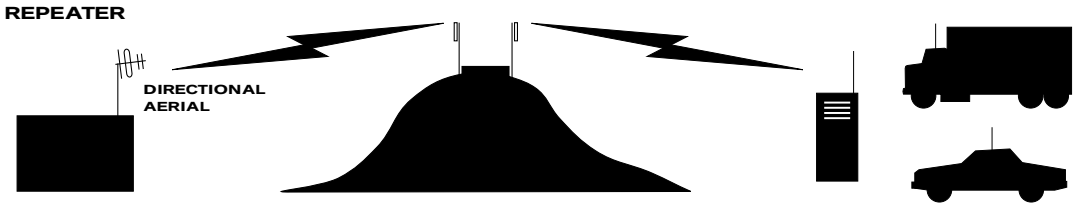
The privacy of radio communications is covered by Regulation 28 of the Radiocommunications (Radio) Regulations 1993. However, it must be accepted that any radio communication can be received by persons for whom the communication is not intended. When a high degree of information security is required, privacy devices are available to be installed on land mobile systems. These devices must not cause the radio apparatus to operate outside the parameters given in the specification defined for the radio service.

Types of radio systems

Simplex (single frequency) systems use a common frequency for both base and mobile sets with only one transmission being able to be made at a time. This means that when transmitting, the receiver is inoperative, and vice versa. Communication is limited to the direct line-of-sight signal path between units. The service is often used for short range communication.

Repeater systems use a pair of frequencies transmitted through a radio repeater located at an elevated site to extend the coverage over a wider geographical area than simplex systems. Communication through the repeater can be made by base and mobile sets over the entire coverage area. Base control of repeaters can be by fixed wired landline, which allows the base to be used with both transmitter and receiver switched on at the same time in a duplex arrangement that has some operational advantages. Control can also be by a trigger base, which is the equivalent of a mobile set, fixed wired in an office or other control point.

(See diagram at top of page 9)



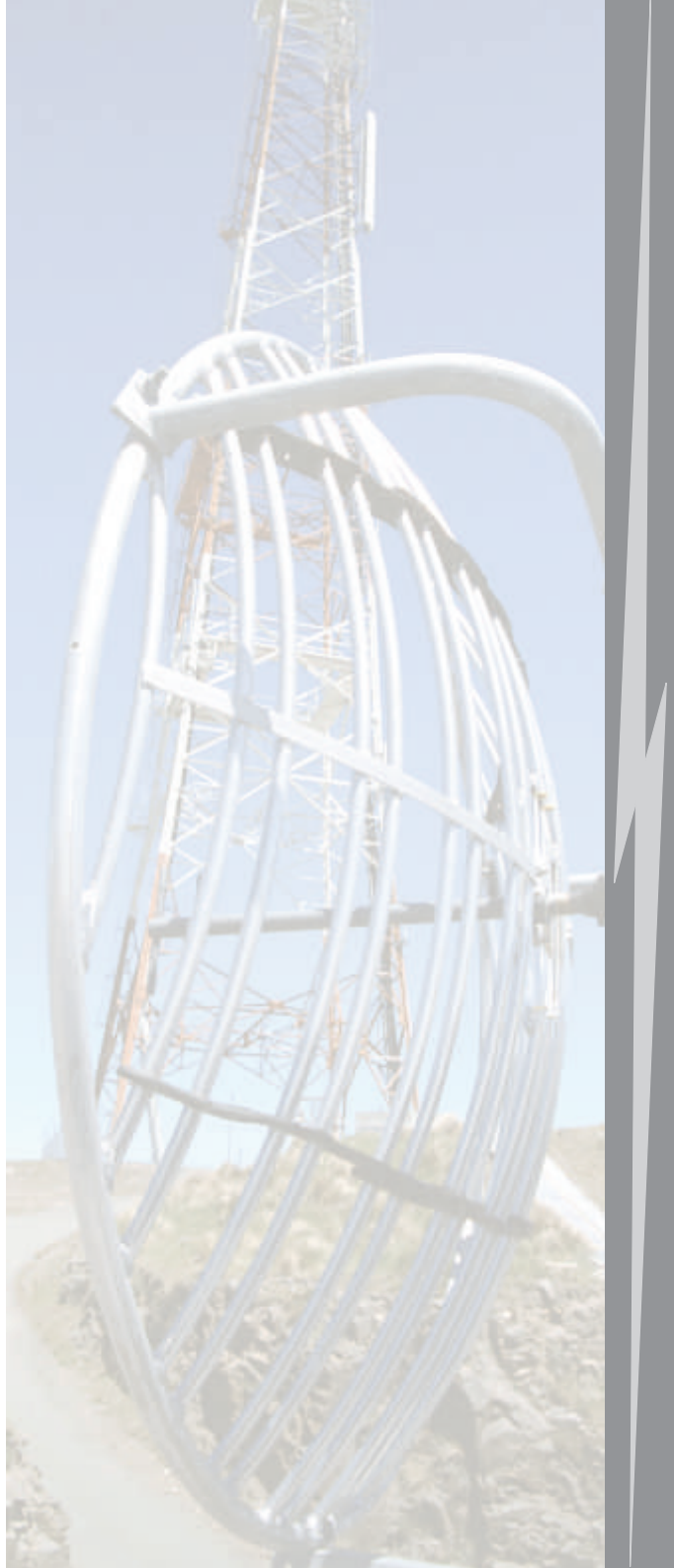
Trunked dispatch systems use two-frequency repeaters that are computer controlled to allow greater use to be made of available channels. A pool of channels is installed at a repeater site. On making an initial call on a control channel, a mobile is automatically allocated a vacant channel for the call, or placed in a waiting queue. These systems may be used in networks for wide-area coverage. They have the advantages of short waiting times and scope for many useful enhancements.

Radio dispatch service enhancements

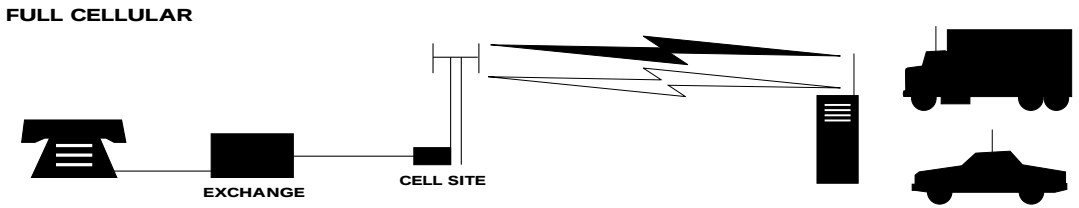
A ***Continuous Tone Coded Squelch System*** (CTCSS) transmits an inaudible low frequency tone, along with the speech or data, which activates specific mobile receivers on a channel (for example, those of one company). If the tone is not present the mobile receiver(s) remains muted. Tones are arranged in two specific groups (A or B), one of which may be allocated to one repeater site and the other to the next, permitting a degree of overlapping coverage. This system allows improved channel reuse as the mobile receiver does not respond to unwanted transmissions from other repeater sites. It also has the advantage of masking electrical interference.

Coded tone calling, where either multi-tone coding or digital data information is sent at the commencement of a call, can provide a number of enhancements such as group calling, specific mobile calling, mobile status reports, call waiting, telephone linking and automatic identification, as well as other proprietary features. Coded calls are audible transmissions, but the mobile receiver(s) are muted during the period that the coded calls are being sent. These additional facilities can usually be offered by land mobile radio service providers. Coded tone calling also masks electrical interference.

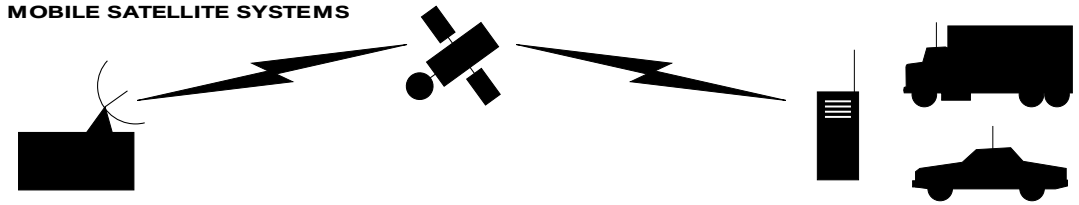
Computer aided despatch systems are available from some service providers. These systems send data directly from a computer terminal screen at a base control position to a display unit in a mobile. Information from mobiles (usually pre-programmed) can also be communicated in this way.



Full cellular systems permit simultaneous two-way transmissions as used by the cellular telephone network. Computer controlled exchanges and base station (cell) sites automatically assign channels to mobiles and connect them into the standard telephone system (the public switched telephone network or PSTN). Major cities have many radio sites and channels which are shared between all cellular phone users. The frequencies which are currently used for these systems are contained within management rights which are held by the providers of the systems.



Mobile satellite systems for global mobile communications are presently in an advanced planning stage. In New Zealand, land mobile communications via satellite would be particularly useful for communications from remote locations not covered by existing services.



FIXED LINKING SERVICES

There are a number of system variations associated with fixed linking communications. The transmitted data or information can be uni-directional, where the signal only travels in the one direction, or bi-directional, where the data is able to be transmitted in both directions.

Point to point services

Point to point refers to communication provided by a radio-relay link between two stations located at specified fixed points.

Studio to Transmitter Links (STLs) are a good example of a point to point uni-directional link where the programme content is sent from the broadcast studio to the transmission site.

POINT TO POINT

Point to multi-point services

Point to multi-point refers to communication provided by radio-relay links between a single station located at a specified fixed point and a number of out stations located at specified fixed points.

Spread spectrum services

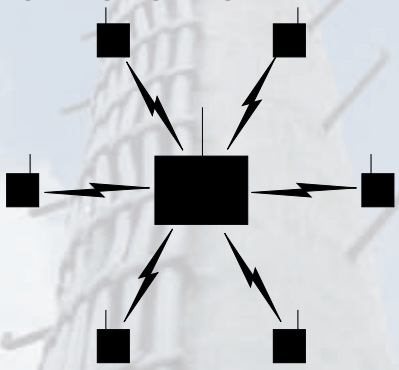
There are two types of spread spectrum transmission:

1 Frequency hopping, where the carrier hops in frequency in an apparently random manner.

2 Broad spread spectrum where, because of the way the transmitted information is modulated, a broad spectrum of frequencies is taken up with very low power levels at any one point.

The spread spectrum system is not in common use in New Zealand. Its great advantage is that it is difficult for others to detect—this is important when privacy is an issue.

POINT TO MULTI POINT



RECOGNISING AND AVOIDING INTERFERENCE

There are many sources and types of radio interference which affect fixed and land mobile radiocommunications services. It is possible that you may both receive and cause interference.

Transmitters may cause interference to television receivers, telephones, telephone exchanges, computers, audio apparatus and other electronic equipment. Fixed and land mobile receivers may also be affected. Interference may be caused by overload of the receiver resulting from close proximity to a transmitter, or by intermodulation where two or more strong signals mix together to produce an interfering signal. Channels in A and B bands are most susceptible to this type of interference.

Unintentional transmissions

Complete jamming of a channel can occur when a microphone is accidentally turned on by being stuck between seats or left on a seat and covered with an object. The microphone must always be correctly returned to the microphone holder. Some transmitters are fitted with “transmitter time limiting” which turns the transmitter off after being locked on for a predetermined period.

Propagation

Interference to and from channels operating on the same frequency in adjacent geographical areas can occur when a land mobile transmitter is used beyond the limits of a designated coverage area. Care must be taken by operators when transmitting from high altitudes, as they may cause interference to distant channels on the same frequency.

From time to time interference may be experienced from distant transmitters through a naturally occurring effect known as anomalous propagation. For example, it is not unusual to receive transmissions from Australian FM broadcast stations during periods of stable summer weather. There is little that can be done to alleviate these occasional problems, which usually last for only a short time.

The use of one of the forms of coding described on page 9 will assist in reducing any annoyance caused by interference.

Receiver overload

It is possible, when in close proximity to transmitters on an adjacent channel, for transmissions to be heard by other parties. In such situations, it is likely that receiver performance will be severely affected, resulting in poor reception of the wanted signal.

Good installation practices will minimise the effects of interference from motor vehicle electrical systems (see the section on engineering practices on page 15). Diesel powered vehicles are less likely to cause interference than petrol powered vehicles. Apparatus using the narrow band FM mode of transmission will greatly increase immunity to this type of interference.

Interference from other vehicles is not so easy to eliminate but may be minimised by appropriate aerial placement (for example, aerials in radio control bases should be located remote from noisy situations) and close attention to aerial cabling. Often the noise is transient and will cease when the offending vehicle moves on.

How we can help you to avoid interference

Resolution Advisory Service

A key role of the Communications Division is to facilitate the resolution of interference problems and provide advice on the prevention of interference.

The Radio Operations Group provides a professional interference resolution service. The cost of this service is often included as a component of the licence fee. Where this service is not covered in the licence fee, the Radio Operations Group may provide a contractual service.

Where the interference relates to a band controlled by a manager other than the Crown, Radio Operations staff may still assist with the location of the interference. However it is then the responsibility of the band manager to facilitate resolution. Radio Operations' participation in resolving interference issues for other band managers will normally result in the recovery of costs.

Skilled and experienced field staff with modern test and location equipment are available to respond to your requirements. Support is provided by the Engineering and Services Group in Wellington which specialises in radio spectrum design and allocation.

Powerlines and appliances

Electrical noise from electrical and electronic apparatus (including domestic appliances and powerlines) may interfere with reception. Locating the aerial away from these sources will assist in reducing interference. (These devices are normally required to meet international standards aimed at limiting the radiation of noise.)

What to do when you are receiving interference

Radio Operations staff will normally assist with resolving major interference problems. However, before you contact your nearest field office you are encouraged to check your own radio apparatus to ensure it is not faulty. If you contact a field office and it is found that the problem is entirely the result of a fault in your radio system, recovery of costs may be sought.

Having established that your apparatus is operating satisfactorily, you should provide full details as to the nature of the problem and channels affected to your nearest Radio Operations field office. Information about where unwanted transmissions are audible, any callsigns heard and the nature of the discussions are helpful. This will assist Radio Operations staff in the timely location of the problem.

If you are unable to reach Radio Operations staff using local contact numbers on the back cover of this brochure, a National Coordinator can be contacted by telephoning the Nationwide telepaging service on **026 106091** and leaving your name, organisation and contact telephone number with the operator. For example:

"Please phone Alan Smith, International Rescue, 04 555 6789"

Your message will be received by a National Coordinator who will contact you by telephone within 15 minutes to discuss the problem and arrange communication with the appropriate Radio Operations staff member.

Interference dispute resolution

When interference occurs, no matter what system is used or which parties are involved, the cause of interference and ownership of the offending equipment needs to be identified. To resolve such problems, the Ministry of Commerce has to establish that the stations concerned are operating in accordance with their licences and then look to the standards of engineering and options available to all parties. A spirit of cooperation is essential in these situations.

Nearby audio equipment

Interference caused by a land mobile transmitter to telephones and associated PABX units, computers, and other electronic equipment or to land mobile receivers is normally seen to be a deficiency of the audio equipment and the responsibility of the owner/provider of the audio equipment to resolve. This may involve the replacement of inferior equipment with equipment known to have immunity to high levels of radio frequency radiation.

OPERATING PROCEDURES

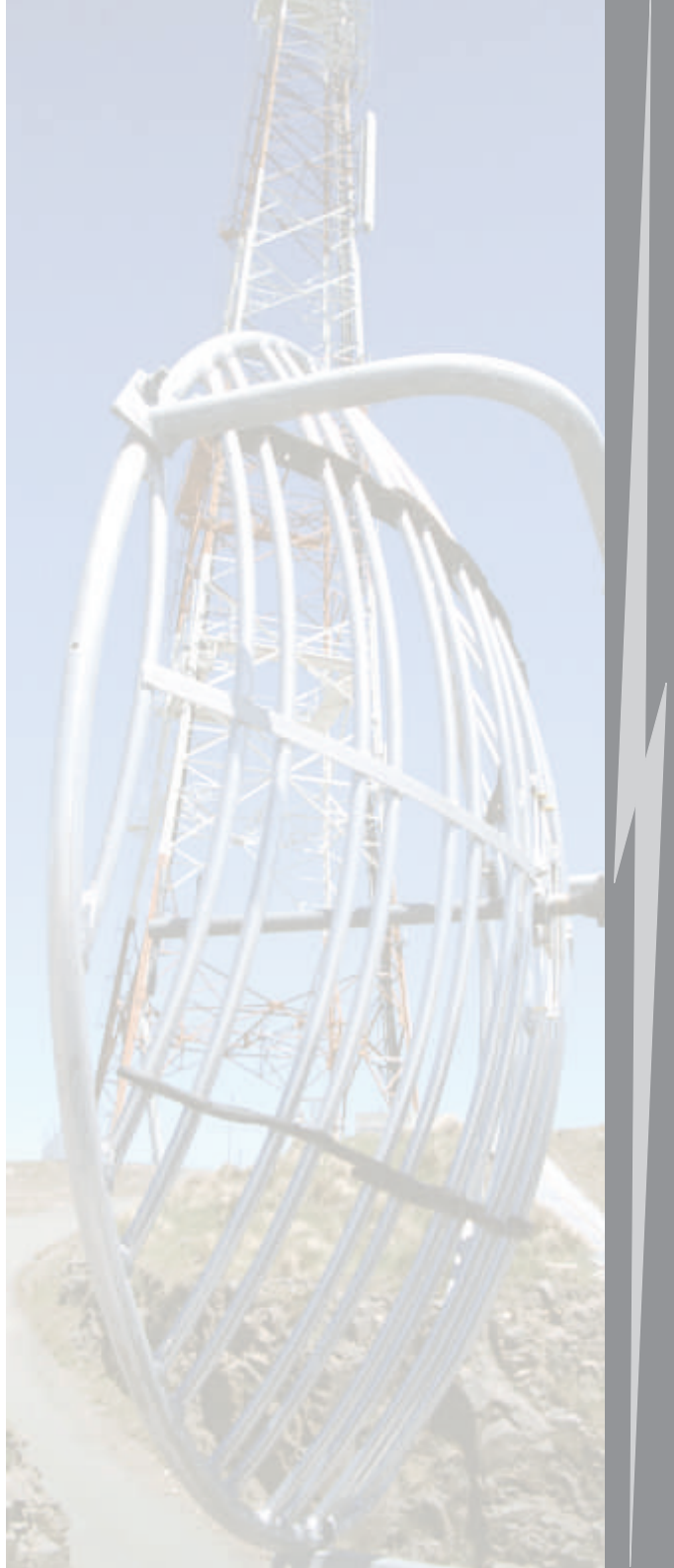
Correct operating procedures will assist the clear understanding of messages, save time, and reduce channel usage and interference to other users. Callsigns should be used by both base and mobile operators. For MF and HF services, callsigns from the international series are allocated by Radio Operations staff. Operators should adopt a concise method of procedure and transmit only such information as is necessary to achieve the objective of the call, for example:

- *Base from M3 - Do you read?*
- *M3 from Base - Go ahead*
- *Base from M3 - Arrived at 28 John Street. Will carry out repairs and report in at 2 pm for the next job*
- *M3 from Base - Message received*

Operators should speak naturally, clearly and slowly, and be courteous. The radio channel should not be used for conversations about general matters, nor should unnecessarily long conservations take place.

The base operator should set a high operating standard and correct any tendency on the part of mobile operators to use irregular procedures.

It is the responsibility of the licence holders to ensure that the persons operating radio apparatus use the radios in an efficient and effective manner.



MOBILE INSTALLATION PRACTICES

Approved radio apparatus for land mobile systems are available from New Zealand and overseas sources. It is important that the equipment's maximum frequency switching range is adhered to for multi-channel operation and that the equipment is not modified without ensuring it continues to meets Ministry of Commerce Approval Standards.

Service providers of channels licensed under Regulation 12 do not necessarily sell, install, or maintain radio equipment used in land mobile systems. Sales and servicing are largely handled by dealers licensed to supply apparatus under Part II of the Radiocommunications (Radio) Regulations 1993.

Vehicles

The aerial position on a vehicle is an important factor influencing the range of the radio—as well as susceptibility to interference from the vehicle electrical system. Aerials must be correctly installed and tuned for their operating frequencies. The centre of the vehicle's roof is the preferred aerial position for best performance. Other positions such as either side of the roof, front or back fenders, or the centre of the boot lid, may be used but are likely to result in a loss of efficiency. A tendency for the signal strength to vary according to the relative heading of the vehicle and the direction of the base station may also be experienced.

The coaxial cable which connects the radio to the aerial must also be of the correct type for the frequencies in use. Effective radio interference suppression of the vehicle's ignition and alternator systems is also necessary for good reception, particularly for HF SSB systems.

Microphone holders should be conveniently located to ensure that the microphone is returned to the holder after use to prevent accidental transmission and to enable coded squelch systems.

Trigger Base Stations

A Radio Control (trigger) base should use an outdoor directional aerial with the minimum transmitter power necessary to allow satisfactory operation of the service. In positioning the aerial of a trigger base, its location in respect to telephones, PABX equipment, cabling of audio

IDEAL POSITION FOR MOBILE AERIAL

equipment, computers, etc should be noted. Physical separation can be used to prevent compatibility problems between the transmitted and received radio frequency energy and other equipment.

Simplex Base Stations

As simplex services rely on line-of-sight coverage from the base station, the base station aerial height and location will determine the coverage obtained. Although locating remote controlled simplex base stations on hilltops is not encouraged, some degree of remote operation to the top of a nearby high rise building will improve coverage and quality of received signals, and reduce the influence of localised noise.

The simplex base station aerial is usually omnidirectional to give 360 degree coverage.

Repeater Base Stations

Time invested in planning new repeater base stations or installing additional equipment at existing base station sites is time well invested. The following criteria, if not applied, may result in less than optimal service or potential interference. These problems may occur at the most inconvenient times, and cause dispute with other site users. Criteria to take into account when planning repeater base stations include:

- filtering
- the appropriate type of filtering (ie, duplexer versus bandpass)
- the separation and isolation of aerials from other services
- the receiver gating level
- the standard of earthing practices to avoid static discharge and external intermodulation.

Radio Operations staff may be able to assist in contacting other site users with a view to minimising the impact of new services on existing services and vice versa. In locations where high powered broadcast stations exist, or are planned, these requirements are particularly important.

RADIO OPERATIONS SERVICES

Performance objectives

Licensees may expect the following minimum service objectives to be provided.

	Emergency	Non-emergency	Action taken
Response to initial complaint (normal hours)*	15 minutes	1 hour	Discussion on planned action to take
Affirmative action taken (normal hours)*	1 hour	Within 1 working day	Monitoring, direction finding, collection of information and data analysis
Response to initial complaint (after hours)	15 minutes	15 minutes	Discussion of planned action to take
Affirmative action taken (after hours)	1.5 hours	Next working day	Monitoring, direction finding, collection of information and data analysis
Feedback on activity by Radio Operations	5 hourly	Every second day	Format and details as agreed with client

* Normal Hours are Monday through Friday, 8 am to 4:30 pm.

Radio Operations staff will attempt to respond to complaints within a time frame appropriate to the urgency of the situation.

Although staff will seek to investigate and resolve situations to the satisfaction of complainants, it should be noted that not all interference complaints can be satisfactory resolved. Users of the radio spectrum should also recognise that resolution of complex interference issues may require substantial data collection and consultation.

Emergency services

Radio Operations staff undertake to respond to after-hours complaints of harmful interference affecting recognised emergency services and agencies.

For emergencies during normal working hours, call the nearest Radio Operations field office. Local after-hours contact arrangements exist at Radio Operations field offices.

However, where contact cannot be made please ring the National Coordinator on pager number **026 106091**.

Cooperation

Radio Operations clients should recognise that interference investigation is likely to require a large degree of cooperation from all parties involved. Parties not involved may be asked to participate in the switching off of equipment for short periods.

Site access

High gain aerial systems, as commonly used at radio sites, have the capacity to make signals with a weak field strength useable. It is often difficult for Radio Operations to hear these signals using a portable receiving aerial. It may therefore be necessary for access to be provided to the buildings containing the affected radio apparatus to enable the interfering signal to be heard.

TERMS AND DEFINITIONS

A3E	Double-sideband telephony channel
dBm	Decibels referenced to 1 milliwatt
F3E	Frequency modulated telephony channel
Fixed service	A radiocommunication service between specified fixed points.
HF	High Frequency (3 to 30 MHz)
J3E	Single-sideband telephony channel with suppressed carrier
kHz	Kilohertz
Land mobile service	A mobile service between base stations and land mobile stations, or between land mobile stations.
MDS	Microwave Distribution System
MF	Medium Frequency (300 to 3,000 kHz)
MHz	Megahertz
PIB	Public Information Brochure
SHF	Super High Frequency (3,000 MHz to 300 GHz)
UHF	Ultra High Frequency (300 to 3,000 MHz)
VHF	Very High Frequency (30 to 300 MHz)

Receiver gating levels

Fixed services

The Ministry of Commerce will generally protect levels that were specified in the original application for the licence as agreed to by the Ministry. These are specific to each circuit.

Land mobile services

The Ministry will generally protect services to the level of dBm.

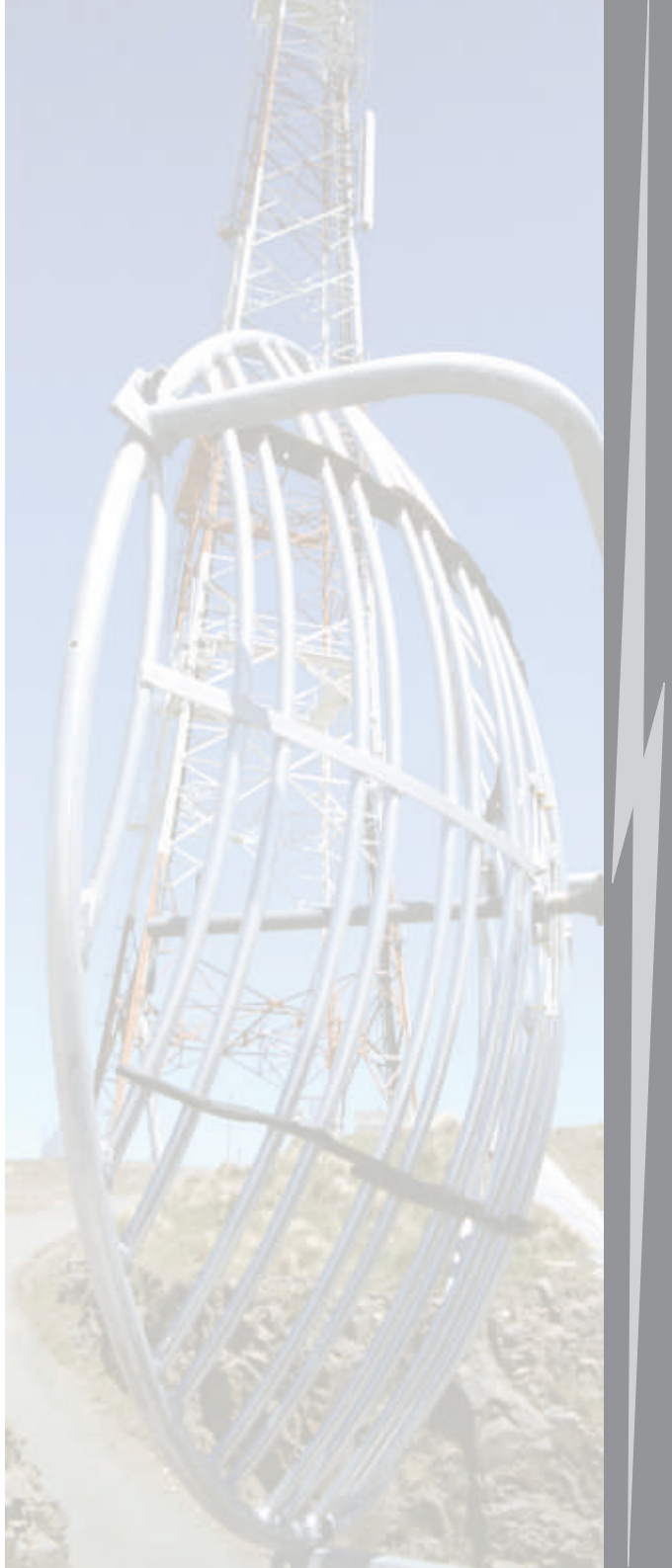
Gating levels are typically set at:

AM channels – 109dBm

FM channels – 117dBm

Gating levels in use are often beyond the scope of the equipment used in the investigation and thus may not be able to be protected.

Generally, the more sensitive a receiver the greater the chance of interference.



FIELD OFFICE ADDRESSES

	TELEPHONE	FAX
WHANGAREI		
Unit C, 148-152 Bank Street, PO Box 449	09-438-8491	09-438-8663
AUCKLAND		
Open Technology House		
Cnr Newton Road & Abbey Street	09-378-8537	09-378-8344
P O Box 68217, Newton		
HAMILTON		
512 Grey Street PO Box 982	07-834-2958	07-834-2961
ROTORUA		
Govt Life Building		
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PO Box 846	07-577-9229	07-577-6750
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NEW PLYMOUTH		
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WELLINGTON		
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CHRISTCHURCH		
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Riccarton PO Box 8562	03-343-1240	03-343-1219
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