BASIC

COMMUNICATIONS

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Contents

Introduction

This manual is intended as basic training in the use of CB Radio equipment, especially UHF CB Radio equipment used by many non-profit organisations for communications in the field, and general procedures for the operation of radio transceivers.

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Radio Communications

When you are in the field it may not always be possible, or convenient, to gain access to a telephone, and mobile telephones do not always work well from remote locations. For these reasons you may need to operate a two-way or CB Radio to communicate with other members of your group or even summon help in the event of an emergency.

CB Radio

CB, or "Citizens Band" Radio is a radio service that was first legalised in Australia in 1977, to provide the average citizen a means of communicating with each other by radio without the need to sit the examinations required to enter the world of Amateur Radio. At first each CB had to be licensed by the Federal Government but in 1982 the rules were changed so that every CB user is automatically covered by what is known as a "Class Licence". The Class Licence governs how CB can be used, what frequencies can be used, and sets penalties for the misuse of the bands.

In Australia there are two CB bands, the 27MHz or HF band, often seen on US TV shows and movies like "Smokey and the Bandit" or "Convoy", and the UHF band. After legalisation the HF band became extremely popular and CB spread rapidly across Australia, but as mobile telephones and internet came along popularity died off and now the UHF band is more widely used, particularly by businesses, farmers, truckies and other people in the community.

This training manual will deal primarily with UHF CB equipment as that is the type of equipment you will most likely encounter. Even the cheap 80 (or older 40) channel UHF "personal communicators" (or similar) available at numerous retailers, including warehouses, hardware stores, discount stores, etc, from as little as $20 each use the UHF CB band and are subject to the same rules that govern the use of every other CB in Australia, although many people do not realise this.

Terms & Definitions

Some of the common terms you may encounter are:

27 Meg	Refers to the CB band on the 27 MHz band.
AM	AM. Amplitude Modulation. A type of signal that uses the audio signal to vary the strength of the transmitted signal.
Co-ax	Co-axial cable. A special type of cable that uses a central core with a braided shield. Co-axial cable comes in different grades and impedances. Most radiocommunications equipment needs co-ax of 50 Ohm impedence (TV uses 75 Ohm).
FM	Frequency Modulation. A type of signal that uses the audio signal to vary the frequency of the transmitted signal.
Ground Plane	An electrically conductive surface that serves as the near-field reflection point for the antenna. A ground plane must be at least a one quarter of the wavelength for the frequency used, and can consist of a natural surface (e.g. Earth), or an artificial metal surface (e.g. car roof, ground plane radials, etc.)
HF	High Frequency. The part of the radio spectrum between 3 MHz and 30 MHz. In CB terms refers to the CB band on 27 MegaHertz.

LSB	Lower Side Band. An SSB signal that uses the lower portion of the full AM signal.
Mic	Microphone. Used to convert speech into electrical signals.
PTT	Push To Talk. The button on the microphone that you push to activate the transmitter.
Rx	Receive, receiver.
Squelch	A control that allows you to eliminate the background noise present when no signal is being received.
SSB	Single Side Band. A type of signal that uses only a small portion of the full AM signal. Generally better for long distance communications.
SWR	(sometimes pronounced "swar") Standing Wave Ratio (technically should be VSWR – Voltage Standing Wave Ratio). A ratio of the current flowing along the transmission line and antenna vs the current reflected back to the transmitter from the antenna.
SWR Meter	A meter used to measure the Standing Wave Ratio of the antenna.
Transceiver	A device that incorporates a receiver and transmitter in the one unit.
TVI	Television Interference. The interference caused to television by CB and other radiocommunications.
Tx	Transmit, transmitter.
UHF	Ultra High Frequency. The part of the radio spectrum between 300 MHz and 3000 GHz. In CB terms the CB band in the 476-477 MegaHertz range.
USB	Upper Side Band. An SSB signal that uses the upper portion of the full AM signal.

Some of the more common terms you may encounter that are unique to UHF CB are:

CTCSS	Also called "Sub channels", uses an inaudible tone that is transmitted with your signal that allows the other radios to 'hear' your signal.
Collinear	An antenna made up of an array of dipole antennae phased together to create gain.
Duplex	Refers to the use of two channels to send signals via a repeater station.
Elevated Feed	A type of mobile antenna that uses a length of tubing to simulate the antenna ground plane and increase the height of the antenna.
Ground Plane Independent	An antenna that has the ground plane element incorporated in the antenna design so it can be mounted onto non-metallic surfaces.
Repeater, or Range Extender	A device usually located on a hill or tall building that utilises two channels to receive a signal on the input channel and simultaneously re-transmit the signal on the output channel. On UHF CB repeaters are commonly referred to using the output channel number only.
SelCall, or Tone Call	Selective Calling. Allows you to mute the radio so you can not hear any station at all, until someone sends the correct series of audible tones.
Simplex	Signals are sent directly from one set to another set.
Speaker Mike (Mic)	A microphone commonly used on hand-held units that also incorporates a speaker so you can listen to and speak into it.

Simplex, Duplex, Tone Call and CTCSS will be explained in more detail in the following sections.

Types of CB Equipment

There are basically three types of CB Radio equipment available:

Base Station

Although not extremely common these days, base station radio's incorporate the CB and a 12 volt DC power supply into the one unit. In addition to full base station units, there were a few modular designs in the past that allowed a mobile CB set to be inserted into a case module that contained the power supply turning the radio into a base station version.

These days, the term "base station" is taken to mean a set up in a house or business rather than in a car.

Mobile Transceiver

Almost all CB transceivers, other than hand-helds, on the market today are of the mobile transceiver design. These are often small, to fit into cars, 4WD's, trucks, etc, but output the same amount of radio frequency power as a larger base station set.

Mobile transceivers can be used at a fixed location as a base station radio by using a power supply that reduces the 240 volt AC mains power down to 12 volts DC. This kind of power supply is called a "13.8 volt DC regulated power supply". Some people use a car battery instead of a power supply and whilst this is OK, in can cause a mess if the battery acid spills. You should NEVER use a car battery charger or un-regulated power supply to run a CB radio.

Portable or Hand-Held Transceiver

Small, low powered 80 channel CB hand-held units can be purchased for as little as $20 these days. These units have the same channels as mobile and base CB sets so can easily talk to anyone else that has a CB, provided they are within range. Portable radio units typically have much lower radio frequency power output so can transmit over a much shorter range.

Portable CB units can be very convenient as they can easily clip on a belt or even fit in a pocket, and they can be used to communicate with any other CB within range so you aren't limited to talking to just a few people using special dedicated radio systems.

The Law

As mentioned earlier, the use of CB in Australia is covered by a Class Licence which, along with the Radiocommunications Act 1992 (cwlth) and Radiocommunications Regulation 1993 (cwlth), govern how the bands can be used, what channels are used for specific purposes, and other details relevant to the CB service. The Class Licence automatically covers anyone that uses a CB in Australia, whether they know it's a CB or not, and provides for some heavy penalties when the conditions are breached.

The Citizen Band Radio Stations Class Licence, the Radiocommunications Act and Regulation are federal legislation, and are enforced by the federal agency "Australian Communications & Media Authority" (ACMA). State authorities, such as Police, have very limited powers over the operation of CB and other radio equipment except in specific circumstances, however ACMA and Federal Police not only have wide ranging powers should they need to implement them, but also possess equipment that is capable of locating a station within minutes when necessary (referred to as "Radio Direction Finding" or "RDF").

Radio Operation

Transmitting and Receiving

Despite what you may see in movies with CB Radio only one person can speak at any time. If you transmit your message while the other station is still talking, they will not hear you!

To place the radio into transmit mode so you can send your message, you press (and hold) the PTT or "Push To Talk" button, wait about 1 second, then start speaking. This is important because many people actually start talking before they depress the PTT and the first part of their message is cut off, so always make sure your push the PTT, **wait for 1 second**, <u>then</u> start speaking.

The PTT button will generally be the largest button on the side of a hand-held radio, or on the side or top of the microphone. There may also be other buttons, for example to change channels or activate certain features, but generally the PTT will be the largest.

Antenna

All CB sets require an antenna to work properly as this is what radiates the signal into the air. If you have a mobile or base setup it is best to get someone that knows about CB antenna to help you as improper installation can seriously reduce the range you can communicate and can also damage your CB set. For example, mobile antenna must be kept clear of any metal on the car, so mounting the antenna on the front bumper of a 4WD that is fitted with a bull-bar is not a good idea! It would be much better to mount the antenna on top of the bull-bar.

With hand-held sets the antenna is usually on top of the set. It is very important to try and keep the antenna straight up while using the radio as this will give you optimum performance. Also keep clear of large metal objects or structures, and do NOT touch the antenna while transmitting.

Simplex Operation

Simplex operation is probably the least complicated means to communicate, and in most group activities will be the only means required. The key points of simplex operation are:

- Only one person can talk at a time
- Limited range – signal easily blocked by large structures, tree's, etc.
- Uses only one frequency to link each radio directly
- Ideal for workgroups in a limited geographical area
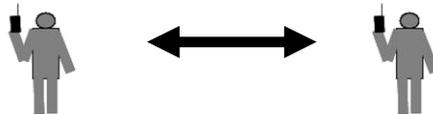
Range

Simplex range is somewhat limited, and on UHF is generally considered "line of sight". This, of course, depends on a number of factors, including:

- Power output of radio – mobile sets are often more powerful than portable sets
- Type and height of antenna – mobile and base setups have higher and better gain antenna than portables
- Type of terrain – mountains and hills will block signals where flat open ground will not.

As a general rule, maximum simplex range should be 5km in open, flat country regions, or 2km in city regions. Of course, this could be much less if the set is very low powered or there are unusual obstructions between the stations.

Manual Relay

One way to extend the range of simplex operations is by the use of a manual relay station situated between two stations, or on a slight hill. This can be handy for short operations where a worker may need to move into a fringe coverage area for a short time, however it is time consuming and should not be used for extensive operations unless there is no other choice.

A manual relay station will involve the use of a simplex channel, with the relay station receiving the message from station 1 then re-transmitting that message to station 2, and so on. This is what makes the process so time consuming.
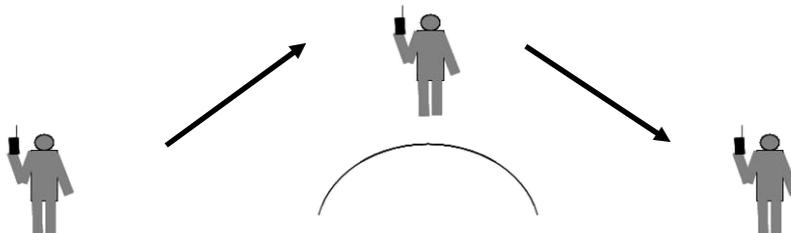
Repeater Operation

Repeaters are automatic relay stations, usually established on a high building or mountain, used to greatly extend the distance people can communicate. On the CB band repeaters are a shared resource and **anyone setting up a repeater must allow <u>all</u> other CB users access to the repeater <u>free</u> of charge**. CB repeaters are licensed by the ACMA.

Repeaters utilise two channels to operate, and on the UHF CB band channels 1 to 8, 31 to 38, 41 to 48* and 71 to 78* have been reserved for use by repeaters. They use two channels because they automatically retransmit the received signal simultaneously, so there is no delay between what you say and it being retransmitted to the other users.

Repeaters use what is termed an "input" and an "output" channel, which refer to the channels that the repeater receives a signal on and the channel that it retransmits the signal back to other users. Generally repeaters are known by the output channel, which are channels 1 to 8 and 41 to 48. These are the channels you listen to when you want to hear the repeater.

* On 27 May 2011 changes to the Class Licence were introduced that expanded the UHF CB band from 40 channels to 80 channels. See the section on Channels for more information.

How the repeater works

As you know, in simplex mode the radio uses just one single channel or 'frequency'. That is, if you are using channel 28 then your radio will transmit and receive on channel 28 only. But in repeater or 'duplex' mode, this changes.

When you switch the Duplex or Repeater switch on, AND, the radio is on a channel between 1 and 8 (or 41 to 48), the radio is operating in Duplex mode. In this mode, it automatically changes channels when you push the PTT or transmit button, and then changes back when you let go so you can receive. Some sets show this function by changing the channel display but most do not.

So, for example, if you are listening to channel 1 repeater and you transmit, your radio will automatically switch to channel 31 and transmit to the repeater. Then, when you release the PTT button, the radio will automatically revert back to channel 1. At the repeater, the opposite happens – the repeater HEARS or receives your signal on channel 31 and then, automatically and simultaneously, retransmits it over channel 1.

CB repeaters always use channels that are spaced 30 channels apart, so channel 1 and 31, 2 and 32, 3 and 33, etc up to 8 and 38. Under the new Class Licence a second repeater band starts at 41 to 48 with the input channels 30 channels higher at 71 to 78. All repeaters are available for general use *<u>EXCEPT</u>* those on channel **5 / 35** which are **<u>emergency</u>** repeaters only. These can only be used to call for help, or for operation in connection with some emergency, etc.

This two channel operation confuses many people who can not understand why, if they are talking on channel 35, they would be causing problems for a channel 5 repeater. It is also a very good reason why you should avoid using channels 31 to 38 and 71 to 78 even if there are no repeaters in your area using those channels, because under certain conditions UHF signals can travel very far and you could interfere with a repeater that you never even knew existed! Also, if there is a repeater within range and you are using the repeater input channel to chat, while you remain totally unaware of what is happening the repeater will be happily re-transmitting everything you say so that anyone within range of that repeater will be able to hear your conversation.

Another matter that often causes confusion is switching off the "duplex" button to listen for the other station direct. Many times new operators will listen to a repeater, turn off the duplex button, and then tell the person that they can hear them simplex or direct because the repeater button was off. This is totally incorrect! Remember above, the repeater transmits its signal on the output channels (1 to 8/41 to 48), which your radio will be tuned to. Turning the duplex button on only affects the radio when **you** transmit, so whether the duplex button is on or off your radio will still be listening to the OUTPUT of the repeater. To know if you can hear the other person directly you need to listen to the repeater's INPUT channel (i.e. 31 to 38/71 to 78). Only then will you know if you can hear the other station directly or not.

Giving radio checks is also a matter of some confusion. Remember that when you are talking to someone through a repeater it is the **repeater** that is receiving them directly and not you – you are receiving the repeater! If, for example, you are in Newcastle City and listening to the Newcastle repeater at Mount Sugarloaf. A person in Swansea, which is a considerable distance from Newcastle City and well outside of the simplex range of a UHF CB, asks for a radio check on the repeater. Many people would respond "loud and clear in Newcastle", but this is incorrect! The correct response is "loud and clear to the Mount Sugarloaf repeater" (or similar) as it is Mount Sugarloaf that their signal is reaching. You in Newcastle are simply hearing the retransmitted signal from Mt Sugarloaf.
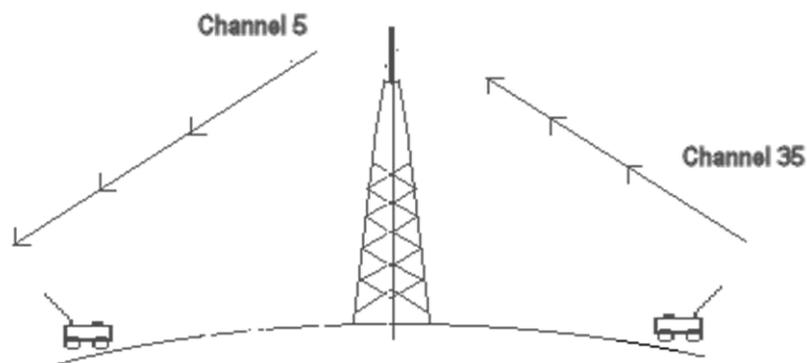
Fig. 3 Duplex - the repeater re-transmits the signal to extend the coverage.

Repeater 'Tail' and 'Timer'

Almost all repeater systems have a short burst of 'noise' added after the user has released their PTT button and stopped transmitting. This is called the "tail" and it keeps the repeater transmitting for 1 or 2 seconds after the signal on its input channel has stopped. It is used for a couple of reasons:

1. It keeps the repeater transmitting when an input signal may be cutting in and out – if mobile your signal strength may vary and may occasionally reduce to a level below what the repeater can hear. Without a tail the repeater would cut off immediately your signal dropped and then start transmitting again when it came back up. This may be a matter of milliseconds so the tail helps to avoid that annoying habit and also reduce strain on the repeater control systems.

2. It helps confirm the repeater is working or that you can access the repeater – when you press your PTT button on a repeater and then release it again you will hear the repeater tail for a brief second or so before it cuts out. This tells you that the repeater is working, and that you are getting your signal to it strong enough to trigger its transmitter.

When you use a repeater you should wait for the tail to finish before you transmit your reply. Repeaters also have "Timers" built in that limit the length of time the repeater can transmit continuously before it cuts off, even if there is still a signal being received. This helps prevent the repeater from over-heating and also from blocking the channel because someone has accidentally left a radio transmitting. How much time you have before the repeater cuts off varies from repeater to repeater – some are set at 1 minute and others at 20 seconds, so you should try and ask local operators about the time out period if you are not sure.

Repeater timers often do not reset until the tail has finished and the repeater transmitter stops. This is why it is very important to wait for the tail to finish before you respond. Imagine for example that the repeater has a timer of 30 seconds, and that the other person talks for 20 seconds before releasing their PTT. If you wait for the tail to finish before you reply you will have another 30 seconds within which to answer, BUT, if you start transmitting before the tail has finished you would only have **10 seconds** before the repeater "timed out" and shut down the transmitter.

Selective Calling or "SELCALL"

Selective calling, also called "Tone Calling" or "Interference Eliminator", is a technology that allows you to keep your radio silent until it is called by someone who knows the correct code for your set. There are two types of Selective Calling that are used on CB today – the traditional SelCall or Tone Call, sometimes also called "5 digit SelCall", and "CTCSS" which is also called "interference eliminator", "privacy tones" or "sub-channels". More modern units may include another type of system called "Digital Coded Squelch" or "DCS".

Each of these systems works by disconnecting the speaker so that nothing can be heard until you either:
   a) manually disable the mute so you can hear, or "monitor", the channel, or;
   b) receive the correct tone or series of tones, dependent on which system is used.

SelCall

This system uses a series of audible tones, transmitted together, to activate the other radio. There are a number of different tones that can be used, plus the length of the tones, gap between each tone, and many other features, can be changed so that unique identities can be created. With this system, each radio is given a SelCall identity that usually consists of 4 or 5 numbers, and by selecting those numbers on your radio and pushing the "Tone Call" button, a series of tones is transmitted across the channel.

If the tones are the correct numbers, in the correct order, of the correct length and spacing, it will cause the SelCall system on the other radio to alert the user they are being called. Usually this involves sounding a brief alarm tone and un-muting the radio speaker so the user can hear people on the channel.

CTCSS

This is now becoming more popular and is being sold as "38 sub channels" or "interference eliminator", which can be somewhat misleading. As before, the radio is muted so it can not hear anyone transmitting on the channel. There are some 38 tones used in this system, but these tones are "sub-audible" which means the human ear can not detect them, so the

chosen tone is transmitted continuously with the signal whenever you are transmitting. If the tone being transmitted is the same as the tone that has been pre-set in the other radio, then the speaker will be un-muted and your transmission will be heard, otherwise the speaker stays muted and nothing is heard.

As with any good communications system, CTCSS is known by several different names depending on the manufacturer:
- Motorola – PL (Private Line);
- General Electric – CG (Channel Guard);
- RCA Corp. – QC (Quiet Channel);
- Others – TS (Tone Squelch)

DCS

DCS is very similar the CTCSS, however instead of sending a continuous audio tone DCS sends a low level digital signal. To be more precise, DCS superimposes a continuous stream of FSK digital data, at 134.4 bits per second, on the transmitted signal. DCS is known by several names:
- Motorola – DPL (Digital Private Line);
- General Electric – DCG (Digital Channel Guard);
- Icom – DTCS (Digital Tone Code Squelch).

THIS IS IMPORTANT! None of these systems gives you privacy from other people listening to your transmissions! Although with CTCSS and DCS you can't hear any other stations on the channel, if they do not have CTCSS/DCS active they **will hear you and everything you say**.

Callsigns

Callsigns are important as they identify you and your station. If you are using the radio during field work or similar you will usually be given a callsign, but if not use your first name or a descriptive callsign such as your location (e.g. carpark 2, entry 1, etc). Callsigns should always be used when calling another station with the generally accepted format being "[station being called] This is [your callsign], over". For example, Control wants to contact Carpark 3:

> *"Carpark 3, This is Control, over"*

Why? The reason why we call the other station first is because it alerts the other person that they are wanted, and they can then listen to hear who is calling them. Radio operators are often doing a number of different things whilst they are waiting for a call, and if you put your callsign first they may not be taking notice, until they hear their station callsign. By announcing your callsign second you reduce the chance that they will need you to repeat your callsign.

Voice Procedures

Unlike a telephone, with radio communications only one person can speak at a time, and depending on conditions the signal may be weak and difficult to hear or understand. To help improve the flow of communications traffic, especially during difficult conditions, certain standard procedures have been adopted.

Speaking Clearly

When using radio it is very important to speak clearly. Microphones should be held at a slight angle so you speak *across* the face and not directly into it. One method commonly used to help ensure the correct position is to hold the microphone in your left hand using your thumb to activate the PTT button. If you then keep that thumb and the edge of the microphone against the left side of your face it will automatically place the microphone the correct distance and angle from your face.

When speaking you should remember **RSVP**:

Rhythm	Keep a natural rhythm dividing the message into phrases. Long transmissions should be broken into sections.
Speed	Speed should be slightly slower than usual. Keep in mind that the person at the other end may need to write down your message and if this is the case you should try and imagine that you are also writing the message and adjust the speed accordingly.
Volume	Volume should be very slightly louder than normal – this does NOT mean shout, it means SLIGHTLY louder than normal conversation.
Pitch	Pitch should be slightly higher than usual – it is a fact that a higher pitched female voice penetrates via radio far better than a deep pitch male voice.

Whenever you use a radio, try and remember the **KISS** principle: *Keep It Short and Simple*. Think about what you need to say before you start transmitting, and convey only the essential information needed to get the message across. Think BEFORE you speak!

Radio operators also need to keep in mind the **BASS** principle:

Brevity	Be brief, but not at the expense of accuracy. Remember others can not use the radio while you are transmitting, so keep messages short and to the point.
Accuracy	Accuracy is critical as it is no good getting help if you send it to the wrong location! If you aren't sure what was said, ask the caller to "say again".
Speed	There may be times when messages may be important or even life and death. Speed is important – the message needs to be gotten out as quickly as possible, but again not at the expense of accuracy. Talk at a pace that can be easily understood as having to repeat yourself several times will only take longer.
Simplicity	Keep thinks simple – use plain language and avoid complicated codes or jargon that others may not understand.

Radio Procedures

In the past radio operators used complex codes and languages to pass messages, and a formal method of communicating was strictly laid out and adhered to. Thankfully we are dealing with CB Radio and there is simply no need for complex codes, language or protocols. Having said that, in the interests of facilitating easy communications, especially during emergencies, some of the basics of the international NATO procedures need to be retained.

To help keep radio networks working smoothly a basic rule for the exchange of information needs to be observed. The flow of information during a radio message should look like this:

Control is wishing to pass a message to Station A:

> *"Station A this is Control, over"*

> *"Control this is Station A, over"*

> *"[this is my message], over"*

> *"Roger, over"*

> *"[this is any further information, over] OR [Out]"*

In the above example:

- The first two transmissions are used to establish the identities of the stations involved. Callsigns do not need to be used for each transmission once the ID of each has been established.

- The message is passed.

- The receiving station confirms that the message was received (or other appropriate response).

- The originating station is then given the opportunity to transmit further information or, if that concludes the contact, the originating station ends the contact.

Calling Multiple Stations

A station may call more than one station at a time if they have the same message to pass to all of them. When multiple stations are called the called stations should respond in the order they were called.

e.g.   "Station 1, Carpark 3, This Is Control, over"

> "Station 1, over"

> "Carpark 3, over"

The message is then passed in the usual way.

The pro-words "Over" and "Out" are used to end transmissions so other users know that you have completed your transmission. Note that each has a particular meaning:

Over   I have completed my transmission and I expect a reply.

Out   I have completed my transmission and I do NOT expect a reply.

Note that you only use **EITHER** *"Over"* **OR** *"Out"* to end a transmission, **never both**. The term "Over and Out" is a contradiction. Once the originating station ends the contact with "Out" there is no need for the other station to also respond – the contact has been ended and by transmitting "Out" the originating station has indicated to others that the frequency is now clear and available for use.

Pauses

In case another station on the channel has a more urgent message, a slight pause should be left between each transmission. Also, if the message is very long, it should be broken into smaller sections with a small pause between each section so another station can interrupt if necessary.

Prowords

Prowords are words or short phrases that convey an entire message and can therefore be used to help reduce transmission time and improve clarity. The following standard prowords are the most common and should be used as appropriate.

Proword	Meaning
Affirmative	Yes, correct.
Correction	An error has been made, the correct version is…….
I Spell	I will spell the following phonetically.
Figures	The following are numbers.
Say Again	Say your last message (or the part indicated) again.
I Say Again	I am repeating part of my message.
Location	What is your location? / My location is …………..
Negative	No, incorrect.
Over	Your turn to speak.
Out	End of contact, no response needed.
Roger	Message received and understood.
Roger So Far	Have you received my message so far? (more to come) / I have received your message so far.
Send	I am ready to receive your message.
Sitrep	What is your Situation Report? / My Situation Report is …..
Standby	Please wait a short time – other stations may use the frequency.
Through Me	I will relay your message to the station you wish to contact.
Wilco	I understand and will comply.
Wait	Please wait (for not longer than 10 seconds) – other stations should NOT use the frequency.
Wait, Out	Long delay is expected. Other stations may use the frequency.

Using the correct procedure helps to get your message across quickly and accurately, regardless of the conditions and situation. The following table contains some examples of poor operating procedure and the preferred alternative.

Wrong	Right
Repeat	Say Again
I Repeat	I Say Again
Roger Wilco	Wilco
Wilco, over and out	Wilco, out
Over and out	Out
Negatory	Negative
10-4	Affirmative
Clear	Out
Copy	Roger

Phonetic Alphabet

If conditions are bad or you are trying to relay letters that may sound similar to other letters over radio (e.g. M and N, F and S), the International Phonetic Alphabet can be used to spell words or distinguish exactly what letter you are referring to. The following is the recognised official International Phonetic Alphabet and you should try to avoid using substitute terms rather than the accepted phonetic allocation.

Letter	Phonetic	Pronunciation	Letter	Phonetic	Pronunciation
A	Alpha	AL fah	N	November	no VEM ber
B	Bravo	BRAH voh	O	Oscar	OSS cah
C	Charlie	CHAR lee	P	Papa	pah PAH
D	Delta	DELL tah	Q	Quebec	kwee BEK
E	Echo	ECK oh	R	Romeo	ROW me oh
F	Foxtrot	FOKS trot	S	Sierra	see AIR rah
G	Golf	GOLF	T	Tango	TANG go
H	Hotel	hoh TEL	U	Uniform	YOU nee form
I	India	IN dee ah	V	Victor	VIK tah
J	Juliet	JEW lee ETT	W	Whiskey	WISS key
K	Kilo	KEY loh	X	X-Ray	ECKS ray
L	Lima	LEE mah	Y	Yankee	YANG key
M	Mike	MIKE	Z	Zulu	ZOO loo

Numbers and Characters

No.	Pronounced	No.	Pronounced	Char.	Pronounced
0	Zero	5	Fi yiv	.	Full stop
1	Wun	6	Six	,	Comma
2	Too	7	Se ven	-	Hyphen
3	Thuh ree	8	Ate	( )	Open bracket, Closed bracket
4	For wer	9	Niner	' '	Quote, unquote
		Decimal point	Day see mal	/	Slash

Radio Checks

Sometimes it may be necessary to test how well your transmissions will be heard from a particular location, such as when you are first positioned somewhere or if signals appear to be weak or distorted. The following prowords relate to radio checks or signal reports. A radio check simply requires you to advise how well you can receive that station from your location, OR, if you are talking through a repeater, how well you are receiving that station via that repeater.

Proword	*Meaning*
Radio Check	I wish to check that my radio is working, what is my readability?
Loud and Clear	Your signal has excellent quality.
Readable	Your signal has satisfactory quality.
Readable with Noise	Your signal can be understood, but there is some noise present.
Unreadable	Your signal is so bad I can not understand you.

Simple Do's and Don'ts

DO listen to ensure the channel is not in use before you make a call.

DO wait until others have finished their conversation before calling another station (unless urgent).

DO stick to recognised procedure.

DO use the callsign you have been allocated.

DO keep transmissions short and to the point.

DO leave a pause between transmissions in case a more urgent matter needs attention.

DON'T transmit while someone else is also transmitting.

DON'T use obscene or offensive language.

DON'T speak faster than you could write down the message.

DON'T repeatedly ask for radio checks or signal reports.

DON'T use the radio unnecessarily.

Emergencies

If you have an emergency while in the field, obtaining help fast could mean saving someone's life. If you are part of an organised group or network, often the word **"Emergency"** will be used to indicate a situation where there is immediate danger to life and/or property.

Both CB bands include legally allocated emergency channels. These have been gazetted by law for emergency use only, and heavy penalties can apply if they are misused. The emergency channels are:

- 27MHz or HF band – **channel 9** (on 40 or 23 channel sets. Channel 5 on 18 channel sets)
- UHF band – **channels 5 AND 35** (35 is the input channel for channel 5 repeater systems)

It is essential that these channels be kept clear for emergency calls. An on-the-spot fine of **$420**, or a court imposed penalty of up to **2 years imprisonment**, or up to **$315,000 fine**, can apply if you misuse any of the emergency channels. If an emergency call is blocked these penalties increase up to **5 years imprisonment** or **$1,050,000** fine.

Distress Calls

By international convention, the word **"Mayday"** (pronounced as "Maider") is used to indicate grave and immediate danger. Mayday calls have, by law, absolute priority over all other radio traffic and anyone hearing a distress call is obliged to answer and render assistance, or maintain silence if another station is in the process of rendering assistance. A Mayday call can also be relayed by a station that may not be in a position to render assistance but that had never-the-less received a distress call. Relayed distress calls are prefixed with **"Mayday Relay"**.

The chances of receiving a distress call on CB bands is extremely remote, however it is presented here as it is very widely recognised worldwide as a distress call even by non-radio operators, so in the event of needing to call for help yourself it may become an option to use the distress signal to summon help. Be aware however that very heavy penalties apply to anyone that misuses the distress signal.

Channels

The Class Licence stipulates certain channels on both CB bands that are to be used for certain purposes only. A full channel chart appears as an Appendix in this manual, however a summary of the allocated channels are:

27MHz HF Band

8	Road Channel (legally recommended)
9	Emergency
11	Calling (AM)
16	Calling (SSB)

UHF Band

1 to 8 31 to 38 41 to 48* 71 to 78*	Repeater channels
5 and 35	Emergency
11	Calling
22 and 23	Data only – no voice
40	Road Channel (legally recommended)

* See following section for the new 80 channel plan.

New UHF Channels

On 27 May 2011 changes to the CBRS Class Licence became effective. The most significant change made was the expansion of the UHF band from 40 to 80 channels.

In effect, the existing 40 channels remain as per previous allocations. That is, channels 1 to 8 remain repeater output, channels 31 to 38 remain repeater input, channels 5 and 35 remain emergency channels, channel 11 remains a call channel, channels 22 and 23 remain data only, and channel 40 remains a road channel. The big change occurs from channel 41 up.

Under the new channel scheme the channel spacing changes from 25kHz to 12.5kHz, which effectively doubles the available channels. The new frequencies are numbered channel 41 to 80, with the following allocations:

- Channels 41 to 48 are repeater output channels
- Channels 71 to 78 are repeater input channels
- Channels 61, 62 and 63 are not used at this time.

Appendix C shows the now old 40 channel allocation chart, with the new 80 channel band allocation shown in **Appendix B**.

Data Channels

The Class Licence allocates two channels for data operation only. These are UHF Channels 22 and 23. Under the Class Licence there is NO VOICE operation permitted on these channels.

The Data channels are most commonly used for:

- Telemetry – e.g. dam levels, irrigation flow, etc.
- Telecommand – e.g. control pumps, turn on/off irrigation, etc.

Maintaining Communications Equipment

From a general users point there is very little you can do when it comes to the serious maintenance and repair of equipment. However some very simple and basic user maintenance can help to ensure that radio equipment works when it is most needed.

Basic Checks

- Visually check all connections.
- Test radios regularly.
- Keep rechargeable batteries charged.
- Cycle rechargeable batteries as necessary.

If you find a fault, **LABEL THE RADIO AS FAULTY**. Attach a label showing date and a description of the fault, and then report the problem to someone responsible for the maintenance of equipment.

Simple Fault Finding

If the checks below do not resolve the problem, label the equipment as faulty and advise the relevant person or arrange for repair.

Total Failure (i.e. dead radio)

1. Make sure radio is turned on and any lamps, lights or displays are working.
2. Make sure the power supply or battery is connected properly.
3. Test battery on another radio to make sure battery is fully charged.
4. Check fuses in power leads and/or power supply. Only replace blown fuses with a fuse of the same type and rating.
5. Check any extension speaker is connected properly.

Receiver Failure (radio will transmit but not receive)

1. Check volume control.
2. Check squelch or mute control.
3. Check external speaker connection.
4. Check antenna is erected and connected properly.

Transmitter Failure (radio is receiving)

1. Check microphone connection and PTT button is working.
2. Check antenna is erected and connected properly.
3. Check radio is in correct mode (i.e. simplex or duplex).

Rechargeable Batteries

Rechargeable batteries require proper care to ensure they are ready for use when needed, and that they will last as long as they should when being used. There are two types of rechargeable batteries commonly used today:

- Nickel Cadmium (NiCad)
- Nickel Metal Hydride (NiMH)

You should ALWAYS follow the manufacturer's instructions and guidelines regarding the use and recharging of batteries. Remember not all batteries can be recharged and you should NEVER try to recharge normal dry cells (i.e. 'Heavy Duty', 'Alkaline', etc.).

Charging New Batteries

New rechargeable batteries should be commissioned by the following procedure to help ensure they are ready for use and at optimum capacity:

1. Place battery in charger and charge for 14 hours (or as recommended by manufacturer for first charge).
2. Discharge the battery by using the radio.
3. Repeat the whole process 3 times.

Once a battery has been charged it should be removed from the charger, unless the battery charger is specifically designed to allow the battery to remain connected at all times (some chargers have automatic circuits that prevent any over-charging or damage).

Deep Cycling Batteries

Good battery maintenance means that batteries are deep cycled, preferably at least every few recharges. Deep cycling means that batteries are completely discharged before being fully recharged. It is sometimes good practice to, every few months, repeat this cycle 2 – 3 times as you did with the new battery, to help remove any memory the battery may have developed.

Appendix A – 27MHz CB Band Channel Chart

Channel (40 / 23)	Channel (18)	Frequency	Use/Notes
1	-	26.965	General use
2	-	26.975	General use
3	-	26.985	General use
4	-	27.005	General use
5	1	27.015	General use
6	2	27.025	General use
7	3	27.035	General use
8	4	27.055	Road Channel (truckies channel) – legally recommended
9	5	27.065	Emergency Channel – legally allocated
10	-	27.075	General use
11	6	27.085	Call Channel (AM mode) – legally allocated
-	7	27.095	Withdrawn from use
12	8	27.105	General use
13	9	27.115	General use
14	10	27.125	General use
15	11	27.135	General use
16	12	27.155	Call Channel (LSB mode) – legally allocated
17	13	27.165	General use
18	14	27.175	General use
19	15	27.185	General use
-	16	27.195	Withdrawn from use
20	17	27.205	General use
21	-	27.215	General use
22	18	27.225	General use
23		27.255	General use
24		27.235	General use
25		27.245	General use
26		27.265	General use
27		27.275	General use
28		27.285	General use
29		27.295	General use
30		27.305	General use
31		27.315	General use
32		27.325	General use
33		27.335	General use
34		27.345	General use
35		27.355	DX Call Channel (LSB) – commonly accepted
36		27.365	General use
37		27.375	General use
38		27.385	General use
39		27.395	General use
40		27.405	General use

Note: Although not a legal requirement, common practice restricts AM mode between channels 1 and 14, and SSB modes between channels 15 and 40.

Appendix B – New 80 Channel UHF CB Band Channel Chart

The following channel plan is the new 12.5kHz plan implemented 27 May 2011.

Ch	Frequency	Use	Ch	Frequency	Use
1	476.4250	Repeater 1 output	41	476.4375	Repeater 41 output
2	476.4500	Repeater 2 output	42	476.4625	Repeater 42 output
3	476.4750	Repeater 3 output	43	476.4875	Repeater 43 output
4	476.5000	Repeater 4 output	44	476.5125	Repeater 44 output
5	**476.5250**	**Emergency[1]/Rptr 5 out**	45	476.5375	Repeater 45 output
6	476.5500	Repeater 6 output	46	476.5625	Repeater 46 output
7	476.5750	Repeater 7 output	47	476.5875	Repeater 47 output
8	476.6000	Repeater 8 output	48	476.6125	Repeater 48 output
9	476.6250	General use	49	476.6375	General use
10	476.6500	4WD channel[2]	50	476.6625	General use
11	476.6750	Call Channel[3]	51	476.6875	General use
12	476.7000	General use	52	476.7125	General use
13	476.7250	General use	53	476.7375	General use
14	476.7500	General use	54	476.7625	General use
15	476.7750	General use	55	476.7875	General use
16	476.8000	General use	56	476.8125	General use
17	476.8250	General use	57	476.8375	General use
18	476.8500	Caravan/tourist channel[2]	58	476.8625	General use
19	476.8750	General use	59	476.8875	General use
20	476.9000	General use	60	476.9125	General use
21	476.9250	General use	61	476.9375	Not used[7]
22	476.9500	Data only – NO VOICE[4]	62	476.9625	Not used[7]
23	476.9750	Data only – NO VOICE[4]	63	476.9875	Not used[7]
24	477.0000	General use	64	477.0125	General use
25	477.0250	General use	65	477.0375	General use
26	477.0500	General use	66	477.0625	General use
27	477.0750	General use	67	477.0875	General use
28	477.1000	General use	68	477.1125	General use
29	477.1250	General use	69	477.1375	General use
30	477.1500	General use	70	477.1625	General use
31	477.1750	Repeater 1 input	71	477.1875	Repeater 41 input
32	477.2000	Repeater 2 input	72	477.2125	Repeater 42 input
33	477.2250	Repeater 3 input	73	477.2375	Repeater 43 input
34	477.2500	Repeater 4 input	74	477.2625	Repeater 44 input
35	**477.2750**	**Emergency[5]/Rptr 5 in**	75	477.2875	Repeater 45 input
36	477.3000	Repeater 6 input	76	477.3125	Repeater 46 input
37	477.3250	Repeater 7 input	77	477.3375	Repeater 47 input
38	477.3500	Repeater 8 input	78	477.3625	Repeater 48 input
39	477.3750	General use	79	477.3875	General use
40	477.4000	Road channel[6]	80	477.4125	General use

[1] Legally allocated as Primary Emergency Channel. CTCSS and DCS not permitted.
[2] Widely used for this purpose, although legally a General Use channel.
[3] Legally allocated as primary call channel. Must change channel after establishing contact.
[4] Legally allocated for telemetry and telecommand data only – NO VOICE permitted.
[5] Legally allocated as secondary emergency channel. CTCSS and DCS not permitted.
[6] Generally accepted use. Channel used for this purpose since legalisation of band.
[7] Reserved for later allocation – data channel guard band.

Appendix C – (Old) 40 channel UHF CB Band Channel Chart

Channel	Frequency	Use/Notes
1	476.425	Repeater output
2	476.450	Repeater output
3	476.475	Repeater output
4	476.500	Repeater output
5	**476.525**	**Emergency Channel – legally allocated.** Repeater output
6	476.550	Repeater output
7	476.575	Repeater output
8	476.600	Repeater output
9	476.625	General use
10	476.650	General use *[used by 4WD clubs*]*
11	476.675	Call Channel - legally allocated
12	476.700	General use
13	476.725	General use
14	476.750	General use
15	476.775	General use
16	476.800	General use
17	476.825	General use
18	476.850	General use *[used by Caravan & Campers*]*
19	476.875	General use
20	476.900	General use
21	476.925	General use
22	476.950	Data only (no voice) – legally allocated
23	476.975	Data only (no voice) – legally allocated
24	477.000	General use
25	477.025	General use
26	477.050	General use
27	477.075	General use
28	477.100	General use
29	477.125	General use *[used as road channel on Pacific Hwy*]*
30	477.150	General use
31	477.175	Repeater input
32	477.200	Repeater input
33	477.225	Repeater input
34	477.250	Repeater input
35	**477.275**	**Emergency – legally allocated.** Repeater input
36	477.300	Repeater input
37	477.325	Repeater input
38	477.350	Repeater input
39	477.375	General use
40	477.400	Road Channel – legally recommended

Note: With the exception of channels 5 and 35, the Class Licence permits repeater channels to be used for simplex operation in regions where they are not being used by a repeater, however we recommend that this be avoided in order to ensure you do not interfere with a distant repeater.

* Common uses, not part of the legally allocated or legally recommended channels, but commonly used around Australia.

Index