

Fitting a UHF CB radio to a 1990

Words: Michael Collinson, Southern Tasmania Chapter

Belonging to three motoring groups I get to enjoy many club runs over a year; but they are not all alike.

One of the great aspects of a Mazda MX-5 Club Run is the use of UHF CB radio. The lead car in the convoy warns of any hazards that are met on the road and advises the direction to be taken at road junctions on the way. 'Tail-end Charlie' advises when all the cars have passed the hazard or have negotiated each road junction. With up to eight or so cars on any Club run fitted with UHF CB, or using hand-helds, there is a fair amount of conversation, with scenic observations and banter, between the various navigators.

As a navigator, my wife has now suffered a couple of years or more holding a UHF hand-held (which only provides limited range and low output volume that cannot be heard when the top is down), so for us it was about time that a fixed UHF CB radio was installed.

Searching online, we identified a UHF CB radio which has all the controls for the radio located on the microphone. The **Oricom UHF285PK** (below) is supplied complete with a *rubber ducky* antenna and everything necessary to complete the installation – and, unlike my two previous UHF radios, it is programmed with 80 UHF CB channels.



Back in 2012 the ACMA (Australian Communications and Media Authority) approved the new 80-channel UHF CB equipment with the announcement that the existing 40 channel radios could be used for six years (up to mid-2018).

However, in February 2017 the ACMA reversed their decision and are now allowing owners of the 'old' 40-channel radios to continue using them alongside the new 80-channel models.

The installation was quite straightforward. The UHF

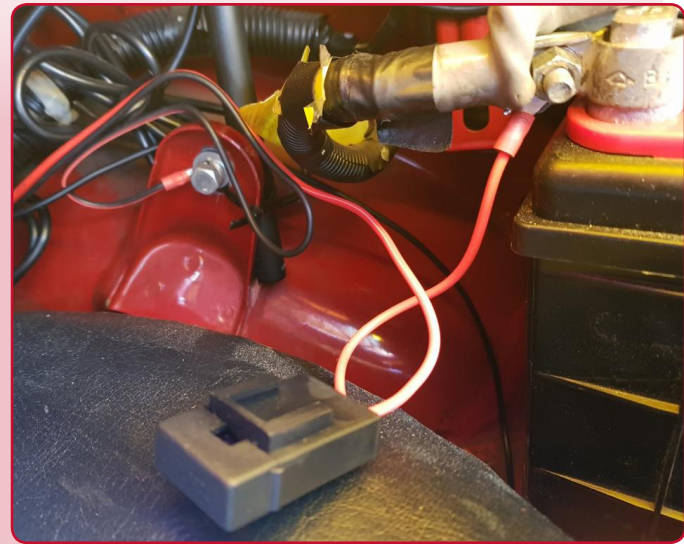
transceiver is very compact and, even with the microphone, the unit fits neatly between the driver and passenger seats above the centre console. The transceiver is supplied with a mounting bracket and fixing screws. However, I replaced the small fixing screws, and the screws supplied with the microphone bracket, with larger ones. The position is perfect as the speaker, located in the microphone, is quite close to both driver and navigator when mounted in its bracket, and can be easily reached for operation.



The 12 Volt DC supply cable supplied with the radio is more than long enough to reach the battery located in the boot. The cable comes fitted with a 2 Amp blade fuse holder located about 12cm from the Positive battery terminal end.

I fed both the DC power cable and the antenna coaxial cable into the boot through a convenient hole located behind the driver's seat.

A couple of eye terminals were crimped on to the DC power cable, the red lead terminal being bolted to the Positive battery terminal and the black lead bolted to a chassis earth connection to the rear of the battery.



UHF radio 12 Volt connections

Wiring the UHF radio directly to the battery does require that you have to remember to switch off the radio at the end of every outing in order to avoid discharging the battery.

Choosing the position for the antenna took a little more thought. There appeared to be only one possible location that was available.

The fuel inlet on the nearside wing limited the choice of position for the UHF antenna to the offside wing just to the rear of the FM radio antenna (see right).

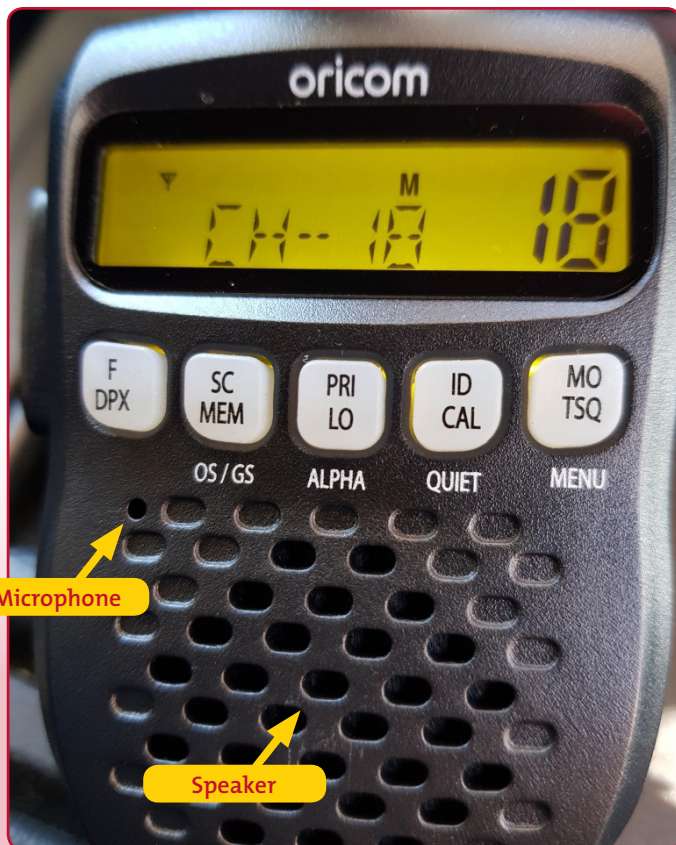
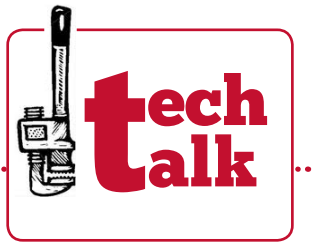
An automatic centre punch fixed the position before drilling the required hole to mount the antenna.

The excess antenna coaxial cable (the antenna is supplied with 3.6 metres of coaxial cable) was coiled at the rear of the boot behind the spare wheel.

A 3.5mm external speaker socket is available which I have yet to put into use.

■ **Please note:** All "Tech Talk" information is provided as a guide only. All work is carried out at the owner's risk.

MX-5 NA (Eunos Roadster)



Omicom microphone controls

Operation of the radio is very straightforward. The Power ON/OFF button is located on the top of the microphone between two buttons for *Volume Up* and *Volume Down*. These double up as *Channel Up* and *Channel Down* after a brief press of the Power button.

All the other functions of a UHF CB radio are available via five other multi-function buttons.

The first function to be set is the **Squelch Level**. Having taught radio communication for over 40 years I have found that this is the least understood of all FM radio functions. The Squelch Level adjustment is the first in the Menu List.

The user manual supplied with the Oricom UHF states to "Use the channel KNOB to change the value of the setting." What they really mean to say is: use the *Channel Up* and *Channel Down* buttons to adjust the level of the Squelch setting.

The setting limits are: 1 – *Max sensitivity (minimum squelch)*, and 7 – *Minimum sensitivity (maximum/tight squelch)*.

The actual setting required is determined by the ambient temperature, or rather the temperature of the Receiver circuitry. The 'hiss' sound,

that is audible when the Squelch is set at Level 1, is the sound of millions of electrons in the receiver moving around the receiver circuits. *It is nothing to do with received signals.* Test this out by disconnecting the antenna. The hissing sound does not diminish.

Squelch is not actually adjusting the "sensitivity" of the UHF receiver. The Squelch Control is used to set a *threshold* above which received signals are passed to the audio amplifier and to the loudspeaker.

If the Squelch level is set too high (at 7) then even reasonably strong signals will not be audible; that is passed to the audio amplifier to be heard at the speaker.

To set the Squelch Level, turn up the *Volume* setting. Set the *Squelch Level* to (1). The hissing sound should now be quite loud. Adjust the *Squelch Level* towards (7) one step at a time until the 'hiss' sound just stops being audible. That is the correct Squelch setting for the current ambient temperature.

If you were to make this adjustment on a cold winter's morning in Tasmania and then take the car out for a run, with the top down, in the lovely warm winter sunshine that we often experience, the hissing sound might reappear. This is because the receiver circuitry has become hotter and the electrons are now more 'agitated'. So simply move the *Squelch Level*, usually only one setting higher, to silence the hiss.

The large illuminated display on the microphone is easily read and has settings for three different back-light colours: amber, red or green.

The UHF receiver has the 80 UHF CB channels pre-programmed. In addition, 200 channels can be programmed by the user across the UHF Band 400 – 512 MHz.

Under the *Radiocommunications Act 1992* the operators of all radiocommunications transmitting equipment must be licenced. In the case of UHF CB this takes the form of a Citizen Band Radio Station Class Licence issued by the ACMA.

"The CB Class Licence authorises operation on frequencies mentioned in the class licence by any person provided that the conditions of the CB Class Licence are complied with."

It should be noted that the mix of Narrow Band [NB] (the new 80-Channel UHF CB radio) and Wide Band [WB] (the older 40-Channel UHF CB radio) operations can give rise to some interference and differing levels of receive volume.

- » When an NB radio receives a transmission from a WB radio on the same channel, the audio may sound loud and the speech distorted.
- » When a WB radio receives a transmission from an NB radio on the same channel, the audio will be quieter compared to a WB radios transmission.
- » When using a WB radio for example on channel 10 and an NB radio is using channel 49 or 50 (which are adjacent to channel 10), the WB radio will hear the NB radio which will sound distorted and off frequency, whereas a NB radio will not open its squelch to the WB radio signal. ●

Note than an extended version of this article can be found in the Technical section of the Club's website, mx5vic.org.au. This includes an explanatory statement on licences from ACMA, and a UHF CB Channel and Frequency List.



Fitting a UHF CB to a 1990 MX-5 NA (Eunos Roadster)



The image shows an Oricom UHF285 5 Watt Compact UHF CB Radio with a Controller Speaker Microphone and an ANU050 3dBi UHF CB Antenna. The radio is black with a red LCD display showing '7.8-8.0' and several control buttons. The antenna is a long, flexible whip with a pre-terminated FME connector and a PL259 connector. The background features green circular graphics.

UHF285

Compact UHF CB with
Controller Speaker Microphone

UHF285

5 WATT COMPACT UHF CB RADIO

Key Features:

- Heavy duty controller speaker microphone
- Wide band scanner (400 – 512MHz)
- 80 channels*
- 200 user programmable receive only channels
- 5 digit Selcall ID with alpha display
- 38 CTCSS and 104 DCS
- Duplex (range extender)
- Open/Instant/Priority Scan
- Large, easy to read display
- 5 Year Warranty on UHF285*

ANU050

3dBi UHF CB ANTENNA

Key Features:

- Pre-tuned to UHF CB frequency
- Ground independent
- Highly flexible whip
- Antenna length 350mm
- Includes 3.6 metres RG58 coax cable, pre-terminated FME connector and PL259 connector

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ORICOM
5
YEAR
WARRANTY



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Connecting you now.

*This 80 channel narrowband radio has a total of 75 usable voice channels. Channels 21 and 23 are used for Telemetry and Telemetry, voice communications are not allowed on these channels. Channels 25, 65 and 66 are guard channels and are not available for use.

EXPLANATORY STATEMENT

Issued by the Australian Communications and Media Authority
Radiocommunications (Citizen Band Radio Stations) Class Licence
Variation 2011 (No. 1)
Radiocommunications Act 1992

Purpose

The purpose of the *Radiocommunications (Citizen Band Radio Stations) Class Licence Variation 2011 (No. 1)* (**the Class Licence Variation**) is to vary the *Radiocommunications (Citizen Band Radio Stations) Class Licence 2002* (**the CB Class Licence**) to include additional UHF radio frequency channels, additional functionality and minimise interference between citizen band radio stations.

Legislative Provisions

Under section 132 of the *Radiocommunications Act 1992* (**the Act**), the Australian Communications and Media Authority (**the ACMA**) may issue class licences authorising the operation of a radiocommunications device of a specified kind, or for a specified purpose or of a specified kind for a specified purpose. The CB Class Licence was issued under section 132. Section 134 of the Act provides that the ACMA may, subject to public consultation, vary a class licence by notice published in the *Gazette*.

The Class Licence Variation is a legislative instrument for the purposes of the *Legislative Instruments Act 2003*.

Background

The CB Class Licence authorises the operation of certain radiocommunications devices used in connection with the Citizen Band Radio Service (namely, citizen band radio stations (**CB stations**)). The Citizen Band Radio Service (**CBRS**) is a two-way, short distance communications service that may be used by any person or business in Australia. The CBRS operates in two distinct frequency bands – the 26.965 - 27.405 MHz (the high frequency (**HF**) CBRS band) and the 476.4125 - 477.4125 MHz (the ultra high frequency (**UHF**) CBRS band). Under the CB Class Licence, all operators of CB stations must share the available frequency channels specified in the CB Class Licence and there is no right to the exclusive use of any channel.

The CB Class Licence authorises operation on frequencies mentioned in the class licence by any person provided that the conditions of the CB Class Licence are complied with.

From April 2008 until December 2010 the ACMA has been reviewing the future arrangements for the radiofrequency spectrum in the range 403-520 MHz (the review of the 400 MHz band). In the context of that review, the ACMA has undertaken extensive consultation regarding proposed changes to spectrum arrangements in the UHF band. One of the outcomes of the review was that the ACMA decided to make changes to the UHF CBRS band.

There are currently forty 25 kHz channels in the UHF CBRS band. These channels are highly utilised, with congestion experienced by users in some local environments. In reviewing the operation of the UHF CBRS band, the ACMA's objective was to improve the utility of the UHF CBRS band. The outcomes of the review of the 400 MHz band that have implications for the UHF CBRS band include:

- the transition of all speech channels, including repeater channels, from 25 kHz to 12.5 kHz channel spacing;
- the retention of the existing technical arrangements for telemetry and telecommand channels (that is, 25kHz channel spacing will continue to be employed in relation to those particular channels); and
- the inclusion of forty new Citizen Band channels (**CB channels**) that are interleaved between the existing forty 25 kHz (now to be 12.5 kHz) CB channels;

Operation

The Class Licence Variation will give regulatory effect to the outcomes of the review described above.

The Class Licence Variation also implements related policy outcomes, such as authorising the operation of CB stations that transmit signals that identify the station and its location; allowing additional time for the transmission of telemetry and telecommand signals by CB stations; and requiring that CB stations to which the *Radiocommunications (UHF CB Radio Equipment) Standard 2011 (No.1)* (the **UHF CB Equipment Standard 2011**) applies (CB stations that operate within the 12.5 kHz channel arrangements), comply with that Standard.

The UHF CB Equipment Standard makes standards for the performance of UHF CB radio equipment. The UHF CB Equipment Standard was made by the ACMA in accordance with section 162 of the Act and adopts, with modification, the technical parameters set out in industry standard AS/NZS 4365:2011.

The new 12.5 kHz channel arrangements allow for an additional 40 channels to be provided in the UHF CBRS band, increasing the total number of available channels to 80. The introduction of the new channel arrangements corresponds with a transition period to phase out the use of UHF CB stations that operate under 25 kHz channel spacing arrangements. The Class Licence Variation provides for a transition period until and including 30 June 2017. During this transition period, a person may operate a UHF CB station under either the existing forty 25 kHz channel arrangements or the new eighty 12.5 kHz channel arrangements. This transition period balances the need to minimise the period during which there is a potential for interference between '25 kHz' and '12.5 kHz' UHF CB stations with user expectations of a reasonable period in which to operate their '25 kHz' CB equipment and the availability and supply of new '12.5 kHz' CB equipment to the market. At the end of the transition period, it will not be possible to operate a UHF CB station under the forty 25 kHz channel arrangements (other than in relation to the telemetry and telecommand channels).

The ACMA proposes to review the arrangements for the cessation of UHF CB equipment operating under 25 kHz channel spacing arrangements in 2016. The ACMA also proposes to review the channel arrangements applicable to the transmission of telemetry and telecommand signals. A date for this review is yet to be set.

Further details on the operation of the Class Licence Variation are contained in the "Notes on Sections" in the Attachment to this Explanatory Statement.

Consultation

The ACMA has undertaken extensive consultation with industry and members of the public on the outcomes of the 400 MHz review, which included the proposal to change the existing arrangements of the CBRS to introduce 40 additional UHF channels. The ACMA also undertook a consultation process on the development and making of the UHF CB Equipment Standard 2011.

The variations to the CB Class Licence are inherently linked to the outcome of the review of the 400 MHz band, as well as the subsequent making of the new industry standard (AS/NZS 4365:2011) and the UHF CB Equipment Standard 2011.

The ACMA undertook consultation on the proposed variation to the CB Class Licence in accordance with section 136 of the Act. On 28 January 2011, the ACMA published a notice in the *Gazette* stating that it proposed to vary the CB Class Licence, stating the subject matter of the proposed variation, the place where copies of the CB Class Licence and proposed variation could be obtained, and inviting persons to make representations to the ACMA about the proposed variations by 4 March 2011. The ACMA also consulted directly with recognised stakeholders, such as equipment manufacturers and suppliers, as well as the licensees of 268 CB repeater stations. The proposed variations to the CB Class Licence, together with an associated discussion paper, were also published on the ACMA's website.

The ACMA received 17 submissions regarding the proposed variations. There was general support for the changes to the CB Class Licence. There were five comments received from

stakeholders opposing the proposal to prohibit the linking of CB repeater stations and the linking of CB channels. Those proposed variations would have the effect of limiting the geographic extent to which some CB operators are able to utilise the CBRS. However, the variation to prohibit linking in the CBRS will reduce the risk of interference and reduce congestion experienced on some channels in local areas. On balance, the ACMA considers that the variations to prohibit linking will have minimum impact on CB operators and will benefit the overall operation of the CBRS.

In addition it became apparent as a result of the consultation phase that there was some confusion about the operation of the transition period because certain carrier frequencies are mentioned in more than one item in Part 2 of Schedule 1 to the CB Class Licence as it is proposed to be varied. In order to address that confusion, the Class Licence Variation proposes that section 5 of the CB Class Licence be replaced with a new section 5 that more clearly distinguishes between CB stations that are operated under the existing forty 25kHz channel arrangements and CB stations that will be operated under the new eighty 12.5 kHz channel arrangements.

As a result of the consultation, some further minor changes were made to the Class Licence Variation. These changes include:

- amending typographical errors; and
- providing for the continued operation of CB stations on the telemetry and telecommand channels under the 25 kHz channel spacing arrangements.

Regulatory Impact

The Office of Best Practice Regulation (OBPR) has advised that it has considered the ACMA's preliminary assessment of the regulatory impact of varying the CB Class Licence. The OBPR has further advised that it considers that the amendments will have minor/machinery impacts and therefore no further analysis (in the form of a Regulation Impact Statement) is required. The OBPR reference number is 2011/12501.

ATTACHMENT

Notes on Sections

Section 1 Name of Variation

Section 1 provides that the name of the instrument is the *Radiocommunications (Citizen Band Radio Stations) Class Licence Variation 2011 (No.1)*.

Section 2 Commencement

Section 2 provides that the Class Licence Variation commences on the later of the day after it is registered on the Federal Register of Legislative Instruments and the day on which it is published in the Gazette. Both events must occur for the Variation to commence.

Section 3 Variation to the *Radiocommunications (Citizen Band Radio Stations) Class Licence 2002*

Section 3 provides that Schedule 1 varies the *Radiocommunications (Citizen Band Radio Stations) Class Licence 2002*.

Schedule 1 Variations

Item [1] Section 3, definition of *CB repeater station*

This item amends the definition of 'CB repeater station' in the CB Class Licence to include an additional reference to item 8 of Schedule 1 in order to reflect the introduction of additional frequencies.

Item [2] Section 3, after definition of *device compliance day*

This item inserts definitions of 'F3E' and 'G3E'. These terms respectively replace the terms 'FM' and 'PM' which are no longer used. The terms describe the type of modulation of the main carrier, the nature of the signals modifying the carrier and the type of information being transmitted.

Item [3] Section 3, definition of *PM*

This item omits the definition 'PM'(phase modulation) in the CB Class Licence as it will no longer be used in the CB Class Licence once it is varied.

Item [4] Section 3, after definition of *relevant document*

This item inserts the definition of 'telecommunications network' into the CB Class Licence. The definition is the same as the definition of 'telecommunications network' in section 7 of the *Telecommunications Act 1997*.

Item [5] Section 5

This item substitutes section 5 to provide for the parallel operation of the existing UHF Citizen Band channel arrangements(25 kHz channel spacing) and new UHF Citizen Band channel arrangements (12.5 kHz channel spacing) until and including 30 June 2017.

After 30 June 2017 speech transmissions will only be permitted under the 12.5 kHz channel spacing arrangements. This arrangement is a compromise between allowing reasonable

usage of recently purchased 25 kHz CB equipment and minimising the potential for interference between 25 kHz and 12.5 kHz CB stations.

Telemetry and telecommand transmissions will continue to be permitted under the 25 kHz channel spacing arrangements after 30 June 2017.

Section 5 now allows for the operation of CB stations that transmit signals to communicate with another CB station to identify the CB station or indicate the geographic location of the station. This aligns with the UHF CB Equipment Standard in allowing for the transmission of signals which identify a CB station or indicate its geographic location.

Item [6] Paragraph 6(g)

This item amends paragraph 6(g) of the CB Class Licence so that additional paragraphs can be inserted after paragraph 6(g).

Item [7] At the end of section 6

This item inserts new paragraphs 6(h), 6(i) and 6(j) into section 6 of the CB Class Licence. Paragraph 6(h) imposes a licence condition that prohibits the transmission of speech on channels 22 and 23, which are restricted to telemetry and telecommand transmissions.

Paragraph 6(i) imposes a licence condition that prohibits the linking of signals from a CB repeater station, directly or indirectly, to another CB repeater station. Paragraph 6(i) also imposes a licence condition that prohibits the linking of signals from a CB channel, directly or indirectly, to another CB channel. This has been introduced because linking CB repeater stations or CB channels together has the potential to cause interference and congestion.

Paragraph 6(j) imposes a licence condition that prohibits the operation of a CB station to transmit signals that identify a CB station or indicate its geographical location, with a duty cycle of more than 10 seconds in any period of 60 minutes.

Item [8] Paragraph 7(b)

This item amends paragraph 7(b) to insert additional references to items 7 and 8 of Schedule 1 to reflect the introduction of additional frequencies.

Item [9] Section 8

This item substitutes section 8 to provide that, except for the purpose of transmitting to a CB repeater station, a person must not operate a CB station on a channel mentioned in items 5 or 8 of Schedule 1 within operational range of a CB repeater station. This variation is aimed at reducing interference to CB stations operating through a CB repeater station.

Item [10] Paragraph 9(3)(d)

This item omits the term 'AusSAR' in paragraph 9(3)(d) because it is no longer a currently used abbreviation for the Australian Maritime Safety Authority's Rescue Coordination Centre.

Item [11] Section 10

The CB Class Licence presently includes, in section 10, a licence condition that certain CB stations comply with the technical requirements contained in the "relevant document" specified in Schedule 2 to the CB Class Licence. The "relevant documents" only apply in relation to CB stations that have a device compliance day before 20 December 1996. CB stations that have a device compliance day on or after 20 December 1996 must comply with the applicable standard made under section 162 of the Act (see section 11 of the current CB Class Licence).

Item 11 substitutes section 10 so as to clarify that distinction. That is, a person must not operate a CB station with a device compliance day before 20 December 1996 on a frequency mentioned in item 1, 2, 3, 4 or 5 in Schedule 1 to the CB Class Licence, unless the CB station complies with the requirements of the “relevant document” in Schedule 1.

Item [12] Section 11

The CB Class Licence presently includes, in section 11, a licence condition that in effect requires that certain CB stations that have a device compliance day on or after 20 December 1996 must comply with the applicable standard made under section 162 of the Act. Section 11 presently refers to potentially applicable standards by name. As standards are amended or made over time, this has rendered section 11 confusing.

Item 12 substitutes section 11 so that it does not refer to the potentially applicable standards by name. That is, new section 11 will provide that a person must not operate certain CB stations with a device compliance day on or after 20 December 1996 unless the CB station complies with each applicable standard made under section 162 of the Act that is in force on the device compliance day.

Item [13] After section 11

This item inserts section 12 to regulate the operation of a CB station that is connected to a telecommunications network. The additional licence condition aims to ensure that CB stations that are connected to a telecommunications network are compliant with the relevant telecommunications and labelling requirements.

Item [14] Schedule 1, Part 2 UHF

This item substitutes Part 2 UHF of Schedule 1 to the CB Class Licence with the new Part 2 – (UHF 25 kHz channels) to reflect the introduction of additional frequencies with 12.5 kHz channel spacing. Item 6 relates to telemetry and telecommand channels which will remain as 25 kHz channels.

Item [15] Schedule 1, after item 6

This item inserts Part 3 (UHF – 12.5 kHz channels) into Schedule 1 of the CB Class Licence. New items 7 and 8 of Part 3 of Schedule 1 list the carrier frequencies and channels with a 12.5 kHz channel spacing which are the additional frequencies inserted into the CB Class Licence.
