Private Mobile Radio

An Introduction

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Table of Contents

Introduction

Radios, and in particular Private Mobile Radios (P.M.R.s) are the life blood of REVCOM. The aims and objectives of REVCOM are to provide radio communications services to other public organizations - which would be a little difficult without radios.

This booklet covers all the information you will need to know about setting up and operating P.M.R.'s. Included is setting up the radios, where and when they can be used; and using the correct operating procedures. This booklet is aimed very much at the novice. If your only radio experience is listening to the breakfast show on Radio 1 you will be at home here. If you are an experienced radio operator, you may simply want to read the appendices and in particular Appendix 4 Voice Procedure In A Nutshell. I would still suggest that you flick through the booklet. You never know what little snippet you've forgotten or maybe never knew.

It is very important that the procedures described in this booklet are followed. The Radio Agency (RA) who issue our license can monitor our transmissions without our knowledge, and can turn up at any time to inspect our sets. They have the power to remove any equipment that they think may be faulty, interfering with others, or not within the license conditions. They can even revoke the entire license if we misbehave.

Note: P.M.R. sets are not private CB's. They can not be used for informal chit-chat.

This booklet is split into three chapters covering the three areas of having and operating a P.M.R. set.

Chapter 1 covers the P.M.R. license, giving details of what the license is and what it gives us. The main points covered here describe when the sets can be used and what they can be used for. Probably more importantly, it covered when the sets cannot be used.

Chapter 2 discusses what P.M.R. radios are. It covers what the different bits are, what they do, and how they go together.

Chapter 3 illustrates how we actually operate the radios, walking through the procedure of actually talking over the radios so that they are used correctly, efficiently, and making sure that what you want to say is what is actually heard at the other end. Also, touched on a little are the steps involved in preparing for an event.

Finally, we have four appendices containing useful reference information.

Appendix A contains technical information about the P.M.R. sets and about the license conditions relating to those sets.

Appendix B contains the Phonetic Alphabet. This alphabet is used to ensure that important or complicated information can be transmitted over the radios without losing accuracy. It is basically a way of speaking letters and numbers clearly and in a standard way.

Appendix C contains useful contact information. It includes details for contacting REVCOM national officers, as well as listing the national and regional R.A. offices.

Appendix D is Voice Procedure in a Nutshell. It provides a quick reference to the voice procedure described in Chapter 3.

Chapter 1. The License

As members of REVCOM we are allowed to use P.M.R. sets to talk to each other privately. This is possible because REVCOM holds a license that has been issued to us by the Radio Agency (R.A.), a part of the Department of Trade and Industry (DTI).

However, as with most things, it is not as straight forward as it first appears. The license comes with certain restrictions. Below is a list of the main points, followed by a brief description of each point and how it affects our use of P.M.R.'s.

- All radio equipment must be type approved.
- Only specified frequencies are allowed.
- Transmission signal strength cannot exceed 5 Watts.
- Transmission mode may be AM or FM.
- The antenna cannot be directional.
- Base Station configurations are not allowed.
- Only voice communications are allowed - not data.
- No sound pre-processing is allowed.
- All sets must be registered and have a unique identifier.
- When transmitting, a station must always identify itself.
- All transmissions must have a stated 'End Of Message'.
- The frequencies can only be used for REVCOM business
- The R.A. has to be informed before the P.M.R.'s are used.
- Any or all of the above may be changed.

A quick look at the list above could make you wonder why, if it is so limiting, have we bothered getting a P.M.R. license in the first place? In reality, it is easy to work within these limits, and make full use of the radios. As I promised, I will now go into each of these items in a little more detail, illustrating how they affect our use of the radios.

Type Approval

Before a radio can be put onto the REVCOM license it must meet a minimum standard. These checks have to be made for each type of radio. Once the checks have been passed, the radio is 'Type Approved'.

The specifications for type approval changes from time to time. Each revision of these standards is given a name. The current type approval is [insert MP number here].

Although each revision of the type approval specification usually becomes more strict than the one it is replacing, you do not need to worry about your set becoming non-type approved. Providing there is not a problem with the set, once your set gets type approval and is put on the license, it will still be usable if it then does not meet later type approval standards. Moving it to someone else's license may be a problem though.

Specified Frequencies Only

Because there are so many people and organisations out there, with many different uses for the radio spectrum [1] , someone has to say who goes where. For this reason, when the R.A. issue a license, they specify which frequencies can be used with it. At the moment our frequencies are 86.3750Mhz and 86.3625Mhz

Although this sounds like a restriction, it is really a good thing. Just as we cannot use other people's frequencies, they cannot use ours [2] which make them as secure as they can be. [3]

Transmission Strength

The P.M.R.'s transmit a radio wave. The strength of radio waves are measured in Watts (the same Watts used to measure electricity). The maximum strength that our license permits us to transmit is 5 Watts. When you can buy (legal to buy, illegal to use) 100 Watt power boosters (also known as burners) for C.B. sets, 5 Watts does not sound much. It is in fact perfectly acceptable for the type of use REVCOM make of their sets. On a good day, it is possible to cover 30 miles or so. It is unusual for an event to cover more ground that that. If the control centre is in the middle of the event, that gives you a 60 mile diameter working area.

Transmission Mode

There are two main modes of transmitting over radio waves. These are Amplitude Modulation [4] (AM) and Frequency Modulation (FM). The license permits the use of either mode. There is a third mode, Digital which is basically using FM, but encoding the signal first, but that is not covered by the license, and is outside the scope of this booklet.

Amplitude Modulation is the easiest way of transmitting, and when radios were first invented, was the only way. Unfortunately, the sound quality of AM is not brilliant, so some bright spark invented Frequency Modulation. The sound quality of an FM signal is much clearer than AM and is also less likely to get distorted or interfered with, making it much more reliable. The only drawback with FM is that once the signal strength drops below a certain level, the sound simply vanishes - while AM will carry on regardless, just getting quieter and quieter. Because of this, AM will often go further than FM in the same situation.

On the other hand, AM is more susceptible to interference by the atmosphere than FM. Anyone who listens to an AM (A.K.A. medium wave) radio station knows that the reception quality goes down with the sun. Also, AM is blocked more by structures than FM - the radio goes quiet right in the middle of your favorite song as you drive under a bridge, and comes back on with Cliff Richards when you drive out again.

Because of FM's higher quality most manufacturers now only produce FM sets, which means that if you want AM sets, you will either have to look harder and pay more, or settle for second hand.

If this is the case, why would anyone want to buy AM radios any more? Because of the different ways in which AM and FM carry the signal, they cannot talk to each other. In fact if both types of set are used in the same area, they will interfere with each other. This does mean that if the rest of your team uses AM sets, then you will need AM too.

The R.A. have note restricted our license regarding modulation which means that we can use both AM and FM. As stated earlier e cannot use digital transmissions as that

involves encoding the signal which is not covered by our license. This is described further later in the section Voice transmissions only.

Directional Antenna

When you transmit using a radio, the radio waves are transmitted along the length of the antenna. With the antenna pointing straight up, you get a nice even signal emitted in all directions (think of the ripples on the surface of water). You can however buy directional antennas, designed to concentrate the transmission in a focussed direction. You can even get a standard antenna to work in a similar way. Neither of these two options are allowed under REVCOM's license.

Base Stations

You can get radios that are designed to be used as base stations in a fixed setup. They plug into the mains, and usually are connected to a base antenna, usually half or full wave. With these setups, you can usually perform better, transmitting and receiving over longer distances. However, this type of setup goes against the 'M' (mobile) bit of P.M.R., and is not allowed under our license.

Voice Transmissions Only

In REVCOM, we use radios to talk to each other, to pass messages, to carry out our purpose on an event. That is what REVCOM was created for. You can however, use radios to transmit information in other formats. Examples of these are using the good old fashioned Morse code, or connecting the radios to a computer to send data. As none of these are part of what REVCOM does, and would not help us use our radios better, they are not included in the the license.

What we can say is also covered by the license. You may not use C.B. slang, codes (alphabetic or numeric), swearing or foul language, or language that may cause offense.

Sound Pre-Processing

There are available devices, some inside microphones, other go between the microphone and the radio, which can change the signals sent from the microphone to the radio. This then changes how those signals are heard. These effects can be things like adding echo or re-verb to the sound. While these effects can be fun (while others find them annoying), they do not help with the use of the radios, and again they are not included in the license.

Registration

Once you have acquired a set, and made sure that it is type approved, you will want to use it. Before you can do this, you need to register the set with the P.M.R. Officer (See Appendix C). He will record the details of the set, and allocate a callsign for it. The callsign will be unique to that set, and will be the reference for that set while ever you have it registered. The callsign will be in the format `REVCOMxxx` where `REVCOM` is fixed and `'xxx'` will be a 3 digit number. The first digit of the callsign represents the region in which the radio lives. The last 2 digits simply make the callsign unique.

Note: See the section Obtaining A Set in Chapter 2 for a fuller description of how to go about registering a new set.

The main reason for registering a set is that the R.A. can at any point contact the P.M.R. Officer, and request information about any set that is currently on license. If this information is not made available to them, we could be considered in breach of the license and have it revoked.

Transmitting Station Identity

When you use a radio you should always identify yourself to the rest of the network (everyone else using the radios in the same area). To do this you should start every transmission with your radio's callsign. Although this is a requirement of the license, the main reason for doing this is to make sure that everyone knows who is talking.

The callsign used must be the one registered to that radio regardless of who is using it and what they are using it for. You cannot generate your own callsigns, even for one-off situations such as a radio being used as a control station. If you require a control callsign, then you must apply to the P.M.R. Officer. The control callsign may only be used when that radio is acting as control. At all other times, the normal callsign must be used.

End Of Message

For exactly the same reasons as above, you should always state clearly when you have finished talking. Depending on the situation, you will probably do this by appending to the end of your message one of "`Over`", "`Standing By`" or "`Standing Down`". For a fuller description of how to talk over the radios see the section on Voice Procedure in Chapter 3.

REVCOM Use Only

The P.M.R. license has been issued solely to let us carry out the business of REVCOM as set down in the "Aims and Objectives" of the REVCOM Constitution [5]. Put simply, this just means that the P.M.R. is not a direct replacement for C.B. You cannot use P.M.R.'s for normal chatting. You can however use them for anything REVCOM related, such as carrying out events, pre-event station checks, or any other REVCOM related activity. Obviously, equipment checks are allowed.

Notifying The R.A.

As part of the license conditions, we are required to inform the R.A. at lease 14 days in advance of where and when the sets are going to be used. Obviously if a team is called out at short notice this is not possible. In this situation, notifying the R.A. after the event should be okay.

Officially, the notification has to be in writing, and needs to contain the license number, date, time and location of the event, a list of teams attending and all callsigns that will be used. However, in some areas the local teams have built up such a rapor with their local office that a single letter sent each January stating that the radios will be used in their area for the forthcoming year is sufficient. It can not be emphasised

strong enough that this is purely because REVCOM have an excellent reputation, and we must do everything necessary to keep it that way.

The office that requires the notification is the one that is responsible for the region in which the event is taking place. This is important to remember when you are going to be working outside your normal area. This is especially important for those teams who normally get away with only sending one letter per year. As a matter of courtesy, it would not hurt to send your local office a copy of any letter that you send to neighboring regional offices.

Changes to the License

The last point to mention here is that the world of radios, as with everything else these days, is in constant change. This means that the contents of our license may also be changed. Although in theory any part of the license may be altered, to date the only changes that have occurred were frequency changes. We had one frequency added, and another removed. Both times we were notified well before the changes were made.

Any changes to the license will be reflected in revisions of this booklet. Each team will also be notified by the P.M.R. Officer.

Warning

As we leave this chapter, the main point to always remember is that the license is not set in stone. One person misbehaving on P.M.R. could lose REVCOM it's license.

Notes

1. The radio spectrum is the collective name for the space that is available for radio waves. Although the radio spectrum is huge, as any one frequency can only be used for one purpose at once it gets used up very quickly. A full description of how radio waves work and the radio spectrum is outside of the reach of this booklet.
2. Actually, the R.A. can and have issued the frequencies given to us to other people as well, but it is very rare for us to hear them, or them to hear us.
3. Radio transmissions of any description can be overheard with the right equipment. Even digital GSM mobile phones can be eavesdropped on. *Never* assume that a frequency is totally secure.
4. Modulation is basically the sounds that you wish to transmit, enclosed in a way that allows them to be carried by the radio wave. There are many excellent technical books available if you wish to go this deep into radio communications. I will not repeat their good work here.
5. A copy of the REVCOM constitution should be held, along with a copy of the Code of Practice, by every team secretary. Copies are available from the REVCOM Web site

   6. http://www.revcom.org.uk/members/library.html
   or on request from the National Secretary (See Appendix C).
6. http://www.revcom.org.uk/members/library.html

Chapter 2. The Equipment

Private Mobile Radios (P.M.R.'s) are two-way radio sets that allow operators to communicate over relatively long distances, efficiently, cheaply, and privately.

Before you can use a P.M.R. you must have the correct equipment set up. This consists of:

- Radio set
- microphone
- Speaker
- Antenna
- SWR Meter
- Power Source

Radio Set

The radio set is basically the box that sits in the middle, with the rest of the items listed below connected to it. This is the bit that does all the work. It's job is to take sound signals from the microphone and transmit them over radio waves, and to receive radio waves and send them as sound signals to the speaker.

There are basically three categories of Radio Set, these being Base Station, Mobile, and Hand-Held (HH). They all work in exactly the same way, the only differences are size and performance.

Base Station

Base Station radio sets tend to be physically bigger than mobiles and HH sets. There are two reasons for this. Firstly, they are designed to plug into a mains power supply, and therefore need to have a transformer inside them to convert the 240 volt AC mains supply to 12 volt DC. Secondly, as a rule it costs more to make things small, and if the radio is going on top of a desk in an office instead of under the dash of car it doesn't matter if it's a bit bigger. Base Station sets tend to have base station antenna's too, and because of this their performance is usually better than that of mobiles and HH sets.

> **Note:** The terms of REVCOM's P.M.R. license does not allow the use of base station sets or mobile sets in a base station type environment.

Mobiles

Mobile sets are very similar to base stations, but being design to be installed in vehicles they tend to be smaller. They are designed to be run from a car battery, and therefore do not need a transformer. If you wish to run a mobile set in a base station environment, you can buy a power transformer (power pack) to allow you to run the set from the mains (see the note above about the license).

Hand-Held

Hand-Held (HH) sets are quite a different type of set. These sets are designed to be as small and light as possible, and to be totally self-contained. To do this, the microphone, antenna, and a battery pack are all built into the case of the unit. Their purpose is to allow the operator to be totally free to move around. Because of the restrictions on the size, weight and power, HH sets tend to have a lower transmission strength (the stronger the transmission the more the power drain) and therefore a shorter operating range. Also, because they use internal battery packs they have a shorter operating time (1 car battery will last for days, whereas battery packs only last a few hours each).

Because they are free to move around, but have limited range and operating time, HH sets are better suited to small local events such as county shows, rather that more disperse events such as marathons.

Antenna

An Antenna is to a two-way radio what an aerial is to a radio receiver (Hi-Fi, T.V. set etc). However, an antenna is a much more specialised piece of equipment. With an aerial almost anything metal, including a coat hanger, will do. If an antenna is not configured correctly, your radio won't transmit correctly, and could even be damaged beyond reasonable repair.

Having said that, The antenna is still just a piece of metal. This piece of metal is used to transmit the radio signal generated by the radio set. This is done, by the radio signal being emitted along the full length of the metal surface of the antenna. This is where the important bit comes in. The length of the metal bit of the antenna must match the wavelength of the radio wave being transmitted, or a fraction of it. What this means is that for our frequencies (86 Mhz), a quarter wave (i.e. 1/4 of the wavelength of the signal) antenna should be 832 mm.

> **Note:** The piece of metal actually needs to be a little bit longer that 832 mm as you need enough to insert into the antenna base. When SWRing the antenna, you need to be able to slide the antenna in and out of the base until the SWR is right. (Also, it's easier to take a little bit more off that it is to put some back on)

At the base of the antenna is the antenna base (No! Really?). The antenna base is used to fasten the antenna to wherever you want it putting - for a mobile radio, this is usually your vehicle. There are two points to consider when choosing an antenna base.

Firstly, the base must be compatible with the antenna. This is not usually a problem, because the antenna attachments (the little collars that the antenna whip slots into) usually have a standard sized screw thread on them. If they do not, then they may come with an adaptor. Sometimes a base is made specifically for one type of antenna and will not work with anything else. Make sure when choosing your base that it is suitable for your antenna.

Secondly, when choosing your base, make sure you know how - and where - you wish to place your antenna on your vehicle. There are a few commonly available options, and the one you choose will probably depend on how permanent you want the antenna to be, and whether you're happy taking a drill to your beloved automobile. Right over on the permanent side, is the traditional screw-in wing or roof mounted base. This involves drilling a whole into a panel of your car, through which you push

the base. The base is then secured in place with a large nut screwed onto it from the under-side of the panel.

Swinging right over to the other end of the permanency scale is the 'mag-mount'. This consists if a large magnet fastened to an outer case. The outer case then has the screw socket for the antenna. The benefit of this is that you can install and remove the antenna in seconds onto any vehicle - as long as it's got a suitable metal panel. I would however, recommend placing a small piece of cloth between the vehicle's panel and the mag-mount just to help prevent scratches. The cloth should not be too thick as this could reduce the magnetic effect, and the antenna could come off while the vehicle is moving.

Smack bang in the middle we have boot-mount and gutter-mount bases. These are basically clamp style bases that are attached, usually by two screws to the edge of the boot lit in the case of the boot mount, or the roof guttering in the case of the gutter-mount. If like me you have a new shape Ford Escort, which is a hatch-back, and has no roof gutters, this makes life a little difficult. However, I have successfully attached a boot-mount base to the bonnet though.

The antenna base is connected to the radio set by a piece of co-axial cable. This is very similar to normal (T.V.) co-ax, but needs to be of a better quality. The cable needs to be 50 Ohms impedance. You don't need to know what this means, but you need to make sure that's what you ask for when you're buying it. Usually, these day when you buy an antenna base, it comes with a length of the correct co-axial cable already attached so you won't have to worry about it.

The only other thing to remember about antennas and the co-ax cable is the plug on the end of the cable. Older sets (mostly AM) use a screw on PL259 plug just like many C.B.'s, while newer sets use bayonet style push and twist BNC plug.

Microphone

It is the job of the microphone to pick up sound waves, and convert them into electrical energy that the radio sets can understand and transmit. There is a button on the microphone usually labelled "Transmit", "Push To Speak" (or PTS), or "Push To Talk" (or PTT). This is used to tell the radio when to transmit. It is important that the microphone in use is compatible with the radio set it is connected to. This is not as simple as it may seem, as there are a number of different standards. To make matters worse, some different standards use the same shape plugs, only with the wires connected differently. Make sure that when you are acquiring a microphone that it will work with your set.

There are three different types of microphone to match the three types of radio set. Again, these are Base Station, Mobile, and Hand Held.

Base Station

Base station microphones, like base station radios tend to be bigger than the rest, and often have extra features. They tend to be designed to stand on the desk while being used, rather than being held in the hand like a mobile mike. They can have features like 'mike lock', and volume controls. A Mike Lock lets an operator transmit 'hands free' for long periods, without having to keep the transmit button held down. Volume controls allow the operator to adjust the sound level of the transmission.

Mobile

Mobile microphones are designed to be small and operated by being held in the hand. Usually they have some form of clip on the back so that when not in use they can be hung up out of the way. They tend not to have the facilities of the base station microphones.

Hand-Held

There is very little to say about hand-held microphones. They tend to be build into the casing of the radio making it a self-contained unit. You can however sometimes get external (extension) microphones, which may also act as external speakers (think of the beat bobby talking into the little black box clipped to his shirt breast). As a rule these are specific to a make and model, and do not easily interchange with other radios.

Speaker

You would think that the easiest part of the setup would be the speaker, and most of the time you would be correct. Most modern sets, be they base station, mobile, or HH come with internal speakers and you don't have to worry. Older P.M.R. sets often came with an external speaker which was permanently connected to the set or had a specialised plug. For the purpose of this section, class this as being an internal speaker.

However, if you do not have an internal speaker, or want to connect headphones, an external speaker or whatever takes your fancy, you need to make sure that what you are plugging in is okay for that set. It is possible to damage the output chip of the radio, requiring expensive repairs if you connect the wrong type of speaker. Generally, the only two things to worry about and the resistance and the size of the speaker - the one usually being related to the other. Larger speakers having a higher resistance can put an excessive load on the output chip and overload it.

SWR Meter

Technically speaking, you do not need a SWR Meter to operate a radio set. In fact during normal operations, the meter should be disconnected. However, you do need a SWR meter when you are first setting up a radio system, or when you subsequently test the setup.

What a SWR Meter does is compare the signal your antenna is transmitting with what should be transmitted. If you look at the section above on the Antenna you will see that it has to be a specific size to work correctly. The SWR Meter gives you a 'Signal to Wave Ratio' reading for your antenna. In other words, when your SWR meter reads 1:1, you antenna matches exactly the wavelength, and your system will work fine.

Make sure when you get a SWR meter it is suitable for the frequency range of the set. Normal C.B. SWR meters will not return a true reading for the P.M.R. set. Also, because the SWR meter goes between the radio set and the antenna, you have the same compatibility problem with the plug as you do with the co-ax cable.

Power source

Radios are electronic devices and therefore need electricity to operate. To you and I this may seem a silly statement, but when you are out on an event, and have no power, you will not be talking to many people.

Most home-base radios operate on 240 volt AC. and can be plugged straight into a normal mains power socket. Some can also use 12 volts DC like mobiles.

Most mobile radios operate on 12 volt DC. This means that they can be connected directly or indirectly to a car battery. More often than not, this is how mobile radios will be run. If you are wanting to use mobile radios out of the car, and mains power is available, you can use power transformers (also known as Power Packs) to convert 240 volt AC mains supply into 12 volt DC.

One thing to remember about power supplies, be they transformers inside a base station, a separate power pack, or the car's battery is the fuse. Just as a chain is only as strong as it's weakest link, so is an electrical circuit. This weak link, when it breaks will need replacing so it makes sense to make the weakest link the cheapest thing to replace - hence the fuse. 50p to replace a fuse is a lot cheaper (and easier) than £50 to repair a radio.

If you are using a base station or a power pack, then you will obviously need a fuse in the mains plug. This fuse wants to be as small as possible, either a 2Amp or a 3Amp fuse would be fine.

This however is not enough protection for your radio because there is still nothing between it and the 12 Volt DC supply. You will need a second fuse, just before the power goes into the radio set. On base station sets, you will often find a fuse compartment, usually round the back, where you put this second fuse. On mobiles, whether they are connected to a power pack, permanently connected to the car, or plugged into the cigar socket, an "In-Line" fuse can be used. An in-line fuse, is basically a cylinder housing a fuse. The red power lead is cut in two, and the two pieces connected to either end of the housing. Again, this fuse wants to be 2 Amps rated.

Hand-held radios have internal battery packs, which mean that they are totally portable. These battery packs will either be specifically designed ones for that set, or will consist of a battery compartment in which you can put normal batteries. If you do use normal batteries, buy rechargable ones, otherwise it will get very expensive. Some radios have a power socket to let you plug it in to charge the batteries up inside the set. Others do not, so you may need a separate charger.

> **Note:** Forgetting to charge hand-held sets is one of the most common reasons for sets being unusable on events. Make sure you have all hand-held sets fully charged before they are needed.

Obtaining a Set

When you are getting a radio set, there are a few points to think about before you part with your money. Firstly, you need to decide which set you want. Here you will need to make two choices. The first choice is between mobile and hand-held. This will depend on how you want to use the radio. Secondly, you will need to choose between AM and FM. The main point to consider here is who will you want to talk to. If they are on AM you will need an AM set. On the other hand if they are on FM, then you will need FM.

The last step before getting a set is to make sure that it will go on the license. To do this, record the make, model, and even the serial number of the set you wish to get. Then pass this on to the national P.M.R. officer (See Appendix C). He will confirm with the R.A. that the set is "Type Approved" and okay to be put on the license.

Once you have acquired a radio it is important that you inform the P.M.R. officer using a PMR1. [1] Once this has been completed, you will be issued with a Callsign for that set. The callsign is specific to that set and should not be used with any other set. The set cannot be used until the callsign has been issued.

Setting Up

Sat in front of you you have this pile of bits; let's check that they're all there. You've got an antenna whip just over 832mm long, attached to your base. Out of the base comes your co-axial cable, at the other end of which is the correct type of plug for your radio. At the side of this is you SWR Meter with it's patch cable - again both with the right plug and socket. Taking pride of place in the middle of this scene is your new radio, complete with a microphone plugged in at the front and red and black wires coming out of the back for the power. In the middle of the red wire should be an in-line fuse.

Resting nicely on the front of the radio is your shiny new REVCOM P.M.R. Authorisation card proudly showing your radio's Callsign.

Now isn't that a pretty picture? Pretty yes, useful no! With everything in a pile on your desk, you're not going to do much. You now need to set up your radio system, probably in your car as we're not allowed base stations.

Before we start, let me say here and now that I am *NOT* a radio engineer nor am I an auto-electrician. If while following these directions you car goes boom then - Oops!, Sorry. Having said that, provided you do not do anything silly, like connecting the live wire straight to earth, or shove a screwdriver where a screwdriver shouldn't go then there should be no problems, and you and your car should be safe.

The number of tools that you will require vary from none if you are using a mag-mount and will be using your cigar lighter for power, to a drill, spanners, screwdrivers, screws, brackets and cable clips if you are going to install the radio permanently.

Installing the Radio

Okay, you've collected your bits and your tools and you're sat in your car - what do you do first? You will have to decide where you are going to put your radio. The main thing to consider here is safety. You do not want to put the radio in a place where it or it's cables can interfere with your handling of the car. Remember that you will have to route the cables in a safe way to the radio. Also, you do not want to put the radio where someone can catch and injure themselves.

The second point to consider is convenience. You want to put the set where you can easily read the displays and adjust the dials. This also affects safety. If you have to perform a cross between Yoga and origami to turn the volume up, you are not in safe control of your vehicle.

If you are doing a permanent installation, you will probably want to place it somewhere under the dashboard. If that's the case then you will need suitable brackets and some self-tapping screws. Make sure that when you are screwing in the brackets that you know what is behind the panel that you are screwing into and that you do not screw through something important.

If you are doing a temporary installation, one that you can set up before an event and remove afterwards, then you could simply place the radio on the passenger seat. If you're going to do this you may find it useful to build a cradle to fit it in. The reason for this is that quite often the radios have the speaker fastened to the underside of the case for when the radio is fastened under the dash. Unfortunately, when you place your radio on the seat, the speaker is severely muffled.

Safety is just as important when you are doing a temporary installation. The cables still need to be routed safely so that the do not trip up anyone. Also, where you decide to rest the radio must be reasonably secure. If the set falls off the seat while you are driving, it will distract your attention.

Connecting the Power

Okay, now that you have the radio installed, you will need to provide it with power. If you have a Cigar Lighter plug on the end of your cable then all you have to do is plug it in and away you go. If you are doing a permanent install, you will need to find a suitable power supply.

To do this, you need to decide whether you want the radio to be powered all the time, requiring you to turn it on and off, or whether you want it to behave like your normal car radio and go off when you remove your car key. If the second option is what you're after, then you will need to find the cable that feeds power to your radio. To do this, look at the back of your normal radio for a red and black pair similar to the ones on your set - they will probably be part of a collection of wires going into one large plug. [3] To complicate matters, many modern radios have two power supply leads, one permenantly live and one that is switched by the ignition. This second live wire is used by the anti-theft security feature in these sets that require a PIN number to be entered before the set can be used if it has been disconnected from the battery. However, it does provide us with both types of power lead in an easy to find place.

To find out which is which, you will need a circuit tester. Cheap testers are available for only a few pounds from most car or D.I.Y. shops. They look like a small screw-driver, with a bulb in the handle and a wire coming out of the end. Usually there is a clip on the end of the wire. If you cannot get hold of a tester, two small pieces of wire and a bulb will do just as well.

To use the tester, clip then end of the wire to a suitable earth wire, or a bare piece of car body. With the ignition turned off, insert the end of the tester into the plug for each red wire, making sure that the tester touches the metal pin. If the bulb lights up, you have found your permenant power lead.

Now turn the ignition to position 1 and repeat the search. This will find you the wire that is controlled by the ignition. If you do not find a power lead then you probably have one of three problems: either the bulb in the tester is faulty, the earth wire on the tester does not have a good connection, or someone has stolen your battery.

If you want the radio to have power all the time, and your car radio does not have two power feeds, then you will need to find a suitable lead elsewhere. One way to do this is to follow the leads from the ignition switch itself. This is a slightly more complicated bit as it varies from car to car. You may need a manual for this.

Obviously, if you choose the option of controlling the radio with the ignition key, the power switch on your PMR radio will still work, but the radio will only operate when the radio and the ignition key are turned on. In this way you cannot accidentally leave the PMR on when you leave your car and return to a flat battery.

Once you have chosen your lead, you need to attach the red wire from your radio to it. There are a number of different ways of doing this. A number of connectors have been designed for this job, or you could cut the wire, and use a terminal block to

re-connect it with your wire inserted too. In my opinion, the Scotch-Clip® is one of it easiest. These little clips are designed to be crimped on to both the existing and new cables, breaking only enough insulation on both to make contact. This helps reduce corrosion in both cables by keeping the amount of metal open to the elements as low as possible.

Finding somewhere to attach the black wire is much simpler. You can attach it to practically any earth wire available, or even just attach it to the car body.

Once you have attached both wires, you should have power to your radio. Test this by turning it on. Remember to turn on the ignition if this is required. If nothing happens check both wires again.

> **Warning**
>
> Do not try to transmit on the radio yet. Pressing the transmit button on the microphone before you have set up your antenna could damage your set.

When you first turn on your set make sure that all the displays and indicators look okay. In particular make sure that the transmit light does not come on. If it does then you probably have a problem with your microphone. Turn your set off immediately. If your radio transmits before you have set up your antenna you could damage it.

Installing the Antenna

The next step on your road to radio heaven is the antenna. First of all you need to decide where to place it. Then you need to worry about routing the co-axial cable from it to the radio.

When deciding where to place your antenna, you need to consider what is called the “ground plane”. The metal body of your car will tend to pull the signal in one direction. For example if you place the antenna at the back of your car the signal will be stronger in the direction that your car is facing. While there are times where this can be useful, in general you want the signal to be transmitted pretty evenly. To do this, you want to place the antenna as close to the centre of the car as possible.

Another point to consider here is obstructions. Although radio waves do not need “Line Of Sight” they are affected by objects between themselves and the receiver. For instance, if you have a large box van where the box is larger than the cab, then the box will block your signal. To get round this, and also to help avoid other obstructions such as building and trees, you will want to put the antenna as high on your vehicle as possible. Putting the antenna in the middle of your roof will probably give you the best performance as you will have an even ground plane with no obstructions.

Bear in mind that the antenna will increase the overall height of your vehicle. This may cause clearance problems going under low structures. If you store your car in a garage then this is particularly important.

Your decisions will of course be governed by the type of antenna base that you have. If you have a gutter or boot (bonnet) mount then your choices are limited. If you are using a mag-mount then you can use any *flat* metal panel. Curved or bent panels will reduce the magnetic effect and mean that the base will have less hold. One benefit of a mag-mount is that you can reposition your antenna on a per-event basis to make best use of the Ground Plane effect.

When routing the co-axial cable there is only one point to remember and that is safety. Whether you have a permanent or temporary installation you need to make sure

that the cable will not get in the way or otherwise interfere with you while you are driving.

SWRing In

All you should have left now is your SWR meter. You will now use this to set up your antenna. At one end of the SWR meter is a socket for you to plug in your antenna cable and at the other end there should be a patch cable. The patch cable goes into the antenna socket on your radio.

As mentioned earlier in this chapter in the section on SWR Meters, the purpose of the SWR Meter is to compare the signal that you are transmitting with the one that you should be. When they match (i.e. you have a ratio of 1:1) you antenna is set up perfectly. We will now go through the steps of SWR'ing your antenna.

Different SWR meters vary in how they look and work, but generally they all behave in the same way. They all have some form of display, usually a needle. Some have two displays while others have one plus a two-way switch to change the mode of the display. They also have a rotary dial. On the ones with switches, it should be set to "Set", on the ones with two displays, look at the display labelled "Set". Now press the transmit ("Push To Talk") button on the microphone. Once the radio starts to transmit, you should see the display(s) move. Now turn the rotary dial turned until the needle reads the "Set" value. Once this is done, either put the switch back the other way or simply look at the other dial. The value displayed is your SWR reading. In a perfect world, the needle will drop right on 1. Anything near 1 is okay, but if it gets up towards 2 or more then you need to make some adjustments.

If you do get a bad SWR reading, slide the antenna a little further into the base and then repeat the steps above. If the reading improves, slide it in a bit further. If the reading gets worse, try sliding the antenna out. Keep repeating these steps until you get the best reading you can. If you cannot push your antenna far enough into the base then cut a little bit off the whip. If you cannot pull the whip far enough out then you're stuck because you can't glue a bit back on.

This can be a bit fiddly and tiresome, but the effort put in is well worth it as the SWR of your antenna greatly effects the performance of your radio. A well SWR'd antenna can go many times further than one with a bad SWR.

Once you have got the best SWR that you can, disconnect your SWR Meter from the antenna and the radio, and then plug the antenna directly into the radio. The SWR Meter can be in a safe place in case it's needed again. That's it! You now have a correctly configured and working radio - happy talking.

Notes

1. PMR1 forms are available from the REVCOM Web site

   2. http://www.revcom.org.uk/members/library.html
   or on request from the P.M.R. Officer (See Appendix C).

2. http://www.revcom.org.uk/members/library.html
3. If your car radio has a security feature where it needs a PIN number entering if it is disconnected from the battery, make sure that you know what it is before proceeding any further.

Chapter 3. P.M.R. Operation

Okay, so you've read and understood Chapter 1. You've followed Chapter 2 and now you have a working P.M.R. - now what? This chapter will discuss how you communicate with other people on the radios, and walk you through the radio procedures. Radio Procedure is simply a defined system of planning, using and talking over the radios in a way that makes best use of them.

The Reasons

When a group of people are operating radios together, it soon becomes clear that some form of structure is required. This is mainly due to limitations of the radios. The best way to envisage these limitations is to compare the situations of a boardroom and a lounge chat.

In a lounge chat, everyone sits around and if someone wants to talks they simply speak up. This is possible because the rest of the room can hear many different sounds, and then choose which one to listen to.

In a boardroom, where everything has to be recorded for posterity, the person taking minutes can only write one word at a time. Because of this, people have to take it in turns, and ask for permission before talking.

Using radios is like being the boardroom recorder. You can only listen to one sound at once, so everyone has to behave in an orderly manner, getting permission before speaking and then doing so clearly and quickly.

These limits are caused by two basic problems. These are "dupliexing" and what I call "The big mouth syndrome".

Duplexing

Duplexing is the fancy name for transmission flow control. The simplest duplex is `simplex`. With simplex radios you have one radio that can only transmit, and you have other radios that can only receive. An example of simplex transmission is you sat at home listening (receiving) to the breakfast show on BBC Radio 1 (transmitting).

Right at the other end of the Duplex ladder is `Full Duplex`. With Full Duplex radios can transmit and receive at the same time. They do this by using one frequency to transmit and another frequency to receive. Because of the big mouth syndrome Full Duplex only really works between two points. An example of Full Duplex is mobile phones. They transmit to a zone mast on one frequency, and the mast transmits back on another frequency. All the clever stuff like connecting to the phone system is done at the mast end.

`Half Duplex` sits nicely in the middle of Simplex and Full Duplex. With Half Duplex, all radios can transmit and receive, but not at the same time. For half duplex transmitting and receiving are both done on the same frequency.

The Big-Mouth Syndrome

The eloquent term "Big Mouth Syndrome" nicely describes the other main limitation on Radios. As we all know, if two people are having an argument, it is not the person who is correct who wins, but the one with the biggest mouth. Similarly, with radios, it is not necessarily the person you wish to listen to that you will hear, but the one with the strongest signal. Radios can only receive one signal at once, and any other signals at the time will simply be ignored.

The Practice

Radio Procedure, is a collection of rules and guides, developed over the years, designed to let the radio operators work best within the limitations that radios have. It is split into two main sections, “Preparation and Planning”, and “Voice Procedure”.

Preparation and Planning covers all of the aspects that should be considered before an event. Voice Procedure covers actually talking over the radios to enable the successful handling of an event.

Preparation And Planning

In the Preparation and Planning stages, the points to be covered include the placement and manning of stations. When placing a station, you will need to consider what that station’s function will be. You will also need to consider the radio signal performance. For instance, if the event organizers have a marshal point you will probably need an outstation there. However, if the marshal point is in a hollow, they will not be able to talk very far. At this point you have two choices, you either move the outstation to a hill overlooking the marshal point and have a runner, or have another station relaying messages for the one in the hollow.

The position and function of a station should also be considered when deciding who will be manning it. It makes more sense to put a member who is an off duty police officer at a busy road junction that it would a non-driver. In the same way, someone who is quick thinking and calm in a crisis would be better suited to control.

All of the points mentioned for organizing an outstation also hold true when placing the two control stations. I say two controls because, if possible, it is always a good idea to split the functions of network control and event control. While the event control should ideally be as close the the event organizers as possible, the network control should be placed in the best position to control the radio network - even if this is in a field at the top of a hill in the middle of nowhere.

Once you have placed all of your stations, it is time to do a radio check. To carry out a radio check you should set up as many of the outstations and the controls as possible. You then make sure that everyone can talk to everyone else. In this way, if you have anyone who cannot talk to others, you have time to move them, or to arrange relay routes before the event. For instance if you have to move the network control because of a big oak tree killing your signal on one side, and you’re beaming live into thousands of living rooms because you’ve got a T.V. transmitter on the other side, you don’t want to find this out 15 minutes before the event starts.

The next part of PnP is deciding what information the stations and controls need before the event, and what information they will require when the event first starts. This may be such items as a map of the event, a list of outstation locations and callsigns before the event; and a total number of competitors once the event has started.

The last and most important part of PnP, and this goes to every member who will be on the event, is to check their equipment is working. There is no point in doing any of the steps above, if on the day no sets are working.

Voice Procedure

Okay, you’ve done all of the PnP. The day of the event is here, somebody has to say something. This is where the second half of the Radio Procedure, the Voice Procedure, comes into play. It is quite possible to run a network of 20 or more radios, even with the limitations imposed (see above) if correct voice procedure is followed. Voice

procedure covers every aspect of transmitting over a radio, including what to say and when to say it.

Some parts of the voice procedure are required by under the terms of the license, most notably the need to always identify yourself when you transmit, and to state the end of a message. However, that is not why we use Voice Procedure. The reason that we use it is because it works and works well.

The first rule of using a radio is to listen. This may be another point where you think that I am stating the obvious. I don't care! The art of listening is one that we all should practice. To listen to a radio is not always as easy as you may think. For example you may only hear half of a conversation because the other station is out of reach, or the quality of the signal may not be too good.

But why do I have to listen, they're not talking to me?

When you are on an event, you should listen to every message. A message affecting another station will probably affect you too at some point. If the station before you reports to control that a runner is struggling and wobbly, you need to know so that you can tell your marshals to keep a lookout for him and make sure he doesn't disappear between stations.

There are procedure guides to cover almost all aspects of using the radio, from setting up a station, to closing it down, and everything in between.

Most of the voice procedures shown here will be in the form of example dialogs. In these dialogs we will use callsign `REVCOM 201` as the outstation and `REVCOM CHARLIE CONTROL` as the network control. *ALL* transmissions must go through Network control unless control allows a talk-through, or exceptional conditions dictate otherwise.

> **The Controller is King:** At all times the network controller is in command of the frequency. Nothing should happen on frequency without their permission.

Your First Dialog

All message dialogs are basically collections of individual transmissions. These transmissions build up the structure of the dialog. This structure consists of

- The initial contact
- passing the message
- confirmation of receipt
- signing off

If the message is a long one, or is complicated, the message passing / confirmation pair may be repeated a number of times. Okay, now you know what a message dialog looks like, lets have our first example. Notice in the example that the individual transmissions also have a structure.

Example 3-1. A typical message passing dialog

```
    [wait for quiet]
(1) REVCOM CHARLIE CONTROL , REVCOM 201 calling Over.
    [pause]
(2) REVCOM CHARLIE CONTROL  Receiving, go ahead REVCOM 201 Over.
    [pause]
(3) From REVCOM 201, the quick brown fox jumped
```

```
    over the lazy dog, Over.
    [pause]
(4) From REVCOM CHARLIE CONTROL , Received, Over.
    [pause]
(5) REVCOM 201 to standby.
    [pause]
(6) REVCOM CHARLIE CONTROL  to standby.
```

The first thing to always remember is that if someone else is talking, you must wait until they have finished.

In line (1) the outstation (that's me) tries to contact the network controller. *Note* that their callsign comes before my callsign. This is because of human nature. If my callsign was to go first, then the controller may think that call is someone else trying to call me and, although not intentionally, take less notice of the call.

The word "calling" simply means that I am calling control and wish to talk to them. The word "Over" means that I have finished what I am saying and am about to stop transmitting.

You should also have noticed that before every transmission there is a pause. This is very important as we will discuss later when we talk about *priority* calls. The pause does not need to be long, only a few seconds, not much more that the time it takes to move the microphone to your mouth.

In line (2) the controller has responded to the call. Make sure that when you receive this transmission, that it is actually the controller that is transmitting, and also that it is you that they are responding to. It is quite common for two outstations to call control at the same time. You will not here this as you are deaf while you are transmitting, and control will only hear the outstation with the stronger signal. Once again, the "Over" is tagged on the end.

Line (3) is where we actually pass our message. The transmission starts of with me identifying myself. I then say what I have to say, and again finish with "Over". If I had a lot to say, I would split it up into smaller messages.

When I hear line (4), I know that my message has got to control. In know this because they identified themselves as control, and then confirmed my message with the word "Received". If they had not received my message okay, they would have said "Say Again" instead.

I am now quite happy that my message has been sent successfully, so I can shut up now and go back to sitting down. In line (4) I identify myself as usual, but instead of ending with "Over" I finish my message with "to Standby". This tells everyone that I have finished my dialog.

Finally, in line (6), control does the same. Once everyone has heard control go to standby, they know that they can have a go. Apart from priority calls, nobody should transmit until Control is at standby.

That's it. It's that simple. No black magic; my mystical incantions. Practically every message that you will want to pass is based on this example. There are some more specialised radio usage based jobs that you will want to do. The rest of this chapter will cover these jobs.

These jobs include Opening an outstation, closing an outstation, opening and closing the network control, passing a priority message, requesting and performing a talk-through and finally, relaying a message.

Opening An Outstation

The first job in this list is opening an outstation. This is also the first job that you will have to do. Once you have got to your location, you will need to tell the controller that you are ready.

Example 3-2. Opening an Outstation

```
    [wait for quiet]
(1) REVCOM CHARLIE CONTROL , REVCOM 201 calling Over.
    [pause]
(2) REVCOM CHARLIE CONTROL  Receiving, go ahead REVCOM 201 Over.
    [pause]
(3) From REVCOM 201, I am on location, radio check, Over.
    [pause]
(4) From REVCOM CHARLIE CONTROL , Receiving loud and clear, Over.
    [pause]
(5) REVCOM 201 to standby.
    [pause]
(6) REVCOM CHARLIE CONTROL  to standby.
```

If you compare this example with the previous one, you will notice that the only difference between the two is the body of the message, lines (3) and (4). As well as telling control that you are on location and on-frequency, you are asking control how good your signal is. Ideally, “loud and clear” will be your reply. If control report that you are quiet, or the sound is poor, try moving and try again. Also, if control is quiet to you, move and try again.

Once these checks have been done I can go to standby happy that control knows that you are there, and that they can talk to you. Quite often you will do this immediately after turning on your radio. If this is the case, the wait before line (1) is even more important.

Closing An Outstation

At the other end of the day, you will want to close your station. As usual this is a normal dialog with a slight change.

Example 3-3. Closing an Outstation

```
    [wait for quiet]
(1) REVCOM CHARLIE CONTROL , REVCOM 201 calling Over.
    [pause]
(2) REVCOM CHARLIE CONTROL  Receiving, go ahead REVCOM 201 Over.
    [pause]
(3) From REVCOM 201, request permission to close down, Over.
    [pause]
(4) From REVCOM CHARLIE CONTROL , permission granted, Over.
    [pause]
(5) REVCOM 201 standing down.
    [pause]
(6) REVCOM CHARLIE CONTROL  to standby.
```

The first point to notice from this example is that you do not tell control that you are closing, but ask. This is a small but important point. Don’t forget that the Controller is King. They may be aware of a problem that you don’t. The last thing control wants if a runner has vanished is for an outstation to vanish too.

The second point to notice is that on line (5) you are not going to standby, because you are not going to be standing by - you are closing down.

Opening Control

Opening the network control is even easier than opening an outstation. It consists of just one transmission and then waiting for each outstation to announce itself as described above.

Example 3-4. Opening the Control Station

```
     [wait for quiet]
(1) REVCOM CHARLIE CONTROL  now on station standing by.
```

Straight forward or what? In that one short transmission you have informed everyone who you are and what callsign you are using, and also that you are standing by for them to call you.

Closing Control

The transmission to close down a control station is just as easy. Realistically, this should not be needed as there should be nobody to hear it. This is because the control should always be the last station to close down - while there are still outstations operating, the control should be available.

Example 3-5. Closing the Control Station

```
(1) REVCOM CHARLIE CONTROL  Closing down.
```

Notice that in this example that the initial wait for quiet was not included. This is because the network should already be quiet.

Priority Messages

Next on the list of tasks is “Priority Messages”. These messages are a bit of a double edged sword. These messages are the main reason people join REVCOM in the first place. However, I personally consider an event to be a successful one if we have not had one priority call.

The main purpose of an outstation is to inform control of any incident that affects the safety of the competitors. These include things such as road accidents, or a competitor requiring first aid. However, organisers often like other information such as competitor progress, who is in front. Priority Messages are a way of getting the important messages through even if the network is in use on messages that are not as important. In this example control is currently talking to REVCOM 212

Example 3-6. Starting A Priority Message

```
    [wait for pause]
(1) REVCOM CHARLIE CONTROL , REVCOM 201 Priority Message Over.
    [pause]
(2) REVCOM CHARLIE CONTROL , All stations quiet.
    Go ahead REVCOM 201 Over.
```

```
    [pause]
(3) From REVCOM 201, competitor thirsty at my location, Over.
    [pause]
(4) From REVCOM CHARLIE CONTROL , First Aid informed, Over.
    [pause]
(5) REVCOM 201 to standby.
    [pause]
(6) REVCOM 212 from REVCOM CHARLIE CONTROL  continue message, Over.
```

Okay, lets look at this example. The first thing to note is that the wait before line (1) has changed. This time, because of the urgency, you do not want to wait until the network is quiet. You will transmit line (1) as soon as there is a gap. Immediately after the station transmitting says "Over", get straight in there. That's what the gap is there for. Depending on how quickly you get in and how long the pause is, you may not get through to control on the first attempt. If not, keep trying every time someone stops talking.

At line (2), control has heard you. The first thing that is done is that all other stations are told to go quiet. At this point, everyone else should stop what they are doing and not try to transmit. You are then told to pass your message. Obviously, you would not use a priority message to say something this trivial, but lines (3) to (5) show that this part of a priority is exactly like a normal message.

In line (6), control has finished talking to you, and goes back to the station that it was talking to before you interrupted.

Performing a Talkthrough

Next, we have talk-though. This allows one outstation to talk directly to another outstation. There are some very good arguments against ever using talk-through, most notably the handling of priority messages above. The preferred method is "Relaying" as discussed in the next section.

However, talkthrough is possible and is allowed so I will show you an example here. In this example, REVCOM 201 will talk through to REVCOM 212 .

Example 3-7. A typical talk-through dialog

```
    [wait for quiet]
(1) REVCOM CHARLIE CONTROL , REVCOM 201 calling Over.
    [pause]
(2) REVCOM CHARLIE CONTROL  Receiving, go ahead REVCOM 201 Over.
    [pause]
(3) From REVCOM 201, request talk-through to REVCOM 212 Over.
    [pause]
(4) From REVCOM CHARLIE CONTROL , Permission granted, Over.
    [pause]
(5) REVCOM 212, REVCOM 201 calling Over.
    [pause]
(6) REVCOM 212 Receiving, go ahead REVCOM 201 Over.
    [pause]
(7) From REVCOM 201, My marshal fancies your marshal Over.
    [pause]
(8) From REVCOM 212, received, Over.
    [pause]
(9) From REVCOM 201, nothing further Over.
    [pause]
(10)From REVCOM 212, received, to standby.
    [pause]
```

```
(11)REVCOM CHARLIE CONTROL , REVCOM 201 talk-through completed,
    to standby.
    [pause]
(12)REVCOM CHARLIE CONTROL  received, to standby.
```

As you can see, this is the longest example we have seen so far. This is one of the reasons talk-throughs should be avoided.

The dialog starts perfectly normal with lines (1) and (2). Then at line (3), instead of passing a message you ask control for the talk-through. In line (4) control grants you permission. If control does not grant you permission, ask control to relay the message for you. Never disobey control.

Once you have control, the dialog between you and the other station, lines (5) to (8), are a normal message dialog. Once you have finished talking to the other station, you have to hand then network back to the controller. This is done in lines (11) and (12). Remember that no other station can start to transmit until after control has gone to standby.

Relaying Through Control

The preferred way of sending a message from one outstation to another is by "Relaying". This involves you sending the message to control, who then send it on to the station that is it intended for. The first thing to realise with relaying is that the message potentially has to be sent twice taking up double the amount of time needed to pass it. In Reality (and in the example below), this is not the case.

Example 3-8. Relaying A Message

```
    [wait for quiet]
(1) REVCOM CHARLIE CONTROL , REVCOM 201 calling Over.
    [pause]
(2) REVCOM CHARLIE CONTROL  Receiving, go ahead REVCOM 201 Over.
    [pause]
(3) From REVCOM 201, message for REVCOM 212 Over.
    [pause]
(4) From REVCOM CHARLIE CONTROL , Go ahead, Over.
    [pause]
(5) From REVCOM 201, The last competitor is approaching
    you now. Over.
    [pause]
(6) From REVCOM CHARLIE CONTROL , received, Over.
    [pause]
(7) REVCOM 201 all sent, standing by.
    [pause]
(8) REVCOM 212, REVCOM CHARLIE CONTROL  Calling, Over.
    [pause]
(9) From REVCOM 212, All received, Over.
    [pause]
(10)From REVCOM CHARLIE CONTROL, nothing further Over.
    [pause]
(11)From REVCOM 212, to standby.
    [pause]
(12)From REVCOM CHARLIE CONTROL to standby.
```

With lines (1) and (2) the dialog starts normally. In line (3) you tell control that the message is not for them, but for REVCOM 212 . This does two things; it tells control

who the message is for, but it also tells REVCOM 212 who is already listening to pay a little more attentions. Once control has acknowledged your request in line (4) you can send the actual message in line (5). As usual, control will confirm that they have received the message in line (6) and then you can go back to standby in line (7).

Once you are out of the way, control will then contact the other station in line (8). REVCOM 212, again being the good little operator that they are, know what control wants and are waiting for control to call. In line (9) they confirm that they heard and understood the message that was for them. This saves control having to repeat it. Control can simply acknowledge REVCOM 212 and say that there is nothing further in line (10). The only thing left is for REVCOM 212 to go to standby followed by control - lines (11) and (12).

If you compare relaying through control with talk-through, you will notice that relaying is no faster that talk-through, and can even take longer if the receiver did not hear the message in the first place. If this is the case, then why relay?

The first reason is one of control. With talk-through the network controller hands over the rains to someone else. This is never a good thing. If a station has a priority call because someone is injured or in danger, it is much harder to regain control.

The second reason is one of ability. The only reason that relaying would need the message to be transmitted twice is if the receiving station cannot hear the sending station. If this is the case, then talk-through would not be an option anyway.

That's it. Anything else that you will want to do over the radios should be possible by using the examples above.

Appendix A. P.M.R. Technical Details

What needs to go here?

Appendix B. The Phonetic Alphabet

As we have already mentioned in chapter 3, when we were talking about voice procedure, the sound quality over radios is not brilliant. As a result of this, it is often difficult to distinguish between similar sounding words. If the information that you are sending is not a normal word, then this problem gets even worse. An example of this is when you are sending a car registration number.

To get round this, the Phonetic Alphabet has been created. This is basically a list of words, used to "say" letters. This works because the words, or more importantly the pronunciation, of these words, are all quite different. It also works because the person receiving knows what words to expect when someone is spelling out a word this way. Because of this last point, everyone should always use the same set of words. The rest of this appendix gives you the words for each letter of the alphabet, as well as the words for the digits zero to nine.

Table B-1. The Phonetic A to Z

Letter	Word
A	Alpha
B	Bravo
C	Charlie
D	Delta
E	Echo
F	Foxtrot
G	Golf
H	Hotel
I	India
J	Juliet
K	Kilo
L	Lima
M	Mike
N	November
O	Oscar
P	Papa
Q	Quebec
R	Romeo
S	Sierra
T	Tango
U	Uniform
V	Victor
W	Whiskey
X	X-Ray
Y	Yanky
Z	Zulu

Table B-2. The Phonetic 0 to 9

Digit	Word
0	Zero
1	Wun
2	Tou (as in You)
3	ThRee
4	Fower
5	FiVe
6	Sicks
7	SeVon
8	Ate
9	Niner

Appendix C. Useful Contacts

REVCOM Officers

P.M.R. Officer

National Secretary

R.A. Offices

R.A. National Address

Region 1

North East

Scotland

Region 2

North West

Northern Ireland and Isle Of Man

Wales

Region 3

South West

Region 4

Midlands and East Anglia

Region 5

London and South East

Appendix D. Voice Procedure in a Nutshell

In Chapter 3, we looked at Voice Procedures, and discussed the correct way to talk over the radios. We did this by looking at some example dialogs, and then walking through them examining each step. Those examples are repeated here verbatim, but without the examinations that go with them. In this way, this appendix can be used as quick reference guide, to be kept handy when using the radios. For a fuller description of each example, refer back to Chapter 3.

Example D-1. A typical message passing dialog

```
    [wait for quiet]
(1) REVCOM CHARLIE CONTROL , REVCOM 201 calling Over.
    [pause]
(2) REVCOM CHARLIE CONTROL  Receiving, go ahead REVCOM 201 Over.
    [pause]
(3) From REVCOM 201, the quick brown fox jumped
    over the lazy dog, Over.
    [pause]
(4) From REVCOM CHARLIE CONTROL , Received, Over.
    [pause]
(5) REVCOM 201 to standby.
    [pause]
(6) REVCOM CHARLIE CONTROL  to standby.
```

Example D-2. Opening an Outstation

```
    [wait for quiet]
(1) REVCOM CHARLIE CONTROL , REVCOM 201 calling Over.
    [pause]
(2) REVCOM CHARLIE CONTROL  Receiving, go ahead REVCOM 201 Over.
    [pause]
(3) From REVCOM 201, I am on location, radio check, Over.
    [pause]
(4) From REVCOM CHARLIE CONTROL , Receiving loud and clear, Over.
    [pause]
(5) REVCOM 201 to standby.
    [pause]
(6) REVCOM CHARLIE CONTROL  to standby.
```

Example D-3. Closing an Outstation

```
    [wait for quiet]
(1) REVCOM CHARLIE CONTROL , REVCOM 201 calling Over.
    [pause]
(2) REVCOM CHARLIE CONTROL  Receiving, go ahead REVCOM 201 Over.
    [pause]
(3) From REVCOM 201, request permission to close down, Over.
    [pause]
(4) From REVCOM CHARLIE CONTROL , permission granted, Over.
    [pause]
(5) REVCOM 201 standing down.
    [pause]
(6) REVCOM CHARLIE CONTROL  to standby.
```

Example D-4. Opening the Control Station

```
    [wait for quiet]
(1) REVCOM CHARLIE CONTROL  now on station standing by.
```

Example D-5. Closing the Control Station

```
(1) REVCOM CHARLIE CONTROL  Closing down.
```

Example D-6. Starting A Priority Message

```
    [wait for pause]
(1) REVCOM CHARLIE CONTROL , REVCOM 201 Priority Message Over.
    [pause]
(2) REVCOM CHARLIE CONTROL , All stations quiet.
    Go ahead REVCOM 201 Over.
    [pause]
(3) From REVCOM 201, competitor thirsty at my location, Over.
    [pause]
(4) From REVCOM CHARLIE CONTROL , First Aid informed, Over.
    [pause]
(5) REVCOM 201 to standby.
    [pause]
(6) REVCOM 212 from REVCOM CHARLIE CONTROL  continue message, Over.
```

Example D-7. A typical talk-through dialog

```
    [wait for quiet]
(1) REVCOM CHARLIE CONTROL , REVCOM 201 calling Over.
    [pause]
(2) REVCOM CHARLIE CONTROL  Receiving, go ahead REVCOM 201 Over.
    [pause]
(3) From REVCOM 201, request talk-through to REVCOM 212 Over.
    [pause]
(4) From REVCOM CHARLIE CONTROL , Permission granted, Over.
    [pause]
(5) REVCOM 212, REVCOM 201 calling Over.
    [pause]
(6) REVCOM 212 Receiving, go ahead REVCOM 201 Over.
    [pause]
(7) From REVCOM 201, My marshal fancies your marshal Over.
    [pause]
(8) From REVCOM 212, received, Over.
    [pause]
(9) From REVCOM 201, nothing further Over.
    [pause]
(10)From REVCOM 212, received, to standby.
    [pause]
(11)REVCOM CHARLIE CONTROL , REVCOM 201 talk-through completed, to standby.
    [pause]
(12)REVCOM CHARLIE CONTROL  received, to standby.
```

Example D-8. Relaying A Message

```
    [wait for quiet]
(1) REVCOM CHARLIE CONTROL , REVCOM 201 calling Over.
    [pause]
(2) REVCOM CHARLIE CONTROL  Receiving, go ahead REVCOM 201 Over.
    [pause]
(3) From REVCOM 201, message for REVCOM 212 Over.
    [pause]
(4) From REVCOM CHARLIE CONTROL , Go ahead, Over.
    [pause]
(5) From REVCOM 201, The last competitor is approaching you now. Over.
    [pause]
(6) From REVCOM CHARLIE CONTROL , received, Over.
    [pause]
(7) REVCOM 201 all sent, standing by.
    [pause]
(8) REVCOM 212, REVCOM CHARLIE CONTROL Calling, Over.
    [pause]
(9) From REVCOM 212, All received, Over.
    [pause]
(10)From REVCOM CHARLIE CONTROL, nothing further Over.
    [pause]
(11)From REVCOM 212, to standby.
    [pause]
(12)From REVCOM CHARLIE CONTROL to standby.
```