

# Guide to Repeater Licensing

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## Contents

### [1 Introduction](#)

### [2 Principles of Repeater Management](#)

#### 2.1 Purpose of the Repeater Network

#### 2.2 Service Areas and Overlap

#### 2.3 Technical Requirements

### [3 The Application Process](#)

#### 3.1 How to Get Started

#### 3.2 The Application Form

#### 3.3 How Your Application is Processed

### [4 Changes to the Repeater](#)

#### 4.1 Technical Changes

#### 4.2 Repeater Closedown

### [5 Additional Facilities](#)

#### 5.1 Linking of Repeaters

#### 5.2 Remote Control

#### 5.3 Voice Announcements

### [6 Contact Points](#)

#### [Annex 1](#) Procedural Flow Diagram

#### [Annex 2](#) Timescales

#### [Annex 3](#) Technical Requirements

#### [Annex 4](#) Sample Notice of Variation

#### [Annex 5](#) Sample Schedule to Notice of Variation

#### [Annex 6](#) Useful Reading

#### [Annex 7](#) Glossary of Terms

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## 1 Introduction

This document provides guidance to potential Amateur Radio Repeater Keepers. To run a Repeater in the UK, you must apply for a Notice of Variation to your Amateur Radio Licence. This varies your licence and

confers additional responsibilities on you as a Repeater Keeper. These responsibilities are defined in the terms of the Notice of Variation.

The role of the Radiocommunications Agency (the Agency) is to provide a broad framework of rules under which radio amateurs operate. The Radio Society of Great Britain (RSGB) is responsible for the detailed management of the Repeater network under contract to the Agency. However, any applicant who feels that their application has not been handled in a satisfactory manner by the RSGB, can raise the matter with the Agency. In the first instance, the matter should be referred to RSGB HQ who are required to investigate the complaint in a fair and impartial manner. Should it not be possible to resolve the matter, or reach a compromise, acceptable to all parties, the complainant should send details of the complaint, in writing, to the Agency, who will then conduct a formal investigation. The Agency's decision in all matters of dispute will be final, subject to normal Agency appeals procedures. Any applicant can contact the Agency at any stage of their application if they feel that there is a problem. However, it clearly makes sense for the RSGB to initially be involved in sorting out any problems. A list of contact points is provided at the end of this document should you require further help.

This document explains the process and procedures necessary to establish a Repeater Station conforming to established modes, specifications and operation. The Radiocommunications Agency and the RSGB encourage innovative proposals as part of the experimental, development and self-training of radio amateurs. Such proposals can be accepted at any time by the Agency who will work in conjunction with the applicant and the RSGB to accommodate any special provision in the form of a Notice of Variation to the applicant's Amateur Radio Licence.

## **2 Principles Of Repeater Management**

The principal reasons for managing the Amateur Repeater network are to provide efficient use of the spectrum, to reduce interference, and to combat cases of abuse. There are only a small number of frequencies available for use by Amateur Repeaters and if their use were not planned and co-ordinated there would be significant potential for interference between Repeaters, thereby reducing their effectiveness. The nature of Repeaters is such that when abuse occurs, the effect can be more serious than that from other types of Amateur station. It is therefore important that the Agency's Local Customer Services hold the necessary records, to enable them to deal with cases of abuse or interference.

### **2.1 Purpose of the Repeater Network**

The Agency has identified two principal purposes for establishing Amateur Repeaters. These are to provide improved coverage for those operating voice mobile stations and/or fixed stations using modes such as TV at microwave frequencies, and to provide opportunities for experimentation. The majority of existing Repeater networks operate in the UHF and VHF bands. There are several other less congested bands in the Amateur

Service allocations where there is more scope for the establishment of Repeaters. Proposals for Repeaters which fulfil purposes other than those mentioned or operate in different bands will be treated in the same way. Many areas of the country are fully served by established Repeaters and this leaves less opportunity for more to be established. However, anyone believing they have identified a genuine requirement for a new Repeater should not be discouraged from submitting a proposal including a statement of the requirement for the Repeater which will be considered as part of the Repeater network planning and spectrum management process. Such proposals or newly identified requirements should be discussed with the RSGB, who will be pleased to discuss and develop any ideas or plans with potential applicants.

## **2.2 Service Areas and Overlap**

Originally, it was possible for the first repeaters to provide coverage over large areas of the country, so wide in fact that it was felt necessary to set an arbitrary limit to their permitted coverage areas; at 332 km for UHF Repeaters and 1002 km for VHF Repeaters. Gradually, the size of each coverage area has become limited by neighbouring Repeaters, and such limits for the maximum coverage area are no longer considered appropriate. This should also avoid the misunderstanding that these values are the "minimum" or "required" size of Repeater coverage. As Repeaters are closed down any subsequent applications to establish new Repeaters in the same area should be designed, and will be assessed, on the basis of what is technically and geographically appropriate for the region, rather than on the basis of what the old Repeater was permitted to do. Once a Repeater has ceased operation for more than six months, or as soon as a second Notice of Variation (which effectively removes the authority for the Repeater) has been issued, any site and/or frequency clearances for a Repeater covering the same area need to be reapplied for. This is because the situation with respect to frequency or site use by other radio users in the region may have changed since the original Repeater was first approved. Applicants should be clear that there is no such thing as a perpetual approval for a Repeater. Any new Repeater is as likely to be approved whether it is proposing to cover an old Repeater area, or a totally new one, and each application will be considered on its merits.

If a Repeater is temporarily closed down by the Agency, or if the running of a Repeater is taken over by a new Keeper without a break in operation or change in any technical details, then this Repeater will continue to operate without new formal clearances. If a new Repeater Keeper is appointed, new NoV's must be issued to both the old and new Repeater Keepers.

In the UHF and VHF bands, the main reason for establishing a Repeater is for the purpose of providing improved communications for those operating mobile stations and fixed stations in difficult terrain. As a communications service with a limited number of available channels, it is necessary to encourage the use of standard spectrum management principles in order to achieve a workable system. This includes the

principle of efficient frequency use, in which any given area may be covered by only one channel in any given band. To provide coverage to a single service area from more than one Repeater in the same band is wasteful of spectrum, unless justified to solve a particular problem, such as congestion. There may be certain conditions under which significant overlap may be desirable, for example where high population density causes congestion or where interference or geographical conditions give rise to holes in the coverage. In these cases, a solution should be found through agreement between Repeater Keepers and network planners.

The extent of each Repeater's service area will be determined by a number of factors, including the local terrain, the position of neighbouring Repeaters, the reason for establishing the Repeater and its target audience. Once the applicant has identified the need for a new Repeater, the RSGB will be able to help develop the initial idea into a successful application. The application cannot be altered by the RSGB unless there is agreement with the applicant. They will be able to advise on the service-area which would provide a useful service and complement existing Repeaters, and on the technical and physical implementation of the Repeater to achieve the declared service. Factors such as site height, antenna type, antenna height, and effective radiated power will need to be used to achieve the requirement identified in the application. As part of the assessment of the application, a computer generated prediction will be carried out in order to identify any potential interference to other users of the band.

### **2.3 Technical Requirements**

In order to ensure successful co-existence with other Services and with other operators in the Amateur Service, the Agency requires all Repeaters to meet certain technical performance criteria which affect spectrum occupancy, spurious emissions, interference to other services and accessibility to users. The minimum parameters are as follows:

- Maximum Effective Radiated Power;
- Maximum Tx and Rx Spurious Emissions;
- Frequency Stability ;
- Bandwidth / Frequency Deviation;
- Frequency of Operation;
- Antenna Polarisation (where applicable);
- Receiver sensitivity;
- Station Identification;
- Access method;
- Duration of talk-through operation;
- Time-out on completion of talk-through operation;
- Requirement for remote control;
- Modulation.

The values set (where applicable) for each of these parameters for the different types of Repeaters are given in Annex 3 to this Guide. These

parameters may need to be modified from time to time, as technologies, standards and international requirements change.

The requirements for the repeater are contained in the Notice of Variation (NoV) to the Licence of the Repeater Keeper. A sample copy of an NoV is given at Annex 4. The NoV places the responsibility on the Repeater Keeper to ensure that the Repeater:

- meets certain minimum technical requirements and the parameters given in the Schedule; and
- continues to meet these requirements throughout its life. The Repeater Keeper may be required to implement a programme of periodic testing.

The relevant technical parameters which each Repeater is required to meet will be listed in the Schedule to the NoV. The principal parameters will be those listed above, but the Schedule may include others. A sample copy of a Schedule is given at Annex 5. Any changes to the parameters listed in the Schedule issued for a particular Repeater will require the prior written approval of the Agency. If any Repeater Keeper is unsure whether any parameter they wish to change requires Agency approval, advice should be sought in the first instance from the RSGB.

[↑Top](#)

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## 3 The Application Process

### 3.1 How to Get Started

If you feel there is a need for a Repeater in your area, the first action you must take is to clearly identify the area that you wish to cover. A sketch-map showing the desired service area should be produced and accompany your application to the RSGB. The more realistic you make the coverage map, the easier it will be to assess and subsequently approve. If you intend to carry out any trials prior to submitting an application you should note that they must comply with clause 2(4) of the Amateur Radio Licence Terms, Provisions and Limitations Booklet BR68. To ensure that your application is processed as quickly as possible, which in general will take a number of months, you are strongly encouraged to speak to the RSGB's Repeater Management Committee (RMC) at an early stage, and to carry out as much preparation work as possible before submitting the application. The RSGB will be able to advise you of any potential problems with your proposals. It will also be helpful to the RSGB in their assessment of any competing applications within the same area, to have evidence of strong support for the Repeater from local amateurs and clubs.

When selecting a site for the Repeater, you should ensure that you are aware of any requirements or conditions placed on the use of that site by the site owner or local authorities. These sites are often subject to

conditions of use relating to on-site safety and insurance, which should be discussed with the Site Owner. In the case of a new mast, or if the height of an existing mast or structure is increased by the addition of the Repeater mast or antenna, then Local Authority permission may be required. It is the responsibility of the applicant to establish whether or not such permission is necessary and then to obtain from the Site Owner written permission to use the site.

### 3.2 The Application Form

The application form (RA356) asks for the minimum information required for your application to be processed. The information is required for four main purposes:

**Frequency Clearance:** Many repeater stations operate in bands shared with other, mainly government, services. The Agency, therefore, has a duty to consult these users over proposals for new assignments in these bands. This is carried out by a committee set up under the auspices of the Cabinet Office, called the National Frequency Assignment Panel (NFAP). The NFAP can only consider Amateur assignments operating from fixed stations, not mobiles.

**Site Clearance:** The UK Radio Site Clearance procedure is administered through a governmental committee charged with ensuring that all proposals to establish new or modify existing radio masts are scrutinised for compatibility with existing users at, or near, the proposed site. The information obtained from this procedure is used for secondary purposes such as the creation of databases of mast heights and locations which are used by the Civil Aviation Authority (CAA). It is also used to create EMC maps of the UK for military and other purposes. The procedure does not take into account the effect of radio services on non-radio equipment such as electronic devices which may malfunction or operate incorrectly in the presence of radio transmissions. The Site Clearance procedure is carried out if the application includes a new mast or antenna greater than 30 metres above ground level, or if the installation of an antenna will change the height of an existing mast or structure by 5 metres. The application is sent to approximately 50 other government departments and agencies, who have 28 days in which to make any objections.

**Enforcement Purposes:** Because of the potential for abuse to Repeaters or interference problems, the Agency's Local Customer Services staff need to hold details of Repeaters in their area and be able to shut them down quickly when required. The requirements for these purposes include information concerning closedown procedures and operators, and contact details for the site owner.

**Network Management Purposes:** Information is required to ascertain the service area of a new Repeater and its impact on the existing network. The applicant also needs to make clear the intended aims and coverage of the new Repeater.

### **3.3 How the Application is Processed**

Processing the application is a complicated process, although we have tried to simplify the procedure as much as possible. Annex A provides a flowchart which details the various processes that are carried out. There may well be a need for proposals to be modified during the application process and this will inevitably introduce some delays. In general the detailed discussions necessary to modify applications will take place between yourself and the RSGB, and ideally any problems will be resolved in this manner and the application process continued.

However where this does not occur within the time scales indicated in Annex 1 you may raise the matter with the Agency so that any delays or difficulties can be addressed. Annex B lists the time scales in which the RSGB and the Agency are required to respond to correspondence or complete certain actions.

Before an application is put through the formal clearance process, the applicant will be sent a copy of the application to confirm any modifications agreed in dialogue with the RSGB. Applicants are asked to return this confirmation by post or enter into written correspondence concerning the modifications as soon as possible. If nothing is heard from the applicant within 4 months, the application will be cancelled.

### **3.4 Issue of the Notice of Variation**

Once the Repeater has been formally approved, a Notice of Variation (NoV) will be issued to the Repeater Keeper. The Repeater should then be brought into service within 3 months of the date of issue of the NoV. Failing this, the approval will no longer be valid, and a Second NoV will be issued to cancel the first. A second NoV can only be issued under the instruction of the Secretary of State. Exceptional circumstances which prevent the Repeater being established within this timeframe, such as a remote location and adverse weather conditions, should be discussed with the RSGB as it may be possible for the Agency to agree an extended timescale.

### **3.5 Bringing the Repeater into Service**

The Repeater Keeper must inform the local customer services office of the Radiocommunications Agency and the RSGB in writing, of the date the Repeater is to be brought into service.

## **4 Changes To The Repeater**

### **4.1 Technical Changes**

The Repeater's technical parameters will be detailed in the Schedule to the Notice of Variation. If it is necessary to change any of these parameters, you will need to discuss them with the RSGB as the changes may need to be cleared with the Agency. If you change equipment without altering any

of the technical parameters then there is no need to give such notification. Moves to a new site will normally require full clearance by the Agency. However where the new site is within 2 km of the original Repeater site, full clearance will not be required and processing times correspondingly reduced.

## 4.2 Repeater Closedown

The application form requires the provision of a list of closedown-operators to enable the Agency's Local Customer Services staff to contact the duly nominated personnel and arrange for the Repeater to be switched off. It is the Repeater Keeper's responsibility to ensure that this list is kept up to date and that any changes are notified to the local office.

In certain circumstances, it is possible that a closedown-operator may not be a licensed amateur, but someone who is available at the transmitter site for a high percentage of the time, and who has been trained in the procedure to switch off the Repeater. However, such nominated personnel will not be permitted to switch the Repeater back on again.

The Repeater may be switched off for brief periods, for example, to undertake routine maintenance. The Repeater Keeper is also responsible for turning the repeater off if abuse is discovered. In these circumstances and where practicable, a prior announcement of the closedown should be made on air. When the repeater is to be taken off air for periods exceeding 72 hours, the RSGB and the Local Customer Service office of the Agency must be notified in writing.

If you decide that you no longer wish to be responsible for your Repeater it would be helpful if you were able to identify someone else who is willing to take on this responsibility so that the Repeater can be kept operational. Otherwise you should complete section A1 of the application form in order to close the Repeater down. If a Repeater is off the air for longer than six months, a second NoV will be issued which removes the authority for that Repeater.

 [Top](#)

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## 5 Additional Facilities

The Agency encourages experimentation and is prepared to look positively at requests for new facilities. However, this does not mean that every request will be agreed automatically. Ideas should be submitted in the first instance to the RSGB, who will be able to help the Agency to assess the application.

### 5.1 Repeater Linking

Applications for repeater linking should be sent to the RMC where a particular need can be identified. Consideration would need to be given to levels of abuse in the area. In cases where problems exist, it is unlikely the Agency would agree to increased coverage.

## **5.2 Remote Control**

The use of remote control to close down a Repeater is encouraged by the Agency as a useful aid in combating abuse. Remote control is permitted by varying the Repeater Keeper's NoV or by issuing an NoV to other nominated individuals. Remote control closedown operators should then be identified on the closedown list. These NoVs may be requested at the time of applying for the Repeater NoV, or after the Repeater becomes operational. From 1 January 2001, all new Repeaters must be fitted with remote control facilities before commencing operation.

## **5.3 Voice Announcements**

The Agency allows limited use of voice announcements on Repeaters. Applications should be made to the RSGB. Guidelines covering the type of message together with restrictions on the frequency of their transmission and duration are available from the RSGB. [Need to be added].

## **6 Contact Points**

For general information on Repeaters, and enquiries on individual applications:

Radio Society of Great Britain  
Lambda House  
Cranborne Road  
Potters Bar  
Herts  
EN6 3JE

Tel: 01707 659015  
Fax: 01707 645105  
e-mail: [ar.dept@rsgb.org.uk](mailto:ar.dept@rsgb.org.uk)

For enquiries about licensing matters:

Amateur Radio Section  
Radiocommunications Agency  
Wyndham House  
189 Marsh Wall  
London  
E14 9SX

Tel: 020 7211 0160  
Fax: 020 7211 0228  
e-mail: [amcb@ra.gsi.gov.uk](mailto:amcb@ra.gsi.gov.uk)

A list of the Agency's Local Customer Services Offices (RA206) may be obtained from the Agency's Information and Library Service on 020 7211 0502 or 0505.

 [Top](#)

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## Annex 1

[Application For Amateur Repeaters Procedural Flow Diagram](#) ( PDF Document - 10Kb)

(Please refer to the above Flow Diagram)

1-3 Applicant sends application form to RSGB HQ who allocate a reference number, acknowledge receipt and copy the application to the Repeater Management Committee (RMC) by the next working day. This process also caters for requested changes to the application or requests for change if the operational repeater does not meet the applicant's requirements.

4 The RMC examine the application.

5-5.1 If there are errors or omissions, the applicant will be contacted by the RMC so that these can be rectified.

6-7 The RMC will process the application. If the application does not meet the guidelines agreed by the Agency and the RSGB, the applicant will be notified within 28 days. Where the applicant's requirements can be met, 95% of applications will be passed to the Agency within 28 days, the remainder within 42 days.

7.1 Where the requirements cannot be met in full, the applicant will be contacted so that the matter can be resolved. This may take some time to resolve. If you feel that your application is not being progressed as smoothly as you would like, you should refer the problem in the first instance to RSGB HQ. If they are not able to resolve the problem, you should refer the matter to the Agency who will investigate the matter and report back to you.

8-8.2 Once RMC and the Applicant are content with the application, a copy of the application form and the relevant coverage map is sent to the Agency, RSGB HQ and the applicant.

8.3-8.3.1 The applicant is sent a copy so that he can check that the application form is as agreed with the RMC. If there is any discrepancy, this should be taken up with the RMC and the Agency.

8.4-8.4.2 Assuming everything is as agreed, the application form should be signed by the applicant and returned to RSGB within 4 months. A reminder will be sent to the applicant after 2 months if nothing is received by RSGB

HQ. If nothing is received after 4 months, the application is cancelled. This is in order to be fair to others who may wish to provide a service in the same area.

8.5 On receipt of the signed application form, RSGB HQ sends this and the coverage map to the Agency.

9-10.1 The Agency already has a copy of the application form (see stage 8) so if there are discrepancies, the two versions can be compared. If the two did not match, RSGB HQ would be contacted.

11-11.1 Assuming there are no problems, the application moves into the final stage of clearance by the Agency. RSGB HQ are informed that clearance has been initiated and the applicant and RMC are advised accordingly. Copies of the form and map are sent to the relevant Agency local office and to the Primary User of the band (if relevant). The local office have one month in which to respond. After this time it is assumed that they have no comments. The Primary User is not given a set time in which to respond but the Agency does encourage replies within two months.

12 If there are objections from the local office or the Primary User, RSGB HQ are notified and the applicant contacted so that appropriate changes can be made to the application. Depending on the nature of the objection, it may be possible for the application to be refused.

13-14 In the absence of objections, the application moves to the next stage and is sent to the NFAP for frequency clearance and site clearance where required.

15 If either site or frequency clearance is unsuccessful, RSGB HQ are advised and the application re-considered.

16 In the majority of cases the application will be successfully cleared. RSGB HQ are informed and the NoV issued (95% within 14 days and the remainder within 28 days).

17-17.1 The Repeater is required to become operational within three months of the issue of the NoV, unless there are exceptional circumstances (see section 3.4). This requirement ensures fairness to other groups who may wish to provide a service in the area.

18 -20 If the operational repeater does not meet the applicant's desired coverage requirements then the applicant may choose to submit a request for change. Where the repeater meets the desired requirements, changes will only be made where a specific reason can be identified eg cases where the repeater is found to cause interference.

## **Annex 2**

### **Timescales**

## A2.1 Timescales to be met by the Agent

The timescales as agreed between the Radiocommunications Agency and the RSGB as Agent, and stated in formal Agreement, are as follows:

The Agent shall:

- acknowledge receipt of 100% of correspondence by the next working day, respond to 95% of all correspondence within 21 days and respond to 100% of all correspondence within 28 days;
- produce reports as may be requested by the Secretary of State from time to time. Initial reports will be produced within 2 weeks of receiving a request and if required, more detailed reports within 6 weeks of receiving a request;
- for those completed applications which conform to the guidelines for issue as provided by the Agency and which **do not** require re-submission to the Agency for clearance, issue 95% of Notices of Variation or amendments to Notices of Variation or their Schedules within 28 days and issue 100% of Notices of Variation or amended Notices of Variation or their Schedules within 42 days;
- for those completed applications which conform to the guidelines and which do require submission to the Agency for clearance, submit 95% of applications to the Agency for clearance within 28 days and submit 100% of applications to the Agency for clearance within 42 days. Upon the Agent receiving notification that applications submitted for clearance have been approved, issue 95% of Notices of Variation within 14 days of receipt of such notification and issue 100% of Notices of Variation within 28 days of receipt of such notification;
- for those completed applications which **do not** conform to the guidelines, inform the applicant that the application is unsuccessful within 28 days;
- at the request of the Repeater Keeper , issue 100% of Second Notices of Variation within 28 days; and
- on the instruction of the Agency, issue 100% of Second Notices of Variation within 7 days.

## A2.2 Other Timescales

The Agency publishes the targets for its services in RA238; The Agency's Standards of Service, and RA239 The Agency's Quality of Service Targets. These are available on request from the Agency's Library and Information Services on 020 7211 0502 or 0505 .

Frequency and site clearance procedures:

The National Frequency Assignment Panel (NFAP) meets every 3 weeks. Prior to an application being presented to the NFAP, the other users of the band in question are requested to comment on the application. Applications are not submitted to the NFAP until it is known whether or not the other users will be able to approve the application. Consideration

by Radiocommunications Agency Local Customer Services: 1 month;  
Consideration by Primary User of frequency band: no mandatory maximum time set, but the Agency encourages them to reply in 2 months. Where site clearance is required, the application is sent to approximately 50 other government departments and agencies, who have 28 days in which to make any objections.

## **Annex 3**

### **Technical Requirements**

#### **A3.1 Service Areas**

The Service Area for each Repeater will be calculated from the data given in the application form using the radio system, computer prediction tool used by the Agency's Local Customer Service Offices in the licensing of Private Business Radio. Those parameters of the planned Repeater which can be modified will be adjusted in the calculations until the optimum performance for the Repeater has been found. Every effort will be made to find the combination of Repeater parameters necessary to achieve the Service Area identified in the application. This could include proposals that the Repeater should be implemented using a lower or a higher power than proposed, or by using, for example, a different antenna type.

The edge of the service area will be defined in the same way for every Repeater. A minimum practical field strength suitable for the type of mobile receivers for which the Repeater network is established will be used to define the edge of the Service Area. This has been calculated in accordance with ITU-R Report 358, "Protection ratios and minimum field strengths required in the mobile services". The edge of the service area of a Repeater will be represented by a contour, x, at the field strengths given in the table below:

50 - 52 MHz	25 dB $\mu$ V/m
144 - 146 MHz	20 dB $\mu$ V/m
430 - 440 MHz	24 dB $\mu$ V/m

Note: Amateurs may, using more powerful or higher quality equipment, be able to use or hear the Repeater outside this Service Area. However, this additional coverage would be considered to lie outside the normal operating range of the Repeater and therefore will not be guaranteed or considered as part of the Service Area.

#### **A3.2 Overlap of Service Areas**

The Service Area of a Repeater should, as far as possible, avoid overlapping the Service Area of the neighbouring Repeaters. There may be certain conditions under which significant overlap may be desirable, for example where high population density causes congestion or where interference or geographical conditions cause holes in the coverage. In

these cases, a solution agreeable by involved Repeater Keepers should be found.

### A3.3 Co-channel interference

In order to ensure efficient frequency re-use in the planning of the Repeater network, the following co-channel interference criteria will be used. The service area edge is represented by a contour x (as above), and the co-channel interference protection ratio is represented by a contour y at a value 10dB below x.

The Service Areas of two Repeaters operating on the same frequency may not overlap x on x, or y on x.

There shall be no restriction on the overlap of the y contour of Repeater A on the y contour of Repeater B.

### A3.4 Specifications

The following specifications give the minimum requirements to ensure minimum interference to other services, and to ensure consistency of access arrangements across the whole Repeater network.

In some cases, and particularly for TV Repeaters, the requirements have become more stringent in recent years. This is due to the need to prevent any interference to the Aeronautical Radionavigation Service. For all Repeaters, specific cases of interference may require that the operation of a particular Repeater be modified to meet more stringent requirements. This will be particularly important where interference is being experienced by a safety of life service.

### A3.5 50 MHz FM Speech Repeaters

#### Spectrum management parameters

<b>Transmitter</b>	
Maximum Effective Radiated Power	To be calculated for each Repeater on the basis of required service area and set down in the Schedule of the NoV, but up to max. 26 dBW.
Maximum Spurious Emissions	43 + 10 log(P) or 70 dBc whichever is the less stringent (NB P=mean power in Watts supplied to the antenna transmission line)
Frequency Stability	+/- 1 kHz (in line with Specification ETS 300 086)
Bandwidth / Frequency Deviation	+/- 2.3 kHz peak deviation.
<b>Receiver</b>	
Maximum Receiver Spurious	-60 dBm

Emissions	
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### Other Repeater Characteristics

<b>Receiver</b>	
Maximum usable sensitivity	12 dB SINAD for a 0.3µV signal
Frequency stability	+/- 1kHz (in line with Specification ETS 300 086)
<b>Antennas</b>	
Polarisation	Vertical
<b>Access arrangements</b>	
Station identification	Morse or Voice or both Automatically every 5 - 15 mins whilst in use, also permitted when not in use
Access	only by use of CTCSS tones
Duration of talk-through operation	Limitation of talk-through time per access permissible, e.g. 2 - 5 minutes per access
Timeout	Recommended that on completion of a transmission, the Repeater should automatically close down after 5 - 15 seconds of no signal appearing on the input.
Remote Control	Recommended, Mandatory for each new Repeater after January 2001

### A3.6 145 MHz / 430 MHz FM Speech Repeaters

#### Spectrum management parameters

<b>Transmitter</b>	
Maximum Effective Radiated Power	To be calculated for each Repeater on the basis of required service area and set down in the Schedule of the NoV, but up to max. 26 dBW.
Maximum Spurious Emissions	43 + 10 log (P) or 70 dBc whichever is the less stringent (NB P=mean power in Watts supplied to the antenna transmission line)
Frequency Stability	+/- 1kHz (in line with Specification ETS 300 086)
Frequency Deviation 145 MHz	+/- 2.3 kHz peak deviation recommended (12 ½ kHz channel spacing)

	Mandatory for all Repeaters after June 2000.
Frequency Deviation 430 MHz	+/- 4.8 kHz peak deviation recommended (25 kHz channel spacing) Mandatory for all Repeaters after 1st Jan 2004. +/- 5 kHz peak deviation permitted until 2004
<b>Receiver</b>	
Maximum Receiver Spurious Emissions	-57 dBm

### Other Repeater Characteristics

<b>Receiver</b>	
Maximum usable sensitivity	+ 6 dB $\mu$ V emf
Frequency stability	+/- 1 kHz (in line with Specification ETS 300 086)
<b>Antennas</b>	
Polarisation	Vertical
<b>Access arrangements</b>	
Station identification	Morse or Voice or both Automatically every 5 - 15 mins whilst in use, Also permitted when not in use
Access	Access shall be by means of a 1750 Hz tone (+/- 25 Hz) at half system deviation. Acceptance time of the tone shall be between 200 and 400 ms. Alternatively, use of CTCSS tones is permissible, and for new Repeaters, is recommended. It is anticipated that their use will be mandatory for new Repeaters after Jan. 2004.
Duration of talk-through operation	Limitation of talk-through time per access recommended, e.g. 2 - 5 minutes per access
Remote Control	Recommended, Mandatory for each new Repeater after January 2001

### A3.7 1.3 GHz and 2.3 GHz FM Speech Repeaters

#### Spectrum management parameters

<b>Transmitter</b>	
Maximum Effective Radiated Power	To be calculated for each Repeater on the basis of required service area and set down in the Schedule of the NoV, but up to 26 dBW max.
Maximum Spurious Emissions	43 + 10 log (P) or 70 dBc whichever is the less stringent (NB P=mean power in Watts supplied to the antenna transmission line)
Frequency Stability	+/- 0.01 %
Frequency Deviation	+/- 5 kHz peak deviation
<b>Receiver</b>	
Maximum Receiver Spurious Emissions	-47 dBm

### Other Repeater Characteristics

<b>Receiver</b>	
Maximum usable sensitivity	+ 6 dBµV emf
Frequency stability	+/- 0.01 %
<b>Access arrangements</b>	
Station identification (1st Row) Signal Type 16KOF3WWN	Morse or Voice or both Automatically every 5 - 15 mins whilst in use, also permitted when not in use
<b>Access</b>	
Station identification	Morse or Voice or both Automatically every 5 - 15 mins whilst in use, Also permitted when not in use
Access	Access shall be by means of a 1750 Hz tone (+/- 25 Hz) at half system deviation. Acceptance time of the tone shall be between 200 and 400 ms. Alternatively, the use of CTCSS tones is permissible, and for new Repeaters is recommended. It is anticipated that their use for new repeaters will be mandatory after Jan. 2004.
Duration of talk-through operation	Limitation of talk-through time per access recommended, e.g. 2 - 5 minutes per access
Timeout	Recommended that on completion of a transmission, the Repeater should

	automatically close down after 5 - 15 seconds of no signal appearing on the input
Remote Control	Recommended, Mandatory for each new Repeater after January 2001

### A3.8 1.3 GHz to 10 GHz Television Repeaters

#### Spectrum management parameters

<b>Transmitter</b>	
Maximum Effective Radiated Power	To be calculated for each Repeater on the basis of the required service area and set down in the Schedule of the NoV, 26 dBW max.
Maximum Spurious Emissions	-70 dBc
Frequency Stability (1.3 GHz band)	+/- 0.005 %
Frequency Stability (2.3 GHz band)	+/- 0.01 %
Bandwidth (of vision carrier)	+/- 6 MHz at -18 dBc +/- 12 MHz at -50 dBc +/- 18 MHz at -70 dBc
<b>Receiver</b>	
Maximum Receiver Spurious Emissions	-57 dBm at the Rx antenna terminal

#### Other Repeater characteristics

<b>Receiver</b>	
Maximum usable sensitivity	+ 15dB $\mu$ V emf
Frequency stability	+/- 0.01 %
<b>Access arrangements</b>	
Signal type	FMTV, 16MoF8WWF
Station identification	Given on both Audio (Morse or voice) and Video (call sign given with a vertical height of not less than 10% of total vertical scan), Automatically every 5 - 15 mins whether in use or not
Timeout	Recommended that on completion of a transmission, the Repeater should automatically close down after 5 - 15 seconds of no signal appearing on the

	input.
Remote Control	Recommended, Mandatory for each new Repeater after January 2001

## Annex 4

### Sample NoV

#### First Notice of variation

#### Wireless Telegraphy Act 1949

#### Notice of Variation of Amateur Radio Licence

Name of Licensee:

("the Licensee")

Licensee's Mailing Address:

Licensee's Call Sign:

Date of Issue of the Notice of Variation :

("the Date of Issue")

The Secretary of State, in exercise of the power conferred by s.1(4) of the Wireless Telegraphy Act 1949, hereby varies the Amateur Radio Licence ("the Licence") as follows:

1.1 Terms and expressions defined in the Licence shall have the same meaning herein except where the context requires otherwise.

1.2 In this Notice "the Booklet" means the Amateur Radio Licence (A) or (A/B) or (B) Terms, Provisions and Limitations Booklet BR68 (March 2000 Iss 1 Rev 7 edition) as amended from time to time the terms of which form part of the Licence.

2 As and from the date hereof the Licence shall be read and construed as if:-

- (1) the words "(a)" and "; or (b) a telephony repeater (a facility which receives and simultaneously retransmits Messages by telephony for and behalf of other licensed amateurs). "were deleted from sub-clause 5(5) and a full-stop were inserted at the end of sub-clause 5(5) of the Booklet;
- (2) the following new sub-clause were inserted at the end of Clause 5 of the Booklet:-

### Establishment of Repeater Station

5A (a) Subject to paragraphs (b) to (g) below, the Licensee shall be permitted to establish a repeater station ("Repeater Station") at the location specified in the repeater schedule ("Repeater Schedule").

### **Purpose of the Repeater Station**

(b) The Licensee may operate the Repeater Station attended or unattended so that:

- (i) the Repeater Station may automatically receive from and retransmit to licensed amateur stations Messages and Signals which are permitted under the terms of the Amateur Radio Licence;
- (ii) the Repeater Station may be tested from time to time; and
- (iii) the repeater station may transmit voice announcements to licensed amateur stations, the content and frequency of which must have been agreed in writing in advance by the Radio Society of Great Britain on behalf of the Secretary of State.

### **Limitations**

(c) The Licensee shall operate the Repeater Station at or with:

- (i) the call sign specified in the Repeater Schedule;
- (ii) the frequencies specified in the Repeater Schedule;
- (iii) the single or combined classes of emission specified in the Repeater Schedule;
- (iv) a power not exceeding that specified in the Repeater Schedule;
- (v) the antenna characteristics specified in the Repeater Schedule; and
- (vi) the technical characteristics specified in the Repeater Schedule and for the purpose and type of service specified in the Repeater Schedule.

### **Supply of Information**

(d) Between one and two months before 31st March each year the Licensee shall confirm in writing to the Radio Society of Great Britain on behalf of the Secretary of State that the Repeater Station will continue to be operated in accordance with the Repeater Schedule; failing which the Secretary of State may withdraw the permission contained herein by issuing a further notice of variation to the Licence.

### **Repeater Apparatus**

(e) The Licensee shall:

- (i) at all times take every precaution to avoid over-modulation and keep the radiated energy within the narrowest possible frequency bands having regard to the class of emission in use; and
- (ii) use measuring equipment to verify from time to time that the apparatus comprising the Repeater Station is operating on the frequency, with the class of emission and not greater than the maximum power specified in the Repeater Schedule.

## Control of and Access to the Repeater Station

(f)

(i) Except in an emergency when no written authority is required, the Licensee shall not permit or suffer any person to operate the Repeater Station unless that person is:

(A) under the control of the Licensee or authorised by the Licensee in writing so to do; and

(B) a holder of a current United Kingdom Amateur Radio Licence (A) or (A/B) or (B) appropriate to the frequency used by the Repeater Station.

(ii) The Licensee shall as soon as reasonably practicable notify in writing the Manager of the Local Customer Service office in whose region the Repeater Station is located, on behalf of the Secretary of State, of any change to the closedown arrangements.

(iii) The Licensee shall take all reasonable steps to ensure that all persons operating the Repeater Station are made aware of and comply with the terms, provisions and limitations of this sub-clause 5A and the Repeater Schedule.

(iv) The Licensee shall take reasonable steps to prevent unauthorised operation of the Repeater Station.

(v) The Licensee shall arrange that the Repeater Station is monitored from time to time to verify that it conforms with the Repeater Schedule and that the content of Messages and Signals is in accordance with the terms of the Amateur Radio Licence.

(vi) So far as is reasonable practicable, the licensee shall restrict the operation of the repeater station so as to inhibit the retransmission of messages and signals which are contrary to the Wireless Telegraphy(Content of Transmission) Regulations 1988 or the provisions of the Amateur Radio Licence.

(vii) The Licensee shall as soon as reasonably practicable inform in writing the Radio Society of Great Britain and by telephone the Manager of the Local Customer Service office, in whose region the Repeater Station is located, on behalf of the Secretary of State, whenever the Repeater Station is or is to be switched off or is otherwise not available for use for periods exceeding 72 hours in total or any significant change to the availability of the Repeater such as the installation of a time clock.

(viii) The Licensee shall ensure that, at the request of the local customer service office of the Agency in whose region the Repeater is located, the Repeater can be switched off within 30 minutes of such a request being received. The Licensee is required to inform both the Radio Society of Great Britain and the local customer service office of any changes to the closedown list for the Repeater.

## **Repeater Station Log**

(g)

(i) The Licensee shall keep a record (the "Repeater Log") for the Repeater Station showing:

(A) the dates and times (in Co-ordinated Universal Time (UTC)) during which the Repeater Station is switched on and available for use, or during which test transmissions are made; and

(B) details of tests carried out from time to time to ensure that the requirements of sub- clause 5A(e) (ii) are met."

(3) the word "Station" included "Repeater Station" except in sub-clause 4(5) and the word "Log" included "Repeater Log" unless in both cases the context requires otherwise; and

(4) the repeater Schedule attached hereto as amended or replaced from time to time by notice from the Secretary of State were inserted after the Notes to the Schedule to the Booklet.

3 In addition to the circumstances referred to in sub-clause 5A(d) of the Licence set out above the Secretary of State may withdraw the permission contained herein at any time by issuing a further notice of variation to the Licence if inter alia the Secretary of State sees fit to determine that a more effective geographical coverage would be achieved for the repeater network if the Repeater Station were closed down and a Repeater Station were established in a different location or if the Repeater Station is operated outside the terms of sub-clause 5A, the Repeater Schedule and the other terms and conditions of the Licence.

**On behalf of the Secretary of State for Trade and Industry**

## **Annex 5**

### **Sample Schedule to NoV**

Issued to:

Call sign:

Date of issue:

### **Repeater Station**

Repeater Call sign:

Date of issue of NoV:

Purpose of Repeater Station and Type of Service:

Description of coverage area:

Repeater Station Location:

National Grid Reference:

Site height (m amsl)

### **Technical Details**

Technical Specification reference:

Date:

**Frequencies** (where applicable, and including units):

- Transmitter:
- Receiver:
- CTCSS Frequency:
- Linking frequencies:
- Any additional frequencies:

**Class of Emission** (for each frequency of operation):

Maximum Transmitter Power (Peak effective radiated power, dBW, for each frequency of operation quoted):

### **Antenna Characteristics**

- Antenna type:
- Direction of maximum radiation (degrees East of True North):
- Polarisation:
- Height of antenna above ground (m agl):

### **Voice Announcements**

**Note:**

**No change may be made to the Repeater Station without prior written approval of the Secretary of State if that change would cause the Repeater Station to deviate from this Schedule.**

### **Annex 6**

#### **Useful Reading**

#### **Available from the Agency**

MPT 1326 Angle-modulated VHF and UHF radio equipment for use at fixed

and mobile stations in the Private Mobile Radio Service;  
 MPT 1351 Code of Practice for Repeater Operation at Communal Sites;  
 MPT 1362 Code of Practice for installation of mobile radio equipment in land based vehicles;  
 MPT 1368 Code of Practice for the inspection of a Land Mobile Radio System for conformity with the Wireless Telegraphy Act Licence and Performance Specification;  
 MPT 1372 Code of Practice for field maintenance and repair of civil land mobile radio;  
 RA 206 Radiocommunications Agency's Local Offices.  
 RA 97 Guide to Class of Emissions.

**Available from the RSGB**

RSGB Year Book Radiocommunication Handbook  
 The VHF/UHF Handbook

**Available from the ITU**

CCIR Recommendation 405-1 Pre-emphasis characteristics for frequency modulation radio-relay systems for television.

The above can be found in Recommendations of the CCIR, 1990 Volume IX-Part 1 and is available from the ITU whose website is at [www.itu.int](http://www.itu.int)

**Annex 7**

**Glossary of Terms**

IARU International Amateur Radio Union ITU International Telecommunications Union Agrees and publishes ITU Radio Regulations  
 ITU-R ITU Radiocommunications Sector kHz KiloHertz 1000 Hz km Kilometre 1000m km<sup>2</sup> Kilometre squared Unit of Area Lat Latitude Long Longitude m metre(s) Unit of distance MHz MegaHertz Unit of frequency x10<sup>6</sup> ms Millisecond(s) Unit of time x10<sup>-3</sup> mV milli-Volt(s) Unit of voltage x10<sup>-3</sup> mW milli-Watt(s) Unit of power x10<sup>-3</sup> NFAP National Frequency Assignment Panel Cabinet Office Committee NGR National Grid Reference NoV Notice of Variation (to Amateur Radio Licence) RA Radiocommunications Agency Executive Agency of the Department of Trade and Industry RMC Repeater Management Committee Committee of RSGB RSGB Radio Society of Great Britain RSGB HQ RSGB Headquarters Llambda House, Cranborne Road, Potters Bar, Herts EN6 3JE RX Receiver s Second Unit of time SINAD (Signal+Noise+Distortion)/ (Noise+Distortion) Signal to noise and distortion ratio TV Television TX Transmitter UHF Ultra High Frequency 300 MHz - 3 GHz V Volts unit of voltage μV micro-Volts Unit of voltage x 10<sup>-6</sup> VHF Very High Frequency 30 MHz - 300 MHz W Watt Unit of power

ABBREVIATION	MEANING	REMARKS

agl	Above ground level	
amsl	Above mean sea level	
CAA	Civil Aviation Authority	
CTCSS	Continuous Tone Controlled Squelch System	
dB	Decibel	Logarithmic ratio
dBc	Decibels relative to the unmodulated carrier power of the emission	
dBd	Decibels relative to dipole antenna	
dBm	Decibels relative to 1 milliWatt	
dBW	Decibels relative to 1 Watt	
DCSS	Digital Code Squelch Signalling	
eirp	Equivalent isotropically radiated power	
EMC	Electro Magnetic Compatibility	
erp	Effective radiated power	
FM	Frequency Modulation	
GHz	GigaHertz	Unit of frequency $\times 10^9$
Hz	Hertz	Unit of frequency
IARU	International Amateur Radio Union	
ITU	International Telecommunications Union	Agrees and publishes ITU Radio Regulations
ITU-R	ITU Radiocommunications Sector	
kHz	KiloHertz	1000 Hz
km	Kilometre	1000m
km <sup>2</sup>	Kilometre squared	Unit of Area
Lat	Latitude	
Long	Longitude	
m	metre(s)	Unit of distance
MHz	MegaHertz	Unit of frequency $\times 10^6$
ms	Millisecond(s)	Unit of time $\times 10^{-3}$
mV	milli-Volt(s)	Unit of voltage $\times 10^{-3}$
mW	milli-Watt(s)	Unit of power $\times 10^{-3}$
NFAP	National Frequency Assignment Panel	Cabinet Office Committee
NGR	National Grid Reference	
NoV	Notice of Variation (to Amateur Radio Licence)	

RA	Radiocommunications Agency	Executive Agency of the Department of Trade and Industry
RMC	Repeater Management Committee	Committee of RSGB
RSGB	Radio Society of Great Britain	
RSGB HQ	RSGB Headquarters	Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JE
RX	Receiver	
s	Second	Unit of time
SINAD	(Signal+Noise+Distortion)/ (Noise+Distortion)	Signal to noise and distortion ratio
TV	Television	
TX	Transmitter	
UHF	Ultra High Frequency	300 MHz - 3 GHz
V	Volts	Unit of voltage
μV	micro-Volts	Unit of voltage $\times 10^{-6}$
VHF	Very High Frequency	30 MHz - 300 MHz
W	Watt	Unit of power