Training Introduction

Welcome to the intriguing hobby of Amateur (or "Ham") Radio. It is a technical hobby open to all and with a wide variety of different activities from the obvious "chatting" on air through data modes where information is sent between computer stations as words or pictures, video transmissions and more esoteric activities such as operating via orbiting satellites or even sending signals via the moon!

Sounds exciting? Sounds like something you want to get involved with? Well your next step is to obtain an Amateur Radio Licence and then develop your knowledge and understanding through the higher levels to demonstrate your increased knowledge and understanding and gain additional privileges.

South Bristol Amateur Radio Club has an enviable reputation for providing classroom based training to assist you in gathering the knowledge and understanding to successfully sit all three levels of the UK Amateur Radio Exam.

In the UK there are 3 levels of Amateur Radio Licence:

- Foundation;
- Intermediate; and
- Full

Each licence level progressively introduces more knowledge and skills in return for greater operating privileges.

You don't have to sit all three levels and you can progress at your own pace but you need to have at least a Foundation Licence before you transmit on air.

The Training Team

South Bristol's training team currently (as 01/01/2024) consists of:

- Steve G0UQT
- Andy G7KNA
- Chris 2E0TBS

Once your course is in progress you will be given the contact details to allow you to get in touch with whomever is running your course. Should you mis-place these details you can always fallback on the training contact (training@sbarc.co.uk).

Please remember that all the training offered by the Club is undertaken on a voluntary basis, the people helping you have lives and commitments outside of the Club; please respect this.

Licence Classes

As a summary, the essential privileges of each licence are:

Foundation Licence

In simplistic terms this is the "entry level" licence, it is the minimum you require to transmit legally on the Amateur Radio bands. The course is an introduction to radio operation and radio theory and can be completed by anyone with an interest in radio and a desire to learn. There is no requirement to have any prior understanding or use of radio. The course will cover:

- content and structure of the licence;
- rules and regulations governing the use of the Amateur Radio spectrum;
- basic electrical theory: application of Ohm's Law (V=IxR and P=IxV) to simple circuits;
- simple propagation theory – how radio waves travel why some bands are worldwide and others are 10 miles in range; and
- an introduction to antennas and feeders (the wire from your transceiver to the antenna).

Once you have obtained your Foundation Licence you will be able to do the following:

- Transmit legally on all Amateur Radio Bands from 2200m – 70cm excluding 60m plus the 13cm, 9cm and 3cm bands;
- Transmit on the Amateur bands with a maximum output of 25W (some bands have additional restrictions);

- Use FM, AM, SSB, CW and data modes in any of the above Amateur Radio Bands as set out in the UK Band Plans;
- Operate via Amateur Radio Satellites;
- Contact other licensed amateurs throughout the world or just around the corner; and
- Take part in Amateur Radio competitions and contests.

Some limitations are imposed on the operation of the Foundation licence, a few are set out below:

- Operate with a maximum power of 25W out of the transceiver (some bands have additional restrictions);
- May not operate from a Vessel at Sea in International Waters although you may contact Full Licence stations and foreign stations who are permitted to operate from such vessels; and
- May not operate in countries outside of the UK without an appropriate licence from the local authorities. The Foundation Licence will not automatically qualify you for a foreign licence in any country outside of the UK.

Intermediate Licence

Step 2 on the ladder, the Intermediate Licence takes you deeper into the theory of radio and electronics and confers additional bands, power and other privileges compared to the Foundation Licence. In order to sit the Intermediate Exam you must have passed the Foundation Exam.

The Intermediate Course builds on the Foundation and the practical experience you will have gained as a Foundation operator and goes deeper into the theories of:

- Electronics – introduction of additional components, tuned circuits, AC;
- Propagation – Increased description of the Ionosphere;
- Antenna – Polar diagrams;
- Feeder – Losses; and
- Construction – soldering, circuit construction.

As a result of passing the Intermediate Exam you will gain the following privileges over and above the Foundation Licence:

- Access to all Amateur Bands from 2200m – 1.2mm excluding 60m;
- Maximum output power of 100W on all allocated Amateur Bands (some bands have additional restrictions);

There are still restrictions imposed upon you as an Intermediate Licence holder, some of the main ones are:

- Limit of 100W maximum power from the transceiver (some bands have additional restrictions);
- May not operate from a Vessel at Sea in International Waters although you may contact Full Licence stations and foreign stations who are permitted to operate from such vessels; and
- May not operate in countries outside of the UK without an appropriate licence from the local authorities. The Intermediate Licence will not automatically qualify you for a foreign licence in any country outside of the UK.

Full Licence

The Full Exam is the final step on the incentive based licensing system and naturally provides the highest level of privileges and requires the highest level of knowledge. The additional knowledge is all related to the theory of radio or electronics.

Once you have passed this exam you will have the following additional privileges over and above the Intermediate Licence:

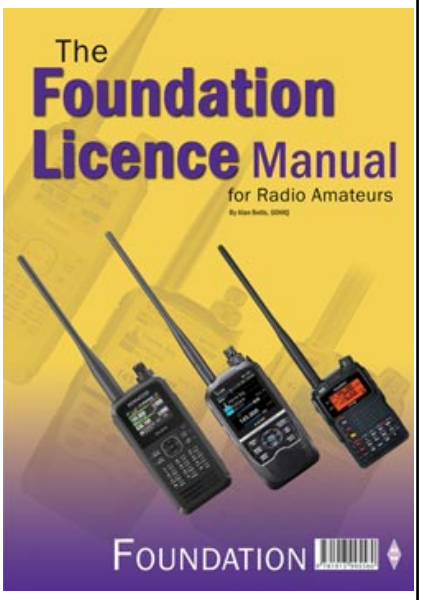
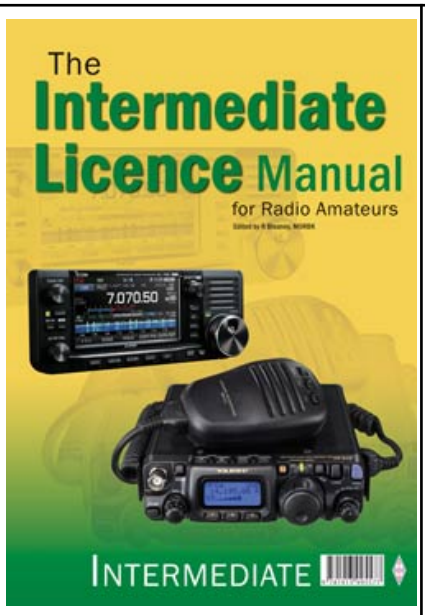
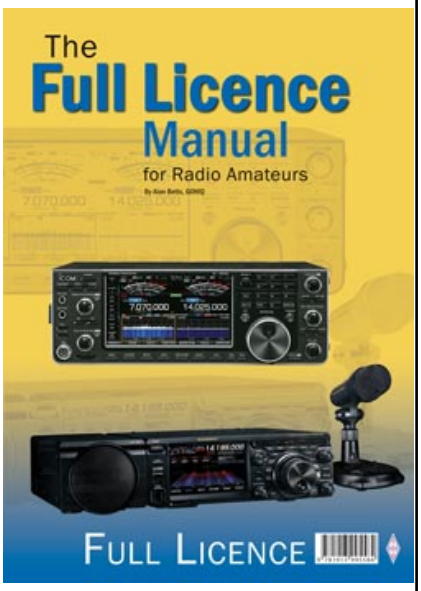
- Limit of 1000W maximum power on primary bands (secondary bands are limited to 400W maximum power and some bands have additional restrictions);
- Ability to operate "Maritime Mobile" from a Vessel at Sea in International Waters with the permission of the vessels master;
- Ability to apply for Notices of Variation (NoV) to operate Special Event stations or for experimental purposes; and
- Reciprocal Licensing Agreements with many other countries allowing operation from foreign countries.

Reference Materials

South Bristol ARC training notes are available through our website at the following URL:

SBARC Training Pages

The RSGB have published books in paper and Kindle format for each of the exam levels.

RSGB Bookshop	RSGB Training Books	
		
Kindle Edition	Kindle Edition	Kindle Edition

The Exam

The knowledge and skills you gain through our courses and your own reading is tested in a multiple choice exam. Each question offers 4 possible answers of which only 1 is fully correct. Your mission (should you choose to accept it) is to identify the correct answer out of the 4 offered.

The exam is offered as an electronic test on computer. The electronic test can be taken at a Club Exam Centre or through remote invigilation at your own home. Paper based exams are available for those with particular needs that would cause them to be disenfranchised

by a computer based exam but can only be sat at an approved exam centre. South Bristol ARC is a registered exam venue.

Some people need assistance with exams to compensate for various personal issues. Some considerations can be accommodated as long as there is sufficient evidence of the need. Remember that these adaptations can only be provided on the presentation of sufficient evidence and we at the Club **cannot** provide this evidence. If you feel you need assistance you will have to discuss this with your assessor and provide the necessary evidence to allow your assessor to present a case to the RSGB who administer the exam system.

Organising an adapted exam takes longer than organising a standard exam, therefore if you feel you need some form of assistance talk to your assessor at the earliest opportunity.

Table 1: Exam Parameters

Parameter	Foundation	Intermediate	Full
Duration	60 minutes	90 minutes	120 minutes
No. of Questions	26	46	58
Pass Mark	19 (73%)	28 (61%)	35 (60%)
Question Breakdown			
Amateur Radio, Licences and Callsigns	6	6	7
Technical Aspects	3	14	11
Transmitters and Receivers	3	7	12
Feeders and Antennas	3	4	4
Propagation	2	3	3
EMC	3	4	10
Operating	3	2	2
Safety	3	3	4
Measurements and Construction	0	3	5
Practical Assessments	No	No	No

Costs

South Bristol ARC offers on-line virtual classroom courses at no cost. If you would like to meet us in person we meet at the Novers Park Community Association in Novers Park

Road, you can get full details from our website. Membership charges are set each year but require the individuals to also make their own arrangements to join the Novers park Community Association.

The RSGB, who administer the exams, charge each candidate for their exams.You can pay online through the RSGB selecting "Individual booking" at:

Link to Online Exam Payments

Current exam charges (correct at 01/05/2024):

- Foundation £35.50
- Intermediate £39.00
- Full £45.00
- Direct to Full £95.00

Notes and Handouts

We have prepared lesson notes for each topic in the syllabus. These have been set out to closely follow the published syllabus and reflect the actual wording within the syllabus. The syllabus uses two terms to differentiate the level of knowledge that a student is expected to have at each stage of the Licence structure, these are: **recall** and **understand**.

Recall indicates the need to remember a fact and apply it fairly directly to a question or situation. A thorough understanding of why the fact is so and the full range of circumstances in which it is applicable is not required, but questions will expect a basic understanding of its meaning and implications.

Understand indicates the need for a more detailed knowledge of the subject, fully comprehending the reasons why the point is correct and the range of circumstances in which it is relevant and applicable. Typically, this will be where the candidates will find themselves having to make judgements or apply a practice to a wider range of circumstances.

These terms should be read in the context of the level of the examination concerned. At Foundation level there are more 'recall' syllabus items than 'understand' whereas at Full

level the majority are of an 'understand' nature that will expect the candidate to know the background to the topic and the implications of not adopting the accepted practice.

Formulae

At Foundation level it is important that candidates understand the fundamental principles behind the theoretical topics discussed. For that reason, no formula sheet is provided.

At Intermediate level some of the more complex formulae are provided but may need to be transposed.

At Full level, all formulae will be provided. They will not be titled or explained, and candidates will be expected to recognise which formula is appropriate and may need to transpose it depending on the parameter to be calculated.

Mathematics and Symbols

Some knowledge of mathematics will be required during any course and prior to the relevant examination. Tutors and candidates should address this requirement as necessary.

Foundation Licence

The following levels of knowledge and ability are needed by the time candidates are ready to take the Foundation Licence Examination.

Mathematical:

- Addition, subtraction, multiplication, and division.
- Simple fractions and their decimal equivalents.
- Multiple and sub-multiple units from micro to Giga.
- Conversion of numbers from 10^{-3} to 10^{9} to/from decimal.
- Understanding of simple formulae, e.g. $I = \frac{V}{R}$ and rearrange them to make any parameter the subject of the formula.

Circuit Symbols and Diagrams:

- The symbols shown in Table 1 and the diagrams in Table 2 may be used in any examination item as required.

Table 1 - Symbols for the Foundation Exam

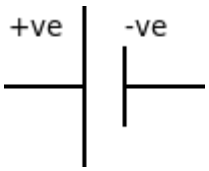
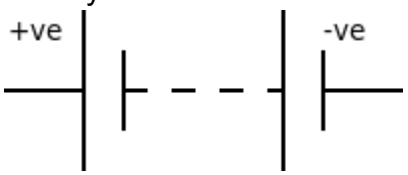
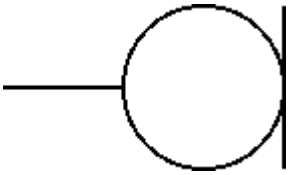
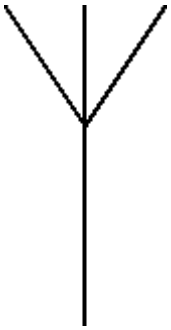
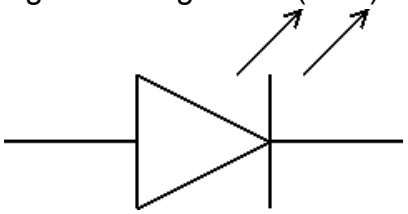
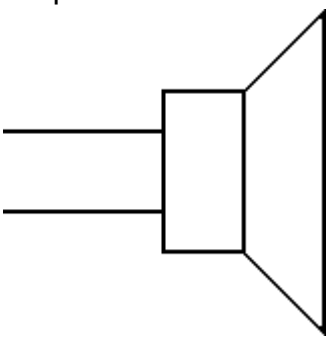
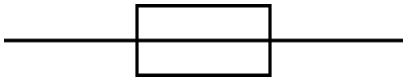
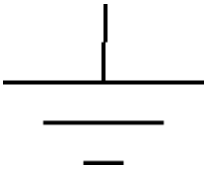
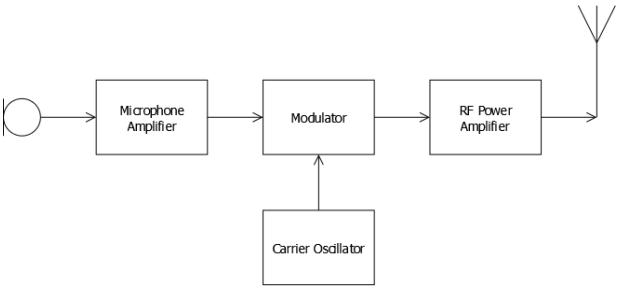
Cell 	Battery 	Lamp (Incandescent) 
Switch s.p.s.t. 	Resistor 	Microphone 
Antenna 	Light Emitting Diode (LED) 	Loudspeaker 
	Fuse 	Earth 

Table 2 - Diagrams for the Foundation Exam

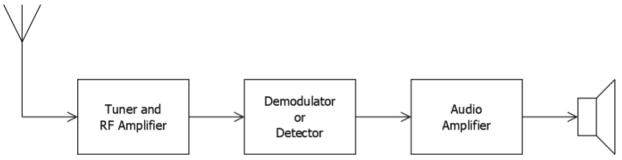
Analogue Transmitter
The block diagram shown will be used for all assessment questions. It is not intended that the blocks will relate to any particular architecture of radio, merely the basic functions that need to be performed.

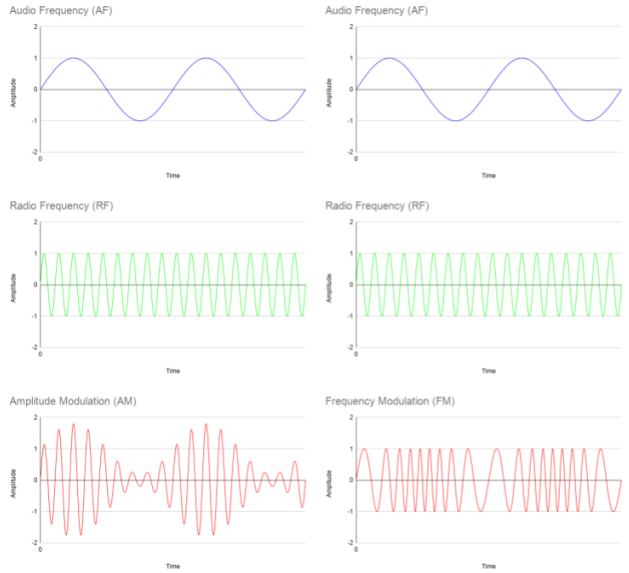
The symbols for the microphone and antenna should also be known



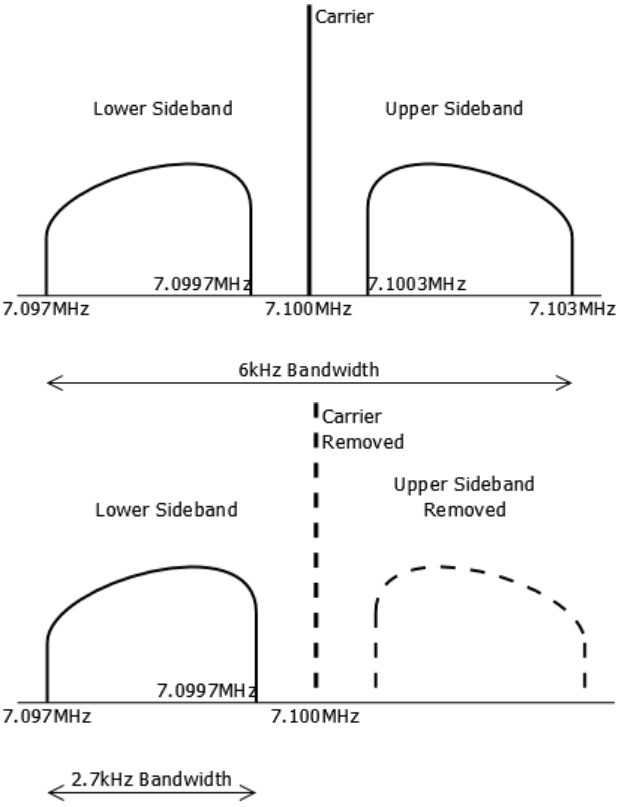
Analogue Receiver
The block diagram shown will be used for all assessment questions. It is not intended that the blocks will relate to any particular architecture of radio, merely the basic functions that need to be performed.

The loudspeaker symbol should be known.





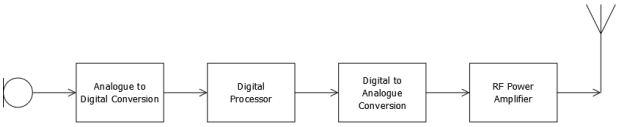
Note: different AM depths of modulation may be used



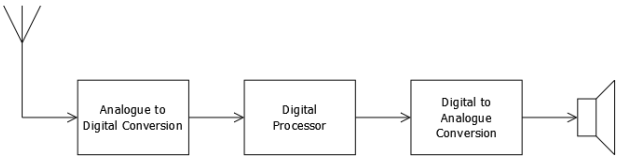
Note: different bandwidths may be used

CW Signal Envelope

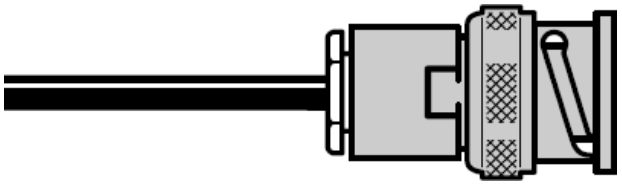
Digital Transmitter
A to D is an analogue to digital converter
D to A is a digital to analogue converter



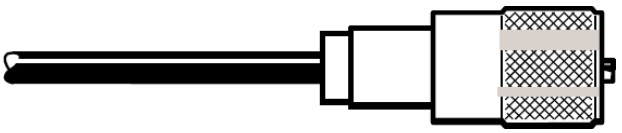
Digital Receiver
A to D is an analogue to digital converter
D to A is a digital to analogue converter



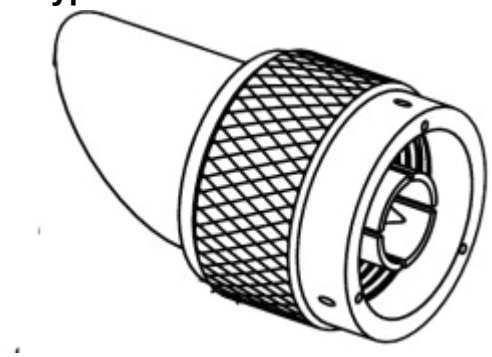
BNC



BPL259



N-Type



SMA

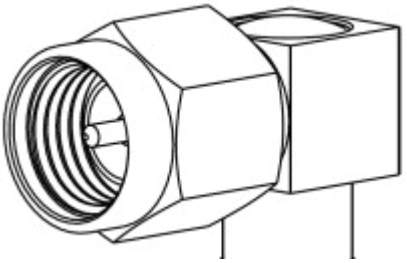
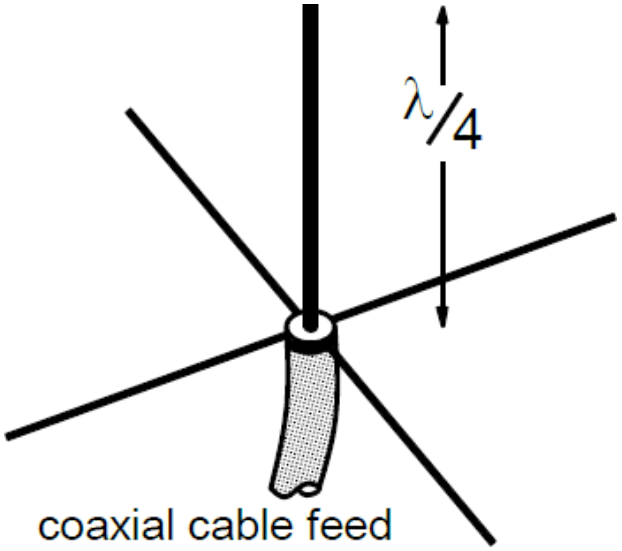


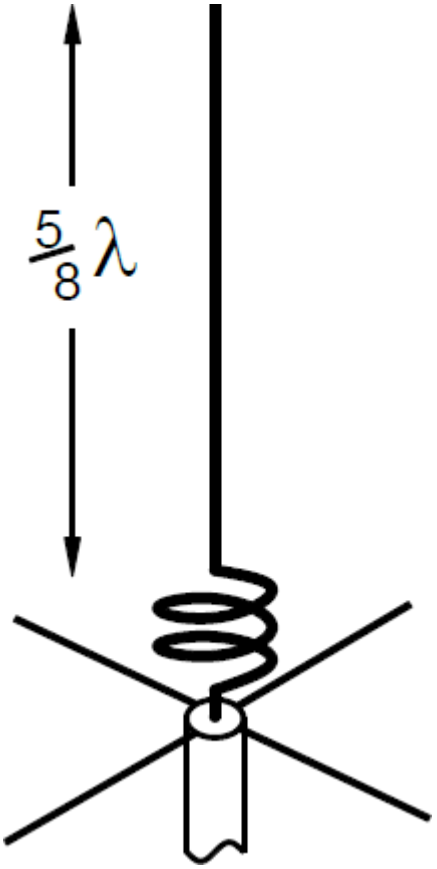
Table 2 - Diagrams for the Foundation Exam (continued)

¼ λ Ground Plane



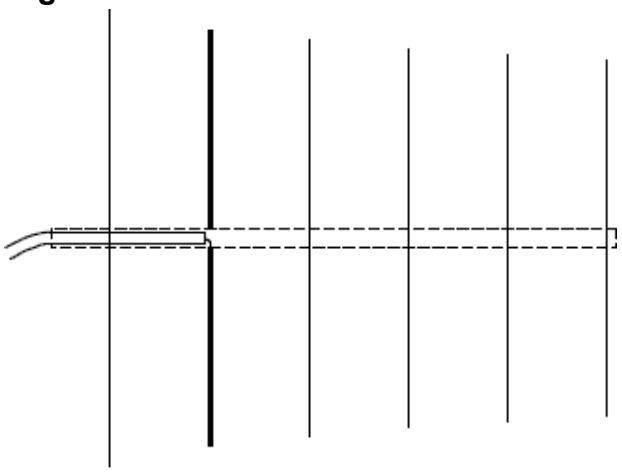
Note: Exam questions will not show the dimensions

⅝ λ Ground Plane



Note: Exam questions will not show the dimensions

Yagi



Dipole

Intermediate Licence

The following levels of knowledge and ability as well as those at Foundation level are needed by the time candidates are ready to take the Intermediate Licence Examination.

Mathematical:

- Requirements of Foundation plus:
- Multiple and sub-multiple prefixes from Pico to Giga.
- Calculations with quantities from 10^{-12} to 10^{12} recognising that interim stages may go outside those limits.
- Use of simple formulae containing brackets, squared or square root operators e.g. $I = \sqrt{\left(\frac{P}{R}\right)}$ or $P = \frac{V^2}{R}$

Circuit Symbols;

- The symbols and diagrams shown in Tables 3 and 4 may be used in any examination item as required.

Table 3 - Symbols for the Intermediate Exam

<TO BE ADDED>

Table 4 - Diagrams for the Intermediate Exam

<TO BE ADDED>

Full Licence

The following levels of knowledge and ability as well as those at Foundation and Intermediate levels are needed by the time candidates are ready to take the Full Licence Examination.

Mathematical:

- Requirements of Intermediate plus:
- Use and transposition of more complex formulae e.g. $f = \frac{1}{\left(2\pi\sqrt{LC}\right)}$
- The symbols in Table 5 may be used in any examination item as required.

Table 5 - Symbols for the Full Exam

<TO BE ADDED>