



REQUIREMENTS FOR THE PRACTICAL ASSESSMENTS FOR THE AMATEUR RADIO EXAMINATIONS

For Examinations from 1 September 2019

This document covers Candidate Practical Achievement Records (CPAR) for both Foundation and Intermediate examination levels.

Issuing the Foundation CPAR.

The CPAR must be issued to each candidate by a Registered Assessor (RA).

Only original forms are valid, no photocopies or scanned images.

CPAR forms are available to RAs only from the RSGB Examination Department.

The RA must check the candidate details are correct, enter the date of issue, the date of the Foundation examination and then sign in the 'Issued' box with his or her printed name and registration number.

Only then is the Foundation CPAR valid for Operating* under clause 3(3)(a) of the Full licence.

Candidates should keep their CPAR document safe. It must be shown during the ID process conducted prior to commencement of the examination. Once signed at the top by a registered assessor the named candidate may operate an amateur radio transmitter in accordance with licence clause 3(3)(a) during the time period between issue of the CPAR and the date of the Foundation examination.

* Operating includes setting the transmitter/transceiver controls and pressing the PTT.

Introduction

This document defines practical elements or skills of amateur radio, which are assessed at the Foundation and Intermediate levels. The skills aim to complement and reinforce, by hands-on experience, the theoretical work studied by the candidate.

All registered examination centres in the United Kingdom, the Channel Islands and the Isle of Man must adhere to these specifications, which seek to introduce the candidate to the basics of both good operating practice when using a radio and the basics of radio construction methods. In so doing we also hope to promulgate good practice across the amateur radio community. All examination candidates should read a copy of this document well in advance of their practical assessment and be familiar with the requirements. Candidates are also advised to work with an experienced radio amateur for a period during the training course and witness at first hand good practice in both operation and construction methods.

The various skills for each level described in the following pages may be assessed in any order and spread over several sessions if this proves either necessary or convenient.

Each skill involves a number of tasks, which must all be completed before an assessor can sign off the task as being complete. The theory examination at Foundation level may only be taken when foundation level tasks have been successfully completed. Similarly, the theory examination at Intermediate level may only be taken after the Intermediate level practical tasks have been successfully completed. There is no objection to Intermediate tasks being completed prior to the Foundation examination and completed assessments are valid for 12 months from the date of signature by the Registered Assessor.

Any appropriately licensed radio amateur approved by the Registered Assessor may oversee, assess and sign off individual tasks that make up each of the elements. Such confirmation should only be done once all the separate, individual, numbered elements or tasks have been completed to the Registered Assessor's satisfaction.

Only a Registered Assessor (RA) may sign-off as complete a Candidate's Practical Record of Achievement. The RA should take appropriate steps to ensure that all elements assessed and signed off by others have been completed to the standard required (e.g. by speaking to the assessor and/or the candidate checking that all individual elements of an item have been completed).

If a candidate finds difficulty in attaining the required standard with any task the assessor or tutor is encouraged to offer advice and assistance until such time that they judge the candidate has reached a sufficient level of proficiency. However, assessors should follow the procedures closely to ensure comparability and maintenance of standards across examination centres.

Notes:

There is no formal requirement placed on persons assessing individual tasks other than:

1. Being judged competent by the RA. Any radio amateur licensed at either Intermediate or Advanced level may apply to the RSGB to become a RA. RAs holding an Intermediate licence are only permitted to sign off records at the Foundation level.
2. The Morse practical element at Foundation level must be conducted by an amateur the RA deems competent in that mode.

FOUNDATION LEVEL PRACTICAL ASSESSMENT

In order to complete this assessment, it is necessary for Foundation level candidates to demonstrate ability in the operation of an amateur radio transceiver at both VHF/UHF and HF frequencies to standards described below. Prior to taking the Foundation Examination an unlicensed candidate may Operate a transceiver for training purposes under supervision of a Full Licensed amateur providing the candidate is in possession of a valid document CPAR-F.

*The issuing Registered Assessor (RA) **must** sign the top of the CPAR-F form to certify that the candidate is on a recognised training course and may operate an amateur radio transmitter under clause 3(3)(a) of a Full Licence. The date of issue and the date of the examination must be shown when the CPAR-F is issued.*

*The issuing RA **must** keep a record of who CPAR-F forms have been issued to provide a means of checking the CPAR-F has been validly issued.*

Candidates may Operate in the presence of and under the direct supervision of a Full Licensee from the time of issue of this document until the date of the examination shown on the CPAR-F. The location of formal lectures and practical assessments may differ as facilities permit.

Operation under licence clause 3(3)(a) includes setting the controls and pressing the PTT. Operation after the examination is not in accordance with the supervisor's licence and unsupervised operation is not permitted until the candidate has his or her own licence.

Speaking into the microphone under clause 3(4) is not regarded as Operation by the candidate and the Full licensee must then set the controls and press the PPT. A desk microphone or separate PTT is preferred.

Operating

<p>10A1</p>	<p>Demonstrate the ability to make a contact using a mode other than telephony.</p> <p>This may be either: A data contact on-air or Receiving and sending Morse code which need not be on-air.</p>	<p>Data Contact. This contact must be made on air and include as a minimum:</p> <ul style="list-style-type: none"> • tuning the radio and/or the computer system to the correct frequency, • selecting the correct mode, • setting the radio microphone gain and/or computer audio interface to correct levels and, • the two-way exchange of call sign, signal report, location. <p>The candidate must type and send all information in real time.</p>
		<p>Morse Code. Demonstrate ability to send correctly by hand, and to receive correctly by ear, text in Morse Code. The receiving and sending test shall be conducted using text from the RSGB provided booklet. The candidate may choose the character speed and spacing*. The candidate will be provided with a copy of the Morse Code both in code and alphabetical sequence during the assessment.</p> <p>Receiving test: The candidate may, if desired, write down the dots and dashes for subsequent transcription and proceed one letter at a time. The tutor may re-send characters if required. Sufficient correct code must be received for the content of the message to be understood.</p> <p>Sending test: The candidate is permitted to make any necessary preparations prior to sending, including writing the Morse code for each character to be sent. The assessor will indicate which characters, if any, were incorrectly sent and these shall be re-sent. This may be on a letter-by-letter basis or at the end of the exercise. Sufficient correct code must be sent for the content of the message to be understood.</p> <p><i>* The use of pre-recordings or software is permitted provided the above requirements are met.</i></p>

10A2	Demonstrate the ability to make a contact using SSB.	<p>The contact must be made on air and include as a minimum:</p> <ul style="list-style-type: none"> • Tuning the radio to the correct frequency, or section of the band; • Selecting the correct mode; • Setting the radio microphone gain to the correct level; • Checking if the frequency is in use and make a CQ call; • Vacating the calling frequency if appropriate after establishing the initial contact; • The two-way exchange must include call sign, signal report and location; • Ending the contact • Recording all details of the contact on the log page in this booklet.
10A3	Demonstrate the ability to make a contact using FM simplex.	<p>The contact must be made on air and include as a minimum:</p> <ul style="list-style-type: none"> • Setting the radio to the correct calling frequency; • Selecting the correct mode; • Correct setting of the squelch control; • Making a CQ call; • Vacating the calling frequency after establishing the initial contact; • Checking if the new (working) frequency is in use; • Establishing contact on the working frequency. • The two-way exchange must include call sign, signal report and location; • Ending the contact. • Recording all details of the contact on the log page in this booklet.
10A4	Adjust the physical length of an antenna for lowest SWR.	<p>Assessment to be performed using an adjustable antenna with a transmitter or transceiver and a SWR meter¹. Alternatively an antenna analyser displaying SWR may be used².</p> <p>Candidate must:</p> <ul style="list-style-type: none"> • be familiar with the operation of the SWR meter available for the test. • adjust the length of the antenna to achieve an SWR of 1 or close to it. <p>Note: The antenna elements are not to be adjusted whilst transmitting. Correct procedure for a radiating test shall be demonstrated.</p> <p>The two halves of the antenna must be set to the same length on each test.</p> <p>It must be evident that the lowest SWR is achieved, for example by recording or plotting the SWR against length showing the minimum point and an increase in SWR each side of the minimum.</p> <p><i>1. The SWR meter may be internal or external with single, twin or, crossed needle provided the SWR is clear.</i></p> <p><i>2. The analyser must display SWR and may also display R and X depending on type.</i></p>

10A5	Using a manual Antenna Matching Unit (AMU or ATU)	<p>Match an antenna system for lowest SWR on at least two bands using a transmitter or transceiver and a (manual) antenna matching unit.</p> <p>Note that the lowest SWR may require three components to be adjusted so that the lowest obtainable value is achieved whereas adjusting just two components will produce false minimums.</p>
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Construction

10B1	Correctly connect up a station.	<p>Connect up a station such that it is ready for on-air operation.</p> <p>Items to be connected will include, as a minimum, mains PSU, amateur radio transmitter/receiver or transceiver, microphone or PC interface, external item (e.g. VSWR/Power meter, AMU, filter), feeder and antenna. Other accessories can be included as appropriate to local circumstances (e.g. external speaker).</p> <p>Correct setting up shall be demonstrated by means of a brief contact.</p> <p>Note: A dummy load may be used for this part of the assessment in place of an antenna if it is convenient or appropriate to do so with the 'contact' being locally arranged.</p>

When the Candidate has finished all parts of the assessment and the assessor has confirmed each item has been completed successfully, the Registered Assessor should fill in the boxes at the very end of the form confirming that the candidate has completed the total assessment according to the requirements of the Foundation Level Syllabus.

INTERMEDIATE LEVEL PRACTICAL ASSESSMENT

Intermediate Assessment requirements

Item	Skill	Procedure
10B1	Safety briefing	Prior to carrying out constructional activities candidates should review the relevant safety features contained in the Foundation syllabus at 8a6, 8a7, 8a8, 8B and 8D.
10B2	Demonstrate the ability to make good solder joints	<p>Joints can be made using surface mount or through-hole components, tracked PCB, PCB pads, strip board, solder tags etc. A minimum of 5 good joints are required.</p> <p>1) The assessor may choose to see the candidate make a soldered joint using an available soldering station or 2) May rely on evidence presented by the candidate in their construction project.</p> <p>In either case the joint must:</p> <ol style="list-style-type: none"> a) contain an appropriate volume of solder b) assuming tin/ lead solder has been used the joints are bright; no visual evidence of dry joints c) not have solder that has flowed into other areas that may cause problems with short circuits.
10B3	Make a simple circuit	<p>Make a simple circuit. consisting of a battery, Light Emitting Diode (LED), or lamp and switch</p> <p>This can be done in any convenient way using circuit board or 'plug-in' board that emphasises to the candidate that current will only flow if there is a complete circuit.</p>
10B4	Transistor operation	<ul style="list-style-type: none"> • Demonstrate that a transistor can be used as a switch in a simple DC circuit. • Measure base and collector currents and calculate gain. <p><i>Note: The circuit in 10B3 may be expanded to include the transistor demonstration circuit.</i></p>
10B5	Construction project	<p>Build an amateur radio related project containing a selection of electronic components*. Key requirements are sufficiently complex to demonstrate: correct selection of a variety of components, correct orientation and soldering of components, project must be complete and working as intended. Construction may be carried out either within a course or elsewhere, but the assessor must be satisfied that the bulk of the work is that of the candidate.</p> <p><i>* See guide below.</i></p>

10B6	RF Connector	<p>Fit a suitable RF connector (such as PL259, BNC, N or other suitable RF connector type) to a piece of coaxial cable. Connectors may be soldered, compression, crimped or a combination.</p> <p>Candidate to demonstrate:</p> <ul style="list-style-type: none"> • That the cable is properly prepared. Braid, insulation and inner conductor not damaged • Braid, inner conductor and insulation cut to fit connector accurately • where solder is used, a well-made joint has resulted • electrical continuity of braid and inner conductor • there is no short circuit between inner conductor and braid.
10C1	Measure DC potential difference (PD) and current in series and parallel circuits.	<p>Measurement of PD The candidate must...</p> <ul style="list-style-type: none"> • select an appropriate DC range on the voltmeter • measure the PD across each component accurately and record their values • be able to comment knowledgeably on the relationship between the measured battery PD and those measured in the circuit • switch off the meter and circuit when the measurements are completed. <p>Measurement of current</p> <ul style="list-style-type: none"> • high DC current range selected on ammeter • current measured by bridging switch with ammeter and reading noted • more appropriate range on ammeter selected correctly • current measured by bridging switch with ammeter and reading recorded • meter removed and circuit broken at a point other than the switch • current measured by bridging the break with ammeter and reading recorded • current reading at two points compared <p><i>Note: The circuit in 10B3 may be expanded to include this task.</i></p>
10C2	Measurement of resistance	<p>Measure the value of a number of resistors and compare with the component markings. A minimum of four resistors (at least one from each of the ranges: 1-99, 100-999, 1k-99k and $\geq 100k$) must be correctly measured.</p> <p>Any type of resistor is acceptable a numeric or colour value scheme may be used.</p> <ul style="list-style-type: none"> • Values read using colour/numeric code and correctly recorded • correct ohmmeter range selected • analogue meter set to zero (if used) • values measured correctly and recorded • measured values compared with code values to confirm accurate reading/measurement
10C3	Resistor values	Determine the value of at least two resistors using measured values of V and I and compare with the marked component values.
10C4	Crystal oscillator	Demonstrate that a crystal oscillator is stable when subjected to reasonable temperature changes and mechanical shock.

10C5	VFO	Demonstrate that an LC Variable Frequency Oscillator (VFO) is not very stable when subjected to reasonable temperature changes and mechanical shock.
10C6	Harmonics	Find at least the 2nd and 3rd harmonics from an RF oscillator by using either a receiver or spectrum analyser.
10C7	Filters	Demonstrate the reduction in harmonics by using a low pass filter, measured using either a receiver or spectrum analyser.
10C8	VFO calibration	Calibrate a variable RF oscillator using a receiver, frequency counter or spectrum analyser of known accuracy. Band edges and two intermediate points are required to be marked at zero beat. (Oscillator type, refer tutor guidance information).

Construction project guide

Rationale:

Assuming the candidate is successful in the examination at Intermediate level they are granted the privilege of constructing their own radio equipment for use on the air. Clearly any such constructed equipment has to comply with the terms and limitations of the Intermediate Licence. This Intermediate level project is an opportunity for the candidate to demonstrate their competency in construction.

Choice of Project:

Candidates must consult with their assessor to agree suitability of any proposal for the construction project.

As a guide, direct conversion receivers, superhet receivers, simple transmitters, crystal calibrators AF amplifiers and RF oscillators have all featured as construction projects. This list is not exhaustive.

The project must be amateur radio related. Some 20 to 30 soldered joints should be regarded as a guide size and the device must contain at least one active component such as a transistor or chip. This does not prevent a more ambitious project being selected but it must be shown completed and working as set out below. There is no requirement for the entire construction to be performed at the training venue provided assessors are content it is the work of the candidate.

The candidate must demonstrate that:

- The construction is their own work. The candidate may receive help but the nature of this help must be declared to the assessor. Any help received must be restricted to advisory and limited.
- The project is safe to use and where appropriate complies with the terms of the Licence conditions.

The candidate must demonstrate the quality of construction checking that:

- The soldering is neat and not likely to cause bad connections or short circuits.
- The candidate can identify the various components.
- The candidate can provide a simple account of the principles underlying their project.
- The candidate can demonstrate the project working including calibration procedures.

It is recommended that mains powered equipment is not constructed at Intermediate level.

If a competent candidate submits mains powered, high voltage or high current equipment the style and standard of construction must be such that the equipment is fit and suitable for general use, is appropriately boxed and would, for example, pass a PAT test.

Tutor guidance on RF oscillator.

The oscillator should cover rather more than the chosen band but not so wide that tuning and calibration are unduly sensitive. Assuming a 180 degree variable capacitor is used, the amateur band should occupy 120 to 150 degrees of rotation. This can be achieved by pre-set or selected fixed series and parallel capacitors. A Colpitts design is likely to be most successful and mirrors the examples in the training books.

When the Candidate has finished all parts of the assessment and the assessor has confirmed each item has been completed successfully, the Registered Assessor should fill in the boxes at the very end of the form confirming that the candidate has completed the total assessment according to the requirements of the Intermediate Level Syllabus.

