American Radio Relay League

USA RULES FOR
Radio Orienteering

Effective Date: 1 Jan 2026

ARRL Radio Orienteering Committee

Contents

Document Conventions

1. Corresponding IARU Region 1 rules numbering is shown in parentheses.
2. Italicized words are listed in the Definitions section.
3. Capitalization:
   - 3.1. Normal English capitalization rules.
   - 3.2. Names of objects found on a Radio Orienteering course and indicated on a competition map are capitalized.
   - 3.3. Event names and competition *format* names are capitalized.
   - 3.4. Major *event* activities or ceremonies are capitalized.

Organizational Rules

4. (2.) General Provisions

- 4.1. (2.1) These rules are valid for and shall be used in connection with USA Championships and other ARRL-sanctioned Radio Orienteering *events*.
- 4.2. (2.4) In all cases these rules should be interpreted so as to maximize fairness.
- 4.3. (2.5) Any Radio Orienteering event shall equally challenge the technical (direction finding), orienteering and physical skills of a competitor.
- 4.4. (2.6) All technical (direction finding) and orienteering tasks must be solvable by means of the *direction-finding receiver* and an appropriate map of the *competition area*.
- 4.5. (2.7) Changes to these Rules are subject to approval by The ARRL Radio Orienteering Committee (The Committee).
- 4.6. (2.8) The Committee will review these rules at least annually and consider all proposals that have come from the USA Radio Orienteering community.
- 4.7. (2.9) The Committee shall publish the full text of updated rules within one month after approval by the full Committee.
- 4.8. (2.10) Unless otherwise decided by The Committee, rules document revisions will go into effect on January 1 of the year following their date of approval.

5. (3.) Event Program

- 5.1. (3.1) USA Radio Orienteering *Championships* should be held every year.
- 5.2. (3.2) The *event* dates and the program are proposed by the Organizer. They require approval by The Committee.

6. (4.) Event Preparations

- 6.1. (4.1) An organization or group must apply to The Committee to organize a *Championship* Radio Orienteering *event*.
- 6.2. (4.2) The Sanctioning Subcommittee will provide instructions for submitting applications to organize sanctioned *events*, and will make them available from a URL posted on https://arrl.org/Radio Orienteering.

7. (5.) Participation

- 7.1. (5.1) Competitors eligible for USA Radio Orienteering Champion shall be citizens of the USA, Green Card holders, or have lived in the USA for the previous year while not having competed for the title of Champion in any other country during that time.
- 7.2. (5.3) Competitors participate at their own risk. Personal accident insurance shall be the responsibility of individual competitors.
- 7.3. (5.6) Competitors not eligible for USA Radio Orienteering Champion may take part unofficially in USA Radio Orienteering Championship events.
- 7.4. (5.7) All *Organizers,* Team Officials and participants shall abide by the OUSA and IARU Child Protection Policies.

7.4.1. Event *Organizers,* Team Officials and others associated with the *event* shall read and understand the OUSA Child Protection Policy and The IARU Child Protection Policy and sign to indicate that they will operate to its requirements.

8. (6.) Costs

8.1. (6.1) The costs of organizing an *event* are the responsibility of the *Organizer*. To cover the costs of the competition(s) the *Organizer* may charge an entry fee for competitors.

8.2. (6.7) The participants shall bear the entry fees, the traveling costs to and from the place(s) of the *event*, and the costs of accommodation and board during the *event*.

9. (7.) Entries

9.1. (7.2) The *Organizer* may set deadlines for entries and may adjust the entry fee based on the registration date or date of the receipt of funds from the competitor

9.2. (7.4) The *Organizer* may exclude competitors if their entry fee is not paid and no agreement has been reached about payment.

10. (10.) Protests & Jury

10.1. (10.1) Protests against infringements of the rules by the *Organizers* or a competitor or accompanying parties shall be made in writing to the *Organizer* as soon as possible.

10.1.1. The complainant and any other affected parties shall be informed about the decision immediately.

10.2. (10.2) Protests shall be made within one hour of the previously-announced time of closure of the Finish, or of the actual closure of the Finish, whichever is later. Protests received after this time limit shall only be considered if there are valid circumstances, which must be explained in the protest.

10.3. (10.3) If a protest is against a provisional result, it shall be raised within one hour of the results being posted.

10.4. (10.4) Protests against the decision of the *Organizer* shall be made in writing to the *Organizer* within one hour of the announcement of the protest decision.

10.5. (10.5) The *Jury* shall deal with all filed protests before the *event* has disbanded.

10.6. (10.6) No fee shall be charged to file a protest.

10.7. (10.7) The *Event Director* shall appoint a *Jury* of at least three people from widely-separated clubs. Jury members shall not be competitors whose results could be affected by their decision.

10.8. (10.8) The duties of the *Jury* shall be to deal with infringements of the rules and any other questions arising out of protests.

10.9. (10.9) The basis for the decisions by the *Jury* or *Organizer* shall be this Rules document.

10.10. (10.10) In the event of a protest the *Organizer* and *Jury* shall interpret these rules with regard to the specific situation surrounding the protest. They shall determine whether the fairness of the *competition* has been compromised, and whether conditions requiring the disqualification of a competitor or course exist.

10.11. (10.11) A representative of the *Organizers* may attend and participate at Jury meetings, but shall have no vote.

10.12. (10.12) The *Jury* forms a quorum when all members are present. If a member is prevented from attending, the *Organizer* shall nominate a substitute

member.

10.13. (10.13) When in response to a protest the *Organizer* or *Jury* determines that any of the following conditions have existed and affected the finish order of competitors in a class, and no fair resolution can be found, then the class or course shall be voided.

10.13.1. A control flag is missing.

10.13.2. The Start, or the Finish is not within the marked circle or triangle.

10.13.3. A *transmitter* has been off for 5 minutes or longer.

10.13.4. Incorrect and confusing identifying markings at a control.

10.13.5. Unfair conditions that probably had an impact on the results.

10.14. (10.14) When in response to a protest, the *Organizer* or *Jury* determines that a competitor has violated these rules it may disqualify the competitor.

10.15. (10.15) When in response to a protest the *Organizer* or *Jury* determines that a rule has been broken and the effect on the results is minor and only a few competitors have been affected, then the *Organizer* or *Jury* may allow, request or require a *Sporting Withdrawal* (SPW) by the affected competitors. Competitors may not elect a *Sporting Withdrawal* (as used in this rule) without the consent of the *Organizer* or *Jury*.

10.16. (10.6) If a *gross infringement* in these rules is discovered after an *event* has disbanded the protest shall be filed directly with the The Committee which shall take whatever action it deems necessary.

10.17. (10.7) Decisions of the *Organizer* or *Jury* may be appealed in writing to The Committee within seven days after the ruling.

11. (12.) Event Reports

11.1. (12.1) Not more than one month after the *event*, the Organizer shall submit a report to The Committee containing:

11.1.1. Results of each *competition*.

11.1.2. Master map with the Start, Finish & transmitter locations for each *competition*.

11.1.2.1. Transmitter assignments for each *category* for each *competition*.

11.1.2.2. *Course lengths* for each *category* for each *competition*.

11.1.2.3. Climb for each *category* for each *competition*.

11.1.3. (12.1.3) Composition of the *Jury* if one is appointed.

11.1.4. (12.1.4) Decision of the *Organizer* or *Jury* regarding a protest.

11.1.5. (12.1.5) Any deviations from these rules.

11.1.6. (12.1.6) Comments about the *event* including what worked, what didn't and how future *events* could be improved.

Technical Rules

12. (13.) Event Information

12.1. (13.1) Official rules, bulletins and announcements shall be written and distributed in English. Only the official English text shall be used to decide any disputes. Official information may be given orally in response to questions at official meetings.

12.2. (13.2) Information from the *Organizer* shall be published on the event website.

12.3. (13.3) The initial event information shall be published no later than 1 week after sanctioning is approved

12.4. (13.4) The initial event information shall include:

12.4.1. Name of the *Event Director* and *Registrar*.

12.4.2. *Organizer's* physical mail and e-mail address.

12.4.3. General location for the *event* (near-by city or county).

12.4.4. Dates and types of *competitions*.
12.4.5. The *categories* for the *competitions*.

12.5. (13.5) The *Organizer* shall include the following information no later than four weeks before the event:
12.5.1. Entry fee for competitors.
12.5.2. Event center or hotel.
12.5.3. Address of the closest hospital and/or Urgent Care center and the phone number to call in an emergency.
12.5.4. Details for payments and latest date for funds to be received to avoid late payment fees.
12.5.5. Latest date for acceptance of entries.
12.5.6. Description and type of any transport offered, if any.
12.5.7. *Event schedule*.
12.5.8. Any deviations from the rules (must be approved by The Committee).
12.5.9. Information about obtaining visas and official invitations from the *Organizer*.
12.5.10. Description of terrain, climate and any hazards specific to the venues.
12.5.11. Opportunities for training.
12.5.12. Procedure for notifying the competitors in the field during a competition if the event needs to be called off prematurely. (i.e.Thunder storms)
12.5.13. Type of control *registering devices* to be used (e.g., SI, pin punch, RFID card).
12.5.14. The frequencies and *radiated power* of *transmitters* to be used for each *competition*.
12.5.15. Any requirements or restrictions for competitors (e.g.,Carry water, wear long sleeves or pants, no metal cleats).
12.5.16. Current map(s) of the *competition areas* that have been made public or used in a previous *event*.
12.5.17. Number of entries in each *category* or names & *category* of each competitor and date the data was updated.
12.5.18. Time and location for official meetings.
12.5.19. An explanation and diagram of the Sprint Start, spectator, and Finish area.

12.6. (13.8) Information to be published on the website under a heading for each *competition*:
12.6.1. *Time limit*.
12.6.2. List of transmitter and *band* assignments for each *category*.
12.6.3. Size of the map paper and the size area used in each *competition* (i.e., when extraneous areas are folded for use on a smaller map board), scales and vertical contour intervals of the maps for each *competition*.
12.6.4. The parking or staging location of the Start and Finish for each *competition*.
12.6.5. Restricted areas.
12.6.6. The frequencies and *radiated power* of *transmitters* to be used for each *competition*.
12.6.7. Description of the antenna
12.6.8. *Start list*.
12.6.9. Any additional pertinent information about the event or venue.

13. (14.) Competition Formats

13.1. 14.1 *Championship* Radio Orienteering events shall include the following formats:

13.1.1. 80-Meter Classic (80m *band*).
13.1.2. 2-Meter Classic (2m *band*).
13.1.3. Sprint (80m *band*).
13.1.4. Foxoring (80m *band*).

13.2. (14.2) There shall be only one *competition* per day for a competitor.

13.3. (14.4) Rules specific to the different formats are located in the Appendix section for that format

14. (15.) Categories

14.1. (15.1) Competitors shall be divided into at least the following age and gender categories:.

Women (W)	Men (M)	Age
W19	M19	19 and younger
W21	M21	regardless of age
W35	M40	35/40 and older
W45	M50	45/50 and older
W55	M60	55/60 and older
W65	M70	65/70 and older
W75	M80	75/80 and older

14.2. (15.3 - 15.4)Competitors belong to each category from the beginning of the calendar year in which they reach the given age.

14.3. (15.5) Competitors may compete in any single age-and-gender *category* for which they qualify in a given *competition*, and may compete under different categories for different *competitions* in a given *event*.

15. (16.) Equipment Check

15.1. (16.1) There shall be an *Equipment Check* on the day prior to each *competition* to demonstrate the *transmitter* characteristics, the set-up of *transmitters* and antennas, the *registering devices,* etc. which will be used in the *competition*. If practical, the terrain type and map quality shall also be similar to the *competitions*.

15.2. (16.2) The *Equipment Check* shall be open to anyone.

15.3. (16.4) *Transmitters*, antennas, flags and *registering devices* used in the *Equipment Check*, shall be identical to those used in the *competitions*, and they shall be installed and set to perform the same as in the *competitions*.

16. (17.) Starting Order

16.1. (17.1) The *Organizer* shall determine the competitors' starting order.

16.2. (17.2) The *start list* shall be published no later than the day before the *competition*.

16.3. (17.6) Competitors from the same *category* or running the same course (needing to locate the exact same *transmitters*) may not start at the same time.

16.4. (17.7) As much as practical, the start times of competitors within the same *category* shall be spaced at equal time intervals.

16.5. (17.8) All competitors of a particular *category* shall start in the same Start

Corridor and at the same part of the cycle: usually at the start of transmitter #1.

17. (18.) Competitor Meeting

17.1. (18.1) The *Organizer* shall hold a meeting to which all competitors will be invited before the first *competition.*

17.2. (18.2) All competition material (start number bibs, *start lists*, transport schedules, latest information, etc.) shall be handed out at or before the meeting.

17.3. Information regarding safety shall be explained. (i.e. dangers in the field, need to carry water, procedure for ending the race prematurely)

17.4. (18.3) Competitors and others may ask questions of the *Organizers*.

18. (19.) Terrain

18.1. (19.1) The terrain shall be suitable for setting competitive Radio Orienteering courses without any serious hazards to competitors, and avoiding as much as possible man-made objects which could interfere with direction finding activities. (Such as power lines) Interfering objects shall be mentioned in the Bulletin no later than the first day of the event, and in the opening briefing.

18.2. (19.3) If the venue has been used in a Radio Orienteering or Orienteering competition less than 5 years prior to the *Championship* event, then competitors may visit the venue until control flags or other markings have been placed in the terrain.

18.2.1. If the venue has not been used for a Radio Orienteering or orienteering event in the 5 years prior to the *Championship* event, the area is *Embargoed*.

18.2.2. The *Organizers*, competitors, and their associates shall obey all the rules and regulations of the land owners, and shall obtain permission from the land owners to hold the event.

19. (20.) Courses

19.1. (20.1) The Principles for Radio Orienteering Course Planning found in the appendices shall be followed.

19.2. (20.2) The radio direction finding skills, navigational skills, and running ability of the competitors shall all be tested.

19.3. (20.4) *Course lengths* shall be given as the length in meters of the *shortest viable route* (avoiding features shown as unpassable or prohibited areas) from the start line via the *transmitters* in optimum order to the finish line.

19.4. (20.5) Total climb along the *shortest viable route* shall not exceed 6% of the *course length*.

20. (21.) Time Limit

20.1. (21.1) Competitors whose time exceeds the *time limit* shall be disqualified as Overtime (OVT).

21. (22.) Restricted Areas and Routes

21.1. (22.2) *Out-of-bounds* or dangerous areas, forbidden routes, line features that shall not be crossed, etc., shall be marked on the map. If the feature is not obvious on the map (e.g., obvious like roads, rivers, marked boundary), they shall also be marked in the terrain with flagging tape where permitted by land managers. Competitors may not enter such areas.

21.1.1. When a course has any of the above areas, it shall be posted both on the event website and on a map at the Start with the specific information about the course.

21.2. (22.3) Compulsory routes and crossing points shall be indicated clearly on the map and marked in the terrain with flagging tape. Competitors shall follow the entire length of any marked section of their course.

21.2.1. *Registering devices* identical to those used at transmitters, or official observers, shall be positioned at each end of compulsory routes and crossing points.

21.2.2. When a course has above routes it shall be posted both on the event website and on a map at the start with the specific information about the course.

21.3. (22.4) The use of official transport, such as to a previously undisclosed start area, during the Championship may be declared mandatory by the *Organizer*.

22. (23.) Maps

22.1. (23.1) Maps and additional overprinting shall be drawn and printed according to the IOF International Specification for Orienteering Maps (*ISOM* or *ISSOM* as appropriate).

22.1.1. Sprint maps should use the ISSOM orienteering specification when available.

22.2. (23.2) Corrections for map errors and changes which have occurred in the terrain since the map was printed shall be overprinted on the competitors maps if they have a bearing on the event.

22.3. (23.3) The competition map shall cover the whole *competition area* including Start, Finish and all *transmitters*. The Start, Finish Beacon(s), Finish Corridor, and Finish Line shall be clearly marked on the map. The Start is marked by a triangle (symbol 701), the Finish Beacon by a circle (symbol 702), the Finish Corridor by a dashed line (symbol 705) and the Finish by two concentric circles (symbol 706).

22.4. (23.4) Unless otherwise noted, the area covered by the map issued by the *Organizer* shall define the *competition area*.

23. (24.) Equipment Used by Competitors

23.1. (24.1) Every competitor shall have a *direction-finding receiver* for the relevant *band*. The receivers shall meet the Technical Specifications for Radio Orienteering Equipment (see Appendix 1, section 1).

23.2. (24.2) The *Organizers* may require competitors to wear identifying numbers on a bib on the chest and/or back. The competitor shall not conceal any information on the bib. The bib shall not be larger than 20cm by 24cm. The numerals shall be at least 12cm high.

23.3. (24.3) As long as the rules of the *Organizer* do not specify otherwise, the choice of clothing and footwear shall be at the competitor's discretion.

23.4. (24.4) Any equipment not specifically prohibited by these rules may be carried by competitors, provided that it is not used for navigation or communication. (E.g., phones for safety, GPS devices for tracking and post-race analysis).

23.4.1. The *Organizer* may require that communication and/or navigation equipment be sealed to confirm that it has not been used during the race.

24. (25.) Control Cards and Registering Devices

24.1. (25.1) See Appendix 2 for a list of acceptable *registering devices*.

24.2. (25.3) Competitors shall be responsible for registering at each *transmitter* using the registering device provided. They are responsible for correct markings which must be clearly identifiable.

24.2.1. If the Registering Device fails to respond, the competitor shall use the

backup device as defined in the event information to prove his or her presence at the control.

24.3. (25.4) Missing or unidentifiable *control marks* shall not be considered, unless it can be established with certainty that the competitor visited the *transmitter*.

24.4. (25.5) Competitors without recorded results shall be classified as Did Not Finish (DNF).

24.4.1.

25. (26.) Start

25.1. (26.1) Competitors may pre-position spare receivers and components, clearly marked as property of a particular competitor, at a location designated by the *Organizer* just beyond the starting line beside the Start Corridor.

25.2. (26.2) When the *Organizer* supplies transportation, all competitors shall have at least 30 minutes for undisturbed preparation and warm-up at the Start area. Only competitors who have not started and *Organizers* shall be allowed to enter the warm-up area.

25.3. (26.3) The following information shall be shown at the Start area:

25.3.1. *Time limit*.

25.3.2. Transmitter frequencies.

25.3.3. List of *transmitter* and *band* assignments for each *category*.

25.3.4. *Start list*.

25.3.5. The competition map without overprints.

25.3.6. Clock showing the official time of the *competition*.

25.4. (26.4) The *Organizer* shall call up competitors before their start time as specified for the particular event format described in the Appendices.

25.5. (26.6) The Start shall be organized so that later competitors cannot see the maps and the route choices of the starters.

25.6. (26.7) When the starting signal is given, competitors shall move along the Start Corridor without stopping except to return to the designated area with backup equipment because of a receiver malfunction.

25.7. (26.8) Competitors whose equipment fail, or take an incorrect map, etc., may return to the start line and take their spare receiver or parts from the *Organizer*.

25.7.1. It is strictly forbidden to give or take any assistance to or from any person except the *Organizer*.

25.7.2. If the competitor returns within the first minute or the return is due to the fault of the *Organizer*, the competitor can be given a new start time.

25.7.3. For all competitors returning to the Start for any reason the *Organizer* shall keep a record of both their original start time and the time they return to the course.

25.8. (26.9) Start Corridors shall be provided by the *Organizer*. The end of each *corridor* shall not be visible either from the Start area or from any part of another *corridor*. The end of the Start Corridor shall be clearly marked.

25.9. (26.10) Competitors who are late for their start time shall be permitted to start. The *Organizer* shall determine at which time they may start which shall be as soon as possible but taking into consideration possible influence on other competitors. If the late start is the fault of the competitor, the *Organizer* may use either their originally assigned start time or the time of their actual start, however all such late starters shall be treated equally.

25.10. (26.11) Competitors who are late for their start time because of a fault of the *Organizer* shall be given a new start time.

26. (27.) Transmitters

26.1. (27.1) *Transmitters* shall meet the Technical Specifications for Radio Orienteering Equipment in the Appendix.
26.2. (27.2) The *antenna installation* shall not be changed during the competition .
26.3. (27.3) Finish Beacons shall be clearly audible throughout the whole *competition area*.
26.4. (27.4) *Transmitters* shall begin operating before the first start and shall be checked before the first start. Fox t*ransmitters* shall remain operating until the end of the *time limit* of the last competitor or until the final competitor has finished their course, whichever is earlier. The Finish Beacon *transmitter*(s) shall remain operating until all competitors have checked in at the finish.
26.5. (27.5) In the event that *Organizers* decide to prematurely end a *competition*,the organizers shall have a procedure for notifying the competitors in the field.. Finish Beacon(s) remain in operation until all competitors reach the Finish.
26.6. (27.6) Station call signs should be sent as required by the FCC, during a *transmitter's* normal transmit interval.
26.7. (27.7) The Finish Beacon, shall be registered as the last *transmitter*.
26.8. (27.8) The Finish Beacon(s) shall be placed at the entrance of the Finish Corridor. They shall be registered in the same way as other *transmitters*. If two *bands* are running simultaneously, Finish Beacons for both *bands* shall share one flag and one set of *registering devices*.
26.9. (27.12) Each *transmitter* must be easily recognizable by its code number and *band*, which shall be fixed to the flag or to the registering device.
26.9.1. When two bands are running simultaneously the flags should have different markings that are obvious from any direction at a distance of 30m or more. (e.g., blue stripe and no blue stripe)
26.10. (27.13) All transmissions from the *transmitters* must be monitored by the *Organizer* during the *competition*.

27. (28.) Transmitters Arrangement

27.1. (28.1) The *transmitter arrangement* for each competition *format* is defined in the course sections of the appendices.

28. (29.) Finish and Time-Keeping

28.1. (29.1) The competition ends for a competitor when the competitor crosses the finish line
28.2. (29.2) The Finish Corridor begins at the Finish Beacon and ends at the finish line. It shall be clearly marked by uninterrupted marking (i.e. tape, flagging, etc.).
28.3. (29.3) The finish line shall be at least 3 m wide and shall be at a right angle to the direction of the run-in. The exact position of the finish line shall be obvious to approaching competitors. Competitors in the Finish Corridor may run only in the direction from the *beacon* towards the finish line.
28.3.1. There shall be space for a competitor to run outside the Finish Corridor on either side of the Finish Corridor when it is marked on both sides.
28.3.2. If the Finish Corridor is not flagged, or marked only on a single side then competitors may run in either direction.
28.4. (29.4) Times shall be rounded down to whole seconds. Times shall be given in either hours, minutes and seconds, or in minutes and seconds.
28.5. (29.5) Having completed the competition, a competitor may not re-enter the *competition area* before everyone has finished without the permission of the Organizer. A competitor who finishes or stops competing before arriving at the Finish shall in no way influence the competition nor help another competitor

and shall report to the Finish as soon as possible.

28.6. (29.6) There shall be first-aid supplies and transportation to a hospital available at the Finish.

28.7. (29.7) The time-keeping system shall meet the Technical Specifications in the Appendix.

29. (30.) Results

29.1. (30.1) The place of an individual competitor depends on (first) the number of *transmitters* found and (second) his or her running time. Only *transmitters* which are scored for the particular *category* are considered.

29.1.1. Competitors who have failed either to find any *transmitter* assigned to their course other than the Finish Beacon shall be classified as Did Not Finish (DNF).

29.1.2. Competitors who have exceeded the *time limit* shall be classified Overtime (OVT).

29.2. (30.3) Two or more competitors having the same result shall be given the same placing in the results list. The position(s) following the tie shall remain vacant.

29.3. (30.4) Provisional results shall be displayed or available electronically in the Finish area during the *competition* when practical.

29.3.1. A map with the locations of the *transmitters* shall be posted at the Finish after all the competitors have started.

29.4. (30.5) The official results, including split times, shall be published on the event website as soon as possible and shall include all participating competitors. Competitors' names shall be associated with their bib numbers either in the results or in a separate list.

30. (31.) Awards

30.1. (31.1) The title of USA Champion and/or Overall Champion as appropriate for the event shall be awarded for each *competition* and for each official *category* separately.

30.2. (31.2) Awards shall be given for 1st through 3rd place positions.

30.3. (31.5) The *Organizer* shall arrange a dignified prize-giving ceremony.

31. (32.) Fair play

31.1. (32.1) All persons taking part in a Radio Orienteering *event* shall behave with fairness and honesty. They shall have a sporting attitude and a spirit of friendship. Competitors shall show respect for each other, for officials, journalists, spectators and the inhabitants of and adjacent to the *competition area*. The competitors shall be as quiet as possible in the terrain.

31.2. (32.2) It is forbidden to give assistance to any competitor, take assistance from any person, or to utilize any means of transport, except:

31.2.1. Assistance provided by the *Organizer* within the scope of their defined duties, as long as that assistance is equally available to all competitors.

31.2.2. It is the duty of all competitors to help injured runners. Competitors withdrawing from the *competition* because of helping an injured competitor shall be classified *Sporting Withdrawal* (SPW).

31.2.3. Competitors may continue their competition after helping an injured competitor, however they will not have their time adjusted.

31.3. (32.3) The use of drugs prohibited by the World Anti-Doping Agency (WADA) is forbidden.

31.3.1. These rules are published at https://www.wada-ama.org/.

31.4. (32.4) Secrecy regarding the courses, Finish and start areas shall be

maintained until published by the *Organizer*.

31.5. (32.5) Surveying or training in the area declared *embargoed* by the *Organizer* is not allowed. Attempts to gain any information related to the courses, beyond that provided by the *Organizer*, are not permitted before and during the competition.

31.6. (32.6) Coaches, competitors, media representatives and spectators shall remain in the areas assigned to them as specified by the *Organizer*.

31.7. (32.7) *Organizers* in the *competition area* shall neither disturb, detain, nor supply any information to a competitor.. They shall remain quiet and shall not help competitors approaching a transmitter.

31.8. (32.8) A competitor who breaks any rule or benefits from the breaking of any rule shall be disqualified.

31.9. (32.9) The Organizer may conduct or require testing of any competitor's receiver or other equipment used by a competitor during an event to ascertain that it meets the requirements in these rules.

Appendix C: Classic Competitions

C1. (C1.) General Provisions

C1.1. (C1.1) This format tests skill in direction finding, navigating on a map, and running, such that all are critically important. Making strategic decisions regarding route choice and transmitter order is integral to this format.

C2. (C20.) Courses

C2.1. (C20.3) *Transmitters,* including the Finish Beacon, shall be located not less than 400 meters apart. The *transmitter* nearest to the Start shall be located not less than 750 meters from the Start. *Transmitters* on different *bands* shall be located not less than 200 meters apart. When both 80m and 2m *bands* are used in the same *competition area* the *beacons* for both *bands* will be located at the entrance to the Finish Corridor.

C2.2. *Transmitters* may be taken in any order

C2.3. (C20.7) The number of *transmitters* and *course lengths* assigned to particular categories:

Category	Number of Transmitters	Effective Course Length
W19	4 + Finish Beacon	6-8 km
W21	4 + Finish Beacon	7-9 km
W35	4-5 + Finish Beacon	6-8 km
W45	3-4 + Finish Beacon	5-7 km
W55	3-4 + Finish Beacon	4-6 km
W65	3-4 + Finish Beacon	4-6 km
W75	2-4 + Finish Beacon	3-5 km
M19	4 + Finish Beacon	8-10 km
M21	5 + Finish Beacon	9-12 km
M40	4 + Finish Beacon	8-10 km
M50	4-5 + Finish Beacon	6-8 km
M60	3-4 + Finish Beacon	5-7 km
M70	3-4 + Finish Beacon	4-6 km
M80	2-4 + Finish Beacon	3-5 km

C3. (C21.) Time Limit

C3.1. (C21.1) The *time limit* shall be 3 hours.

C4. (C23.) Maps

C4.1. (C23.3) Portions of the *exclusion zones* that are in the *competition area* shall be clearly marked on the map.

C5. (C26.) Start

C5.1. (C26.1) On arrival at the *competition area*, competitors shall place their receivers in the impound area as indicated to them by the *Organizers*.

C5.2. (C26.5) Competitors shall enter the pre-start area TEN MINUTES before their start time. At that time they shall be given their receivers and maps.

C5.3. (C26.7) Competitors may not switch on their receivers until the start signal is given

C5.4. (C26.9) The Start Corridors shall not be longer than 250 meters.

C6. (C27.) Transmitters

C6.1. (C27.1) The *flag* shall be less than 4 meters from the transmitter antenna. The *flag* shall be clearly visible to competitors when they are within 1 meter in any direction from the transmitter antenna.

C6.2. The registering device shall be within 1 meter of the *flag* and clearly visible.

C6.3. It is recommended that the registering device be attached to the *flag* or to the pole supporting the *flag*.

C6.4. (C2.6) Classic 80m competition transmitter specifications:

- C6.4.1. *Radiated power*: 1 - 5 W
- C6.4.2. *Keying speed*: 8 - 15 WPM
- C6.4.3. Frequency separation between simultaneously working *transmitters*: ≥ 20 kHz (0.02 MHz)

C6.5. (C2.7) Classic 2m competition transmitter specifications:

- C6.5.1. *Keying speed*: 8 - 15 WPM
- C6.5.2. Antenna polarization: horizontal
- C6.5.3. Antenna height: 2 - 3 meters above ground level
- C6.5.4. Channel spacing between simultaneously working *transmitters*: ≥ 200 kHz
- C6.5.5. *Radiated power*: 0.25 - 1 W

C6.6. (C27.4) *Transmitters* begin to operate after all receivers have been impounded at the Start, or earlier if other arrangements have been made by the *Organizer* to prevent competitors from listening to the *transmitters*.

C6.7. (C27.9) All *transmitters* shall be marked by a flag consisting of three squares 30 x 30 cm arranged in a triangular form. Each square shall be divided diagonally, one half being white and the other orange.

C7. (C28.) Transmitters Arrangement

C7.1. (C28.1) Classic *competitions* may be organized on either the 80m or 2m *band*, or both simultaneously. If both *bands* are used simultaneously, then the categories are divided into two groups: one group contains categories M19, M21, M40, W19, and W21, the other group contains categories M50, M60, M70, W35, W45, W55, and W65. On the first Classic competition day, one group runs on the 80m *band* and the other group on the 2m *band*. On the second Classic competition day, the *bands* are swapped.

C7.2. (C28.2) If both *bands* are used simultaneously, there are 12 *transmitters* in the *competition area*: 6 on each *band*. *Transmitters* on each *band* shall operate in the following sequence:

Transmitter	Code Sent	Frequency	Operating Period of the 5-minute cycle, starting at
Finish Beacon	MO	A	continuously
Transmitter No.1	MOE	B	in the first minute
Transmitter No.2	MOI	B	in the second minute
Transmitter No.3	MOS	B	in the third minute
Transmitter No.4	MOH	B	in the fourth minute
Transmitter No.5	MO5	B	in the fifth minute
The maximum overlap of any two *transmitters* is 5 seconds			

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Appendix F: Foxoring Competition Rules

F1. Race System

F1.1. At the Start, competitors get a competition map with marked Start, Finish Beacon, and nominal positions of the *transmitters*.

F1.2. *Transmitters*, except for the Finish Beacon, are placed close to their nominal positions marked on the maps.

F1.3. All *transmitters* except for the Finish Beacon are very weak and therefore audible only in the close vicinity of the antenna. All *transmitters* operate continuously.

F1.4. The RF field strength of each *transmitter* is adjusted so that :

F1.4.1. The *transmitter* is clearly audible from the center of the circle that is marked on the map, AND at a minimum distance of 30m from its actual position in the terrain.

F1.4.2. The *transmitter* is NOT audible at a distance of 250m from its real position.

F1.4.3. Adjusting the field strength so the signal can just barely be tuned in at 100m is a recommended strength that might allow poor quality receivers to receive it at 30m, and high quality receivers not to receive it at 250m

F1.5. Competitors navigate to the vicinity of the *transmitters* by means of the map and then complete the final approach by means of the *direction-finding receiver*.

F2. (F16.) Equipment Check

F2.1. (F16.1) One Foxoring *transmitter* on each frequency shall be operating at the Start until the last competitor has started.

F3. (F17.) Starting order

F3.1. (F17.7) The competitors within the same *category* start at equal start intervals. Minimum start interval is 2 minutes.

F3.1.1. Competitors receive their map at their start time.

F3.1.2. Receivers are not impounded prior to the start.

F4. (F20.) Courses

F4.1. (F20.3) The *Organizer* may define the order in which the controls must be taken, allow the controls to be taken in any order, or combine the two in one course.

F4.1.1. If a mandatory order of the controls is defined then a line must connect the control circles on the map and this instruction must be clearly stated on the website in the course information, posted at the Start, and delivered orally at the Start.

F4.2. (F20.4) Transmitters, including the Finish Beacon, shall be located not less than 250 meters apart. The transmitter nearest to the Start shall be located not less than 250 meters from the Start.

F4.3. (F20.5) Number of transmitters and *course lengths* recommended for particular categories:

Category	Number of Transmitters	Effective Course Length
W19	5-8 + Finish Beacon	4-6 km
W21	6-10 + Finish Beacon	5-7 km
W35	5-8 + Finish Beacon	4-6 km

W45	4-7 + Finish Beacon	4-6 km
W55	4-7 + Finish Beacon	3-5 km
W65	4-7 + Finish Beacon	3-5 km
W75	4-7 + Finish Beacon	3-4 km
M19	6-8 + Finish Beacon	6-8 km
M21	8-10+ Finish Beacon	7-9 km
M40	6-8 + Finish Beacon	6-8 km
M50	5-8 + Finish Beacon	5-7 km
M60	5-8 + Finish Beacon	4-6 km
M70	4-7 + Finish Beacon	3-5 km
M80	4-7 + Finish Beacon	3-4 km

F5. (F21.) Time Limit

F5.1. (F21.1) The *time limit* shall be 3 hours.

F6. (F23.) Maps

F6.1. (F23.3) The competition map shall cover the whole *competition area* including Start, Finish Beacon and all *transmitters*. The map Start (the point where competitors obtain the maps), nominal positions of *transmitters* assigned to the particular category, Finish Beacon and the Finish Corridor shall be clearly marked on the map. The Start is marked by a triangle (symbol 701), all *transmitters* by a circle (symbol 702), the Finish Corridor by a dashed line (symbol 705) and the Finish by two concentric circles (symbol 706).

F7. (F26.) Start

F7.1. (F26.1) On arrival at the *competition area*, competitors shall keep their receivers..

F7.2. (F26.5) Competitors shall enter the pre-start area not earlier than FIVE MINUTES before their own start. Competitors receive maps at their start time, at the Starting Line or at the indicated point within the Start Corridor.

F7.2.1. A table with map bags, tape, and waterproof pens shall be made available immediately after receiving the map.

F8. (F27.) Transmitters

F8.1. (F27.3) Each Foxoring *transmitter* shall be clearly audible during the whole *competition* at its nominal position marked on the map AND at a distance of 30m from its real position. *Transmitters* shall NOT be audible at a distance of 250 m from their real positions.

F8.1.1. The Finish Beacon operates at normal power and therefore shall be clearly audible during the whole *competition* from everywhere on the map.

F8.2. (F27.9) The Foxoring *transmitters* have no *flags*. *Registering devices* shall be placed no more than one meter from each transmitter antenna and shall be clearly visible from the transmitter antenna.

F9. (F28.) Transmitters Arrangement

F9.1. (F28.2) *Transmitters* shall operate continuously.

F10. (F29.) Radio Orienteering Foxoring Transmitter Specifications

F10.1. (FT2.6) Foxoring competition transmitter specifications:

F10.1.1. Frequency spacing between the Finish Beacon and other *transmitters*: ≥30 kHz (0.03 MHz)

F10.1.2. Frequency spacing between Foxoring *transmitters*: ≥20 kHz (0.02 MHz)

F10.1.3. *Keying speed* for Foxoring *transmitters*: Continuous

F10.1.4. *Keying speed* for Finish Beacon: 8-15 WPM

F10.1.5. *Radiated power* (Finish Beacon): 1 - 5 W

F10.1.6. *Radiated power* (Foxoring *transmitters*): to be heard ≥30m & ≤250m

F10.2. (FT2.9) Field *transmitters* may operate at different frequencies.

F10.2.1. Note: this removes the interference between nearby *transmitters*. In addition, it calls for better technical skill of competitors since Foxoring on a single frequency is very easy, easier than orienteering itself.

Appendix P: Principles for Radio Orienteering Course Planning

P1. Purpose

P1.1. These principles describe standards for planning Radio Orienteering courses. Their goal is to help ensure fair *competitions* and to preserve the unique character of Radio Orienteering.

P2. Principles

Designers of courses for *Championship* Radio Orienteering events shall follow these principles.

P2.1. Courses should be designed to test competitors' technical and physical abilities.

P2.2. Courses should require competitors to demonstrate the following skills:

- P2.2.1. Operating the *direction-finding receiver* and interpreting its measurements.
- P2.2.2. Accurate map reading.
- P2.2.3. Route choice evaluation.
- P2.2.4. Concentration under stress.
- P2.2.5. Quick decision making.
- P2.2.6. Running in natural terrain.
- P2.2.7. Physical ability.

P3. Fairness

P3.1. Courses should be designed to minimize the role of luck in Radio Orienteering *competitions*, and to ensure that all competitors face the same conditions on every part of the course during the entire *competition*.

P4. Appropriate Courses

P4.1. Courses shall be appropriate for the target competitors in terms of length, physical and technical difficulty, transmitter locations, etc.

P5. Environment

P5.1. (P4.2) The environment shall be taken into account when designing courses. This includes:

- P5.1.1. Wildlife that may be disturbed.
- P5.1.2. Vegetation and sensitive areas prone to erosion.
- P5.1.3. People living in or near the *competition area.*
- P5.1.4. Structions, such as walls, fences, cultivated land, buildings and other constructions, etc. that could be damaged by competitors.

P5.2. (P4.3) *Organizers* shall ensure that competitors have unfettered access to inbounds areas, and that any sensitive areas in the terrain are discovered in advance and marked *out-of-bounds*.

P6. Public

P6.1. (P5.1) *Organizers* shall consider the media and spectators when planning courses.

Appendix R: Registering Devices

R1. Approved Devices

R1.1. The only approved electronic registering system is the SPORTident Classic System.

R1.1.1. The *SI-Station* is near the *transmitter*.

R1.1.2. The *SI-Card* is carried by the competitor.

R1.2. SPORTident AIR+ system is not approved.

R2. Registering

R2.1. It is the competitors' responsibility to ensure that the *SI-card* is held in the *SI-station* until the feedback signal has been received.

R2.2. A pin punch backup shall be at each *transmitter*. The competitor may punch either the map or number bib. The competitor is responsible for the correct mark which must be clearly identifiable at the finish.

R3. Alternate Registration Systems

R3.1. If a different registering system is used the *Organizer* must receive approval from the ARRL Radio Orienteering Committee.

Appendix S: Sprint Rules for the Radio Orienteering Competition

S1. General Provisions

S1.1. The Sprint event shall preferably be organized in an open park easily accessible by the public.

S1.1.1. Holding the sprint in a runnable forest is permitted.

S2. Race System

S2.1. The *competition* shall be run as two loops which can be overlapped. The Spectator, which connects the two loops, and the Finish, will be able to accommodate spectators.

S2.2. Each competitor runs through the Start Corridor, which leads to the area with *transmitters* No.1 to No.5 (slow keying). After finding some or all the required *transmitters* from this loop, the competitor runs to the spectator control and through the Spectator Corridor to the area with *transmitters* No.1F to No.5F (fast keying). After finding some or all the required transmitters from this loop, the competitor runs to the Finish Beacon and through the Finish Corridor to the Finish Line.

S2.3. The *transmitters* searched for on each of the loops may be visited in any order. All *transmitters* searched for on each loop shall be on the same frequency.

S2.4. Any Fast transmitters found before the Spectator will be ignored for competitor scoring, as will be any Slow transmitters found after the Spectator

S2.5. The Finish Beacon and the spectator control may be at the same place. In this case, there is no spectator control *transmitter* and the Beacon serves both purposes.

S3. Corridors

S3.1. The Start Corridor is a marked *corridor* that runs away from the Start. The end shall be clearly marked and only after this point can the competitor stop. The Start Corridor shall not be longer than 400 meters.

S3.2. When leaving the Spectator Control, competitors shall run along the Spectator Corridor. The Spectator Corridor shall not be longer than 300 meters. The Spectator Control shall be placed at the entrance to the Spectator Corridor.

S3.3. The Finish Corridor is the *corridor* that shall run from the Finish Beacon to the Finish Line. The Finish Beacon shall be placed at the entrance to the Finish Corridor. The Finish Corridor shall not be longer than 400 meters.

S3.4. When the Beacon is used as the Spectator transmitter there shall be separate corridors which are well marked as to which is the Spectator and which is the Finish Corridor.

S4. (S17.) Starting order

S4.1. (S17.7) The competitors within one *category* start at equal start intervals.

S4.1.1. Minimum start interval is 2 minutes.

S4.1.2. When possible, competitors from the same *category* should not start consecutively.

S5. (S20.) Courses

S5.1. (S20.3) The *transmitters* shall be located not less than 100 meters apart and not less than 100 meters from the Start.

S5.1.1. The Finish Beacon (B) and the spectator control (S), if this differs from the Finish Beacon, could be located less than 100 meters from the Start.

S5.2. (S20.7) The courses shall be planned for an expected winning time of 15

minutes for an elite competitor in all categories.

S5.2.1. The number of *transmitters* assigned to each *category* will normally be twice the number assigned for Classic Radio Orienteering (see Appendix C).

S6. (S21.) Time Limit

S6.1. (S21.2) The *time limit* shall be 1 hour.

S7. (S23) Maps

S7.1. (S23.1) The map for the Sprint event shall be made at the scale 1:5000 or 1:4000.

S7.2. (S23.3) The Start, Finish Beacon, spectator control, if this differs from the Finish Beacon, Finish Corridor and Finish Line shall be clearly marked on the map. The Start is marked by a triangle (symbol 701), the Finish Beacon and Spectator Control by a circle (symbol 702), the Finish Corridor by a dashed line (symbol 705) and the Finish by two concentric circles (symbol 706).

S8. (S26.) Start

S8.1. (S26.3) The organization of the start, spectator, and finish areas shall be explained and diagramed for the competitors in advance and posted at the Start.

S8.2. (S26.5) The competitor receives the map along with the receiver in the pre-start area 2 minutes before the start and shall not listen to any transmitters until his or her start.

S9. (S27.) Transmitters

S9.1. (S27.9) Field *transmitters* have no *flags* and their *registering devices* stands are marked with red and white stripes,

S9.2. (S27.10) The *registering devices* must be no more than 1m from the antenna and be clearly visible from the antenna.

S9.3. (S27.8) The spectator control and the Finish Beacon are equipped with control *flags*.

S9.3.1. The Finish Beacon shall be equipped with at least two *registering devices*. The *Organizer* should consider additional *registering devices* if the Finish Beacon is acting as the Spectator Control as well.

S9.3.2. The Finish Beacon (B) and the spectator control (S), if this differs from the Finish Beacon, are registered as any other *transmitter*.

S9.3.3. *Registering devices* shall be clearly visible and placed not more than 1 m away from the antenna.

S9.4. (S27.13) The antenna and any grounding system shall be deployed so that it can not be inadvertently disconnected by a competitor.

S10. (S28.) Transmitters Arrangement

S10.1. (S-T2.6) Sprint specific specifications for the 80m *band transmitters*

S10.1.1. *Radiated power*: 0.3 - 5 W

S10.1.2. All the *transmitters* must be clearly heard over the whole *competition area*.

S10.1.3. *Radiated power* for Finish Beacon & spectator control: 1-5W

S10.1.4. Frequency spacing between simultaneously working *transmitters*: ≥20 kHz (0.02 MHz)

S10.2. Two sets of five *transmitters* shall be used in the Sprint event. Transmitter groups 1 to 5 and 1F to 5F shall operate with different keying speeds with 1F to 5F operating at a faster keying speed.

S10.3. Example of frequency and *keying speed* assignment:

Frequency	Function	Code	Keying Speed
3.530 MHz	TX 1-5	MOE-MO5	10 WPM
3.550 MHz	Spectator Control	S	10 WPM
3.570 MHz	TX 1F (fast)-5F	MOE-MO5	15 WPM
3.600 MHz	Finish Beacon	MO	10 WPM

S10.4. (S28.2) Transmitters operate in the following sequence:

No. 1 and 1F	sending code MOE in seconds 0 to12
No. 2 and 2F	sending code MOI in seconds 12 to 24
No. 3 and 3F	sending code MOS in seconds 24 to 36
No. 4 and 4F	sending code MOH in seconds 36 to 48
No. 5 and 5F	sending code MO5 in seconds 48 to 60
	– of a 1-minute cycle starting at 0:00
Timing	The maximum overlap for any two transmitters is 3 seconds

S11. (S32.6) Fairness

S11.1. (S8.1) Competitors waiting for their start shall be well separated from any other people (spectators and competitors who already finished their races) once the first competitor has started.

Appendix T: Technical Specifications for Radio Orienteering Equipment

T1. Receivers

T1.1. Receivers and antennas of any type may be used by the competitors.

T1.2. Any receiver found producing audible interference or radio frequency interference to other receivers in the 80m or 2m *band* at a distance of 10 meters or more shall not be used in the *competitions*.

T1.2.1. To accomplish this test the *Organizer* shall use a typical competition-grade receiver to tune in a course *transmitter* at approximately the distance of the farthest *transmitter* on the course. Then the receiver being tested shall be turned on at a distance of 10 meters from the typical receiver. The *Organizer* will then judge whether there is interference detected from the receiver that would interfere with another competitor.

T1.2.2. At the *Organizers* option this test may be conducted either at the Equipment Test or at the Start.

T1.3. The *Organizer* may require tests on any competitor's receiver and other equipment prior to or after its use in a *competition*.

T2. Transmitters

T2.1. All *transmitters* must comply with FCC regulations.

T2.2. All *transmitters,* excluding the *beacon*(s) within one *competition,* shall have the same parameters and the same *antenna installation*.

T2.3. (T2.4) When not scheduled to be transmitting, neither the *transmitter* nor its antenna may radiate detectable RF energy in the competition *band*(s) in use.

T2.4. (T2.5) Antennas shall provide omnidirectional radiation patterns.

T2.5. (T2.6) Specifications for the 80m-*band transmitters,* including *transmitters* used for beacons:

T2.5.1.	Carrier frequency:	See Appendix Z
T2.5.2.	*Frequency stability*:	better than 50 ppm
T2.5.3.	*Spurious emissions*:	conforming to FCC regulations
T2.5.4.	*Mode*:	A1A (keyed unmodulated carrier)
T2.5.5.	Antenna polarization:	vertical
T2.5.6.	Frequency separation between simultaneously working *transmitters*:	See format specific specifications
T2.5.7.	*Radiated power*:	See format specific specifications
T2.5.8.	*Keying speed*:	See format specific specifications

T2.6. (T2.8) Specifications for the 2m-*band transmitters* including *transmitters* used for beacons:

T2.6.1.	Carrier frequency:	See Appendix Z
T2.6.2.	*Frequency stability*:	better than 50 ppm
T2.6.3.	Frequency separation between simultaneously working *transmitters*:	200 kHz (0.2 MHz)
T2.6.4.	*Spurious emissions*:	conforming to the FCC regulations
T2.6.5.	*Radiated power*:	See format specific specifications
T2.6.6.	*Mode*:	A2A keyed carrier modulated by AF tone
T2.6.7.	*Modulation depth*:	70 - 80 %
T2.6.8.	*Keying speed*:	See format specific specifications
T2.6.9.	Antenna polarization:	See format specifications
T2.6.10.	Antenna height:	See format specifications

T2.7. (T2.9) Measuring Transmitter *Radiated Power*

Transmitters, their antenna systems and any feedline shall be considered when estimating *radiated power*. Any reasonable method for estimating *radiated power* may be used. Estimates should be accurate to within +/- 3 dB of actual *radiated power* whenever practical.

T3. Time-Keeping System

T3.1. The official competition time shall correspond to the official local time.

T3.2. The maximum deviation of the clocks at the Start and Finish lines is ONE SECOND against the official time during the whole *competition*.

T4. Other Equipment

T4.1. Any other equipment used by the *Organizer* (service radio net, time-keeping system, computers, electronic *registering devices,* etc.) shall not cause audible interference or RF interference to competitors' receivers.

T4.2. The use of satellite positioning devices for navigation purposes is allowed provided that no map is displayed.

Appendix Y: Youth Rules for the USA Radio Orienteering Championships

The following rules apply to Youth Championships. All other rules remain the same.

Y1. (Y15) Categories:

Y1.1. (Y15.2) Youth Categories

Women (W)	Men (M)	Age
W12	M12	12 and younger
W14	M14	14 and younger
W16	M16	16 and younger

Y1.2. (Y15.3) Competitors belong to a particular *category* based on their age on Dec. 31 .

Y2. (Y20.) Courses

Y2.1. (Y20.3) *Transmitters*, including the Finish Beacon, shall be located not less than 400 meters apart. The *transmitter* nearest to the Start shall be located not less than 500 meters from the Start.

Y2.2. (Y20.7) Number of *transmitters* and *course lengths* assigned to particular categories:

Category	Number of Transmitters	Effective Course Length
W12	3 + Finish Beacon	2-3 km
W14	4 + Finish Beacon	2.5-3 km
W16	5 + Finish Beacon	3.5-4 km
M12	3 + Finish Beacon	2-3 km
M14	4 + Finish Beacon	2.5-3 km
M16	5 + Finish Beacon	3.5-4 km

Appendix Z: Selecting Frequencies for Radio Orienteering Transmitters

This appendix describes how organizers in the USA shall select frequencies for fox and beacon transmitters for Classic (80m and 2m), Sprint (80m), and Foxoring (80m). It assumes moderate amateur-radio knowledge and summarizes relevant requirements from the USA ARDF Rules.

Core principles

- Regulatory compliance & band plans. All transmitters must comply with FCC regulations. On 80m, the allowed range for ARDF transmitters is 3.510–3.600 MHz; on 2m, use 144.500–144.800 MHz or 145.500–145.800 MHz, avoiding coordinated repeater inputs/outputs and other primary uses.
- Control-operator privileges. Ensure the identifying call sign is authorized on the selected frequencies. *Example:* if the transmitters identify with a Technician Class call sign, keep 80m emissions at least 0.001 MHz above 3.525 MHz (or use a control operator with higher privileges), since Technicians are not authorized below that point in the recommended 80m segment.
- Pre-bulletin vetting. Before issuing the first event bulletin that lists specific frequencies, investigate and verify their suitability: monitor at or near the venue and likely event times, consult local coordination/band-plan resources, test representative transmit setups if practical, and prepare alternates.
- On-site checks. Before race day, re-check each chosen frequency at the venue; keep alternates ready for unexpected activity.
- Equipment-check alignment. All equipment check transmitters must use the same frequencies that the competition transmitters will use.
- Minimize unique 80m frequencies. To reduce competitor confusion and simplify logistics, reuse a small set of 80m frequencies across Foxoring, Sprint, and Classic whenever practical.
- World-Championship alignment (when practical). Prefer the pattern commonly used at WCs, where Foxoring foxes use three different frequencies that are shared with Sprint and Classic.

Required spacing between simultaneously operating transmitters

Use at least the following separations whenever two or more transmitters on the same band are on the air at the same time (per USA ARDF Rules):

- 80m (Classic): ≥ 20 kHz between transmitters.
- 80m (Foxoring): ≥ 20 kHz between Foxoring foxes, and ≥ 30 kHz between the finish

beacon and any Foxoring fox frequency.

- 2m (Classic): ≥ 0.2 MHz between transmitters operating at the same time (e.g., a fox and a 2m beacon).

Note: In 80m and 2m Classic, foxes are time-multiplexed on one frequency; spacing then concerns any beacon that may be transmitting concurrently.

Format-specific guidance

- Sprint (80m). To minimize confusion, assign frequencies in ascending order: slow, spectator, fast, beacon (mirrors the order competitors typically encounter them). Maintain the spacing rules above.
- Foxoring (80m). Use three distinct fox frequencies (shared with Sprint/Classic where practical) and keep the beacon ≥ 30 kHz from the nearest fox frequency.
- Classic (80m). Use a single fox frequency (time-multiplexed) and a separate beacon frequency.
- Classic (2m). In the USA, 144.50 MHz and 145.55 MHz are commonly workable choices; verify locally and adjust within the permitted 2m sub-bands if needed to avoid repeaters and other users.

Sample frequency plan (USA)

The table below illustrates one simple, WC-aligned plan that reuses the same 80m frequencies across formats and adopts a separate 2m beacon far enough from the fox frequency. Adjust as needed to avoid local activity and to match control-operator privileges.

Band/Format	Purpose / Assignment	Frequency (MHz)	Notes
80m Sprint	Slow	3.530	Ascending order: slow → spectator → fast → beacon
	Spectator	3.550	≥ 20 kHz steps satisfy spacing
	Fast	3.570	
	Beacon	3.600	≥ 30 kHz from fast (meets spacing)
80m Foxoring	Fox A / Fox B / Fox C	3.530 / 3.550 / 3.570	Three fox frequencies shared with Sprint/Classic; beacon separated
	Finish beacon	3.600	≥ 30 kHz from nearest fox
80m Classic	Foxes (time-multiplexed)	3.530	Reuse Sprint/Foxoring frequency to minimize total frequencies
	Finish beacon	3.600	Separate from fox frequency
2m Classic	Foxes (time-multiplexed)	144.50	Within permitted 2m sub-band; verify local coordination
	Finish beacon	145.55	≥ 0.2 MHz from foxes (well separated)

Control-operator note: If the identifying call sign is Technician Class, use only frequencies above 3.525 MHz (e.g., 3.530 MHz) and below 3.600 MHz (e.g., 3.590 MHz), or use a higher-class control operator for 80m identification.

Publication & Adjustments

- Publish the vetted frequency list (and any alternates) in pre-event information and at the competitor briefing.
- If unexpected interference occurs, shift to a prepared alternative frequency that maintains the spacing and regulatory requirements and announce the change immediately.

These practices keep events compliant, clear for competitors, and consistent with USA

ARDF Rules while accommodating local frequency realities.

Definitions

Amateur Radio Direction Finding: (Radio Orienteering) is an amateur radio sport in which competitors by means of a direction-finding receiver and a map are to find a number of transmitters in previously undisclosed locations in the competition area in the shortest possible time.

Antenna Installation: A transmit antenna's location and position with reference to its environment, and any other parameters that could affect the strength or polarization of the signals it radiates.

ARRL Radio Orienteering Committee: The committee under the jurisdiction of the ARRL that manages Radio Orienteering in the United States.

Band: A segment of Amateur Radio Service spectrum used by Radio Orienteering transmitters and receivers.

Beacon: A transmitter which sends a continuous radio signal strong enough to be received at all points on the competition area.

Category: Age and gender grouping of competitors

Championship: Radio Orienteering Championship - A sanctioned Radio Orienteering competition held for the purpose of determining one or more Radio Orienteering champions in one or more categories.

Control Mark: A physical or electronic pattern that is recorded to prove that a competitor visited a specific transmitter location.

Competition Area: The area covered by the map issued by the Organizer, unless otherwise defined by the Organizer.

Competition: Radio Orienteering competition - A Radio Orienteering competition is a single competitive Radio Orienteering contest type held on a particular course over a certain period of time. E.g., "2m Classic" is the format of one Radio Orienteering competition.

Control Card: A sheet or card used to record control marks.

Corridor: A narrow belt of land, marked by ribbons or tape, along or through which competitors are required to pass.

Course Length: The length of the shortest route from the Start Line via the transmitters with optimum route choice to the Finish Line as determined by the course designer.

Direction-Finding Receiver: A radio receiver along with a directional antenna designed for use on one or more bands.

Effective Course Length: The course length + 10 times the total climb along it.

Embargoed: Declared to be an area that a competitor may not enter for a designated period of time immediately prior to a Radio Orienteering event, so as to ensure that no competitor has an unfair advantage in familiarity with the terrain or course when not competing

Equipment Check: An activity in which competition equipment is set up to demonstrate its operation and characteristics. An Equipment Check is conducted to allow competitors to familiarize themselves with event hardware and confirm that their receivers and registering devices are compatible.

Event: Radio Orienteering Event - A series of one or more Radio Orienteering competitions held for the purpose of determining one or more winning contestants. Radio Orienteering Events might be held over a period of one or more days. Differs from Radio Orienteering

practices, which are training exercises that might not be competitive in nature.

Event Director: The person with ultimate responsibility for ensuring that an event is successful and is conducted in accordance with these rules.

Event Schedule: A written statement of event details that includes the dates and times of all practice sessions, Equipment Checks, competitions, meetings, ceremonies and other planned activities.

Exclusion Zone: A part of the *competition area* in which no transmitters may be placed.

Flag: A three-sided construct consisting of three squares 30 x 30 cm arranged in a triangular form. Each square is divided diagonally, one half being white and the other orange. Flags are hung vertically, so that the openings are above and below.

Format: the type of competition, i.e., Classic, Sprint or Foxoring

Fox (or Fox Transmitter): is a radio transmitter placed at a control point on a Radio Orienteering course that competitors must locate and register to receive credit.

Frequency Stability: The degree to which a transmitter's output frequency drifts during a competition.

***ISOM*:** International Specification Orienteering Maps from the International Orienteering Federation (IOF)

ISSOM: International Specification Sprint Orienteering Maps from the IOF

Jury: One or more individuals assigned to adjudicate Protests or settle matters related to an event.

Keying Speed: Morse code transmission rate expressed in words per minute (WPM) in accordance with https://en.wikipedia.org/wiki/Morse_code#Speed_in_words_per_minute using the "PARIS" standard.

Mode: the modulation method employed by a transmitter.

Out-of-Bounds: A location where a competitor may not enter or cross *during* a competition.

Organizer: The entity responsible for organizing an event. Usually the Event Director and persons authorized by the Event Director to assist with the event.

Radiated Power: the amount of power a radio transmitter and antenna radiates specified in Watts. In Radio Orienteering, it is an approximate value that may be measured or calculated based on transmitter, feedline, and antenna system properties.

Registrar: the person or entity responsible for collecting fees and recording competitor registrations for an event.

Registering Devices: Equipment that records evidence of a competitor's arrival at a transmitter. (SPORTident equipment and pin punches)

Shortest Viable Route: A path between two locations that, in the judgement of the course designer, is the quickest route for a runner to follow.

SI-Station: Approved equipment located at the Control for recording a competitor's arrival at the transmitter. (Manufactured by SPORTident)

SI-Card: Approved equipment carried by a competitor to record the competitor's arrival at the transmitter. (Manufactured by SPORTident)

Sporting Withdrawal (SPW): A disqualification because of helping an injured person or to avoid disqualifying a whole course when only a few people are affected.

Spurious Emissions: see Electronic Code of Federal Regulations (e-CFR) 47 CFR § 97.3 (a) (43) and § 97.307 Emission standards.

Start List: A printed series of competitor names, bib numbers, and starting times ordered chronologically by start time for a specific competition. In addition it may also be ordered by competitor name or category.

Time Limit: The period in which a competitor must complete the race or be given the result of OVT (Overtime)

Transmitter: A set of equipment used to generate and transmit electromagnetic waves, placed at control or beacon locations.

Transmitter Arrangement: The total number, distance of separation, and other placement constraints imposed on transmitters by competition format rules.