Appendix B
Robot Skills Challenge

Overview

This Appendix describes the combined Robot Skills Challenge rules for VEX Robotics Competition Change Up.

Please note that the Robot Skills Challenge may not be offered at all tournaments. Please check with your local Event Partner or www.robotevents.com for more information.

Robot Skills Challenge Description

In this challenge, Teams will compete in a Match lasting a maximum of sixty seconds (1:00) in an effort to score as many points as possible. These Matches consist of Driving Skills Matches, which will be entirely driver controlled, and Programming Skills Matches, which will be autonomous with no human interaction. Teams will be ranked based on their combined score in the two types of Matches.

The playing field will have Field Elements setup exactly the same as a normal VEX Robotics Competition Change Up Match, however, the Balls will start as displayed below.

Note: Only (15) of each colored Ball is used in a Robot Skills Match.
Game Definitions

Please note that all definitions from “The Game” section of the manual apply to the Robot Skills Challenge, unless otherwise specified.

Driving Skills Match – A Driving Skills Match consists of a sixty second (1:00) Driver Controlled Period. There is no Autonomous Period.

Programming Skills Match – A Programming Skills Match consists of a sixty second (1:00) Autonomous Period. There is no Driver Controlled Period.

Robot Skills Match – A Driving Skills Match or Programming Skills Match

Skills Stop Time – The time remaining in a Robot Skills Match when a Team ends the Match early. If a Team does not end the Match early, they receive a default Skills Stop Time of 0.
a. The moment when the Match ends early is defined as the moment when the Robot is “disabled” by the field control system. See the “Skills Stop Time” section for more details.
b. If a V5 Robot Brain or Tournament Manager display is being used for field control, then the Skills Stop Time is the time shown on the display when the Match is ended early (i.e. in 1-second increments).
c. If a VEXnet Competition Switch is being used for field control, in conjunction with a manual timer that counts down to 0 with greater accuracy than 1-second increments, then the time shown on the timer should be rounded up to the nearest second.
i. For example, if the Robot is disabled and the stopwatch shows 25.2 seconds, then the Skills Stop Time should be recorded as 26.

Robot Skills Challenge Rules

Please note that all rules from “The Game” section of the manual apply to the Robot Skills Challenge, unless otherwise specified.

<RSC1> Robots may start the Robot Skills Match per <SG1> in either Home Zone.

Note: The other three (3) Preloads are not used in a Robot Skills Match.

<RSC2> In Robot Skills Matches, Teams play as if they are on the red Alliance Scoring only red Balls and Owning only red Goals.

<RSC3> Rules <SG2> and <SG3> do not apply in Programming Skills Matches.
Robot Skills Challenge Scoring

*Teams* receive points according to the same Scoring rules in VEX Robotics Competition Change Up when Scoring for the red *Alliance*.

Additionally, *Teams* receive points for any blue *Balls* that are removed from their starting positions in *Goals*. These points are equal to how many points would have been “de-scored” from the blue *Alliance* by removing that *Ball*.

To calculate this, all *Balls* will be scored at the end of a *Robot Skills Match* for their respective *Alliance*, with the same scoring rules as a standard VRC Change Up *Match*. The *Team’s Robot Skills Match* score will then be calculated as follows:

\[(\text{Red Alliance Score}) - (\text{Blue Alliance Score}) + 63\]

One intent of this scoring method is to simulate a standard VRC Change Up Match that has already begun. The *Team* represents a member of the red *Alliance*, competing against a blue *Alliance* who has scored all of their *Balls*. The final score can be interpreted as how far the red *Robot* has been able to overcome this deficit in their 60-second *Robot Skills Match*.

Skills Stop Time

If a *Team* wishes to end their *Robot Skills Match* early, they may elect to record a *Skills Stop Time*. This may be used as a tiebreaker for *Robot Skills Challenge* rankings. A *Skills Stop Time* does not affect a *Team’s score* for a given *Robot Skills Match*.

- *Teams* who intend to attempt a *Skills Stop Time* must “opt-in” by verbally confirming with the scorekeeper referee prior to the *Robot Skills Match*. If no notification is given prior to the start of the *Match*, then the *Team* forfeits their option for recording a *Skills Stop Time*.
  - This conversation should include informing the scorekeeper referee which *Drive Team Member* will be signaling the stop. The *Match* may only be ended early by a *Drive Team Member* standing in the *Alliance Station*.
  - If a *Team* is running multiple *Robot Skills Matches* in a row, they must reconfirm their *Skills Stop Time* choice with the scorekeeper referee prior to each *Match*.
  - Any questions regarding a *Skills Stop Time* should be reviewed and settled immediately following the *Match*. <T1> and <T2> apply to *Robot Skills Matches*.

- If the event is utilizing a V5 Robot Brain or TM Mobile app for *Robot Skills Challenge* field control, a *Drive Team Member* may elect to start and stop their own *Robot Skills Match*.
  - This V5 Robot Brain, or device running the TM Mobile app, will be used to start the *Robot Skills Match* (i.e. “enable” the *Robot*), end the *Robot Skills Match* (i.e. “disable” the *Robot*), and display the official *Skills Stop Time* to be recorded.
  - This V5 Robot Brain must be running the official field control user program.
  - For more information regarding the use of a V5 Robot Brain for *Robot Skills Challenge* field control, and to download the official field control user program, visit [this VEX Knowledge Base article](#).
  - For more information regarding the use of TM Mobile for field control, see the Tournament Manager documentation.
At events which do not have a V5 Robot Brain or TM Mobile available for Robot Skills Challenge field control, Drive Team Members and field staff must agree prior to the Match on the signal that will be used to end the Match early.

- As noted in the definition of Skills Stop Time, the moment when the Match ends early is defined as the moment when the Robot is “disabled” by the field control system.
- The agreed-upon signal must be both verbal and visual, such as Drive Team Members crossing their arms in an “X”, or placing their V5 Controller(s) / VEXnet Joystick(s) on the ground.
- The signal must be given by a Drive Team Member standing in the Alliance Station.
- Drive Team Members are also recommended to provide verbal notice that they are approaching their Skills Stop Times, such as by counting out “3-2-1-stop”.

It is at the Event Partner’s discretion which method will be used to record Skills Stop Times at a given event. The chosen method must be communicated prior to the event (such as during a drivers’ meeting), and made equally available to all Teams.

- If an event intends to use a manual timekeeping method, a Team may not bring their own V5 Robot Brain just for use during their own Robot Skills Match.
- If an event intends to utilize a V5 Robot Brain, all Teams must use the same V5 Robot Brain for all Robot Skills Matches on a given field.
- If an event is using multiple fields for Robot Skills Matches, the same method must be used at all fields. Multiple V5 Robot Brains may be used as needed, e.g. a “Field 1 Brain” and a “Field 2 Brain”.
- The default “Drive” program accessed from a V5 Controller is intended for practice only, and may not be used for an official Robot Skills Match.

Robot Skills Challenge Ranking at Events

For each Robot Skills Match, Teams are awarded a score as described in the Robot Skills Challenge Scoring section, and a Skills Stop Time as described in the Skills Stop Time section. Teams will be ranked based on the following tiebreakers:

1. Sum of highest Programming Skills Match score and highest Driving Skills Match score.
4. Second-highest Driving Skills Match score.
5. Highest sum of Skills Stop Times from a Team’s highest Programming Skills Match and highest Driving Skills Match (i.e. the Matches in point 1).
6. Highest Skills Stop Time from a Team’s highest Programming Skills Match (i.e. the Match in point 2).
7. Third-highest Programming Skills Match score.
8. Third-highest Driving Skills Match score.

If a tie cannot be broken after all above criteria, then the following ordered criteria will be used to determine which Team had the “best” Programming Skills Match:

1. Number of Connected Rows.
2. Number of Scored Balls.
• If the tie still cannot be broken, the same process in the step above will be applied to the Teams’ best Driving Skills Match.

• If the tie still isn’t broken, events may choose to allow Teams to have one more deciding Driving Skills Match, to be ranked according to the standard criteria above, or declare both Teams the Robot Skills Challenge Winner.

**Robot Skills Challenge Ranking Globally**

Teams will be ranked Globally based on their Robot Skills scores from Tournaments and Leagues that upload results to robotevents.com according to the following tiebreakers.

1. Highest Robot Skills score (combined Programming Skills Match and Driving Skills Match Score from a single event).
2. Highest Programming Skills Match score (from any event).
3. Highest sum of Skills Stop Times from the Robot Skills Matches used for point 1.
4. Highest Skills Stop Time from the Programming Skills Match used for point 2.
5. Highest Driving Skills Match score (from any event).
6. Highest Skills Stop Time from the Driving Skills Match score used for point 5.
   a. The first Team to post a score ranks ahead of other Teams that post the same score at a later time, all else being equal.
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**Robot Skills Challenge Format Options**

To better accommodate varying health & safety circumstances in different regions, the 2020-2021 season will feature several different avenues for Event Partners to host Robot Skills Challenge competitions. Regardless of the format chosen for a given event, all rules, scoring, and rankings listed in this Appendix apply. However, some formats will have additional rules in place to ensure fair and consistent gameplay.

**Robot Skills Challenge at a Standard Qualifying Tournament**

• The Robot Skills Challenge is an optional event. Teams who do not compete will not be penalized in the main tournament.

• Teams may play Robot Skills Matches on a “first come, first serve” basis, or by a pre-scheduled method determined by the Event Partner.

• Teams will be given the opportunity to play exactly three (3) Programming Skills Matches and three (3) Driving Skills Matches. Teams should be aware of when the Robot Skills fields are open so that they do not miss their opportunity, e.g. if a Team waits until five minutes before the Robot Skills fields close, then they have not used the opportunity given to them and will not be able to compete in all six matches.
Skills-Only Event: In-Person, Live

- Teams may play Robot Skills Matches on a “first come, first serve” basis, or by a pre-scheduled method determined by the Event Partner.
- Further details regarding Skills-Only Event logistics can be found in the REC Foundation Qualification Criteria document.

Skills-Only Event: Remote, Live

A “Remote, Live” Skills-Only Event is an event held exclusively via a live online video platform organized by the Event Partner. The intent of a Remote, Live event is to replicate the competition experience of an “In-Person, Live” Skills-Only Event as much as possible.

Additional rules and requirements have been established in an effort to help facilitate a fair and flexible experience for all Teams and Event Partners.

<RSE1> The Remote Skills Only environment (i.e. digital platform) may be chosen at Event Partner discretion.
   a. All registered Teams must be able to view live the matches being played by all other registered Teams.
   b. REC Foundation Staff must have access to view all matches while being played live.
   c. The online meeting environment must not be accessed or viewed by the general online public while the event is live, e.g. the event must be password protected or invite-only.
      i. Guests invited by the Event Partner can be able to view, but may not have use of their microphone or camera or display anything for teams to see or hear.
      ii. One example that would satisfy this requirement would be to use an online video conferencing application that allows for a large number of people who must register to attend. The Event Partner would approve spectators who can view the matches, but would only give Teams the ability to share their screen, camera or microphone.
      iii. After the event is over, there are no such restrictions (i.e. the Event Partner may post a recording of the event if they wish).

<RSE2> Registered Teams will be assigned scheduled times to complete Robot Inspection and up to (3) Programming Skills Matches and (3) Driving Skills Matches over a live, online environment.

<RSE3> The minimum event staff must include one (1) Event Partner and at least one (1) certified Head Referee. A dedicated Tournament Manager operator is also recommended, but not required, if the Head Referee and/or Event Partner wish to fulfill this role.

<RSE4> At all times, there must be a minimum of (2) Adults over the age of 18 in the remote meeting environment before Students are allowed to connect. One of those Adults must be the Event Partner.

<RSE5> The Team’s Primary Contact, or another designated Adult Team contact (over the age of 18), must be present in the remote meeting environment throughout the duration of the scheduled time for that Team. The Team’s Primary Contact will be responsible for providing the Adult representative’s contact information to the Event Partner prior to the event.
<RSE6> Teams will complete a full Robot inspection, in accordance with <R3>, live with the Head Referee prior to their first Robot Skills Match. This inspection process should follow the checklist on a standard inspection sheet, including a demonstration of sizing compliance as explained in <R5>. 

**Note:** This inspection may also include an informal “Field inspection”, to ensure that a Team’s remote environment is set up properly for their Matches.

<RSE7> All Team camera footage must be streamed live, from one camera feed, with no “cuts”.

a. Pre-recorded Robot Skills Matches are strictly prohibited in a Live, Remote event.

b. The Drive Team Member(s), Robot(s), Controller(s) and complete competition field must remain on camera at all times during the match.

c. A Stopwatch / Tournament Manager display that shows the match time must be on video the entire time during the match.

d. The camera must be able to move around the field, with no breaks or “cuts”, so that it can verify standard Head Referee checks before and after the Match. These could include (but are not limited to) Starting Position placement, game and field element placements, and any necessary scoring verification.

i. If this is not feasible due to a Team’s equipment or facility limitations, a second camera stream must be used for these close-up checks. This is the only permissible exception to the “single-camera” rule set forth by <RSE7>, and Teams utilizing this exception should expect additional scrutiny.

<RSE8> Live, Remote Robot Skills Matches must include some live interaction between the Team and the Head Referee.

a. A Drive Team Member must pair their Controller to their Robot on video prior to each Match.

b. The Head Referee must ask the Team if they are ready, and the Team must respond verbally/visually on video.

i. If the Head Referee needs to see a closer or different angle of the Robot Starting Position or any field elements, the Team must be able to satisfy this request, per <RSE7>.

c. The Match will begin with the Team member who is controlling their clock to give a countdown for the Match to start. This person does not need to be a Drive Team Member.

d. After the Match, Teams must move the camera per the Head Referee’s instructions to verify scored game elements before the field is reset, per <RSE7>. The Head Referee will confirm to the Team verbally what is being counted.

i. <T1> still applies - the Head Referee’s judgment based on what can be seen on camera is final, as it would if they were observing it in person. There are no video or photo replays in a Live, Remote Skills-Only Event.

One common example will be for a referee to ask a Team to move the camera over to a goal to show if Balls are properly scored in that Goal. The Head Referee will ask the Team a series of questions, and might ask for a couple of different camera angles, but once the referee makes a determination based on these questions and viewing angles, the referee’s decision is final.

<RSE9> Match replays are at the discretion of the Head Referee. In addition to the examples provided in <G20>, live video circumstances (such as a video cutting out, or a Match timing error) could warrant a Match replay at the Head Referee’s discretion.

<RSE10> Any violation of any rules will result in the Match score being recorded as zero. That Match will count as one of the Team’s allotted Matches.
Skills-Only Event: Remote, Pre-Recorded

A “Remote, Pre-Recorded” Skills-Only Event is an event held exclusively via videos of Robot Skills Matches that are submitted to and scored by an Event Partner and/or Head Referee.

- Videos submitted for a Pre-Recorded Skills event must be recorded and submitted within the duration of the event set by the Event Partner. Videos recorded prior to the event’s start date & time will not be acceptable.
- Event Partners will generate a set of unique, randomized alphanumeric code to be sent to each Team at the beginning of the Event.
- All video format rules set forth by <RSE7> apply. Furthermore, a second clock showing the current date / time must be on video during the entire Match.
- Matches should follow a standard procedure, done and shown on one video without any “cuts” or edits, in the following order:
  1. Robot Inspection is done by the Team, showing on video, the inspection sheet signed and completed. Measurements must be done using a measuring device such as a Robot Sizing Tool or tape measure.
  2. The Team says the random code that they were given by the Event Partner out loud on video while writing the code visibly on a paper or whiteboard.
  3. Teams pair the Controller to the Robot.
  4. The Team shows on video a closeup view of the Starting Position to provide video evidence that the Robot is in a legal starting position.
  5. The Team says out loud and writes on paper or whiteboard if they are attempting a Programming Skills Match or Driving Skills Match.
  6. The Team starts a Match when the clock begins.
  7. After the Match, the Team must move the camera to each of the Goals saying out loud what counts as scored and records onto an official referee scoresheet.
  8. The scoresheet is then shown clearly on video for a minimum of 10 seconds. While the score-sheet is being recorded, Teams can reset the field for the next Match.
  9. The Team can then repeat steps 3-8 for their remaining allotment of Matches, i.e. maximum of 3 Programming Skills Matches and 3 Driving Skills Matches, one after another on the same video recording.
  10. The video recording can now be stopped.

- Teams will need to upload their video on a publicly accessible platform like YouTube, Facebook Video, Google Classroom, SchoolTube, etc and submit the URL to the Event Partner per the instructions on the event site.