



THE GAME

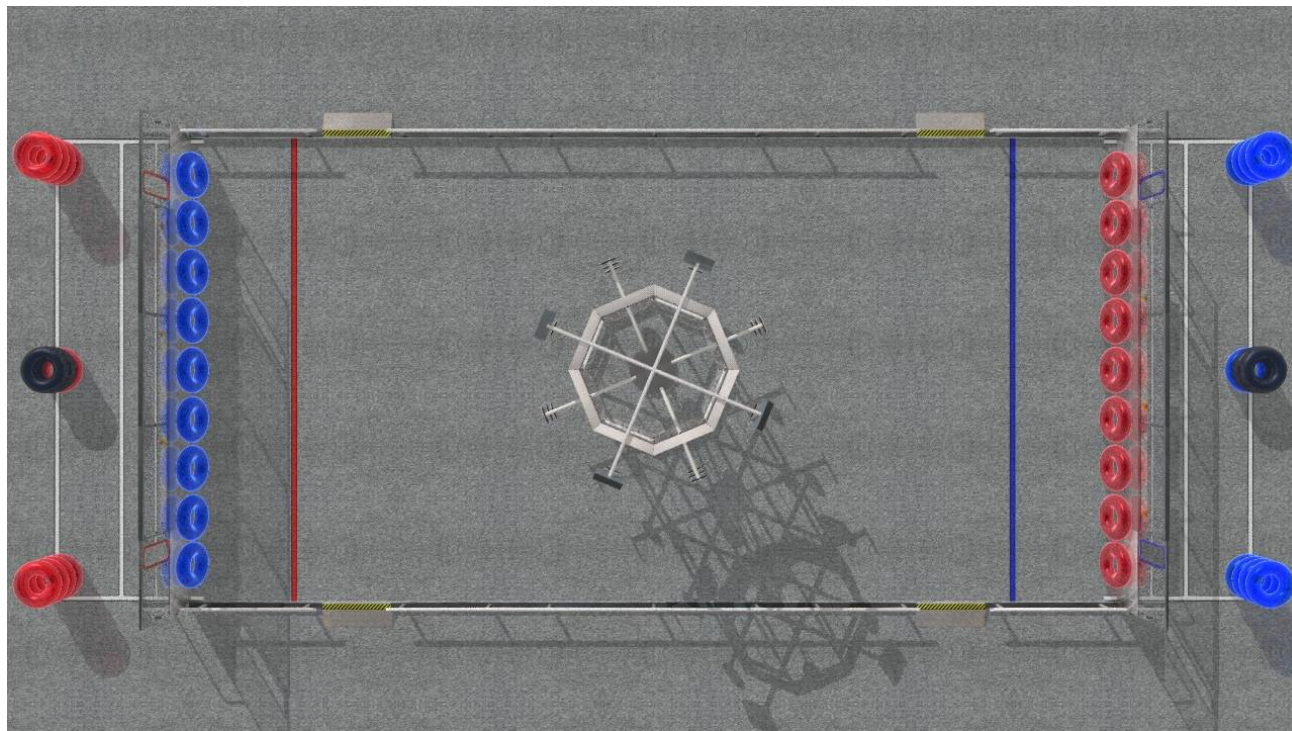
TABLE OF CONTENTS

7 THE GAME.....	2
7.1 GAME OVERVIEW	2
7.2 THE GAME.....	2
7.2.1 Definitions	2
7.2.2 Match Format.....	3
7.3 RULES	3
7.3.1 Safety.....	3
7.3.2 Game Play	4
7.3.3 Robot Operations.....	7
7.3.4 Team Member Actions	10
7.3.5 Referee Interactions.....	11
7.3.6 Scoring.....	11

7 THE GAME

7.1 GAME OVERVIEW

Rack 'n' Roll is a game played on a field as illustrated in the figure below. Two ALLIANCES, one red and one blue, composed of three teams each, compete in each match. The object of the game is to attain a higher score than your opponent ALLIANCE by placing toroidal GAME PIECES on the central goal structure (the RACK), and/or by having ROBOTS in their HOME ZONE and not in contact with the playing field at the end of the match. The point values for each of those actions are explained below.



Note: The illustrations in this section of the manual are for a general visual understanding of the field and game only. Teams should refer to the drawings for exact dimensions and field construction.

7.2 THE GAME

7.2.1 Definitions

ALLIANCE: a set of three *FIRST* Robotics Competition teams that work together during a match to play Rack 'n' Roll against an opposing ALLIANCE. ALLIANCES are identified during the match by their assigned color, either red or blue.

BUMPER ZONE: the volume between two planes parallel to the floor, the lower being 2-1/2 inches above the floor, and the upper being 8-1/2 inches above the floor. The BUMPER ZONE is defined with respect to the ROBOT when in PLAYING CONFIGURATION.

HANGING: a GAME PIECE is considered HANGING if its' weight is fully supported by a SPIDER LEG and it has been released by the POSSESSING ROBOT. A GAME PIECE is not considered HANGING if it is supported by the SPIDER FOOT.

POSSESSION: a GAME PIECE is considered to be in the POSSESSION of a ROBOT if it is being fully supported by the ROBOT, or if the ROBOT is controlling the position and movement of the GAME PIECE. A GAME PIECE on the floor is considered to be in the POSSESSION of a

ROBOT if it contacts the ROBOT at more than a single point (e.g. the ROBOT has a concave "plow" feature that is used to push the GAME PIECE in a controlled manner).

ROBOT: anything that has passed ROBOT inspection that a TEAM places on the field prior to the start of a match.

ROW: a set of SPIDER LEGS that are SCORED for the same ALLIANCE and are adjacent and aligned either vertically or horizontally.

SCORED: a SPIDER LEG is considered SCORED if one or two GAME PIECES are HANGING on it in a legal configuration. Based on the particular configuration of the GAME PIECES (as defined in Rule <G57>). The SPIDER LEG may be considered SCORED for the "Red" ALLIANCE, for the "Blue" ALLIANCE, or "Null".

SINGLETON: a SPIDER LEG that has been SCORED, but is not part of any ROW.

TEAM: four representatives from a registered *FIRST* Robotics Competition team that interact with their robot and their ALLIANCE partners to play Rack 'n' Roll. The positions on the TEAM include:

COACH: a student or adult mentor designated as the team advisor during the match and identified as the person wearing a "COACH" pin or button. There is one COACH per TEAM.

DRIVER: a pre-college student team member responsible for operating and controlling the ROBOT. There are two DRIVERS per TEAM.

HUMAN PLAYER: a pre-college student team member designated as the only team member permitted to enter GAME PIECES onto the field. There is one HUMAN PLAYER per TEAM.

7.2.2 Match Format

A match is 2 minutes and 15 seconds long. A brief AUTONOMOUS PERIOD starts each match in which the ROBOTS are controlled by pre-programmed instructions. The AUTONOMOUS PERIOD is followed by the TELEOPERATED PERIOD during which the DRIVERS assume control of the robot. There may be a short pause between AUTONOMOUS PERIOD and the start of the TELEOPERATED PERIOD as the player's stations are activated. The final portion of the TELEOPERATED PERIOD is known as the END GAME. The END GAME is played as a continuation of the TELEOPERATED PERIOD, except ROBOTS are not permitted in their opponent's HOME ZONE.

7.3 RULES

7.3.1 Safety

<S01> If at any time a ROBOT'S operation or design is deemed unsafe by the head referee, it will receive a 10-point penalty and be disabled for the remainder of the match. If the safety violation is due to the ROBOT design, the head referee has the option to not allow the ROBOT back onto the field until the design has been corrected. Examples of unsafe operation include uncontrolled motion that cannot be stopped by the drivers, throwing GAME PIECES into the audience etc.

<S02> HUMAN PLAYERS, DRIVERS, and COACHES may not directly contact any ROBOT at any time during the match. Illegal contact will result in the disabling of the TEAM'S ROBOT for the remainder of the match.

<S03> ° ROBOTS cannot break the plane of the CHUTE.

° HUMAN PLAYERS cannot break the plane of the CHUTE.

Violating this rule may result in the disabling of the ROBOT for the remainder of the match.

<S04> E-Stop - An Emergency Stop (E-Stop) button is located in each TEAM'S Player Station. Pressing an E-Stop button will cause the TEAM'S ROBOT to be disabled for the remainder of the match. The E-Stop buttons are intended for remote shut down during a match in the event of safety hazards and will not otherwise affect match score or duration. Any team member, including COACHES, may press the E-Stop button. If a team member stops a ROBOT by pressing the E-Stop button, the ROBOT will not be re-enabled for the remainder of the match.

7.3.2 Game Play

7.3.2.1 Game Periods

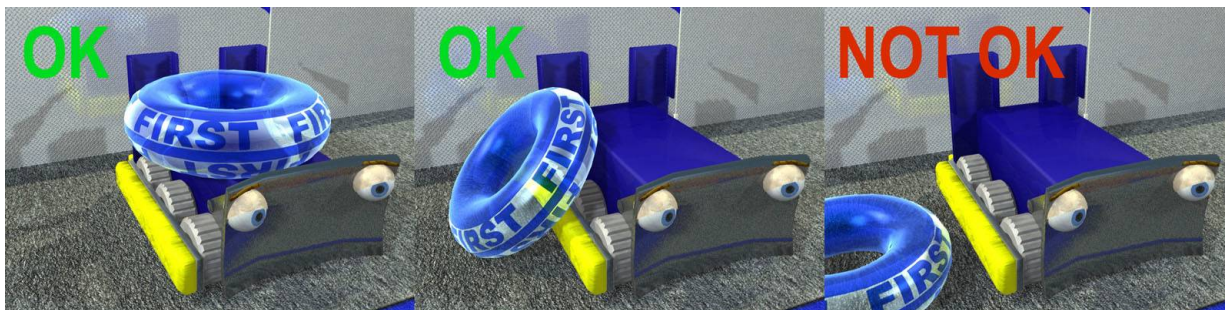
<G01> AUTONOMOUS PERIOD - The AUTONOMOUS PERIOD is the 15-second period at the start of the match. Human control of the ROBOT is not permitted at this time. The ROBOTS may react only to sensor inputs and commands programmed into the onboard control system. All ROBOT safety rules are still applicable during AUTONOMOUS PERIOD. The AUTONOMOUS PERIOD ends when the field timer displays zero seconds left in the period.

<G02> TELEOPERATED PERIOD - At the beginning of the 2-minute TELEOPERATED PERIOD Alliance Station controls are activated and DRIVERS then begin to remotely control their ROBOTS. The DRIVERS continue to teleoperate their ROBOTS for the remainder of the match. The TELEOPERATED PERIOD ends when the field timer displays zero seconds, which also indicates the end of the match.

<G03> END GAME - The final 15 seconds of the TELEOPERATED PERIOD is called the END GAME. During this period, no ROBOT may be in an opposing ALLIANCE HOME ZONE. The intent of this period is to permit ALLIANCES to attempt to score bonus points without undue interference. An audio signal will sound five seconds before the start of the END GAME period, and again at the start of the END GAME period.

7.3.2.2 Starting Conditions

<G04> KEEPER locations - Each ROBOT may start the match in POSSESSION of one KEEPER. The KEEPER does NOT need to be contained within the ROBOT'S starting volume, however it must be in contact with the ROBOT and be entirely within the HOME ZONE. The head referee will require that KEEPERS that do not meet these criteria be removed from the game. It is the responsibility of the head referee to verify that this rule is satisfied prior to the start of the match.



- <G05>** RINGER locations - Each ALLIANCE plays Rack 'n' Roll with 18 RINGERS. Prior to the start of the match, nine RINGERS are lined up along the width of the Alliance Station Wall of the opposing ALLIANCE. These RINGERS are resting on the floor, and lean against the Alliance Station Wall at the far end of the field. An additional nine RINGERS are placed in stacks at the back edge of the ALLIANCE ZONE of the corresponding ALLIANCE. See Section 6.4 for an illustration of the location of these stacks.
- <G06>** SPOILER locations - Each ALLIANCE plays Rack 'n' Roll with two (2) SPOILERS. Prior to the start of the match, the SPOILERS are placed in the center stack of GAME PIECES at the back edge of the ALLIANCE ZONE. See Section 6.4 for an illustration of the location of these stacks.
- <G07>** Center RACK position - After all six ROBOTS are in their starting positions and the DRIVERS, COACHES and HUMAN PLAYERS are in the ALLIANCE ZONE, the RACK will be moved (translated and/or rotated) to an arbitrary position so that the center of the RACK is within a 3 foot radius of the playing field center but the exact location and orientation of the RACK is unpredictable. After this point in time no ROBOT may be moved or repositioned until the match starts.

7.3.2.3 Match Play

- <G08>** Obtaining GAME PIECES - ROBOTS may obtain GAME PIECES via any of the following methods:
- Accepting a KEEPER prior to the start of the match as detailed in Rule <G04>
 - Picking up RINGERS from the opposing ALLIANCE HOME ZONE that were placed there prior to the start of the match
 - Grasping RINGERS or SPOILERS that have been placed in the CHUTE by the HUMAN PLAYER
 - Picking up RINGERS or SPOILERS from the playing field surface
 - Removing a SPOILER from a HANGING position on the RACK
- <G09>** POSSESSION - ROBOTS may only have 1 (one) GAME PIECE in their POSSESSION at any time during the match. A 10-point penalty will be assessed for each infraction. Inadvertent bulldozing of GAME PIECES while the ROBOT moves around the field is allowed. Controlled "herding" of a single GAME PIECE lying on the floor is permitted as long as no other GAME PIECE is in the POSSESSION of the ROBOT. Herding of multiple GAME PIECES, or herding of a GAME PIECE on the floor while in POSSESSION of another GAME PIECE is not permitted (as this would be considered POSSESSION of more than one GAME PIECE). GAME PIECES may fall on to a ROBOT during the course of normal game play (e.g. a RINGER falls on a ROBOT while attempting to HANG it on a Spider Leg). In such cases, GAME PIECES that are already in the POSSESSION of the ROBOT may be played. However, the additional GAME PIECE must be removed from the ROBOT (either by the ROBOT or by an ALLIANCE partner) before it can POSSESS a new GAME PIECE. GAME PIECES may not be intentionally placed on opposing ROBOTS for the purpose of causing a violation of this rule. Any such GAME PIECE placements will not be considered in POSSESSION of the affected ROBOT, and will be ignored.
- <G10>** SPIDER LEG loading - A maximum of two GAME PIECES may HANG from any one SPIDER LEG. While it may be physically possible to force a configuration in which additional GAME PIECES may be supported by the SPIDER LEG, only the first two will be considered HANGING when calculating scores at the end of the match. All additional GAME PIECES on a single SPIDER LEG will be ignored.

- <G11> SCORING SPIDER LEGS** - when an ALLIANCE legally HANGS a KEEPER or RINGER on a SPIDER LEG, the SPIDER LEG is then SCORED for the ALLIANCE. The SPIDER LEG stays SCORED for the ALLIANCE unless later placement of other GAME PIECES on the same SPIDER LEG cause the SCORING to be negated (e.g. by HANGING a SPOILER over a RINGER on the SPIDER LEG).
- <G12> KEEPER scoring** - A SPIDER LEG can only be SCORED with a KEEPER during the AUTONOMOUS PERIOD. At the end of the AUTONOMOUS PERIOD, any KEEPERS that are not HANGING are considered void.
- <G13> KEEPER advantage** - KEEPERS that have been SCORED can not be covered by another GAME PIECE and can not be negated by a SPOILER. Any GAME PIECE placed in a HANGING position on the same SPIDER LEG after a KEEPER (including another KEEPER) will be ignored when determining the match score. In all other aspects, KEEPERS are treated the same as RINGERS.
- <G14> Late KEEPERS** - After the AUTONOMOUS PERIOD ends, ROBOTS may not HANG any KEEPERS for the remainder of the match. Any KEEPERS that a ROBOT may POSSESS must be immediately released and dropped to the floor. If necessary, referees may validate placement of KEEPERS during the pause following the end of the AUTONOMOUS PERIOD. The referees may remove any KEEPERS that are not HANGING. If a ROBOT HANGS a KEEPER after the AUTONOMOUS PERIOD, it will result in a disqualification. If the “late KEEPER” is placed on a SPIDER LEG on which an opposing RINGER is already HANGING, the “late KEEPER” will be ignored during the calculation of the match score. If the “late KEEPER” is placed on a SPIDER LEG on which a RINGER from the same alliance is already HANGING, the two will cancel each other and both will be ignored when determining if the SPIDER LEG is SCORED. Note: as RINGERS and SPOILERS can be HANGING only after the end of the AUTONOMOUS PERIOD, any KEEPERS HANGING on a SPIDER LEG after a RINGER or SPOILER will automatically be determined to be a “late KEEPER.”
- <G15> Double RINGERS** - a RINGER can not be placed on a SPIDER LEG on which a RINGER is already HANGING. If a ROBOT HANGS a RINGER on a SPIDER LEG that already has a HANGING RINGER from the opposing ALLIANCE, the second RINGER will be ignored when calculating the match score. If a ROBOT HANGS a RINGER on a SPIDER LEG that already has a HANGING RINGER from their own ALLIANCE (for example, to prevent a SPOILER from being placed on the SPIDER LEG), the two RINGERS will cancel each other and both will be ignored when determining if the SPIDER LEG is SCORED.
- <G16> Negating with SPOILERS** - SPOILERS negate a HANGING RINGER when they HANG on a SPIDER LEG after the RINGER. The affected SPIDER LEG is considered “Null” when ROWS are identified during calculation of the ALLIANCE score.
- <G17> Solitary SPOILERS** - Single or double SPOILERS HANGING by themselves on a SPIDER LEG (i.e. not covering any RINGERS) have no affect on the SCORING of the SPIDER LEG. In either case, the affected SPIDER LEG is considered “Null” when ROWS are identified during calculation of the ALLIANCE score.
- <G18> Removing SPOILERS** - SPOILERS that are HANGING may be removed from the RACK by either ALLIANCE. Any RINGERS and SPIDER LEGS “unspoiled” by the removal of the SPOILER will then be evaluated as if they had never been “spoiled” when the final match score is determined. SPOILERS removed from the RACK are fully in play, and may be placed in any other legal position on the RACK.
- <G19> Spoiling SPOILERS** - RINGERS can HANG on a SPIDER LEG on which a single SPOILER has already been placed, thereby covering the SPOILER. In this case, the SPOILER does not negate the outer RINGER, as the SPOILER is not HANGING over it (see Rule <G16>). The SPIDER LEG is SCORED for the ALLIANCE that HANGS the RINGER.

- <G20>** De-scoring - ROBOTS may not remove RINGERS or KEEPERS once they are HANGING. If a RINGER or KEEPER is moved out of a HANGING configuration after the POSSESSING ROBOT has released it, it is still considered HANGING. If a ROBOT incidentally removes a RINGER or KEEPER from the SPIDER LEG on which it was HANGING (e.g. knocks it off while placing another GAME PIECE), a 10-point penalty will be assessed. Obviously intentional removal of a RINGER or KEEPER will result in a disqualification of the offending team.
- <G21>** SCORING for opponents - ROBOTS may not HANG a GAME PIECE of an opposing ALLIANCE. If this rule is violated a 10-point penalty will be assessed per infraction. If the ROBOT HANGS a KEEPER off from the opposing ALLIANCE, it will be ignored when determining the score. If the ROBOT HANGS a RINGER on an otherwise empty Spider Leg, it will be SCORED as if it were placed there by the opposing ALLIANCE. If the ROBOT HANGS an opposing RINGER on a Spider Leg on which their own RINGER is already HANGING, the two will cancel each other and the Spider Leg will be SCORED as "Null." If the ROBOT HANGS an opposing RINGER on a Spider Leg on which an opposing RINGER is already HANGING, the added RINGER will be ignored and the Spider Leg will continue to be SCORED for the opposing ALLIANCE.
- <G22>** GAME PIECES out of play - GAME PIECES that leave the playing field will be placed back on the field at the earliest safe opportunity. The GAME PIECES will be placed on the field at the approximate location where they exited play.
- <G23>** GAME PIECES through CHUTE – GAME PIECES may be entered onto the field through the CHUTE (see Rule <G08>). ROBOTS may not pass GAME PIECES from the Playing Field through the CHUTE into the Alliance Zone.
- <G24>** Clearing HOME ZONE – the first audio signal, sounded five seconds before the start of the END GAME, serves as a warning for ROBOTS to exit from the opposing HOME ZONE. ROBOTS attempting to exit from the HOME ZONE after the audio signal may not be blocked or impeded in this attempt.
- <G25>** END GAME play – ROBOTS may not occupy the opponents HOME ZONE during the END GAME. Any ROBOT in an opponent's HOME ZONE at the start of the END GAME will be assessed a 10-point penalty. A second 10-point penalty will be assessed if the ROBOT is still in the HOME ZONE 5 seconds after the start of the END GAME. Another 10-point penalty will be assessed if the ROBOT remains in the HOME ZONE 10 seconds after the start of the END GAME. However, a ROBOT that has been blocked or otherwise prevented from exiting the HOME ZONE (as described in Rule <G24>) will not be assessed any penalty.

7.3.3 Robot Operations

7.3.3.1 Starting Conditions

- <G26>** Starting positions - At the beginning of a match, the three alliance ROBOTS must be placed entirely inside their HOME ZONE. It is the responsibility of the head referee to verify that this rule is satisfied prior to the start of the match. The match will not be started until all robots are in the starting position.
- <G27>** Alignment devices - Alignment devices (templates, tape measures, etc.) that are not part of the ROBOT may not be used to assist with positioning the ROBOT. TEAMS that use external alignment devices to position their ROBOT will have their ROBOT arbitrarily repositioned by the head referee.
- <G28>** Starting size - At the beginning of a match, each ROBOT must not exceed the maximum volume specified in Section 8. The ROBOT'S maximum starting height is proportional to its maximum weight. It is the responsibility of the head referee to verify that this rule is satisfied

prior to the start of the match. The head referee may call for an inspector's recertification of the ROBOT size and weight prior to the start of any match.

- <G29>** ROBOT orientation - ROBOTS must start the match with their long (maximum) dimension in a vertical orientation. After the start of the match, ROBOTS may change their orientation such that the long dimension is either vertical or horizontal. Refer to Rule <R37> in Section 8 to determine how this affects the use of bumpers.

7.3.3.2 Robot Out Of Bounds

- <G30>** ROBOT out of bounds - Any ROBOT that touches any surface outside of the field boundary will be disabled for the remainder of the period (either AUTONOMOUS or TELEOPERATED). No penalty points will be assessed.
- <G31>** Grace period after autonomous - If a ROBOT should touch any surface outside of the field boundary during the AUTONOMOUS PERIOD, it will have a 10 second "grace period" to right itself and return to the playing field at the beginning of the TELEOPERATED PERIOD. If the ROBOT is unable to right itself within the grace period, it will be disabled for the remainder of the match. If at any time the referee should determine that the attempts to recover from the situation constitute unsafe operations, Rule <S01> will take precedence.
- <G32>** Alliance Station wall - ROBOTS may not extend/cross over the Alliance Station wall for any reason. If a violation of this rule occurs a 10-point penalty will be assessed and the ROBOT may be disabled.

7.3.3.3 Robot Actions

- <G33>** Field interaction - ROBOTS may push or react against any elements of the field, provided there is no damage or disruption of the field elements. ROBOTS may not grab, grasp, grapple, or attach to any field structure. Robot may not HANG GAME PIECES on the Vision System Targets, or otherwise block visual access to the Vision System Targets. If a ROBOT violates this rule, the head referee will give one warning. If the referee determines that the TEAM is disregarding the warning, their ROBOT will be disabled for the remainder of the match.
- <G34>** Field damage - The head referee may disable a ROBOT that has damaged the playing field, carpet, goals, GAME PIECES, etc. if the head referee feels that further damage is likely to occur. The head referee may require corrective action, such as eliminating a sharp edge, and re-inspection, before the ROBOT will be allowed to compete in subsequent matches.
- <G35>** Intentional ROBOT - ROBOT interaction - Strategies aimed solely at the destruction, damage, tipping over, or entanglement of ROBOTS are not in the spirit of the *FIRST* Robotics Competition and are not allowed. In all cases involving robot-to-robot contact, the head referee may assess a 10-point penalty and/or the ROBOT may be disqualified. However, Rack 'n' Roll is a highly interactive game, and some appropriate contact is allowed under the following guidelines:
- Any contact within the BUMPER ZONE is generally acceptable, with the exception of high speed, long distance ramming. If TEAMS choose not to use bumpers, and their ROBOT contacts another ROBOT such that simultaneous contact occurs both in and out of the BUMPER ZONE, then this contact is considered within the BUMPER ZONE.
 - Contact outside of the BUMPER ZONE is generally not acceptable, and the offending ROBOT will be assessed a 10-point penalty, and may be disqualified from the match if the offense is particularly egregious or if it results in substantial damage to another ROBOT. Incidental contact will not be penalized. Contact outside the BUMPER ZONE

that is a result of tipping caused by contact within the BUMPER ZONE will be considered incidental contact.

- If a ROBOT extends outside of its 28 inch by 38 inch starting footprint, it is responsible for the extension's contact with other ROBOTS and must not use the extension to contact other ROBOTS outside of the BUMPER ZONE. Likewise, other ROBOTS will not be responsible for contact with the extension outside of the BUMPER ZONE. Again, incidental contact will not be penalized.
- Extension to extension contact between two ROBOTS with appendages outside the 28-inch by 38-inch starting footprint will generally not be penalized.
- Contact with a tilted ROBOT such that the contact is outside the BUMPER ZONE will generally be considered incidental contact.
- A ROBOT may attach to and/or climb onto a ROBOT on its own ALLIANCE. A ROBOT may not attach to and/or climb onto a ROBOT on an opposing ALLIANCE (doing so will be interpreted as an attempt to damage an opposing robot, and may be penalized as such).
- Use of any sloped or angled feature of the ROBOT as a wedge to overturn an opposing ROBOT is explicitly prohibited, and will be assessed as a violation of Rule <R05>.

<G36> Goal defense - ROBOTS may defend SPIDER LEGS by pushing and/or blocking other ROBOTS as they attempt to HANG GAME PIECES. If a ROBOT is in POSSESSION a GAME PIECE, a ROBOT on the opposing ALLIANCE may not grasp/attach to the GAME PIECE in order to remove it from their POSSESSION or prevent them from HANGING. A violation will result in a 10-point penalty being assessed to the offending ROBOT.

<G37> GAME PIECE entanglement - During the course of game play, it is probable that a ROBOT may insert a manipulator or other extension into the center opening of a GAME PIECE that is in the POSSESSION of an opposing ROBOT, and become momentary intertwined. This situation may occur frequently, and is NOT considered an "entanglement" situation. The ROBOTS will be permitted to extract themselves from the situation as a part of normal game play, without penalty. The one exception to this is if either ROBOT uses the intertwined state with the GAME PIECE as an opportunity to pull/tip over the opponent ROBOT by pulling on the intertwined GAME PIECE. In this case, the offending ROBOT will be disabled for the remainder of the match and the TEAM disqualified.

<G38> Entanglement – If a ROBOT entangles an opposing ROBOT, and the referee determines that the entangling action was intentional, the offending ROBOT will be disqualified. Any entangled robot may be disabled if the Head Referee deems it necessary. Robots that become entangled in the field barriers, field elements or other robots will not be freed until after the match has finished, unless the entanglement represents a safety hazard. If, due to loose cables, hoses, cordage, etc., a ROBOT unintentionally but routinely entangles another ROBOT as a result of normal game interaction, the head referee has the authority to disqualify the offending ROBOT and require that the entangling elements be repaired prior to the ROBOT'S next match.

<G39> Pinning - While on the carpeted field surface, a ROBOT cannot pin (inhibit the movement of another ROBOT while in contact with a field element or border) for more than 10 seconds. If a ROBOT has been pinned for 10 seconds, the TEAM with the pinning ROBOT will be told by a referee to release the pinned ROBOT and back away approximately 3 feet for a minimum of 3 seconds. Once the pinning ROBOT has backed off by at least 3 feet for 3 seconds, it may again attempt to pin its opponent, and if successful, the 10 second count

will start over. If a referee determines that this rule has been violated, a 10-point penalty will be assessed for each violation. Note that a ROBOT attempting to HANG a GAME PIECE on the RACK will be immune from a "pinning" violation as long as it is clear that the ROBOT is continuing to attempt to HANG the GAME PIECE.

- <G40>** Detaching mechanisms - ROBOTS may not intentionally detach parts or leave multiple mechanisms on the field. Violations will result in a 10-point penalty per incident. If an intentionally detached component or mechanism significantly impedes access to the RACK or an ALLIANCE ROBOT during the END GAME, the offending ROBOT will be disqualified from the match.
- <G41>** Field reset - ROBOTS must be designed to permit the release and removal of any GAME PIECES from the ROBOT without being powered up after a match. If a ROBOT violates this rule, the head referee will warn the offending TEAM and request that they modify the ROBOT. If the modification is not made, the head referee may not allow the ROBOT to compete in future matches.
- <G41-A>** Violations of Rule <R12> while the ROBOT is outside of the HOME ZONE during match play will be penalized. A violation of this rule may result in the ROBOT being disabled or disqualified, based on the severity of the infraction.

7.3.4 Team Member Actions

- <G42>** Number of people in the ALLIANCE ZONE - Each TEAM shall include a maximum of one HUMAN PLAYER, two DRIVERS, and one COACH. Any ALLIANCE with additional personnel in the ALLIANCE ZONE will be assessed a 10-point penalty, and the additional person must leave the ALLIANCE ZONE before the match can proceed.
- <G43>** Travel within the ALLIANCE ZONE - All TEAM members may travel anywhere within the ALLIANCE ZONE.
- <G44>** TEAM members stepping out of ZONE - All TEAM members must stay within their ALLIANCE ZONE during the entire match. Each incident of stepping out of the ALLIANCE ZONE will result in a 10-point penalty to the offending ALLIANCE.
- <G45>** TEAM members over the PLAYER'S LINE during AUTONOMOUS PERIOD - No TEAM member may pass the PLAYER'S LINE in the ALLIANCE ZONE until the conclusion of the AUTONOMOUS PERIOD. Each violation will result in a 10-point penalty to the offending ALLIANCE. Exceptions will be made in cases involving personal or robot control safety.
- <G46>** Entering GAME PIECES on the field during AUTONOMOUS PERIOD - GAME PIECES may not be entered onto the field during AUTONOMOUS PERIOD. A violation of this rule will result in a 10-point penalty to the offending ALLIANCE.
- <G47>** Handling GAME PIECES - Any HUMAN PLAYER, DRIVER, or COACH may handle RINGERS or SPOILERS that are in the ALLIANCE ZONE after the end of AUTONOMOUS PERIOD. GAME PIECES cannot be handled during the AUTONOMOUS PERIOD. Violations of this rule will result in a 10-point penalty to the offending ALLIANCE.
- <G48>** Entering GAME PIECES onto the field - Only the HUMAN PLAYERS may enter a RINGER or SPOILER onto the field once the TELEOPERATED PERIOD begins. This may be done by attempting to throw it to a ROBOT or onto the RACK, passing it through the CHUTE to a ROBOT, or passing it through the CHUTE for pickup by a ROBOT. If GAME PIECES are thrown, they must be thrown over the top of the Alliance Station Wall, and may not be thrown around the side of the Alliance Station Wall. Violations of this rule will result in a 10-point penalty per GAME PIECE entered onto the field.
- <G49>** DRIVERS Operating ROBOTS - During a match, the ROBOTS may be remotely operated solely by the DRIVERS and/or by software running in the on-board control system. Any

operation of the ROBOT by either the COACH or HUMAN PLAYER will result in the ROBOT being disabled and the offending TEAM disqualified from the match.

<G50> Respect and professional demeanor - *FIRST* Competitions promote respect and professional demeanor. In the event that any TEAM members on the playing field are uncivil towards competition field personnel or other TEAMS, the TEAM may be disqualified from the match. This rule applies to TEAMS at all times while on the playing field (including before and after the match). TEAMS will not receive match penalties for actions off the field, however event personnel will hold them accountable for their off-field actions.

7.3.5 Referee Interactions

<G51> Any discussions regarding rules, scores, or penalties must be between the DRIVERS or HUMAN PLAYERS (pre-college team members) and the head referee.

<G52> When making a ruling, the head referee may receive input from other sources, particularly Game Design Committee members, *FIRST* personnel, and technical staff that may be present at an event. However, the head referee's decision is final (also see Rule <T04>).

7.3.6 Scoring

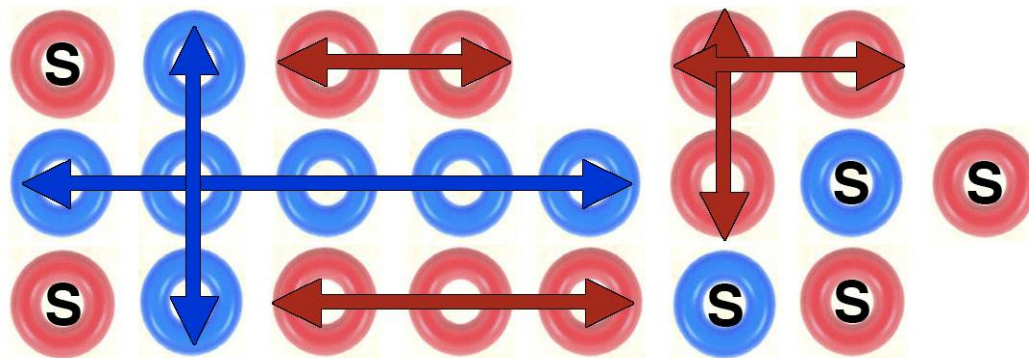
When playing Rack 'n' Roll, points are awarded based on the number and length of horizontal and vertical ROWS of SCORED SPIDER LEGS constructed by the ALLIANCE. ALLIANCES build up their scores by HANGING GAME PIECES on the SPIDER LEGS of the RACK.

<G53> The HANGING GAME PIECES cause the associated SPIDER LEG to be SCORED for the "Red" ALLIANCE, the "Blue" ALLIANCE, or "Null" (in the event the GAME PIECE is a properly placed SPOILER). A SPIDER LEG that is SCORED is considered either a SINGLETON or as part of one or two ROWS (if it is at the intersection of a horizontal and vertical ROW).

<G54> SCORING - Total point values of SCORED ROWS are as follows:

- SINGLETON - 2 points
- ROW of 2 SCORED SPIDER LEGS - 4 points
- ROW of 3 SCORED SPIDER LEGS - 8 points
- ROW of 4 SCORED SPIDER LEGS - 16 points
- ROW of 5 SCORED SPIDER LEGS - 32 points
- ROW of 6 SCORED SPIDER LEGS - 64 points
- ROW of 7 SCORED SPIDER LEGS - 128 points
- ROW of 8 SCORED SPIDER LEGS - 256 points

Note: There is not an additional 2 points for each GAME PIECE in a ROW.



In the above illustration, the letter “S” indicates SINGLETONS and ROWS are indicated with corresponding colored arrows. In this example, the Blue ALLIANCE has created 2 SINGLETONS (for a total of 4 points), one ROW of 3 SPIDER LEGS (8 points) and one ROW of 5 SPIDER LEGS (32 points). The Red ALLIANCE has created 4 SINGLETONS (for a total of 8 points), three ROWS of 2 SPIDER LEGS (a total of 12 points) and one ROW of 3 SPIDER LEGS (8 points). The Blue ALLIANCE would receive 44 points and the Red ALLIANCE would receive 28 points.

























<G55> Deflated GAME PIECES - A GAME PIECE that has been deflated is evaluated the same as one that is inflated when determining the match score. Intentionally deflating a GAME PIECE is considered field damage (see <G34>).

<G56> ROBOTS in HOME ZONE - ROBOTS score bonus points at the end of the match if they are entirely in their HOME ZONE, not in contact with any element of the field (carpet, alliance station, goal, etc.), not supported by a GAME PIECE, and the lowest point of the ROBOT is higher than 4 inches and/or 12 inches above the carpeted field surface. The number of bonus points an ALLIANCE receives is based on the total number of ROBOTS satisfying these conditions. Each ALLIANCE ROBOT entirely in their HOME ZONE at the end of the match is eligible to receive the following bonus points:

- Each ROBOT between 0 and 3.9 inches above floor level - 0 bonus points
- Each ROBOT between 4.0 and 11.9 inches above floor level - 15 bonus points
- Each ROBOT 12.0 inches or more above floor level - 30 bonus points

<G57> The following table illustrates the possible configurations of GAME PIECES that can HANG on the SPIDER LEGS, and how each configuration is interpreted when SCORING ROWS.

OBJECTS (INNER/OUTER)	SCORED AS / RELATED RULE	OBJECTS (INNER/OUTER)	SCORED AS / RELATED RULE
	BLUE Rule <G11>		RED Rule <G11>
	BLUE Rule <G11>		RED Rule <G11>
	BLUE Rule <G13>		RED Rule <G13>

	NONE Rule <G16>		NONE Rule <G16>
	BLUE Rule <G13>		RED Rule <G13>
	BLUE Rule <G13>		RED Rule <G13>
	BLUE Rule <G13>		RED Rule <G13>
	BLUE Rule <G13>		RED Rule <G13>
	BLUE Rule <G14>		RED Rule <G14>
	BLUE Rule <G15>		RED Rule <G15>
	BLUE Rule <G19>		RED Rule <G19>
	NONE Rule <G14>		NONE Rule <G14>
	NONE Rule <G15>		NONE Rule <G15>
	NONE Rule <G17>		NONE Rule <G17>
	NONE Rule <G14>		NONE Rule <G14>

Note: this chart is based on the premise that ROBOTS are HANGING GAME PIECES of their own color on the Rack. Exceptions to the chart occur when ROBOTS HANG opponent GAME PIECES. These exceptions are explained in Rules <G15> and <G21>.