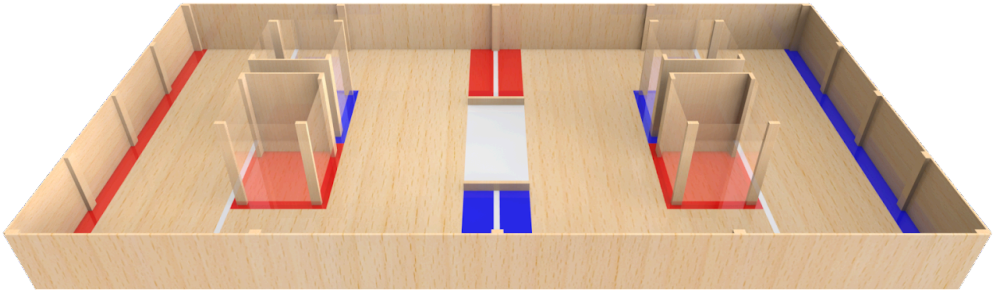
CardinalBotics Team 4159
2022 Internal Robotics Competition: Prism Panic

Game Overview

In the 2022 Team 4159 Internal Robotics Competition (IRC) we will play *Prism Panic*, a modified version of Power Up, the 2018 FRC game.



I. Introduction

The Internal Robotics Competition begins with the Kickoff on Friday, September 30th, 2022. Six teams of four or five people will work over the following nine weeks to construct their IRC robots. They will assemble a prepared drivetrain and create their own mechanisms to compete in the tournament at Lowell on the evening of Friday, December 2, 2022.

II. Matches

Each match will be 2 minutes, 15 seconds long. In the first 15 seconds of the match, the robots will be in the AUTONOMOUS period, and not controlled by their Driver. In the last 20 seconds of the match (the ENDGAME), robots will compete for a parking space in the PARKING ZONE. DRIVERS and COACHES will stand behind a protective wall on opposite ends of the field and control the robots remotely for the entire match.

III. Scoring

There are four ways to score points in a match: cross the AUTO LINE (5 points per robot), score a POWER PRISM in the SWITCH (10 points if done in AUTONOMOUS, 5 points if done in TELEOPERATED), POSSESS a SWITCH at the end of the match (10 points), and have a robot PARKED in the PARKING ZONE (10 points). In addition, an ALLIANCE may earn more ranking points in two ways: have both their robots cross the AUTO LINE and/or score a POWER PRISM in AUTONOMOUS, or have OWNERSHIP over both the SWITCHES at the end of the match.

IV. The Drive Team

The drive team of each team will be made up of a DRIVER, a COACH and 1 HUMAN PLAYER. The DRIVER controls the robot from behind their ALLIANCE WALL. The COACH stands behind the wall and may talk to the DRIVER, HUMAN PLAYERS, and the allied drive team. The HUMAN PLAYER will stand outside of the field near the designated alliance's PICKUP ZONE and inbound POWER PRISMS.

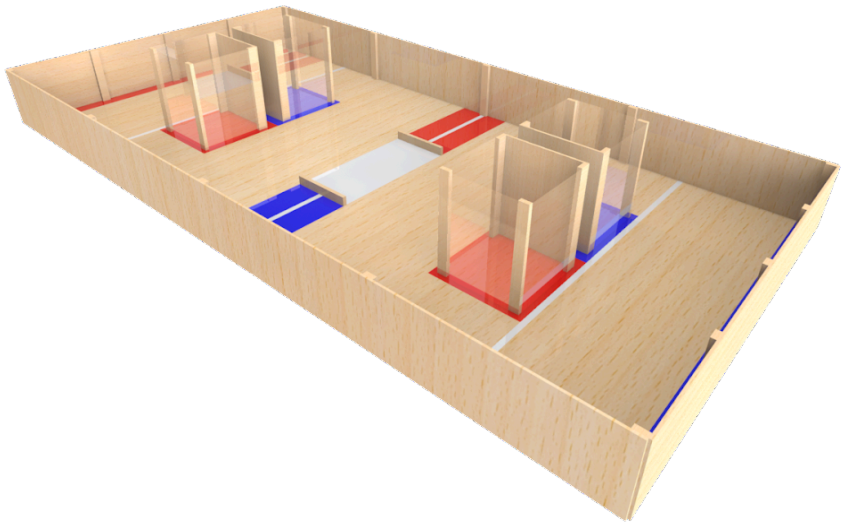
V. Tournament

The tournament begins with a series of six qualification matches, with each team playing in four. Teams will earn ranking points through winning matches (2 RP for winning a match, 1 RP for a tie) and for accomplishing certain in-match tasks. At the end of the qualification matches, teams will be ranked in order of most to least average ranking points per match. If teams have the same amount of average ranking points, average match score will be used as a tiebreaker. The highest-ranked teams will participate in alliance selection, choosing another team to join their Finalist ALLIANCE. These two two-team Finalist ALLIANCES will play in a best-two-out-of-three set to determine the winner of the IRC.

The Game Field

I. The Game Field

The game field will be divided into two 12' x 12' zones with a CENTER LINE down the middle of the field. The two zones will be referred to as the Red ALLIANCE ZONE and the Blue ALLIANCE ZONE. There will be an AUTO LINE 4 ft away from the alliance walls. The red ALLIANCE ZONE is on the same side as the red alliance wall. The blue ALLIANCE ZONE is on the same side as the blue alliance wall.



II. The Game Pieces

The game pieces will be 8”x 8”x 8” cardboard boxes called POWER PRISMS. There will be no POWER PRISMS found on the field itself; instead they will be placed either into the PICKUP ZONE or directly into a ROBOT positioned fully within the PICKUP ZONE.

III. The SWITCH

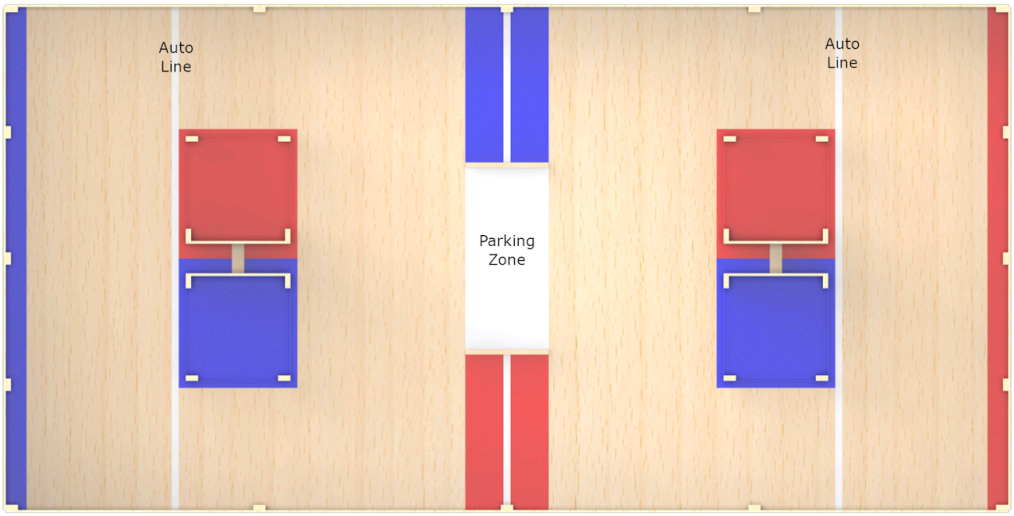
The field has two SWITCHES, one on each side of the field. Each SWITCH has a red side and a blue side. The top openings of the SWITCH are 30”x 30” in. for each color, and are 36” in. high. (30”x 30”x 36” inches), with clear polycarbonate walls. POWER PRISMS must be placed into the SWITCH through the top opening and remain fully inside to score.

IV. The PARKING ZONE

In the center of the field there is a marked (taped) 24”x 52” inch zone with 3.5” wooden rails on the short sides: this is the PARKING ZONE. Robots may travel *through* the PARKING ZONE during the normal TELEOPERATED period, but they should not remain there. During the ENDGAME, robots may attempt to enter and remain in the PARKING ZONE, which is big enough to contain two robots.

V. The AUTO LINES

There is an AUTO LINE for each alliance across the length of the field. It is taped out 4 feet away from the alliance wall, in line with the front of the SWITCH. Robots will attempt to cross the AUTO LINE to score points in the AUTONOMOUS period.



Gameplay

I. Match Start and End

The game starts with each alliance's robots placed touching their alliance wall. Each team may start with one POWER PRISM of their alliance's color in contact with and fully supported by their robot. The match will start with an audible signal from the Head Referee, at which point teams start their robots' AUTONOMOUS routines. The match ends 2 minutes, 15 seconds later with another audible signal. The DRIVERS of both alliances must immediately bring their robots to rest and release the controls of their robots when the end game signal sounds. POWER PRISMS scored after the end game signal will not count, and teams will be penalized for egregious movement after the end of the match.

II. Match Periods

There are three distinct periods of time in the match: the AUTONOMOUS period, TELEOPERATED period, and the ENDGAME. The times are as detailed below:

Match Period	**Duration**	**Length**
AUTONOMOUS	2:15 - 2:00	15 seconds
TELEOPERATED	2:00 - 0:20	100 seconds
ENDGAME	0:20 - 0:00	20 seconds

AUTONOMOUS: The first 15 seconds of a match are the AUTONOMOUS period, during which robots move with pre-programmed routines. Drivers will start the robot with one touch of the driver station at the Referee's start-of-match signal. After that, drivers may not touch the controls or otherwise attempt to influence the match until the end of the AUTONOMOUS period.

TELEOPERATED: This is the main period of the match. During this time teams earn points by scoring POWER PRISMS into the SWITCHES. They may use POWER PRISMS that start on the field, or ones that are inbounded by their HUMAN PLAYER into an alliance robot or the ALLIANCE PICKUP ZONE. Teams must only use POWER PRISMS of their own alliance's color to score.

ENDGAME: Teams may continue to score POWER PRISMS, and now may also attempt to enter the PARKING ZONE. The PARKING ZONE is large enough to fit two robots in any combination of alliance colors. Teams may compete to enter the PARKING ZONE and push others out if they so choose. PARKING points are awarded based on the robots' final positions at the *instant the match ends*.

III. Scoring

There are four ways to score match points in PRISM PANIC. Teams may earn points through crossing the AUTO LINE in AUTONOMOUS, scoring POWER PRISMS in the SWITCHES, PARKING during the ENDGAME, and owning SWITCHES at the end of the match. The point values are as listed below:

Scoring Method	**Point Value**
Cross the AUTO LINE in AUTONOMOUS	5 points
PRISM scored in the SWITCH	5 points in TELEOP, 10 in AUTONOMOUS
OWN a SWITCH at the end of the game	10 points
Be PARKED at the end of the match	10 points

To have officially crossed the AUTO LINE, a robot must have moved from its starting position and had at least some part of its bumper moved across the line.

Teams may score POWER PRISMS in the SWITCHES at any point in the match. To score, a team must place a POWER PRISM of their alliance's color in a matching side of a SWITCH (i.e., the red alliance should be scoring red POWER PRISMS in the red side of either SWITCH). A POWER PRISM must be fully contained in a SWITCH to be considered scored. Each POWER PRISM is worth 10 points if scored in AUTONOMOUS and 5 points if scored in TELEOP or the ENDGAME.

To OWN a SWITCH, an alliance must have at least 3 POWER PRISMS in their side **and** have more POWER PRISMS in their color than the opposing alliance has in their own. At the end of a match, an alliance may OWN one, both, or neither of the SWITCHES. If fewer than three POWER PRISMS per side have been scored, or there is an even amount of POWER PRISMS in each side of a SWITCH, it will not be OWNED by either alliance.

To be PARKED, a robot must be fully contained in the PARKING ZONE at the instant the match ends. A maximum of two robots (in any combination of alliances) will fit in the PARKING ZONE.

Alliances may also earn additional ranking points by accomplishing certain tasks in the match. There are two possibilities to earn these:

- Both robots on the alliance cross the auto line in AUTONOMOUS
- The alliance OWNS both SWITCHES at the end of the match

Thus, a maximum of four ranking points may possibly be earned in a match: two from winning, and one from each of the additional in-match tasks.

IV. POWER PRISM Inbounding

POWER PRISMS must enter play by being inbounded by a HUMAN PLAYER. To inbound, a HUMAN PLAYER introduces a POWER PRISM from their reserve to the field (they should gently toss the POWER PRISM, not reach *into* the field). It must land either on the ground in their alliance's PICKUP ZONE (in the designated, taped-out area at center of the field), or in a ROBOT fully contained within that PICKUP ZONE. The POWER PRISMS cannot be thrown outside the PICKUP ZONE or into either of the SWITCHES.

V. Penalty Assessment

Upon a rule violation, FOUL or TECHNICAL FOUL points will immediately be credited to the opposing ALLIANCE.
A FOUL will be worth 5 points. A TECHNICAL FOUL will be worth 15 points.

Directly below is a list of particularly common rule violations you should seek to avoid. **This abbreviated list is here for your convenience and is *not* comprehensive. You should read *all* the rules that follow in the manual.**

- **G7:** A ROBOT may only possess one POWER PRISM at a time.
- **G8:** An alliance may not POSSESS their opponent's POWER PRISMS.
- **G15:** ROBOTS may not pass the center line in AUTONOMOUS.
- **G18:** An ALLIANCE may not pin an opponent ROBOT for more than five (5) seconds.
- **G19:** ROBOTS may not contact an opposing ALLIANCE ROBOT while the opposing robot is in its respective PICKUP ZONE.
- **G22:** Inbounded POWER PRISMS must land in the alliance's own PICKUP ZONE, or in a ROBOT that is fully contained in that PICKUP ZONE.
- **G24:** Before the ENDGAME, teams may not stay in the PARKING ZONE for more than 5 seconds.

VI. Game Rules

G1 Teams may not climb on any FIELD element intentionally, except for the parking zone .
Violation: YELLOW CARD

G2 ROBOTS whose operation or design is unsafe are not permitted.
Violation: FOUL & DISABLED.

Pre-MATCH

G3 When placed on the FIELD, each ROBOT must be:
A. in compliance with all ROBOT rules (i.e. have passed Inspection)
B. confined to its STARTING CONFIGURATION
C. contained within their own ALLIANCE ZONE
D. fully supported by the floor.
Violation: MATCH will not start until the situation is corrected.

G4 Each TEAM member must be in designated areas:
A. COACHES and DRIVERS must be in the ALLIANCE STATION
B. HUMAN PLAYERS must be outside the field near their alliance's PICKUP ZONE.
Violation: MATCH will not start until the situation is corrected.

General Rules

G5 The following actions are prohibited with regards to interaction with FIELD elements (items A-D exclude POWER PRISMS):
A. grabbing,
B. grasping
C. grappling
D. attaching to,
E. damaging,
F. becoming entangled
Violation: FOUL. If the Head Referee determines that further damage is likely to occur, DISABLED.

- *Corrective action (such as eliminating sharp edges, removing the damaging mechanism, and/or re-Inspection) may be required before the ROBOT will be allowed to compete in subsequent MATCHES.*
- *ROBOTS may push or react against any element of the FIELD.*
- *POWER PRISMS are expected to undergo a reasonable amount of wear and tear as they are handled by ROBOTS, such as scratches and occasional marks. However, ROBOTS that break, crush, or routinely mark POWER PRISMS will be considered in violation of G5.*

G6 POWER PRISMS may not be intentionally or repeatedly ejected from gameplay.
Violation: FOUL per instance, YELLOW CARD if strategic.

G7 A ROBOT may only possess one POWER PRISM at a time. (See **G8** for definition).
Violation: FOUL, if unintentional and inconsequential (i.e. does not significantly impact MATCH play). TECHNICAL FOUL per consequential instance. TECHNICAL FOUL per extended instance. If strategic, RED CARD for the ALLIANCE.

G8 An ALLIANCE may not POSSESS their opponent's POWER PRISMS. The following criteria define POSSESSION:
A. "carrying" (moving while supporting POWER PRISMS in or on the ROBOT or holding the POWER PRISM in or on the ROBOT),
B. "herding" (repeated pushing or bumping),
C. "launching" (impelling POWER PRISMS to a desired location or direction via a MECHANISM in motion relative to the ROBOT), or
D. "trapping" (overt isolation or holding one or more POWER PRISMS against a FIELD element or ROBOT in an attempt to shield them).
Violation: FOUL, if unintentional and inconsequential (i.e. does not significantly impact MATCH play). TECHNICAL FOUL per consequential instance. TECHNICAL FOUL per extended instance. If strategic, RED CARD for the ALLIANCE.

- *Examples of POWER PRISM interaction that are not POSSESSION are*
  A. "bulldozing" (inadvertently coming in contact with POWER PRISMS that happen to be in the path of the ROBOT as it moves about the FIELD)
  B. "deflecting" (a single hit to or being hit by a POWER PRISM that bounces or rolls off the ROBOT or a POWER PRISM slips through the grips of a ROBOT without arresting the POWER PRISM'S momentum).
- *A POWER PRISM that becomes unintentionally lodged on a ROBOT will be considered POSSESSED by the ROBOT. It is important to design your ROBOT so that it is impossible to inadvertently or intentionally POSSESS an opponent's POWER PRISM.*
- *The intent of G8 is to prevent an ALLIANCE from inhibiting an opponent's ability to interact with their POWER PRISM, but accommodate accidental and inconsequential actions by way of fewer FOUL points. Actions which are perceived as consequential and extended are distinct violations, as there are scenarios where POSSESSION of an opponent's POWER PRISM could be consequential or extended, but not necessarily both.*

G9 Strategies aimed solely at forcing the opposing ALLIANCE to violate a rule are not in the spirit of FIRST and are not allowed. Rule violations forced in this manner will not result in assessment of a penalty on the target ALLIANCE.
Violation: YELLOW CARD

G10 ROBOTS on the same ALLIANCE may not blockade the FIELD in an attempt to stop the flow of the MATCH. This rule has no effect on individual ROBOT-ROBOT interaction.
Violation: TECHNICAL FOUL, YELLOW CARD if strategic.

ROBOT Actions

G11 ROBOTS may not intentionally detach or leave parts on the FIELD.
Violation: TECHNICAL FOUL

G12 ROBOTS may not extend outside the FIELD.
Violation: FOUL. If continuous or repeated violations, TECHNICAL FOUL. If contact with anything outside the field (other than the floor), RED CARD and the ROBOT will be DISABLED.

G13 A ROBOT'S horizontal dimensions must remain within 18" of its FRAME PERIMETER
Violation: FOUL. If continuous or repeated violations, TECHNICAL FOUL.

G14 ROBOTS may not break the planes of the openings of the opponent's SWITCH in an attempt to impede opponent SCORING in that SWITCH.
Violation: TECHNICAL FOUL.

- *Situations violating this rule include, but are not limited to, having part of the ROBOT inside the opponent's SWITCH for an extended period of time (regardless of intent) while an opponent ROBOT is attempting to SCORE a POWER PRISM in that SWITCH. Minor unintentional incursions of the ROBOT into the opponent's SWITCH while attempting other actions are generally not violations of this rule, unless that incursion also impedes the opponent's opportunity to SCORE.*

G15 ROBOTS may not pass the CENTER LINE during autonomous.
Violation: FOUL.

- *If another ROBOT is impeded from crossing the AUTO line and receiving the AUTONOMOUS QUALIFYING POINT, the robot who did not cross may still be awarded the QUALIFYING POINT by the HEAD REFEREE.*

ROBOT-ROBOT Interaction

G16 Strategies aimed at and/or game play resulting in the damage, destruction or inhibition of opponent ROBOTS via actions such as high-speed or repeated, aggressive ramming, attachment, tipping, or entanglement of ROBOTS are not allowed.
Violation: FOUL. If strategic, TECHNICAL FOUL. Potential YELLOW CARD.

- *For example, a wedge-like mechanism to flip ROBOTS would be considered a violation of G16. MECHANISMS outside the FRAME PERIMETER are particularly susceptible to causing such damage and drawing this penalty and/or penalties associated with violations of G16. Teams are encouraged to be cautious in their use of such appendages when engaging in ROBOT to ROBOT MATCH play.*

G17 Initiating deliberate or damaging contact with an opponent ROBOT on or inside the vertical extension of its FRAME PERIMETER is not allowed.
Violation: TECHNICAL FOUL.

- *High speed accidental collisions may occur during the MATCH and are expected. Generally, ROBOTS extend elements outside of the FRAME PERIMETER at their own risk. A ROBOT with an element outside its FRAME PERIMETER may be penalized under this rule if it appears they are using that element to purposefully contact another ROBOT page inside its FRAME PERIMETER. Regardless of intent, a ROBOT with an element outside its FRAME PERIMETER that causes damage to another ROBOT inside of its FRAME PERIMETER will be penalized, unless the actions of the damaged ROBOT are the catalyst for the damage.*

G18 An ALLIANCE may not pin an opponent ROBOT for more than five (5) seconds. A ROBOT will be considered pinned if it is held in place on the field and unable to escape the maneuver, and will still be considered "pinned" until the ROBOTS have separated by at least three (3) ft. The pinning ROBOT(S) must then wait for at least three (3) seconds before attempting to pin the same ROBOT again. Pinning is transitive through other objects.
*Pinning rules do not apply in the last 20 seconds of the game within the parking zone
Violation: TECHNICAL FOUL.

- *If the pinned ROBOT chases the pinning ROBOT upon retreat, the pinning ROBOT will not be penalized per G18, and the pin will be considered complete.*

G19 ROBOTS may not contact an opposing ALLIANCE ROBOT while the opposing robot is in its respective PICKUP ZONE.
Violation: FOUL, TECHNICAL FOUL if contact is repeated/egregious.

Human Actions

G20 Strategies employing TEAM member actions to inhibit ROBOTS are not allowed.

Violation: YELLOW CARD.

G21 Strategies employing TEAM member actions to deflect POWER PRISMS are not allowed.
Violation: TECHNICAL FOUL.

- *Note: As a matter of safety concerns, the only exception to G21 is in order for a Drive Team member to protect themself/another member from any POWER PRISMS that may hit them as a result of being ejected from play.*

G22 COACHES may not contact POWER PRISMS. Inadvertent, inconsequential, or contact for safety reasons will not be penalized.
Violation: FOUL.

G23 Inbounded POWER PRISMS must land in the alliance's own PICKUP ZONE, or in a ROBOT that is fully contained in that PICKUP ZONE.
Violation: FOUL. If repeated or egregious, TECHNICAL FOUL

G24 During the MATCH, TEAMS may not extend any body part into the field, beyond the GUARDRAIL, except when inbounding.
Violation: TECHNICAL FOUL.
Accidentally crossing over the barrier when no ROBOTS are nearby will not be penalized unless it is repeated or prolonged.

G25 Before the ENDGAME, teams may not stay in the PARKING ZONE for more than 5 seconds.
Violation: FOUL

Robot Rules

R1 The ROBOT must satisfy the following size constraints:
A. The ROBOT's Frame perimeter (not including bumpers) must fit in a 21" wide x 21" deep x 25" tall box at the start of every match. (STARTING CONFIGURATION)
B. a ROBOT may not extend more than 20" in. HORIZONTALLY beyond the FRAME PERIMETER at any point in the match
C. No part of the ROBOT can extend higher than 5 ft during the Match

R2 The ROBOT weight may not exceed 60 lbs. When determining weight, the basic ROBOT structure and all elements of all additional MECHANISMS that might be used in different configurations of the ROBOT shall be weighed together. For the purposes of determining compliance with the weight limitations the ROBOT battery isn't counted.

R3 Traction devices may not have surface features such as metal, sandpaper, hard plastic studs, cleats, or similar attachments. Traction devices include all parts of the ROBOT that are designed to transmit any propulsive and/or braking forces between the ROBOT and the FIELD.

R4 ROBOTS must allow removal of POWER PRISMS from the ROBOT and the ROBOT from FIELD elements while powered off.

Safety & Damage Prevention

R5 ROBOT parts shall not be made from hazardous materials, be unsafe, cause an unsafe condition, or interfere with the operation of other ROBOTS.

R6 Protrusions from the ROBOT and exposed surfaces on the ROBOT shall not pose hazards to the ARENA elements (including the POWER PRISMS) or people. If the ROBOT includes protrusions that form the "leading edge" of the ROBOT as it drives and has a surface area of less than 1 in.2, it will invite detailed Inspection. For example, forklifts, lifting arms, or grapplers may be carefully Inspected for these hazards.

Budget

R7 The total cost of all items on the ROBOT shall not exceed $400 USD. All costs are to be determined as explained in Section 4.3: Budget Constraints. Exceptions are as follows:
A. individual COTS (Commercial off-the-shelf) items that are less than $1 each and
B. Kit of Parts (KOP) items
Teams should be prepared to disclose to Inspectors the cost of any non-KOP item and the total cost of the ROBOT.

BUMPER Rules

R8 ROBOTS are required to use BUMPERS to protect all outside corners of the FRAME PERIMETER. For adequate protection, at least 4 in. of BUMPER must be placed on each side of each outside corner (see Figure 4-5). If a side is shorter than 4 in., the entire side must be protected by BUMPER (see Figure 4-6). For the purposes of R8, a round or circular FRAME PERIMETER has an infinite number of corners.

R9 BUMPERS must be constructed as follows:
A. be backed by at least ⅛ in. (nominal) thick by 5 in. (± 1/2 in) tall plywood or solid, robust wood. Small clearance pockets and/or access holes in the plywood backing are permitted, as long as they do not significantly affect the structural integrity of the BUMPER.
B. hard BUMPER parts allowed per R9-A and -E may not extend more than 1 in. beyond the end of the FRAME PERIMETER
C. use one to two approximately 2 1/2 in. round, petal, or hex "pool noodles" (solid or hollow) as the BUMPER cushion material . Cushion material may extend up to 2 1/2 in. beyond the end of the plywood.
D. BUMPERS may be permanently attached to the ROBOT OR may attach to the FRAME PERIMETER of the ROBOT with a rigid fastening system to form a tight, robust connection to the main structure/frame (e.g. not attached with hook-and-loop or tie-wraps). The attachment system must be designed to withstand vigorous game play. All removable fasteners (e.g. bolts, locking pins, pip-pins, etc.) will be considered part of the BUMPERS.
E. be sufficiently covered with duct tape.

R10 BUMPERS must be located entirely within the BUMPER ZONE, which is between two (2) and ten (10) in. from the floor, in reference to the ROBOT standing normally on a flat floor.
There is no explicit requirement that BUMPERS be perfectly parallel to the floor. However BUMPERS are required to have the same vertical cross-section all over.

R11 Corner joints between BUMPERS must be filled with pool noodle material.

R12 BUMPERS must be supported by the structure/frame of the ROBOT (see Figure 4-10). To be considered supported, a minimum of 1/2 in. at each end of the BUMPER must be backed by the FRAME PERIMETER. Additionally, any gap between the backing material and the frame
A. must not be greater than 1/4 in. deep, or
B. not more than 8 in. wide.

R13 Each ROBOT must be able to securely mount a red or blue FLAG to match their ALLIANCE color, as assigned in the MATCH schedule distributed at the event. The FLAG is a 6” x 12” cloth mounted on a ½” diameter shaft 24” tall.

R14 Team numbers must be displayed on the BUMPERS and meet the following criteria:
A. consist of numerals at least 4 in. high, at least 1/2 in. in stroke width.

Motors & Actuators

R15 The only motors and actuators permitted on 2022 IRC ROBOTS include the following:
2 Mini CIM motors for the drivetrain, and any combination of additional Mini CIM, BAG, and 775 pro motors. There is no limit that the rules impose on the number of motors you may use, but you can power a maximum of 16 off of the Power Distribution Panel.

Battery

R16 The ROBOT must use a single, standard FRC 12V battery.

R17 The ROBOT battery must be secured such that it will not dislodge should the ROBOT be turned over or placed in any arbitrary orientation.

R18 Non-electrical sources of energy used by the ROBOT, (i.e., stored at the start of a MATCH), shall come only from the following sources:
A. a change in the altitude of the ROBOT center of gravity,
B. storage achieved by deformation of ROBOT parts, i.e. springs

R19 The one ROBOT battery, Anderson Power Products (or APP) Connectors (p/n SB50), the one main 120-amp (120A) circuit breaker (Cooper Bussman P/N: CB185-120), and the one Power Distribution (PD) Board shall be connected as shown in Figure 4-11. Please note that we may be using a smaller PD Board than the one shown in Figure 4-11.

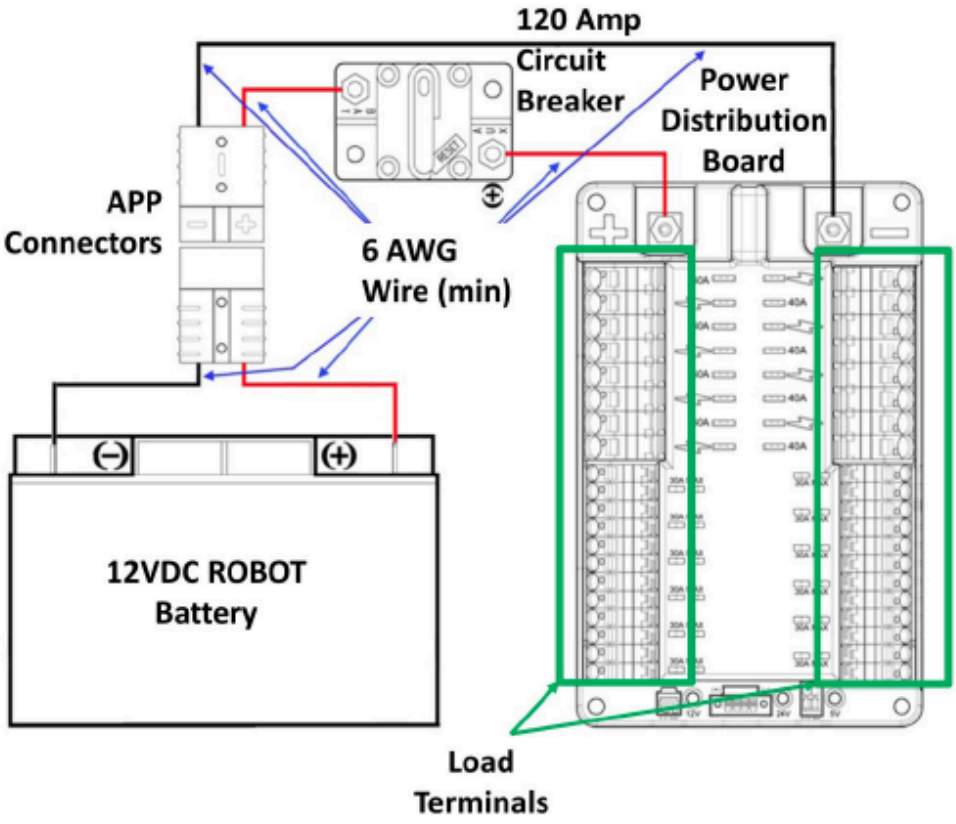


Figure 4-11: Main Power Distribution

R20 The PD Board and all circuit breakers must be easily visible for Inspection.

R21 The only circuit breakers permitted for use in the PD Board are:
A. Snap Action VB3-A Series, terminal style F57
B. Snap Action MX5-A40

R22 All circuits shall be wired with appropriately sized insulated wire:
Table 4-3: Legal Wire Size
Application Minimum Wire Size
30 – 40A protected circuit 12 AWG (2.052mm)
20 – 30A protected circuit 14 AWG (1.628mm)
5 – 20A protected circuit 18 AWG (1.024mm)
All ROBOTS will be controlled with a RoboRio and connection to a driver station laptop. More details will be provided to teams.

This manual is subject to rules updates at any time. Updates, if they occur, will be announced to teams. Rules are ultimately enforced at the Referee's discretion. If you have questions at any point about the rules, ask Daniel Markarov or, during the time of competition or inspection, any referees or mentors conducting robot inspections.