



NRG FALL 2021

SOS Synergy

**A Robotics Program for
4-6th Graders**

GAME MANUAL

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What is NRG?

NRG is a collaboration of FRC (FIRST Robotics Challenge) teams who are creating a program to educate young students in the field of robotics. In NRG, we strive to get young minds interested in STEM to lead the way to a better future. Code Red Robotics founded the NRG program in the fall of 2015 to fulfill these goals.

In NRG we use small Arduino robots that are programmed in C++. The robots are controlled wirelessly from a computer via bluetooth. Each student will receive their own robot at the beginning of the program that they will build, program and compete with. Each parent will work with their child as a team throughout the season.

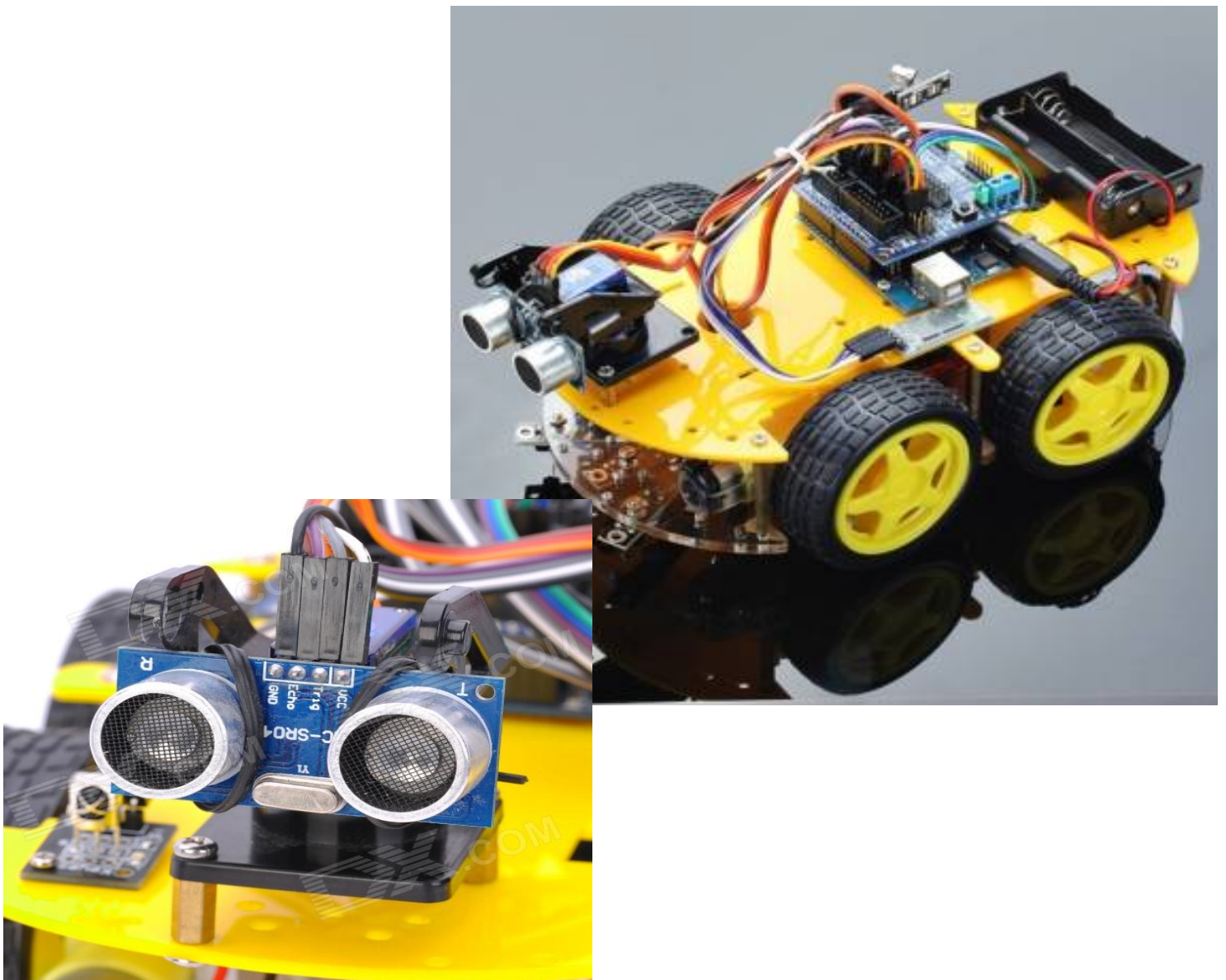
NRG's Core Values

- ★ Teams always practice good sportsmanship and are always gracious no matter what happens.
- ★ We act with integrity.
- ★ We have fun! =D
- ★ We are a welcoming community of students, parents, mentors, and volunteers.
- ★ What we learn is more important than what we win.
- ★ We respect each other and celebrate our differences.
- ★ Students and adults work together to find solutions to challenges.
- ★ We honor the spirit of friendly competition.
- ★ We behave with courtesy and compassion for others at all times.



The Robot:

Each team will be given a kit containing the parts for a basic Arduino robot. The student and their parent/guardian will work together to assemble the robot. Students are encouraged to bring items from home to customize their robot with decorative and/or functional pieces as long as they are not harmful to students, robots, or game pieces. These pieces may be used to manipulate game pieces. With all attachments, the robot must be no more than 12" long and 12" wide.



Game Overview:

The 2021 NRG game is **S.O.S. Synergy!** In this game robots find themselves on a deserted island and must gather FUEL to activate a BEACON and get rescued. Gather Supply Rings to stay alive on the island until help can come.

S.O.S. Synergy is played by two alliances of two teams each. Alliances compete against each other to earn points. Points can be earned by scoring FUEL in the BEACON, scoring SUPPLY RINGS in the SUPPLY ZONES, and parking on the BEACON.

The game is played on an 8' by 8' field. Each alliance commands a BEACON and a SUPPLY ZONE on the ground. The field is divided into two halves by a white centerline. One half contains the SUPPLY ZONES and FUELING ZONE, and the other contains the BEACONS and the SUPPLY RINGS.

Each team competing in a match will consist of a student driver and an adult drive coach, making an alliance of four total members.

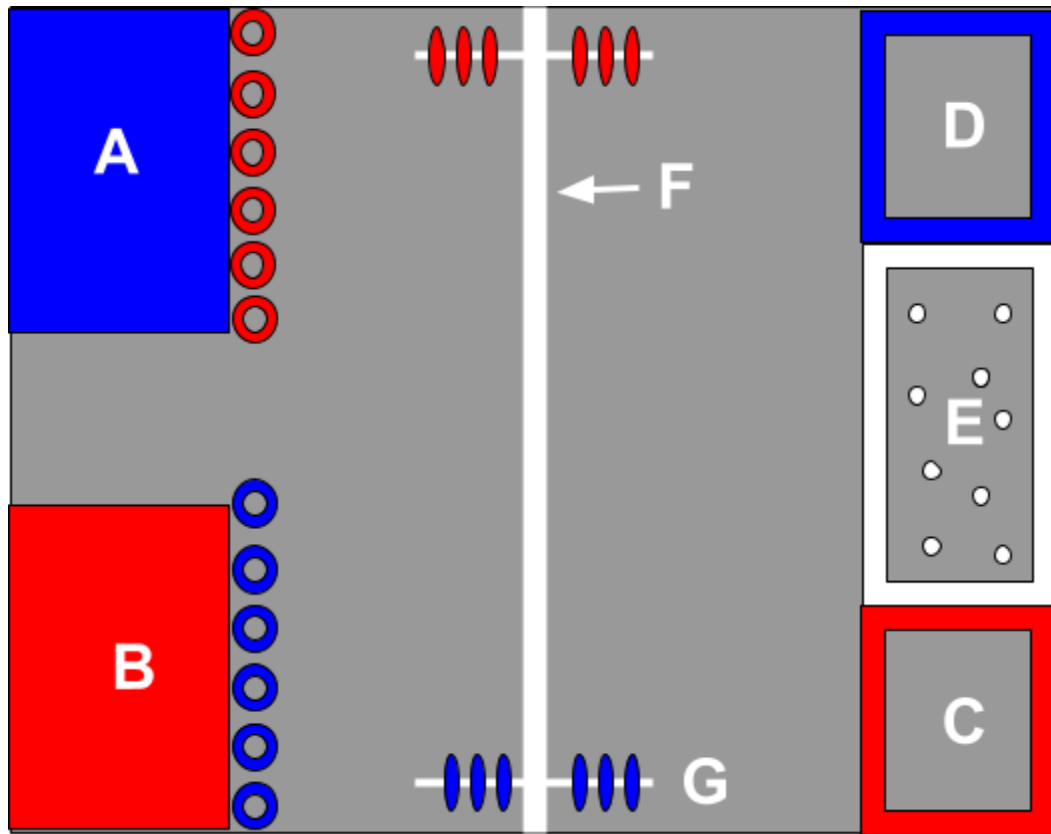
Each match is 2 minutes and 15 seconds long. In a match, robots work in alliances to score points. Alliances are randomly assigned during qualification matches. We encourage students to discuss a strategy with their alliance partner before the match. Alliances may continue to communicate during a match to score the maximum amount of points.

During the game, alliance members will need to work together to remove FUEL from a containment center and simultaneously score FUEL in their alliance's BEACON and SUPPLY RINGS in their alliance's SUPPLY ZONE.

Note: please see page 7 for an explanation of game elements.

Field Layout:

This is the basic field layout (simplified):



A - Blue BEACON Blue alliance scores FUEL here

B - Red BEACON. Red alliance scores FUEL here

C - Red SUPPLY ZONE (Score Red SUPPLY RINGS here)

D - Blue SUPPLY ZONE (Score Blue SUPPLY RINGS here)

E - FUELING ZONE

F - Centerline (See rules 1 and 2)

G -SUPPLY RING Containment Center

Note: Rings are not to scale.

Match Periods Breakdown

Matches consist of Supply Release, Tele-operated, and End-Game periods. A match is 2 minutes and 15 seconds long.

Supply Release:

Time: 15 seconds

During the supply release period, robots work with their alliance partners to remove SUPPLY RINGS from the containment center. Each robot in an alliance is on their side of the center line and works to remove the SUPPLY RINGS from his/her side of the field. During this period, robots, SUPPLY RINGS, and FUEL may not cross the center line.

Actions during this period:

- Remove SUPPLY RINGS from the Containment Center. Each SUPPLY RING removed from the Containment Center during the Supply Release period is worth 5 points (Note: there are no points earned for removing SUPPLY RINGS after the Supply Release period).
- Move FUEL and SUPPLY RINGS up to (but not over) the center line in preparation for the tele-operated period.

Tele-Operated:

Time: 90 seconds (1 minute, 30 seconds)

During the tele-operated period, robots will work with their alliance partner to score SUPPLY RINGS and FUEL into their alliance specific SUPPLY ZONES and BEACON.

Actions during this period:

- Score SUPPLY RINGS into SUPPLY ZONES. If the SUPPLY RING color matches the SUPPLY ZONE color, the SUPPLY RING is worth 7 points. If the SUPPLY RING color does not match the color of the zone, they will subtract 3 points from the alliance score.
- Score FUEL into alliance specific BEACONS. Each FUEL is worth 5 points.

End-Game:

Time: Last 30 seconds of Tele-operated Period

There are several rule changes during the last 30 seconds of a match.
(See rules 2 and 3)

Actions during this period:

- Continue scoring SUPPLY RINGS and FUEL
- Park robots on their alliance BEACON. One robot parked on the BEACON is worth 5 points. Two robots parked is worth 15 points.
- Robots are allowed to cross the centerline with no penalty during the end-game. (Rule 1 is no longer in effect).
- Robots are not allowed inside of their opponent's SUPPLY ZONE during the last 30 seconds of the match.

Scoring Summary

Action	Point Value
Removing SUPPLY RINGS from the Containment Center during the Supply Release period only.	5 points per ring
Removing SUPPLY RINGS of the opposite alliance color from the Containment Center	-3 points per ring
Placing FUEL in the BEACON	5 points
Scoring a SUPPLY RING matching alliance color	7 points
Scoring a SUPPLY RING opposite of the alliance color	-3 points
Parking 1 robot on BEACON	5 points
Parking 2 robots on BEACON	15 points

Note: Scoring is calculated by score keepers and assessed at the end of the match. The score keeper and referee rulings are final.

Field Elements Summary

Name	Summary	Count
FUEL	2" diameter white whiffle ball	50
SUPPLY RING	Plastic, donut shaped ring. Outer diameter: 4.75", Inner Diameter: 2.75".	6 red, 6 blue
BEACON	Scoring ramp located in two of the field corners.	Total 2. One for each alliance.
SUPPLY ZONE	Marked with tape on the floor, for scoring SUPPLY RINGS	Total 2. One for each alliance.
CENTERLINE	Marked with tape on the floor, to divide each side of the field.	1 in the center of the field.
CONTAINMENT CENTER	Elevated bars positioned on the two sides of the center line that hold a total of six SUPPLY RINGS (3 per side)	1 at each end of the center line along the side of the field (total of 2)

Rules:

1. Robots may not cross the centerline.
 - a. **One exception is allowed:** Robots are permitted to cross the centerline in order to assist their alliance partner's robot if it becomes hung up on a game element. Robots performing this action must follow these rules while on the other side (10 point penalty per violation):
 - i. Robots must not come in contact with game pieces
 - ii. Robots must not come in contact with opposing robots.
 - iii. Robots must immediately return to their starting side when their alliance partner has been freed.
 - iv. Robots may not cause game pieces to cross the centerline in either direction while performing this action.
 - b. **Passing Game Pieces**
 - i. A robot may partially cross the centerline to acquire game pieces if the robot stays in contact with their starting side.
2. Rule #1 is not in effect during the end-game (last 30 seconds). Robots are free to cross the centerline without penalty.
3. Driving into an opposing alliance's SUPPLY ZONE during the end-game is a 5 point penalty. Removing or adding SUPPLY RINGS to an opposing alliance's SUPPLY ZONE is a 25 point penalty. (Note that removing or adding SUPPLY RINGS to an opposing alliance's SUPPLY ZONE **is permitted** before end-game starts).
4. Any additional (non kit) part added to the robot should not make the robot more than 12" in length and 12" in width.
5. Only the student driver is permitted to touch the controller during a match.
6. Robots may not pin other robots. Breaking this rule will result in a 10 point penalty (5 points every additional 5 seconds).
7. Robots from an opposing alliance may not remove SUPPLY RINGS from the Containment Center of the opposing alliance. Removing rings of the opposing alliance results in a 3 point penalty per ring.
8. Robots may not drive up onto the opposing alliance's BEACON. Incidental contact that does not interfere with game play is allowed. Breaking this rule will result in a 20 point penalty.

Sponsors:

