



NRG 2018

NEXT ROBOTICS GENERATION

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 have created 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.

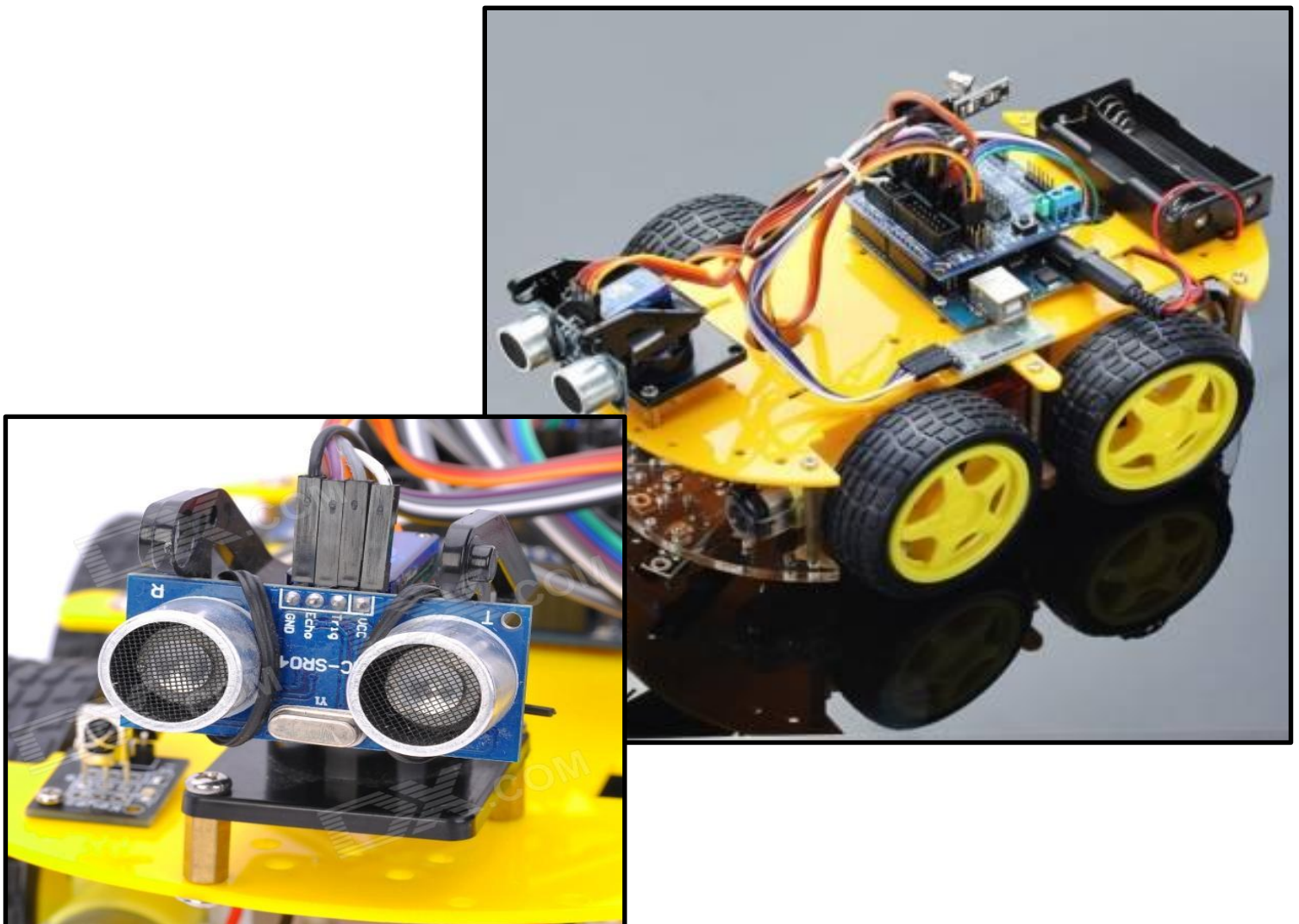
In NRG we use small Arduino robots that are programmed in C++. The robots are controlled wirelessly from a computer via Wi-Fi. Each student will receive their own robot at the beginning of the program that they will build, program, and compete with. Each parent will work with their child as a team throughout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

NRG'S CORE VALUES:

- We always practice good sportsmanship and are always gracious no matter what happens.
- We act with integrity.
- 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 always behave with courtesy and compassion for others.
- We have fun! =D

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 if they are not harmful to students, robots, or game pieces. These components may be used to manipulate game pieces. With all attachments, the robot must be no more than 12" long and 12" wide. Additional robot rules are on page 12.



GAME OVERVIEW:

CODE RED ROBOTICS IS PROUD TO PRESENT THE 2018 NRG
GAME... NRG LIFTOFF!

Two alliances of 2 robots have crashed and are stranded in deep space. Astronauts must escape the **WRECKAGE** of the ship and deliver **SPARE PARTS** to the **ENGINE ROOMS** to repair the engine. Then they will start the engine and prepare for liftoff to escape certain peril.

The game is played on an 8' by 8' field with 1' high walls. On the field are two 30" by 2' ramps, called **GENERATORS** with a pivoting ramp, making it tilt to one side. Placed throughout the field are thirty 2.5" tall foam cylinders, called **SPARE PARTS**. **SPARE PARTS** are scored into 1' by 3' alliance specific zones called **ENGINE ROOMS**. **ROBOTS CROSS GENERATORS** to help generate power for the engine.

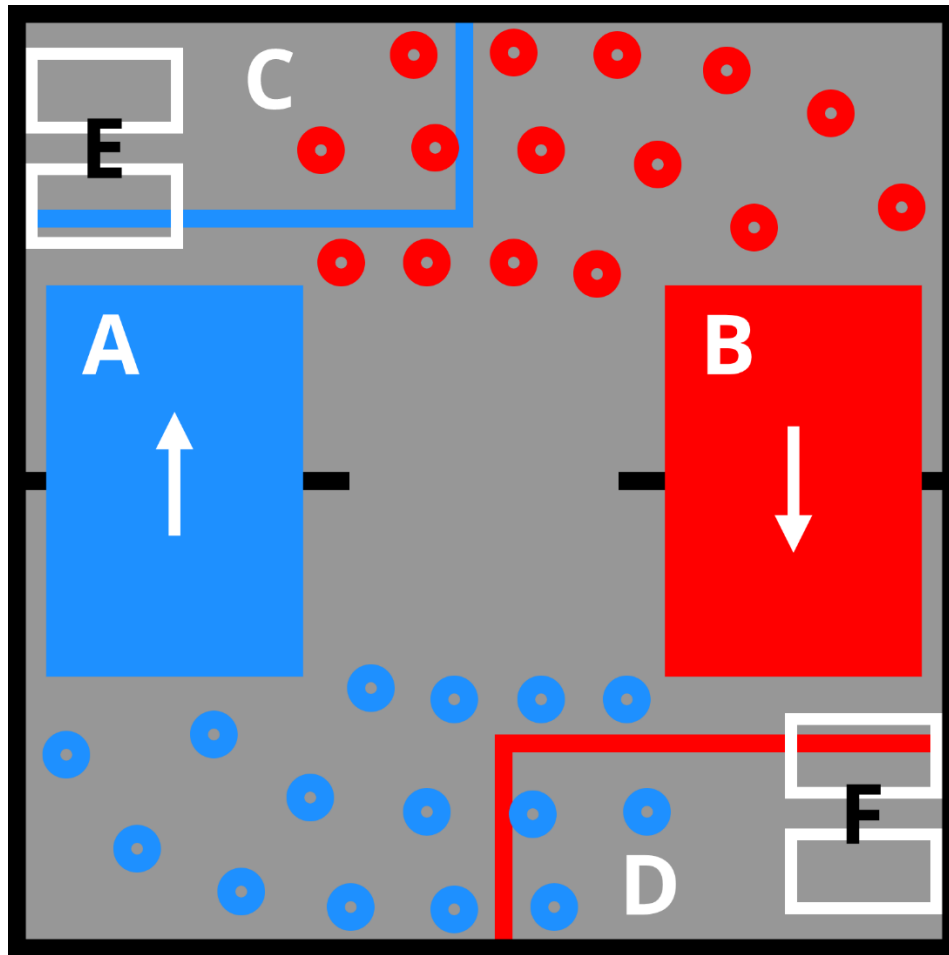
At the end of the match, robots that are **PARKED** on their alliance's **GENERATOR** will earn 5 points per robot. If one robot is **BALANCED** on their alliance's **GENERATOR**, they will receive 10 points. If both alliance robots are **BALANCED** on their **GENERATOR**, then their alliance will receive 30 points, and an extra **RANKING POINT** at the end of the match.

Note: Game Element Summary Table is on Page 10.

Terms that are CAPITALIZED or Italicized are further defined on pages 13-14.

FIELD LAYOUT:

Simplified Diagram:



- A** - Blue GENERATOR
- B** - Red GENERATOR
- C** - Blue ENGINE ROOM
- D** - Red ENGINE ROOM
- E** - Red robot starting position
- F** - Blue robot starting position

MATCH BREAKDOWN:

Matches consist of an *Obstacle Course Period*, a *Tele-operated period* and an *End Game* period. Matches are 2 minutes and 30 seconds long in total.

OBSTACLE COURSE:

Time: 10 seconds

The *Obstacle Course Period* takes place in the first 10 seconds of the match. During the *obstacle course* period robots work to escape the WRECKAGE. There will be 15 SPARE PARTS for robots to avoid during this period. Robots will earn points based on how many SPARE PARTS they knock over: 0 knocked down is 10 points, 1 knocked down is 7 points, 2-3 knocked down is 5 points. If more than 3 SPARE PARTS are knocked over, then no points are earned. Robots can gain additional points by CROSSING over the GENERATOR.

TELE-OPERATED:

Time: 110 seconds (1 minute, 50 seconds)

During the *Tele-Op Period*, robots work with their alliance partner to score SPARE PARTS into their coordinating alliance colored ENGINE ROOM. The field starts with 30 SPARE PARTS. SPARE PARTS are scored into their coordinating alliance color ENGINE ROOM. Each SPARE PART scored earns 5 points. Robots will need to drive over the GENERATORS to restore power to the engine. Robots earn 3 points when they CROSS over their alliance GENERATOR. Robots will earn 5 points when they CROSS over their alliance GENERATOR with possession of SPARE PARTS.

ACTIONS DURING THIS PERIOD:

- Placing SPARE PARTS in the ENGINE ROOM.
 - This action is worth 5 points
- CROSSING over corresponding alliance GENERATOR.
 - This action is worth 3 points when not in control of SPARE PARTS and 5 points when in control of SPARE PARTS
 - If an alliance crosses over their alliance GENERATOR 6 times they will receive an extra RANKING POINT.

END GAME:

Time: 30 seconds

During the *End Game*, normal gameplay continues, but robots work to become FULLY SUPPORTED by the GENERATORS and to BALANCE on them. BALANCING is scored if the neither end of the alliance's GENERATOR is touching the field floor.

ACTIONS DURING THIS PERIOD:

- Parking on alliance GENERATORS
 - This action is worth 5 points per robot
- BALANCING on alliance GENERATORS
 - This action is worth 10 points for 1 robot, and 30 points for 2 robots.
 - Teams that complete this action will receive an extra RANKING POINT

SCORING SUMMARY:

ACTION:	POINT VALUE:
Placing SPARE PARTS into the ENGINE ROOM	5 points per spare part
CROSSING over the matching alliance GENERATOR	3 points
CROSSING over the matching alliance GENERATOR with a SPARE PART in the robot's POSSESSION.	5 points per cross
Robot fully SUPPORTED by the GENERATOR at the end of the match.	5 per robot
One robot BALANCED on the GENERATOR at the end of the match	10 points
Both alliance robots BALANCED on the GENERATOR at the end of the match	30 points
OBSTACLE COURSE ACTION:	POINT VALUE:
0 knocked down	10 points
1 knocked down	7 points
2-3 knocked down	5 points
4 or more knocked down	0 points
Ramp Crossing	5 for one robot, 15 for two

Note: Scoring of SPARE PARTS and parking is assessed at the end of the match.

RANKING POINT SUMMARY:

NAME:	ACTION	RANKING POINTS
Win	Win	2 RANKING POINTS
Tie	Tie	1 RANKING POINT
Loss	Loss	0 RANKING POINTS
Start the Engine	CROSS alliance GENERATOR 6 Times	1 RANKING POINT
Prepare for Liftoff	2 robots BALANCED	1 RANKING POINT

This year NRG is introducing a new concept: RANKING POINTS. During the tournament, robots will be ranked by the average number of RANKING POINTS they have earned per match. The top-ranking teams will be selected to participate in the playoff matches after qualification matches have completed. Due to this, it is recommended that teams take RANKING POINTS into consideration when forming strategies.

GAME ELEMENTS SUMMARY:

NAME:	SUMMARY:	COUNT:
SPARE PARTS	2.5'' Alliance specific color Pool Noodles	15 Red, 15 Blue
GENERATORS	30'' by 2' Alliance specific colored bridges.	One per alliance
ENGINE ROOMS	1' by 3' scoring zones marked with alliance specific Gaff tape	One per alliance

GAME RULES:

1. Only the student driver is permitted to touch the robot controller during a match.
2. Robots may not PIN other robots. PINNING is defined as manipulating another robot in a way that prevents their ability to move. However, if a robot can move, it is not PINNING. Breaking this rule will result in a 5-point *foul*, and an additional 5-point *foul* for every 5 seconds the robot is PINNED.
3. Robots may not enter or descore SPARE PARTS from the opposing alliance's ENGINE ROOM. Breaking this rule will result in a 5-point *foul*.
4. Strategic contact with the opposing alliance's ENGINE ROOM is a 5-point *foul*. Incidental contact is not penalized, this is determined by the referee.
5. Placing the opposing alliance's SPARE PARTS into your alliance's ENGINE ROOM will result in a 5-point *foul*.
6. Placing your alliance's SPARE PARTS into the opposing alliance's ENGINE ROOM will result in 3 *fouls* (15 points).
7. BLOCKING the opposing alliance's GENERATOR will result in a *foul*. If this action is repeated, it will result in a *tech foul*.
8. Robots may not launch any game element or robot part. If launching is strategic or repeated, robots will receive a *tech foul*.

Note: All calls are up to the discretion of the referees and are final. Video replays will not be accepted.

All rules and penalties can escalate to a *tech foul* if repeated or strategic.

ROBOT RULES:

1. Any additional (non-kit) parts must not purposefully detach from the robot and must be attached in a secure fashion.
2. The robot must be no more than 12" in length, and 12" in width. This includes any additional (non-kit) parts that you may have attached.
3. Robots must fit into the official Code Red Robotics NRG sizing cube.

The following types of parts and mechanisms are not allowed:

1. Those that are sharp and/or potentially injure a participant, volunteer, or audience member.
2. Those that could damage the playing field.
3. Those that frequently fall or detach from the robot.
4. Those that could entangle, damage, or flip other robots.
5. Those that contain liquids.
6. Lubricants that foul the field.
7. Any other material (liquid or solid) that could foul the field or other robots is not allowed.
8. Robots may not contain liquids or gases under pressure (i.e. Pneumatic or hydraulic devices).
9. Robot Power must be provided exclusively by two 18650 3.7V Lithium ion batteries. Decorative lighting may use a separate power source.

Note: Any robots that do not adhere to these rules will not pass inspection and will not be able to compete.

GLOSSARY:

GAME TERMS:	DEFINITION:
BALANCED	Robots must be fully SUPPORTED by the GENERATOR and neither side of the GENERATOR is touching the ground.
BLOCKING	When a robot is positioned in such a way that another robot cannot access their alliance GENERATOR for more than 5 seconds.
CROSSED	When all four wheels of the robot have broken the plane of the field floor.
ENGINE ROOMS	A 1' by 3' zone that robots score SPARE PARTS into.
GENERATORS	26" by 3' Alliance specific colored bridges.
PINNING	When a robot is positioned in such a way that they are preventing a robot of the opposing alliance from moving away.
RANKING POINT	Points earned during gameplay that help teams to rank higher in the tournament. Further explanation on page 9.
SPARE PARTS	A 2.5" pool noodle that is scored into matching color ENGINE ROOMS to score points.
SUPPORTED	When a robot has all 4 wheels entirely on their alliance's GENERATOR.
WRECKAGE	SPARE PARTS lined up in such a way that they create an <i>obstacle course</i> that robots navigate during the first 10 seconds of the match.

GENERAL TERM:	DEFINITION:
<i>Obstacle Course Period</i>	The <i>Obstacle Course</i> Period takes place in the first 10 seconds of the match. More Information on page 6.
<i>End Game Period</i>	The <i>End Game</i> Period takes place in the last 30 seconds of the match. More information on page 7.
<i>Foul</i>	When a team breaks a rule and 5 points are added to the other alliance's score.
<i>Tech Foul</i>	When a team repeatedly breaks a rule or is behaving in a way that is ungracious, referees may give a <i>tech foul</i> , adding 25 points to the opposing alliance's score.
<i>Tele-operated Period</i>	The <i>tele-operated</i> period is 110 seconds, robots compete to score SPARE PARTS into ENGINE ROOMS. More information on pages 6-7.

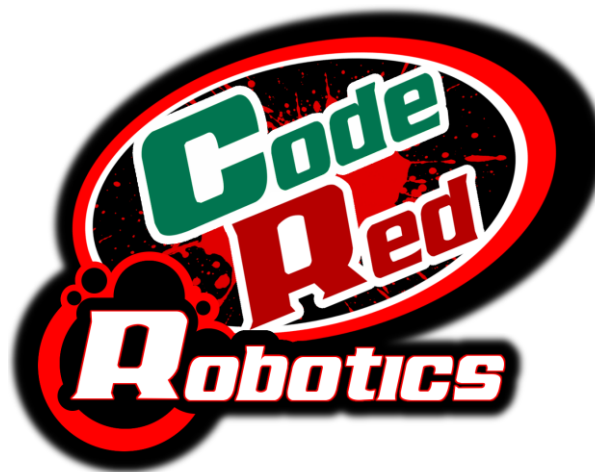
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