

UNOFFICIAL 2019 FRC Inspection Checklist

TEAM NUMBER: _____
INITIALS (after passing): _____
REINSPECTION (initial) _____

INSPECTOR: _____
DATE (after passing): ____/____/____
FINAL INSPECTION (initial) _____

Initial Inspection

- _____ **Weight** - Robot Weight (<= 125lbs. excluding bumpers and battery) <R5> _____ pounds
_____ Bumper Weight (Bumpers must be <= 15 pounds) <R30> Red Bumper _____ Blue Bumper _____ pounds
- _____ **Starting Configuration**-Parts may not extend beyond the vertical projection of the FRAME PERIMETER <R2>
_____ Starting Volume –Less than 48 in tall (~122cm tall) and FRAME PERIMETER ≤ 120" convex perimeter <R3>
_____ FRAME PERIMETER – F.P. must be in bumper zone (<7.5" from floor) and non-articulated. <R1>
_____ Playing Configuration –Robot attachments may extend beyond the Starting Configuration ≤30" (~76 cm). <R4>
_____ Standard Bumpers-must follow all specifications in Sec. 10.5 Bumper rules.
- o Bumpers must provide protection ≥ 6" on both sides of all outside corners. (Wood within ¼" of corner) <R24>
 - o Hard bumper parts defined by bumper backing, may not extend >1" beyond robot frame. <R31-B>
 - o No bumper segment may be unsupported by robot frame for a length > 8". Gaps may be < ¼" <R33>
 - o Bumpers must be supported by at least ½" (12.7mm) of Robot Frame at each end (< ¼" gap) <R33>
 - o Corners must be filled with pool noodle such that no "hard parts" are exposed.<R32>
 - o Must use ¾" (~19mm) thick x 5± ½" (~127±12.7 mm) tall plywood or solid robust wood backing w/ no extraneous holes that may affect structural integrity. (clearance pockets and/or access holes are acceptable). <R31-A>
 - o Must use a pair of vertically-stacked 2.5" pool noodles. Pool noodles may be any shape cross section, solid or hollow, but all noodles of each bumper set must be identical in shape and density <R31-C>
 - o Must use a durable fabric cover for the noodles secured as in Fig 10-6 cross section.<R31-D>
 - o Must be able to display red or blue (color similar to FIRST Logo) Bumpers to match alliance color.<R28>
 - o Team number displayed with min. font 4" tall x ½" stroke, in white or outlined in white and be easily read when walking around the robot. No logos may be used for numerals. FIRST Logos similar to 2017 KOP are OK. <R28>
 - o Must be securely mounted when attached and be easily removable for inspection. <R31-G& R27>
 - o When on flat floor, bumpers must reside entirely between the floor and 7-1/2" above floor (evaluated when sitting flat on floor) and may not be articulated relative to the FRAME PERIMETER. <R25 & R26>

Mechanical

- _____ No Sharp Edges or Protrusions that pose a hazard for participants, robots, arena, or field. <R7 & R8>
_____ No Prohibited Materials – e.g. sound, lasers, noxious or toxic gases or inhalable particles or chemicals <R9>
_____ No Unsafe Energy Storage Devices - Carefully consider safety of stored energy or pneumatic systems <R9>
_____ No Risk of Damage to Other Robots - e.g. spearing, entangling, upending or adhering <G20 & R9>
_____ No Risk of Damage to Field –e.g. metal cleats on traction devices or sharp points on frame. <R7>
_____ Decorations -Cannot interfere with other robots' electronics and sensors (particularly via color distraction) and be in spirit of "Gracious Professionalism". <R9>
_____ BOM Cost – Team must present worksheet with total cost <= \$5500; no single component > \$500. <R12-R13>
_____ End Game – Game Objects can be removed from robot and robot from field without power. <R10>
_____ Robot may not be designed to launch a HATCH PANEL > 3' beyond the FRAME PERIMETER <R6>

Electrical

- _____ Components –None may be modified, except for motor mounting and output shaft, motor wires trimmed, window motor locking pins removed, and certain devices repaired with parts identical to the originals. PD fuses may be replaced with identical fuses only. Servos may be modified per manufacturer's instructions. <R35 & R73>
_____ Battery – A single 12V, 17-18.2 AH robot battery (or listed equivalent), securely fastened inside robot. <R39, R44>
_____ Other Batteries – Integral to COTS computing device or camera or COTS USB < 100Wh (20,000mAh) 2.5A max per port, and used for COTS computing device and accessories only. <R40>
_____ Visibility – The single PDP and PDP breakers must be easily visible for inspection. <R51>
_____ Main Breaker Accessibility – The single 120A main breaker must be readily accessible (labeling preferred).<R50>
_____ Branch Breakers - Only VB3-A, MX5-A or MX5-L Series, Snap-Action breakers may be inserted in the PDP <R57>
_____ Robot Radio – A single Open Mesh OM5P-AN or OM5P-AC radio must be powered via the VRM +12V, 2A output. VRM must connect to dedicated +12V output on the PDP. Radio LEDs must be visible. <R54, R55, R71>
_____ RoboRio Power – Only the RoboRio must be connected to dedicated power terminals on PDP. <R53>
_____ CAN BUS – The RoboRio & PDP must be connected via CAN even if no other CAN devices. <R79>
_____ Wire Size - Obey the wiring size conventions.
- _____ All wire from battery->main breaker->PDP must have min #6 AWG (4.11mm) wire <R47 & Fig.10-9>
 - _____ 40 amp breakers must have min #12 AWG (4 mm²) wire <R60>
 - _____ 30 amp breakers must have min #14 AWG (2.5 mm²) wire <R60>
 - _____ 20 amp breakers must have min #18 AWG (1 mm²) wire <R60>

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- ___ Wire Colors – All power wire must be color coded - red, white, brown, yellow, or black w/stripes for +24, +12, +5 VDC supply wires and black/blue for supply return wires <R62>
- ___ Copper Wire Only – All wire used on robot must be copper (excludes SIGNAL LEVEL wires) <R60>
- ___ 1 Wire per WAGO – Only 1 wire may be inserted in each WAGO, splices and/or terminal blocks, may be used to distribute power to multiple branch circuits but all wires in the splice are subject to the Wire Size rules <R56>
- ___ Motors – Unlimited 2019 KoP auto motors or other legal motors per table 10-1 <R34>
- ___ Actuators – Electrical solenoid actuators, max. 1” stroke and ≤10W @12V continuous duty. <R34>
- ___ Motor/Actuator Power – Each CIM, mini-CIM, BAG, AM-9015, 775Pro, RedLine, Banebots, NEO motor must be controlled by a separate legal controller. Most other motors may be controlled by a separate legal Relay Module, or up to two motors per motor controller. (however multiple pneumatic valves may be driven by a single Relay). Two PWM controllers can be connected by a PWM “Y” cable. <R36, R37 & Table 10-2>
- ___ Motor/Actuator Control – Motors/actuators must be controlled by legal motor controllers and driven directly by PWM signals from RoboRio or through legal MXP board or by CAN bus. <R75-R77>
- ___ Custom Circuits, Sensors and Additional Electronics - Cannot directly control speed controllers, relays, actuators or servos. May not produce > 24V <R52 & R63>
- ___ Pneumatic Control Module (PCM) - PCM modules must be connected to RoboRio via CAN bus. <R78>
- ___ Spike Fuse – Spike must have 20 amp fuse installed. When used for compressor control only, the Spike fuse may be replaced with 20 amp, snap action, breaker. <R73-D>
- ___ Isolated Frame – Frame must be electrically isolated from battery (>3k Ohm between PDP input posts and chassis) <R49>

Pneumatic System W/ On Board Compressors (n/a for robots that do not use pneumatics)

- ___ No Modifications - Pneumatic parts may not be modified exc. removing actuator mounting pins. <R83>
- ___ Compressor - Exactly one compressor, max 1.1 CFM flow rate. Must be onboard if pneumatics used. <R86>
- ___ Compressor Power - Must use the PCM or Legal Relay Module <R37 & Table 10-2>
- ___ Compressor Control – Pressure Switch must be wired directly to the PCM or RIO to control compressor. <R92>
- ___ Compressor Relief Valve – Set to 125 psi, attached [through legal hard fittings] to compressor outlet port. <R91>
- ___ Vent Plug Valve – Must include an easily-accessible manual vent plug valve to release system pressure. <R93>
- ___ Tubing – Equiv. to KOP with a maximum OD of ¼” (6.35mm) with screen printed rating or supporting documentation. <R84-D>
- ___ Relieving Pressure Regulator – Set to ≤ 60 psi providing all working pressure. Norgren R07-100-RNEA or Monnier P/N: 101-3002-1 or equivalent. <R88>
- ___ Gauges - Must be present at both the high pressure side and low pressure regulator outlet(s) and be readily visible. <R90>
- ___ Pressure Rating - All pneumatic components must be rated for at least 70psi (~483kPa). All components upstream of primary regulator must be rated for at least 125 psi (~862 kPa). <R82>
- ___ Valve Control - Pneumatic solenoid valves must have a max 1/8” NPT, BSPP, BSPT or ¼” OD push fitting port, be controlled by either PCM or Legal Relay and valve outputs may not be plumbed together. <R37, R84-C & R94>

Power On Check (Driver Station must be tethered to the Robot)

- ___ Unauthorized Wireless Communication – No wireless communication to/from ROBOT or OPERATOR CONSOLE without prior FIRST written permission. No radios allowed on the OPERATOR CONSOLE or in the pit <R70, R99>
- ___ Confirm Pneumatics Operation – With no pressure in system, compressor should start when robot is enabled.
- ___ Compressor should stop automatically at ~120 psi under RoboRio control. <R92>
- ___ Stored air pressure ≤ 120 psi <R87> and Working Pressure ≤ 60 psi <R88>
- ___ Robot Signal Light(s) - The Robot Signal Light (two max.) from the KOP must be visible from 3’ in front of the robot, and be plugged into the RSL port on RoboRio. Confirm that the RSL flashes in sync with RoboRio. <R72>
- ___ Verify Team Number on DS – Team has programmed the OpenMesh Radio at kiosk for this event. <R65>
- ___ Software Versions - The RoboRio image (FRC_2019_v12 or later) and DS (19.0 or later) up-to-date. <R64, R95>
- ___ Power Off – Open Main Breaker to remove power from the robot, confirm all LEDs are off, actuate pneumatic vent plug valve and confirm that all pressure is vented to atmosphere and all gauges read 0 psi pressure.
- ___ Driver Console is less than 60” x 14” x 6’6” above floor. May have velcro to secure to Driver’s Station shelf. <R98>

Team Compliance Statement

We, the Team Mentor and Team Captain, attest by our signing below, that our team’s robot was built after the Kickoff on January 5, 2019 and in accordance with all of the 2019 FRC rules, including all Fabrication Schedule rules. We have conducted our own inspection and determined that our robot satisfies all of the 2019 FRC rules for robot design.

Team Captain: _____

Team Mentor: _____