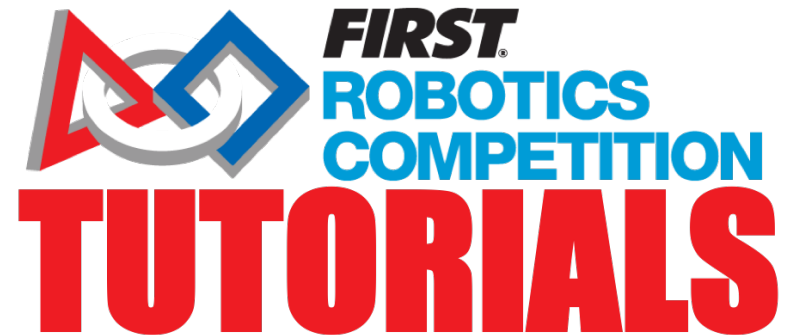


Passing Inspection

TEAM 8027



What is Inspection?

- **Every robot must pass inspection twice:**
 - On Thursday. This is a full inspection. It can take an hour+
 - On Saturday before playoffs. This inspection round is easier. You just have to account for any changes from the previous round.
- They will weigh your robot without bumpers and weigh the bumpers separately on Thursday at the Inspection station. After weighing, you will sign up for inspection in your pit.
- On Saturday, you will not have to take off the bumpers for the reweighing process at the Inspection Station. If your weight has changed, you will have to explain it to the Inspectors.
- Once you have completed inspection on Thursday, you are allowed to fill in for teams who have not shown up for their practice matches. Therefore, it is helpful to complete inspection early in the day.

Know the Rules and Use the Checklist

- The frame perimeter, wiring and bumper rules are available in the challenge documents (<https://firstfrc.blob.core.windows.net/frc2020/Manual/2020FRCGameSeasonManual.pdf>)
- The Inspection Checklist is provided to all teams in advance so use it to conduct your own inspection the week before. There should be no big surprises <https://firstfrc.blob.core.windows.net/frc2020/Manual/2020-inspection-checklist.pdf>

2020 FRC Inspection Checklist

Rev 1

TEAM NUMBER:	INSPECTOR:
INITIALS (after passing):	DATE (after passing):
REINSPECTION (initial)	FINAL INSPECTION (initial)

Initial Inspection

Robot Inspectors - Please initial all checklist items for tracking reasons. Do not use checkmarks.

☐ **Robot Weight** (must be <=125 lbs (-56kg) excluding bumpers and battery) <R3> _____ pounds

☐ **Bumper Weight** (must be <= 15 pounds (-6.8kg)) <R30> **Red Bumper** _____ pounds

☐ **Blue Bumper** _____ pounds

☐ **Additional Items**. Does the team have additional configurations? ☐ No ☐ Yes - If Yes, Weight of all items <=150lbs (-68kg) _____ pounds

☐ **Weight of 2nd configuration** (must be <=125 lbs (-56kg) excluding bumpers and battery) <R5> _____ pounds

☐ **If more than 2 configurations, How many?** _____ Track weights here _____

☐ **FRAME PERIMETER** - Frame must be non-articulated. Minor protrusions <1/4" (6mm) OK <R1>

☐ **Starting Configuration** - Parts may not extend beyond the vertical projection of the FRAME PERIMETER <R2>

☐ **Starting Volume** - FRAME PERIMETER Not greater than 120in. (-304 cm) and not taller than 45 in. (-114 cm) <R3>

☐ **Playing Configuration** - Robot may not extend beyond the FRAME PERIMETER by more than 12 in. (-30 cm) <R4>

☐ **Standard Bumpers** - must follow all specifications in Sec. 9.5. **BUMPER RULES**

☐ Bumpers must protect at least 6" (-16cm) on both sides of all outside corners. (Wood within 1/2" of corner) <R17>

☐ Hard bumper parts defined by bumper backing, may not extend >1" (-25mm) beyond robot frame <R24-B>

☐ No bumper segment may be unsupported by robot structure frame for a length greater than 8" (-20cm), if the gap is greater than 1/2". Gaps must be less than or equal to 1/2" (-6mm). Bumpers must be supported by at least 1/2" (-13mm) of robot frame at each end (< 1/4" (-6mm) gap OK) <R26>

☐ Corners must be filled with pool noodle such that no "hard parts" are exposed. <R25 & Fig 9-7>

☐ Must use 1/2" (-19mm) thick x 5" (-127 mm x 127 mm) tall plywood, OSB, or solid robust wood backing with no extraneous holes that may affect structural integrity. (clearance pockets and/or access holes are acceptable) <R24-A>

☐ Must use a pair of vertically-stacked 2.5" pool noodles. Pool noodles may be any shape cross section, solid or hollow, but both must be identical in shape and density. <R24-C>. Must use a durable fabric cover for the noodles secured as in Fig 9-6 cross section. <R24-D>

☐ Must be able to display red or blue to match alliance color. <R21>

☐ Team number displayed with Aztec Font, min. font 4" (-1cm) tall x 1/2" (-13mm) stroke, in white or outlined in white with a minimum 1/16in. (-2mm) outline and be used for numerals. FIRST Logos compared

☐ Must be securely mounted when attached

☐ When on flat floor, bumpers must reside at flat on floor and may not be articulated. <

Mechanical

- BOM Cost** - Team must present worksheet
- No Sharp Edges or Protrusions** that are a
- No Prohibited Materials** - e.g. sound, laser
- No Unsafe Energy Storage Devices** - capacitors
- No Risk of Damage to Other Robots** - e.g.
- No Risk of Damage to Field** - e.g. metal ch
- Decorations** - Cannot interfere with other ro
- End Game** - Game pieces can be removed i

Electrical

- Components** - **None** may be modified, exc
- motor locking pins may be removed, and ce
- be replaced with identical fuses only. Servos
- Battery** - A single 12 volt, 17-18.2 Ah robot
- Other Batteries** - Integral to COTS comput
- max output per port used for COTS comput
- PDP Visibility** - The single PDP and PDP m
- Main Breaker Accessibility** - the single 12
- Allowable PD Breakers** - Only VBS-A, MD
- the PDP <R50>
- Robot Radio** - A single OpenMesh OM5P,
- VXM must connect to the dedicated 12 vol
- CAN BUS - The RoboRio and PDP must be
- RoboRio Power** - Only the RoboRio must i

2020 FRC Inspection Checklist

Rev 1

- Wire Size Minimum and Breaker Size** - obey the wiring size conventions.
- All wire from battery to main breaker to PDP must have min 6 AWG (7 SWG or 16mm2) wire <R40 & Fig 9-9>
- 40 amp breakers must have min 12 AWG (13 SWG or 4 mm2) wire <R53>
- 50 amp breakers must have min 14 AWG (16 SWG or 2.5 mm2) wire <R53>
- 20 amp breakers must have min 18 AWG (18 SWG or 1 mm2) wire <R53>
- Wire Colors** - All power wire must be color coded - red, white, brown, yellow, or black w/stripes for +24, +12, +5 VDC supply (positive) wires and black or blue for common (negative) for supply return wires <R55>
- Copper Wire Only** - All wire used on robot must be copper wire, stranded preferred. (Signal wire excluded) <R53>
- 1 Wire per WAGO** - Only 1 wire may be inserted in each WAGO terminal, splice 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 <R49>
- Motors** - Only motors listed per table 9-1 <R27>
- Actuators** - Electrical solenoid actuators, max. 1 in. stroke and no greater than 10 watts @ 12V continuous duty <R27>
- Motor/Actuator Power** - Each motor controller may have one motor connected to the load terminals with exceptions in Table 9-2, <R30>, and single specified motors may be connected to Spike or Automation Direct Relay (however multiple pneumatic valves may be driven by a single Spike). Specified motors must be fed by speed controllers only. Two PWM controllers can be connected by a PWM "Y" cable. <R29, R30 & Table 9-2>
- 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 <R29, R30 & R73>
- Custom Circuits, Sensors and Additional Electronics** - cannot directly control speed controllers, relays, actuators or servos. Custom Circuits may not produce voltage exceeding 24V <R45 & R56>
- Pneumatic Control Module (PCM)** - PCM modules must be connected to RoboRio via CAN bus <R71>
- Isolated Frame** - Frame must be electrically isolated from battery, RoboRio must be insulated from frame. <3k Ohm between either PDP battery post and chassis) <R42>
- Pneumatic System using one on-board compressor (n/a for robots that do not use pneumatics)**
- No Modifications** - Actuator mounting pins may be removed, small labels allowed. No painting or large labels <R76>
- Compressor** - Only one (on robot only) compressor (max 1.1 CFM flow rate) may be used. <R79>
- Compressor Power** - must use a PCM or Relay module <R30 & Table 9-2>
- Compressor Control** - A Pressure Switch must be wired directly to the PCM or RoboRio to control compressor. <R85>
- Vent Plug Valve** - must include an easily-accessible manual vent plug valve to release all system pressure. <R86>
- Tubing** - Equiv. to KOP with a maximum OD of 1/8" (-6 mm) with screen printed rating or documentation. <R77-D>
- Gauges** - must be present at both the high pressure side and low pressure regulator outlet(s) and be readily visible. <R78, R83>
- Pressure Rating** - all pneumatic components at pressure, must be rated for at least 70 psi (-483 kPa). <R75> All components at stored pressure must be rated for at least 125 psi (-862 kPa). <R75>
- Valve Control** - pneumatic solenoid valves must have a max 1/8" NPT, BSPP, or BSPT port diameter, be controlled by either a PCM or Relay Module and valve outputs must not be plumbed together < Table 9-2, R77-C, & R87>
- 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 <R63, R92 >
- 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. <R80>
- Check that Main Pressure** <= 120 psi <R80> and Working Pressure <= 60 psi <R80 & R81>
- Relieving Pressure Regulator** - Set to <= 60 psi, providing all working pressure. <R81>
- Relieving Pressure Regulator** - Set to <= 60 psi, providing all working pressure. <R81>
- Robot Signal Light(s)** - The RoboRio 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. <R65>
- Verify Team Number on DS** - Team number programmed the OpenMesh Wireless Bridge at kiosk for this event. <R61>
- Software Versions** - The RoboRio image (FRC 2020_v10 or later) and DS (20.0 or later) must be loaded <R57 & R88>
- Power Off** - Disable robot and 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 6ft" x 14" x 6" above floor (approx.)**. May have hook and loop hook side attached to secure to Driver's Station shelf. <R91>

Team Compliance Statement

We, the Team Mentor and Team Captain, attest by our signing below, that our team's ROBOT was built after the 2020 Kickoff, and we are aware of any rules it violates. We confirm that it and its MAJOR MECHANISMS are products of our team's work.

Team Captain: _____

Team Mentor: _____

What to bring

- Flashlight
- Multimeter
- Robot with all the mechanisms on it
- Proof of wire gauge
- Any documentation for pneumatics and electronics
- Completed Bill of Materials (BOM)
(<https://firstfrc.blob.core.windows.net/frc2020/AuxFiles/2020/BillofMaterial-Template.xlsx>)



Tips for Success

- Get inspected early. Get your robot weighed and then get in line for inspection as soon as you can.
- That way, if you have any problems, you will have time during the day to solve them.
- Keep your pit clean and organized
- Make sure you have no protrusions/sharp edges
- You must be able to take off and put back your bumpers during inspection within a reasonable amount of time.
- **[Rookie Tip]** Talk to your inspector and ask them to explain if you don't understand.



Credits

- This lesson was written by FRC 8027 for FRCTutorials.com
- You can contact the author at team@droidsrobotics.org



- More lessons for FIRST Robotics Competition are available at www.FRCTutorials.com



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