**TEAM NUMBER:_____** 2010 FRC Inspection Checklist Rev C – March 8, 2010

**INSPECTOR:_____ INITIALS + DATE (after passing):_____**

## FMS Communication

____ **Wireless Encryption** – Verify team has successfully set their Wireless Router encryption (either via the "9091" report from the kiosk for WGA600N routers or direct verification for WET610N routers) <No rule reference>
____ **Verify Team Number is Correct on DS** <R57>
____ **cRIO Firmware Version** - cRIO image must be 2010_V20 <R86>
____ **DS Firmware Version** – DS Firmware must be 10.02.08.00 <R86>

## Initial Inspection

____ **Bag & Tag Robots** – If you are at a Bag and Tag event, or the robot arrived from a Bag and Tag event, ensure that the Bag & Tag Rules were followed. Note there is a log sheet at Pit Admin ("Misc." Box) <R26, R27, Section 4.8>
____ **Weight** -
- Robot Weight (<= 120lbs excluding bumpers and battery) <R10, R13> = _____ pounds
- Red Bumper Weight (Bumpers must be <= 20 pounds) <R07.G> = _____ pounds
- Blue Bumper Weight (Bumpers must be <= 20 pounds) <R07.G> = _____ pounds

____ **Size** – Without bumpers installed, fit within a 28"x38"x60" rectangular volume <R10>
____ **Standard Bumpers**
- Bumpers must provide complete protection of the FRAME PERIMETER <R07.A>
- All segments must be >= 6" <R07.B>
- Bumpers must protect all exterior corners of the FRAME PERIMETER <R07.K,L,N >
- Must use approximately ¾" thick x 5" tall plywood backing and a pair of vertically-stacked 2.5" pool noodles with no extraneous holes for weight reduction (mounting holes and small cut-outs are acceptable) <R07.C,D>
- Must use a durable fabric cover for the noodles <R07.E>
- Must have either complete sets of both blue and red bumpers (with colors similar to the FIRST logo) or be able to easily change bumper color between red and blue over the entire perimeter <R07.F, R12>
- Team number displayed with 4" tall x ¾" stroke, on the bumpers, 4 locations at approximately 90 deg spacing, clear contrast <R15>
- No markings, decorations or colors other than team #, red/blue fabric and functional stitching <R07.F, R15>
- Must be removable for inspection <R07.H>
- Must be securely mounted when attached <R07.I,J>
- When on flat floor, bumpers must reside entirely in region between 10" and 16" from floor <BUMPER ZONE>
- Must be mounted with a structural robot component supporting the entire length of each segment <R07.M>
- The frame to which the bumpers are attached cannot intentionally change shape <R11>

____ **BoM Cost** – Teams must show their BoM (must use FIRST template), inspector must copy BoM to inspection computer, <= $3500 of additional components, no single component > $400 <R21, R22, R23, R89>
____ **Excursion Beyond FRAME PERIMETER** - No robot components can reside outside the FRAME PERIMETER except briefly per rule <G30> and during Finale <R16>
____ **Intrusion of Balls Inside FRAME PERIMETER** –
- Under the bumpers - balls cannot roll more than 3" inside the FRAME PERIMETER <R19.A>
- Above the bumpers – features designed to deflect balls shall not "trap" the balls by more than 3" <R19.B>
- **Remind teams that balls that are trapped under the robot may result in a penalty**

## Mechanical

____ **No Sharp Edges** <R04, R05>
____ **No Prohibited Materials** - eg sound, exposed lasers, noxious or toxic gases or inhalable particles or chemicals <R02>
____ **No Unsafe Energy Storage Devices** - carefully consider safety of any springs or pneumatic systems <R01.B,D>
____ **No Risk of Damage to Other Robots** - e.g. spearing, entangling, upending or adhering <R05, R06, R17>
____ **No Risk of Damage to Field** – e.g. metal cleats on wheels, frame should be > 1" above plane of wheels
____ **Kicker Safety** – Must be of sturdy construction and able to be dry fired without any undue safety hazards <R01, R05>
____ **Decorations** - Cannot interfere with other robots' electronics and sensors (particularly color) and be "GP". <R17>
____ **Team Name** - Display the team's school name and primary sponsor name/logo <R14>

## Electrical

____ **Battery** - Only a single MK ES17-12 battery (2007 or later) or EnerSys NP18-12 is permitted on robot. <R40, R42.A>
____ **Securely-Fastened Items** - Battery and control system must be securely fastened <R18>
____ **Insulated Battery Terminals** - Must be well-covered with insulation <R43, R44.C>
____ **Battery Connector** – only the KoP APP connector (with proper polarity) may be used for battery connection <R44>

____ **Main Breaker Accessibility** – The 120A main breaker must be readily accessible <R44.G>
____ **Allowable PD & Breakers** – Only 1 PD can be used for power distribution from the 120A main breaker and only 20, 30 and 40 Amp Snap-Action breakers may be installed in the PD <R42, R46>
____ **Only Copper Wire** – aluminum or other non-copper wire may not be used <R42>
____ **Robot Radio** – The wireless adapter (WET610N and WGA600N are both legal) on the robot must be powered via the dedicated connector on the PD <R45.B>
____ **24V from PD** – only the cRIO and one Solenoid Breakout can be attached to the PD's 24V supply <R45>
____ **Controller** – 1 cRIO must be used on the robot and it must be the only device connected to the 37-pin Digital Sidecar ports and the 25-pin ports on the Solenoid and Analog Breakout(s) used on the robot <R56>
____ **Wire Size** - Obey the wiring size conventions.
- All wire from battery to PD have min #6 AWG wire <R44.F>
- 40 amp breakers have min #12 AWG wire <R47.A>
- 30 amp breakers have min #14 AWG wire <R47.B>
- 20 amp breakers have min #18 AWG wire <R47.C>

____ **Wire Colors** - Must be color coded - red/white/brown for + supply wires and black/blue for supply return wires <R48>
____ **1 Wire per WAGO** - Only 1 wire may be inserted in each WAGO, splices may be used to distribute power to multiple Breakouts and Sidecars but all wires in the splice are subjected to the Wire Size rules <R45.E>
____ **Servos** - must be attached directly to the Digital Sidecar's PWM Outputs. An unlimited number of FTC servos (HS-475HB) or any servo up to max torque of 55 oz-in and max speed of 100 rpm at 6VDC may be used. <R52.B,C>
____ **Only KoP Motors** – 5 CIM, 2 Denso Left, 2 Denso Right, 2 Fisher Price, and 2 Mabuchi. <R52.A,D,E>
____ **Motor/Gearbox Mods** – gearboxes may be removed from FP motors, only mounting and shaft connection mods are permitted (no shaft removal or structural modifications) <R54>
____ **Electromagnets** – electromagnetic coil actuators are allowed but only for holding and "friction" (not to generate motion themselves), must be driven by a Victor, Jaguar or Spike. <R53, R55>
____ **Motor Power** – Only one motor or electromagnet may be attached to each Spike, Victor or Jaguar <R49>
____ **CIM and Fisher Price Motors** – must be powered by Victors or Jaguars <R55.A>
____ **Motor Control** – Must be controlled by Spike, Victor or Jag with signals directly from a Digital Sidecar, brake/coast inputs can either use jumpers or Sidecar or custom circuit outputs, Jags may be controlled via CAN <R55, R63>
____ **Custom Circuits, Sensors and Additional Electronics** - Cannot directly control Victors, Spikes, servos or Jaguars (with the exception of cRIO-to-CAN gateways (eg 2CAN module) that bridge cRIO Ethernet or RS232 ports to CAN). <R50>
____ **Powered Decorations (if any)** – Can only draw power from a 20A breaker on the PD <R51>
____ **Solenoid Breakout** – only pneumatic valves may be driven by the Solenoid Breakout module. The breakout board can be powered from either a 20A breaker on PD or the PD's 24 volt supply (if 2 breakouts are used, only 1 can use 24V). <R65>
____ **Isolated Frame** – Must be electrically isolated from battery (>100k Ohm between either battery post and chassis), **remind teams that flexing frames that intermittently contact the cRIO chassis can be an issue** <R43>
____ **Jaguars with CAN** – Must use firmware version 86 or newer and cannot be connected to a PWM signal <R63>
____ **Jaguars with PWM** – Cannot have anything connected to ports other than the coast/brake port <R60.K, R63>

## Pneumatic System (n/a for robots that do not use pneumatics)

____ **Compressor** - Only one KoP Thomas compressor (or equivalent) may be used (on or off robot). <R72.A>
____ **Compressor Power** - Must use a Spike (recommend replacing Spike's 20A fuse with a 20A breaker) <R55.C, R60.F>
____ **Compressor Control** – Nason Pressure Switch must be wired directly to a Digital Sidecar. <R74, R78>
____ **Compressor Relief Valve** – 125 PSI relief valve must be directly attached to compressor <R77>
____ **Vent Valve** – Must include an easily-accessible manual vent valve <R79>
____ **Off-Robot Compressor (if used)** – The on-robot control system must be used to control the compressor. The Norgren regulator and Nason Pressure Switch may be located off-robot as well. <R75, R76.D, R79>
____ **Accumulators** - Up to 4 Clippard AVT-32-16 pneumatic storage tanks may be used <R72.A>
____ **Tubing** - No extraneous tubing or tubing with ID other than 0.16" <R72.E>
____ **Gauges** - Must be present on both the stored and working side of the circuit and be readily visible <R76.C>
____ **Pressure Rating** - All pneumatic components must be rated for at least 125PSI. If components are rated for less than 125 PSI, another relief valve must be installed on working pressure side to vent at the lower pressure. <R72.C>
____ **Primary Regulator** – Only 1 Norgren regulator can be used to convert the compressor's output to <=60PSI <R76>
____ **Valve Control** - Valves must have a max Cv of 0.32, controlled by Spike or NI 9472 (>1 per is legal). <R71.C>
____ **Allowable Cylinders** - Any may be used, must be rated for at least 125PSI, <= 24" stroke, <= 2" bore <R72.D>
____ **Allowable Rotary Actuators** - Any may be used, must be rated for at least 125PSI <R72D>
____ **No Unsafe Alterations** - Pneumatic parts cannot be altered such that their 125PSI rating may be compromised <R73.B>

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

____ **Driver Station** – Only the Classmate PC from the KoP can be used as the primary controller in the driver station <R84>
____ **Inputs to the Classmate** – team-supplied I/O devices can only be connected to the Classmate's USB ports
____ **Unauthorized Wireless Communication** – No other wireless comm. without FIRST permission. <R58, R68, R87>
____ **Wireless Adapters** – No radios allowed on the OPERATOR CONSOLE, robot radio should be off when in the pits <R87>
____ **Confirm Pneumatics Operation** – Vent all pressure, power up robot, compressor should kick in
- Compressor should stop automatically when pressure is reached <R78>
- Main Pressure <= 125 psi <R73.A, R75> and Working Pressure <= 60 psi <R73.A, R76, R01.B>
- Dump pressure via manual vent valve, compressor should start automatically and stop when full <R74, R79>
- Using clip leads, short the Nason pressure switch to force the compressor "on", confirm that the relief valve automatically opens at < 130 psi (remove the short if pressure exceeds 135 psi) <R74>

____ **Robot Signal Light** - The Robot Signal Light from the KoP must be visible from 3' in front of the robot, and be plugged into the RSL port on one of the Digital Sidecars. Confirm that La and Lb are shorted and operation via power-up <R59>.
____ **Battery Voltage Monitoring** – The DS must display a battery voltage <R66>
____ **Confirm that mechanisms below the BUMPER can only briefly reach up to the BUMPER PERIMETER when activated <R16, G30> (If you believe a robot will have trouble complying with the 2 second rule, notify a referee)**
____ **Size during FINALE CONFIGURATION -** must fit within a 7' diameter vertical cylinder with 90" height <R10>
____ **Power Off –** Remove power from the robot, confirm all LEDs are off, actuate pneumatic vent valve (if applicable) and confirm that all pressure is vented and gauges read 0 pressure
____ **Removing the Robot from the Field –** Confirm removal when unpowered (eg hanging robots) <R20>

## Team Compliance Statement

We, the Team Mentor and Team Captain, attest by our signing below, that our team's robot was built after the 2010 Kickoff on January 9, 2010 and in accordance with all of the 2010 FRC rules, including all Fabrication Schedule rules. We have conducted our own inspection and determined that our robot satisfies all of the 2010 FRC rules for robot design.

Team Captain:_____ Team Mentor:_____