



THE KIT OF PARTS

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10. THE KIT OF PARTS

10.1 THE KIT OF PARTS - GENERAL

FIRST provides a Kit Of Parts (KOP) to each FRC team. The items provided in the KOP are considered Kit Parts. Some Kit Parts may legally be used in additional quantities as described in *Section 8 The Robot* of the FRC Manual. Additional quantities of these parts are considered to be "Additional Parts" and not "Kit Parts".

Section 10 The Kit Of Parts is dedicated to important information about specific kit items. For instructional tips, please refer to the *2009 FRC Recommendations* document posted on the *FIRST* website off of the manual landing page, <http://www.usfirst.org/community/frc/content.aspx?id=452>.

Some of the exciting and important additions found in the 2009 KOP include the following items:

- Complete control system (including Axis 206 camera, WiFi hardware, cRIO controller, two kinds of motor controllers, power distribution board, and more)
- AndyMark, Inc. C-base chassis kit
- AutomationDirect push button
- BaneBots RS-545 motors
- Orbit ball
- 2009 Rover Wheels (aka *FIRST* Slick wheels)
- Sprocket spacers
- Camera pan/tilt kit
- Trailer hitch spacer
- Gloves
- Lazy Susan
- Optical encoder

The FRC 2009 KOP is provided in multiple containers. They consist of the following packages:

- 1 – *Kamen* large black plastic tote for pickup at Kickoff
- 1 – *Flowers* large black plastic tote for pickup at Kickoff
- 1 – Control System box for pickup at Kickoff
- 1 – C-base chassis kit from AndyMark, Inc. for pickup at Kickoff
- 1 – Battery box from MK Battery for pickup at Kickoff
- 1 – Gyro/Accelerometer sensor set from Diversified Systems for pickup at Kickoff
- 2 – RS-545 DC motors from BaneBots for pickup at Kickoff
- 1 – FedEx envelope for pickup at Kickoff

10.1.1 Replacement Parts Requests

Use the *2009 Kit of Parts Checklist* provided at <http://www.usfirst.org/community/frc/content.aspx?id=452> to inventory your KOP. The inventory must be completed within 48 hours of receiving the kit in order to determine that all items are present.

The first column on the checklist should be marked when the item and quantities are correct. Photos are included in the checklist in case you are not sure what a particular part looks like.

If you find that certain Kit Parts are missing or damaged, you will need to submit a "Replacement Parts Request" by 11:59pm (EST), January 7, 2009. The Replacement Parts Request link will be posted on the Team Information Management System (TIMS) after the Kickoff event. Replacement parts will be shipped only via this online request system.

The steps required to submit a Replacement Parts Request (after the kickoff) are as follows:

- Log into TIMS with your Logon ID and Password
- Click on the "Submit a Replacement Parts Request" link on right side of the Team Summary page
- Follow TIMS instructions to complete a Replacement Parts Request. Please be specific when describing the issue with the part (missing, damaged, etc).

Please remember that this is a **time limited, one-time only** opportunity to submit your Replacement Parts Request. Make sure that your request is both accurate and complete prior to pressing the "Submit Request" button. Once the request is submitted you cannot make any changes to it. Please note that the system will not allow teams to request a quantity of parts higher than the number originally sent with the kit. This system is also not to be used to order additional and/or purchased parts.

**Any kit irregularities must be reported by 11:59pm (EST),
Wednesday, January 7, 2009 per the instructions in this document.**

Replacement Parts Requests will be processed daily and shipped during the next open shipping window. Items will be shipped to the shipping contact listed in your team's TIMS record.

10.1.2 Obtaining Additional or Spare Parts

Depending on what parts are left over after kitting and replacement parts shipments, FRC will provide spare parts at the Regional events. The items included in this limited group will be listed during the build season. If your robot uses parts that are not included on this list, and there is a reasonable possibility that the part could be damaged or broken during competition, it is recommended that you bring the appropriate SPARE PARTS with you to events in accordance with *Section 8.3.5*.

If, at any event, your team needs to borrow a cRIO, Driver Station, Power Distribution Board, Digital Sidecar, or Analog/Solenoid Breakout, your team must provide Credit Card information to ensure proper return of the items immediately upon completion of the event. If the borrowed part is not returned by the end of the event, *FIRST* retains the right to bill the provided credit card number for the item(s). All "loan" items will be available on a first-come, first-served basis.

Some Kit Parts will be available to teams that wish to purchase more. The resources available vary by part. Details will be published on the *FIRST* website at <http://www.usfirst.org/community/frc/content.aspx?id=452>.

10.2 PART INFORMATION

This section of the manual provides additional information about *some* of the parts included in your KOP. For a complete list of the 2009 KOP contents, please refer to the 2009 KOP Checklist located on the *FIRST* homepage (<http://www.usfirst.org/community/frc/content.aspx?id=452>).

10.2.1 Control System Components

Please refer to the FRC website for details about the components included in the 2009 FRC Controls Kit (<http://www.usfirst.org/community/frc/content.aspx?id=10934>).

10.2.2 Chassis

Please refer to the AndyMark, Inc. website for details about the C-base chassis kit included in the 2009 FRC KOP (www.andymark.biz).

10.2.3 Motors

10.2.3.1 FisherPrice Motors

Unlike in the 2008 KOP, the FisherPrice motors provided in the 2009 KOP are already assembled to the plastic gearboxes. For the motor curve, please refer to www.usfirst.org/community/frc/content.aspx?id=482.

10.2.3.2 BaneBots RS-545

The BaneBots motors were supplied separately at the kit pickup locations. More information about the motors and their performance can be found on the BaneBots website at <http://banebots.com/pc/MOTOR-BRUSH/M1-RS545-120>.

10.2.4 The Drive Train

10.2.4.1 Wheels

The wheels supplied in the 2009 KOP are very different from previous years' kit wheels. The tread material is Celcon M90, and has the following coefficients of friction on white, rippled fiberglass plastic sheet

Inline, static: 0.06

Inline, dynamic: 0.05

Transverse, static: 0.14

Transverse, dynamic: 0.10

Please refer to *Section 8* regarding wheel usage. No other form of traction is permitted in *Lunacy*. Also note that sprocket spacers are required if you are mounting sprockets to the wheels. The sprocket spacers shift the sprocket so that the wheel tread does not interfere with the drive chain.

10.2.5 Electrical Components

10.2.5.1 Batteries

The batteries supplied in the 2009 KOP are the same as those provided in the 2007 and 2008 KOP. The part number is ES17-12, and they are 12V, 18AH batteries. MK Battery ES17-12s are the only permitted batteries in the *FIRST* Robotics Competition.



Please remember that if you plan to ship your batteries in your crate, it's important to save the box and the rest of the packaging for further transport!

10.2.5.2 FCI Burndy Battery terminal lugs

FCI Burndy Products has donated two types of lugs for connecting your quick-disconnect battery connectors to your battery terminals. The mechanical lugs, PN YAZV6CTC14FX, should only be used if you have the appropriate crimp tool. Lugs with part number KPA4CUP are screw lugs, and no crimp tool is required. For details about these parts and information about recommended crimp tools, please visit the FCI Burndy Products website at [http://portal.fciconnect.com/portal/page/portal/FcicntPublic/ComergentConnect?appname=catDisplayStyle\\$domProductQueryName=KPA4C*\\$OP=search](http://portal.fciconnect.com/portal/page/portal/FcicntPublic/ComergentConnect?appname=catDisplayStyle$domProductQueryName=KPA4C*$OP=search) and [http://portal.fciconnect.com/portal/page/portal/FcicntPublic/ComergentConnect?appname=catDisplayStyle\\$domProductQueryName=YA6C*\\$OP=search](http://portal.fciconnect.com/portal/page/portal/FcicntPublic/ComergentConnect?appname=catDisplayStyle$domProductQueryName=YA6C*$OP=search).

10.2.5.3 Quick Disconnect Battery Connector

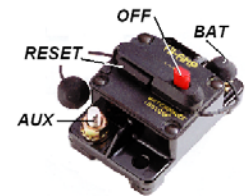
Each 2009 KOP contains four quick-disconnect battery connectors. They are assembled from Delphi red and black 6 AWG wire and Anderson Power Products (APP) quick-disconnect connector, SB-50. The datasheet for the connector can be found on APP website at www.andersonpower.com/products/multipole-sb.html.



10.2.5.4 120A Circuit Breaker

The 120A main circuit breaker/disconnect switch functions as the Main Power **ON/OFF** switch for the robot and as a Safety current overload protection device.

To power down the robot power manually, push the Red **OFF** button on the breaker. To reset Robot Power to ON, push the **RESET** lever back into its nested position.



120 Amp CB Layout

The Positive (Red) wire on the output side of the Anderson connector should have a ¼” Ring lug crimped/soldered on and then be connected directly to the **BAT** post of the 120A main circuit breaker. Tighten the nut. Finish by fully pushing the rubber-insulating cap back down over the nut. This will assure that all power from the 12v battery now flows directly to the 120A breaker. Do not connect anything other than the 120A main circuit breaker/disconnect switch directly to the 12v battery’s positive (+) terminal.

A fully charged 12Vdc battery can deliver current in excess of 200 Amps for a sustained period of time (minutes) in a short circuit situation. This amount of current can make wires smoke, melt through insulation in a fraction of a second, start a fire, cause the battery to leak highly corrosive acid or explode, and result in serious burns or other injuries. Always make sure that the 120A main circuit breaker/disconnect switch is wired in series with the 12v battery positive (+) terminal and can break the circuit when necessary.

10.2.5.5 Quick Disconnect Battery Connector - Plugs

The battery plugs included in your kit are to help protect the contacts of the Anderson connectors when not in use. They can also be used to indicate the charge state of a battery.

10.2.6 Sensing

10.2.6.1 Sensor Strip

The 2009 Kit of Parts contains a sensor strip including a gyro and tri-axis accelerometer. For details about these devices, please reference the *2009 Sensors Manual* which will be posted on the *FIRST* website at <http://www.usfirst.org/community/frc/content.aspx?id=452>.

10.2.6.2 Optical Encoder

Details for the optical encoders found in the kit can be found on the US Digital website at <http://www.usdigital.com/products/encoders/incremental/rotary/kit/e4p/>.

10.2.6.3 Axis 206 Camera

Details about the Axis 206 camera found in the kit can be found on the Axis website at http://www.axis.com/products/cam_206/index.htm.

10.2.7 Pneumatic Components

Please refer to the *2009 Pneumatics Manual*, which will be posted on the *FIRST* website at <http://www.usfirst.org/community/frc/content.aspx?id=452> for details about the 2009 pneumatic kit items.