

5.4 KIT OF PARTS 2006

FIRST provides a Kit of Parts to each team. Only the exact parts provided in the Kit (or their exact replacement) are considered as Kit Parts. Some Kit Parts may legally be used in additional quantities. Additional quantities of these parts are considered to be "Additional Parts" and not "Kit Parts".

5.4.1 2006 Kit Changes

Some of the exciting and important changes found in the 2006 Kit Items include:

- Labview8 and Easy C software supplied for vision system software development and programming.
- Removed two of the CIM motors and replaced them with two larger CIM "mini-bike" motors.
- 3 New Sensors for 2006 - Gear Tooth Sensor, Dual Axis Accelerometer, and Angular (Yaw) Rate Gyro. Each provides critical positioning and attitude sensing data for precision robot control.
- Enhanced CMUcam2 Vision System with new servo driven Pan/Tilt Brackets adds the capability for vision-based tracking of illuminated targets - essential to achieving competitive performance skills in this year's game.
- New igus Linear Bearing and Guide System kit provides robust lightweight components useful for designing efficient mechanical control systems.
- New Allen-Bradley Infrared Transmitted Beam Sensor for any applications where broken beam detection is a useful and important requirement.
- Returned the MAXI and the ATC fuse panels to the kit in place of the single Circuit Breaker/Power Distribution panel.
- Spiraled Pneumatic tubing from Freelin-Wade.

5.4.2 Kit Of Parts Contents

The FIRST 2006 Kit of Parts is provided in multiple containers. They consist of; 2 Large plastic Totes (blue and red) of robot parts and construction materials shipped from FIRST, cartons containing 1-KitBot box, 1 Electronics Kit, 1 Drive Kit, and 1 Motor Kit shipped from Innovation First, Inc and 2 items.

Use the tables below to inventory your Kit of Parts. The inventory may take about 45 minutes, but should be completed within 48 hours of receiving the kit in order to determine that all items are present. Any irregularities must be reported by 11:59 pm (EST) on Wednesday, January 11, 2006.

The CHECK column should be marked when the item and quantities are correct. All bags are labeled. If you are not sure what a particular part should look like, match the Pix Number to the numbered photograph for clarification. (N/A = picture not available). Kit photos are attached to the checklist supplied with the kits and may be downloaded from the FIRST web site at http://www.usfirst.org/robotics/doc_updt.htm

5.4.2.1 The following part items will be found inside the Blue container

BLUE CONTAINER ITEM 1

| | | <i>BATTERY BOX</i> | EXIDE | Contains 2 ea. | |
|-------|----------------|-----------------------|-------------|----------------|--|
| ✓ Pix | Part Name | Description | Part Number | Qty | |
| K11 | Battery, Exide | 12V, 18AH, Deep Cycle | EX18-12 | 2 | |

BLUE CONTAINER ITEM 2

| | | <i>COUPLER BAG</i> | | MMH | |
|-------|-----------------------------|-----------------------|--------------|-----|--|
| ✓ Pix | Part Name | Description | Part Number | Qty | |
| K21 | Wheel Hub, Plastic | Hub for Skyway wheels | DEKA | 4 | |
| K22 | Coupler, Nippon-Denso Motor | Injection molded | DEKA Denso_6 | 2 | |

BLUE CONTAINER ITEM 3

| | | <i>ELECTRICAL BAG</i> | | MMH | |
|-------|-------------------------------|--------------------------|-------------------------------|-----|--|
| ✓ Pix | Part Name | Description | Part Number | Qty | |
| K31 | Connector, Quick Disconnect | #6 Wire Pair, 12" | 6331G1 | 4 | |
| K32 | Battery Connector Safety Plug | White (45) small plastic | AndyMark, Inc. | 8 | |
| K33 | Fan, Muffin (Tiny) | 12 Vdc | 412 | 6 | |
| K34 | Fan, Muffin, (Large) | 12 Vdc | 4212/19H-490 or 4112N/12GL | 2 | |
| K35 | Latex Tubing | ¼" ID, 3/8" OD, 5 feet | 5234k44 | 2 | |

BLUE CONTAINER ITEM 4

| | | <i>FREELIN WADE</i> | | | |
|-------|-----------------------|---------------------|---------------|-----|--|
| ✓ Pix | Part Name | Description | Part Number | Qty | |
| K41 | Spiral Tubing | Coil | 2MC-151-5P-FW | 1 | |
| K42 | Tubing, ¼" | 100 Ft length | 1J-151-07P-FW | 1 | |
| K43 | Catalog, Freelin-Wade | | FWRGSI | 1 | |

BLUE CONTAINER ITEM 5

| | | <i>LOOSE MATERIALS</i> | | | |
|-------|---------------------------------------|------------------------|-----------------------------------|-----|--|
| ✓ Pix | Part Name | Description | Part Number | Qty | |
| K51 | Coil, Wire, Black | 10' , # 6 AWG, Black | Delphi Conn. Systems | 1 | |
| K51 | Coil, Wire, Red | 10' , # 6 AWG, Red | Delphi Conn. Systems | 1 | |
| K52 | Battery Charger, Automatic | 6 Amp, Midtronics | CXC-2005 | 1 | |
| K54 | Ball, 7" Foam Basketball | Sport balls | Poof-slinky.com | 1 | |
| K55 | Motor, Fisher-Price, w/19T #7 Gearbox | 12 Vdc | 00968-9003 or 00968-9012 supplied | 2 | |
| K56 | Wheel, wheelchair, 8" | Precision Hub w/o brg. | WHL70C | 4 | |

BLUE CONTAINER ITEM 6

| | | <i>MAGAZINE BAG</i> | | May be loose in Tote | |
|-------|--------------------------|---------------------|-------------|----------------------|--|
| ✓ Pix | Part Name | Description | Part Number | Qty | |
| N/A | Magazine, Nuts and Volts | | | 1 | |
| N/A | Magazine, Servo | | | 1 | |

BLUE CONTAINER ITEM 7

| <i>TARGET BAG</i> | | | | |
|-------------------|-------------------------|-------------------------|----------------|-----|
| ↳ Pix | Part Name | Description | Part Number | Qty |
| K71 | Cold Cathode Dual Kit | 12" green (2 bulbs/box) | Oznum | 4 |
| K72 | Transformer | | Oznum | 4 |
| K73 | Target Lens, HDPE Panel | 16" x 8"(nom) x 1/8" | Plastic Supply | 1 |

BLUE CONTAINER ITEM 8

| <i>TERMINAL SUPPLY BAG</i> | | | | |
|----------------------------|-----------------------------------|--------------------------|----------------------------------|-----|
| ↳ Pix | Part Name | Description | Part Number | Qty |
| K81 | Circuit Breaker, 120A, Buss | 120A, Automotive style | CB3-SM-120 185-120-F01-1(old) | 1 |
| K82 | Nylon Ring Terminal | AWG 22-18 | A-532-06 | 10 |
| K83 | Nylon Ring Terminal | AWG 16-14 | B-523-06 | 6 |
| K84 | Maxi Style Fuse Block, 4 Position | Gold plated | JEF-531D | 1 |
| K85 | Terminal Lug, SLU-35 | 6-14ga solderless lug | SLU-35 | 8 |
| K86 | ATC Fuse Panel, | 12 Position | 15600-12-21 | 1 |
| K87 | ATC Fuse Panel, | 6 Position | 15600-06-21 | 1 |
| K88 | Nylon Ring Terminal | #6ga- 1/4" stud | E760-14 | 4 |
| K89 | Nylon Ring Terminal | #6ga- #10 stud | E760-10 | 6 |
| K810 | Nylon Ring Terminal | #6ga- 3/8" stud | E757-38 | 6 |
| K811 | Female Quick Disconnect, Nylon | 12-10ga, .250d | C-572 | 56 |
| K812 | Nylon Ring Terminal | 12-10ga Ring Lugs | C-536-06 | 20 |
| K813 | Fem Quick Disconnect, Nylon | 22-18ga, .250d | AA-8140 | 8 |
| K814 | Fem Quick Disconnect, Nylon | 10-12ga, .250d | C-850 | 14 |
| K815 | Male Quick Disconnect, Nylon | 16-14ga, .250d | MCT-850 | 14 |
| K816 | Fem Quick Disconnect, insulated | 16-14ga, .250d | B-850 | 4 |
| K817 | Stud w/ Nut | 3/8" stud terminal block | TB-1 | 1 |
| K818 | Male Quick Disconnect, Nylon | 12-10ga, .250d | MCT-C-850 | 14 |

5.4.2.2 The following part items will be found inside the Red container

RED CONTAINER ITEM 1

| <i>IGUS BAG</i> | | | | |
|-----------------|-----------------------------|---------------------------|-------------|-----|
| ↳ Pix | Part Name | Description | Part Number | Qty |
| KR11 | Igubal Pillow Block- 5/8" | 2 in separate bag in Tote | KSTI-10 | 4 |
| KR12 | Iglide Flange Bearing-5/8" | | JFI-1012-12 | 4 |
| | IGUS Product Guide | | | 1 |
| KR14 | Plastic Linear Bearing | 5/8" | RJI-01-10 | 2 |
| KR15 | 5/8" Aluminum Shafting | 18" Hard Anodized | AWI-10 | 1 |
| KR15 | 3/8" Aluminum Shafting | 18" Hard Anodized | AWI-06 | 1 |
| KR17 | Iglide Sleeve Bearing-5/8" | | JSI-1012-12 | 4 |
| KR18 | 2-Hole Flange Bearing- 3/8" | | EFOI-06 | 2 |
| KR19 | Clevis Joint w/pin & Clip | 3/8" | GERIK-06 | 2 |

| | | | | | |
|--|-------|------------------------------------|------------------------------------|---------------|---|
| | KR110 | 5/8" Rod end Bearing | | EBRI-10R | 2 |
| | KR111 | 3/8" Rod end Bearing | | EBRI-06R | 2 |
| | KR112 | EZ Chain | 18" Long | Z06-16-018-0 | 1 |
| | KR113 | Mounting Bracket – EZ Chain | 1 Set/ 2 Pieces | 060-16-12PZ | 1 |
| | KR114 | Low Profile Linear Guide 27mm wide | 2 pieces, 18" Long, 4 carriages | NK01-27-2-457 | 2 |

RED CONTAINER ITEM 2


| LOOSE MATERIALS | | | | | |
|------------------------|-------|--------------------------------|-----------------------------------|-----------------|-----|
| ☞ | Pix | Part Name | Description | Part Number | Qty |
| | KR21 | Motor, Globe, w/drive assy | 12 Vdc | 409A587 | 2 |
| | KR22 | Volume Tank, Clippard | 2" bore by 6" long | AVT-32-16 | 2 |
| | KR23 | Motor, CIM | Keyed output shaft | FR801-001 | 2 |
| | KR24 | Motor, Nippon-Denso Window, RH | | 262100-3030/ RH | 1 |
| | KR25 | Motor, Nippon-Denso Window, LH | | 262100-3040/ LH | 1 |
| | KR26 | Motor, Sliding Door, Van | Bosch | 16636815 | 1 |
| | KR27 | Joystick, Analog | AVB Top Shot Analog | GC-1000FR | 2 |
| | KR28 | Rod Clevis Kit | | LO7130 0400 | 1 |
| | KR29 | Pivot Bracket Set (R/L) | | LO7131 0300 | 1 |
| | KR210 | Lead Screw w/ Nut | | BZ6050 x 12" | 1 |
| | KR211 | Motor, Mabuchi | | RS-545SH-2485 | 1 |
| | KR212 | Cylinder | 1.5" bore x 8" stroke; rear pivot | 1.5DPSR8.00 | 1 |
| | KR213 | Compressor, Thomas | | 405ADC38/12 | 1 |
| | KR214 | US Patent + Trademark Office | DVD | | 1 |
| | KR215 | 80/20 CD | | | 1 |
| | KR71 | MSC Catalogue – CDROM | & Starrett table | | 1 |
| | KR216 | FedEx Envelope | | | 1 |

RED CONTAINER ITEM 3

| KR30 PNEUMATICS – SMC | | <i>Note: 24V solenoid is an extra item</i> | | | |
|------------------------------|-------|---|---------------------------------------|-------------------------------------|-----|
| ☞ | Pix | Part Name | Description | Part Number | Qty |
| | KR31 | Flow Control | | NAS2201F-N01-07S | 6 |
| | KR32 | Fitting, Straight | ¼" tube, straight | KQH07-34S | 10 |
| | KR33 | Fitting, 90 Elbow | ¼" tube, 90° elbow | KQ2L07-34S | 5 |
| | KR34 | Solenoid Valve, Double w/ Lead Wire Assy, Pilot Valve & gaskets | 12VDC pilot valves hardwired to assy. | SY3240-6HZ-X70 | 2 |
| | KR314 | Solenoid Valve, Double w/ Pilot valves 24VDC | 24VDC, no lead wires | SY3240-5LOZ (Spare for solenoid) | 1 |
| | KR37 | Sub Base, | 1/8" ports | SY3000-27-1T | 2 |
| | KR38 | Fitting, 90 Elbow | 90° Elbow ¼" tube | KQLO7-35S | 10 |
| | KR39 | Fitting, Tee-Union | Tee union – 1/4" tube | KQTO7-00 | 5 |


| | | | | | |
|--|-------|-------------------|---|------------|---|
| | KR312 | Fitting, 90 Elbow | Male, 90° Elbow, 5/32" tube- 1/8 NPT | KQ2L03-34S | 1 |
| | KR313 | Fitting, Straight | Male Conn. 5/32" tube -1/8 NPT | KQ2H03-34S | 1 |

RED CONTAINER ITEM 4


| <i>PNEUMATICS BAG #1</i> | | | | | |
|---|-------|--|----------------------------|--------------------|-----|
|  | Pix | Part Name | Description | Part Number | Qty |
| | KR41 | Teflon Tape | ¼" x 520' | | 1 |
| | KR42 | Pressure Gauges, Wika | 1/8" NPT, 0-160 psi | 9690242 | 2 |
| | KR43 | Solenoid, Festo, Single valve kit | Single solenoid valve | VPLE18-M5H-4/2-1/4 | 2 |
| | KR44 | Vibration isolators, Lord | | SMB003-0100-2 | 3 |
| | KR45 | Secondary Regulator & Bracket, Mounier | Regulator & Mtg Kit | 101-3002-1 | 1 |
| | KR46 | Pressure Switch, Nason | Open; 115, Close; 95psi | SM-2B-115R | 1 |
| ** | KR47 | Main Regulator, Norgren, 60psi | 60 psi Max output | R07-153-RNEAJ060 | 1 |
| | KR48 | Regulator Mounting Kit | Bracket & Nut | 18-025-003 | 1 |
| | KR49 | Relief Valve, Norgren, 120 psi | 120 psi Relief Valve | 16-004-074 | 1 |
| | KR410 | Gauge, Norgren | Gauge, 0-160 psi | 18-013-212 | 1 |
| | KR411 | Parker Brass Bag | | | 1 |

** Verify part number is R07-153-RNEAJ060

RED CONTAINER ITEM 5


| <i>PNEUMATICS #2 BAG</i> | | | | | |
|---|------|-----------------------------|----------------------|---------------|-----|
|  | Pix | Part Name | Description | Part Number | Qty |
| | KR51 | Valve, BoschRexroth | Valve, 12V | 5728400410 | 1 |
| | KR52 | Connector kit, BoschRexroth | Connector, & hdwre | H894101-02202 | 1 |
| | KR53 | Nut, BoschRexroth | Gray Nut - ¼" tubing | H893071-4904 | 3 |

RED CONTAINER ITEM 6

| <i>SENSOR BAG</i> | | | | | |
|---|------|--------------------------|---------------------|---------------|-----|
|  | Pix | Part Name | Description | Part Number | Qty |
| | KR61 | Receiver | Combine Rx & Source | 42SMR-7100 | 1 |
| | KR62 | Source | Rockwell Automation | 42SML-7100 | 1 |
| | KR63 | Power Distribution Block | Rockwell Automation | 1492-PDM 3141 | 1 |
| | KR64 | Micro switch | Sager Electronics | V7-2B17D8-048 | 2 |


5.4.2.3 The following part items are shipped from Innovation First

INNOVATION FIRST, INC. ITEM 1


| <i>FIRST-2006 ELECTRONICS KIT</i> | | | | E-KIT-2006 | |
|---|-------|--------------------------------|--|----------------------------|-----|
|  | Pix | Part Name | Description | Part Number | Qty |
| | IF16 | Robot Controller Unit | ROBOT-RC | FR-2006-RC | 1 |
| | IF17 | Operator Interface Unit | ROBOT-OI | FR-2006-OI | 1 |
| | IF13 | Radio Modem – Robot Controller | RS-422, 9 pin, M, w/ Rubber Antenna | ROBOT-RADIO-RC | 1 |
| | IF14 | Radio Modem – Op. Interface | RS-422, 9 pin, M, Metal Antenna | ROBOT-RADIO-OI | 1 |
| | IF110 | Speed Controller, Victor 884 | VICTOR-884-12-12 | FR-VIC884 | 4 |
| | IF18 | Cable, PWM/Relay | Hitec/JR –36” | CABLE-PWM-36 | 8 |
| | IF19 | Cable, PWM/Relay – Y | Hitec/JR –24” | CABLE-PWM-Y | 2 |
| | IF119 | Adapter, 7.2V Battery Charger | Old Connector to Spade-Lock | ADAPT-BATTERY- 7.2 | 1 |
| | IF11 | Cable, 9 pin, M/F, Blk, 6” | DB9 M/F 6’, Shielded | CABLE-DB9-6FT-MF | 3 |
| | IF111 | Cable, 9-Pin, 6’, Tether | DB9 Female/Female | CABLE-DB9-6FT-FF | 1 |
| | IF117 | Battery, 7.2V, NiCad, Backup | 7.2V NiCad | BATTERY-BACK-7.2 | 1 |
| | IF124 | Wall Adapter – OI | AC/DC Adapter 9VDC | AC-ADAPTOR-OI | 1 |
| | IF12 | Servo | 42 oz/in peak torque 0.19 | SERVO-HS-322HD | 2 |
| | IF120 | Circuit Breaker Bag | 20Ax4, 30Ax2, 40Ax4 | CB-20A, CB-30A, CB- 40A | 1 |
| | IF123 | MPLAB CBOT Compiler | MicroChip Software | C-BOT-COMPILER | 1 |
| | IF128 | LabView Software | Student Edition | National Instruments | 1 |
| | IF15 | Spike Relay | 12v, 20A | SPIKE-RELAY-H | 4 |
| | IF115 | Camera Pan/Tilt Bracket Kit | 3 Brackets plus h/w | FRC-PANTILT-01 | 1 |
| | IF122 | LED Cluster | Robot LED, Red/Blue | ROBOT-LED-RB | 1 |
| | IF112 | Camera Lens | Camera Lens | CAMERA-CMU-2 | 1 |
| | IF113 | CMU CAM Printed Circuit Board | CMU-CAM-2 PCB | CAMERA-CMU-2 | 1 |
| | IF114 | TTL-232 | TTL-RS232 Converter | CAMERA-CMU-2 | 1 |
| ** | IF125 | Sensor Strip | DAA, YRG, GTSx2 | SENSOR-STRIP-01 | 1 |
| | N/A | Gear-Tooth Sensor Hardware | Not Used | See Motor kit item 3 | 1 |
| | IF127 | Picasa Software Ver 2.0 on CD | for Google Camera | | 1 |

** Note: See <http://www.ifrobotics.com/> BEFORE wiring the YRG sensor.


INNOVATION FIRST, INC. ITEM 2

| <i>FIRST 2005 KITBOT</i> | | | | FRC-KITBOT-001 | |
|---|------|----------------------------|-----------------------|------------------|-----|
|  | Pix | Part Name | Description | Part Number | Qty |
| | IF31 | Transmission Support Frame | Metal plate, 30” x 5” | KITBOT-TRAN-TOP | 1 |
| | IF32 | Bumper, C-Channel | Metal C- channel, 37” | KITBOT-BUMPER | 2 |
| | IF33 | Main Chassis Rail | Rail | KIT-BOT- RAIL | 4 |
| | IF34 | End Cap | U-shaped C-channel | KITBOT-ENDCAP | 4 |
| | IF35 | Mount Plate, Transmission | Plate, 9’ x 2.75” | KITBOT-TRAN-MNT | 2 |
| | IF36 | Chassis Stiffener | Angle Bracket, 6” | KITBOT-STIFFENER | 4 |
| | IF37 | Hardware Kit | Misc Hardware | KITBOT-2005-HDWR | 1 |

INNOVATION FIRST, INC. ITEM 3


| <i>MOTOR KIT</i> | | | | FRC-KIT-MOTOR-001 | |
|---|------|--|--|-------------------|-----|
|  | Pix | Part Name | Description | Part Number | Qty |
| | IF41 | Motor (Large) | Motor | FP801-005 | 2 |
| | IF21 | Bearing, Timken | Skyway Wheel Bearing | S3KDD | 8 |
| | N/A | Screw Kit (contains 4 each - 8/32" flat head screws) | Hardware for mounting Gear tooth sensor. | JSU-229 | 1 |

INNOVATION FIRST, INC. ITEM 4 BOX UPC: 356

| <i>DRIVE KIT</i> | | | | FRC-KIT-DRIVE-001 | |
|---|-------|-------------------------------|-----------------------------|--------------------|-----|
|  | Pix | Part Name | Description | Part Number * | Qty |
| | IF66 | Output Sprocket | Output Sprocket | FRC-2005-112-009 | 2 |
| | IF65 | Wheel Sprocket | Wheel Sprocket | FRC-2005-120-01 | 2 |
| | IF614 | Hardware Pack | Hardware Pack | Hardware-TranPk-01 | 1 |
| | N/A | Hardware Pack | Hardware Pack | Hardware-TranPk-02 | 1 |
| | IF64 | Cover | Cover | FRC-2005-112-002 | 2 |
| | IF613 | Hex Cluster Shaft | Hex Cluster Shaft | FRC-2005-112-003 | 2 |
| | IF612 | Hex Output Shaft | Hex Output Shaft | FRC-2005-112-004 | 2 |
| | IF69 | Hex Shaft Cluster Gear | Hex Shaft Cluster Gear | FRC-2005-112-005 | 2 |
| | IF610 | Small Hex shaft Gear | Small Hex shaft Gear | FRC-2005-112-006 | 2 |
| | IF68 | CIM Motor Input Gear | CIM Motor Input Gear | FRC-2005-111-007 | 4 |
| | IF611 | Large Hex Shaft Output Gear | Large Hex Shaft Output Gear | FRC-2005-112-008 | 2 |
| | IF64 | Transmission Housing | Transmission Housing | FRC-2005-112-001 | 2 |
| | IF63 | Master Link, Chain | # 35 Link | ROBOT-MLINK-35 | 1 |
| | IF62 | Chain, 10' | Browning # 35 | ROBOT-CHAIN-35-10 | 1 |
| | IF22 | Bearing, Transmission- 39KDD | | 39KDD | 6 |
| | IF23 | Bearing, Transmission-9103KDD | | 9103KDD | 2 |

- - Reference: 2005 FIRST Robotics Competition Kit Transmission Manual

5.4.2.4 Kickoff Supplied Materials

| <i>KICKOFF MATERIALS</i> | | | | | |
|---|-------|----------------------------------|--------------------------|-------------|-----|
|  | Pix | Part Name | Description | Part Number | Qty |
| | N/A | Google Digital Camera | Shipped to Kick-off site | | 1 |
| | IF118 | Battery Charger for 7.2V Battery | 7.2V NiCad Charger | CHARGER-7.2 | 1 |

5.4.3 Replacement Parts Requests

After receiving your Kit of Parts (KOP), *FIRST* will be using a similar system as implemented last year for teams to submit a "Replacement Parts Request" within a short period of time after the kickoff. Any parts requested will be sent to teams via this online request system only. The Replacement Parts Request link will be posted on the Team Information Management System (TIMS) at http://www.usfirst.org/robotics/res_art2.htm after the Kickoff event.

To begin the process of submitting a Replacement Parts Request (after the kickoff), teams will: