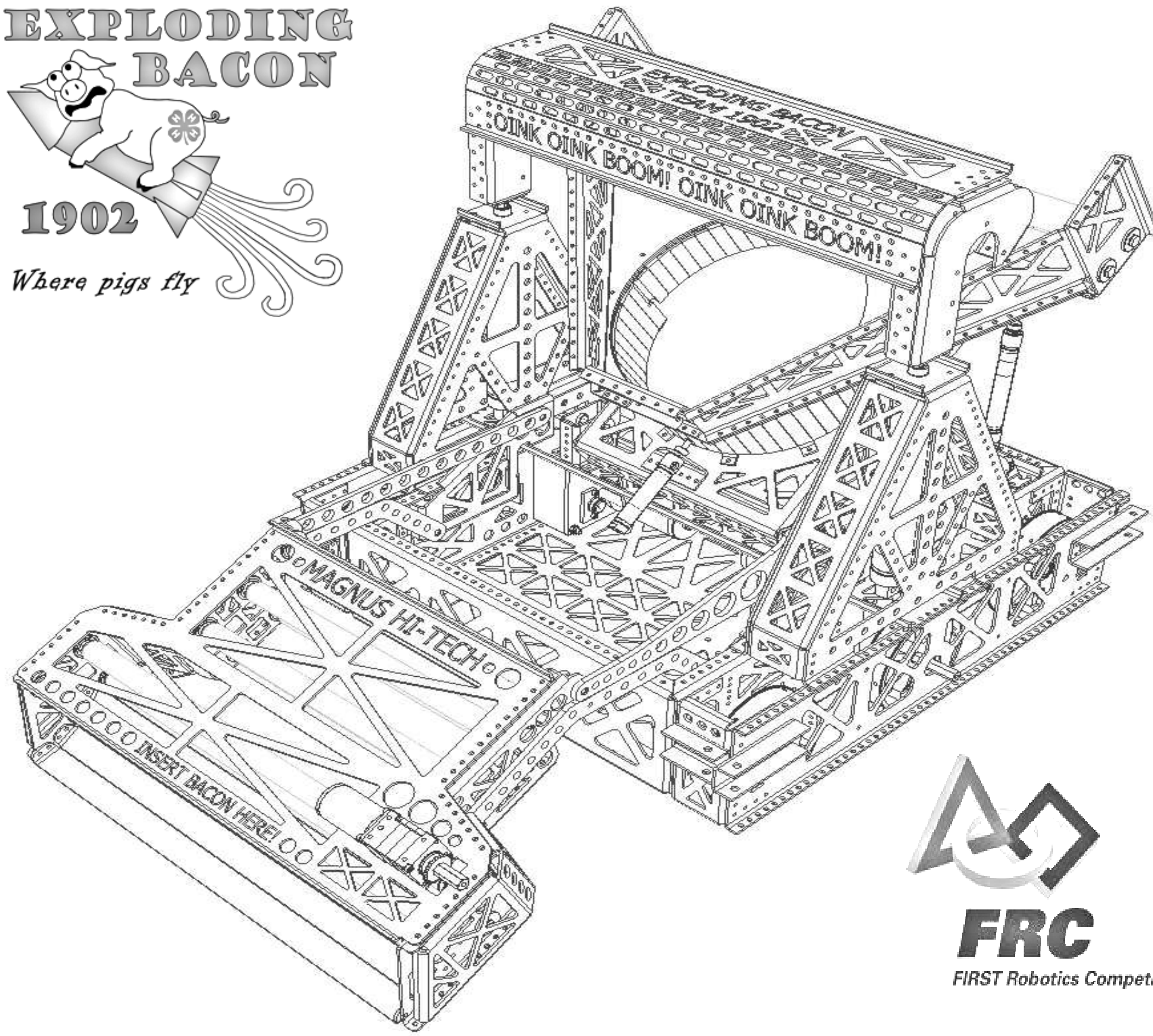
Owner's Manual
Revision 3.0

EXPLODING BACON
1902
Where pigs fly



FRC
FIRST Robotics Competition

2013 FIRST Robotics Competition
Ultimate Ascent Robot
"W-Ham-O"

Model No.
200620131902
Serial No.
00001 of 00001

CAUTION: Read and follow all Safety Rules and operating Instructions before FIRST using this product.

Assembled in the USA at: 3D Perception, 12600 Challenger Pkwy, Orlando, FL from parts fabricated at Magnus Hi-Tech Industries, 1605 Lake St., Melbourne, FL
For more information visit our web page: www.explodingbacon.com/robot

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WARRANTY

FULL ONE YEAR WARRANTY ON W-Ham-O

The robot covered by this manual is guaranteed to inspire kids to pursue careers in STEM fields for a period of 1 (one) year following the 2013 bag and tag date. In the event that this robot fails to give complete satisfaction, **RETURN TO EXPLODING BACON 3D PERCEPTION BUILD SPACE IN THE U.S.**, free of charge.

NOTE: This warranty does not apply to any failure (mechanical, electrical, software, workmanship, or materials), as these types of failures create unique challenges and only contribute more to the FIRST experience.

INTRODUCTION

Congratulations! You and your team are now the proud owners of W-Ham-O, a custom-built, one-of-a-kind FRC robot, specifically designed to play the 2013 ULTIMATE ASCENT game. This robot was carefully designed and built by 4-H Exploding Bacon Robotics Club, a dedicated group of high school and middle school students, and their mentors. The robot was conceived, designed, produced, and tested in exactly 45 days. It has the ability to quickly traverse the length of the field. It is designed to push other robots as well as resist being pushed. It can be manually loaded with flying discs or can pick them up off the floor. It can hold up to four flying discs and rapidly fire them at high targets from a distance. It has the ability to attach itself to a structure and lift itself off the floor. The robot can be programmed to operate autonomously. It can also be controlled remotely from a driver's station (included). It has everything a team needs to play the game, and play it well. It is an excellent tool for learning the importance of teamwork, dedication, perseverance, and gracious professionalism. The team that competes with this robot will be inspired and inspire others to accomplish their goals, whatever they may be.

SPECIFICATIONS

Overall Robot:

Number of motors/speed controllers:	8
Number of pneumatic storage tanks:	4
Number of pneumatic cylinders:	6
Dimensions:	28” long X 27” wide X 28” tall
Weight:	115 lbs (not including battery and bumpers)
Power Supply:	1 12 VDC 18Ah Sealed Lead-Acid Battery
Compressed air supply:	1 12 VDC 1.03 Cfm compressor, 120 psi
Working Pneumatic Pressure:	60 psi

Drive Base

Type:		6-wheel, drop-center, chain-driven tank drive
Wheels:		6-inch AndyMark Performance Wheels
Transmission:		2 AndyMark supershifters with pneumatic shifting
		Gear ratio low: 24.0:1 high: 6.0:1
		2 3/4” Bore, .5” Stroke, single action pneumatic cylinders
Speed:		
	High gear:	20 ft/sec
	Low gear:	5 ft/sec
Torque:		
	High gear:	5 ft lb
	Low gear:	20 ft lb
Chain:		10 feet of #25 chain
Motors:		4 CIM motors
Controllers:		4 Victor 884 Speed Controllers

Shooter

Type:		2-wheel, linear shooter
Motors:		2 VEX BAG motors
Transmission:		
	Front Motor:	VEX Versaplanetary gearbox set to a 1:1 gear ratio
	Rear Motor:	VEX Versaplanetary gearbox set to a 3:1 gear ratio
Speed:		
	Front Motor:	~14000 RPM
	Rear Motor:	~4600 RPM
Controllers:		2 Talon Speed Controllers
Indexer:		1 3/4” Bore, 4” Stroke, double-acting pneumatic cylinder

Feeder/ Hopper

Type:	2-roller, angled funnel feeder
Roller RPM:	~140 RPM
Roller Motor:	1 VEX BAG motor
Transmission:	VEX Versaplanetary gearbox set to a 100:1 gear ratio
Controller:	1 Victor 888 Speed Controller
Capacity:	4 flying discs

Intake:

Type:	rear-loading, retractable floor intake with conveyor
Deploy Mechanism:	modified four-bar, pneumatic deployment
	1 1.25” Bore, 4.5” Stroke, double-acting pneumatic cylinder
Conveyer:	1” Polycarbonate tubes, with round urethane belting
Controller:	1 Victor 888 Speed Controller
Capacity:	2 flying discs

Hanger:

2 1.5” Bore, 8” Stroke, double-acting pneumatic cylinders

SAFETY

Robots, like any other tool, can be dangerous if not operated properly. Always be aware of your surroundings and make sure others are aware of the robot.

Safety glasses and close-toed shoes are not just a safety precaution – they're a part of the FRC culture! Always wear them when working on or near your robot. Keep long hair tied back and tuck in loose clothing.

Ultimate Ascent robots shoot flying discs at high speed. Never stand in front of a robot's disc shooter. Do not load the shooter until the robot is ready to be operated safely. Do not fire discs at people!

It takes a lot of energy to make a robot run, shoot, and hang. Don't release all of that energy at the same time by sticking a tool in the wrong place! Always unplug the battery before servicing the robot.

Exploding Bacon spends the first day of build season learning about the safe use of tools in the build space. Each student and mentor has to pass a safety test before using any equipment.

THE GAME

ULTIMATE ASCENT is played by two competing alliances on a flat, 27x54-foot field. Each Alliance consists of three robots, and they compete to score as many discs into their goals as they can during a two-minute and fifteen-second match. The higher the goal in which the disc is scored, he more points the Alliance receives. The match begins with a fifteen-second Autonomous Period in which robots operate independently of driver inputs. Discs scored during this period are worth additional points. For the remainder of the match, drivers control robots and try to maximize their alliance score by scoring as many goals as possible. The match ends with robots attempting to climb up pyramids located near the middle of the field.

STRATEGY

Exploding Bacon designed W-Ham-O specifically to play ULTIMATE ASCENT. Before picking up a single wrench or writing a line of code, the entire team met and discussed what they thought would be required in this year's game. Here's what they came up with:

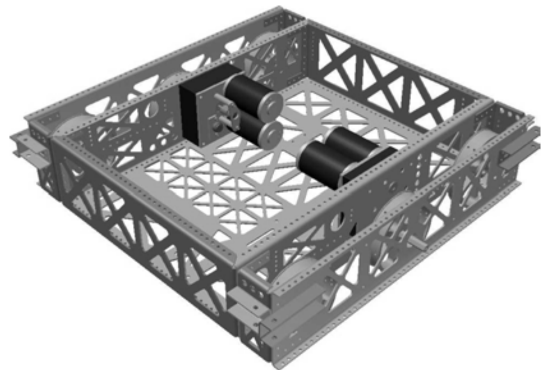
- The human loading station will be very important this year.
- Picking discs up from the floor will be very difficult and take a long time.
- The pyramid climb is time-consuming and perilous for the robot (except for level 1).
- Speed is very important, and there are few obstacles to slow us down!
- Pushing other robots may be necessary to get into position.
- Autonomous mode is very important, especially if we can pick up discs!

Based on this analysis, the team chose to design a robot that can pick up discs and fire them in autonomous mode. However, in tele-operated mode, it depends on moving quickly between the human feeder station and a shooting position near the pyramid. For climbing, the robot will only pull itself up to Level 1, which provides the greatest point gain in the least amount of time and least danger to the robot.

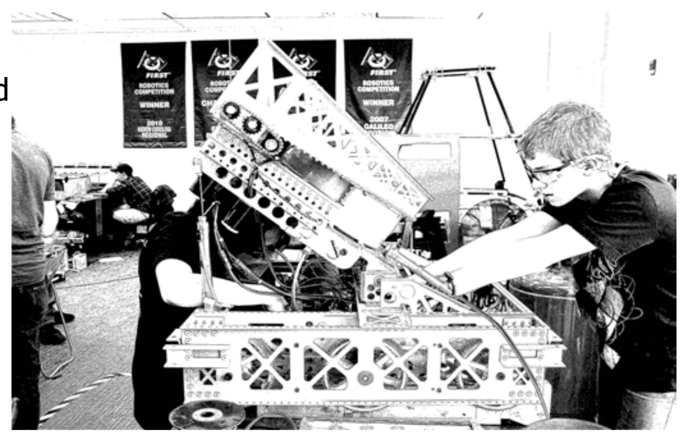
DESIGN

The Exploding Bacon design process focuses on ensuring that the final design is a result of a team effort. Every student, mentor, and parent that comes to the meetings has an opportunity to have their ideas heard. Emphasis is placed on keeping the robot simple and practical while encouraging innovation and eloquence in design. The team relies heavily on the experience of the mentors when deciding what designs we should spend precious time prototyping. The team prototypes everything - sometimes two or three times over! Normally, the final working prototype would be found on the final robot. However, this year we were able to take things farther. Several of our mentors and students have been developing their CAD skills. Magnus Hi-Tech, a machine shop in Melbourne who just joined our team last year, donated machine time to fabricate our final parts! This extra step really improved the quality and reliability of the robot, and makes it look awesome!

Drive Base



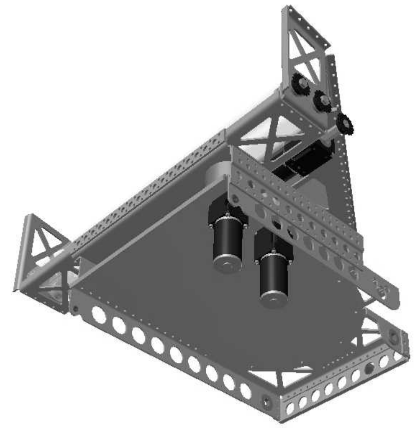
Exploding Bacon has been using custom-built, bent sheet metal drive base designs for years. This year's design builds on that experience and perfects it! The drive base provides structural support for every other component of the robot, so, above all else, it is strong! We have reinforced areas that have sustained damage in the past. We have removed material and used smaller shaft diameters to make the drive base lighter. This year's drive base is the lightest drive base Exploding Bacon has ever constructed!



We chose a 6-wheel, drop-center configuration to support our strategy of speed and power. The lower center wheel provides reduced resistance to quick turns by causing either the front or back wheel pairs to float above the floor by a fraction of an inch. The drive uses pneumatic shifters which are programmed to stay in high speed unless commanded otherwise by the driver. So, the driver only uses low speed for quick acceleration from a stop, pushing other robots, or precisely lining up for a shot. For everything else, the robot runs in high speed.

Each wheel's axle is supported on two sides for strength - no cantilevered axles! Every wheel is driven via chain. The middle wheels are directly driven by super-shifter shafts. Therefore, any broken chains will not disable the robot! With two CIMs on each super-shifter, there is plenty of power to go around, whether you want to use it for speed or torque. Each CIM is precisely controlled by a proven Victor 884 speed controller. The first test and adjust exceeded all of our expectations. W-Ham-O is a highly maneuverable, quick, strong, and smooth robot!

Shooter

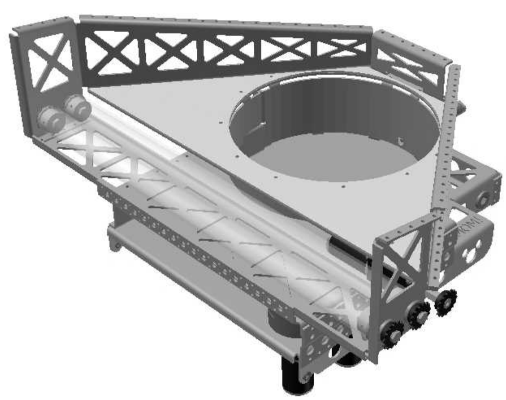


The team poured a lot of resources into the shooter. They built at least six different prototypes: a circular shooter, a slinging shooter, a spring-loaded linear shooter, an inner-tube-lined shooter, and, finally, a short linear shooter inspired by Team 3847 Spectrum, which formed the basis for the final design.

The final design consists of a pneumatic cylinder and two independently driven wheels. The robot controller monitors the speed of the shooter. When speed is high enough, a press of the "FIRE!" button on the drive station causes the cylinder to push a disc into the first wheel. The disc is compressed between the wheel and the aluminum wall, giving the disc some spin. The first wheel accelerates the disc and delivers it to the second wheel, which accelerates it again and ejects it out of the shooter. We had to order a special encoder to read the high RPM's of the second wheel!

The shooter has an adjustable angle, so the drivers have a choice of ideal shooting positions.

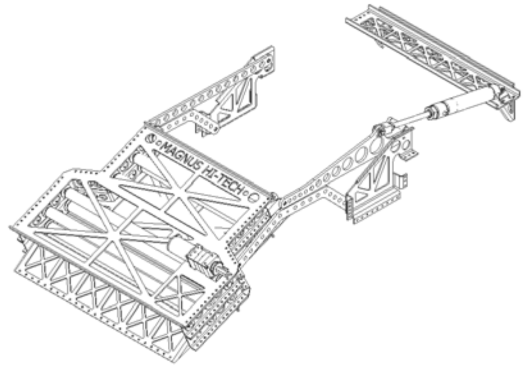
Feeder

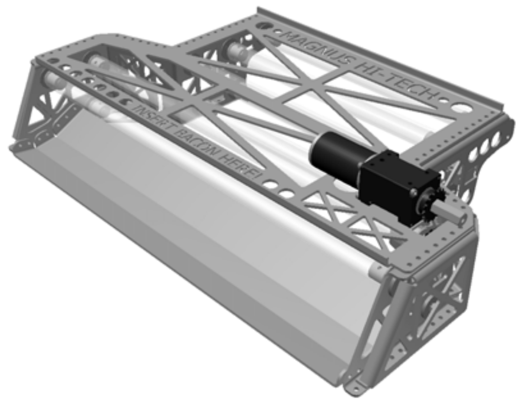


The feeder/hopper prototype was extensively tested. We rejected several designs that were susceptible to jamming. The prototype that worked the best was based on a Firehouse Subs Pickle Bucket! Of course, Magnus Hi-Tech built it out of aluminum. The prototyping paid off by providing us with a hopper that is difficult to jam and capable of securely storing our discs during rough game play. The feeder is positioned at an optimum height for loading from the human player station. The funnel shape allows for quick loading, and the rollers ensure that every disc finds its way into the hopper.

Intake

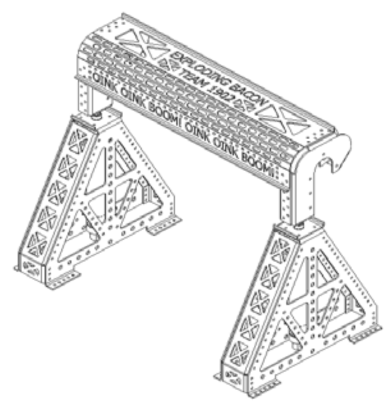
We designed a general purpose all-around good robot. However, we know there are a lot of good teams out there. We needed something that would set us apart - something that would get us points as well as get us noticed. This year, what sets us apart is the ability to pick up discs in autonomous mode. IN autonomous mode, this robot can shoot its payload of discs, pick up two more, shoot them, and maybe, just maybe, have enough time to pick up two more and shoot them. Then, it folds up its intake and prepares for speed!
The intake was prototyped extensively. When it was finally built, it underwent rigorous testing. The team was not satisfied. So they scrapped it, redesigned it, and built it again.

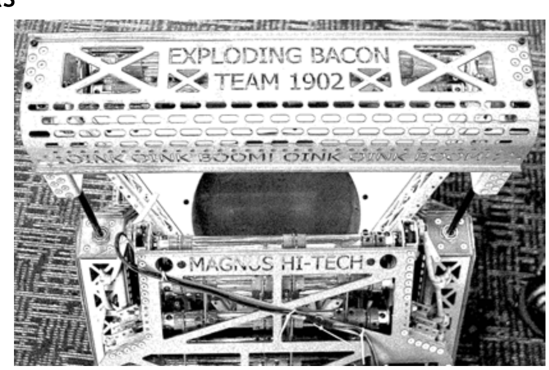




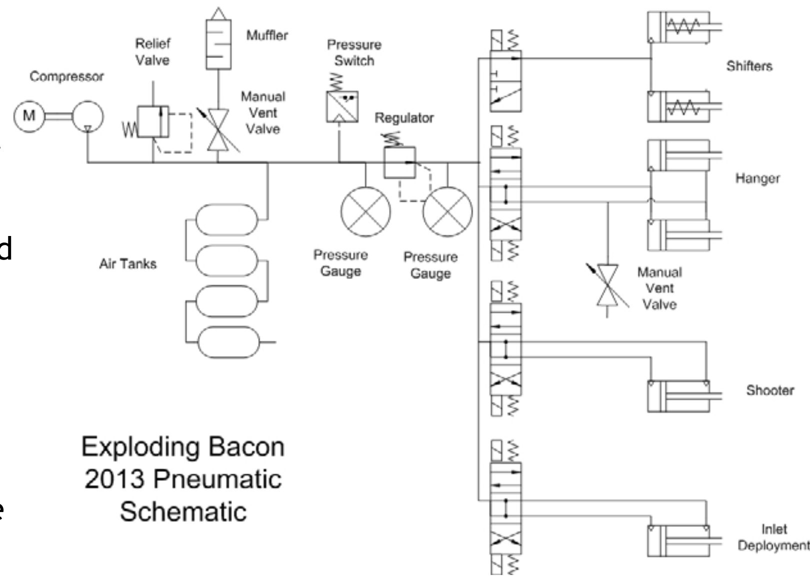
Hanger

Before the team had completed deciding on a strategy, several team members prototyped pyramid climbers. We held demonstrations of at least five prototypes: a chain-driven hook, a two-armed swinging mechanism, a six-telescoping-arm mechanism, an extension-ladder-type ratcheting elevator, and a wedge. The wedge was the most convincing demonstration. It allowed the robot to simply slam into the bottom rung of the pyramid as hard as it wanted and its momentum would force it onto the bottom rung and hang there. However, later, when a prototype robot was built and the full-size pyramid was constructed, we couldn't get the wedge to work! The prototype simply fell over every time we tried to use it. We tried changing center of gravity, changing speeds and approach methods, but it just wouldn't work. It was abandoned in favor of the simplest of all level 1 hangers - a couple of pneumatic cylinders. Of course, we had to make sure the cylinders would lift 120 lbs and keep it there even after the robots were disabled. The final design successfully accomplishes our hanging strategy.





Pneumatics



Exploding Bacon 2013 Pneumatic Schematic

This year, robot operation depends on a reliable pneumatic system with a large capacity. With a pneumatic hanger, the robot needs plenty of air left at the end of the match. Four storage tanks were used to store the air we would need. The system was very carefully assembled, paying attention to every detail and testing every joint for leaks. Any leaks in the system might prevent us from having enough air to hang at the end of the match.

In addition to conserving air, we needed a way to let the operators know how much air was left. We decided to provide an indicator on the driver station. However, a quick check of the rules revealed we could not put a pressure transducer on the high-side pneumatics! Did we give up? No! The programming team stepped up. If we know how much air we start with, how much air we use, and the pressure set-points of the pressure switch, we don't need a transducer! The programmers wrote a "pneumatic simulator" - a piece of robot code that monitors the pneumatic system and "guesses" how much air is left. The robot sends this to the driver station for display. The display itself is another story - see the driver station manual for details. When the robot was assembled, the programming team "calibrated" the simulator by activating the pneumatic components and logging pressure changes. They put these numbers into the code and tested. It worked great!

Electronics

The electronics were designed with simplicity and reliability as the highest priorities. Special attention was paid to the details of making sure terminations were of the highest quality. Everyone who worked on the electronics was trained to use the correct terminal, wire size, and tool for every termination. We only used components that were proven to be reliable and robust.

Every motor has a color coded label that can be seen on the motor, the terminations, the wire, the speed controller, the power distribution board, and the digital sidecar. Every signal wire has a numbered label that can be seen at the digital sidecar, the analog breakout, and the solenoid breakout. These colored and numbered labels have already proven their worth during the initial test and adjust, where several bad motor controllers were discovered and the entire CompactRIO was replaced! Because of the time spent labeling, the team was able to troubleshoot the problem quickly. After replacement, restoring the system was as easy as plugging everything in where its label said it should go.

Software

Our source code consists of 10 individual class files, varying in size from 30 to 300 lines. Each file deals with and maintains a specific part of the robot. This includes five Subsystem classes (Drive Train, Shooter, Intake, Human Feeder, Control Station), two Control classes (an all-encompassing tele-operated, and a multi-mode autonomous), two System Monitoring Classes (an RPM sensor and a Pressure Monitor), and one Master Class, putting all of the others together and telling each to run.

Our code benefits the drivers in a number of ways. We have a program that enables the operator to make quick decisions and have them work every time. But sometimes humans make mistakes! So, the robot makes some decisions for us. For example, the intake will automatically shut off if we are about to spit a disc into the CompactRIO. Also, the shooter will only reverse if you leave the switch backwards for 1.5 seconds. This is the program's way of saying, "Are you SURE you want to do that?"

Our robot has modes for autonomous, and we can change those modes and the shooting speed WITHOUT REDOWNLOADING CODE!! This lets us change things quickly, and have them work accurately and in a timely manner.)

To benefit the drivers, this year's code displays a multitude of messages to the control station letting us know the status of the robot, such as: What gear are we in? (high or low); What is the pressure in the system? (more on this later); What is the RPM of the shooter? (also more on this later).

We have an advanced PSI monitoring system, without the monitoring system. Wait, what? Yeah, exactly. Knowing the pressure on the bot is EXTREMELY important, and we aren't allowed to get this number per FIRST rules. So, we use an amazing system to measure it. We use an equation that monitors the compressor state (add pressure at 1PSI/second if on) and every solenoid trigger (remove PSI for every action of the robot, with a unique amount of pressure we measured separately for each action.)

What is even MORE impressive, is what we DO with this number! We installed and wired an analog pressure gauge to the drivers station control board. To get this number we have to display, we take this constantly changing number, turn it into binary, send each individual 1 or 0 (bit) across 4 different channels from the Cypress board to an Arduino, convert this number to a PWM signal on the Arduino, and send this signal from the Arduino to the analog gauge servo. This means that this number is handled by FOUR SEPARATE COMPUTER SYSTEMS: the CompactRIO on the robot, the Driver Station Laptop, the Cypress Board, and the Arduino, all to display on a pressure gauge how much air we have to use!

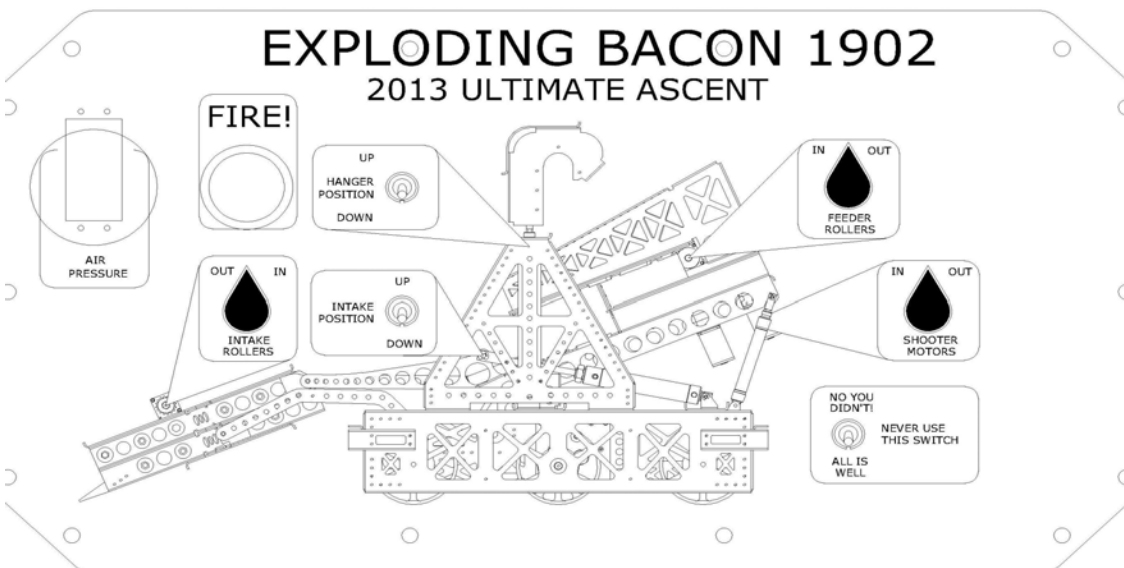
But, wait! There's more! In our autonomous, we use a precisely controlled Proportional Integral Differential Loop. These PID loops control the robot based on degree of error, and allow us to follow a specific angle over a set distance, compensating for any variation. Yeah calculus! We also have a separate system for monitoring in addition to the Pressure Monitor. The RPM of the shooter! This helps us not miss discs, by only firing when the fly wheels are up to speed (about 14k RPM). In addition, we have a very precise "shooting cycle" that prevents jams and mishaps on the robot! Once we are up to RPM, the shooter will complete a cycle before firing again, and once committed, will not stop in between. This means the piston will fire, wait 200 milliseconds, and then retract for 200 milliseconds. This prevents it from going halfway, or staying out too long, and causing jams.

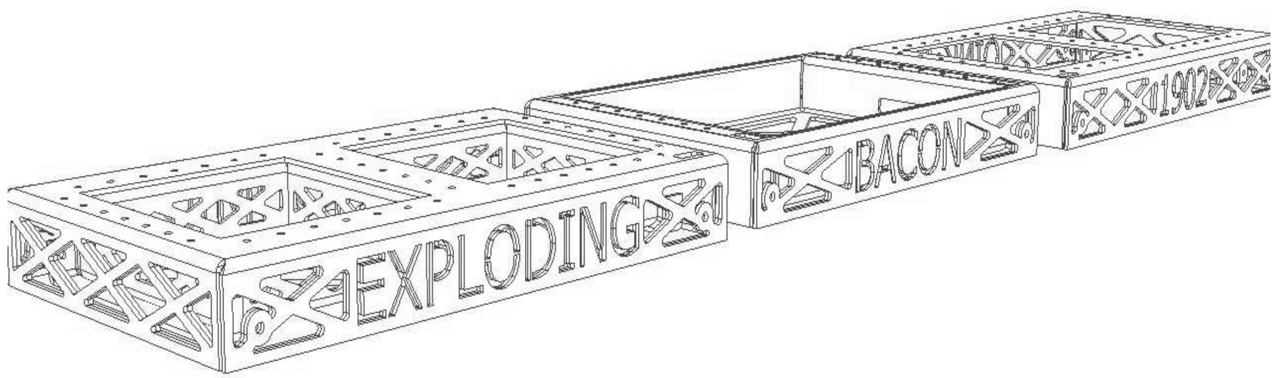
Driver Station

The Exploding Bacon Driver Station has come a long way in the past four years. In 2010, it was a suitcase with a computer and X-Box controllers. In 2011, it was a piece of plywood with 3 joysticks stuck to it with Velcro. In 2012, we spent a lot of time on the driver station, and came up with a sturdy, well-built driver station that protected our computer and electronics. In 2013, we treated the 2012 station as a prototype, and, with the help of Magnus Hi-Tech, built what we believe is the strongest, most complex, and most dependable driver station we have ever had. And, it looks great!

The driver station is built out of 1/8" powder-coated sheet aluminum, just like our robot. It holds and protects our netbook, secures the driver's joysticks, and provides a custom panel for the manipulator. It folds for easy carrying, and is lighter than the 2012 station.

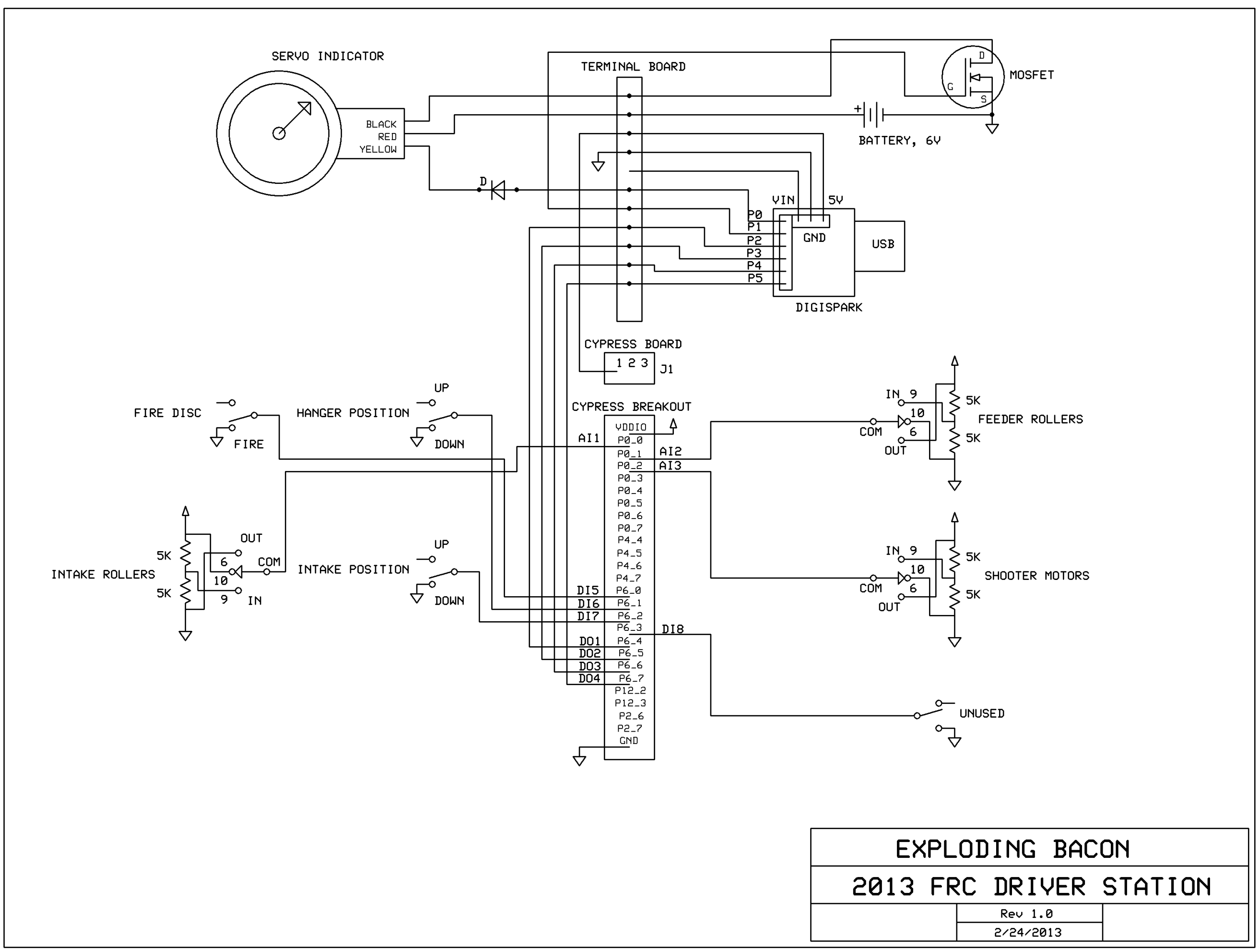
Although the driver station should be reusable each year, the manipulator panel is custom built for ULTIMATE ASCENT. The panel clearly lays out the function of each switch. Anything controlling the intake or expelling of a disc is a rotating selector switch. All pneumatic controls are two-position toggle switches. The panel was laid out such that the direction the control is moved reflects what actually happens on the robot. Want to pull a disc in? Turn the knob toward the center. Want to shoot it out? Turn that knob toward the outside. A wire-frame graphic representation of the robot is silk-screened onto the panel, clearly indicating the purpose of every control.





We quickly used up the available digital I/O on the driver station and needed to find a way to provide more control to the robot. So, the rotary switches have voltage dividers on them. The position of the rotary switch selects 0 V, 1.6 V, or 3.3 V to send to the analog I/O on the driver station, freeing up the digital lines for some other fun stuff (see below).

Why are there pneumatics on the drive station? This is exactly the question we want to hear! The team has come up with an attention-getting, yet practical innovation for interfacing with the robot pneumatics. This year, pneumatics aren't just for auxiliary systems - they are used on all of our primary systems. The driver and manipulator must know the status of the pneumatic system at all times. We needed a way to make sure they are always aware of the air pressure of the system. How we determine the pressure is in another section (see pneumatics and programming). What we do with it is detailed here: The air pressure value received from the robot is displayed on the driver station computer, but the team felt that it was too much of a nuisance for the driver to change his or her attention to the computer repeatedly throughout the game. The team wanted a more physical, easy-to-glance-at indication. So, a pressure gauge was disassembled and attached to a servo. This allows the drivers to read the robot air pressure on an actual pressure gauge! With a quick glance, the driver knows the status of the air, and can use that information to decide on the next move. We must save enough air for our ten-point hang at end-game!



Implementing this indicator was a challenge. The servo needs a 6V power supply and a PWM signal to move the gauge needle into position. The driver station hardware we are using only has discrete digital outputs. We really didn't have the time or know-how to write our own drivers to implement the PWM needed by the servo. However, one of our sponsors provided us with a Digispark - a tiny, USB-powered, Arduino-compatible microcontroller. This Digispark monitors four bits on the driver station (that provide a binary representation of the robot air pressure) and convert it into a servo-compatible PWM signal!

The servo's 6V power supply is provided by a small AA battery pack inside the driver station. However, the last thing the drive team needs is another switch to remember to turn on or off! Luckily, the Digispark had one remaining pin we could use. With the help of our mentors, we installed a MOSFET (an electronically activated switch) that turns the 6V battery off when it is not in use. Actually, it turns the battery off whenever the pressure indication stays the same for longer than two seconds.

Although complex, the driver station electronics were carefully assembled using only solder joints and screw terminals. Every wire is secured and labeled. It is designed to handle the rough environment of an FRC competition.

Digispark Source Code:

```
// Wireless Pneumatics
//
// For use on a Digispark microcontroller
// http://digistump.com/wiki/digispark/tutorials/digispark
//
// Created 2/20/2013 for FRC Exploding Bacons's 2013 Driver Station.
// We wanted a display of robot air pressure at the driver station.
// In addition, we thought it would be unique to display air pressure
// on an actual air pressure gauge. So, we took apart a pressure gauge
// and attached the indicating needle to a servo.
// The robot sends 4 bits to the driver station corresponding
// to an air pressure between 20 and 120 psi. These 4 bits are
// passed directly to the Digispark, which converts the 4 bit
// parallel data to a PWM signal to position the servo!
//
// Updated 2/22/2013 - added a MOSFET on the servo battery and
// programmed the digispark to turn off the battery if the servo
// value hasn't changed for two seconds (infinite battery life!)
//

void displayPressure(float pressure)
{
  // displays air pressure on the servo indicator
  // 120 psi = 2400 usec pulse width
  //  20 psi = 750 usec pulse width
  if (pressure < 20) pressure = 20.0;
  if (pressure > 120) pressure = 120.0;
  float pulseWidth = pressure * 16.5 + 420; // usec
  //   ----------------
  //  |                |
  //  |<--pulseWidth-->|<----20 msec---------------->
  //  |                |
  //--                  -----------------------------
  //
  digitalWrite(0,HIGH);
  delayMicroseconds(pulseWidth);
  digitalWrite(0,LOW);
  delay(20); // msec
}
float getPressure(void)
{
  // gets current air pressure from driver station
  // 4-bit value corresponds to 20-120 psi
  // 0000 = 20 psi, 1111 = 120 psi
  float pressure = (digitalRead(5) * 8 + digitalRead(4) * 4 +
                    digitalRead(3) * 2 + digitalRead(2) * 1);
  pressure = pressure * 6.67 + 20;
  return pressure;
}
void setup()
{
 pinMode(0, OUTPUT); // PWM to Servo Indicator
 pinMode(1, OUTPUT); // LED on digispec + MOSFET gate for battery
 pinMode(2, INPUT); //  1 (LSB from driver station)
 pinMode(3, INPUT); //  2
 pinMode(4, INPUT); //  4
 pinMode(5, INPUT); //  8 (MSB from driver station)
 digitalWrite(0, LOW);
 digitalWrite(1, HIGH); // turn on servo battery
 //digitalWrite(2, HIGH); // enable pullup (for testing w/buttons0
 //digitalWrite(3, HIGH); // enable pullup
 //digitalWrite(4, HIGH); // enable pullup
 //digitalWrite(5, HIGH); // enable pullup
  // Set to 20 psi
 for(int pulses = 0; pulses < 50; pulses +=1)
     displayPressure(20);
 // Set to 120 psi
 for(int pulses = 0; pulses < 50; pulses +=1)
     displayPressure(120);
}

float pressure;
float previousPressure = 0.0;
int count = 0;
void loop()
{
  // get pressure value from driver station
   pressure = getPressure();
   // check to see if pressure has changed since last update
   if(pressure == previousPressure)
   {
     count++;
   }
   else // if the value has changed, reset the counter
   {
     digitalWrite(1, HIGH);
     count = 0;
   }
   if(count > 100)// if pressure hasn't changed in 100 updates
                 // (20 msec * 100) = approx 2 sec
   {
     digitalWrite(1, LOW); // turn off the servo battery
     count = 101;// don't let the count get huge and roll over!
   }

   displayPressure(pressure); // send pressure value to servo
                              // (takes about 20 msec)
   previousPressure = pressure;
}
```

Ooh, Shiny!

This robot was designed to play ULTIMATE ASCENT, but its ultimate mission is to inspire kids to pursue STEM careers. To do that, it has to look cool! It is quite a challenge to carve time out of the build schedule just for looks. That is where Magnus Hi-Tech steps in again! They offered to finish and powder-coat our aluminum with almost no delay in parts delivery! The glossy orange and green finish adds just the right amount of flare to a well designed and capable robot.

ORLANDO REGIONAL

On March 7, 2013, we were able to un-bag W-Ham-O and put it to the test at the Orlando FIRST Robotics Competition! We had a list of things that needed to be done before inspection and got right to work. We installed a few parts, including the entire re-designed intake, and passed inspection on Thursday. There were a few more bugs to work out Thursday and Friday morning, but W-Ham-O was fully operational by Friday afternoon. Our autonomous mode was nearly flawless and it was the fastest tele-operated robot in the arena. The drivers performed as if they had been practicing for months. We took home the Creativity Award on Friday evening. Saturday morning the robot continued to improve as the drivers honed their techniques, evading all defense! Saturday afternoon, although we weren't in the top ten (we were ranked #12), we were picked by the #1 seated team, Team 108, Sigmac@ts! Unfortunately, our Alliance was eliminated in the quarter-finals. The team had a great time. We bagged-and-tagged W-Ham-O and headed to South Florida!

SOUTH FLORIDA REGIONAL

On March 28, we traveled to Ft. Lauderdale to compete in the South Florida Regional. We were awarded the Regional Winner Award for robot performance in matches. We also received the Regional Chairman's Award, the most prestigious award of the competition! It is presented to a team that serves as an example to other FRC teams and embodies the goals and purpose of FIRST.

These accomplishments earn Exploding Bacon a place in the 2013 FRC World Championship in St. Louis! There, we will have the opportunity to compete against some of the best FRC teams in the world. We will also be considered for the Championship Chairman's Award.

Here's a narrative of the final match:

After three days of grueling matches, Exploding Bacon's drive team was both exhausted and exhilarated. The team had managed to qualify among the top teams of the 2013 South Florida Regional FRC Robotics Competition. They were now in alliance with Team 180 SPAM (2012's World Champion) and Team 1251 Techno-Tigers, with a chance of winning the Regional Competition! Their alliance had worked its way up the elimination brackets and was now only one match away from victory. Exploding Bacon's pit crew was working on their last reserves of energy. In the past five matches they had performed numerous repairs to the robot, improvised and implemented a disc anti-jamming device, re-programmed autonomous mode, and re-built all of their battery connections. For the last match, they handed the drive team their last good battery, only 75% charged. A loss now would mean another match and there were no good, charged batteries left. The pneumatics were charged, robots were put into position, and the drivers took their places. The match started, and Bacon's 15-second autonomous mode fired the first three flying discs. The weak battery took its toll – 3 misses! The bell rang and the drivers took control. SPAM headed to their feeder station and quickly began shooting full-court shots straight from the feeder station into the 2-point goals! Exploding Bacon implemented their strategy of grabbing four discs from the feeder station, charging to the other side of the field, and blasting them into the 3-point goals. The drive team compensated for the weak battery by finding a new shooting position. Techno-Tigers stayed by the goals, picking up discs that missed, and firing them into the 3-point goals. However, the defense was intense. The opposing alliance tried their best to keep Bacon from crossing the field. They had also, during the final matches, improvised a defense to SPAM's full-court shot – a tower of metal on top of one of their robots topped with nothing other than a team T-shirt! They were now tall enough to block SPAM's shots. However, SPAM was just as good as Exploding Bacon when it came to "hand"-delivering discs to the 3-point goals. A quick switch of strategies and SPAM was back to racking up points! However, SPAM's robot was tall, the game was fast, and the defense was strong. With 30 seconds left in the match, SPAM's robot collided with a defensive robot, toppled over, and was out of the game! The entire audience rose to their feet. It was up to Bacon and Techno-Tigers to keep the discs flying while their alliance leader was disabled. They were up to the task, evading the defense and continuing to score! When only a few seconds were left, they both headed to the pyramid and pulled themselves up – 20 more points! Time expired and the scoreboard went dark. It was too close to call. The audience remained standing while the referees carefully counted each and every disc and observed each robot's position on the pyramids. The announcement for final scores was made and the scoreboard lit up: 97 to 76. SPAM, Exploding Bacon, and Techno-Tigers were the Regional Winners!

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