

# **Ballin' on a Budget**

**Cheap Thrills, Ugly Hacks, and Stealing Wins**

Billfred Leverette, FRC 1293

# Who am I? – Billfred Leverette

- Pandamaniacs Class of 2004
- IT Consultant, SC Dept. of Agriculture
- Volunteer Coach for Pandamaniacs  
2004-2006, 2018-present
- Previously: 5402, 4901, 2815, 1618,  
and I used to work at AndyMark.



# Who am I? – Billfred Leverette

- Five regional wins and one off-season, across three teams, all as second pick (or once, the backup)



# Today!

- Cheap thrills!
  - Parts and practices that save us money
- Ugly hacks!
  - Hacking prices with the modern American financial system
- How I *think* my teams keep stealing event wins

## Before we begin

Some of these cheap thrills and ugly hacks may require a generous benefactor or a *very* understanding bookkeeper.

*Don't hack off your school admin.*

Most product screenshots are from mid-December 2023.

Prices change, stuff goes out of stock. I tried.



# Cheap Thrills

# Building simpler robots sooner.

Saying no to things makes your robot simpler and cheaper.

We'd already said no to cones in 2023, then we took too long making our floor cube intake before we realized it wouldn't work.

We panic-built a human-load cube pooper around what we had.

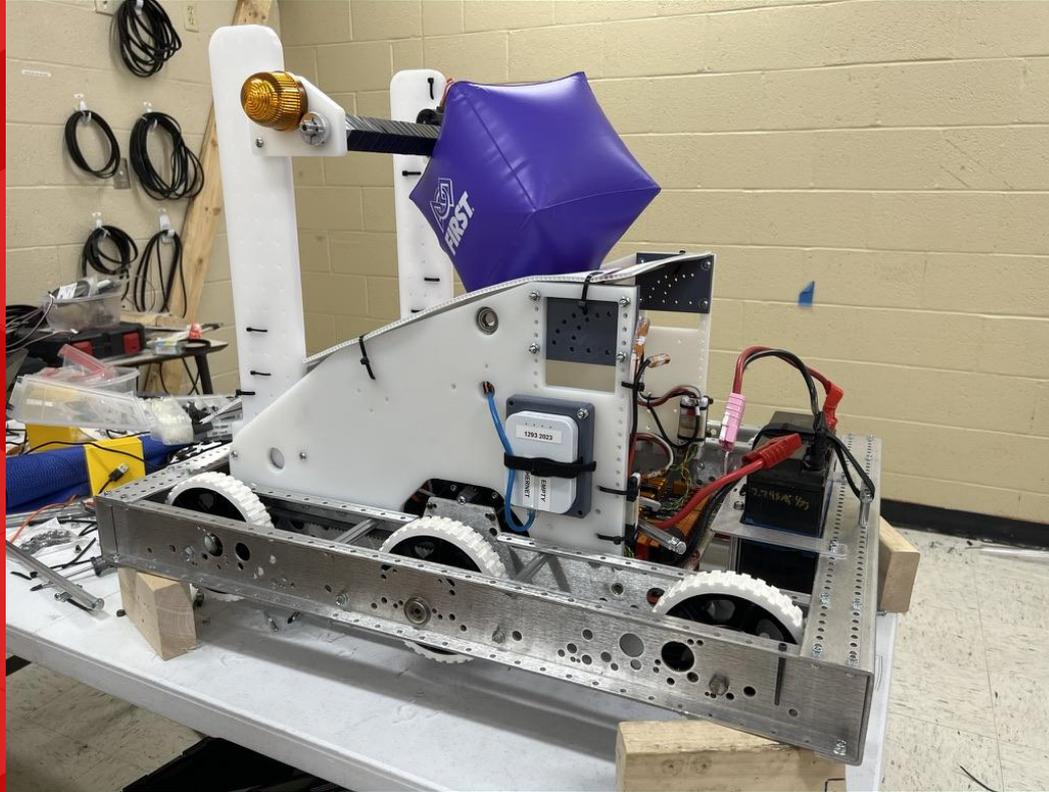
**March 7 (3 days to load-in), 9:03 PM**



**March 8 (2 days to load-in), 9:54 PM**



**March 9 (night before load-in), 9:21 PM**



March 11 (quals day 1), 2:14 PM



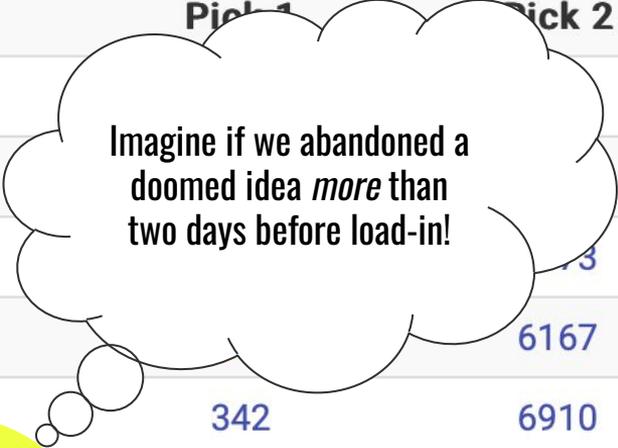
March 11 (quals day 1), 7:01 PM



# March 12 (quals day 2), 12:00ish PM

## Alliances

Alliance	Captain	Pick 1	Pick 2
Alliance 1	4451		
Alliance 2	4189		
Alliance 3	2815		73
Alliance 4	3489		6167
Alliance 5	1212	342	6910
Alliance 6	1293	6366	5130
Alliance 7	3490	1051	3091
Alliance 8	8575	4823	281



Imagine if we abandoned a doomed idea *more* than two days before load-in!

# Scouting

Don't scout to collect data.

Scout to get actionable insights.

Google Sheets or Office 365 will help with this; they can live update a dashboard for drive team.

With this, we usually steal at least one qualification match win per event.

Team # 1051 Match 03 Scouter Joey

Installation Line Position: Even with goal Pointed at goal Even with Trench Run Etc.

Auto besides shots/Installation Line:  
We're pulling API data to see if they get off the installation line, so don't bother writing it. Write it up if grabbing more balls or feeding someone.

Power Call Cycles: (Put tally marks per ball. We're pulling API data to adjust for the endgame points spread for each alliance.)

	Low Port	Upper Port	Missed	Defensive Yets	Defensive Moves
Auto					
Teleop					

Defensive Yets: A shot toward the robot's goal that clearly won't score, but gets it closer.  
Defensive Moves: Hitting a robot about to score, blocking shot trajectory, etc. You know it when you see it.

Control Panel: (circle) Never Touched Did Rotations  
Other Things: Tipped/Died No-Show Yellow/Red Card (We're pulling hang and balance data from the FIRST API)

Notes (obvious fouls, cards, observations): Slow at hang, driver  
Bad at shooting

2020 Palmetto Regional Scouting

File Edit View Insert Format Data Tools Add-ons Help Script Center Menu All changes

100% \$ % .00 123 Arial 12 B I U A

For Match

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
For Match			84													
Team	Short Name	Total	Rank	Total No-Level	Rank	Hang %	Rung Level %	Park %	Score Any B							
4075	Robo Tigers	51.29	6	44.87	7	100.00%	42.86%	0.00%	100.00%							
1293	Pandamianiacs	17.14	37	15.00	38	28.57%	14.29%	42.86%	71.43%							
4020	Cyber Tribe	62.16	2	60.02	2	57.14%	14.29%	42.86%	100.00%							
6167	CB Bearbots	26.43	29	22.14	32	42.86%	28.57%	57.14%	100.00%							
4243	Excelsior!	30.71	22	24.29	28	71.43%	42.86%	28.57%	100.00%							
2614	Mountaineer	60.62	4	47.77	5	85.71%	85.71%	14.29%	100.00%							

Auto Start Spots

	Even	Pointed	TRun	Etc.	Even	P
4075	0	4	1	1	6167	3
1293	3	1	0	2	4243	1
4020	3	2	0	0	2614	0

# Onshape - Cloud-based CAD

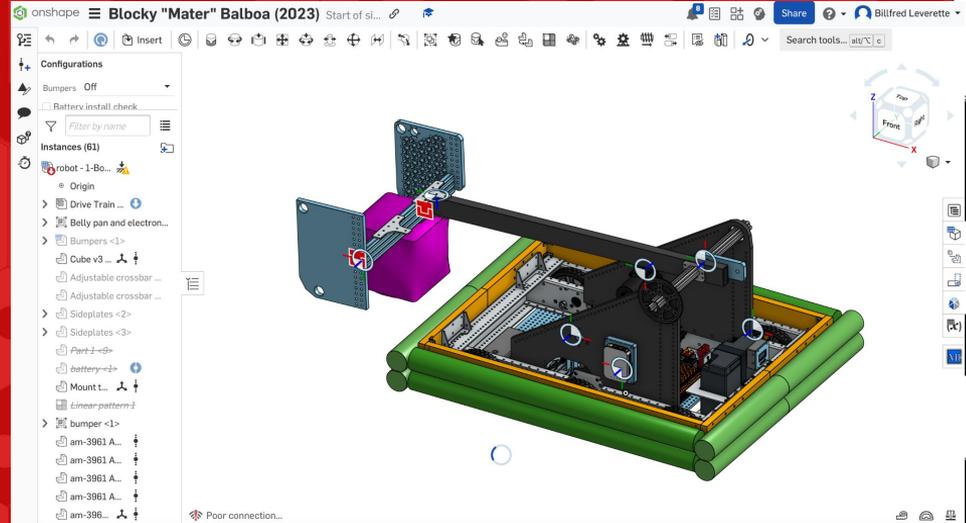
We waste *so much less* material now.

It's free to FRC teams. Training included.

Huge library of COTS parts to drop right into your model.

Even works on our Chromebooks.

If not Onshape, then please do at least some CAD somewhere!



Onshape's parent company PTC is a Pandamaniacs sponsor.

## **Local business connector groups**

We needed some parts machined. Our CNC router wasn't operational. 2815's was down. We had the raw material in-hand, so sending out to SendCutSend or similar would be expensive.

One Facebook post, and a sign shop cut it for us a night later.

# Begging and Trading for Parts

*Every* team has stuff they won't use.

Mentors: Ask on the *FIRST* South Carolina Slack. Fair chance someone has most common items, and they might just give it to you. Or maybe you wheel and deal. Whatever works for y'all.

# Yard Signs

Literally scooped off the side of the road after an election.

Slit the flutes in the plastic on one side for bends.

Get one “nice” sheet of it at Lowe’s or Home Depot.



# The Drill Shirt

Literally, any old T-shirt.

Cover your electronics when working on the robot and making swarf.

Then remove and shake off.



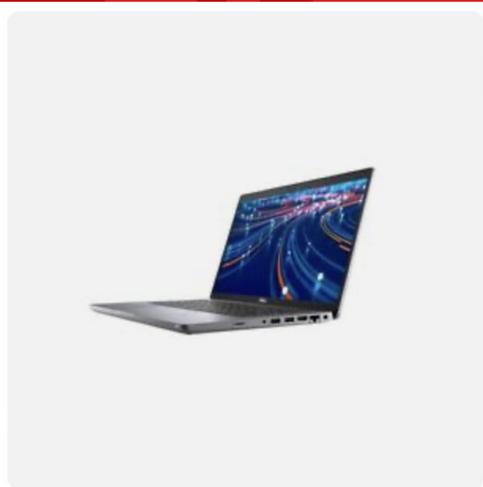
# Laptops

Off-lease business class laptops are the answer for FIRST teams.

- Lenovo ThinkPad
- Dell Latitude
- HP EliteBook

Under \$300 on eBay/Newegg/Amazon all the time, and will *smoke* anything at that price at Best Buy.

# I'm not crazy, they're under \$300.



Sold Dec 11, 2023

DELL LATITUDE 5420 | CORE I5-1145G7 |  
256GB | 16GB RAM | WIN10 PRO | ...  
Very Good - Refurbished · Dell

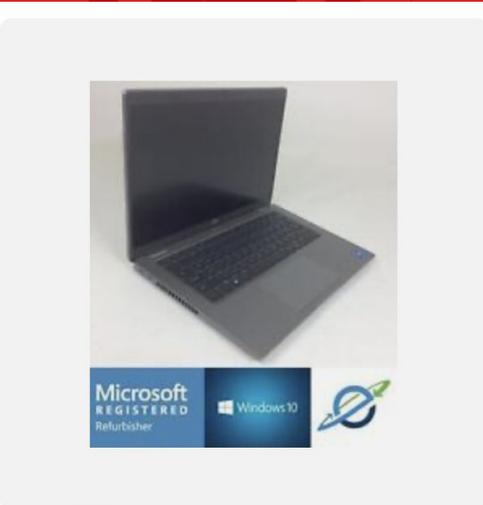
**\$227.50**

20 bids

Free shipping

Free returns

 eBay Refurbished



Sold Dec 11, 2023

DELL LATITUDE 5420 Intel Core i5-1145G7  
2.6GHz 256GB SSD 16GB - Windows 10 Pro  
Pre-Owned · Dell

**\$265.00**

3 bids

Free shipping

Free returns



Sold Dec 10, 2023

Dell Latitude 5420 14" 2021 FHD 2.6GHz i5-  
1145G7 16GB RAM 512GB SSD - Very Good  
Very Good - Refurbished · Dell

**\$284.99**

Buy It Now

Free shipping

Free returns

 eBay Refurbished

# Laptops - What to look for

- Get 16 GB of RAM
  - You could buy one with less and upgrade, but why?
- At least 11th-gen Intel processors
  - i5-11xxxx, i7-11xxxx, etc. i5-12xxxx would be 12th gen.
  - 8th-gen or later is required for Windows 11. Windows 11 is inevitable.
  - I don't know the AMD equivalent, but that'd be fine too.
- Onboard Ethernet for the field/tethering
- Get something that can USB-C charge, it's 2024 y'all.



# Scoring robot parts on eBay



Open-Mesh OM5P-AC FIRST  
Robotics Competition Ro...

am-3205  
\$139.00



Sold Dec 5, 2023

Brand New, AndyMark Open-Mesh OM5P-  
AC FIRST Robotics Competition Radio, am...  
Brand New

**\$79.00**

Buy It Now

Free shipping

**Save up to 10% when you buy more**

# Scoring robot parts on eBay



Steel spur gear 24 tooth 20 DP 1/2 inch hex bore AndyMark am-2459  
New – Open box

**\$12.00**

or Best Offer

Free shipping

Benefits charity

[Home](#) / [Mechanical](#) / [Motion](#) / [Gears](#) / [Standard 20DP Gears](#)



## Standard 20DP Gears

\$14.25

Bore

1/2 in Hex

Material

Steel

Tooth Count

24

Weight Relieved

No

Selected Product Code: am-4214

# Scoring robot parts on eBay



Rev Robotics Plate Sprocket # 25  
REV-21-1972  
Brand New

**\$13.49**

Was: \$14.99 10% off

Buy It Now  
Free shipping



ion

## ION #25 Sprockets

REV-21-1972

**\$14.00**

Bore: MAXSpline Required

1/2in Hex  MAXSpline

Teeth: 64 Required

16  24  48  64

Type: Single Required

Single  Double

Quantity:

1

# Scoring robot parts on eBay



NEW Rev Robotics SPARK MAX Brushed /  
Brushless Motor Controller for FRC roboRIO  
Brand New

**\$79.99**

Buy It Now  
+\$5.33 shipping

Save up to 7% when you buy more



OPEN BOX Rev Robotics SPARK MAX  
Brushed and Brushless Motor Controller, n...  
New - Open box

**\$74.99**

Buy It Now  
+\$5.33 shipping



Rev Robotics SPARK MAX Motor Controller  
Brand New

**\$85.00**

or Best Offer  
Free shipping  
Free returns



SKU: REV-11-2158

SPARK MAX Motor Controller

**\$90.00**

1

Add to Cart

# Scoring robot parts on eBay



Talon SRX Motor Controller by CTRE with power pole connector  
Pre-Owned

**\$29.99**

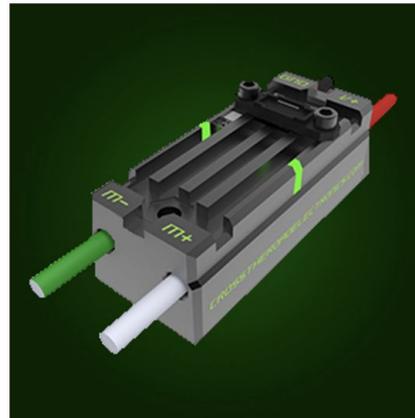
0 bids · **34m**  
or Best Offer  
+ \$5.65 shipping



Talon SRX Motor Controller by Cross the Road Electronics (CTRE)  
Pre-Owned

**\$29.99**

0 bids · 6d 23h  
**\$49.99**  
Buy It Now  
+ \$5.65 shipping



SKU: 14-838288

**Talon SRX**

**\$89.99**

1

Add to Cart

# Use your vouchers!

\$50 to REV Robotics

\$50 to Automation Direct

\$65 to Digi-Key

\$25ish TE Connectivity voucher for electrical bits (amount is squishy)

More to AndyMark and/or REV if you opted out of things

Maybe others to be announced later today?

# REV Voucher Uses

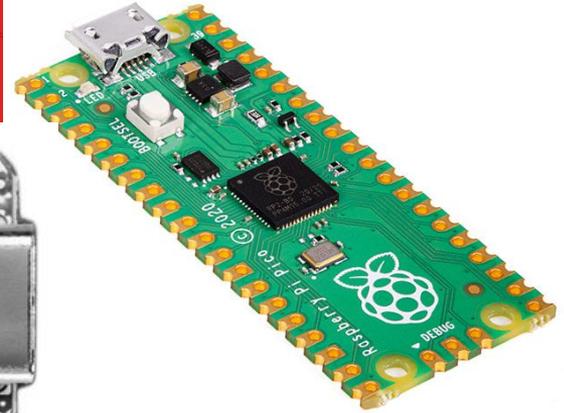
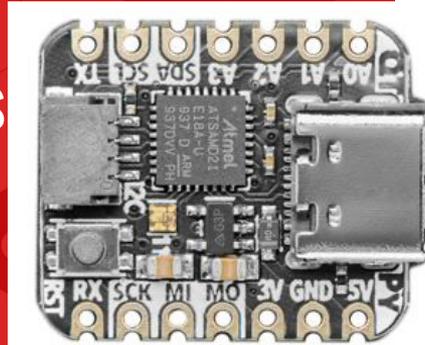
- Control system parts—they're better, trust me!
  - Radio Power Module (\$40)
  - Pneumatic Hub, if you use pneumatics (\$90)
  - Power Distribution Hub (\$240)
- SPARK MAX if you didn't get them off eBay (\$90)
- Brackets (2 for \$5)
- NEO (\$48) or NEO 550 (\$28)

# Automation Direct Voucher Uses

- Pneumatics parts (small and light!)
- Wire
- Zip ties (good ones!)
- Tools
- Limit switches (tough ones!)
- Pushbuttons

# Digi-Key Voucher Uses

- Keystone 4337 Brackets
- Microcontrollers
  - Raspberry Pi Pico, Adafruit boards, etc
- LED strips and panels
- Screws and fasteners
- Small electronic components



# FIRST Choice

Parts available for just the cost of shipping

Credit card required

Round 1 was in December.

Round 2 goes live later today with additional parts available.

I'll have Chris email my Round 2 thoughts later this weekend.

**FIRST Choice**  
Powered by **AndyMark**

VIDEO ON HOW TO? Login

Search store Search

LOGIN PRODUCTS SEARCH MY ACCOUNT MY CREDITS SUPPLIERS FC RULES CONTACT US

**CATEGORIES** HOME > EVERYTHING  
2024 season begins soon! [Please see all detail about FIRST choice here](#)  
Round 1 is over and information of what your team got through the process should be to you by Wed, 12/6/23, Eastern.  
Round 2 starts on Kickoff day!  
Order By:

**CATEGORIES**

- Everything
- In Stock
- Bearings
- Controls
- Couplers
- Electronics
- Misc
- Motors/Servos
- Pneumatics
- Sensors
- Shaft Collars
- Structure
- Tapes/Adhesives
- Tools

**SOURCE**

- 3M
- Analog Devices
- AndyMark, Inc.
- Automation Direct
- Bishop Wisecarver
- Bosch
- Cypress
- Denso
- eBm papst
- Epec Engineered Technologies
- FIRST
- Fujie
- Igus
- Johnson Electric
- MaxBotix Inc.
- Molex
- REV Robotics
- Rockwell Automation
- Shuster Corp
- ThriftyBot
- Triangle Manufacturing

**PROCESS**

- 2024 FIRST Choice Process

**Product Listings:**

- Heat Shrink, Thin-Wall Tubing**  
1/8 in., 4 ft. length, FP 301  
Max Qty Per Team: 20  
5 FIRST Credits
- Duct Tape, Red**  
(70006315215)  
Max Qty Per Team: 5  
5 FIRST Credits
- Heat Shrink, Thin-Wall Tubing**  
1/2 in., 4 ft. length, FP401  
Max Qty Per Team: 20  
5 FIRST Credits
- Duct Tape, Yellow**  
(70006315189)  
Max Qty Per Team: 5  
5 FIRST Credits
- Command Strip, cord clips**  
(70006910655)  
Max Qty Per Team: 20  
5 FIRST Credits
- Vinyl Electrical Tape, Green**  
(R2610934953)  
Max Qty Per Team: 5  
5 FIRST Credits
- 2-Position 4-Pin Position Link Connectors, Qty 10 each with**  
x10  
Max Qty Per Team: 20  
10 FIRST Credits
- VHS Tape, roll**  
(70006291440)  
Max Qty Per Team: 20  
50 FIRST Credits
- Industrial RJ45 Modular Plug**  
(R2118-0000-000CE)  
Max Qty Per Team: 20  
5 FIRST Credits
- Command Strip, light clips**  
(70006909575)  
Max Qty Per Team: 20  
10 FIRST Credits
- IMU, SPI (ADIS16470)**  
Max Qty Per Team: 20  
200 FIRST Credits
- Analog Devices Gyro**  
(ADXRS450)  
Max Qty Per Team: 2  
50 FIRST Credits
- Anchor Bolt Kit, 1/4-20, 1.875 in. long, steel, QTY 5 (am-2234)**  
Max Qty Per Team: 20  
50 FIRST Credits
- Qty 4 of 42 Tooth HTD Pulley**  
(am-2234)  
Max Qty Per Team: 20  
50 FIRST Credits
- 0.125 in. ID 0.188 in. OD 0.23 in. Long Bushing, QTY 20**  
Max Qty Per Team: 20  
5 FIRST Credits

# Amazon Warehouse Deals

Open box, scratch-and-dent, etc.

Still gets Prime shipping. And returnable if it's *that* bad.

Usually, you won't care—so why pay more?

# Amazon Warehouse Deals



Anker Portable Charger, Power Bank, 10,000 mAh Battery Pack with PowerIQ Charging Technology and USB-C (Input Only) for iPhone 15/15 Plus/15 Pro/15 Pro Max, iPhone 14/13 Series, Samsung Galaxy

[Visit the Anker Store](#)

4.5 96,965 ratings

| 1000+ answered questions

Climate Pledge Friendly

10K+ bought in past month

\$21<sup>99</sup>

Same-Day

FREE Returns

**Coupon:**  Apply 30% coupon

Save with Used - Like New

\$11<sup>19</sup>

FREE delivery: Friday, Dec 15

Ships from: Amazon

Sold by: AnkerDirect

# Amazon Warehouse Deals



## Amazon Basics 1/2-Inch Extra Thick Exercise Yoga Mat

[Visit the Amazon Basics Store](#)

4.6 ★★★★★ 74,274 ratings

| [244 answered questions](#)

Amazon's Choice Overall Pick

20K+ bought in past month

\$20<sup>42</sup>

✓prime

FREE Returns

Save up to 13% with business pricing. Sign up for a free Amazon Business account

May be available at a lower price from other sellers, potentially without free Prime shipping.

Color: Black



\$20.42

FREE Delivery

Thursday



\$20.42

FREE Delivery

Thursday



\$20.42

FREE Delivery

Thursday

Save with Used - Very Good

\$17<sup>17</sup>

FREE delivery: **Saturday, Dec 16**

Ships from: Amazon

Sold by: Amazon Warehouse

# Amazon Warehouse Deals



Amazon Basics Easy Grip Workout Dumbbell, Neoprene Coated, Various Sets and Weights available

[Visit the Amazon Basics Store](#)

4.8 90,411 ratings | 233 answered questions

**Amazon's Choice** in Exercise & Fitness Dumbbells by Amazon Basics

10K+ bought in past month

\$15<sup>77</sup>

**prime**  
FREE Returns

Pay \$15.77 ~~\$0.00~~ for this order. Get a \$20 Amazon Business Prime Card. Offer ends

May be available at a lower price from [other shipping](#).



Save with Used - Like New

\$13<sup>37</sup>

FREE delivery: **Friday, Dec 15**

Ships from: Amazon

Sold by: Amazon Warehouse

# Amazon Warehouse Deals



Roll over image to zoom in



Koonie 10000mAh Rechargeable Desk Fan, 8-Inch Battery Operated Clip on Fan, USB Fan, 4 Speeds, Strong Airflow, Sturdy Clamp for Golf Cart Office Desk Outdoor Travel Camping Tent Gym Treadmill,Black

[Visit the Koonie Store](#)

4.6                                                       



# Paying Retail



(yes, sometimes you should)

# Hearing Protection

Everyone thinks of safety glasses, but this is about as important.

We stock foam plugs and cheap \$3 Harbor Freight earmuffs.

The best safety gear is the stuff your kids will actually wear.

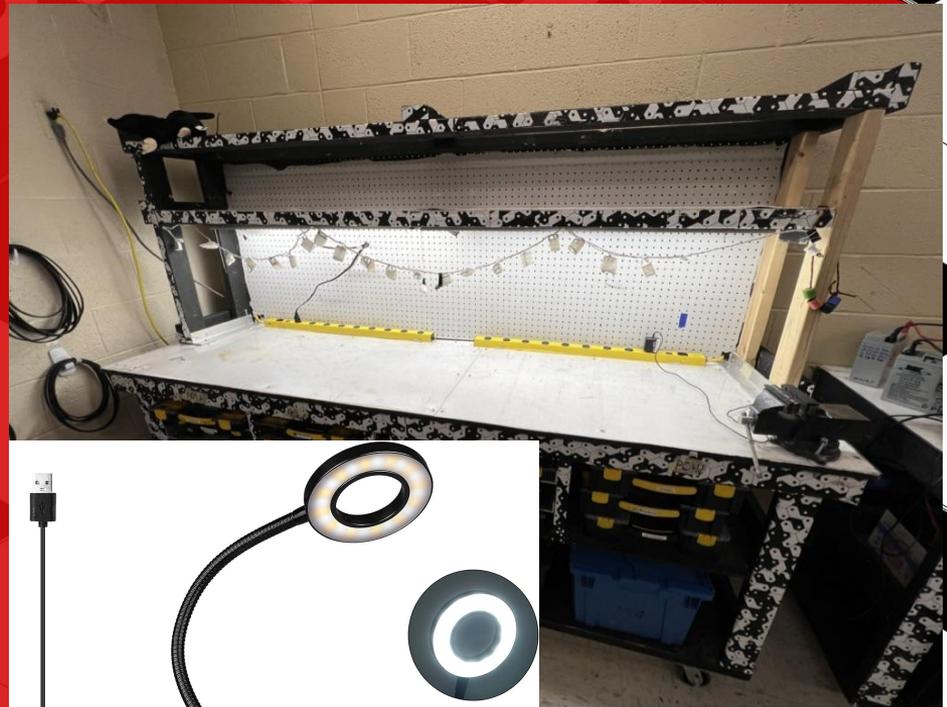


# Lights!

Find more things, help your vision.

Harbor Freight makes a decent \$20ish wall-plug light. We run 2. Wait for a HF coupon if you can.

USB-powered ring lights are great for portable task lighting and run about \$10.



# Label Maker

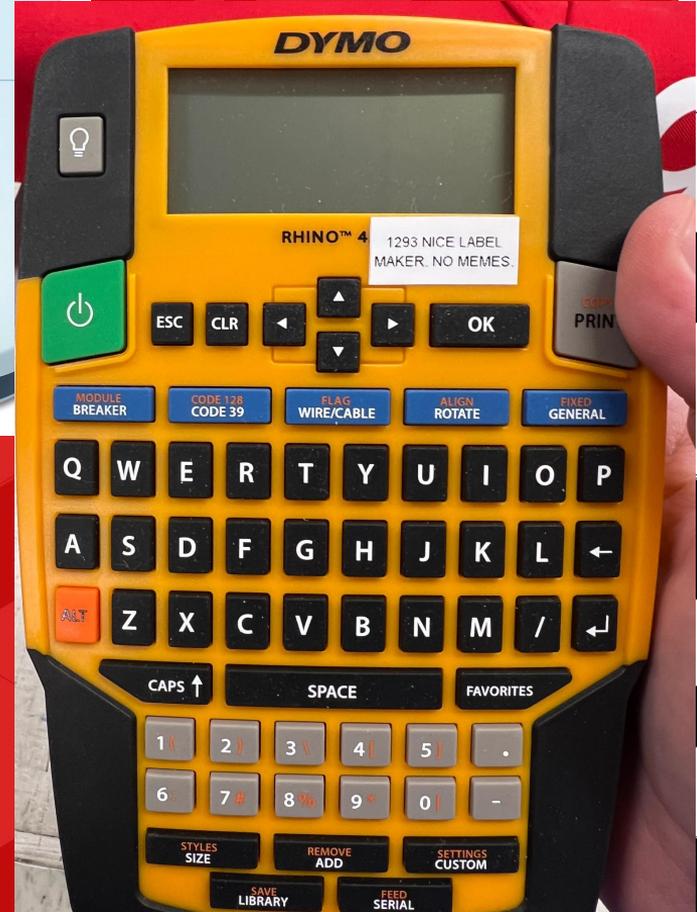
Label your wires.

Label your bins.

Label shelf locations for stuff to go back on.

They start at \$25 on Amazon.

We got a nice one under \$100 that'll do heat shrink and stronger industrial labels.



# Zip Tie Anchors (and alcohol wipes)

Makes your wiring SO MUCH NEATER

Use alcohol wipes to prep the surface before you stick (your fingers are greasy)

\$8/100 on Amazon, surely somewhere with a voucher too.

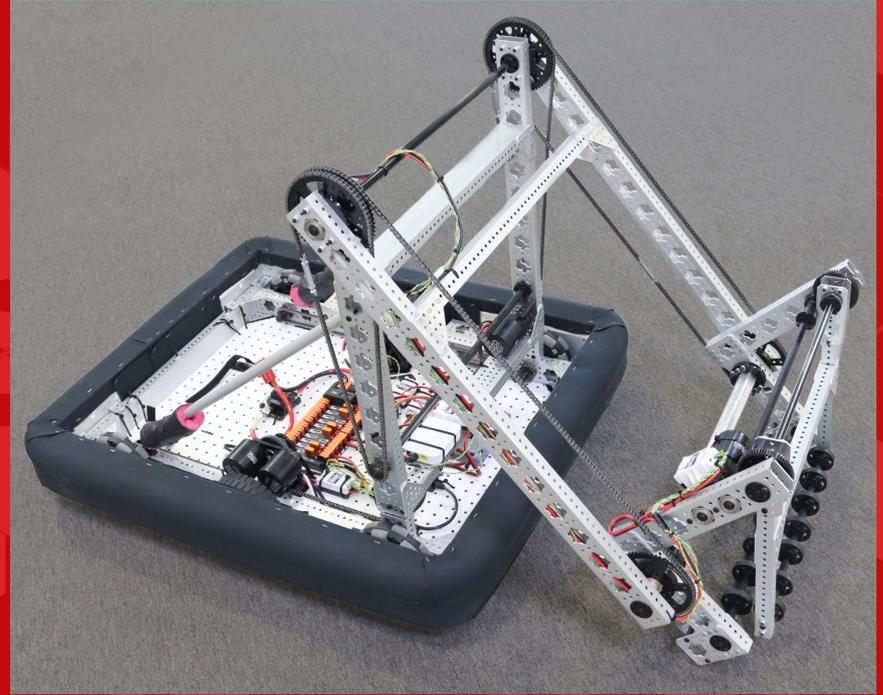


# REV ION system, in general

We used it in our SCRAP rebuild.

It's incredibly well-thought-out and easy to work with regardless of your fabrication abilities.

Not necessarily something you bargain hack (unless it's on eBay), but worth it.



# 10-32 Hardware

Standardize on it anywhere you can! Most COTS parts today have.

Fewer hardware varieties means you spend less on screws that weigh down your cart.

Sources: BoltDepot.com, Fastenal, Zoro, McMaster-Carr, even Amazon or eBay.

I like socket head cap screws.



# UltraPlanetary & MAXPlanetary



For NEO 550 - M3 Hardware



For NEO/CIM/775/550 - 10-32 HW

# Hot glue and electrical tape

Electrical tape covers exposed pins.

Hot glue keeps wires in place.

We use a cheap wall-powered one.

You can get ones powered by tool batteries.

Don't spend a ton on this.





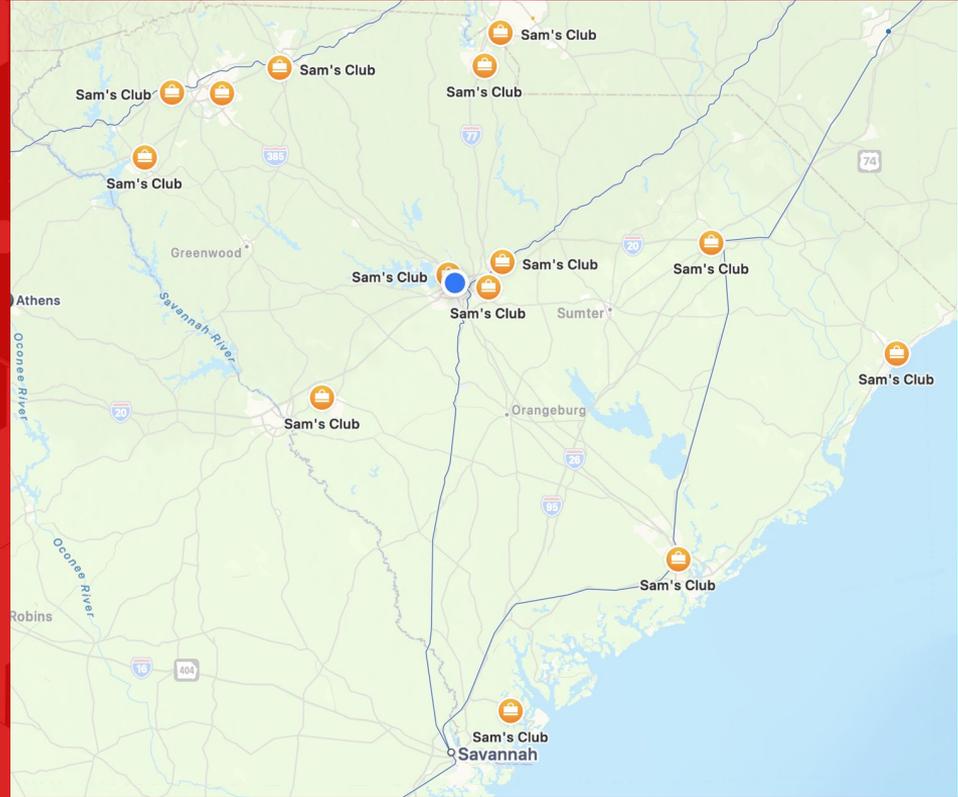
# A Sam's Club card

\$45/year, less with a promo.

Makes breakfasts and lunches  
pass-the-hat cheap.

Nothing against Costco,  
Sam's is in more SC cities.

Also, they have...



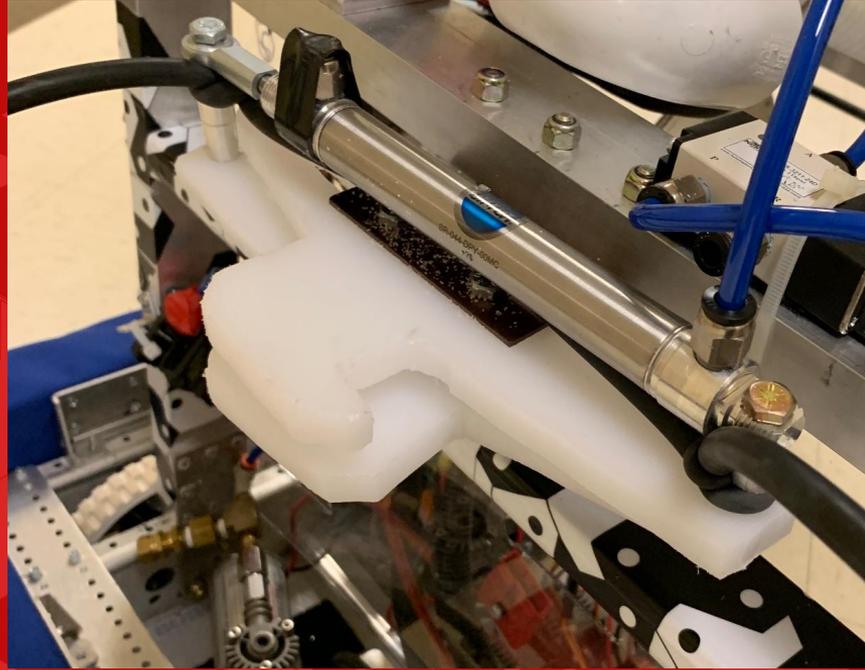
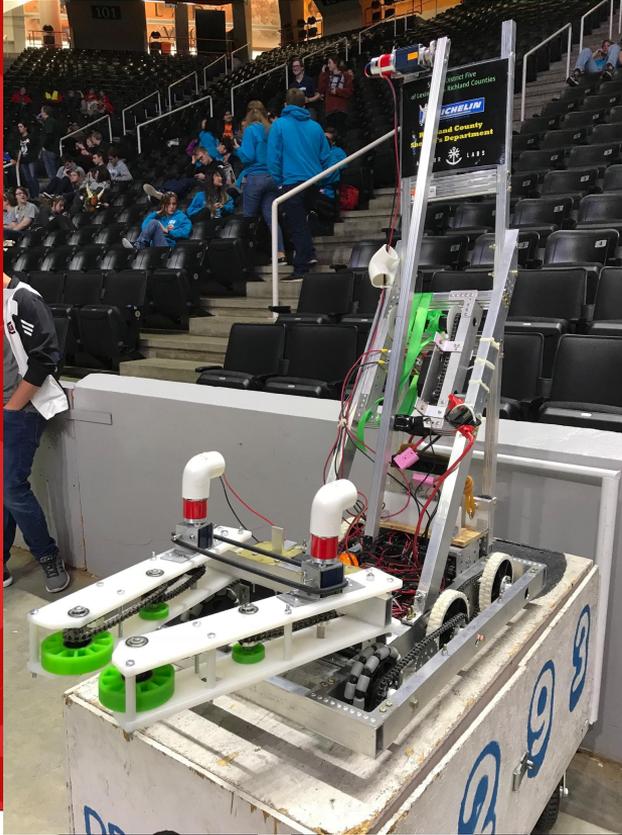
# Sam's Club Cutting Board

Still just \$8.98!

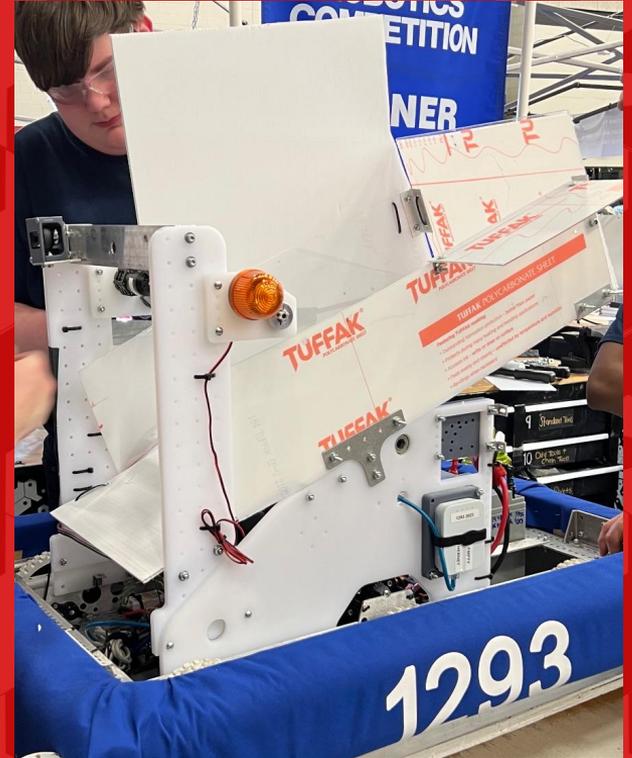
- 15x20x1/2" HDPE Plastic
- Cuts like wood
- Tough enough for the field
- You'd pay double at McMaster-Carr for this with better tolerances.



# Sam's Club Cutting Board



# Sam's Club Cutting Board



# Sam's Club Cutting Board

...okay, *this* was probably the upper limit of cutting boards.

Bit heavy on the long-arm intake, bit flexy on the structure.

It only took us six years to get there.



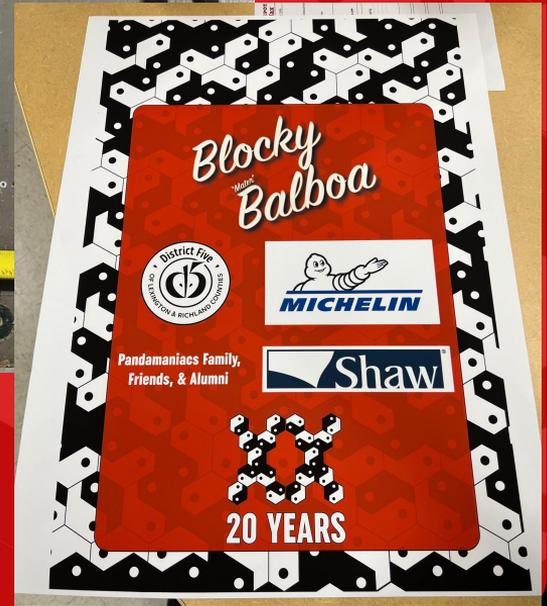
# Adhesive Posters

This was about \$30 at Office Depot.

Drew it up in vector art software  
(I use Linearity Curve for macOS/iOS)

Stuck it on an old piece of polycarb  
and trimmed for clearances. Done.

*Win or lose, look good doing it.*



# Laminated Paper

Not as good as adhesive posters, but cheaper and faster and doable at any copy shop with a self-service counter.

Design for 11x17", trim off bleeds (white edges), then laminate.

*Get your sponsors on the robot.*

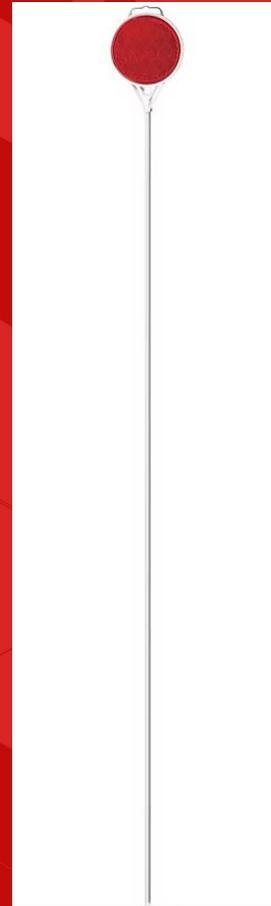


# Driveway Markers

\$3.48 at Lowe's

Handy 48" long fiberglass pole for stuff

If you cut it, use heat shrink on the end.



# Heat Shrink

Some mid stuff is in FIRST Choice.

Or like \$2 at Harbor Freight.

What I actually like:

- 3:1 shrink ratio
- Marine-grade adhesive-lined
- Assorted sizes

\$10-13 on Amazon.



# F4 Tape

- Self-fusing silicone tape
- Nice and grippy
- Makes about anything a competent intake roller
- \$14 on Amazon for 1-2 intakes worth



# F4 Tape



# The Thrifty Bot - [www.thethriftybot.com](http://www.thethriftybot.com)

If they have it, it's good stuff and it's well-priced.

- Bearings
- Brackets
- Elevator and climber kits
- Compliant wheels
- Wire

# The Thrifty Bot - [www.thethriftybot.com](http://www.thethriftybot.com)

- 3D Printed Part Hex Inserts
- \$25 for 5-pack
- Makes a robust spline for printed pulleys, roller plugs, gears, etc.
- Use the Onshape FeatureScript to add the features easily.



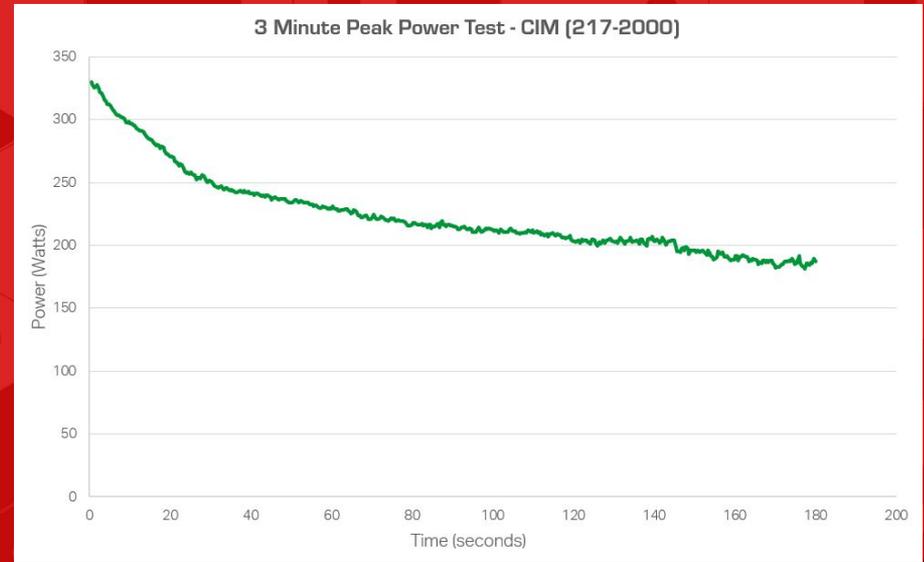
# NEO Brushless Motors on Drivetrain

- SPARK MAX has been the motor controller in the Kickoff kit from 2021-2023, so you'd just need the NEO motors.
  - I'll be shocked if it's something else in 2024.
- Is it a splurge? Yes, but for good cause.
- Swerve drives are increasingly common and incredibly agile. Even 1293 has one now. You've gotta do *something* to keep up.

# Using CIM or NEO 1.0/1.1? Fans after the match.

CIMs lose power over a match due to heat expansion adding more friction to the system. NEO 1.0/1.1's temp sensor can't save the motor in an overheat situation.

Cool them down with fans. Wire in CPU-style ones from FIRST Choice, or use external ones after the match.





# Ugly Hacks

# Gift Card Hacking

You can often get a gift card for less than face value, which can stretch your money further.

 This does tie your money to a store. If they pull a Toys R Us, tough.

Use this when you *know* you're about to spend the money somewhere and you *know* a return is unlikely.

 Your credit card *may* offer extra warranty protection if you use it instead of a gift card. It's less likely to apply on used things and stuff bought for others. Read your credit card agreements if you care.

## Route 1: Store sales

Stores will sell cards at a discount as a promo. Sometimes money off, sometimes fuel points, sometimes “buy the card *and* \$X groceries”.

Kroger, Food Lion, Office Depot, Costco, and Sam’s Club all have these promos at least somewhat often.

I follow [GCGalore.com](https://www.GCGalore.com) for these sales.

## Route 2: Buying discounted cards

Marketplaces exist for people to sell unwanted cards.

They're almost always delivered as an electronic card to print.

Buy from reputable ones that will make you whole if something goes wrong.

Ones I've bought from: [CardDepot.com](https://www.carddepot.com), [Raise.com](https://www.raise.com), [GiftCards.com](https://www.giftcards.com),  
[MyGiftCardsPlus.com](https://www.mygiftcardsplus.com), [eGifter.com](https://www.egifter.com)

## Route 3: Category Hacking

Does your credit card get 5% back at grocery stores?

Does your grocery store have a gift card rack?

Congratulations, you get 5% back at  
eBay/Lowe's/Target/Staples/restaurants/etc.

Check your card for maximums, expect for the cashier to need a manager override, be chill if they're sharing (real or made-up) rules.

# Credit Card Offers

- AmEx Business Platinum: \$200 twice a year at Dell
- AmEx/Chase/Citi/BofA offers to Lowe's/Newegg/Dell/others
- Hit a new card sign-up bonus?

# How I *think* my teams keep stealing event wins

(because I am not the captains that picked us when we won)

# The Right Games (at lower levels)

2011: 2 offense + 1 defense/feeder

2012: Triple offense (we won as a backup)

2014: 2 offense + 1 defense/inbounder

2022: 2 offense + 1 defense

2023: 2 higher cyclers + 1 hybrid node scorer, then triple balance

# The Right Events

Regional team counts: 38, 43, 43, 48, 62.

Deep enough that the top seeds had real options, but shallow enough that they weren't usually looking for big offensive production.

Palmetto 2012, they *could* get enough production (hence, backup).

# The Right Robots

2011: Kit drivetrain, but treaded wheels for more traction

2012: Line up against the fender for easy shots

2014: Spring-loaded shooter on a 6-CIM kit chassis

2022: Kit AM14U with 4 NEOs

2023: 6 NEOs geared dummy fast, single-joint with roller intake, intentionally skinny frame (24" without bumpers).

# The Right Robots

- Get *at least* a basic, consistent auto going.
  - 2023 example: Score a cube and drive out.
- Be able to drive anywhere you're allowed to be.
- Maximize your time on the field.
  - Stuff not working pre-match? Lock it out or take it off.
  - Arm busted mid-match? Know the defense rules and do your best.
  - Arm dragging on the ground/bumper loose? Park somewhere useful.
  - Practice plowing game pieces to your partners with your drivetrain.

## Game Sense

David from 2415 on ChiefDelphi, after Peachtree 2011:

“Do not underestimate 2815’s contribution to our alliance. Without them funneling us tubes so well, we never would have been able to hang enough for those 100+ point matches.”

## Game Sense

1466's SCRAP 2023 blog on ChiefDelphi:

“Some little details worth noting: while we were watching a 1293 qual, their intake broke and was being dragged behind the bot. They quickly drove to the charge station, with the intake supported, and engaged. Our driver thought that was a great sign - a team that knows the rules and makes the right call when things don't go as planned.”

# Be Worth The Gamble

2815 at Peachtree 2011: *tremendous robot issues.*

1293 at Electric City 2022: *tremendous robot issues.*

- We were attacking the issues between matches.
- We kept it real when playing with high-seeded teams.
- We were down for the mission and ready to make modifications.
- They liked playing with us and the defense we served up when we worked, so they decided we were worth the gamble for playoffs.

# Be Worth The Gamble

Paul from 4020, on ChiefDelphi after Electric City 2022:

“I’m a fan of the Pandamaniacs spirit and when 4265 confirmed that they were willing to risk a hail-mary rebuild for elims, they earned a place on our pick list. When the pick came around, 1293 was the team remaining at the top of our list. It took us a little while to commit to the selection given the background already discussed in this thread, but the outcome obviously validated the choice.

I was impressed with the fearlessness and can-do attitude of the Pandamaniacs crew attacking a one-hour remake.”

## In Closing

- Working smart can save you time or money (or, sometimes, both).
- Do things fast, keep testing and improving them.
- Prepare, come to events hungry, and that day will come for you.

# In Closing

Hopefully in less time than it took Pandamaniacs.

It took us 19 years.  
6,555 days.

*But it happened.*





**Ask me anything!**

Or find me on the FSC Slack!