ENGINEERING NOTEBOOK

TEAM 5840C

2025–2026

PUSH BACK

THIS NOTEBOOK IS AUTO-GENERATED

This PDF is compiled programmatically from the live Team 5840C notebook. All entries and referenced resources are pulled directly from the online portfolio at export time.

For the latest version (and interactive content), visit https://m-jeide.github.io/5840C/.

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Meet Team 5840C

We are VEX VRC team 5840C, formed during High Stakes and continuing our journey into Push Back. We're a passionate crew of designers, builders, and programmers focused on learning fast, iterating smarter, and competing together.

Matthew Jeide

CAPTAIN - LEAD PROGRAMMER

> *"I'm too lazy to write a bio rn"*

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Micah Ramunni

CO-CAPTAIN - LEAD DESIGNER & BUILDER

"Hi! I'm Micah Ramunni, the main builder and Vice Captain of the team. I specialize in designing and building our robot with the help of my teammates. Through our four-year engineering program and Vex IQ, I have four years of robotics experience. I've been to states twice and worlds once. I have a passion for reading, exploring video games, and engaging in robotics projects."

Aiden Bishop

LEAD DESIGNER & BUILDER

"My name is Aiden Bishop, and I am a 15-year-old second-year engineering student at MLKHS. I enjoy taking on the roles of a builder and designer. This is my exciting first year in robotics! Outside of school and projects, I enjoy biking, building, and playing video games."

Omri Lavi

BUILDER

"My name is Omri Lavi, and I'm a 16-year-old third-year engineering student at MLK High School. I'm a builder and designer for our team, and this is my first year as a member of the robotics team. I enjoy baking, playing video games, and participating in my synagogue."

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Varun Pais

DESIGNER & BUILDER

> *"My name is Varun Pais. I'm a first-year engineering student at MLK and a builder for Team C. I enjoy building, overscheduling, and band."*

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AUGUST

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Foundation For Push Back

08/26/25 · ENTRY

ABSTRACT

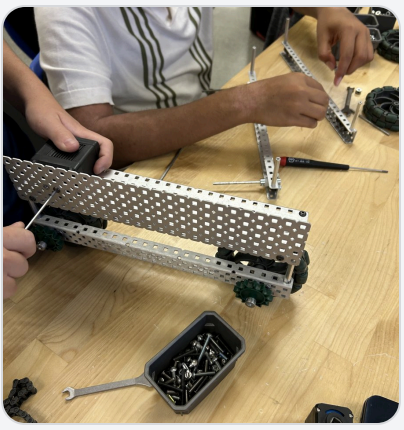
- Addressed a critical build-quality issue by disassembling a post-season drivetrain that failed at a competition last year due to the use of keps nuts instead of nylocks.
- Began construction on a new, more robust drivetrain specifically designed by Micah to navigate this year's parking zone barrier.
- Completed one half of the new drivetrain by the end of the meeting.

Learning from Failure: Disassembling the Old Drive

Our first task of the season was to tear down a drivetrain built after last year's competition. A critical flaw in its construction—the use of keps nuts ('butterflies') instead of more secure nylock nuts—caused the entire frame to fall in on itself during a match. We are salvaging the parts to ensure our new build is far more reliable.

A Purpose-Built Drivetrain

With the lessons from last season in mind, Micah, our drivetrain lead, designed the new base. The structure is being built to provide more clearance, which we anticipate will make it much easier to drive over the parking zone barrier, a key challenge in this year's game.



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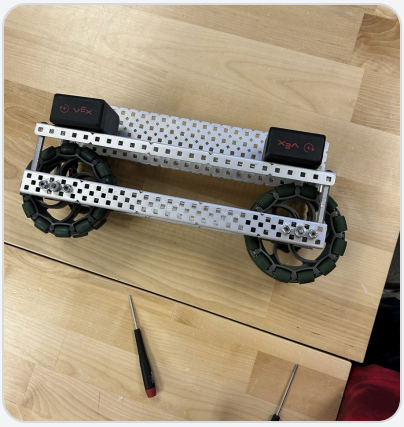

Finished Half

The result of our first meeting: one completed half of the new drivetrain. The build quality is already a significant improvement, using nylock nuts throughout to ensure structural integrity under competition stress.

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Drivetrain V1 - First Drive

08/28/25 · ENTRY

ABSTRACT

- Completed the assembly of our V1 drivetrain prototype, connecting both halves and ensuring structural stability.
- Adapted last year's code into a temporary arcade drive script to test the basic mobility of the new build.
- Successfully conducted the first drive test of the season, confirming all motors and electronics were operational ahead of planned design revisions.

Completing the Drivetrain Assembly

The team worked diligently to assemble the second half of the drivetrain and connect it to the first, creating the complete chassis for our new robot.

V1 Prototype Complete

By the end of the meeting, the drivetrain was fully assembled, wired, and ready for its first run. We successfully tested its movement on the floor using a basic controller script.

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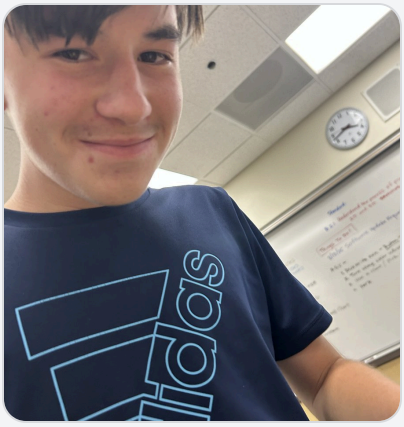

MICAH PICTURE!

The first of many devious Micah pictures this season.

INITIAL DRIVE TEST SCRIPT — PYTHON

```python
# ------------------------------------------------------------------------- #
#                                                                           #
#       Module:       main.py                                               #
#       Author:       jeide                                                 #
#       Created:      8/28/2025, 4:09:25 PM                                 #
#       Description:  V5 project                                            #
#                                                                           #
# ------------------------------------------------------------------------- #

# Library imports
from vex import *

# Brain should be defined by default
brain=Brain()

brain.screen.print("Hello V5")


MOTOR_CONFIG = {
    Ports.PORT1: True,
    Ports.PORT2: True,
    Ports.PORT3: False,
    Ports.PORT4: False
}
RIGHT_MOTORS: list[Motor] = []
LEFT_MOTORS: list[Motor] = []

for motor_port in MOTOR_CONFIG:
    if MOTOR_CONFIG[motor_port]:
        RIGHT_MOTORS.append(Motor(motor_port, True))
    else:
        LEFT_MOTORS.append(Motor(motor_port, True))
```

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```
for motor in RIGHT_MOTORS + LEFT_MOTORS:
    motor: Motor
    motor.spin(FORWARD)
    motor.set_velocity(100, PERCENT)


my_controller = Controller(PRIMARY)

def move(controller: Controller):
    x = controller.axis1.position() / 100  # Normalized to -1 to 1
    y = controller.axis3.position() / 100  # Normalized to -1 to 1

    # Calculate motor speeds with improved distribution
    right_speed = y - x
    left_speed = y + x

    max_input = max(abs(right_speed), abs(left_speed))
    if max_input > 1:
        right_speed /= max_input
        left_speed /= max_input

    # Apply to motor groups with max RPM scaling
    max_rpm = 200

    for motor in RIGHT_MOTORS:
        motor.spin(REVERSE, int(right_speed * max_rpm), RPM)
        """brain.screen.set_cursor(1,1)
        brain.screen.print(int(right_speed * max_rpm))"""

    for motor in LEFT_MOTORS:
        motor.spin(FORWARD, int(left_speed * max_rpm), RPM)



while True:
    move(my_controller)
    wait(20, MSEC)  # Small delay to prevent overwhelming the system
```

About the Drive Script

To get the prototype moving, Matthew adapted our code from last season. This temporary script is a heavily modified and stripped-down version of our old arcade-style controls, mangled down to the bare essentials needed to test basic mobility. It normalizes the joystick inputs and maps them to the left and right motors, allowing for intuitive control during our initial run.

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SEPTEMBER

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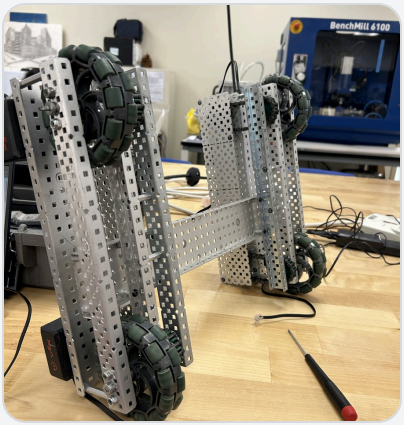
Drivetrain V2 and Team Photos

09/04/25 · ENTRY

ABSTRACT

- Upgraded the drivetrain to V2 by expanding its width for greater stability and to make room for a future intake system.
- Took official portraits of the current team members for the notebook.



Drivetrain V2

Following our initial drive tests, we implemented our first major design iteration. We expanded the width of the drivetrain to improve its stability during turns and to create the necessary space to accommodate an intake system, which is our next design priority.

Team Photos

We took a moment to get official portraits of our current members: Matthew Jeide, Micah Ramunni, Omri Lavi, and Varun Pais. These will be used for the 'Meet the Team' section of our engineering notebook and online portfolio.

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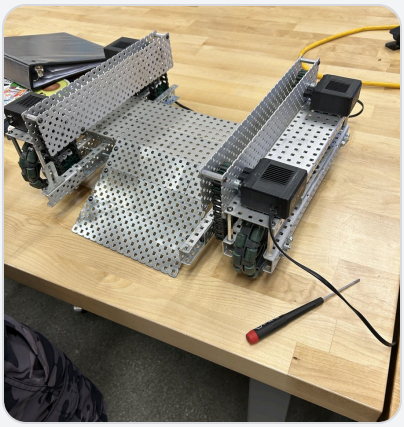
Drivetrain Foundation and Launcher V1

09/09/25 · ENTRY

ABSTRACT

- With the V2 drivetrain chassis stable, work began on adding the necessary framework for an intake.
- In parallel, the rest of the team began designing and prototyping a flywheel-style launching mechanism.
- The launcher prototype was not completed, but the initial concept and parts layout were established.

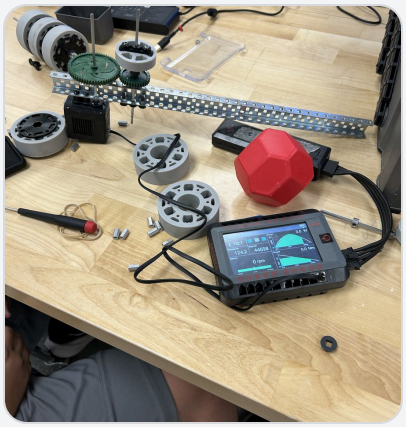


Building the Intake Foundation

Micah continued the development of the drivetrain by building up the structural supports that will form the foundation for our first intake system prototype.

Launcher Prototype V1

As work continued on the chassis, Matthew, Varun, and Omri began prototyping a separate launching mechanism. The initial concept was a flywheel-style system using high-traction VEX Flex Wheels and a gear train to achieve a high launch velocity. The goal was to test if this design could propel scoring objects with enough force to travel up a ramp. The prototype was not fully assembled by the end of the meeting.



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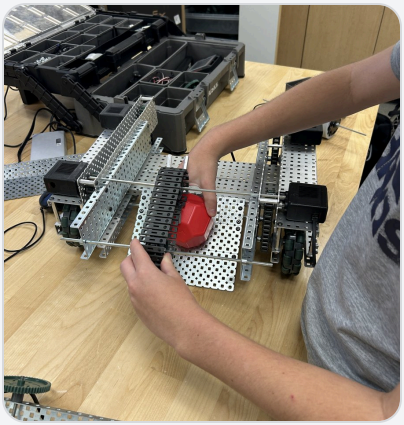
Intake V1 Completion and Testing

09/16/25 · ENTRY

ABSTRACT

- Completed a functioning prototype of our intake system.

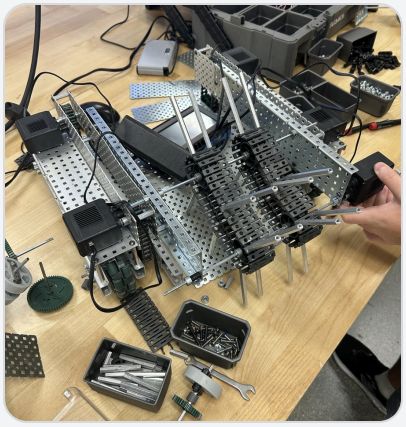


Construction of the Intake Prototype

Micah and Varun continued work on the intake prototype, the design consisted of a chain-driven conveyor with standoffs mounted along the links to act as paddles. These paddles were intended to index and carry blocks upward toward the launching wheels, which would then accelerate the objects onto a scoring ramp. The images show the ongoing construction process and assembly of the conveyor system.

Completed Intake Prototype

The finished prototype consisted of two chain-driven conveyors with standoffs attached as paddles to move blocks toward the launching wheels. The system was powered by a single motor mounted to the side and tested using the VEX brain's onboard controls.



Prototype Testing and Findings; Considerations for Improvement

During testing, we observed that at higher motor speeds the standoffs experienced stress and occasionally jammed against the blocks, locking the conveyor. In some cases, this stress damaged the standoffs or risked them falling off entirely. At lower speeds, jamming still occurred but less frequently, and most blocks were moved successfully. We are currently deciding whether to attempt correction through programming (if possible) or to pursue a mechanical redesign. An additional consideration is optimizing between stability and speed to reduce standoff damage while maintaining effective block movement.

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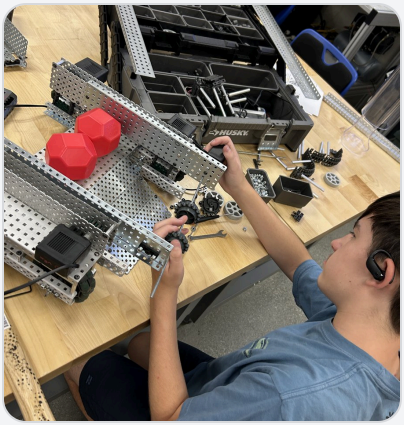
Intake V2 Roller Redesign

09/18/25 · ENTRY

ABSTRACT

- Created a new iteration of our intake prototype.

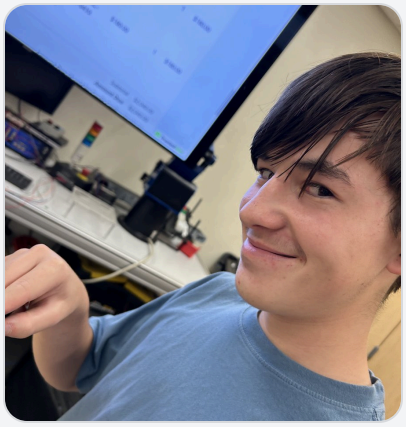


Deconstruction of the Previous Intake Prototype and Beginning of New Intake Prototype Iteration

Micah deconstructed the previous intake prototype in place for a new iteration. The previous prototype had issues with jamming and standoff damage, prompting a redesign.

MICAH PICTURE!

Another devious picture that I caught of Micah.



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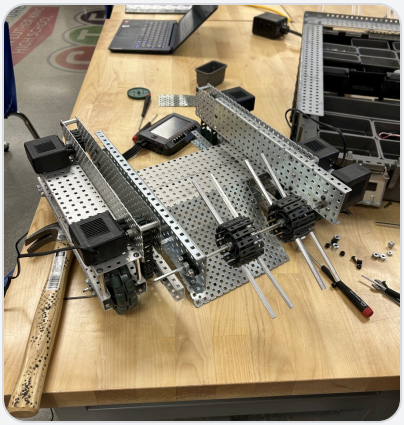

Finished Intake Prototype

The new intake prototype transitions from a conveyor-style design to a roller-based intake. The previous conveyor system suffered from jamming and standoff damage, especially at high speeds when belt slack caused collisions between standoffs. The new roller design eliminates belts entirely, instead using paired rollers to guide and intake blocks more reliably.

Intake System Testing and Launcher Brainstorming

During this practice, the team successfully tested the new roller intake prototype, which showed far fewer jams and less passive stress on the standoffs compared to the earlier conveyor-based design. The roller setup provided smoother intake and more reliable performance. At the same time, Matthew and Omri were fully engaged in brainstorming launcher concepts, dedicating the session to exploring potential designs and mechanisms for future development.

Short N' Sweet: Incoming Members

Several new students visited our meeting today to explore joining robotics. To give context, our advisor Ms. Guzman introduces interested students to the program and evaluates their commitment. Once qualified, team placement is guided by a semi-preference system: students usually join their first-choice team unless it is already too large or too loud compared to others. Since 5840C is the smallest of the four teams, there's a strong chance we'll be welcoming some of today's visitors onto our roster. We're excited for the new talent and energy they could bring!

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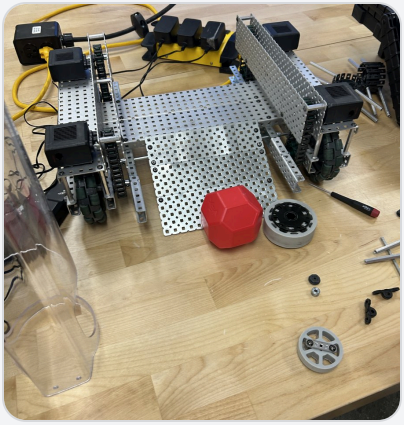
Intake V3 Flywheel Prototype

09/23/25 · ENTRY

ABSTRACT

- Disassembled the roller-based intake from the previous meeting to move forward with a new design.
- Began prototyping a flywheel launching mechanism, building directly onto the existing drivetrain.
- Work focused on determining the optimal placement and spacing for the flywheel assembly to effectively propel scoring objects.

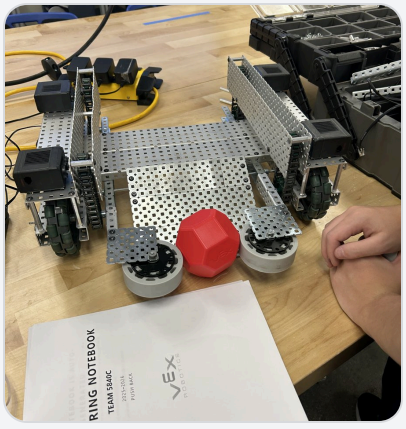


Deconstruction of the Previous Intake Prototype and Beginning of New Intake Prototype Iteration

To begin, we fully deconstructed the roller intake from the September 18th meeting. This left us with the bare drivetrain, providing a clean slate to build a new flywheel launcher concept.

Flywheel Prototype

The primary motivation for this complete redesign was the height of our previous roller intake, which proved incapable of pulling scoring objects out from the game's loaders. To solve this, we pivoted to a more compact flywheel design. By the end of the meeting, we had successfully mounted the VEX Flex Wheels for the new prototype. This system is intended to grip objects directly from the loader and accelerate them for scoring. The photo shows the initial placement we settled on, which will serve as the baseline for our first round of testing.



Team Update: New Members

During this time, several new members were still being onboarded and assigned to the club's various teams. While the core team focused on the flywheel prototype, the prospective members were observing

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and assisting with minor tasks to get familiar with the VEX system. They will be properly introduced in an upcoming entry.

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Motorizing the Flywheel and Welcoming New Members

09/25/25 · ENTRY

ABSTRACT

- Continued work on the flywheel prototype by mounting and wiring the motors.
- Officially welcomed new members Ebrahim and Jayden to the team, who jumped right into the build process.
- Began development of a secondary conveyor/ramp prototype for additional scoring capabilities.

A Nonsense-Free Welcome: Meet Jayden and Ebrahim

We officially welcomed our two newest members, Jayden and Ebrahim, to Team 5840C! They got straight to work, with Ebrahim helping to motorize the flywheel and Jayden working with Omri on the new ramp prototype. We're excited to have them on board and see them make their mark on the team.

Motorizing the Flywheel

With the flywheel structure in place, the team's main goal was to motorize it. New member Ebrahim is pictured here carefully mounting the motors. Getting the alignment just right is critical, as we need this system to be powerful but also want to keep the mechanism as light as a feather.

New Members Ebrahim and Jayden

Jayden and Ebrahim were great additions to the meeting's workflow.

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Parallel Prototyping

While the launcher was being motorized, Omri and Jayden began work on a parallel prototype: a large conveyor ramp. This subsystem is being explored as a potential scoring mechanism or for field element manipulation.

Room for More?

While we're thrilled to have Jayden and Ebrahim, our team might not be done growing yet! A few more new members may be joining 5840C in the coming weeks as the season gets into full swing.

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A Two-System Strategy Pivot

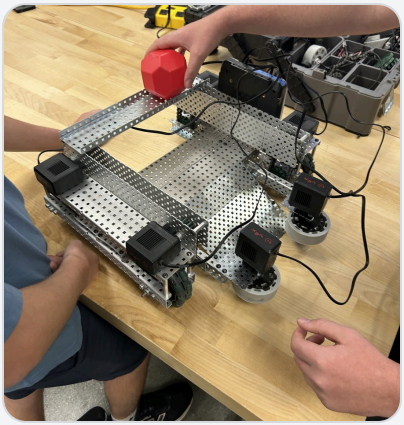
09/30/25 · ENTRY

ABSTRACT

- Conducted a strategic review of the flywheel prototype and identified its limitations as a primary scoring mechanism.
- Redefined the flywheel's role to be collection and storage of scoring objects.
- Determined the necessity of a second, dedicated scoring system to be designed in upcoming meetings.
- Welcomed our newest team member, Aiden!

Redefining Roles: A New Two-System Strategy

This meeting marked a major strategic pivot. After analyzing the geometry of the field and the goals, we concluded that our flywheel mechanism, while effective for intake, is not viable for scoring. Its angle and position make it unable to deposit objects effectively. Therefore, we have redefined the robot's architecture: the flywheel will now be a dedicated collection and storage system. Our primary design focus moving forward will be the creation of a completely separate, secondary mechanism dedicated solely to scoring.



Analyzing Mechanism Limitations

The main activity of the meeting was this hands-on analysis. By manually placing a scoring object on the robot and aligning it with a goal, we visually confirmed the flywheel's inability to score. This simple test was the catalyst for our decision to pursue a two-system design, as it clearly demonstrated the need for a different mechanism to handle the final step of scoring.

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MICAH PICTURE!

A wild Micah appears during the strategy pivot.

And Another One! Welcome Aiden

The team continues to grow! This week we welcomed our newest member, Aiden. He's jumping in at a great time as we start to define our robot's core strategy for the season.

New Member Aiden

Aiden getting familiar with the team and the current robot build. (We'll get a better picture soon, I promise)

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OCTOBER

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Scoring System V1 and Team Organization

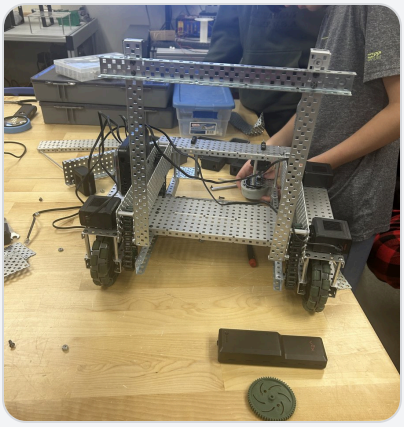
10/07/25 · ENTRY

ABSTRACT

- With a competition on the 18th, the team began construction of the secondary scoring system.
- Formal lead designer roles were assigned: Aiden for the scoring system and Micah for the intake/drivetrain.
- Welcomed new member Michael to the team.
- Jayden was assigned to shadow Matthew in programming to build team depth.

Countdown to Competition: Defining Roles

With our first competition scheduled for October 18th, we've kicked into high gear. To streamline our workflow, we have formally designated lead designer roles. Aiden will be the lead designer for the new secondary scoring system, while Micah will continue to lead design on the intake and drivetrain. This division of labor will allow for parallel development and faster iteration as we push to be competition-ready.



Framework for the Scoring System

Work began immediately on the new scoring system. The image shows the initial vertical framework being built directly onto the chassis. This structure will eventually house the mechanism that deposits scoring objects into the goals.

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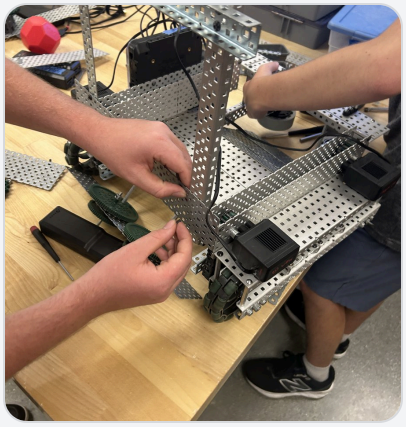
Team Build in Progress

Multiple team members work together to assemble the new structure and begin routing wires. This collaborative effort is essential to meet our deadline for the upcoming competition.



Growing the Team: Welcome Michael & Programming Plans

We're excited to welcome our newest member, Michael, who joins us just in time for the pre-competition push! On the software side, Jayden has officially been assigned to shadow Matthew to build up the programming team's depth. Additionally, our mentor, Guzman, has requested that Matthew lead a basic coding tutorial for members of other teams, which is tentatively planned for October 14th.

Aiden, Lead Designer (Scoring System)

Aiden, now leading the design for the new scoring mechanism.

New Member Michael

Our newest member, Michael, joining the team during a busy build week.

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Team Refocus and Pre-Competition Crunch

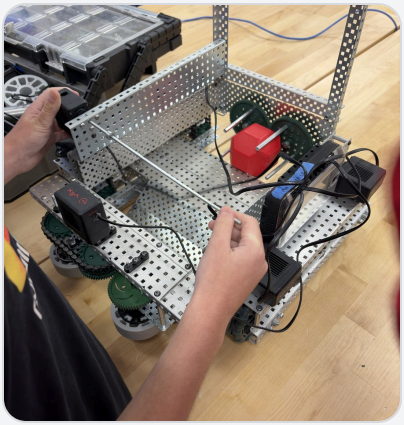
10/14/25 · ENTRY

ABSTRACT

- Per our instructor's decision, the team was restructured to a core competition roster of five members to improve focus and engagement.
- The consolidated team now consists of Matthew, Micah, Omri, Aiden, and Varun.
- With the competition only days away, the team rushed to fully assemble the chain-driven block lifting system, with Aiden leading the design.

A Necessary Refocus: Team Consolidation

To address challenges with our growing team size and to ensure every member was actively engaged, our instructor made the decision to restructure the team. 5840C will now proceed with a core competition roster of five members: Matthew Jeide, Micah Ramunni, Omri Lavi, Aiden, and Varun Pais. The members moved from our roster have formed a new, non-competing team; they will shadow us and the other teams during this weekend's competition to continue learning the process.



Scoring System Framework

With the competition this Saturday, our top priority is building the secondary scoring mechanism. The day started with constructing the core structural frame for the lift system.

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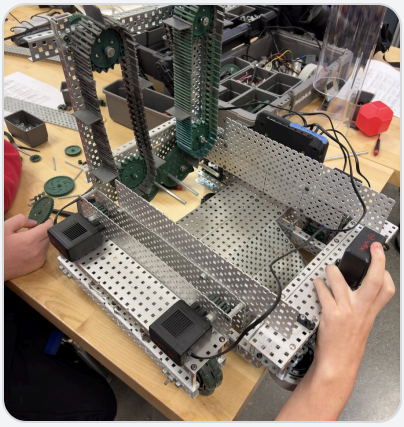
Focused Collaboration

The new team structure allowed for closer collaboration. Aiden, Micah, and Omri are seen here working through the design of the lift's gear train and structural supports.



Lift Assembled by End of Day

By the end of the meeting, we had made a large push and assembled the structure for the chain-driven lift.

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Final Push for Competition

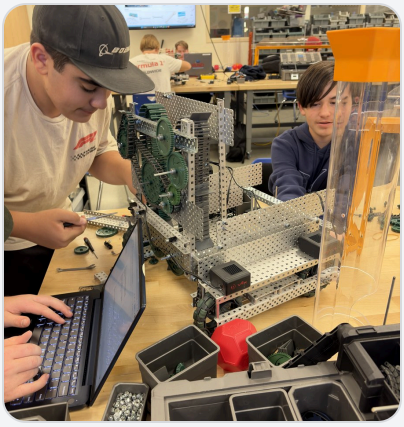
10/16/25 · ENTRY

ABSTRACT

- Made a major push on final mechanical assembly and wiring in preparation for Saturday's competition.
- Developed the first version of our competition driver control script, which is properly commented and structured.
- The new code includes refined arcade drive controls and functions for operating the intake/flywheel motor.

The Pre-Competition Scramble

With the competition just days away, today's meeting was a scramble to get the robot as functional as possible. On the mechanical side, the team focused on critical assembly, reinforcing the new lift, and tackling the complex wiring. In parallel, the first version of our competition code was written and tested, marking a major step towards integrating all systems.



Multitasking Under Pressure

A perfect example of our pre-competition workflow: Omri and Micah work on the lift's gear train while Aiden takes a moment to write his long-overdue bio for the engineering notebook.

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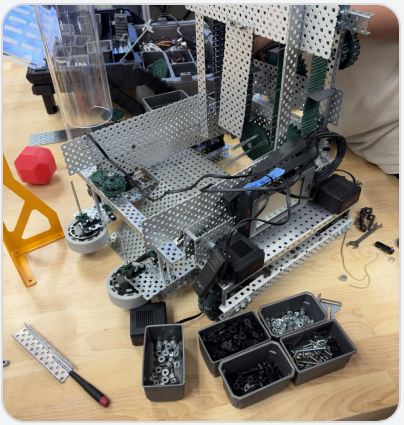
State at End of Day

This is the state we managed to get the robot to by the end of the meeting. The lift is mechanically assembled, but much of the wiring still needs to be finalized and managed before it's competition-ready.



Devious Micah Picture

Micah peeking from behind a field element.

COMPETITION CODE V1 PYTHON

```
# ------------------------------------------------------------------------------ #
#                                                                                #
#       Module:       main.py                                                    #
#       Author:       jeide                                                      #
#       Created:      10/16/2025, 3:43:36 PM                                     #
#       Description:  V5 project                                                 #
#                                                                                #
# ------------------------------------------------------------------------------ #

# Library imports
from vex import *

# Brain should be defined by default
brain=Brain()

brain.screen.print("Hello V5")


RIGHT_MOTORS: list[Motor] = [Motor(Ports.PORT3), Motor(Ports.PORT4)]
LEFT_MOTORS: list[Motor] = [Motor(Ports.PORT1), Motor(Ports.PORT2)]
```

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```
# one of these should be reversed, depends on the build
REVERSE_RIGHT: bool = True
REVERSE_LEFT: bool = False

# suction motor
SUCTION_MOTOR: Motor = Motor(Ports.PORT9)
SUCTION_POWER: int = 100  # percent


def command_move(x: int | float, y: int | float):
    """Command the robot to move in the two axises."""
    # x is left/right
    # y is forward/backward
    right_speed = y - x
    left_speed = y + x
    # review notebook for a diagram

    # sanity check
    max_input = abs(max(right_speed, left_speed))
    if max_input > 100:  # exceeded 100%
        # let's scale it down
        right_speed = right_speed / max_input * 100
        left_speed = left_speed / max_input * 100

    # now let's command the motors
    for right_motor in RIGHT_MOTORS:
        right_motor: Motor
        right_motor.spin(FORWARD if not REVERSE_RIGHT else REVERSE, right_speed, PERCENT)

    for left_motor in LEFT_MOTORS:
        left_motor: Motor
        left_motor.spin(FORWARD if not REVERSE_LEFT else REVERSE, left_speed, PERCENT)


def command_move_via_controller(controller: Controller):
    """Give movement commands via the controller."""
    # you could choose any axis you want, we chose these because we like how they feel while driv
    # get the joystick positions
    x = controller.axis1.position()
    y = controller.axis3.position()
    # pass to the movement function
    command_move(x, y)


def driver_control():
    """Driver control function."""
    # create a controller object
    controller = Controller()

    timer = Timer()

    def start_suction_motor():
```

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```
        """Start the suction motor on."""
        SUCTION_MOTOR.spin(FORWARD, SUCTION_POWER, PERCENT)

    def stop_suction_motor():
        """Stop the suction motor."""
        SUCTION_MOTOR.stop()

    # set up button callbacks
    controller.buttonA.pressed(start_suction_motor)
    controller.buttonB.pressed(stop_suction_motor)

    # loop forever
    while True:
        command_move_via_controller(controller)
        wait(20, MSEC)  # don't hog the CPU


def autonomous():
    """Autonomous function."""
    # example autonomous code
    command_move(0, 50)  # move forward at 50% speed
    wait(2, SECONDS)     # for 2 seconds
    command_move(0, 0)   # stop


if __name__ == "__main__":
    # setup the competition instance
    Competition(driver_control, autonomous)
    driver_control()  # run driver control by default
```

About the Competition Script

This is our first structured script intended for competition. It is organized with clear functions and comments. Key features include a modular arcade drive function (`command_move`) and button callbacks that allow the driver to start (Button A) and stop (Button B) the intake flywheel motor. It also includes a basic autonomous routine that drives forward for two seconds as a starting point for skills.

SIDNEY!

This is our friend Sidney, who's from another 5840 team, who was also working hard on her team's robot before the competition.

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