Bishop Blanchet 2022 FRC Rapid React Coding – Robot Control / Operation

This document outlines the general mechanisms intended to describe how people will interact with the robot and generally accomplish game movements and tasks.

# Setup Phase

This section outlines the key items that need to be done to the robot during the setup phase to prepare for a match.

<TBD>

# Autonomous Phase

This section outlines the key items that need to be done to the robot during the autonomous phase to prepare for a match.

<TBD>

# TeleOperated Phase - Driver and Co-Driver Control Actions

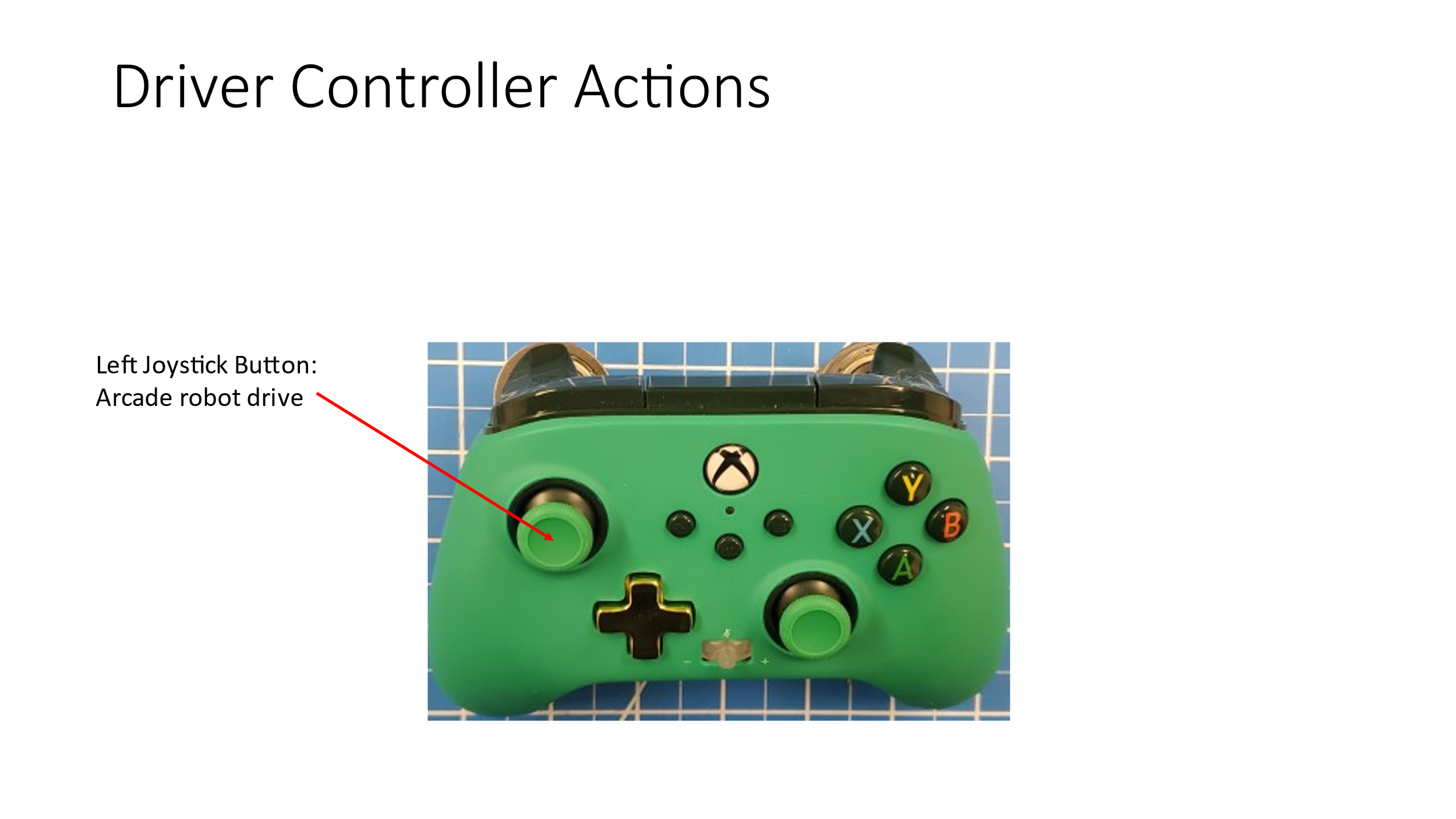
This section outlines how robot drivers will interact with the robot during the TeleOperated phase of the game.

## Xbox Controllers and Button Board

Two individuals will generally be controlling the robot during the manual operation phase of the competition. One individual, named the ‘driver’, will generally be responsible for maneuvering the robot to execute game strategy. The other individual, named the ‘co-driver’ will generally be responsible for operating the controls necessary to score within the game (shooting, hanging, etc.).

### Driver Controls

The driver will be using an Xbox One controller. This specific controller will be explicitly focused at maneuvering the robot around the game field. The primary movement approach will be to use arcade style movement on the left joystick as described in the picture below.



#### Questions

1. Should we split the right and left side drive motors into some form of tank drive for limp mode?

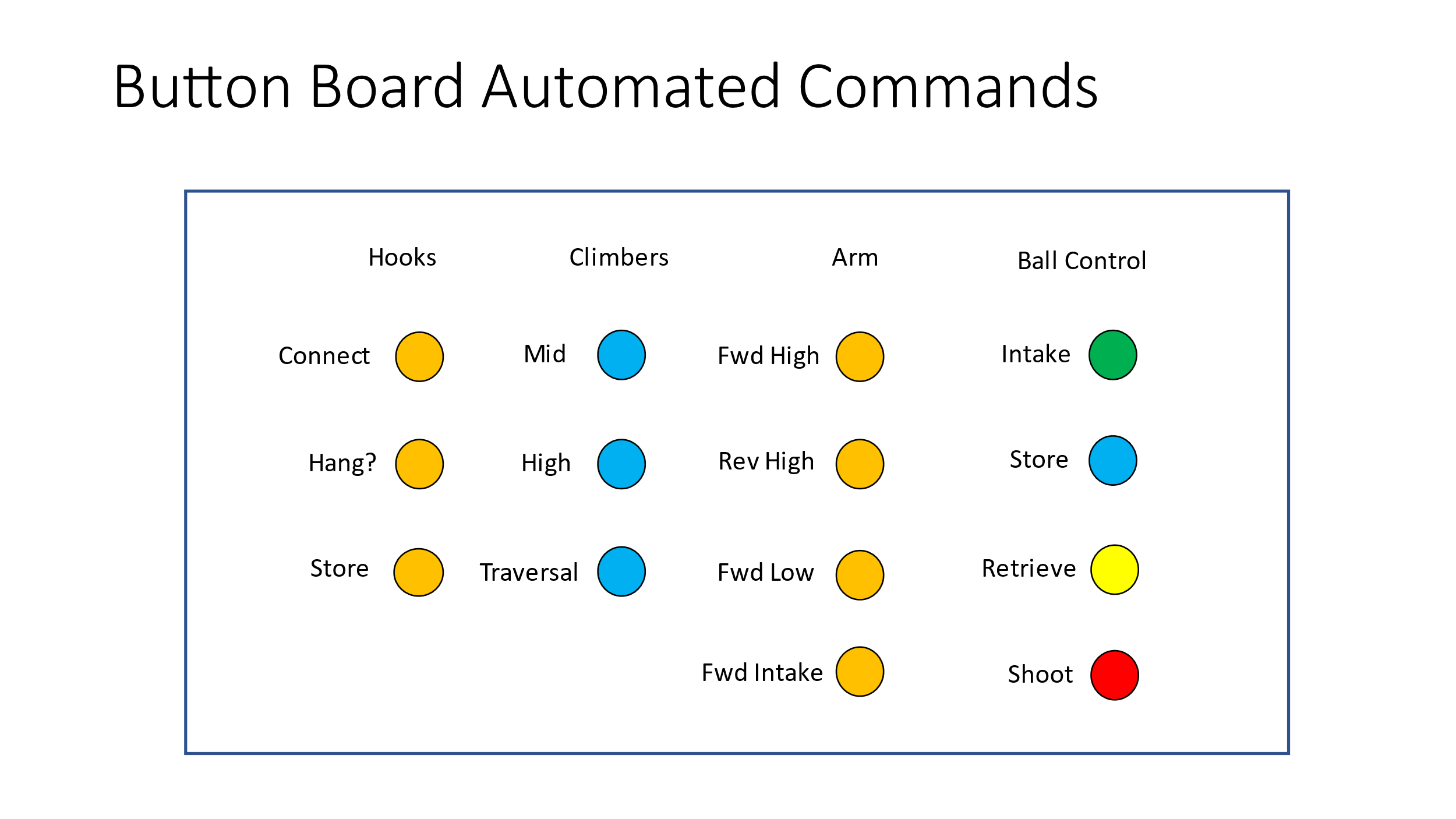
### Co-Driver Controls

The co-driver controls will focus on automating a succession of coordinated actions into a preset library. Each action will be started by a single button press using a constructed button board.

The automated controls are described in the following table.

|  |  |  |
| --- | --- | --- |
| **Category** | **Command Name** | **Description** |
| Hooks | Connect | Will be triggered to connect the hook to the ball shooter arm and also disconnect the hook arm from its storage mount. The operation here be accomplished by first actuating two pneumatics to engage the hooks to the ball shooter arm. Once complete, two pneumatic will be used to disengage the hooks from their storage brackets. |
| Hooks | Hang?? |  |
| Hooks | Store | Will be triggered to connect the hooks to their storage brackets and disconnect the hook from the ball shooter arm. The operation here be accomplished by first actuating two pneumatics to engage the hooks to their storage brackets. Once complete, two pneumatic will be used to disengage the hooks from ball shooter arm. |
| Climbers | Middle | Succession of automation that will accomplish middle rung hang starting with the robot on the playing surface. |
| Climbers | High | Succession of automation that will accomplish high hang starting with the robot hanging from the hooks on the middle rung. |
| Climbers | Traversal | Succession of automation that will accomplish traversal hang starting with the robot hanging from the hooks on the high rung. |
| Arm | Reverse High Goal | Moves the arm to the set point for scoring at the high goal in the ‘reverse’ direction. Ball intended to be sent toward the rear/aft of the robot. |
| Arm | Forward High Goal | Moves the arm to the set point for scoring at the high goal in the ‘forward’ direction. Ball intended to be sent toward the front/fore of the robot. |
| Arm | Forward Low Goal | Moves the arm to the set point for scoring at the low goal in the ‘forward’ direction. Ball intended to be sent toward the front/fore of the robot. |
| Arm | Forward Intake | Moves the arm to the set point used to ingest balls. Ball consumed from the front/fore of the robot. |
| Ball Control | Intake | Will spin the motors to intake a ball. Storage motors intake ball slightly to a ‘shooting position’ so the ball is a safe distance from intake/shooter wheels. |
| Ball Control | Store | Will spin the ball storage motors to gently store the ball at is second position. |
| Ball Control | Retrieve | Will spin the ball storage motors to gently expel the ball from the second position to the shooting position. |
| Ball Control | Shoot | Will spin the motors to the right speed for the arm setting at hand (reverse high, forward high, forward low) and once the motors are at the proper speed ball storage motors will gently expel the ball into the shooting wheels. |

The Button board layout is presented in the following diagram.



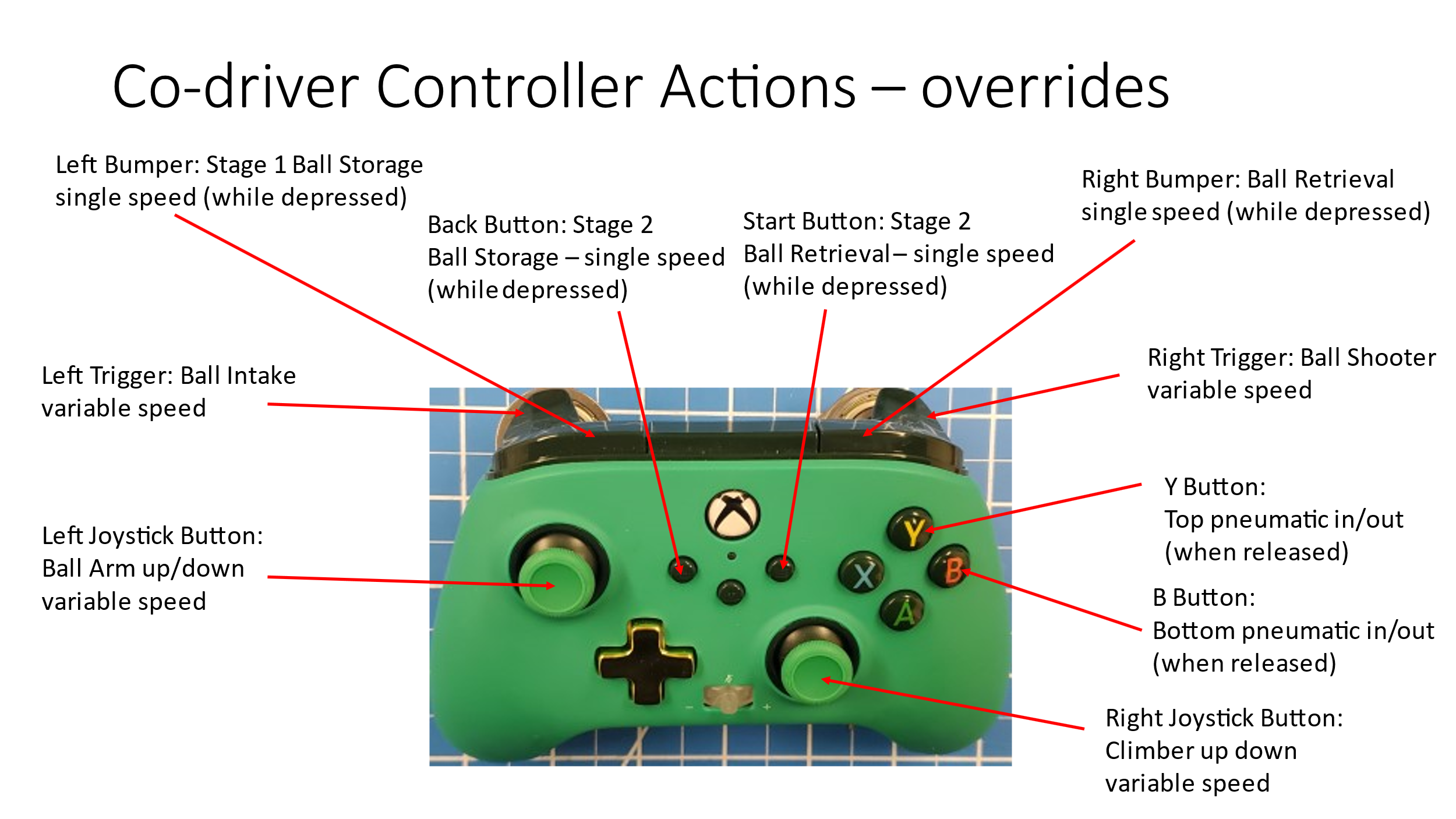
### Co-Driver Backup Controls

Because the automated actions grouped into the button board commonly include a succession of operations, they tend to be more error prone due to the actions generally not considering all variables. To mitigate unforeseen behavior/situations a set of lower-level motor / pneumatic are needed as overrides to the automated actions provided on the button board. The lower-level motor / pneumatic controls will be built into a second Xbox One controller.

Each lower-level action is described in the table below:

|  |  |  |
| --- | --- | --- |
| **Xbox Control** | **Category** | **Description / Notes** |
| Left Joystick Button | Arm | Arm motors operated in tandem (follower). Joystick up implies arm should raise (move in an arc toward the back of the robot). Joystick down implies arm should lower (move in an arc toward the front of robot). Variable speed based on magnitude of joystick up/down. |
| Left Trigger | Ball Handling | Will control both motors moving them in the ‘intake’ direction. Variable speed based on magnitude of trigger up/down. |
| Left Bumper | Ball Handling | Ball storage **stage one** motor control while pressed it will run the motor in the intake direction at a single preset speed (arrived at by testing). |
| Back Button | Ball Handling | Ball storage **stage two** motor control while pressed it will run the motor in the intake direction at a single preset speed (arrived at by testing). |
| Start Button | Ball Handling | Ball storage **stage two** motor control while pressed it will run the motor in the shooting direction at a single preset speed (arrived at by testing). |
| Right Bumper | Ball Handling | Ball storage **stage one** motor control while pressed it will run the motor in the shooting direction at a single preset speed (arrived at by testing). |
| Right Trigger | Ball Handling | Will control both motors moving them in the ‘shooting’ direction. Variable speed based on magnitude of trigger up/down. |
| Y Button | Hook | Each release of the button will toggle the **top** hook arm pneumatics solenoid. If it was engaged it will disengage or vice versa. |
| B Button | Hook | Each release of the button will toggle the **bottom** hook arm pneumatics solenoid. If it was engaged it will disengage or vice versa. |
| Right Joystick Button | Climbers | Climber motors operated in tandem (follower). Joystick up implies climbers should extend. Joystick down implies climbers should retract. Variable speed based on magnitude of joystick up/down. |
|  |  |  |

The operations are summarized in the table above are further described in the picture below.



#### Questions

1. Should we split the right and left climbers to make them independently controlled

# Collect Phase

This section outlines the key items that need to be done to the robot after the match completes.

<TBD>