OPERATION P.E.A.C.C.E. ROBOTICS

4-H FIRST ROBOTICS TEAM 3461

ELECTRICAL MANUAL

18 USC 707

2024 REPORT

OPENING STATEMENT

PREFACE

This document contains information regarding the 2024 Robot's electrical and CAN wiring. It will contain the following information, PDP slot number, correct breaker, wire gauge, CAN ID and physical location on the robot.
This document is split into 3 separate overall sections, one for device information, one for only sensor information, and one for CAN bus connection information. It will also have a subsection for each subsystem that requires additional information aside from the general information regarding its electrical components.

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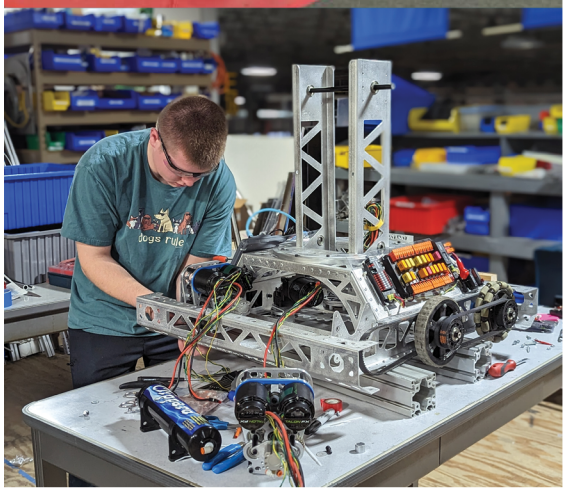
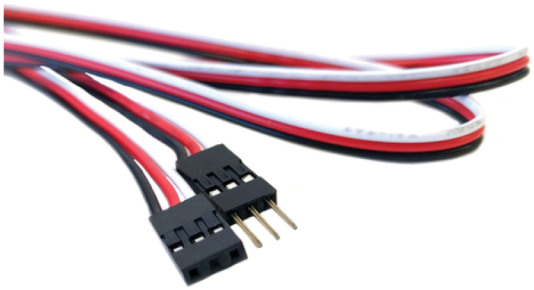


VOCABULARY

1. “CAN Bus” - The CAN Bus is a communication protocol that allows the RoboRio to communicate with microcontrollers and sensors, such as the Falcon 500’s internal motor controller (TalonFX), the Spark MAX that controls the Neo 550 motors, the PDH, and the CANCoder absolute encoder. It can be easily identified by the twisted Yellow and Green wires.

2. “PWM” - PWM is a communication protocol that operates using Pulse-Width Modulation as its signal method, using this signal, the RoboRio can communicate with microcontrollers and sensors such as the Dual Channel Encoder, PWM can be easily identified by its three joined wires in the order of White, Red, Black. This is not the same as the Spark MAX 3-Channel output wires



3. “PDH” - Abbreviation for the REV Power Distribution Hub

4. “VRM” - Abbreviation for the CTRE Voltage Regulator Module

5. “PH” - Abbreviation for REV Pneumatics Hub & CTRE Pneumatics Hub

6. “POE” - Abbreviation for Power Over Ethernet

7. “POE Harness” (or injector) - A POE Harness delivers power over Ethernet through 1 wire and one connection. The polarity is relevant, accidental reversal of the polarity will cause damage to the device it’s connected to.

BREAKDOWN

Power Distribution

All devices receive their power from the PDH or downstream from the PDH via an intermediate device such as a CTRE Voltage Regulator Module, a REV Mini Power Module, a Motor Controller, a Pneumatic Control Device or other control device. The Robot's main 12v power supply comes from the Battery through the main 12v120a circuit breaker into the PDH. In 2024, FRC Electrical Rules permitted extraneous power sources for sensor devices, see 2024 R602 for more information.

Motors and Motor Controllers

Motors are not simple electrical devices that you can just plug in, a motor will spin as fast as the electrical input it is supplied, and reversing the polarity (red to red black to black or red to black and black to red) will change the direction of the motor. In order to control the motor a device must be placed in between the voltage input and the motor. This device is called a motor controller. The motor controller will vary the voltage and polarity delivered to the motor allowing for fine control. Some motors have motor controllers built into their housing, therefore the motor must only be connected to power in the correct polarity and the controller connected to the appropriate bus (CAN or PWM).

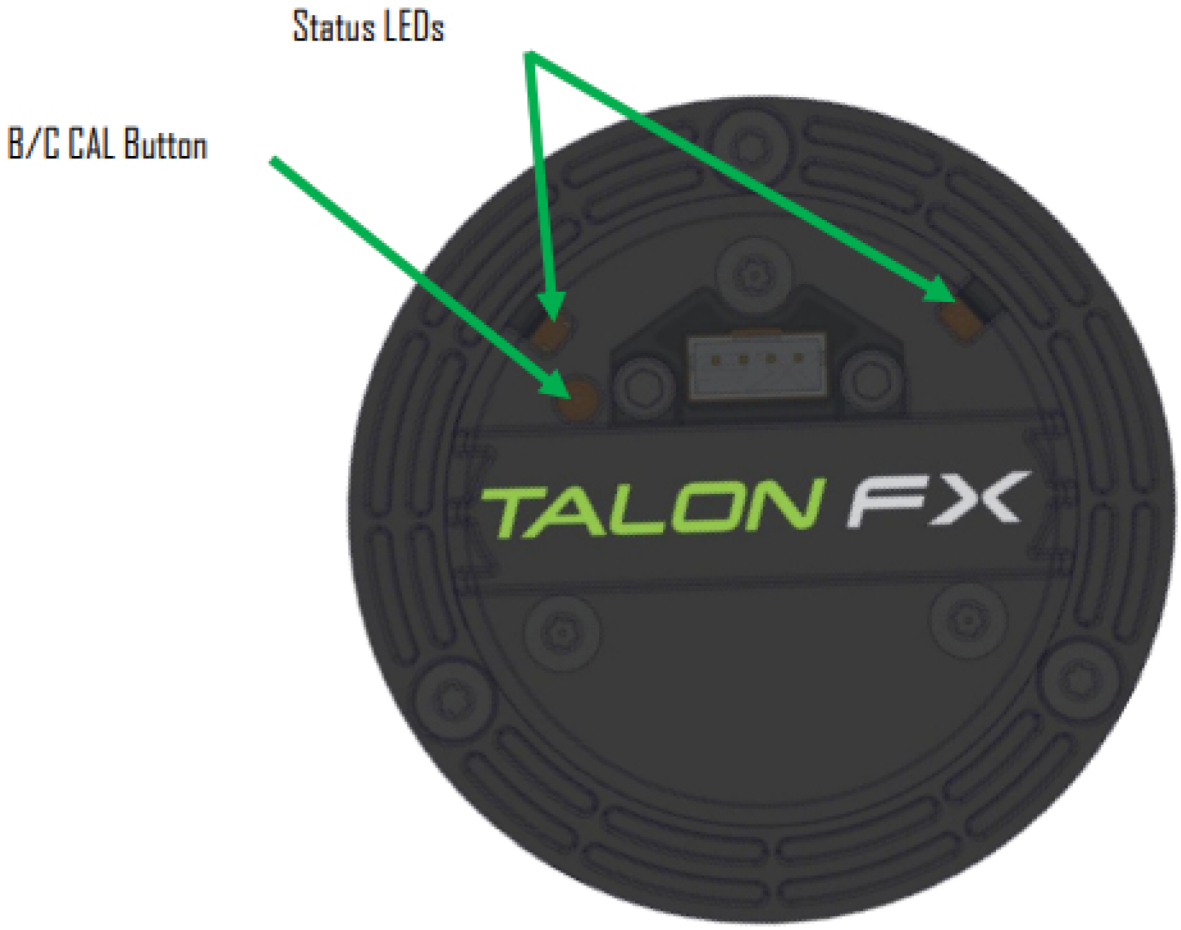
Falcon 500

A Falcon 500 is a brushless motor with an integrated motor controller (TalonFX). It has a red V+ (voltage in) and a black GND (common or "negative" or "ground") lead. Because the motor controller is integrated, you can not reverse the polarity of the motor or it will short out and break. The integrated motor controller connects to the CAN bus for signal.

Neo 550

A Neo 550 is a brushless motor without an integrated motor controller. It has red, white, and black three-phase power connection leads. Because the motor is driven by PWM and does not have an integrated controller, you must use a discrete controller, namely a REV Spark MAX. The Spark MAX takes power in V+ (red) and V- (black) leads and outputs power to the Neo 550 using the A (red) B (black) and C (white) leads. You should not reverse the polarity of the motor to prevent damage. The Spark MAX connects to the CAN bus for signaling.

FALCON-500 - BLINK CODES



LED State	Description
Alternating Off/Orange	Talon FX is disabled. Robot controller is missing on the bus or the diagnostic server is not installed.
Simultaneous Off/Orange	Talon FX is disabled. Phoenix is running in Robot Controller.
Alternating Red/Green	Talon FX is not licensed. Please license device in Phoenix Tuner.
Off/Slow Red	CAN/PWM is not detected.
Red/Orange	Damaged Hardware
Off/Red	Limit Switch or Soft Limit triggered.
Green/Orange	Device is in bootloader.

REV SPARK MAX - BLINK CODES

The below table assumes the Spark MAX is being used with a brushless motor, the Spark MAX has different blink codes for brushed motors. For a full blink code table, please see Appendix D.

LED State		Description
Slow Blink Cyan		Brake Mode - No Signal
Slow Blink Magenta		Coast Mode - No Signal
Solid Cyan		Brake Mode - Valid Signal
Solid Magenta		Coast Mode - Valid Signal
Blink Green		Partial Forward
Solid Green		Full Forward
Blink Red		Partial Reverse
Solid Red		Full Reverse
Alternating Green/White		Forward Limit
Alternating Red/White		Reverse Limit

FAULT BLINK CODES

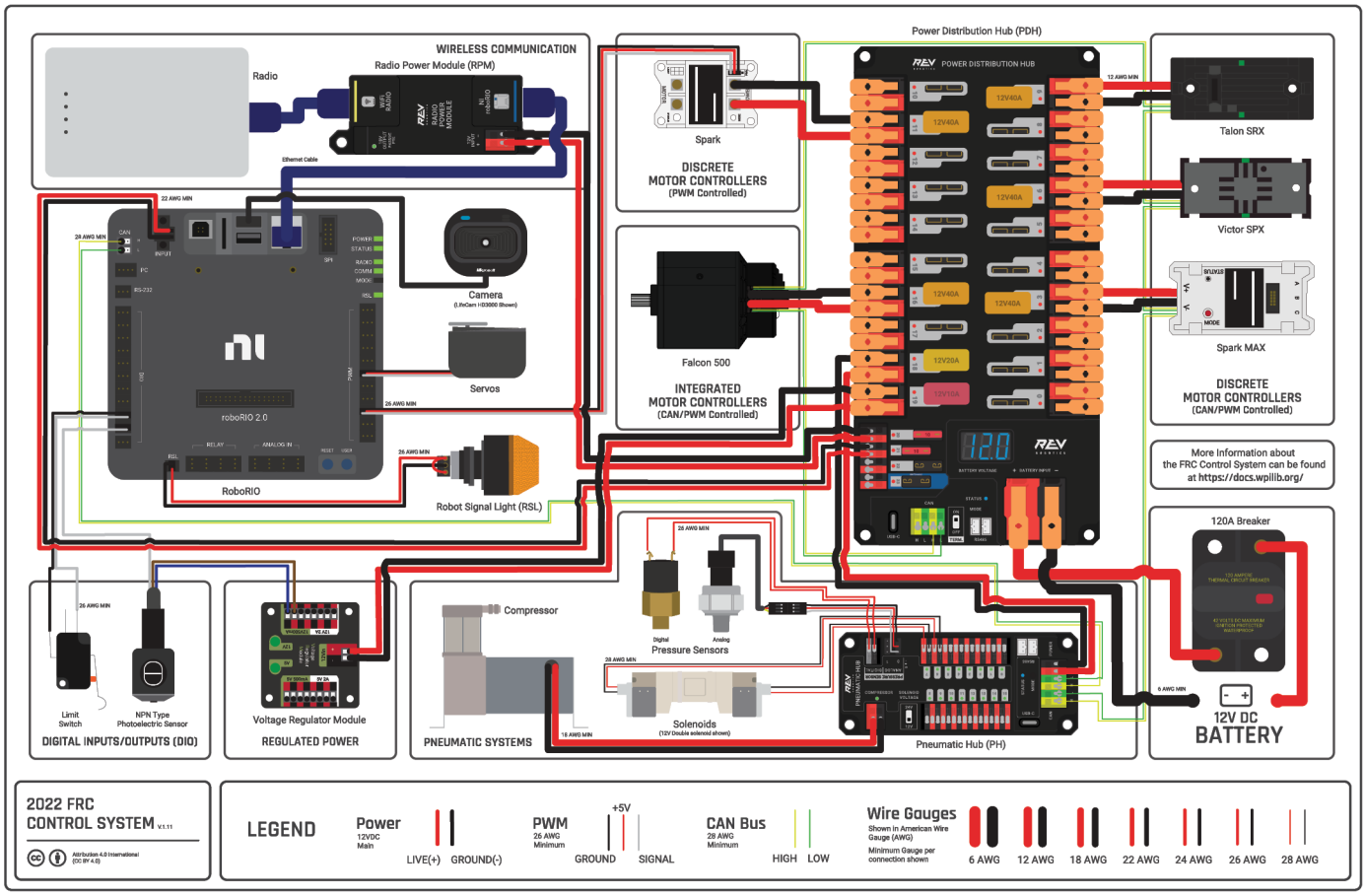
LED State		Description
Slow Alternating Orange/Cyan		Gate Driver Fault - See Documentation
Slow Blink Amber		Unrecoverable Error - See Section ???
Slow Alternating Orange/Magenta		Sensor Fault - See Full Documentation

REV SPARK MAX DOCUMENTATION PAGE

For in-depth insights into the REV SPARK Max, simply scan the QR code to access the complete documentation.

REFERENCE DIAGRAM

The following diagram illustrates how to properly wire FRC robots and can be found along with WPILib documentation. The robot was wired according to this diagram and the 2023 game manual. Note: not all depicted devices are employed on the 2024 Robot, this diagram attempts to show every use case any team might have



Currently the Robot employs devices from the following categories of the diagram

- Battery
- Discrete Motor Controllers
- Digital Input/Output
- Integrated Motor Controllers
- Pneumatics Systems
- Regulated Power
- Pneumatics System
- Pneumatics Sensors
- Solenoids

FIRST WIRING RULES

FIRST Electrical rules for 2023 can be found in Section 9.6 Power Distribution of the Charged Up game manual. The most important rules are below for quick reference

R610 *1 breaker per circuit.

All circuits, with the exceptions of those listed in R615 and R617, must connect to, and have power sourced solely by, a single protected 12VDC WAGO connector pair (i.e. the load terminals, as shown in Figure 9-10) of the PDP/PDH, not the M6 cap screws.

R611 *The ROBOT frame is not a wire.

All wiring and electrical devices shall be electrically isolated from the ROBOT frame. The ROBOT frame must not be used to carry electrical current.

Compliance with this rule is checked by observing a >120Ω resistance between either the (+) or (-) post within the APP connector that is attached to the PDP/PDH and any point on the ROBOT. All legal motor controllers with metal cases are electrically isolated. They may be mounted directly to ROBOT frame COMPONENTS. Note that some cameras, decorative lights, and sensors (e.g. some encoders, some IR sensors, etc.) have grounded enclosures or are manufactured with conductive plastics. These devices must be electrically isolated from the ROBOT frame to ensure compliance with this rule.

R612 *Must be able to turn ROBOT on and off safely.

The 120A circuit breaker must be quickly and safely accessible from the exterior of the ROBOT. This is the only 120A circuit breaker allowed on the ROBOT.

Examples considered not “quickly and safely accessible” include breakers covered by an access panel or door, or mounted on, underneath or immediately adjacent to moving COMPONENTS. It is strongly recommended that the 120A circuit breaker location be clearly and obviously labeled so it can be easily found by FIELD STAFF during a MATCH. R613 *Electrical system must be inspectable. The PDP/PDH, associated wiring, and all circuit breakers must be visible for inspection. “Visible for inspection” does not require that the items be visible when the ROBOT is in STARTING CONFIGURATION, provided the team can make the items viewable during the inspection process.

R613 *Electrical system must be inspectable.

The PDP/PDH, associated wiring, and all circuit breakers must be visible for inspection.

“Visible for inspection” does not require that the items be visible when the ROBOT is in STARTING CONFIGURATION, provided the team can make the items viewable during the inspection process.

R618 *Use PDP/PDH terminals as designed.

Only 1 wire shall be connected to each terminal on the PDP/PDH.

If multi-point distribution of circuit power is needed (e.g. to provide power to multiple PCMs and/or VRMs from 1 20A circuit), then all incoming wires may be appropriately spliced into the main lead (e.g. using an insulated terminal block, crimped splice or soldered wire splice), and the single main lead inserted into the terminal to power the circuit.

R619 *Only use specified circuit breakers in PDP/PDH.

The only circuit breakers permitted for use in the PDP/PDH are:

A. Snap Action VB3-A Series or AT2-A, terminal style F57, 40A rating or lower,

B. Snap Action MX5-A or MX5-L Series, 40A rating or lower, and

C. REV Robotics ATO auto-resetting breakers 40A rating or lower.

R620 *Only use specified fuses in PDP/PDH.

The only fuses permitted for use in the PDP/PDH are mini automotive blade fuses (ATM style) with the following values:

A. for the PDP, values matching the value printed on the device's corresponding fuse holder and

B. for the PDH, 15A or lower with the exception of a single 20A fuse for powering a PCM or PH.

Note that these fuses must be pressed very firmly to seat properly. Improper seating can cause a device to reboot upon impact.

R621 *Protect circuits with appropriate circuit breakers.

Each branch circuit must be protected by 1 and only 1 circuit breaker or fuse on the PDP/PDH per Table 9-3. No other electrical load can be connected to the breaker or fuse supplying this circuit.

Branch Circut	Circut Breaker Value	Quantity Allowed Per Breaker
Motor Controller	Up to 40A	1
Custom Circut	Up to 40A	No Limit
Automation Direct Relay 40A (*6m40*)	Up to 40A	1
Fans permitted per R501 and not part of COTS computing devices	Up to 20A	No Limit
Spike Relay Module	Up to 20A	1
Automation Direct Relay 25A (*6M25*)	Up to 20A	1
PCM/PH - with compressor	Up to 20A	1
Additional VRM (non-radio)/Additional PCM/PH (non-compressor)	Up to 20A	3 total
Automation Direct Relay 12A (*6M12*)	Up to 10A	1

This rule does not prohibit the use of smaller value breakers in the PDP/PDH or any fuses or breakers within CUSTOM CIRCUITS for additional protection

R622 *Use appropriately sized wire.

All circuits shall be wired with appropriately sized insulated copper wire (SIGNAL LEVEL cables don't have to be copper):

Application	Minimum Wire Size
31 - 40A breaker protected circuit	12 AWG (13 SWG or 4 mm^2
21 - 30A breaker protected circuit	14 AWG (16 SWG or 2.5 mm^2
6 - 20A breaker protected circuit	18 AWG (19 SWG or 1 $mm^{2)}$
11-20A fuse protected circuit	
Between the PDP dedicated terminals and the VRM/RPM or PCM/PH	
Compressor outputs from the PCM/PH	
Between the PDH and PCM/PH	
Between the PDP/PDH and the roboRIO	22 AWG (22 SWG or 0.5 mm^2
Between the PDH and the VRM/RPM	
≤5A breaker protected circuit	
≤10A fuse protected circuit	
VRM 2A circuits	24 AWG (24 SWG or 0.25 mm^2)
roboRIO PWM port outputs	26 AWG (27 SWG or 0.14 mm^2)
SIGNAL LEVEL circuits (i.e. circuits which draw ≤1A continuous and have a source incapable of delivering >1A, including but not limited to roboRIO non-PWM outputs, CAN signals, PCM/PH Solenoid outputs, VRM 500mA outputs, RPM outputs, and Arduino outputs)	28 AWG (29 SWG or .08 mm2)

Wires that are recommended by the device manufacturer or originally attached to legal devices are considered part of the device and by default legal. Such wires are exempt from this rule.

In order to show compliance with these rules, teams should use wire with clearly labeled sizes if possible. If unlabeled wiring is used, teams should be prepared to demonstrate that the wire used meets the requirements of this rule (e.g. wire samples and evidence that they are the required size)

R623 *Use only appropriate connectors.

Branch circuits may include intermediate elements such as COTS connectors, splices, COTS flexible/rolling/sliding contacts, and COTS slip rings, as long as the entire electrical pathway is via appropriately gauged/rated elements.

Slip rings containing mercury are prohibited per R203.

R624 *Use specified wire colors (mostly).

All non-SIGNAL LEVEL wiring with a constant polarity (i.e., except for outputs of relay modules, motor controllers, or sensors) shall be color-coded along their entire length from the manufacturer as follows:

A. red, yellow, white, brown, or black-with-stripe on the positive (e.g. +24VDC, +12VDC, +5VDC, etc.) connections

B. black or blue for the common or negative side (-) of the connections Exceptions to this rule include:

Exceptions to this rule include:

C. wires that are originally attached to legal devices and any extensions to these wires using the same color as the manufacturer

D. Ethernet cable used in POE cables

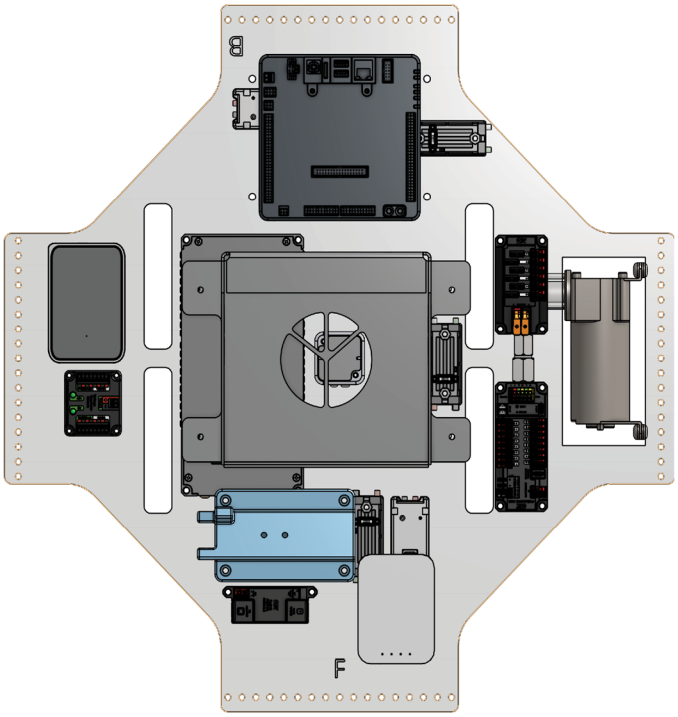
ELECTRICAL PANELS

This year, the robot has electronics on both sides of the panel instead of just one. For consistency, this document will reference the two based on the side of the panel they are mounted on. “Top Face” refers to the side of the electrical panel that faces up and is accessible without removing the lower service panel. “Bottom Face” refers to the side of the electrical panel that faces down and is not accessible without removing the lower service panel.

Top Face of the Electrical Panel

From Left to Right, Top to Bottom:

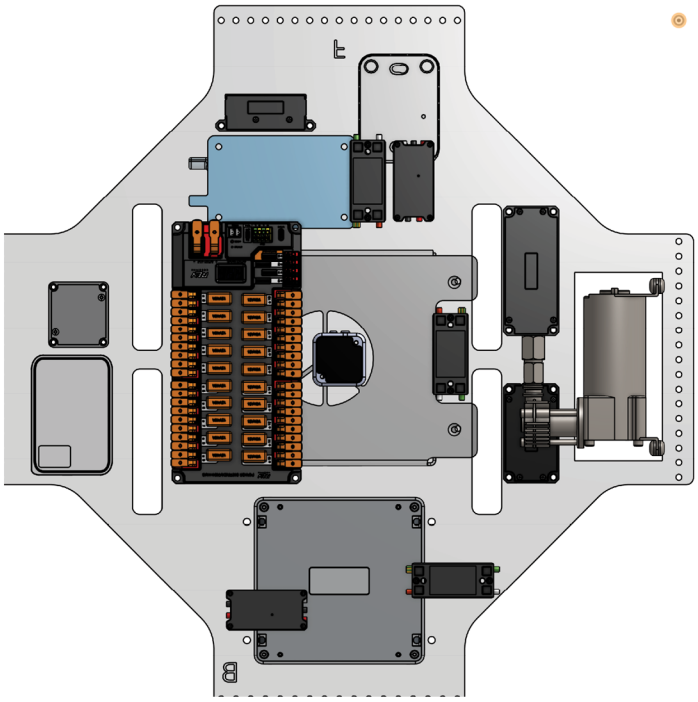
- Network Switch
- Voltage Regulator Module
- RoboRio v2
- REV Radio Power Module
- Radio
- Rev Mini Power Module
- Rev Pneumatic Hub



Bottom Face of the Electrical Panel

From Left to Right, Top to Bottom:

- Rev Power Distribution Hub
- Rear Intake Deploy Spark
- CTRE Pigeon 2.0
- Front Intake Roller Talon
- Front Intake Deploy Spark
- Diverter Roller Talon
- Rear Intake Roller Talon



DEVICE INFORMATION

REV Power Distrubution Hub

DEVICE	PDP SLOT	BREAKER / FUSE	INPUT VOLTAGE	WIRE GAUGE	PHYSICAL LOCATION
Main Breaker	VDC	12v120a	12v	6 AWG	Passenger Side Center below Box Tubing
Swerve Module 0 Drive Motor Falcon 500	0	12v40a	12v	12 AWG	Swerve Module 0 Top Left
Swerve Module 0 Rotate Motor Falcon 500	1	12v40a	12v	12 AWG	Swerve Module 0 Top Left
Swerve Module 1 Drive Motor Falcon 500	2	12v40a	12v	12 AWG	Swerve Module 1 Bottom Left
Swerve Module 1 Rotate Motor Falcon 500	3	12v40a	12v	12 AWG	Swerve Module 1 Bottom Left
Swerve Module 2 Drive Motor Falcon 500	4	12v40a	12v	12 AWG	Swerve Module 2 Bottom Right
Swerve Module 2 Rotate Motor Falcon 500	5	12v40a	12v	12 AWG	Swerve Module 2 Bottom Right
Swerve Module 3 Drive Motor Falcon 500	6	12v40a	12v	12 AWG	Swerve Module 3 Top Right
Swerve Module 3 Drive Motor Falcon 500	7	12v40a	12v	12 AWG Input	Swerve Module 3 Top Right
Intake Deploy Motor Neo 550	8	12v20a	12v	12 AWG	Bottom Face of Panel near back drive rail
Intake Roller Motor Talon SRX	9	12v20a	12v	12 AWG	Bottom Face of Panel near back drive rail
Passenger Side Shooter Motor Falcon 500	10	12v40a	12v	12 AWG	Passenger Side of Shooter Flywheel Shaft
Driver Side Shooter Motor Falcon 500	11	12v40a	12v	12 AWG	Driver Side of Shooter Flywheel Shaft
Trigger Motor Neo 550	12	12v20a	12v	18 AWG	Bottom Plate of the Shooter

DEVICE	PDP SLOT	BREAKER	INPUT VOLTAGE	WIRE GAUGE	PHYSICAL LOCATION
Driver Side Climber Motor Falcon 500	13	12v40a	12v	6 AWG	Passenger Side Climber Common Shaft
Passenger Side Climber Motor Falcon 500	14	12v40a	12v	12 AWG	Driver Side Climber Common Shaft
Diverter Deploy Motor Falcon 500	15	12v40a	12v	12 AWG	Bottom plate of the Shooter
Diverter Roller Motor Talon SRX	16	12v20a	12v	12 AWG Input Output	Bottom Face of Electrical Panel visible between the Driver Side Battery Box mount points
Pivot Motor 0 Falcon 500	17	12v40a	12v	12 AWG	Passenger Side Pivot Shaft
Pivot Motor 1 Falcon 500	18	12v40a	12v	12 AWG	Driver Side Pivot Shaft, Above Roborio
REV Mini Power Module	19	12v40a	12v	12 AWG	Top Face of Electrical Panel, Driver Side
NI RoboRio v2	20	12v10a	12v	12 AWG	Center Back of Top Face of Electrical Panel
REV Radio Power Module	21	12v10a	12v	18 AWG	Top Face of Electrical Panel, Front Edge, next to Radio
REV Pneumatics Hub	22	12v10a	12v	18 AWG	Top Face of Electrical Panel, behind Swerve Module 0
CTRE Voltage Regulator Module	23	12v10a	12v	18 AWG	Top Face of Electrical Panel, behind Swerve Module 3

The color of the cells in the Breaker column is associated with the physical color of the breaker that is rated as such

REV Mini Power Module

The Mini Power Module is a CUSTOM CIRCUIT per R621 Table 8-3 and Blue Box,

DEVICE	SLOT	FUSE	INPUT VOLTAGE	WIRE GAUGE	PHYSICAL LOCATION
PDH Terminal #19	V+	12v40a	12v	18 AWG	Top Face of Electrical Panel, Driver's Side
Front Intake Deploy Motor Falcon 500	0	12v15a	12v	18 AWG	Controller: Bottom face of Top Electrical Panel Motor: Passenger Side Intake Rail (NOT INSTALLED)
Front Intake Roller Motor Falcon 500	1	12v15a	12v	12 AWG	Controller: Bottom face of Top Electrical Panel Motor: Driver Side Intake Rail (NOT INSTALLED)
Not Connected	2				
Not Connected	3				
Not Connected	4				
Not Connected	5				

CTRE Voltage Regulator Module

DEVICE	SLOT	INPUT VOLTAGE	WIRE GAUGE	PHYSICAL LOCATION
PDH Terminal #23	VDC	12v	18 AWG	Top Face of the Top Electrical Panel, Passenger Side next to the Network Switch
Front Limelight	12v2a #1	12v	18 AWG	Front Driverail
Intake Limelight	12v2a #2	12v	18 AWG	Intake Top Protector Plate
CUSTOM CIRCUIT 1	12v500mA #1	12v	18 AWG	Bottom Face of Electrical Panel, near PDH Terminal #17
CUSTOM CIRCUIT 2	12v500mA #2	12v	18 AWG	Top Face of Electrical Panel, near CTRE VRM
OrangePI	5v2a #1	5v	22 AWG	Driver Size, mounted underside of polycarbonate flap
Not Connected	5v2a #2			
Network Switch	5v500mA #1	5v	22 AWG	Top Face of the Top Electrical Panel, next to the CTRE VRM
Not Connected	5v500mA #2			

Custom Circuit Breakout #1

DEVICE	SLOT	INPUT VOLTAGE	WIRE GAUGE	PHYSICAL LOCATION
CTRE VRM 12v500mA Terminal	VDC	12v	18 AWG	Bottom Face of Top Electrical Panel, next to PDH terminal 17
Swerve Module 0 Cancoder	0	12v	18 AWG	Swerve Module 0
Swerve Module 1 Cancoder	1	12v	18 AWG	Swerve Module 1
Swerve Module 2 Cancoder	2	12v	18 AWG	Swerve Module 2
Swerve Module 3 Cancoder	3	12v	18 AWG	Swerve Module 3

Custom Circuit Breakout #2

DEVICE	SLOT	INPUT VOLTAGE	WIRE GAUGE	PHYSICAL LOCATION
CTRE VRM 12v500mA Terminal	VDC	12v	18 AWG	Bottom Face of Top Electrical Panel, near PDH terminal 17
Pivot Cancoder	0	12v	18 AWG	Driver Side Pivot Shaft Mount
CTRE Pigeon IMU 2.0	1	12v	18 AWG	Top Face of Service Hatch

SENSOR INFORMATION

Device	Input Voltage	Protocol	ID	Connection Termination	Sub-system	Physical Location
Swerve Module 0 CANCoder	12v0.06a	CAN	3	CAN Bus	Drivetrain	Swerve Module 0
Swerve Module 1 CANCoder	12v0.06a	CAN	5	CAN Bus	Drivetrain	Swerve Module 1
Swerve Module 2 Cancoder	12v0.06a	CAN	9	CAN Bus	Drivetrain	Swerve Module 2
Swerve Module 3 Cancoder	12v0.06a	CAN	15	CAN Bus	Drivetrain	Swerve Module 3
Front Limelight	12v2A	IP	10.34.61.11:5801	Limelight Ethernet Port	Misc	Front Driverail
Intake Limelight	12v2A	IP	10.34.61.12:5801	POE Harness	Misc	Intake Top Protector Plate
CTRE Pigeon 2.0	12v0.1A	CAN	3	CAN Bus	Misc	Top Face of Service Bellypan, Centered
Pivot Cancoder	12v0.06A	CAN	21	CAN Bus	Pivot	Driver Side Pivot Shaft Mount Panel
Trigger Limit Switch Max	5v	DIO	N/A	RoboRio v2 DIO Port 1	Shooter	Shooter top forward
Trigger limit switch min	5v	DIO	N/A	RoboRio v2 DIO Port 0	Shooter	Shooter top rear
Left Climber Min	5v	DIO	N/A	Left Climber Motor	Climber	Not Installed
Left Climber Max	5v	DIO	N/A	Left Climber Motor	Climber	Not Installed
Right Climber Min	5v	DIO	N/A	Right Climber Motor	Climber	Not Installed
Right Climber Max	5v	DIO	N/A	Right Climber Motor	Climber	Not Installed

NOTE: Does not contain built-in encoders within the Falcon 500 motors as those are handled internally by the Falcon's TalonFX Controller and requires no wiring outside of the CAN Bus connection to the motor, which is documented in the "CAN Bus Connections" table.

CAN BUS LINKS

CAN ID	DEVICE
Bus Origin	**RoboRio v2**
1	**REV Pneumatics Hub**
2	**REV Power Distribution Hub**
3	**CTRE Pigeon 2.0**
4	**Swerve Module 0 Drive Motor**
5	**Swerve Module 0 Rotate Motor**
6	**Swerve Module 0 Cancoder**
7	**Swerve Module 1 Drive Motor**
8	**Swerve Module 1 Rotate Motor**
9	**Swerve Module 1 Cancoder**
10	**Swerve Module 2 Drive Motor**
11	**Swerve Module 2 Rotate Motor**
12	**Swerve Module 2 Cancoder**
13	**Swerve Module 3 Drive Motor**
14	**Swerve Module 3 Rotate Motor**
15	**Swerve Module 3 Cancoder**
16	**Back Intake Roller Motor**
17	**Back Intake Deploy Motor**
18	**Front Intake Roller Motor**
19	**Front Intake Deploy Motor**
20	**Diverter Rollers**
21	**Pivot Cancoder**

CAN ID	DEVICE
22	**Climber Motor 0**
23	**Pivot Motor 0**
24	**Climber Motor 1**
25	**Pivot Motor 1**
26	**Diverter Deploy Motor**
27	**Driver Side Shooter Motor**
28	**Trigger Motor**
29	**Passenger Side Shooter Motor**
N/A	**Termination Resistor**

Displayed in the order the devices are connected from the bus origin (RoboRio) to the bus termination point (Termination Resistor on top of the Shooter plate near the Top Shooter Falcon.)

MAWNE EVENT UPDATE

GENERAL CHANGES

1. Replaced all instances of "V+" with "VDC" to reflect proper terminology for DC Systems (does not include the FRC Manual section which already contained the proper terminology)
2. Secondary (Front) Intake is no longer part of the design, therefore all references to it only refer to the remaining hardware on the robot that may be used for other purposes in the future
3. Updated Solidworks Electrical Map to match (Included in Appendix G)

REV POWER DISTRIBUTION HUB

Main Breaker	V+ VDC	12v120a	12v	6 AWG	Passenger Side Center below Box Tubing
~~Back~~ **Intake Deploy Motor** Neo 550	8	12v20a	12v	12 AWG ~~Input~~	Bottom Face of Panel near back drive rail
~~Back~~ **Intake Roller Motor** Talon SRX	9	12v20a	12v	12 AWG ~~(Input) 14 AWG (Output)~~	Bottom Face of Panel near back drive rail
Driver Side Climber Motor Falcon 500	13	12v40a	12v	6 AWG	Passenger Side Climber Common Shaft ~~Arm~~
Passenger Side Climber Motor Falcon 500	14	12v40a	12v	12 AWG	Driver Side Climber Common ~~Arm~~

CTRE VOLTAGE REGULATOR MODULE

PDH Terminal #23	~~V+~~ VDC	12v	18 AWG	Top Face of the Top Electrical Panel, Passenger Side next to the Network Switch
~~Back~~ **Intake Limelight**	12v2a #2	12v	18 AWG	~~Back Driverail~~ Intake Top Protector Plate

Removed Orange Background indicating device is installed on the Robot

~~Not Connected~~ **OrangePI**	5v2a #1	5v	22 AWG	Driver Size, mounted underside of polycarbonate flap

SENSOR INFORMATION

~~Front Intake Deploy OUT~~	~~5v~~	~~DIO~~	~~n/a~~	~~RoboRio V2 DIO Port 4~~	~~Front Intake~~	~~???~~
~~Front Intake Deploy IN~~	~~5v~~	~~DIO~~	~~n/a~~	~~RoboRio V2 DIO Port 0~~	~~Front Intake~~	~~???~~
~~Pivot Max~~	~~5v~~	~~DIO~~	~~n/a~~	~~RoboRio V2 DIO Port 3~~	~~Shooter~~	~~???~~
~~Pivot Min~~	~~5v~~	~~DIO~~	~~n/a~~	~~RoboRio V2 DIO Port 2~~	~~Shooter~~	~~???~~
~~Rear Intake Deploy OUT~~	~~5v~~	~~DIO~~	~~n/a~~	~~RoboRio V2 DIO Port 5~~	~~Rear Intake~~	~~???~~
~~Rear Intake Deploy IN~~	~~5v~~	~~DIO~~	~~n/a~~	~~MoreBoard DIO Port 1~~	~~Rear Intake~~	~~???~~
~~Diverter Expension~~	~~5v~~	~~DIO~~	~~n/a~~	~~MoreBoard DIO Port 6~~	~~Diverter~~	~~???~~
~~Diverter Extension Max~~	~~5v~~	~~DIO~~	~~n/a~~	~~CAN Bus~~	~~Diverter~~	~~???~~

Left Climber Min	5v	DIO	N/A	~~RoboRiov2 DIO Port 8~~ Left Climber Motor	Climber	Not Installed
Left Climber Max	5v	DIO	N/A	~~MoreBoard DIO 2~~ Left Climber Motor	Climber	Not Installed
Right Climber Min	5v	DIO	N/A	~~RoboRio v2 DIO Port 9~~ Right Climber Motor	Climber	Not Installed
Right Climber Max	5v	DIO	N/A	~~MoreBoard DIO 3~~ Right Climber Motor	Climber	Not Installed