Electrical Components Related to CAN bus

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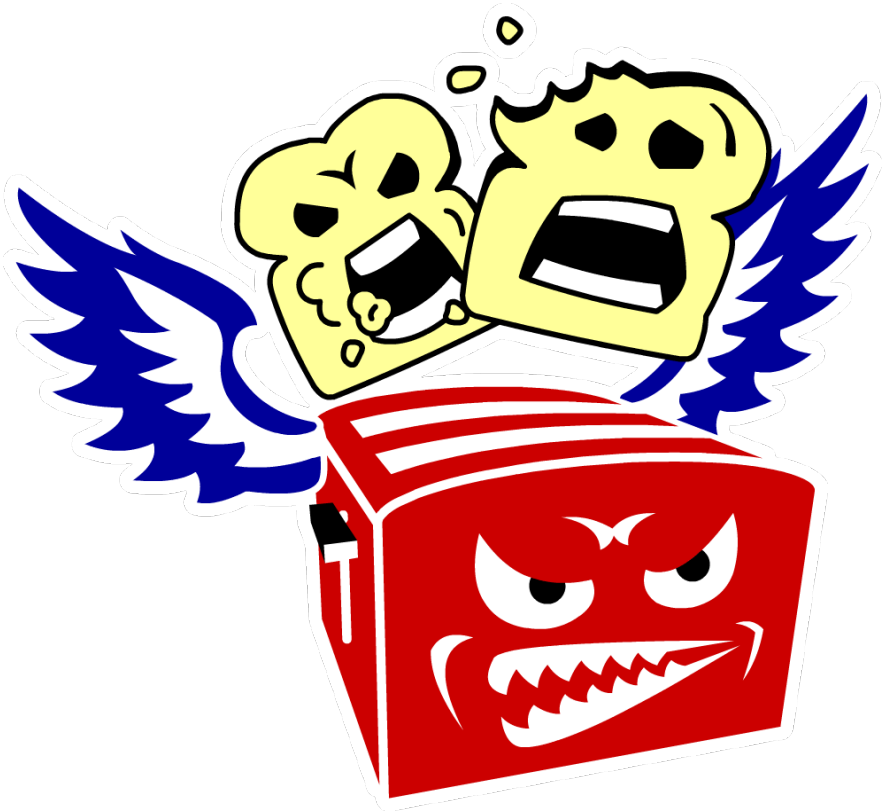
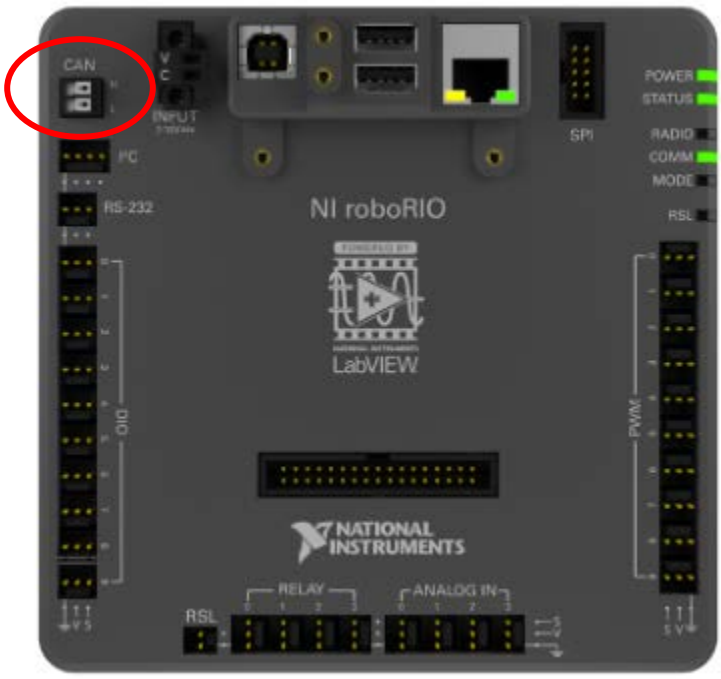


RoboRio/CAN Bus

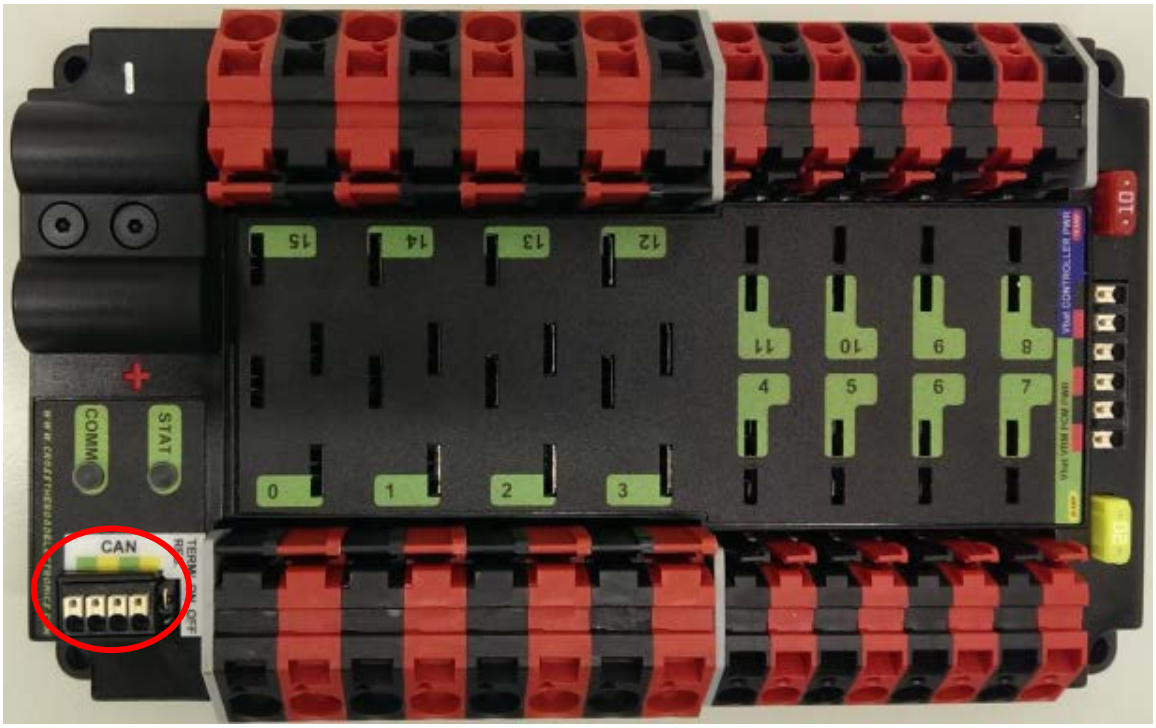


The Ni roboRio is the brain of the electrical components. There are two CAN bus ports on this device, which supply power to the PCM (Pneumatic Control Module), and PDP (Power Distribution Panel). The CAN wire used in FRC control systems is 20AWG. When connecting the CAN bus to the terminals, it is important to understand that the left side is used as input and the right side is used as output. The CAN bus starts at the roboRio, and connects to all of the parts throughout the system. If each part isn't connected properly, the robot won't function. Before connecting the roboRio to the CAN bus, twist the two CAN wires together to maintain neat wiring in the future. In order to connect the CAN wire to the port, you must push down the white button with a fine pin or flat head and insert the CAN wire into the terminal.

Pneumatics Control Module(PCM)

Next in line for CAN bus is the Pneumatics Control Module, otherwise known as the PCM. The Pneumatics Control Module is an optional part used for controlling pneumatics on the robot. If you are not using the Pneumatics Control Module, wire the CAN bus directly from the roboRio to the Power Distribution Panel. However, if you are using Pneumatics, after connecting the CAN bus to the roboRio, connect it to the Pneumatics Control Module. Put the green CAN wires into the green terminals and the yellow CAN wires into the yellow terminals.

Power Distribution Panel(PDP)

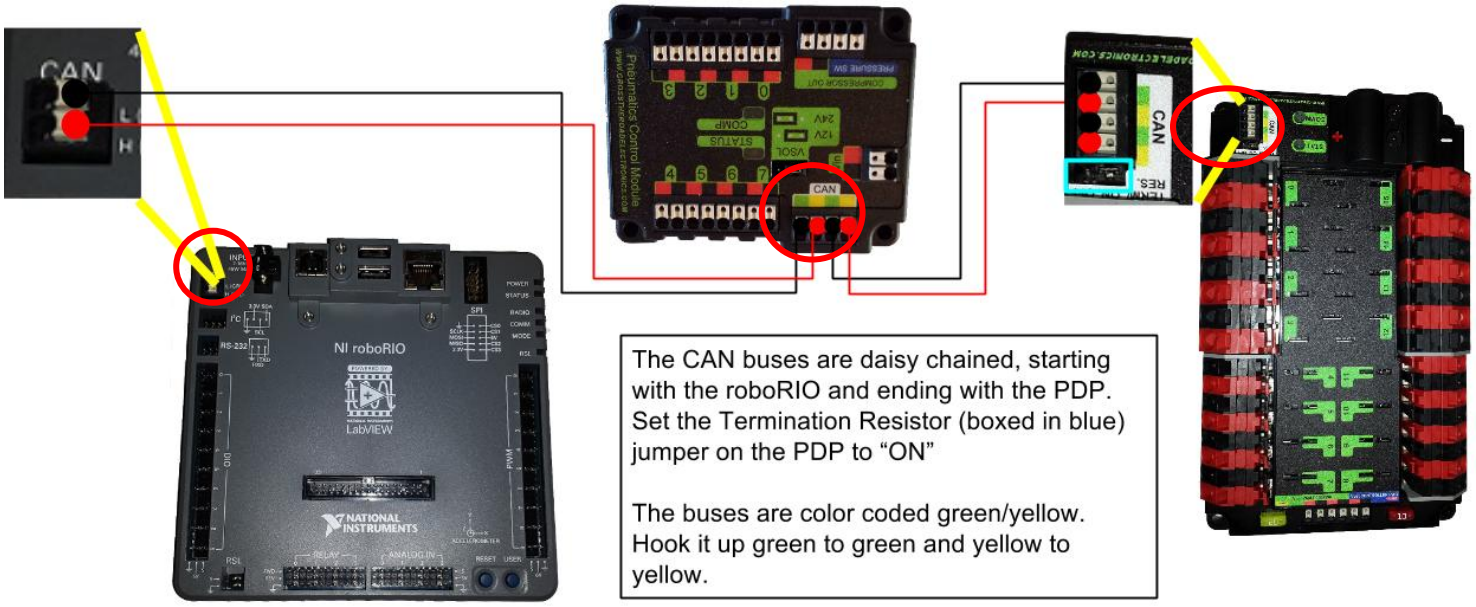


The last element of the CAN bus is the Power Distribution Panel(PDP), which is used to distribute power from the 12V battery to all other robot components used in FRC competition robots. The Power Distribution Panel provides dedicated 12V connectors for the roboRio, Voltage Regular Module, and Pneumatics Control Module. It also provides a CAN interface to detect temperature as well as battery voltage being used. When wiring the CAN interface into the Power Distribution Panel, be sure to turn the terminator resistor to the ON position if you place the PDP in the last position of CAN bus. However, if you chose to place it in the middle of the roboRio and the Pneumatics Control Module, move the jumper to the "OFF" position and place your own terminating resistor at the end of your CAN bus. Finally, before connecting the PDP to the motor controllers, you must first put 40Amp circuit breakers into the corresponding sections to connect with the talons and sparks.

Motor Controller-Talon SRX

Each Talon SRX in FRC control system is a motor controller that prevents the overuse of each motor. When setting up the motors, you must line them up in a row and connect each controller to the one beside it. The male ends attach to female ends. Once you connect the male and female ends, pull tightly to ensure the ends are secure and will not fall out during competition. Label each controller with a number and also label each motor with a number. This way, if we happen to have an issue with the interface down the road, it is easier to determine which motor, or controller is the main cause of the problem. Once you are sure of the location of each component in the system, secure them to the belly pan of the robot.

Electrical CAN bus Overview



Finally, you have succeeded at wiring each unique part in the electrical FRC system. Here is an overview of the system and how it works. First, the CAN bus begins at the roboRio. Next, the CAN bus travels to the Pneumatics Control Module. After that, It is wired into each Talon SRX used, depending on the motors, the numbers will differ. Finally, you connect the CAN bus to the Power Distribution Panel, and be sure to put the terminator resistor to “ON”. Once the whole system is put together, pull tightly on each connector and terminal to be sure the wires are secure. Once you are finished connecting each part together, test the system in order to see if it is functioning properly or not.

Electrical Checklist

Power Distribution Panel

o	Vbat controller PWR (Black)	Roborio
o	Vbat controller PWR (Red)	Roborio
o	Vbat VRM (Black)	Voltage Regulator Module
o	Vbat VRM (Red)	Voltage Regulator Module
o	Vbat PCM (Black)	Pneumatics
o	Vbat PCM (Red)	Pneumatics
o	CAN Termination Resistor (Yellow)	
o	CAN Terminator Resistor (Green)	
o	CAN Termination Resistor (Yellow)	
o	CAN Terminator Resistor (Green)	

Voltage Regulator Module

o	12Vin (Black)	Power Distribution Panel
o	12Vin (Red)	Power Distribution Panel
o	12V/2A (Black)	Radio
o	12V/2A (Red)	Radio
o	12V/2A (Black)	Open
o	12V/2A (Red)	Open
o	12V/500mA (Black)	Open
o	12V/500mA (Red)	Open
o	12V/500mA (Black)	Open
o	12V/500mA (Red)	Open
o	5V/2A (Black)	Raspberry Pi
o	5V/2A (Red)	Raspberry Pi
o	5V/2A (Black)	Open
o	5V/2A (Red)	Open
o	5V/500mA (Black)	Open
o	5V/500mA (Red)	Open
o	5V/500mA (Black)	Open
o	5V/500mA (Red)	Open

RoboRio

- CAN Termination Resistor (green)
- CAN Termination Resistor (yellow)

Pneumatic Control Module

CAN Termination Resistor (green)	
CAN Termination Resistor (yellow)	
CAN Termination Resistor (green)	
CAN Termination Resistor (yellow)	
Solenoid Channel 0 (black)	Solenoid Block
Solenoid Channel 0 (red)	Solenoid Block
Solenoid Channel 1 (black)	Solenoid Block
Solenoid Channel 1 (red)	Solenoid Block
Solenoid Channel 2 (black)	Solenoid Block
Solenoid Channel 2 (red)	Solenoid Block
Solenoid Channel 3 (black)	Solenoid Block
Solenoid Channel 3 (red)	Solenoid Block
Solenoid Channel 4 (black)	Solenoid Block
Solenoid Channel 4 (red)	Solenoid Block
Solenoid Channel 5 (red)	Open
Solenoid Channel 5 (red)	Open
Solenoid Channel 6 (red)	Open
Solenoid Channel 6 (red)	Open
Solenoid Channel 7 (red)	Open
Solenoid Channel 7 (red)	Open
Compressor Output (black)	Air Compressor
Compressor Output (red)	Air Compressor
Pressure Sw. (Black)	Pressure Switch
Pressure Sw. (Red)	Pressure Switch
Vin (Black)	Power Distribution Panel
Vin (Red)	Power Distribution Panel

CAN and Solenoid Blocks (20AWG)
Compressor Output (16AWG)
Other (18AWG)

About the Electrical Checklist

The electrical checklist above was created to make it more efficient to trace your steps when tinning or crimping all wires in the system, besides the PDP(power distribution panel). First, when tinning the wires, you heat the soldering iron up to roughly 800 degrees. You then take a decent piece of the tin spool and touch it to the tip of the solder iron. This allows the tin to conduct easier through the wire. You then place the iron on the underside of the wire and heat it up thoroughly. Finally, you put the piece of tin on top of the wire and melt enough tin onto it to provide a coating on the wire. You fully coat the wire in tin to prevent the wires from fraying and falling out of the terminal. Next, you also have the possibility of crimping ferrules to the exposed wires. First you have to determine which ferrule is the appropriate size for the wire being crimped. The list of these is printed directly at the bottom of the last page. After you find the right size ferrule, adjust the piece to be level with the end of the wire. Finally, use the ferrule crimper and crimp the ferrule all the way down until the last click to ensure security. The last step to this process is inserting the finished wire into the terminal and pulling to be sure the wire is tight and won't move during competition.