Wiring and Connector Standards

GT Off-Road Racing | Data Acquisition

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06/14/2021

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# Overview

## Introduction

# Wiring Standards

## Connector genders between electrical components

All connectors attached to an electrical component/system (PCB, battery, sensor, etc.) from components are male.

[Add analogy about islands and bridges]

All bridging cables/wires are female.

Diagram

Description automatically generated

Figure 1: High-level overview of electrical wiring

## Securing wires

Wires are secured to the car by zip ties. The zip ties typically go through mounting tabs on the car, but can also go around the chassis frame.

# Connector Pinout Standards

## Introduction

A few key rules:

* If a custom color/pin pattern is used, include the connector diagram and pinout table in the relevant project’s documentation.

## XT30

A picture containing music, whistle, kazoo, pipe

Description automatically generated

|  |  |
| --- | --- |
| Female | Male |

Figure 2: XT30 Connectors

#### Power

|  |  |  |
| --- | --- | --- |
| **Pin** | **Color** | **Description** |
| + | Red | Power |
| - | Black | Ground |

## Molex Micro-Fit 3.0

### 2-pin

A picture containing electronics, adapter, projector

Description automatically generated

|  |  |
| --- | --- |
| Female | Male |

Figure 3: Micro-Fit 2-pin connector

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Other  |  |  |  | | --- | --- | --- | | **Pin** | **Color** | **Description** | | 1 | Red |  | | 2 | White | Ground | |  |

### 3-pin

A picture containing electronics, battery, adapter, projector

Description automatically generated

|  |  |
| --- | --- |
| Female | Male |

Figure 4: Micro-Fit 3-pin connector

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Signal  |  |  |  | | --- | --- | --- | | **Pin** | **Color** | **Description** | | 1 | Red | Power | | 2 | White | Signal | | 3 | Black | Ground | | Other  |  |  |  | | --- | --- | --- | | **Pin** | **Color** | **Description** | | 1 | Red |  | | 2 | White |  | | 3 | Black |  | |
| Serial or UART (for self-powered systems)  |  |  |  | | --- | --- | --- | | **Pin** | **Color** | **Description** | | 1 | Red | TX or RX | | 2 | White | TX or RX | | 3 | Black | Ground | |  |

### 4-pin

A picture containing electronics, adapter

Description automatically generated

|  |  |
| --- | --- |
| Female | Male |

Figure 5: Micro-Fit 4-pin connector

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| I2C  |  |  |  | | --- | --- | --- | | **Pin** | **Color** | **Description** | | 1 | Red | Power | | 2 | Green | I2C Data (SDA) | | 3 | White | I2C Clock (SCL) | | 4 | Black | Ground | | Serial/UART (for downstream devices that require a power source)  |  |  |  | | --- | --- | --- | | **Pin** | **Color** | **Description** | | 1 | Red | Power | | 2 | Green | RX or TX | | 3 | White | RX or TX | | 4 | Black | Ground | |
| Strain Gauge PCB Input  |  |  |  | | --- | --- | --- | | **Pin** | **Color** | **Description** | | 1 | Red | Power | | 2 | Green | A+ | | 3 | White | A- | | 4 | Black | Ground | | Strain Gauge PCB Output Signal  |  |  |  | | --- | --- | --- | | **Pin** | **Color** | **Description** | | 1 | Red | Power | | 2 | Green | Vout | | 3 | N/A | N/A | | 4 | Black | Ground | |
| Aux DAQ Serial (RX/TX)  |  |  |  | | --- | --- | --- | | **Pin** | **Color** | **Description** | | 1 | Red |  | | 2 | N/A |  | | 3 | White |  | | 4 | Black | Ground | | Dashboard Serial (RX/TX)  |  |  |  | | --- | --- | --- | | **Pin** | **Color** | **Description** | | 1 | Red | Aux DAQ TX | | 2 | N/A |  | | 3 | White | Aux DAQ RX | | 4 | Black | Ground | |
| Other  |  |  |  | | --- | --- | --- | | **Pin** | **Color** | **Description** | | 1 | Red | Power | | 2 | Green |  | | 3 | White |  | | 4 | Black | Ground | |  |

### 6-pin

A picture containing electronics

Description automatically generated

|  |  |
| --- | --- |
| Female | Male |

Figure 6: Micro-Fit 6-pin connector

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SPI  |  |  |  | | --- | --- | --- | | **Pin** | **Color** | **Description** | | 1 | Red | Power | | 2 | Green | MOSI | | 3 | Blue | MISO | | 4 | Orange | Serial clock (SCK) | | 5 | White | Chip select (CS) | | 6 | Black | Ground | | Other  |  |  |  | | --- | --- | --- | | **Pin** | **Color** | **Description** | | 1 | Red | Power | | 2 | Green |  | | 3 | Blue |  | | 4 | Orange |  | | 5 | White |  | | 6 | Black | Ground | |

## Weather-Pack

### 2-pin

A picture containing toy, projector

Description automatically generated

|  |  |
| --- | --- |
| Female | Male |

Figure 7: Weather-Pack 2-pin connector

Li-Po Batteries

|  |  |  |
| --- | --- | --- |
| **Pin** | **Color** | **Description** |
| 1 | Black | Ground |
| 2 | Red | Power |

## Molex Squba

### 3-pin



|  |  |
| --- | --- |
| Female | Male |

Figure 8: Molex Squba 4-pin connector

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| I2C  |  |  |  | | --- | --- | --- | | **Pin** | **Color** | **Description** | | 1 | Red | Power | | 2 | White | Signal | | 3 | Black | Ground | | 4 | N/A | Plugged shut (waterproof) | |  |

### 4-pin

A picture containing gear

Description automatically generated

|  |  |
| --- | --- |
| Female | Male |

Figure 9: Molex Squba 4-pin connector

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| I2C  |  |  |  | | --- | --- | --- | | **Pin** | **Color** | **Description** | | 1 | Red | Power | | 2 | Green | I2C Data (SDA) | | 3 | White | I2C Clock (SCL) | | 4 | Black | Ground | |  |

## Metri-Pack

### 3-pin



|  |
| --- |
| Female |

Figure 10: Metri-Pack 3-pin connector

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Signal  |  |  |  | | --- | --- | --- | | **Pin** | **Color** | **Description** | | A | Red | Power | | B | Black | Ground | | C | White | Signal | |

# References

# Revision History

9/16/2021 (Ryan Chen) – Created high-level wiring standards for electrical systems/PCBs on the car. Inserted pictures of pins and empty tables of pinout diagrams for connectors.

5/15/2022 (Ryan Chen) – Added Squba and Metri-Pack information