

# **John Deere XUV Gator 850D Robot Documentation**

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# 1 The Electrical System

The electrical system consists of two parts: the power distribution system and signals. Each will be discussed in the following sections. Wiring diagrams are provided in Appendix.

## 1.1 The Power Distribution System

### 1.1.1 Power Supplies

Power to the entire system comes from the 3-prong plug running through the PVC pipe fixtures on the driver's left side of the electronics box.



Figure 1: The power strip on the side of the electronics box

The 3-prong plug attached to the power strip plugs into building power when the vehicle is in the Large Project Building and supplies power to the power strip mounted on the wall of the electronics box on the driver's left side. Alternatively, during operation, the 3-prong plug is plugged into a Honda EU2000i generator that should be mounted in the back of the vehicle:

Power to the rest of the system is then drawn from that power strip. The

devices plugged into that power strip are shown in the diagram below:

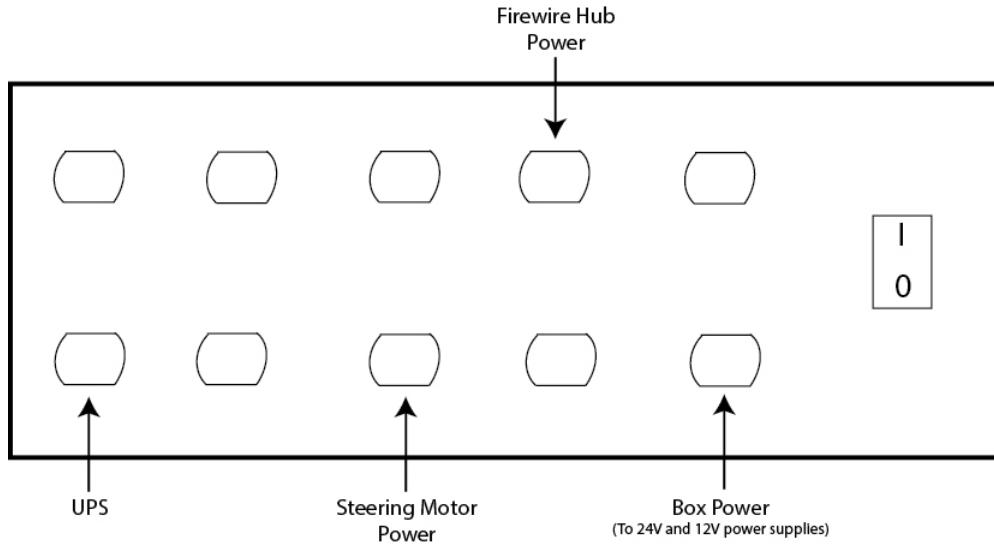


Figure 2: Drawing of devices plugged into the power strip

The entire system has 3 voltages that powers everything: 5 volts, 12 volts and 24 volts:

1. A Meanwell HRP-600-24 converts 120V AC power from the power strip to 24V DC power
2. A Meanwell HRP-300-12 converts 120V AC power from the power strip to 12V DC power
3. A Meanwell SB-15B-05 converts 24V DC power from the 24V DC power supply to 5V DC power

The 24V and 12V power supplies are located on the lower deck of the electronics enclosure and the 5V power supply is located on the upper deck.

### 1.1.2 Fuses

There are 4 main fuse blocks used on the vehicle to distribute power via fuses to all electronic devices on board:

1. 1 Blue Sea Systems fuse block (C24) handles all 24V power distribution
2. 2 Blue Sea Systems fuse blocks (C12 and M12) handle all 12V power distribution
3. 1 linear fuse block handles all 5V power distribution

From the lower deck, three main power busses run to the upper deck: two 24V busses and one 12V bus. One 24V bus runs to the C24 fuse block and the other 24V bus runs to the 5V power supply that converts 24V DC power to 5V DC power. The 12V bus runs to the M12 fuse block. The C12 fuse block is powered from one of the outputs on the M12 fuse block.

### 1.1.3 24V Power Distribution

Five outputs on the C24 fuse block are used:

1. Signal to a 24V sensing probe
2. LIDAR power
3. LIDAR power
4. Navcomm GPS power
5. Safety light power



Figure 3: C24 Fuse Block

Except for the signal to the 24V sensing probe, all of the other 4 lines run to the appropriate equipment outside the electronics box. The signal to the 24V sensing probe runs to the voltage sense project box (discussed in a later subsection).

#### 1.1.4 12V Power Distribution (C12 Fuse Block)

Five outputs on the C12 fuse block are used:

1. Power for the cab fans
2. Signal to a 12V sensing probe
3. INS power
4. Power for ethernet switch
5. E-Stop 12V power

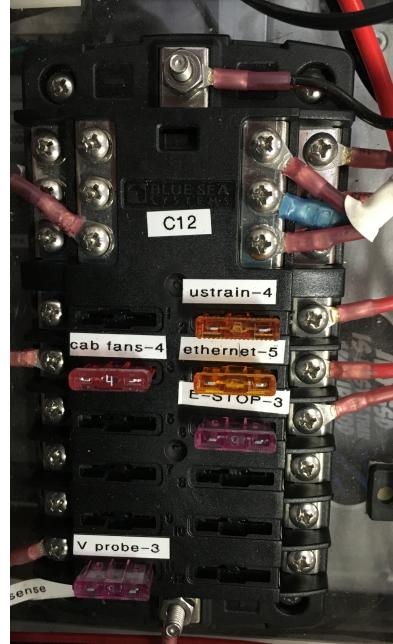


Figure 4: C12 Fuse Block

Power for the cab fans and INS power run to the appropriate equipment outside the electronics box. The signal to the 12V sensing probe runs to the voltage sense project box (discussed in a later subsection) and power to the ethernet switch runs to the netgear ethernet switch on the back corner of the electronics box on the driver's right side of the vehicle. The E-Stop 12V power is utilized by the E-Stop system, which will be discussed in a later section.

### 1.1.5 12V Power Distribution (M12 Fuse Block)

All six outputs on the M12 fuse block are used:

1. Right tilt unit motor power
2. Power to the C12 fuse block
3. Power to the linear actuators
4. Left tilt unit motor power
5. Box fan power
6. Box fan power

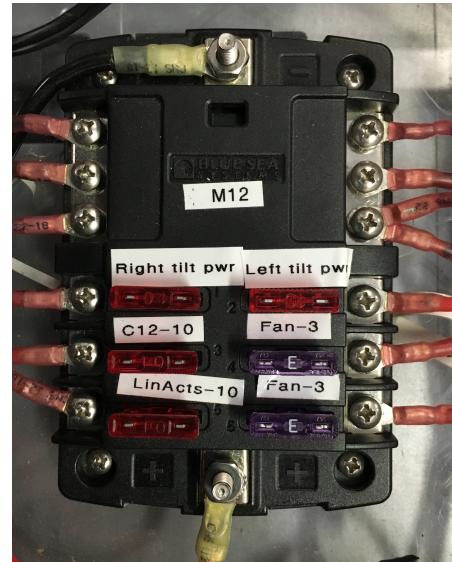


Figure 5: M12 Fuse Block

The power to the C12 fuse block is obtained from the appropriate port on the M12 fuse block. The power to each of the fans mounted to the front of the electronics box that cools the electronics box is also obtained from 2 of the outputs. Power to the right and left tilt units is also drawn from the M12 fuse block outputs and power then runs to the appropriate equipment outside the electronics box. Finally, the power for the linear actuators runs to an E-Stop relay first, then connected to two fuse terminals on the linear fuse block (discussed on the next page)

### **1.1.6 Linear Fuse Block (Various Power Distribution)**

The four lines on the linear fuse block are:

1. Fuse for motor power coming from the steering motor amplifier headed to the steering motor
2. Fuse for the 5V DC power output from the 5V DC power supply headed to the 5V DC power terminal strip
3. Two fuses to distribute 12V power from the E-Stop relay to the gas and brake linear actuators



Figure 6: Linear Fuse Block

### **1.1.7 5V DC Power and Ground Terminal Strips**

There are two terminal strips that serve as busses for 5V DC power and ground. The 5V DC power is used for:

1. Both commfronts that process serial signals from the LiDARs
2. To steering encoder
3. To cabin 5 volts
4. Signal to a 5V sensing probe

The ground terminal strip is used for:

1. Ground connection for the E-Stop magnet coil
2. Ground to the 5V sensing probe
3. Ground to the E-Stop relay