

# Section 5.1

---



## Electrical Systems - Machine Electrical System

Electrical System Components Diagram .....	5.1.2
Electrical System Components .....	5.1.3
IQAN System Components .....	5.1.4
Engine Electrical Load Center: Engine Electrical Load Center Components and Fuses .....	5.1.6
Main Electrical Load Center: Accessory Connector .....	5.1.6
Main Electrical Load Center Fuse Legend .....	5.1.7
Main Electrical Load Center Components .....	5.1.7
Master Disconnect Switch (Battery) .....	5.1.8

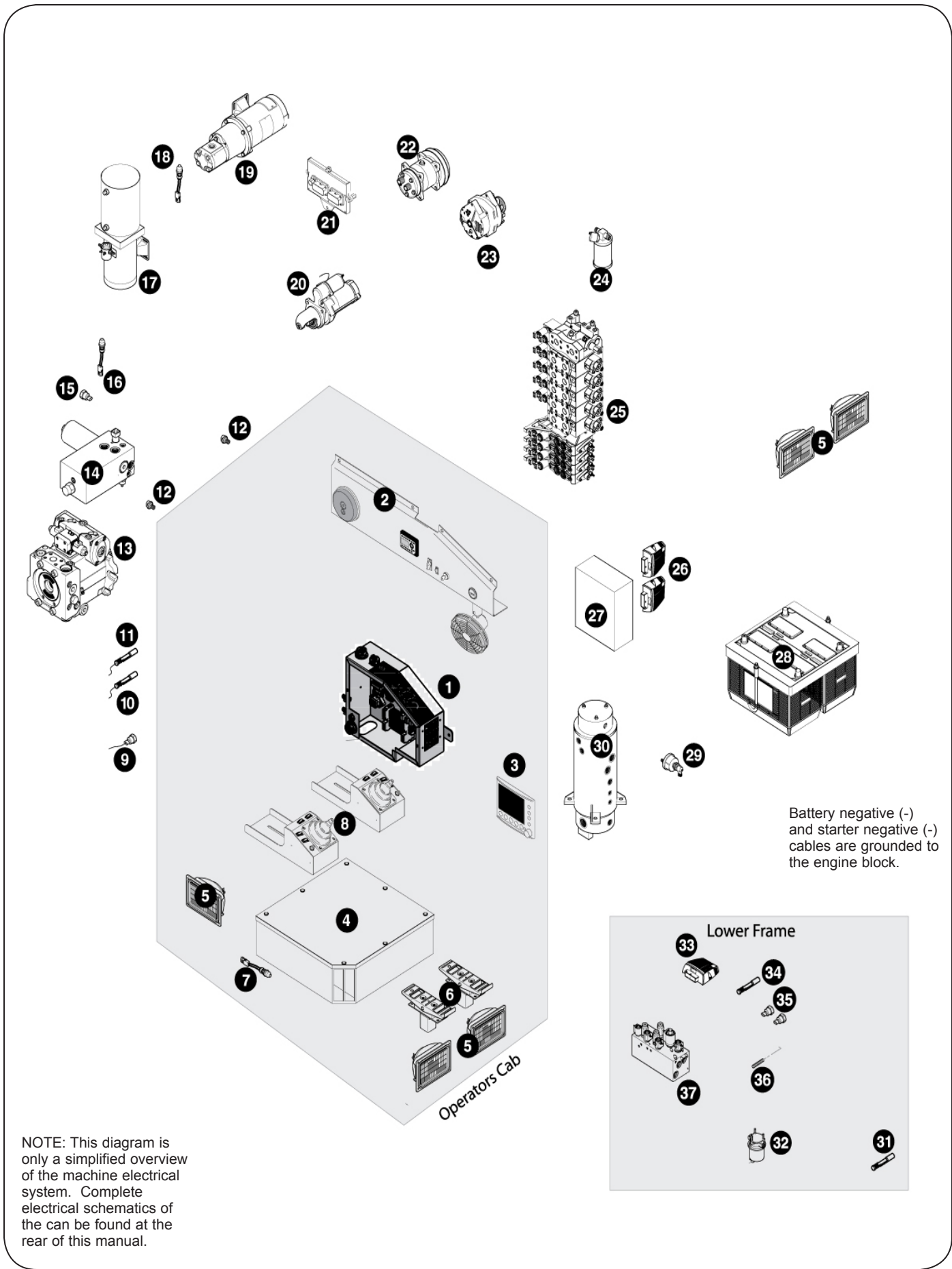


Figure 1: Simplified Machine Electrical Layout

# Machine Electrical System Components

The following are items that are required for the base machine operation.

- 1) **The main electrical load center:** This is the heart of the machine's electrical system. The load center consists of fuses, relays, and harness connection points. The load center also serves as a control panel for the A/C and Heater system.

Also located inside the main electrical load center is an auxiliary connection point to supply 12 or 24 volt power for other electrical items such as CB radios, GPS systems, or harvester computers.

(See figure 3 and 4 later in this section for a complete breakdown and fuse legend of the main electrical center).

- 2) **The dash panel:** This panel contains the radio controls, light switch, key switch, vaccum / vent switch and hour meter. The dash panel is connected to the main electrical load center.
- 3) **The IQAN MDL display** is the brains of the IQAN digital control system. The MDL contains the computer and program that determines how the control system responds to the operator's input.

**The MDL performs many auxiliary functions also:**

- A) Serves as a system monitor and can be programmed to display various system variables like engine RPM, hydraulic oil temperature, and engine information.
- B) The MDL also monitors the control system inputs from joysticks, foot pedals, sensors, and the engine ECU. It then uses this information to control outputs to the engine, valves, and pumps.
- C) It is the interface when uploading and downloading programs or attaching a laptop computer for advanced system troubleshooting.

- 4) **The A/C and Heater system:** this is a large box located under the operators seat. This box preforms two functions. One, as a place to store some of the components of the climate control system (fans, evaporator and heater coils). Two, to offer a riser platform for the operator's seat.

- 5) **Halogen lights or Optional Xenon HID lights.**

- 6) **Track drive pedals:** The pedals are located inside the front of the operator's cab. The foot pedals are a voltage input to the IQAN control system and is a dual axis proportional control.

- 7) **The cab door interlock switch:** This is a normally-open switch that acts as a sensor that won't allow the operator to arm the IQAN system unless the cab door is closed.

- 8) **Joystick Control Panels:** The joystick control panels each consist of a joystick, upper handle and various control switches to operate the machine.

The upper handle contains six push button switches and a trigger switch. The push button switches are ON/OFF except the two most outboard positions (grey switch boot) which are proportional. The trigger switch is also proportional.

The lower joystick body is a two-axis control with a centered, neutral position. Control movement along both axis is proportional.

The control switches located around the lower joystick are all inputs into the IQAN system and are better explained in the Machine Operation section of this manual.

- 9) **Hydraulic Oil Reservoir Temperature Sending Unit:** This sending unit is an input for the IQAN system. The sending unit lets the IQAN system know what the oil temperature is and restricts the output signals the valves and pumps when the oil is too Hot (Above 190°F(88°C)) or when the oil temp is to cold (Below 50° (10°)).

- 10) **Low Hydraulic oil level switch:** The low hydraulic oil switch senses a dangerously low oil level in the hydraulic oil reservoir. It will display a red warning icon on the MDL screen and also

turn on the warning siren to alert the operator of a dangerously low hydraulic oil condition.

- 11) Fill Hydraulic oil level switch:** The fill hydraulic oil level switch alerts the operator when the hydraulic oil reservoir is getting low and needs to be re-filled. A yellow warning icon will be displayed on the MDL screen.
- 12) Hydraulic filter pressure switches:** These two switches monitor the return hydraulic oil pressure. The MDL will display a yellow warning icon if the return pressure is too high and the filters are in need of replacement.
- 13) Wheel Drive Pump:** The wheel drive pump has two 24 volt proportional coils that are controlled by the IQAN system. One coil is for forward travel and the other is for reverse travel.
- 14) Fan / Charge system control valve:** The fan drive and charge system control valve takes care of controlling the radiator, hydraulic oil cooler fan motors and the track drive charge oil system. The valve manifold also contains the charge system filter bypass switch and charge system heater circuit. The charge filter bypass switch will display a yellow warning icon on the MDL screen to alert the operator when the charge system filter needs to be replaced.
- 15) Hydraulic pressure sensor:** This pressure sensor can be used to monitor hydraulic pressures by connecting it to any one of the gauge ports located on the gauge port manifold.
- 16) The engine door interlock switch:** This is a normally-open switch that acts as a sensor that won't allow the operator to swing the cab until the engine door is closed. It will also alert the operator by displaying a message on the IQAN MDL screen if the system is armed and the door is still open.
- 17) Engine door lift pump.** The engine cover power unit supplies hydraulic power to the engine cover open and close cylinder. The controller for this pump is located inside the operator's cab near the door.
- 18) Hydraulic Fill Pump Switch:** This switch controls the hydraulic fill pump. The key switch inside the operator's cab needs to be "on" for the fill pump to work.

**19) Hydraulic oil fill pump:** The fill pump unit serves two different functions on the machine. The first thing is it can be used to re-fill the hydraulic oil reservoir. (See section 3.2) The second use is to circulate the pump drive gearbox oil through the small oil cooler located on the front of the radiator.

**20) Engine Starter Motor:**

**21) Engine ECU (computer):** The engine ECU is the computer module that controls the engine. All engine sensors communicate to the ECU. The ECU also communicates to the IQAN MDL and will send engine information and error codes to the MDL that can then be displayed.

**22) Air Conditioning compressor unit:**

**23) Alternator**

**24) Binary switch:** The binary switch monitors the A/C system pressure and vacuum and controls the A/C compressor clutch.

**25) The VOAC main control valve:** Each valve section has two proportional solenoids (one for each work port). The solenoid coils are energized by a Current or PWM output from the IQAN control system.

**26) IQAN XA2 Module:** The IQAN XA2 control modules is what takes care of all the inputs and outputs of the IQAN control system. These modules work together with the MDL screen to control all of the pump and valve signals that control the machine.

The modules receive incoming signals from control input devices (ie: joysticks) and various sensors (ie: hydraulic oil temperature sensor) and send them to the Master Display Module (MDL) for computer processing.

Upon receiving command signals from the MDL, the switching modules regulate either a digital ON/OFF or a proportional control signal out to the solenoid coils that control the valves, motors and pumps.

**27) Engine compartment electrical center:** The engine compartment electrical center is the main compartment that holds all of the larger system fuses and relays that power the cab

and engine compartment. This control box also houses the fuses for all exterior lights (excluding the cab lights). **(See figure 2 for complete breakdown of engine electrical).**

Major items located in the control box include:

- A) The 100 Amp fuse for the cab electrical load center.
- B) The 100 Amp fuse and latching relay for the Cummins air intake grid heater.
- C) The 100 Amp Alternator charging Fuse.
- D) The 100 Amp fuse for the engine door lift pump.
- E) The 50 Amp fuse and relay for the hydraulic oil fill pump.
- E) The 50 Amp fuse and relay for the engine starter.
- F) 10 amp fuses for exterior lights.
- G) 30 amp engine ECU power fuse

**28) Batteries:** Two heavy-duty, 12-volt batteries are connected in series to power the machine's 24-volt electrical system. The batteries are rated at 1000 cold cranking amps each.

**29) Master disconnect switch:** This switch is provided to allow all electrical power to the machine to be cut-off. The disconnect is located on the positive side of the circuit to protect sensitive computer components in the IQAN digital control system and electronic engine.

## **WARNING**

**It is recommended that the master electrical disconnect switch be turned off during service of the machine and whenever parking the machine for an extended period, such as the end of every work shift!**

**30) Rotary Manifold:** The rotary manifold contains an set of electrical wipers that allow continuous rotation of the cab without disrupting the electrical communication to the lower frame.

**31) Fuel Tank Level Sending Unit:** The fuel tank level sending unit is a voltage input to the lower IQAN XP2 module. The IQAN system controls the YELLOW warning light located in the upper dash. This sending unit warns the operator when the fuel level is at about 15% full.

**32) Fuel Lift Pump:** The lower fuel lift pump is used to help supply fuel from the fuel tank located in the lower frame to the engine. This pump is 12 volt and requires activation from the ignition key switch to turn on.

**33) IQAN Lower XA2 Module:** The IQAN XA2 control modules is what takes care of all the inputs and outputs of the IQAN control system.

**34) High Gear Switch.** The high gear switch is a signal input to the lower XA2 IQAN module. The IQAN system monitors the switch to make sure the gear box is fully in gear.

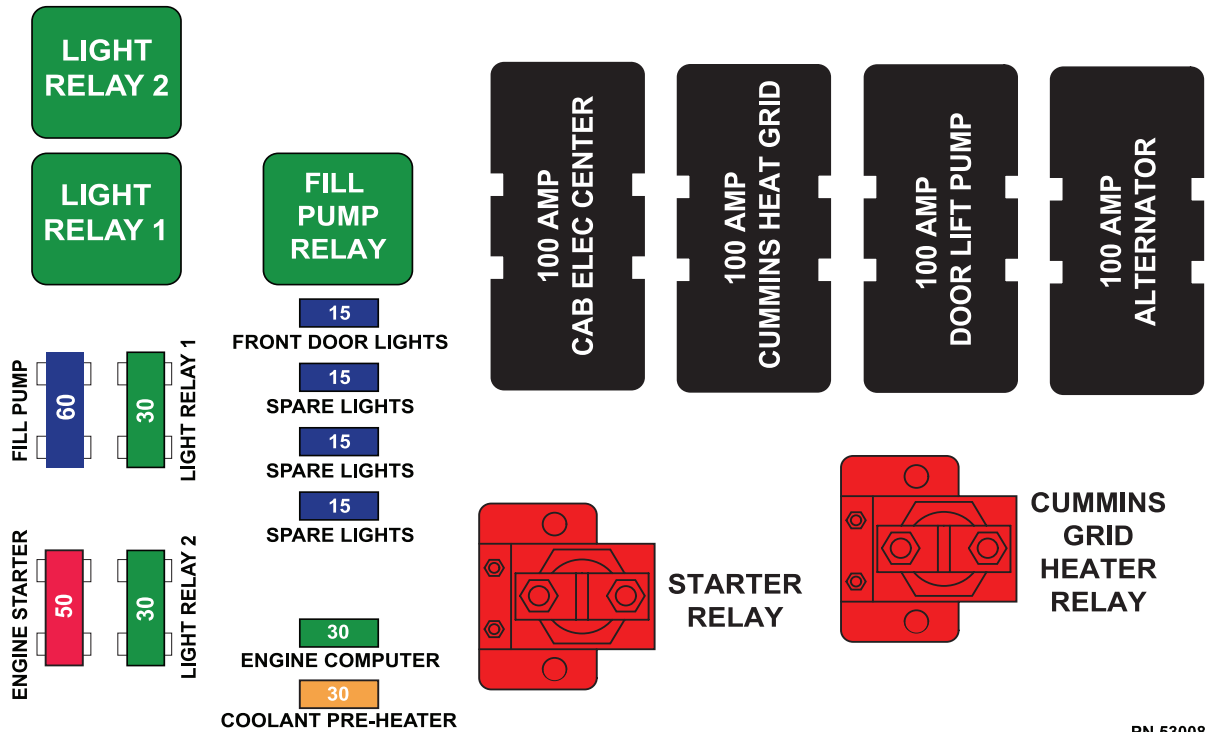
**34) Low Gear Switch.** The low gear switch is a voltage input to the lower XA2 IQAN module. The IQAN system monitors the switch to make sure the gear box is fully in gear.

**36) Gearbox Tach (RPM) Pickup.** The gearbox tach pickup monitors the shaft speed of the hydraulic motor.

**37) Lower Control Manifold.** This manifold is made up of many cartridge valves that are controlled by current and digital outputs from the IQAN XP2 module located in the lower frame. The lower manifold operates things like, Parking Brake, Service Brake, Gearbox Shift, Hydraulic Motor Shift, Differential Lock, and Frame Lock.

# NOTICE

THIS MACHINE IS EQUIPPED WITH A 24-VDC ELECTRICAL SYSTEM.  
ALWAYS REPLACE FUSE WITH THE ONE THAT IS SPECIFIED.



PN 53008

Figure 2: Engine Load Center Fuses and Relays

## Fuses and Relays

The following illustrations show the layout of the fuses and relays that make up the machines electrical system. Always replace fuses and relays with ones that are of the same exact size and rating.

### WARNING

Always replace fuses and relays with ones of the same exact size and rating. Failure to do so could cause major damage to machines electrical system.

## Accessories Connector

The accessories connector is located inside of the main electrical center. This connector is used to for powering auxilary 12 volt accessories such as: CB radios and GPS systems.

The accessories connector also should be used when adding 24 volt accessories such as: Harvester Computers or Saw Control Boxes.

### WARNING

Always use the two pins provided in the accesories connector or the grounding buss bar for grounding any components added to the machine.

### Accessory Connector Pins

Pin #1: 24 vdc battery power - This is a 15 amp circuit used when a constant 24 volt battery power is needed.

Pin #2: 12 vdc switched power - This is a 5 amp circuit that is only active when the keyswitch is in the "ON" position.

Pin #3: 24 vdc switched power - This is a 15 amp circuit that is only active when the keyswitch is in the "ON" position.

Pin #4 & 5: Ground - These are the two ground pins in the accesory connector.

Pin #6: 24 vdc Door Safety - The door safety power is a 24 volt 20 amp circuit that is only active when the door is closed and the "arming switch" has been activated.

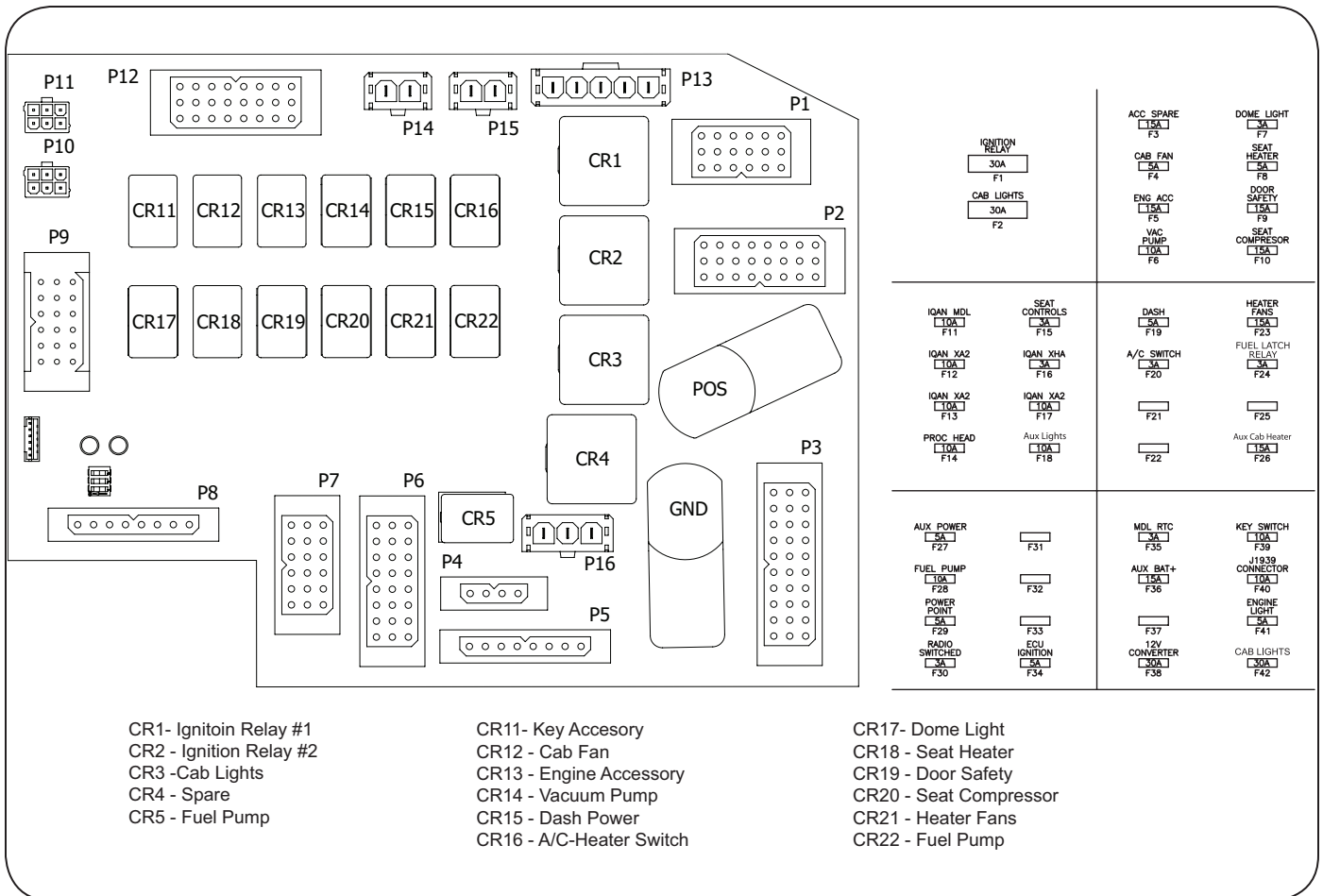


Figure 3: Main Load Center Fuse and Relay Legend

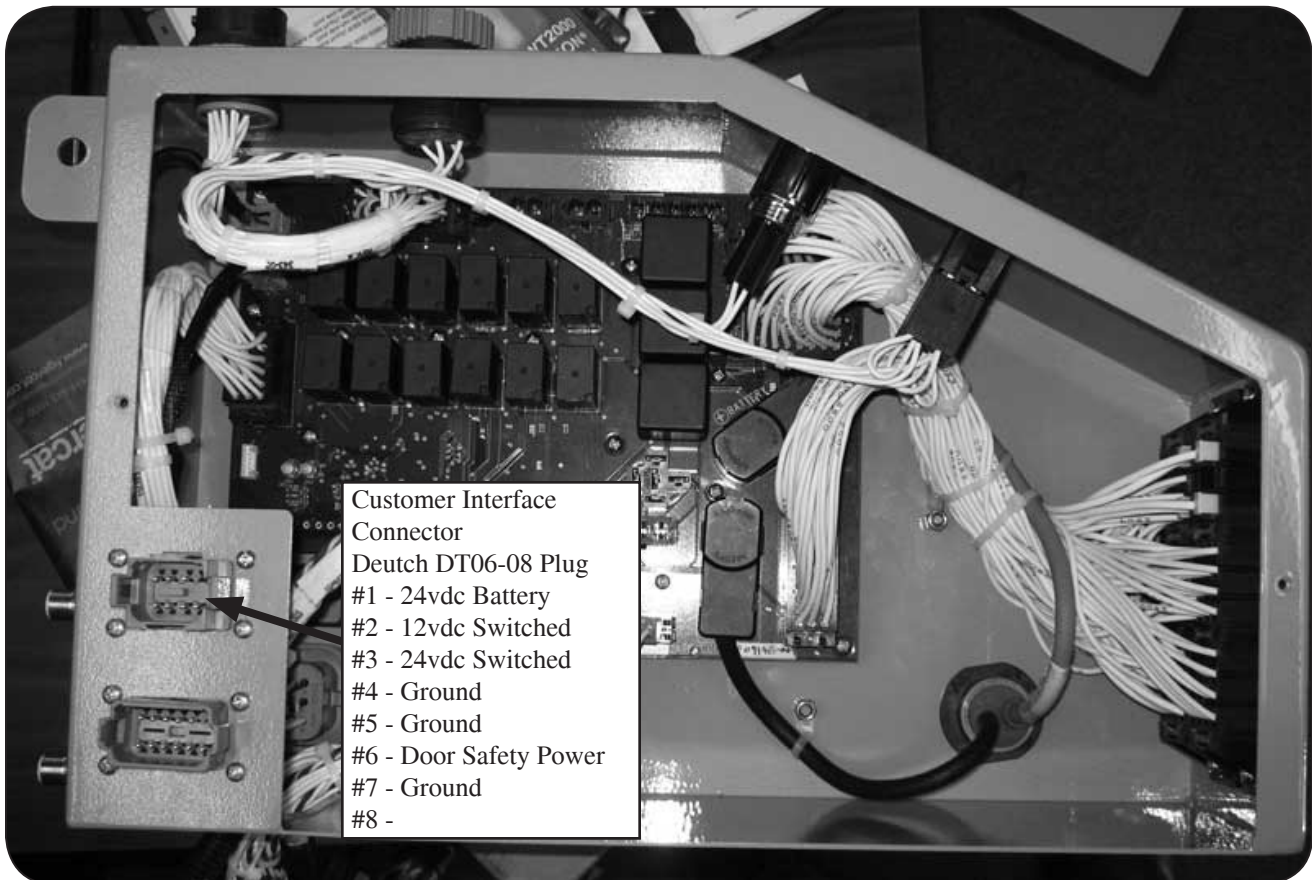


Figure 4: Main Load Center Layout



Figure 4: Main Load Center Layout



## Master Electrical Disconnect

### NOTICE

Do not disable the electrical system when the engine is running. Damage to the engine could result.

The master electrical disconnect switch is located in the front of the upper house near the batteries. It is located under a protective flap. See Figure 5.



**ON** - Turn the switch clockwise to the “ON” position to enable the machine’s electrical system. The master electrical disconnect switch must be in the “ON” position for the engine to start.



**OFF** - Turn the switch counter-clockwise to the “OFF” position to disable the machine’s electrical system.

### ! WARNING

Always disable the master disconnect when charging the batteries to prevent damage to sensitive electrical components.

### ! WARNING

Always disable the electrical system while servicing the machine or when leaving the machine unattended.

### ! WARNING

Always completely disconnect the positive and negative battery cables when welding or using a plasma torch on the machine.

Failure to do so may result in damage to sensitive electrical components