



**FIRE APPARATUS
ELECTRICAL SYSTEM
LOAD ANALYSIS**

KRAKEN POWER LOAD ANALYSIS

ARE YOUR APPARATUS TOOL BATTERIES ALWAYS FULLY CHARGED AND READY? FIND OUT WITH A LOAD ANALYSIS

FOR FIREFIGHTING AND EMERGENCY RESPONSE, OUR #1 GOAL IS BEING PREPARED FOR ANY TYPE OF MISSION. THAT'S WHY WE NEVER STOP TRAINING AND MAKE SURE OUR APPARATUS AND EQUIPMENT IS ALWAYS FULLY READY TO RESPOND TO ANY TYPE OF CALL.

FUEL TANKS AND SCBA BOTTLES ARE ALWAYS 100% FILLED. AND, OUR BATTERY-OPERATED TOOLS LIKE RESCUE TOOLS AND FANS NEED TO ALSO BE FULLY CHARGED. BUT, IN MOST CASES, SHORE POWER AND APPARATUS POWER CAN'T MEET THE ENERGY REQUIREMENTS NEEDED TO FULLY CHARGE THESE NEW GENERATION TOOLS.

KRAKEN'S LOAD ANALYSIS SERVICE PROVIDES THE DATA, INSIGHT AND RECOMMENDATIONS OF YOUR ACTUAL ENERGY NEEDS COMPARED TO HOW MUCH ENERGY IS REQUIRED TO FULLY CHARGE YOUR TOOLS. THIS CUSTOMIZED REPORT CAN GIVE YOUR DEPARTMENT THE COMPLETE CHARGING PICTURE THEY NEED AND PEACE OF MIND, THAT THEY ARE PREPARED FOR ANY MISSION.

To accurately assess the electrical system needs of a fire apparatus, we temporarily install a **Kraken Smart Shunt** to monitor and record **30 days** of history—a good representative period showing how long the apparatus is charging on shore power, at which charge rate, the load on the batteries during engine start up, running, and while on scene.



A shunt is like an electrical flow meter, measuring current (amps) moving into and out of a battery or along an electrical wire.

Often departments acquire battery-powered tools without analyzing the capacity of their apparatus electrical system to keep them charged or understanding the limitations, in time and power, of their shore power connection.

The Kraken Load Analysis can provide your department with a report showing the following:

- 1 AVERAGE TIME ON SHORE POWER**
- 2 CHARGE INPUT TO BATTERIES**
 - FROM SHORE POWER
 - FROM ALTERNATOR
- 3 CHARGE INPUT TO BATTERIES**
 - WHILE ON SHORE POWER
 - WHILE ON CALL

Based on this data, and the additional data from **Kraken Power** showing the typical load required from common battery tools and chargers in the fire service, your department will have a **360o** understanding of your electrical system—now—and how much capacity you need to add

when you decide to electrify your rescue tools, PPV fans, or other high-powered mission critical equipment.

Typical electrical upgrades to better support battery-powered firefighting equipment is a lithium battery, **DC/DC** alternator charger, higher output shore power charger, a properly sized inverter, and a remote battery monitor. All of these components are scalable to meet the electrical demands on your apparatus and to ensure your tools are in-service when needed, regardless of call frequency. You can start small to better support what you have now and upgrade components as you add more battery electric tools, or develop a roadmap for electrification and spec your new build apparatus to support the tools you plan to acquire over the next **5+ years**.



KRAKEN POWER LOAD ANALYSIS

UNDERSTANDING BATTERIES

Batteries are like a fuel or water tank. You keep them filled so you have the resource when you need it. Upgrading at least one of your lead acid batteries to lithium gives you a bigger electrical tank to charge at the station and bring with you while you're out on a call. When you need to plug something in, whether a corded tool or battery charger, you have the energy you need to quickly and immediately operate and recharge without running the engine or waiting for a shore power connection.

CHARGING

On a fire apparatus, batteries are charged from both engine alternator and from shore power via installed **AC/DC** charger.

Alternators are often **>300A** and directly connected to your standard lead acid batteries, which are able to charge—most of the way—at these high currents. **Lithium** batteries require current regulated **DC/DC** chargers to protect battery from damage.

When connected to shore power, your **AC/DC** charger will recharge your batteries. If using batteries with inverter, it is recommended to split battery bank into two—starting and accessory banks. **Kraken** chargers and combis (charger/inverter) can

charge up to three battery banks from a single unit. As you add more battery electric tools and expand your lithium accessory bank, you must charge faster (i.e. higher amps) because you are still limited to the same average station time. **Kraken** chargers are available up to **160A**.

LIMITATIONS

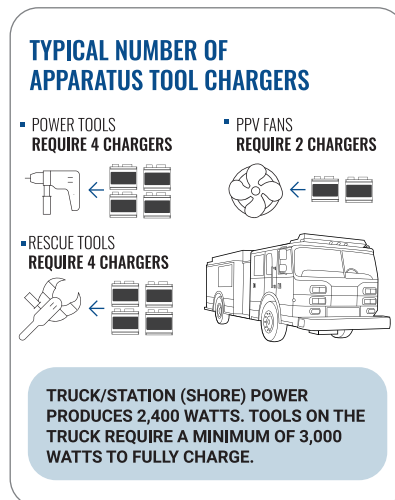
Shore power is **120V/20A**, which allows for **2,400 W** of power. Common **AC/DC** battery chargers in the fire service require **400W**. The average tool charger requires **300W**. This limits your department to six or less tool chargers.

battery power and inverter for tool charging is preferred.

CONTINUOUS ON-BOARD AC POWER

When acquiring battery electric tools, you'll have a choice between **AC or DC** battery chargers. **DC** chargers do not require an inverter, which sounds convenient, but because of their low voltage (**12VDC**) design the charge time will be much longer than **AC** chargers—often more than twice as long.

An inverter allows your battery electric tool chargers to begin charging as soon as a depleted battery is installed. It can take more than **3 hours** to fully charge, which is far longer than the average fire apparatus is connected to shore power. To keep your critical tools in-service, your apparatus needs to deliver continuous on-board **AC** power to allow charging of tool batteries wherever you are.



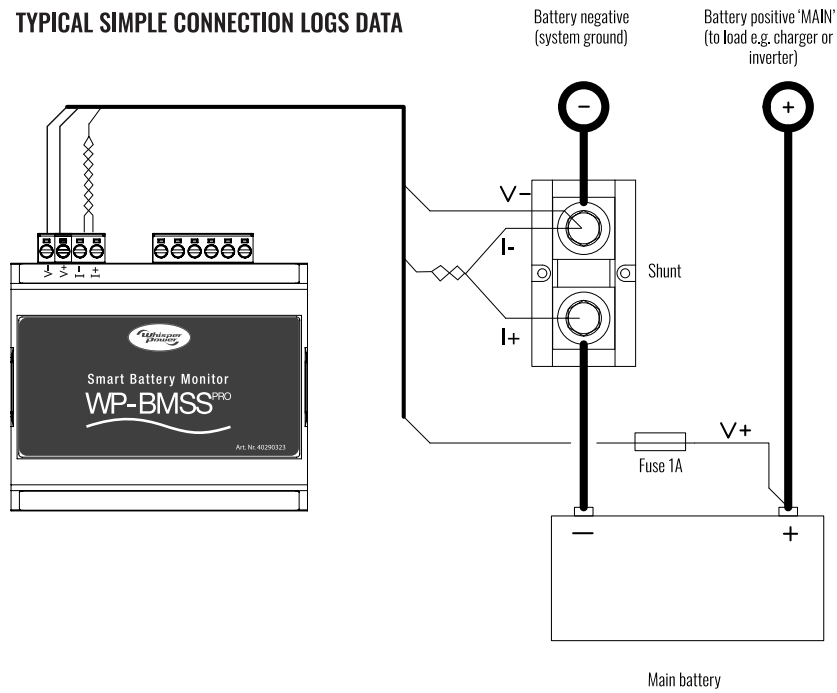
It is very possible that tool chargers alone will push the shore power circuit to its limits, possibly blowing a breaker at the station. This is a core reason why using



KRAKEN POWER LOAD ANALYSIS

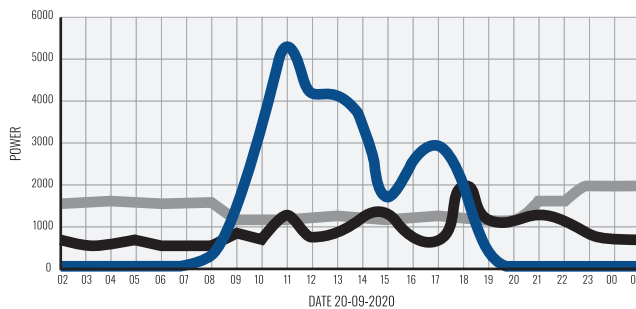
BEFORE YOU PURCHASE AN APPARATUS, GET THE DATA YOU NEED TO FUTURE-PROOF YOUR ELECTRICAL CHARGING NEEDS

TYPICAL SIMPLE CONNECTION LOGS DATA



SAMPLE LOAD ANALYSIS REPORTS

POWER CONSUMPTION ANALYSIS



DEVICE DATA

	26.59 VOLT	-12.2 AMP	-324.3 WATT	97% SOC
	-RPM	-% LOAD	AUTO: ON	STANDBY
	26.58 VOLT	59 AMP	1568.2 WATT	GRID: YES
	234 VOLT	2.9 AMP	678.6 WATT	STATUS: ON
	26.61	24.12	641.8 WATT	PV: 92.31 VOLT



KRAKENPOWER.COM