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Battery Recommendations for Field Use of Analyzers

Summary and Relevance

This document can be used as guidance when running a Picarro CRDS analyzer without line power. At just 60 pounds (27.2 kg), Picarro analyzers are easily deployed to remote field locations. However, Picarro analyzers require a consistent source of power over extended periods of time. When line or generator power is not practical, the analyzer can be run using a battery and inverter.

Battery Selection

For this application, **deep cycle battery** is recommended. A deep cycle battery is designed to (i) provide a steady amount of current over a long period of time, and (ii) be completely and repeatedly discharged. As a battery is cycled (charged and discharged), the internal lead plates are stressed and begin to corrode. A car battery is designed to deliver a large amount of current for a very short amount of time, and then be immediately recharged. To accomplish this, they are made with very thin plates to maximize surface area and hence maximize surge output. However, if a car battery is allowed to "deeply" discharge these plates are quickly eroded and the battery will fail. In contrast, a deep cycle battery is made with thick, durable plates, and can be cycled hundreds of times.

While car batteries may be rated in Cold Cranking Amps (CCA), this measurement is not helpful for deep cycle batteries. Instead, deep cycle batteries are rated for Reserve Capacity (RC), the number of minutes that a battery can deliver 25 amps while keeping its voltage above 10.5 volts. Our system setup requires a minimum of 50 minutes RC.

A second consideration is run time. Picarro analyzers, after startup, require approximately 110 W and an analyzer pump requires 35 W. For a 12 volt battery this translates to 12 amps (Current = Power / Voltage) which is conveniently half of the amperage used to calculate RC. So for a ballpark runtime figure simply double the reserve capacity. This is an estimate for a variety of reasons: instrument startup requires more power, inverters are not 100% efficient, and a slow discharge is more efficient than a fast discharge (a battery that can discharge for 50 minutes at 25 amps can discharge for *more* than 100 minutes at 12.5 amps).

Some high-quality deep cycle battery manufacturers include Lifeline Batteries and Rolls-Surrette, which is marketed in the US as Rolls Battery and internationally as Surrette Battery. They can be found at:

http://www.lifelinebatteries.com/

http://www.rollsbattery.com/

Deep cycle battery specifications are listed on Lifeline Batteries' website:

http://www.lifelinebatteries.com/rvdeepcyclebatteries.php

CAUTION!	*Please note, batteries are capable of storing a large amount of energy and it is important to proceed with caution during installation. A short-circuit between power lines can cause the battery to rapidly discharge, potentially causing a battery explosion and damage to the battery and its surroundings, including possible personal injury.*

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Inverter Selection

An inverter is required to convert the battery's 12 volt DC current to 100 to 240 volt AC current. Ensure that you choose a **pure sine wave inverter** rated for at least 500 watts. A pure sine wave inverter will ensure that the AC motor in the pump runs correctly. Inverters run at about 90% efficiency, and will draw power from a battery whenever they are turned on. Be sure to switch them off when not in use.

Additional Components: Chargers, Wiring, and Fuses

Your battery choice will dictate your charging needs. Consult the battery manufacturer for charging recommendations. Incorrect charging can shorten the lifespan of a battery, destroy the battery, or cause a fire.

When connecting the battery to the inverter, use at least AWG 6 gauge copper wire. Some inverters come with spring loaded clamps to connect to the battery; these can slip off and cause the instrument to power down or even cause a short circuit. Always connect the wires with a substantial, ring-type terminal, rather than a temporary clamp.

Additionally, an inexpensive fuse and fuse holder can protect the system from a short circuit and any resulting fire. At the installers own risk, Picarro recommends the following:

Component	**Manufacturer**	**MFG #**
Maxi fuse in-line fuse holder with protective cap	Littelfuse	0MAH0001Z
FK3 MAXI style blade fuse (40 amps)	Littelfuse	166.6885.5401

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