Criteria for Choosing an Electrofishing Unit

Electrical parameters

Most of these specifications are for control boxes (pulsators)

Operational Characteristics and Capacity: First determine 1) the range of water conductivities that you will encounter and 2) the level of power required for successful electrofishing across water conductivities with a particular gear (use *EF Goal Power* or *Electrofishing with Power*). You'll need to know electrode resistances. Then perform or look-up an output analysis of the gear. In other words, what is the range of water conductivities that can be successfully electrofished with the unit under consideration (do not use conductivity ranges given by manufacturers). A determination of successful electrofishing means that at a given water conductivity and using an effective waveform, you can generate more peak power than you need. The Excel files *Boat Power* and *Backpack* Power can help determine the effective electrofishing range across water conductivities given inputs of equipment specifications and electrode resistance.

Power, maximum output average: backpacks typically are 200 Watt or 400 Watt; control boxes for boat units range from 1700 Watts to 9,000 Watts and more. Higher power capacity can increase the upper range of water conductivities that you can effectively electrofish.

Waveform type: may have one of more of these types- alternating current (AC), direct current (DC), or pulsed direct current (PDC). Having all three options in a control box provides more capabilities for capture and fish trauma control; AC often extends operating range into lower or higher conductivity waters. Some units have a special form of PDC, the gated burst or complex pulse system, primarily used to minimize fish injury potential

Voltage control: Continuous or small increments (e.g., 5 V per selection) desirable; common maximums from 600 V to 1000 V direct pulsed current, up to 700 Vrms (AC); higher voltage can extend effective fishing range into lower water conductivities.

Amperage: peak current typically ranges from 10 amps to well over 75 amps in the high power units; higher amperage capacity can extend effective fishing range into higher conductivity waters.

Frequency: Typically ranges between 7.5 – 120 pulses per second for PDC (50 or 60 Hz typical for AC; best is continuous control from 1 pps to 120 pps; some units go to 1000 pps; higher frequency, at least up to 120 – 150 pps, lower response thresholds (i.e., higher frequency means that less power needs to be applied for a particular capture-prone response); the ability to control frequency enables waveform management to lower fish injury potential.

Pulse width: Units range between less than a millisecond to 10 milliseconds or more; Typical applications use 1 millisecond or more (often up to 4 – 6 milliseconds); pulse width and frequency affect duty cycle.

Duty cycle: Best control is continuous (1% increments) from 1% - 100% (DC); Research has suggested that the optimum range of duty cycle for capturing fish ranges between 10 – 50% so a 50% maximum is sufficient in many cases.

Waveform shape: Shape can vary across models (e.g., capacitor-discharge exponential decay, square, rectified AC); some research on comparison of capture efficiencies and potential for fish injury among different waveform shapes; square waves compared favorably in capture efficiency and lower fish injury and stress levels as well as facilitating accurate metering and description (e.g., duty cycle); square waves can have slanted tops or spikes when under heavy loading, as in high conductivity waters. An operational capacity analysis can indicate how well a unit keeps the waveform shape intact under various levels of loading.

Metering: It is critical to have good peak reading meters; best is a peak reading output voltage meter and a peak output amperage meter; however, either a peak volt or a peak amp meter will allow you to standardize by voltage or amperage (of course, really power); if you have an average reading amperage meter, you'll need a good duty cycle meter or a recently calibrated duty cycle control; assuming that the dialed-in values for voltage is equal to output may be problematic, particularly at high loadings (usually high conductivities); if you don't have metering, calibration of control dials may help.

Electrodes: The design of electrodes is under your control and preferences. For DC or PDC and often AC electrofishing, typically you want the cathode to have larger surface area than the anode. High resistance can limit power output.

Safety features: This is a topic that can be specific to the country or region, depending upon national codes. Features that are standard or desired include an easily-accessible safety (on-off) switch (e.g., mushroom switch), safety switch on hand-held electrode handle (backpacks), foot-activated switch on boats (pedal, mat, or kick-plate); tilt-switches (forward, backward, and/or sideways), and a "power on" light; additional features include an immersion switch (when operator goes down vertically into the water), anode out-of-water switch, battery compartment splash guard, and enunciator ("power on" sound). Other safety issues not considered here are construction standards (wiring capacities, conduet, water-resistant plugs, etc.), clothing, and railings on boats.

Weight: Particularly with backpacks, but also with generators used in shore-based or tow-barge shocking, weight is an important decision criterion. Backpacks vary in weight, due to the gear itself and the battery type and capacity. Batteries increase in weight with amp-hour capacity. Lithium batteries, however, may weigh 55% less than comparable lead-acid batteries.