

MANUAL

VIII-A Backpack



14014 NE Salmon Creek Avenue • Vancouver, WA 98686
Phone: (360) 573-0202 E-mail: sri@smith-root.com
Web site: www.smith-root.com

SMITH-ROOT INC.
TYPE VIII-A ELECTROFISHER
INSTRUCTION MANUAL

Table of Contents

1.0	INTRODUCTION TO ELECTROFISHING	1
2.0	CONSIDERATIONS FOR ELECTROFISHING	2
2.1	INFLUENCE OF RESISTIVITY	2
2.2	EFFECTS OF TEMPERATURE	4
3.0	ELECTROFISHING TECHNIQUES	5
4.0	SAFETY PRECAUTIONS FOR ELECTROFISHING	6
4.1	DO'S AND DON'TS FOR ELECTROFISHING	7
5.0	TYPE VIII-A CONTRCLS AND TERMINALS	8
6.0	OPERATING PROCEDURE	9
7.0	SPECIFICATIONS TYPE VIII-A ELECTROFISHER	12
8.0	WARRANTY	13
9.0	SCHEMATIC DIAGRAM	14

PRINTED IN U.S.A.

1.0 INTRODUCTION TO ELECTROFISHING

For many years it has been known that fish react to electric currents passed through water. These currents either frighten, lead, stun, or kill fish, and it is these aspects that have interested fisheries biologists.

Smith-Root has produced the Type V* Through Type XV electrofishers. Our electrofishers represent the state of the art in design and electronic components. Smith-Root electrofishers are manufactured with the highest quality electronic components and materials available insuring maximum reliability and performance. The following discussion should help you to get the most from your electrofisher.

1.1 OUTPUT PARAMETERS

ALTERNATING CURRENT is a flow of electricity in which the direction of current flow reverses a specified number of times per second.

When a fish enters an A.C. field of sufficient strength, it is stunned and can be easily picked up with a net for examination. There is usually a very strong contraction of the body muscles, which accounts for the rigid condition of the fish when they are picked up. When using alternating current, care must be taken not to use too high a voltage or the larger fish may be killed. The muscular contractions are sometimes so severe that vertebrae are fractured and/or brain damage may occur.

DIRECT CURRENT is a flow of current in one direction only. This flow is from the negative cathode to the positive anode. (electron flow)

The reaction of fish to direct current is quite different from their reaction to alternating current. The first reaction of the fish is to turn toward the positive anode and start to swim toward it. This reaction, known as galvanotaxis, will continue until the fish either reaches the anode or encounters a current sufficiently strong to cause it to turn on its side and become incapable of any further forward movement. This reaction is known as galvanonarcosis. The severe and often harmful muscle contractions encountered with alternating current do not occur and the fish recover much more quickly from a direct current shock.

*Smith-Root Inc. no longer manufactures the Type V Electrofisher.

Thus the mortality rate is much less with direct current than with alternating current. Also, galvanotaxis does not occur with alternating current.

Even greater anode attraction is possible by the use of pulsed direct current. Pulsed direct current is obtained by interrupting a direct current flow with an electronically controlled switch which will give a number of on and off pulses of direct current. Different species of fish differ in the number of pulses per second which will best attract them. Pulse frequency can be important to produce the desired galvanotaxis reaction. Research has also shown that a pulse shape with a fast rise slow decay enhances the galvanotaxis reaction.

2.0 CONSIDERATIONS FOR ELECTROFISHING

The effectiveness of the shocker's output is sometimes altered drastically by environmental and/or biological factors. The power that reaches the fish is greatly effected by the waters parameters and the animals physiological make-up. If these environmental and biological parameters are too far out of line, poor electrofishing will result. Adjustments in the electrofishers output can help to reduce erratic actions and the escape of fish. The following discussion should help to clarify the wide variation of reactions among fish.

2.1 INFLUENCE OF CONDUCTIVITY

The conductivity of the water and of the fish flesh are the main factors that effect electrofishing.

The conductivity of natural water depends on the quantity of dissolved salts and minerals in the water available to carry electric current.

Distilled water is a very good insulator of electric current. If a voltage is applied between two electrodes in distilled water, little or no current would flow through the water and the water would be considered to have extremely low conductivity.

In the past it was customary to talk in terms of volts per inch required to envoke a given response in a fish. From a theoretical standpoint, it is possible to have many volts per inch and not shock the fish at all.

For example, if a fish were placed in distilled water with high voltage applied, no current would flow through the water and hence, no

current would pass through the fish's body even though many volts per inch may be present. What a fish reacts to is the current flowing through its body.

On the other side of the coin if we were able to put a fish in water that had very high conductivity and applied a voltage, a corresponding large current would flow through the water, but negligible current would flow through the fish's body because the electric current would find it much easier to pass through the highly conductive water than through the fish's flesh of medium to low conductivity.

It can be seen from the aforementioned considerations that a fish will receive the maximum shock (current flow) when a voltage is impressed across water having a conductance per cube equal to the conductance per cube of fish flesh.

Generally in lower conductivity, higher voltage is needed in order to get a response from the fish. It also helps to maintain a large cathode while keeping the anode medium size (not over 100 sq. in.). For a given current the smaller anode has a more intense current field near the anode while a large anode distributes the current over a larger area. The Type VIII-A, Type XI, Type XV and Type VI-A have the high voltage necessary for low conductivity use down to about 10 microsiemens/cm³.

In waters of very high conductivity the only solution is to run very heavy current through the water. However, a limit is soon reached where the electrofisher cannot deliver sufficient current to electrofish successfully. The Type IX and the 7.5 GPP have the high current capability necessary for high conductivity use up to about 10,000 microsiemens/cm³.

2.2 EFFECTS OF FISH SIZE

Individual variation is notable among fish even though they are of the same species and have similar lengths. However, The longer the individual of a species, generally, the more sensitive it is to electrical shock. Fish absorb power as a function of body surface area.

2.3 EFFECTS OF TEMPERATURE

Fish flesh has a certain conductivity that increases with increasing temperature. The success of electrofishing may be enhanced or hindered by this effect depending upon whether the water's conductivity is higher or lower than the fish's flesh. If it is in a direction to

cause a closer conductivity match, the fish will receive a greater shock.

Output energies commonly used in electrofishing are capable of killing fish. Mortalities caused by A.C. electrofishing are usually higher than those caused by D.C. or pulsed D.C.. Harmful effects from pulsed D.C. are usually a result of excessive exposure or very intense electrical fields.

** To convert ohms to microsiemens - $\text{microsiemen} = 1(10^6)/(\text{ohm}/\text{cm}^3)$
*** siemen is the internationally used value of conductance - mho=siemen

3.0 ELECTROFISHING TECHNIQUES

One engaged in electrofishing must wade or float, depending upon the depth or swiftness of the water. In suitable waters, the operators wade and can probe the anode into likely fish habitat. Wading upstream eliminates the effects of turbidity caused by bottom sediment. Furthermore, if collections are for food-habitat study, stunned prey are not swept downstream and consumed by predators. If turbidity and predication are unimportant, collections can be made more efficiently and less strenuously when moving downstream. The fish are normally oriented upstream, or toward the descending electrical field, and the shocked fish initially bolt upstream into higher voltage densities, where they are held. Fish that manage to escape are often captured a short distance downstream.

The floating method of electrofishing is used when the stream is too deep or swift to wade. The anode is clamped rigidly ahead of the boat, extending into the water. The cathode is typically clamped to each side of the boat. One man guides the boat with the oars while one or two operators dip fish as the boat drifts with the river.

Collecting can be improved further by introducing the element of surprise through intermittent fishing. The intensity of the anode's peripheral electric energies only frightens fish, causing them to bolt or penetrate deeper into cover. In either situation, chances of capture are reduced. It is better not to move through a body of water with the power continuously on, but rather to fish only in likely habitat. Fish can be extracted from areas of heavy cover or from under shore ice by inserting the anode, turning the power on, and withdrawing the anode slowly and smoothly. Fish follow the anode under the influence of galvanotaxis into the open, where they can be netted. If the stream velocity is appreciable, the electrical power can be left on during floating without loss of efficiency.

Night fishing with lights has proven to be exceedingly productive in lakes. In streams the reflection and refraction of the spotlight beam caused by the ruffled stream surface greatly impairs sighting of the fish. Headlamps are useful for electrofishing when wading at night. For daytime fishing the use of polaroid sunglasses greatly improves locating stunned fish.

4.0 SAFETY PRECAUTIONS FOR ELECTROFISHING

The operator of an Electrofisher must always keep in mind that his chance of receiving an electrical shock is multiplied when dealing with electric currents in or near water more than any other place. Using an electrofisher is like using a firearm, if used properly and with good judgement it is perfectly safe. Have respect for electricity and it is easily controlled, lose respect and you could lose your life.

SMITH-ROOT ELECTROFISHERS HAVE A HIGH VOLTAGE OUTPUT AND CERTAIN SAFETY PRECAUTIONS MUST BE OBSERVED TO PROVIDE SAFE OPERATION AND PREVENT POSSIBLE DANGEROUS ELECTRIC SHOCK.

When operating the Electrofisher NEVER let yourself come in contact with the anode. If it were to happen your body could complete a path for the electric current and a possible lethal shock would result.

The following articles must be worn when using the backpack Electrofisher. They are not just to keep you dry, they are to keep you insulated from the electric currents that may be present.

1. Nonleaking wading boots chest high. If they become wet inside, STOP electrofishing and let them dry out thoroughly. Wet boots can conduct electricity as well as water around them.
2. Nonleaking rubber electricians gloves that reach the elbow or higher. If they become wet inside, STOP electrofishing and let them dry out. Wet gloves conduct electricity.

When boat shocking the following items should be worn to keep you insulated from electric currents that may be present.

1. Nonleaking rubber boots knee high. If they become wet inside dry them out.
2. Rubber gloves for crew members that are operating dipnets or anode assemblies. If they become wet inside dry them out.

4.1 DO'S AND DON'TS FOR ELECTROFISHING

DO - Always make sure that all personnel are clear of the area surrounding the anode before turning on the power. DOUBLE CHECK.

DON'T - Continue to electrofish if your boots or gloves become damp or wet.

DO - Make sure that the anode and cathode electrodes make good connection to the output cable and that both electrodes are in contact with the water.

DON'T - Operate an electrofisher if you have any prior heart ailment history or if you have been under abnormal strain, which may weaken your heart.

DO - Study and know how to administer first aid treatment for electrical shock.

DON'T - Operate an electrofisher without a second person to back you up in case of an emergency.

DO - Wear a floatation device when electrofishing. More than one fisherman has been sucked under by his hip waders.

DO - Remove wristwatch, rings and any other jewelry when handling batteries. A battery is capable of producing very high currents that can severely burn.

DON'T - Smoke or permit flame or spark to occur near a battery at any time, particularly when it is charging.

DO - Take precautions to prevent unqualified personnel from tampering with or attempting to operate the electrofisher.

DO - Have electrical circuits serviced only by qualified technicians.

DO - Disconnect the battery when the electrofisher is not in use.

DON'T - Operate generator without covers or screens. Keep hands, hair, necktie and test leads well away from the flywheel and moving engine parts.

DO - Keep hands and face away from the carburetor when the air cleaner is removed. A sudden backfire can cause serious burns.

DO - !BE CAREFUL!

5.0 TYPE VIII-A CONTROLS AND TERMINALS

The purpose and function of the controls and terminals of the Electrofisher are as follows:

1. BATTERY TERMINALS: Located on 12 volt battery. The red plug connects to the positive terminal and the black plug connects to the negative terminal. BE SURE TO OBSERVE THIS POLARITY OR DAMAGE MAY OCCUR.
2. POWER SWITCH: Located lower right on front panel. This circuit breaker switch controls all the power into the electrofisher. If a short occurs in the unit or if the battery is connected in reverse the breaker will snap off.
3. ANODE CONNECTOR: Located directly below ANODE lettering on front panel lower right. The anode plugs directly into this connector.
4. CATHODE CONNECTOR: Located directly below CATHODE lettering on front panel lower left. The cathode plugs directly into this connector.
5. VOLTAGE SWITCH: Located lower left front panel. This switch selects the output voltage supplied between anode and cathode.
6. FREQUENCY: Located left mid panel. This control adjusts the repetition rate of the output D.C. pulses between the range of 40 to 80 pulses per second.
7. PULSE WIDTH: Located left mid panel. This control adjusts the width of the output D.C. pulses between the range of 4 to 8 milliseconds.
8. OVERLOAD AND RESET: located front panel center. The overload light glows when the overload safety lock out circuit is activated. The lock out circuit is automatically reset when the anode pole switch is released.
9. TIMER AND SWITCH: located right front panel center. This register tallys counts at the rate of one count per second when the timer switch is on and the shockers output is activated.
10. BATTERY VOLTAGE METER: Located top left front panel. This meter indicates the battery voltage when the power switch is in the ON position.
11. OUTPUT CURRENT METER: Located top right front panel. This meter indicates the current passing through the water from cathode to anode.

6.0 OPERATING PROCEDURE

1. After unpacking the dry charge battery, fill with electrolyte solution. Smith-Root doesn't ship electrolyte solution due to shipping regulations. Charge the battery for 8 hours at 3 to 5 amps. Recheck the electrolyte level after charging. Add only distilled water after the battery has once been filled with electrolyte.
2. The gel-cell battery requires no maintenance other than recharging after use. The gell-cell battery should be charged with an automatic battery charger, overcharging with an unregulated charger will shorten the battery's life.
3. Recharge your battery as soon as possible after use. A battery that is allowed to set in a discharged state for too long will lose its ability to be recharged.
4. When the battery is charged, hose it clean with tap water and place in the battery holder. Insert the battery cables into the plugs mounted on the battery terminals.

CAUTION: BE SURE TO OBSERVE POLARITY OR DAMAGE MAY OCCUR TO THE ELECTROFISHER.

Connect the CATHODE plug into the connector mounted directly below the CATHODE lettering on the front panel. If cathode screens are to be used, connect the two clip leads to the two screens supplied. Wrap the two screens around the lower part of your boots and secure. If a cathode pole is used, plug the connector supplied with pole into the connector mounted directly below the CATHODE lettering.

5. Assemble the anode pole and ring. Connect the anode pole plug into the connector mounted directly below the ANODE lettering on the front panel.
6. Set the OUTPUT switch to 200 volts and the PULSE WIDTH and FREQUENCY to minimum. Turn the timer switch on and reset the mechanical register to zero by depressing the reset button. (Do not reset timer while it is counting.)
7. Turn the POWER switch on and observe that the voltmeter indicates 12 volts or greater.
8. Before depressing the anode push-button switch, make sure that the operator is wearing waders and rubber electricians gloves which are dry inside. Check that the cathode is in the water.
9. Place the anode ring in the water making sure that all persons

are well clear of the anode. Depress the anode push-button and observe a 400 HZ tone from the electrofisher indicating the presence of high voltage. The mechanical timer should be counting at the rate of one count per second. The electrofisher is now putting electrical current through the water. If fish are present, they will be shocked and will swim toward the anode ring.

10. If the fish do not seem sufficiently affected, turn up the VOLTAGE and/or PULSE WIDTH.
11. The frequency control may also be adjusted for better response. Small fish are affected by high frequencies while large fish are affected with low frequency settings. It is suggested not to run the PULSE WIDTH and VOLTAGE any higher than necessary to avoid high fish mortality. In general, the less conductive waters will require a higher voltage setting in order to get enough current to flow through the water to sufficiently affect a fish. The converse is true for highly conductive waters. NOTE; The more power you use, the faster the battery will discharge. (POWER=VOLTS X AMPS)
12. If too much power is being drawn from the electrofisher, the overload circuit will lock out. The high voltage will be turned off and the OVER-LOAD lamp will glow. If this does occur, reduce the voltage and/or pulse width. High voltage should resume. If the OVERLOAD locks out again, reduce voltage or pulse width further.-

CAUTION: Do not short the anode to the cathode when high voltage is present or possible damage to the unit may occur.

NOTE: The Electrofisher must be operated within 45 deg. of vertical. The output will be turned off if the electrofisher is tipped more than 45 deg. from its normal operating position. This is a feature added for operator safety.

PACKFRAME:

Description: The packframe used with the Smith-Root Type VII and Type VIII Electrofishers is molded, one-piece, high impact material. It has the lightweight advantage of conventional aluminum packframes plus the frame bends and flexes with your body. Durability is far better as there are no welds or seams to crack. The Type VII now comes with an extra heavy duty packframe.

Adjustments: Molded slots in the frame give over 2000 combinations of upper strap, lower strap, and belt adjustments. To adjust, simply turn the buckles at the end of the upper shoulder straps flat and pull out of used slot. Move to the new slot and push buckle through and turn

cross-wise. On the lower shoulder straps and hip belt straps, the ends are held by retaining pins attached to split rings and chains.

Emergency Packframe Release: If an operator slips or otherwise gets into a dangerous situation and wishes to release the packframe quickly, he needs only to pull on the above mentioned split ring which pulls the retaining pins from the strap ends. The packframe will release immediately leaving only the hip belt still attached to the operator. When testing this feature, be sure to have someone catch the electrofisher otherwise it will fall to the floor. In addition to the quick release feature, the complete electrofisher and battery are removable from the packframe as a one-piece unit for transportation. An added advantage is that the electrofisher and battery will fit all Smith-Root plastic packframes.

If the electrofisher should fall into the water discontinue using the unit. When conditions permit remove the front panel by unscrewing the 3 screws on the top of the box and the 2 screws on the bottom of the front panel, and then carefully lift the top of the panel until the panel is free. Extra care should be taken to prevent damage to the voltage selector switch. Once the front panel is free, remove any standing water inside the electrofisher and allow it to dry out over night. When replacing the front panel put the top screws in first, but don't tighten them until all the screws are in place.

ANODE POLE:

The anode pole supplied with the Type VIII-A is a completely sealed light weight fiberglass pole. The control switch is a magnetically activated reed switch that is placed under the flat spot on the pole. A magnet is imbedded into the end of the rubber flap that is slipped on the pole. When the magnet is pressed down over the flat spot on the pole the electrofisher's output is activated.

7.0 SPECIFICATIONS TYPE VIII-A ELECTROFISHER

Input Voltage.....12 V.D.C.
Output Voltage.....250 to 850 volts (200 volt steps)
Output Pulse Shape.....Rectangular, pulsed D.C.
Pulse Duration.....4-8 milliseconds, adjustable
Pulse Frequency..40-80 pulses per second, adjustable
Input Power.....250 watts, full load
Output Power.....200 watts, full load
Battery Life (32 A.H.).....1 1/2 hours, continuous
Timer Capacity.....9999
Timer Accuracy.....+/-2.5%
Weight on Backpack (with battery).....38 pounds
Construction.....aluminum case
Anode Size*.....11" diameter ring
Cathode pull behind.....1.5 sq. ft. approx.
Anode Pole Length (one piece)**.....6 feet, approx.
Cathode Pole (optional)**.....5 feet, approx.
Cable Length.....18" curl cord extends to 72"
Packframe.....Reinforced high impact plastic

* Other ring sizes available

** Optional two piece poles detach at center

WARRANTY

SMITH-ROOT INC. (SR) products are backed by SR's reputation as a quality manufacturer, and often by years of proven reliable service.

In addition, the products are backed by the following SR factory warranty:

Solely for the benefit of the original purchaser, SR warrants all new products of its manufacture to be free from defects in material and workmanship; and will replace or repair, f.o.b., at its factories in Vancouver, Wash., or other location designated by it, any part or parts returned to it within ninety (90) days of original delivery, which SR's examination shall show to have failed under normal use and service and non-corrosive application by purchaser. Such repair or replacement shall be free of extra charges for all items except repair or replacement shall be subject to prorated charge based on SR's estimate of the percentage or normal service life realized from the part. SR makes no warranty with respect to parts, accessories, or components manufactured by others. The warranty, if any, which applies to such items is that offered by their respective manufacturers.

SR's obligation under this warranty is conditioned upon it receiving prompt written notice of claimed defects which shall in no event be later than the ninety (90) day warranty period; and is limited to repair or replacement as aforesaid.

This warranty is expressly made by SR and accepted by purchaser in lieu of all other warranties, including WARRANTIES OF MERCHANTABILITY and FITNESS FOR A PARTICULAR PURPOSE, whether written or oral, express, implied, or statutory. SR neither assumes nor authorizes any other person to assume for it any other liabilities with respect to its products. SR shall not be liable for normal wear and tear nor for any contingent, incidental, or consequential damage or expense due to partial or complete inoperability of its products for any reason whatsoever.

This warranty shall not apply to products or parts thereof which have been altered or repaired outside of an SR factory, or damaged by improper installation or application, or subjected to misuse, abuse, neglect, or accident.

SR shall not be responsible for any in-transit damage to goods unless inspection clearly reveals defective packaging where SR was responsible for packaging. SR will assist any purchaser or consignee of goods seeking recovery from a carrier for in-transit damage to goods and will, to the extent necessary, assign claims to said purchaser or consignee wherever required in order to provide said purchaser or consignee with complete recourse against said carrier.

Upon buying SR products or parts, purchaser expressly agrees to the foregoing warranty provisions including limitation of remedies, and expressly waives any and all other warranties or undertakings in respect to such products.

Smith-Root Inc.

Smith-Root, Inc.



14014 NE Salmon Creek Avenue • Vancouver, WA 98686

Phone: (360) 573-0202

E-mail: sri@smith-root.com

Web site: www.smith-root.com