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DC-Electrofisher, Type JK 300/600 - 1986
Operation Manual

Fishing with electricity

In an electric field, fish is attracted to the positive electrode (anode) and swims towards it.This action, called taxis, is depending on many factors. If we turn the concept around, we can say that the anode attracts the fish and the ability is called the taxis of the electrode. It can weak and strong, good or bad and is affected by many factors. Ideally, the electrode should attract the fish from along distance and hold the fish at the electrode swimming until it can be caught by the dip net. Unfortunately, this is not always so. Without going to much into details the taxis increases with the conductivity of the water, voltage difference between head and tail of the fish which has to be 1-4 V, and the "quality" of the applied voltage.
The attracting zone reaches 0.5 - 1 m from the anode and depends on the size of the fish, small fish has to be closer to the anode to be attracted. I the fish are inside the attacking zone they will swim towards the anode. Outside this zone is the repelling zone, there the effect is the opposite: the fish swims away from the anode. This fact has to be taken into account during practical fishing (see later).

Types of electrical fishing gear

There are basically two types of electrical fishing equipment: Pulsating current type and direct current or DC type.

Pulsating current fisher

Uses energy pulses, 400-1000 V of short duration, 1-10 mS, at the frequency of 30-100 Hz. Because it is operating only part of the time it consumes little energy and can be battery operated.

Pros:
Low power consumption, battery operated, transportable. Usually a back pack unit which makes practical fishing easy. Affects the nervous system to a higher degree than a DC fisher.

Cons:
High shocking effect, bad taxis, fish tend to fall directly to the bottom. Great effect on nervous system can easily become lethal to the fish.

DC fisher

Uses constant DC voltage so current is fully on all the time. This requires high energy, 300-1500 Watts, and therefore the fisher has to be energized by a petrol engine generator.
Pros:
Generous shocking effect, good taxis, can be used in still water.
Contras:
Unit is heavy if transformer is used to step up voltages, generators are heavy and hardly portable, cable to anode cumbersome and annoying. Mounting, demounting and transport of units is tiresome during practical operations.

Note:
This particular fisher (JK 300/600) is not a transformer type and therefore very light. Also, Honda has now produced a 350 W generator (The EX 350) weighing only 8 kilos. A DC back pack weighing less than ten kilos has therefore become possible, and indeed made and tested. The results were excellent.

DC-Electrofisher, Type JK 300/600,

Specifications:

Input:	220 V AC, 50-60 Hz, 2.5 A max (fuse 2.2 A slow)
Generator:	300-1200 W (Honda E350 or similar)
Output:	Selectable, either 300 V, 1 A or 600V 0.8 A
Ripple Factor:	At 300 V into 700 Ohm (0.43 A): less than 1.5%
	At 600 V into 700 Ohm (0.86 A): less than 2.1%
Function:	See Block diagram in figure 1. on page 7 and circuit diagram in figure 2. on page 8.

The 300 V and 600 V channels are completely separated regarding the high voltage but same switch is used to trigger the relays for both channels. There is a common power supply for both relays, the switch is transistor controlled by a reed relay located on the anode stick. A green LED is located after the 25 V on the power supply to show whether it is functioning or not: A green light there shows that the unit is receiving power from the generator and 25 volts are at hand for switching the relays.
There are red LED's located at the fuses in the 300/600 V channels. If this light goes off, it indicates a blown fuse.
All these LED’s are to ease fault finding in the field.
The proper voltage channel is selected by a switch, which basically routes the voltage to the chosen relay. WHEN THE VOLTAGE SELECTOR IS ACTIVATED IT IS IMPORTANT THAT THE SWITCH ON THE ANODE IS IN AN OFF POSITION.
All plugs are standard household plugs and the extension cable is standard. This is done on purpose: spare parts are easily obtained. This has one disadvantage: The units might accidentally be plugged into the 220 V mains. Therefore:
DO NOT USE THE UNITS FOR OTHER PURPOSES THAN ELECTROFISHING IN THE FIELD.

Extension cable:

Note that the yellow/green wire, normally used for earth connection, is carrying the high voltage. The brown wire and the blue wire, carrying 220 V in normal household system, is used for the magnetic switch. The reason for this connection is that then the plugs can be connected either way around.

Set up in the field

Refer to figure 4 on page 10 and photographs.
The generator is placed on a steady surface near the river bank. The fisher or AC-DC converting box, JK 300/600, hereafter called "the box", is connected to the generator and placed near it on a dry spot. Ensure that the exhaust from the generator is not aimed towards the box.
The earth mat is connected to the box and placed in the river near the bank. The two mats are spread apart and a stone is placed on them to hold them in place.
The extension cable is connected between the box and the anode stick. The part of the cable near the operator is tied around the operators shoulder to ensure that the PLUGS
STAY OUT OF THE WATER. Now, the unit is ready for operation:

Start the motor without depressing the switch on the stick. When the motor is running smoothly, switch the box to 300V, put the anode into the water and ensure it is not near the earth mats, switch on and read the meters in the box. If the voltmeter reads approximately 300V and the ammeter shows that current is running, everything is in order.
Be sure to hold the anode IN THE WATER for a few seconds after switching off in order to discharge the capacitors quickly. It can be seen by watching the voltmeter, that it takes a considerable time for the capacitors to unload when the anode is out of water. The voltmeter shows the actual voltage on the end of the stick: It COULD BE FATAL TO TOUCH IT. Please be aware of this.

Start fishing

Using the 600 V channel is dealt with under the chapter: Practical fishing. Fault finding is treated in a separate chapter.
Practical fishing
Usually this is a two person task, the fisher and the helper. The fisher performs the fishing, holding the anode stick in one hand and the dip net in the other. The helper holds the fish bucket and keeps the cable free off obstacles.
The fishing is performed facing the current, working gradually upstream. The fishing goes in 5-15 s intervals, with 10-20 s between the fishing intervals. When the unit is switched off, hold the anode in the water for few seconds to discharge the capacitors in the box. Usually,
0.2-0.4 A is good working current. If the current is to low at 300V, it can be increased by switching the box to 600V. BE SURE THAT THE ANODE STICK SWITCH IS IN OFF POSITION WHILE CHANGING THE VOLTAGE.

Handle and care of the unit

General:
Do not use the gear in heavy rain. In light rain, cover the box with plastic bag. If the box becomes damp inside, open the lid and dry the box over night. Remember, the box is only splash proof, not watertight.
The anodes can be changed, they have different surface area, it can be of advantage in low conductivity to change to the electrode with the largest area. When doing this, be careful NOT TO PUT STRAIN ON THE BRASS BOLT AT THE END OF THE STICK as the bolt is glued to the glass fibre road. Use 5 mm hexagonal key in the hole of the anode and wrench or spanner for the lock nut.
The switch is fragile and can easily be broken. Be sure to protect it with the rubber band when not in use. The complete switch can be changed by removing the black VINYL TAPE (not the rubber tape). Then the wires become accessible and a new switch can be mounted, **in the field, the wires can be twisted together. The wires to the switch only carry few mA of current and the voltage is less than 1 V so the wires are completely harmless.**

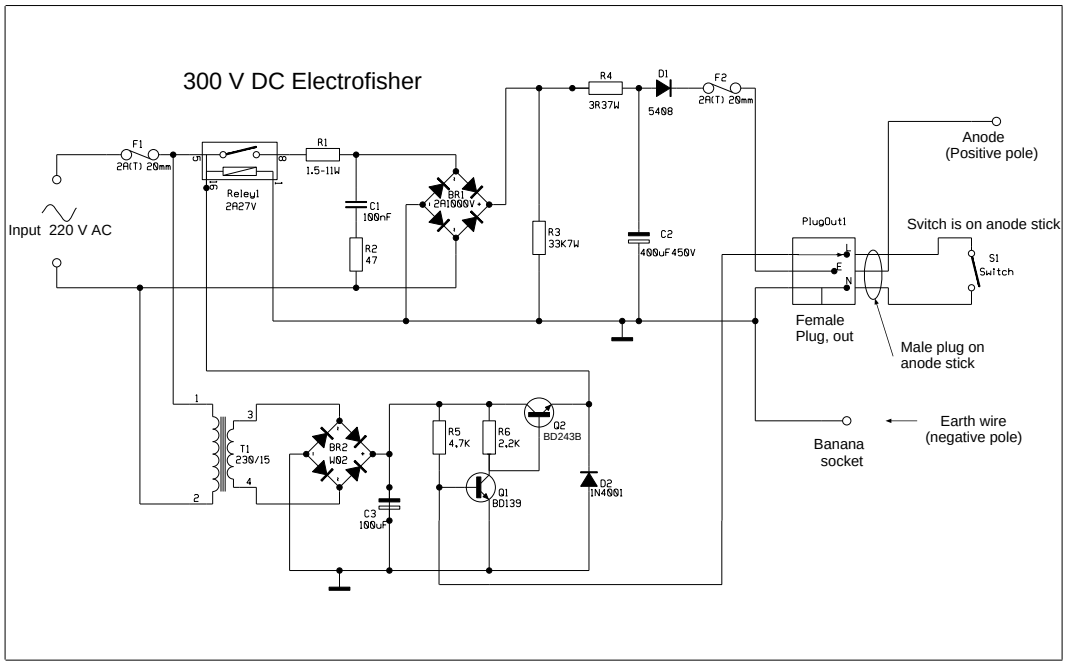
Fault finding
Study the diagrams and check that the set up is correct. Be sure that voltage from the generator is OK. If the GREEN light emitting diode in the box is lighted, it indicates that voltage is reaching the switching unit and the input fuse is in order. If the green light is OFF, voltage does not reach the input, and the fuse at the input is probably blown. This fuse should be a slow blow type.
If the green light is OK but the meters show no current , look for the RED led in the channel in use. If the red led is not lighted, the fuse in the output is probably gone. If the red light is on, look for the trouble in the connecting cable ore anode stick. An AVO meter is very handy to check connections in the field. In the absence of a meter, a bulb and a battery is handy. Also, a soldering iron is a good thing to have in the toolbox.

Addendum 2010

The unit described above was designed and constructed in 1986. Since then, at least 3 units have been in use regularly, some intensively, until now, more than 20 years. They work very well and failures are seldom.

Experience has showed that 600V are seldom used. Later constructions therefor were either 300V or 600V, thus omitting complicated switches.

Below is a diagram of a 300V unit which is so simple that it can be built on a glass fibre Vero-board and put in a very small box.



Circuit diagram of a 300V DC electrofisher, designed in 2010