

INSTRUCTION MANUAL  
MODEL 903 FISH COUNTER

DESCRIPTION:

The Model 903 Fish Counting System is based on the balanced Wheatstone Bridge sometimes called the "Four Element Bridge Principle". Two elements of the bridge circuit are formed by "counting tunnels" which sample the water's resistance. Two additional resistive elements are required and are located within the Model 903 Fish Counter. The 903 features an ABC, or Automatic Balance Circuit, which keeps the bridge in perfect adjustment despite wide changes in water conditions. The system is easy to use and can be set-up and operating in a matter of minutes.

COUNTING TUNNELS:

The fish counting tunnels are fabricated using modern-day fiberglass techniques. They are round and vary from 1/2 to 24 inches in diameter. Other sizes and shapes are available upon special request. Each counting tunnel has pairs of stainless steel electrodes imbedded in the inner surface. These electrode pairs make electrical contact with the water forming resistor elements for the bridge. The elements are connected to the Fish Counter through coaxial cables.

As mentioned above, the 903 counting system requires two resistor elements in the water. The usual arrangement is to have two counting tunnels with a single resistive element in each. The tunnels are then positioned side by side. Fish passing through each tunnel are counted on separate front panel registers on the 903. Coaxial cables up to 200 feet long can be used between counting tunnels and the 903 Fish Counter.

In situations where it is not possible to mount counting tunnels in a side by side arrangement (such as counting in a pipe or hose), they may be cascaded. This, however, will yield the same count on both front panel registers. Smith-Root has available a single counting tunnel which has two resistor elements and two cables attached. This dual tunnel is often used with the Model 902 Directional Fish Counter. It costs less and serves as two single counting tunnels.

In operation, the counting tunnels are placed in the water and the cables are connected to the 903 Fish Counter. The bridge circuit is adjusted for balance. When a fish moves between an electrode pair in a counting tunnel, it causes that element of the bridge circuit to change resistance. This resistance change causes the bridge to become unbalanced and this unbalanced signal is used to activate a front panel count register on the 903. If a fish passes through the other tunnel's resistive element, it causes the opposite register to tally a count.

The bridge balancing procedure is simple and may be completed in less than a minute. Once adjusted, the Auto-Balance Circuit keeps the bridge balanced for slowly changing water conditions. Front panel indicators are provided to insure that all circuits are performing properly.

## CONTROLS & TERMINALS:

### Rear Panel Controls:

Power Input Cable - Located left rear panel. This 3 wire cable supplies 115 volts AC and a safety ground to the instrument when plugged into a properly wired outlet.

Fuse (1 amp rating) - Located left rear panel. Protects instrument wiring against catastrophic internal shorts. Replacement fuses should be of the fast-blow type, 3-AG size. If the fuse blows, determine why before replacing and do not replace with a higher rating.

Tunnel Section - Located right rear panel. Coaxial cables from fish counting tunnels connect to BNC connectors labeled "A" and "B". Fish passing through the counting tunnel connected to the "A" input connector tally counts on front panel "Count A" register and vice versa for the counting tunnel connected to BNC connector "B".

Tunnel Size Switch - The tunnel size switch selects internal resistor elements for the bridge which best match tunnel resistive elements. The "Small" switch position is for tunnels smaller in diameter than 3 inches. The "Medium" position is for tunnels in the 3 to 6 inch size range and the "Large" switch position is for tunnels 6 inches and larger.

Tunnel Test Push Buttons - Located right rear panel. These push buttons test the Model 903 for proper operation. The "A" push button tallies a count on the "A" front panel register each time the button is pressed and then released. Similarly, the "B" push button tallies a count on the "B" front panel count register. NOTE: The Model 903 must be connected to a pair of counting tunnels or a tunnel simulator and balanced before performing the above tests.

### Front Panel Controls:

Power Switch - Located lower left front panel. The power switch applies 115 volts AC to the power supply circuits when the power cord is plugged in.

Count Reset Push Button - This button resets count registers "A" and "B" to all zeros. NOTE: When power is first turned on, count registers are both set to all zeros automatically. In balancing the bridge circuit, several counts may appear. If this happens, just press the count reset push button.

Gain - The gain control changes instrument overall sensitivity approximately 5:1. This control will need to be adjusted by count results. Smaller fish can be prevented from registering by turning this control down.

Over Gain Indicator - This indicator begins to glow if the gain control is set too high for the tunnels being used. The counter will not perform properly if this lamp stays on. It is normal, however, for this indicator to blink when a fish passes through a counting tunnel.

Balance Control and High-Low Indicators - This 10-turn control sets the overall bridge balance. Once the counting tunnel cables have been attached and the size switch has been selected, one of the high-low lamps will glow. If the 10-turn balance control is too far clockwise, the high indicator will glow. If the balance control is too far counter-clockwise, the low indicator lamp will glow. A balanced condition exists when both indicator lamps are out.

Auto Balance Switch - This switch, when on, holds the bridge exactly balanced after the initial balance has been achieved by means of the above mentioned Balance Control. The ABC will correct for any counting tunnel unbalance up to approximately 10%. When manufactured, the counting tunnels are balanced to within 1.0%.

#### OPERATING PROCEDURE:

##### Counting Tunnels

Place the counting tunnel or tunnels into the water making sure there are no large air bubbles or debris passing through the tunnel. These bubbles and/or debris can cause error counts to show up. Connect the tunnel coaxial cables to the 903 rear panel connectors. NOTE: If a dual element tunnel is used, it does not matter which tunnel element is upstream.

##### Controls

Set the "size" switch corresponding to the tunnel size used. This procedure is explained in the CONTROLS & TERMINALS section.

Preset the front panel controls as follows:

- Power Switch - OFF
- Auto Balance - OFF
- Gain Control - 0 (Fully counter-clockwise)

Plug power cord into power source of 115 VAC, 60 Hz.

Turn the power switch to "on" position.

Check that count indicators "A" and "B" are indicating all zeros.

Check the "High" and "Low" indicator lamps. If the Low indicator is on, turn the "Balance" clockwise until the High indicator lamp comes on. Rotate the Balance control back and forth until both indicators are out. At this point, the Bridge is balanced.

Turn the "Auto Balance Control" to the "on" position. The ABC will now hold the bridge circuit balanced for slow changes in water conditions. In setting the balance control, several counts may tally on the digital count registers. If this happens, press the "Count Reset" button to reset the register to all zeros.

Momentarily press the rear panel "A" and "B" test push buttons to check for proper operation of the counters. A count should be tallied each time the buttons are released.

Start passing fish through the counting tunnels. If they do not count, turn the Gain Control clockwise until they begin to count. The final setting for the Gain Control will need to be determined experimentally by manually counting the fish passed through the tunnels and comparing the count with the front panel registers.

Over Gain Indicator - If the "Over Gain" indicator comes on, reduce the Gain Control until the light goes out. Normally the Over Gain indicator will not come on if the Tunnel Size switch has been properly selected for the tunnel size used. If the Over Gain stays on when the gain is reduced, check the tunnels and/or coaxial cables associated with the tunnels.