

Since 1964, the leader in effective, safe and reliable products for fisheries conservation.  
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# USER'S MANUAL 1601 FISH COUNTER



**SMITH-ROOT, INC.**  
Technology For Fisheries Conservation

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**Items manufactured by companies other than Smith-Root carry the original manufacturer's warranty. Please contact product manufacturer for return instructions.**

All Smith-Root, Inc. manufactured products are covered by a one year warranty.

Credit & Refund Policy: Customers returning equipment, in new condition, will be given credit to the applicable VISA/Master Card account within five days from the date of the return. A return authorization must accompany returns. Valid equipment returns include, but are not limited to, ordering incorrect equipment, funding deficits, and defective equipment returned for reimbursement. All returns are subject to a restocking fee and applicable shipping charges. The restocking fee is figured at 10% of the purchase price but not less than \$20.00. Customers receiving equipment in damaged condition will be referred to the shipping company for insurance reimbursement.

# 1601 Fish Counter

## Model SR-1601 Electronic Fish Counter

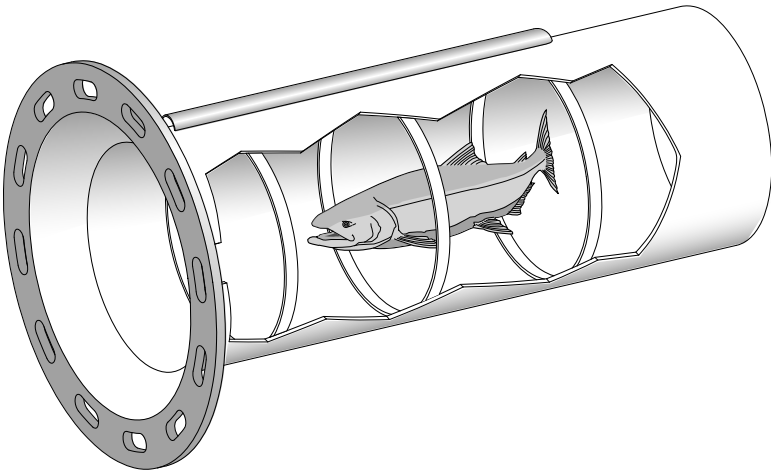


The SR-1601 Fish Counter is a 16-channel fish counter, integrating 16 individual counters into one unit. This unit is designed for hatchery fry, migrating smolt, fish eggs, emergent shrimp, and other macro organisms. The SR-1601 simultaneously monitors all 16 tunnels for downstream movements, giving individual counts for each tunnel. In order to be counted, macro organisms pass through one of multiple counting tunnels and are tallied on separate 16-digit displays. The system easily tallies 10 counts per second per channel, giving 576,000 counts per hour.

# 1601 Fish Counter

## General Description

The Model SR-1601 Fish Counter features a balanced resistance bridge circuit using the tunnel elements to count fish in fresh water. Electronic counters simultaneously monitor up to 16 tubes for downstream fish movements, giving a “real time” readout for each tube showing count distribution. The counting heads are interchangeable and are available with tube diameters ranging from 1/2 to 3 inches. Larger tunnels are available on a custom order basis.



## Principle of Operation

Operation of the SR-1601 Counter is based on the “Balanced Resistance Bridge Principle” using water in the count head as two elements of a four element Balanced Bridge. Passage of a fish through one of the tubes of the count head causes corresponding changes in that tube’s conductance. These conductance changes are used by the SR-1601 to sense the presence of fish in the tubes of the counting head.

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## Advanced Features



The SR-1601 employs numerous advanced features providing such functions as to simultaneously monitor 16 different tunnels giving real time distribution of counts. The counts are displayed on liquid crystal displays (LCDs) which provide easy readability even in direct sunlight. The count is retained by internal batteries for up to 5 years if power to the fish counter is lost. Also included is a wide-range sensitivity control which provides the ability to set the size of the smallest fish that will be counted.

## Water Conditions

The counter is designed to work in fresh water with a conductivity of 10 to 500 microsiemen. The 16 tube counting head must be completely submerged in fresh water and an appropriate water head developed to overcome the swimming ability of the fish to be counted. The fish are then crowded into the vicinity of the tube entrances where they are pulled through and counted. With proper tube size and water flow, count accuracy is better than 98%.

# 1601 Fish Counter



## Counting Head

The SR-16-CH Counting Head is a single unit containing 16 separate counting tubes. Each tube in the Counting Head has a smooth tapered entrance to prevent abrasive damage to the fish. The tubes may have diameters ranging from 1/2 to 3 inches. Tubes are usually arranged in two rows of 8 tubes each. For the best accuracy, tube diameter should be no more than half of the length of the fish to be counted.



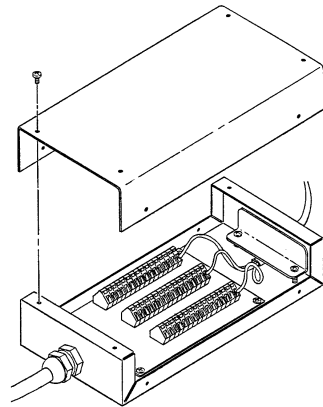
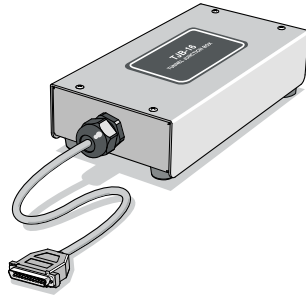
## Single Tunnel

For most fish counting operations, individual tunnels are connected to the 1601 via the TJB-16 Junction Box, which in turn is connected to the 25 pin connector on the panel of the counter. Up to 16 individual tunnels can be connected in this manner.

# 1601 Fish Counter

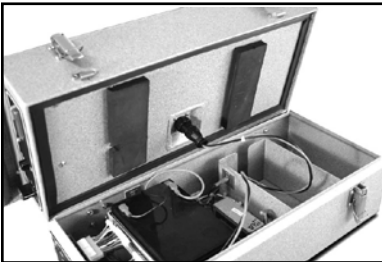
## TJB-16 Junction Box

Allows the connection of up to sixteen individual tunnels to the 1601 Fish Counter. Signal cables pass through a strain-relief and connected to screw terminals on an isolated strip, which is connected to a 25 pin female plug that corresponds to the 1601's Tunnel plug. Unit is housed in a waterproof enclosure.



**TJB-16.....#3360**

# 1601 Fish Counter



## Power Requirements

The Model SR-1601 can be powered from 115VAC, 60Hz, from an optional 12 Volt internal battery, or from an optional 12 Volt external battery. Battery life is four days with the internal 12V batteries. A battery test button is provided to determine the proper time for battery change. An internal battery backup is provided to preserve count data during power failure and while changing the main battery.

## Mechanical Construction

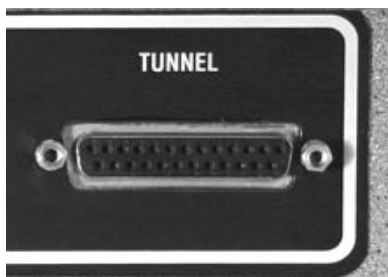
The counter and sealed battery are housed in a weather-proof aluminum case for protection from the elements. The case measures 21.5 inches wide and 9.5 inches deep x 9.2 inches high. A twenty-five pin data plug provides a quick change connection for the submersible counting heads. Each head is supplied with 15 feet of cable and mating connector.



# 1601 Fish Counter

## Connectors and Plugs

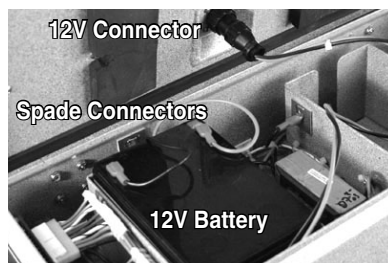
The tunnel connector is a 25 pin data connector with screw locks.



The lower section of the 1601 houses the AC power supply, connector and optional batteries. 12 Volt DC power to the SR-1601 is provided through a single multi-pin quick twist positive locking polarized connector. This insures easy and positive connections.



AC power is plugged in via a standard AC cord. Up to two optional 12VDC batteries can be housed in the lower battery compartment and connected via spade connectors, which goes to the 4-pin plug on the bottom of the counter unit. A similar 4-pin plug is also on the front panel to allow the connection of an additional 12VDC power source.



# 1601 Fish Counter

## Description of Controls and Indicators



### **Power Switch -**

Controls the DC power to operate the fish counter electronics. The DC may be supplied from the internal battery, from an external 12 Volt DC source, or from the internal AC powered DC supply. This switch does not control the AC power to the battery charger circuit. The battery charger charges the internal 12V batteries only.

### **Battery Test Switch And Indicator -**

Press and hold the switch for 30 seconds. If the indicator stays green during this time, the battery is OK. If the indicator turns red or stays red during this time, the battery needs to be recharged. The internal battery will run the fish counter for 4 days, depending on water conductivity.

# 1601 Fish Counter

## **Sensitivity -**

The sensitivity control allows the user to set the size of the smallest fish that the fish counter will sense. Turning the control clockwise allows smaller fish to be detected.

## **Count Switch -**

When in the OFF position, all inputs to the counter are disabled. This prevents the accumulation of any erroneous counts while moving the count head from rearing pond to rearing pond. For normal operation, the switch should be in the ON position.

## **AC Power Connector and Indicator Lamp-**

Lights up whenever the fish counter is connected to 120VAC, 60 Hz outlet.

## **Count Test -**

The switch is used to test the general functioning of the SR-1601. With the Power and Count switches ON and count head connected, pressing this switch causes a single count to be registered on each display. Counter must be connected to a properly submerged tunnel to properly test count.

## **Count Reset-**

Resets all the displays to zero.

## **Count Displays -**

The SR-1601 has 16 individual displays, one for each counter tube. They are 6-digit LCD displays which means they can be read even in direct sunlight. The 16 displays give a real time distribution of counts for each tube in the count head.

# 1601 Fish Counter

## Operation

1. Submerge the count head in water making sure that all of the tubes are completely filled with water. Locking screws must be locked to nuts on counter.
2. Turn the Power Switch ON. It is normal for one or two counts to appear on the displays when the power switch is turned on and off.
3. Press the Battery Test switch and check the condition of the battery.
4. Turn the Count Switch ON.
5. Allow a few fish to pass through the count head and adjust the sensitivity control clockwise until the counter reliably counts fish as they pass through the tubes. Turn the sensitivity control up one more mark.
6. Count accuracy may be checked by hand-counting the fish that are passed through the count head. When you are satisfied that the sensitivity control is set correctly, reset the displays and begin counting fish.

Note: The water flow through the count head can have a dramatic affect on the accuracy of the fish counter. The hydraulics must be such that the fish cannot resist the pull of the water as it passes through the tubes. Tube size is also important and must be such that only one fish at a time can pass through a particular tube. Fish may go through different tubes at the same time without any error occurring. Air bubbles and debris passing through the tubes must also be kept to a minimum. With proper tube size and water flow, count accuracy is better than 98%. Cable runs greater than 50 feet should be made in conduit.

# 1601 Fish Counter

## In Case of Difficulty

### **Counter will not count:**

1. Power Switch turned OFF.
2. Count Switch turned OFF.
3. Sensitivity Control set too low.
4. Battery dead or connected backwards.
5. Count head not connected to fish counter.

### **Counter not accurate:**

1. Battery low- check.
2. Sensitivity Control set too low.
3. Air bubbles accumulating in count head tubes.
4. Debris passing through tubes.
5. Attempting to count fish that are too small for the tube size. More than one fish  
at a time passing through the tubes.
6. Insufficient draw through tubes. Fish able to resist going through tubes, or fish re-entering tubes after passing through. Increase the depth of the water on the upstream side of the count head. Be careful not to increase too much or fish may be damaged.

# 1601 Fish Counter

## Specifications

Count Rate.....	10 counts/second/tube(max).
Count Capacity/Channel.....	999,999 (6 digit)
Count Sensitivity(max.).....	5% tube unbalance.
Power Requirements.....	120VAC 60Hz or 12VDC.
Battery Life.....	4 days depending on water conductivity.
Size.....	21.5" x 9.5 x 9.2
Weight .....	35 pounds, including battery.

Specifications subject to change without notice

# WARRANTY

Smith-Root, Inc. original products have a 1-Year Limited Warranty.

Smith-Root, Inc. warrants that its Products are free from defects in material and workmanship that result in Product failure during normal usage, according to the following terms and conditions:

1. The limited warranty for the Product extends for the length of ownership beginning on the date of the purchase of the Product by the original purchaser ("Consumer") of the Product and is not assignable or transferable to any subsequent purchaser or user.
2. The limited warranty extends only to Consumers who purchase the Product from Smith-Root, Inc. or an authorized distributor.
3. During the 1-year limited warranty period, Smith-Root, Inc. will repair, or replace, at Smith-Root, Inc.'s sole option, any defective parts, or any parts that will not properly operate for their intended use with new or refurbished replacement items if such repair or replacement is needed because of product malfunction or failure during normal usage. No charge will be made to the Consumer for any such parts. Smith-Root, Inc. will also pay for the labor charges incurred by Smith-Root, Inc. in repairing or replacing the defective parts. The limited warranty does not cover defects in appearance, cosmetic, labels or structural items, including framing, and any non-operative parts. Smith-Root, Inc.'s limit of liability under the limited warranty shall be the actual cash value of the Product at the time the Consumer returns the Product for repair, determined by the price paid by the Consumer for the Product less a reasonable amount for usage. Smith-Root, Inc. shall not be liable for any other losses or damages. These remedies are the Consumer's exclusive remedies for breach of warranty.
4. Upon request from Smith-Root, Inc., the Consumer must prove the date of the original purchase of the Product by a dated bill of sale or dated itemized receipt.
5. The Consumer shall bear the cost of shipping the Product to Smith-Root, Inc. Smith-Root, Inc. shall bear the cost of shipping the Product back to the Consumer after the completion of service under this limited warranty.
6. The Consumer shall have no coverage or benefits under this limited warranty if any of the following conditions are applicable:
  - a) The Product has been subjected to abnormal use, abnormal conditions, improper storage, exposure to moisture or dampness, unauthorized modifications, unauthorized connections, unauthorized repair, misuse, neglect, abuse, accident, alteration, improper installation, or other acts which are not the fault of Smith-Root, Inc., including damage caused by shipping.
  - b) The Product has been damaged from external causes such as collision with an object, or from fire, flooding, sand, dirt, windstorm, lightning, earthquake or damage from exposure to weather conditions, an Act of God, or battery leakage, theft, blown fuse, or improper use of any electrical source, or damage caused by the connection to other products not recommended for interconnection by Smith-Root, Inc.
  - c) Smith-Root, Inc. was not advised in writing by the Consumer of the alleged defect or malfunction of the Product within fifteen (15) days after the expiration of the applicable limited warranty period.
  - d) The Product serial number plate or the accessory data code has been removed, defaced or altered.
7. If a problem develops during the limited warranty period, the Consumer shall take the following step-by-step procedure:
  - a) The Consumer shall return the Product to Smith-Root, Inc. for repair or replacement processing.
  - b) The Consumer contacts the Customer Service Department at Smith-Root, Inc., at the number listed on the bottom of this page, for repair or replacement processing.
  - c) The Consumer shall ship the Product prepaid and insured. Expenses related to removing the Product from an installation are not covered under this limited warranty.
  - d) The Consumer will be billed for any parts or labor charges not covered by this limited warranty. The Consumer will be responsible for any expenses related to reinstallation of the Product.
  - e) Smith-Root, Inc. will repair the Product under the limited warranty within 30 days after receipt of the Product. If Smith-Root, Inc. cannot perform repairs covered under this limited warranty within 30 days, or after a reasonable number of attempts to repair the same defect, Smith-Root, Inc. at its sole option, will provide a replacement Product or refund the purchase price of the Product less a reasonable amount for usage.
  - f) If the Product is returned during the limited warranty period, but the problem with the Product is not covered under the terms and conditions of this limited warranty, the Consumer will be notified and given an estimate of the charges the Consumer must pay to have the Product repaired, with all shipping charges billed to the Consumer. If the estimate is refused, the Product will be returned freight collect. If the Product is returned after the expiration of the limited warranty period, Smith-Root, Inc.'s normal service policies shall apply and the Consumer will be responsible for all shipping charges.
8. The Product consists of newly assembled equipment that may contain used components that have been reprocessed to allow machine compliance with Product performance and reliability specifications.
9. ANY IMPLIED WARRANTY OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE OR USE, SHALL BE LIMITED TO THE DURATION OF THE FOREGOING LIMITED WRITTEN WARRANTY. OTHERWISE, THE FOREGOING LIMITED WARRANTY IS THE CONSUMER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED. SMITH-ROOT, INC. SHALL NOT BE LIABLE FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOSS OF ANTICIPATED BENEFITS OR PROFITS, LOSS OF SAVINGS OR REVENUE, PUNITIVE DAMAGES, LOSS OF USE OF THE PRODUCT OR ANY ASSOCIATED EQUIPMENT, COST OF CAPITAL, COST OF ANY SUBSTITUTE EQUIPMENT OR FACILITIES, DOWNTIME, THE CLAIMS OF ANY THIRD PARTIES, INCLUDING CUSTOMERS, AND INJURY TO PROPERTY, RESULTING FROM THE PURCHASE OR USE OF THE PRODUCT OR ARISING FROM BREACH OF THE WARRANTY, BREACH OF CONTRACT, NEGLIGENCE, STRICT TORT, OR ANY OTHER LEGAL OR EQUITABLE THEORY, EVEN IF SMITH-ROOT, INC. KNEW OF THE LIKELIHOOD OF SUCH DAMAGES. SMITH-ROOT, INC. SHALL NOT BE LIABLE FOR DELAY IN RENDERING SERVICE UNDER THE LIMITED WARRANTY, OR LOSS OF USE DURING THE PERIOD THAT THE PRODUCT IS BEING REPAIRED.
10. Some states do not allow limitation of how long an implied warranty lasts, so the above warranty limitation may not apply to you (the Consumer). Some states do not allow the exclusion or limitation of incidental and consequential damages, so certain of the above limitations or exclusions may not apply to you (the Consumer). This limited warranty gives the Consumer specific legal rights and the Consumer may also have other rights which vary from state to state.
11. Smith-Root, Inc. neither assumes nor authorizes any authorized service center or any other person or entity to assume for it any other obligation or liability beyond that which is expressly provided for in this limited warranty including the provider or seller of any extended warranty or service agreement.
12. This is the entire warranty between the Smith-Root, Inc. and the Consumer, and supercedes all prior and contemporaneous agreements or understandings, oral or written, relating to the Product, and no representation, promise or condition not contained herein shall modify these terms.
13. This limited warranty allocates the risk of failure of the Product between the Consumer and Smith-Root, Inc. The allocation is recognized by the Consumer and is reflected in the purchase price.
14. Questions concerning this limited warranty may be directed to:

**Smith-Root, Inc.**  
**14014 NE Salmon Creek Ave.**  
**Vancouver, WA 98686**  
**(360) 573-0202**

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