

# AA100 ACOUSTIC ACTUATOR

USER HARDWARE MANUAL

0014414\_REV\_C

12/15/2016



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## ATTENTION – READ THIS FIRST!

All personnel involved with the installation, operation, or maintenance of the equipment described in this manual should read and understand the warnings and cautions provided below.

**CAUTION!** This equipment contains devices that are extremely sensitive to static electricity. Therefore, extreme care should be taken when handling them. Normal handling precautions involve the use of anti-static protection materials and grounding straps for personnel.

**WARNING!** High Voltage may be present in all parts of the system. Therefore, use caution when the electronics are removed from their containers for servicing.

**CAUTION!** Operation with improper line voltage may cause serious damage to the equipment. Always ensure that the proper line voltage is used.

## HARDWARE VARIATIONS AND COMPATIBILITY

The AA100 Acoustic Actuator contains both standard and proprietary hardware. At times, EdgeTech may change the standard components due to their availability or performance improvements. Although the component manufacturers—along with their models and styles—may change from unit to unit, replacement parts will generally be interchangeable.

EdgeTech will make every effort to see that replacement components are interchangeable and use the same software drivers (if applicable). At times, however, direct replacements may not exist. When this happens, EdgeTech will provide the necessary drivers with the replacement part, if applicable.

EdgeTech may also change certain hardware per customer requirements. Therefore, portions of this manual, such as parts lists and test features, are subject to change. These sections should be used for reference only. When changes are made that affect system operation, they will be explicitly noted. Also, some options and features may not be active in the customer's unit at time of delivery. Upgrades will be made available when these features are implemented.

Contact [EDGE TECH CUSTOMER SERVICE](#) with any questions relating to compatibility.

## ABOUT THIS DOCUMENT

We, the employees at EdgeTech, would like to thank you for purchasing a AA100 Acoustic Actuator. At EdgeTech, it is our policy to provide high-quality, cost-effective products and support services that meet or exceed your requirements. We also strive to deliver them on-time, and to continuously look for ways to improve them. We take pride in the products we manufacture, and want you to be entirely satisfied with your equipment.

### Purpose of this Manual

The purpose of this manual is to provide the user with information on the setup and use of EdgeTech's AA100 Acoustic Actuator. Although this manual encompasses the latest operational features of the AA100 Acoustic Actuator, some features may be periodically upgraded. Therefore, the information in this manual is subject to change and should be used for reference only.

### Liability

EdgeTech has made every effort to document the AA100 Acoustic Actuator in this manual accurately and completely. However, EdgeTech assumes no liability for errors or for any damages that result from the use of this manual or the equipment it documents. EdgeTech reserves the right to upgrade features of this equipment, and to make changes to this manual, without notice at any time.

### Warnings, Cautions, and Notes

Where applicable, warnings, cautions, and notes are provided in this manual as follows:

**WARNING!** Identifies a potential hazard that could cause injury or death.

**CAUTION!** Identifies a potential hazard that could damage equipment or data.

**NOTE:** Recommendations or general information that is particular to the material being presented.

## Revision History

REVISION	DESCRIPTION	DATE	APPROVAL
B	Transfer to Database	01/23/2014	SS
C	Update Content & Format	12/05/2016	SS

## WARRANTY STATEMENT

All equipment manufactured by EdgeTech is warranted against defective components and workmanship for a period of one year after shipment. Warranty repair will be done by EdgeTech free of charge.

Shipping costs are to be borne by the customer. Malfunction due to improper use is not covered in the warranty, and EdgeTech disclaims any liability for consequential damage resulting from defects in the performance of the equipment. No product is warranted as being fit for a purpose, and there is no warranty of merchantability. This warranty applies only if:

- i. The items are used solely under the operating conditions and in the manner recommended in Seller's instruction manual, specifications, or other literature.
- ii. The items have not been misused or abused in any manner, nor have repairs been attempted thereon without the approval of EdgeTech Customer Service.
- iii. Written notice of the failure within the warranty period is forwarded to Seller and the directions received for properly identifying items returned under warranty are followed.
- iv. The return notice authorizes Seller to examine and disassemble returned products to the extent Seller deems necessary to ascertain the cause for failure.

The warranties expressed herein are exclusive. There are no other warranties, either expressed or implied, beyond those set forth herein, and Seller does not assume any other obligation or liability in connection with the sale or use of said products. Any product or service repaired under this warranty shall be warranted for the remaining portion of the original warranty period only.

Equipment not manufactured by EdgeTech is supported only to the extent of the original manufacturer's warranties.

**CAUTION!** If your product is a portable topside, never attempt to ship it in its Storm Case™ alone. Shipping portable topsides without an exterior shipping crate will void the warranty.

## RETURNED MATERIAL AUTHORIZATION

Prior to returning any equipment to EdgeTech, a Returned Material Authorization (RMA) number must be obtained. The RMA will help us identify your equipment when it arrives at our receiving dock and track the equipment while it is at our facility. The material should be shipped to the address provided in the **EDGETECH CUSTOMER SERVICE** section. Please refer to the RMA number on all documents and correspondences as well.

All returned materials must be shipped prepaid. Freight collect shipments will not be accepted. EdgeTech will pay freight charges on materials going back to the customer after they have been evaluated and/or repaired.

**CAUTION!** If your product is a portable topside, never attempt to ship it in its Storm Case™ alone. Although rugged, these cases are not intended to be used as shipping containers, and the delicate internal components could be damaged if used in this manner.

The following steps apply only to material being returned from outside the Continental United States. Follow them carefully to prevent delays and additional costs.

1. All shipments must be accompanied by three copies of your proforma invoice, showing the value of the material and the reason for its return. If the reason is for repair, it must be clearly stated in order to move through customs quickly and without duties being charged. Whenever possible, please send copies of original export shipping documents with the consignment.
2. If the value of the equipment is over \$1000, the following Shipper's oath must be sent with the invoice. This oath can be typed on the invoice, or on a separate letterhead:

"I, \_\_\_\_\_, declare that the articles herein specified are the growth, produce, or manufacture of the United States; that they were exported from the United States from the port of \_\_\_\_\_, on or about \_\_\_\_\_; that they are returned without having been advanced in value or improved in condition by any process of manufacture or any other means; and that no drawback, or allowance has been paid or admitted hereof."

Signed \_\_\_\_\_

3. If there is more than one item per consignment, a packing list must accompany the shipment. It is acceptable to combine the proforma invoice and packing list if the contents of each carton are clearly numbered and identified on the invoice.
4. Small items can be shipped prepaid directly to EdgeTech by FedEx, DHL, UPS, Airborne, etc.
5. If the equipment is the property of EdgeTech (formerly EG&G Marine Instruments Division), please insure for full value.
6. Fax one invoice, packing list, and a copy of the airway bill to EdgeTech upon shipment.

## CUSTOMER SERVICE

Customer service personnel at EdgeTech are always eager to hear from users of our products. Your feedback is welcome, and is a valuable source of information which we use to continually improve these products. Therefore, we encourage you to contact EdgeTech Customer Service to offer any suggestions or to request technical support:

**NOTE:** Please have your system Model and Serial Number available when contacting Customer Service.

<b>E-mail:</b>	service@edgetech.com
<b>Mail:</b>	4 Little Brook Road West Wareham, MA 02576
<b>Telephone:</b>	(508) 291-0057
<b>Facsimile:</b>	(508) 291-2491
<b>24-Hour Emergency Technical Support Line:</b>	(508) 942-8043

For more information please go to [www.EdgeTech.com](http://www.EdgeTech.com).

## COMPANY BACKGROUND

EdgeTech (formerly EG&G Marine Instruments) traces its history in underwater data acquisition and processing back to 1966. EdgeTech has designed, developed, and manufactured products, instruments, and systems—for the acquisition of underwater data, including marine, estuarine, and coastal applications—for over 45 years.

The company has responded to the needs of the scientific, Naval, and offshore communities by providing equipment—such as sub-bottom profilers, side scan sonar, acoustic releases, USBL positioning systems, and bathymetric systems—that have become standards in the industry.

EdgeTech has also consistently anticipated and responded to future needs through an active research and development program. Current efforts are focused on the application of cutting-edge CHIRP and acoustic technology.

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## 1.0 OVERVIEW

The EdgeTech model AA100 Acoustic Actuator provides a reliable and cost-effective means of remotely actuating a submerged device (relay, solenoid, blasting cap, squib, etc.). This product excels in the role of straightforward, acoustic solutions in the short-duration, shallow-water market. Under favorable conditions, these devices provide the user with means of acoustic activating devices at slant ranges more than 5 kilometers.

The model AA100 acoustic actuator is small, lightweight, and designed to present a minimal magnetic signature. This product is simple to use and requires no tools to arm and operate the system. Operation of the model AA100 simply involves the unit being switched on, connected to the device to be actuated, and then sent its unique command code from an EdgeTech deck unit, such as a 8011, 8011A, 8011B, 8011XS, or PACS.

The acoustic command code structure employed in these devices is EdgeTech's field-proven BACS (binary acoustic command) format. BACS commands are 16-bit, FSK encoded tone bursts. The format has minimum transition requirements and no command is re-issued, making it secure, reliable, and widely accepted by the oceanographic community.



## 2.0 SPECIFICATIONS

Specifications for the AA100 unit are as follows:

SPECIFICATION	VALUE
<i>Operating depth</i>	100 meters
<i>Operating modes</i>	Programmable delayed acoustic operation Programmable timed fire (actuation)
<i>Exposed materials</i>	CPVC, BUNA-N, Polyurethane, Neoprene
<i>ON / OFF</i>	Internal On / Off with positive indicator (LED)
<i>External activation</i>	Hand-operated rotary safety driver switch
<i>Power source</i>	1 each 9 volt battery (easily replaceable)
<i>Operational life</i>	30 days & 1 discharge or 1 day & 100 discharges
<i>Storage life (off)</i>	8 years
<i>Storage life (on)</i>	180 days
<i>Output pulse</i>	9 volt 65 milliseconds (2.4 joules)
<i>Magnetic signature</i>	~26 gamma @ 12 inches
<i>Command structure</i>	ARM and FIRE 16-bit frequency encoded BACS

*Table 2-1: Specifications*



## 3.0 TECHNICAL DESCRIPTION

This section describes the basic components of the system and the commands that it can receive.

### 3.1 Command Descriptions

- ARM** After receiving the ARM command the unit will charge up the firing capacitors. This takes 30 seconds, after which the fire circuit will be enabled. When the AA100 is charging the output stage, it will not act on any commands, and the receiver is locked out for the entire 30-second charge period. The system will remain armed for 5 minutes, during which the fire circuit remains charged and will fire if the fire command is received. After the 5 minute armed period, the system discharges the capacitors and must be re-armed before firing.
- FIRE** The AA100 unit will not act on a FIRE command unless the system has been armed and the 5-minute timeout has not elapsed. If the fire circuit is charged, the system will fire immediately upon receiving a FIRE command.

### 3.2 Internal On / Off Switch

The internal On / Off switch is used to power up the system. When the switch is turned on, the system is ready for programming and will hold the program that has been loaded. The system will not execute the program or act on any commands until the external on / off switch is in the on position.

**NOTE:** Be sure the External On / Off switch is in the Off position before installing the electronics in the pressure housing.

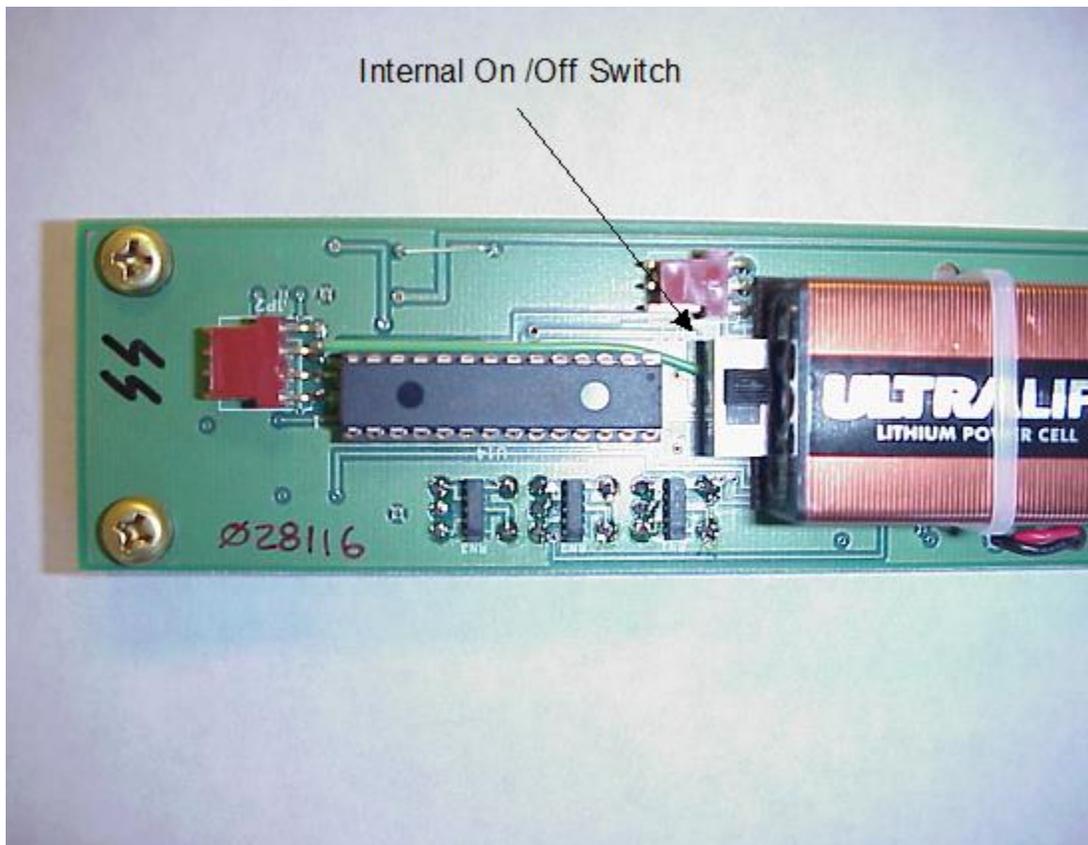


Figure 3-1: Internal On / Off Switch

### 3.3 Operating Modes

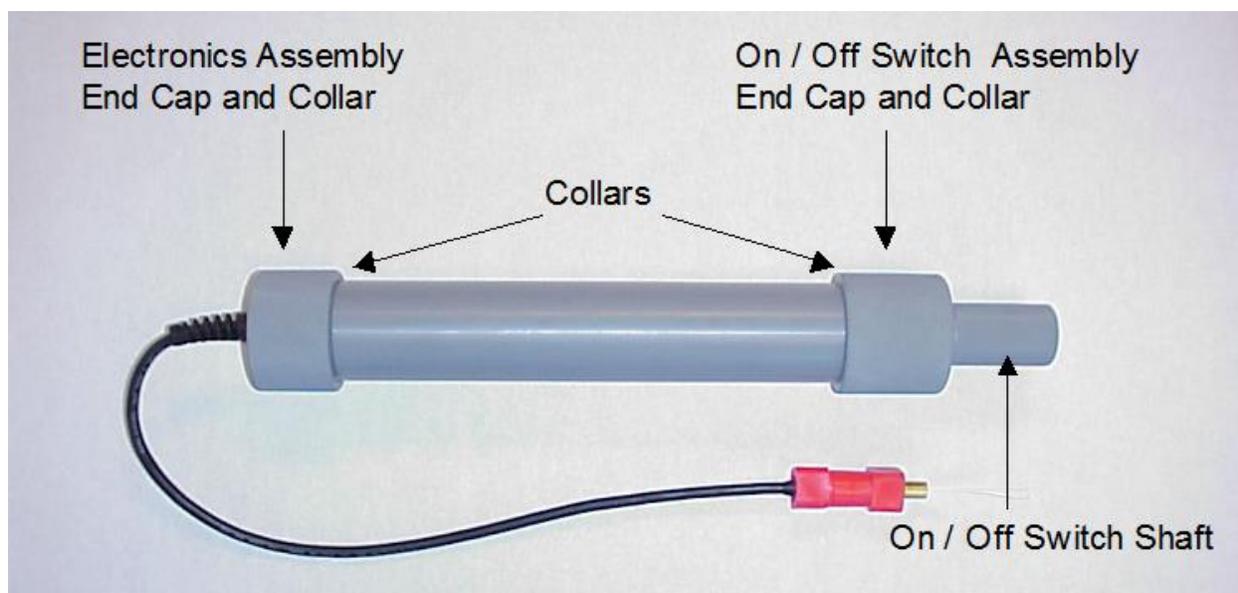
There are 4 operating modes available in the AA100, as described in the subsections to follow. These modes are programmed and entered by using the rotary switches and the push button switch on the electronics board inside the AA100 (see subsection [4.1 OPENING THE HOUSE](#) and Removing the Electronics Assembly)

Before programming, it is necessary to open the housing and remove the electronics assembly. Only open it in a clean and dry environment. To open the assembly:

1. Be sure the housing and collar assemblies are clean.
2. Turn the external On / Off switch to the OFF position.
3. Unscrew the collar on the cable end of the housing.
4. Gently slide the end cap with the attached electronic assembly out of the housing taking care to not scratch the O-ring surfaces on the throat of the housing. It may be necessary to press the end cap from side to side and or rotate it to get the assembly out.

5. Once the assembly is out far enough, then slide the internal On / Off switch to the OFF position.

**NOTE:** It is not necessary to remove the external on / off switch end cap to change the batteries or to program the unit.



*Figure 4-1:* Parts of the AA100

Programming the Unit). The system must be programmed within 1 minute of turning it on with the on/off switch inside the housing. The default unit mode is Mode 1

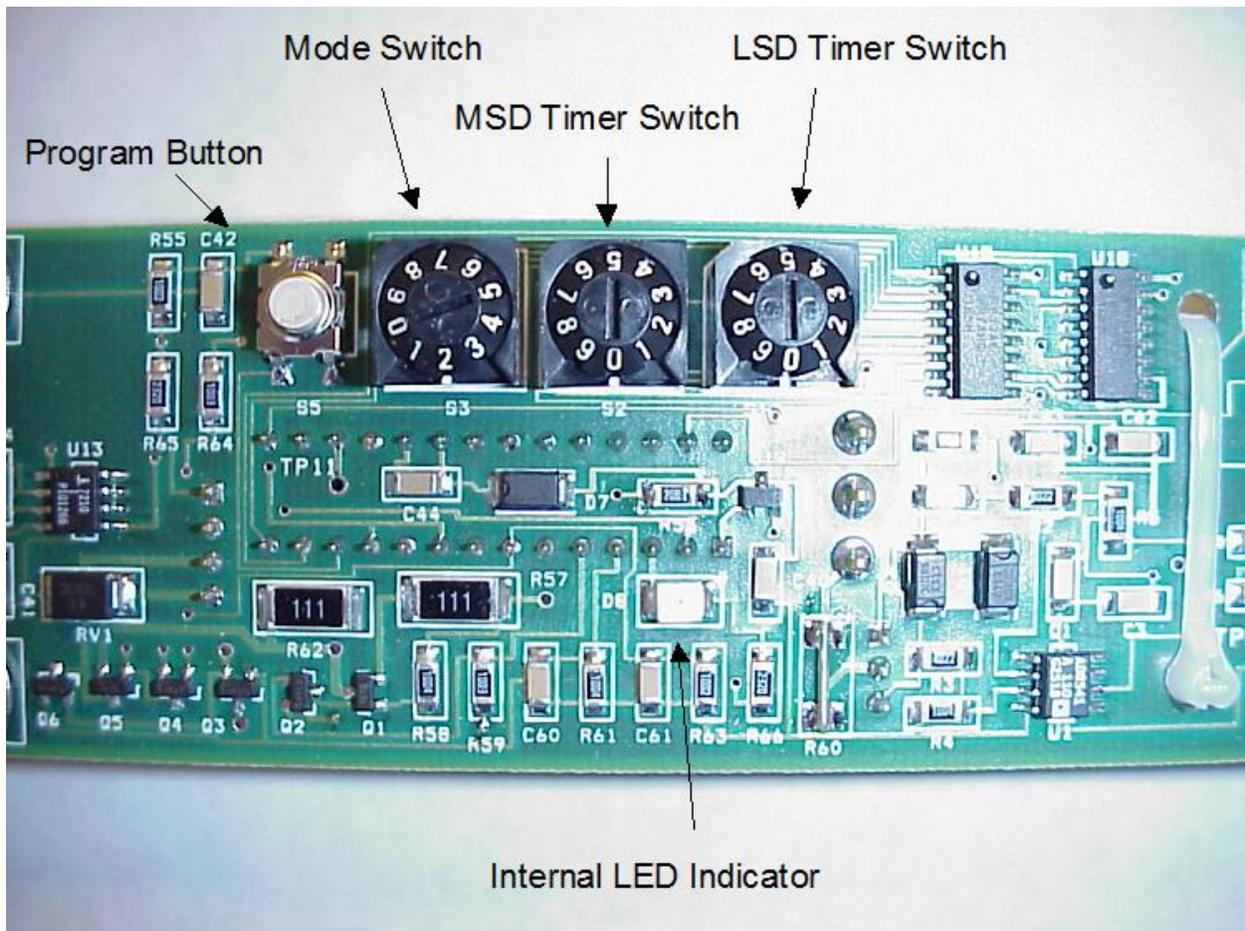


Figure 3-2: Rotary Switches

### 3.3.1 Mode 1

Mode 1 is the default mode that the unit will power up in unless the programming button is pressed. The unit will also enter this mode if the mode rotary switch is in the 1 position when the program button is pressed. The MSD and LSD timer rotary switches have no effect in Mode 1.

In Mode 1, when the external On / Off switch is turned to the ON position, the unit will not respond to any commands for **10 minutes**. After 10 minutes, the system will be ready to receive an ARM command, and then a FIRE command.

If the external On / Off switch is turned OFF, the system can be turned on again, but the 10-minute time out will start again. This time out is intended to allow users to evacuate the area before any arming and or firing can take place.

### 3.3.2 Mode 2

Mode 2 behaves similarly to Mode 1, except that the time delay is set by the user. The system will enter Mode 2 if the rotary switch is in the 2 position when the programming button is pressed. The timer rotary switches are used to set the delay time before the unit can be used.

In Mode 2, when the external On / Off switch is turned to the ON position, the actuator will act on commands received only after the time set on the MSD and LSD timer switches has elapsed. The delay can be set from **0 to 99 minutes**. The MSD switch indicates 10-minute intervals and the LSD indicates 1-minute intervals. The unit will not respond to any commands for number of minutes set on the timer switches.

After the programmed time delay has elapsed, the system can receive an ARM command and then a FIRE command. If the external On / Off switch is turned OFF, the unit can be turned on again, but the user-set time out will start again. This time out is intended to allow users to evacuate the area before any arming and or firing can take place.

### 3.3.3 Mode 4

Mode 4 is almost identical to Mode 2, except that the rotary timer intervals are calibrated for day-long periods of delay rather than minutes. The unit will enter this mode if the mode rotary switch is in the 4 position when the program button is pressed, and then the MSD and LSD timer rotary switches are used to set the delay time before the system is capable of being used.

In mode 4 when the external On / Off switch is turned to the ON position, the actuator will act on commands received only after the time set on the timer switches has elapsed. The delay can be set from **0 to 99 days**. The MSD switch indicates 10-Day intervals and the LSD indicates 1-Day intervals. The unit will not respond to any commands for number of days set on the timer switches.

After the timeout, the unit can receive an ARM command and then a FIRE command. If the external On / Off switch is turned off, the system can be turned on again however the time out will start again. Timeout periods of this length are intended to allow users to deploy systems for longer periods of time. It will normally be used in study type mooring deployments, and is intended for recovery of deployed instruments.

### 3.3.4 Mode 8

Mode 8 is the timed fire mode, and is intended for use when a deck unit is not available or the acoustics in the area are bad. In this mode, the unit will fire immediately after the timer has elapsed. There is no command required.

The system will enter Mode 8 if the mode rotary switch is in the 8 position when the programming button is pressed. The timer rotary switches are used to set the delay time before the system charges, and then fires. 30 seconds before the time is elapsed, the fire circuit will start charging and then the circuit will fire. The delay cannot be set to 0 minutes. If the delay is set to 0 minutes the system will report a mode error

(10 quick flashes on the Internal LED) and go to the default mode (Mode 1). The delay can be set from 1 to 99 minutes. The MSD switch indicates 10-minute intervals and the LSD indicates 1-minute intervals. In mode 8, when the external on / off switch is turned to the on position, the actuator will start timing and fire accordingly. Turning the external on / off switch to the off position will disable the system.

### 3.4 External On / Off Switch

The external On / off is a watertight rotary switch. It can be operated underwater as well as on the surface. The system is OFF when the switch shaft is turned fully counterclockwise. The system is ON when the switch shaft is turned fully clockwise. Total travel of the shaft is 90 degrees. The surface of the collar and the switch shaft are knurled for maintaining an easy grip while using the switch.

To use the switch, hold the collar with one hand and rotate the switch shaft with your other hand. The switch shaft will stop at either the on or the off position depending on the direction of rotation.

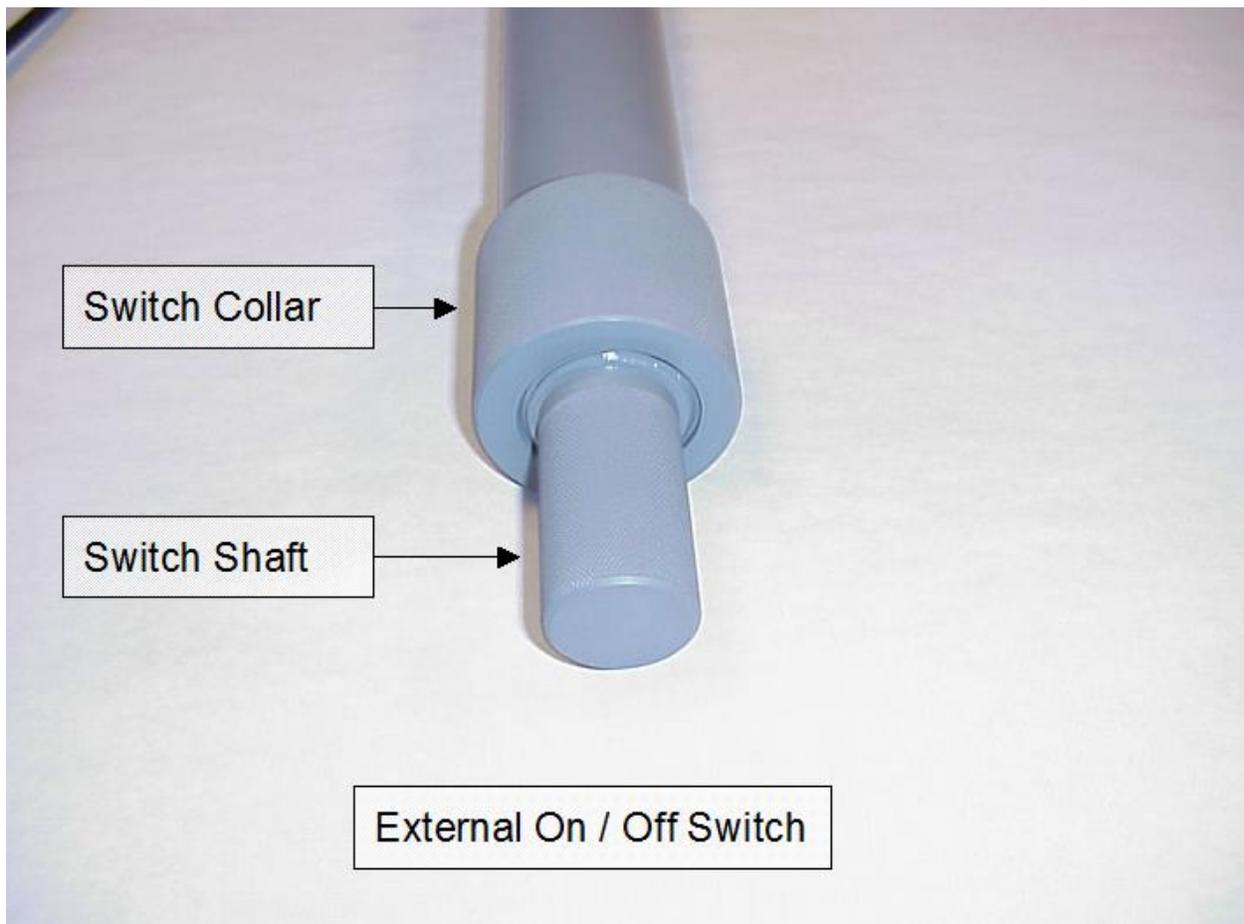


Figure 3-3

**NOTE:** Be sure the External On / Off switch is in the Off position before installing the electronics in the pressure housing.

### 3.5 External LED

When the system is turned on using the External On / Off switch, the External Led will flash several times indicating which mode is set. It will also begin timing if a mode, which includes timing, is active. After 2 seconds the External LED will flash the number of times equal to the mode set.

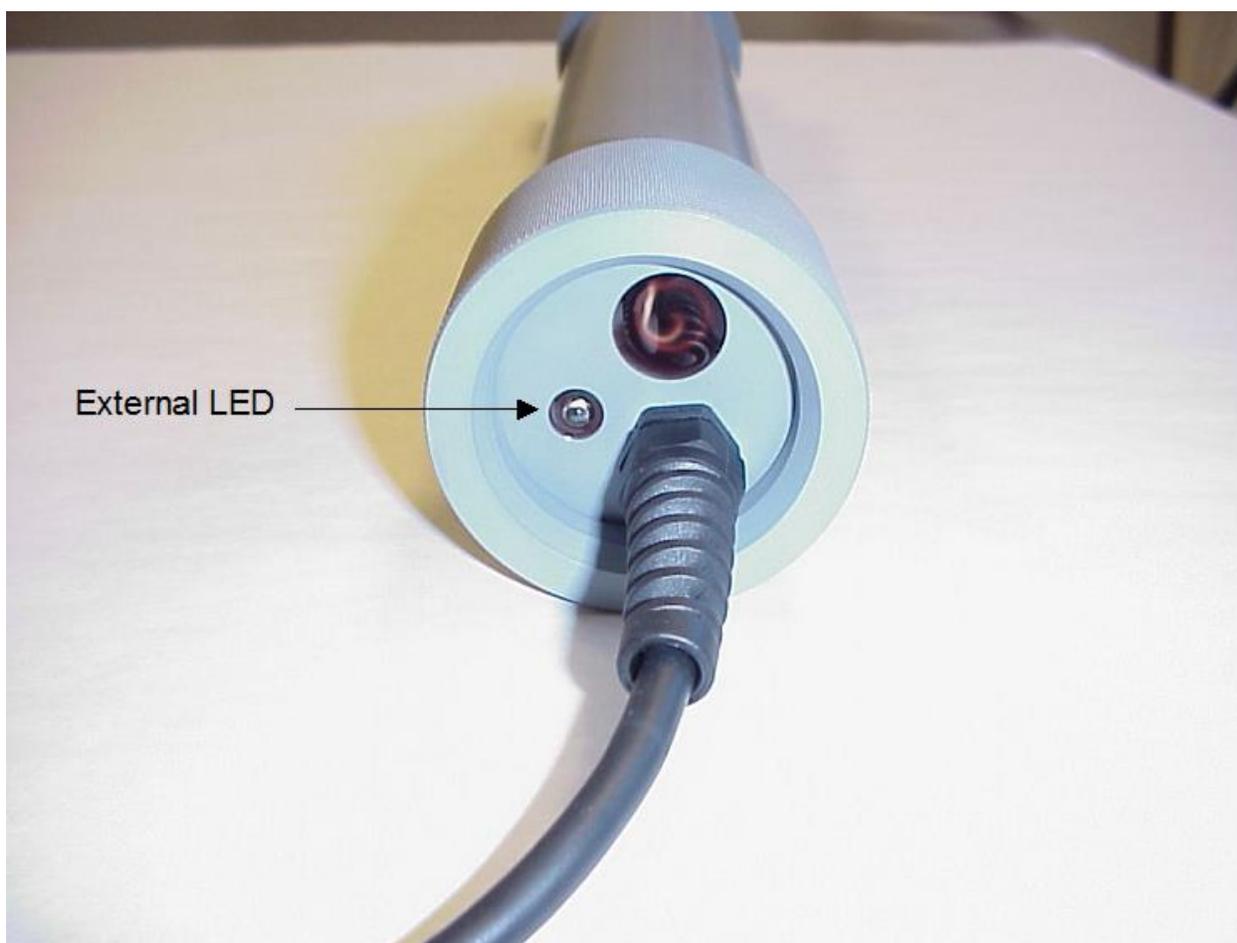


Figure 3-4



## 4.0 SETUP AND ACTIVATION

The following instructions explain how to setup and activate the unit, and should be used in conjunction with the technical description of the mode options in section 3.0.

### 4.1 Opening the House and Removing the Electronics Assembly

Before programming, it is necessary to open the housing and remove the electronics assembly. Only open it in a clean and dry environment. To open the assembly:

6. Be sure the housing and collar assemblies are clean.
7. Turn the external On / Off switch to the OFF position.
8. Unscrew the collar on the cable end of the housing.
9. Gently slide the end cap with the attached electronic assembly out of the housing taking care to not scratch the O-ring surfaces on the throat of the housing. It may be necessary to press the end cap from side to side and or rotate it to get the assembly out.
10. Once the assembly is out far enough, then slide the internal On / Off switch to the OFF position.

**NOTE:** It is not necessary to remove the external on / off switch end cap to change the batteries or to program the unit.

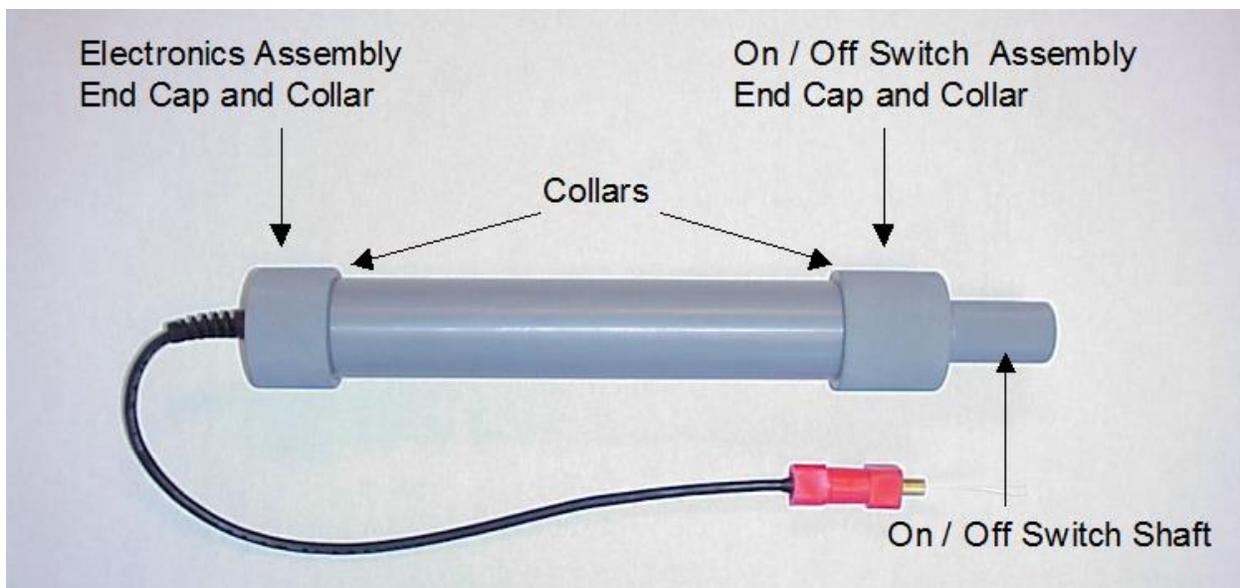


Figure 4-1: Parts of the AA100

## 4.2 Programming the Unit

If the unit is turned on but the programming button and rotary switches are not touched or changed, then the system defaults to Mode 1.

If the mode is to be set to something other than default, a small flat bladed screwdriver is required to change the rotary switches. The position of the rotary switches does not matter unless the program button is pressed within 1 minute of turning the system on. If the program button is pressed within 1 minute of power up, the system will read the position of the rotary switches and set the mode and timer accordingly.

On power up (switching the internal On / Off switch to the ON position), the internal on board LED will flash once, if the Program Button is pressed within 1 minute after this flash, the LED will flash once more indicating that mode and timer switch settings are being loaded.

After the mode is set, the internal LED will flash the number of times to indicate the mode that was set. 1 flash equals mode 1, 2 flashes equals mode 2, 4 flashes equals mode 4, and 8 flashes equals mode 8. It is best to set the rotary switches before turning the system on, this is simply to make it easier to program the unit within the 1-minute timeout. Remember the position of the switches does not matter unless the program button is pressed. In the event of an improper mode setting (an unsupported or unimplemented switch position) the led will flash 10 times quickly and return to the default Mode 1.

## 4.3 Reassembling the Unit

To reassemble the unit after programming or servicing:

1. Apply O-ring lube to all surfaces and the O-rings. (A light coating is all that's required).
2. When you are returning the electronics to the housing please be careful to not scratch the O-ring surfaces inside the housing.
3. Slide the electronics all the way into the housing and then replace the collar.

## 5.0 MAINTENANCE

The AA100 requires minimal maintenance other than occasionally inspecting and changing O-rings, along with battery replacement. The instructions for these procedures are provided below, and should be used in conjunction with the instructions for opening and closing the unit found in the previous section.

### 5.1 Battery Replacement and O-Ring Maintenance

The O-rings should be carefully inspected and replaced periodically. The batteries should also be replaced periodically. The battery is a Long-life lithium power cell. To achieve the life specified only ULTRALIFE model #U9VL-FP should be used. The O-rings are 2-132N70. Whenever installing O-rings, be sure to thoroughly inspect the new O-ring for defects.

To replace the battery:

1. Cut off and dispose of the tie wrap.
2. Disconnect the cable from the battery and dispose of the battery properly.
3. Plug the new battery into the cable and replace the tie wrap. Be sure the isolation rubber pad is still in place under the battery.

When replacing O-rings, be sure to inspect all O-ring surfaces as well as the O-rings for scratches and or debris, which may cause a leak. Then, lubricate the O-rings and all surfaces lightly before closing up the unit.

### 5.2 Servicing the External On / Off Switch

To remove the External on / off switch for service and to replace the O-ring:

1. Hold the Switch in the center of its travel (halfway between on and off) while removing the collar.
2. When the collar has been removed, the shaft can be slid out of the housing. Be careful to not scratch any O-ring surfaces.
3. After replacing the O-ring and inspecting the assembly replace the shaft and the collar.

**NOTE:** For any other questions or concerns, contact [EDGE TECH CUSTOMER SERVICE](#).