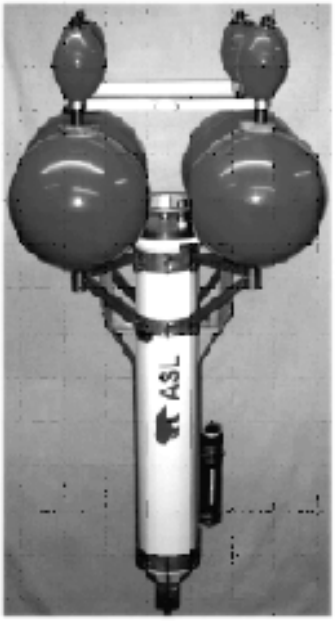
Acoustic Water Column Profiler AWCP-5

Operators Manual

for

Model AWCP5



Release Version R06
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Chapter

1

Overview

1.1 Overview

Thank you for purchasing an "Acoustic Water Column Profiler (AWCP)" from ASL Environmental Sciences.

This instrument has been thoroughly tested at the factory prior to shipment. The sensors have been individually calibrated (see Calibration Sheets in Appendix E and the calibration coefficients provided on the supplied CD.

The purpose of this manual is to provide the user with the technical information required to successfully operate the ASL Water Column Profiler, Model AWCP. To help you get started on using the AWCP, the manual provides a concise step-by-step approach to each required task.

This manual is designed for use in conjunction with the AWCP5Link Users Guide. For further details on a given topic please consult the AWCP5Link manual or the “Help” section of the AWCP5Link program.

Warranty

ASL Environmental Sciences Inc. (ASL) warrants all new products of its manufacture to be free from defects in material and workmanship under normal usage for a period of one year. This warranty is solely for the benefit of the original buyer. ASL will replace or repair free of charge, F.O.B. at its factory in Sidney, BC, Canada, any part or parts returned within one year of original delivery, which ASL’s examination shall show to have failed under normal use and service. This warranty does not apply to any defects or improper functioning caused by negligence, misuse, tampering, accidents, improper installation, or work performed by unauthorized personnel.

This warranty is the only warranty given for the sale of ASL products. No warranties implied in law, including but not limited to the implied warranties of merchantability and fitness for a particular purpose, shall apply. In no event will ASL be liable for any direct, indirect, consequential or incidental damages resulting from the purchase or use of ASL products, or resulting from any delays or failure of performance of ASL under agreement, or resulting from any services furnished by ASL. Equipment not manufactured by ASL is supported only to the extent of the original manufacturer’s warranty.

This warranty may not be modified, amended, or otherwise changed except in writing as properly executed by an officer of ASL.

1.2 Principles of Operation

Functional Description

The Acoustic Water Column Profiler Model 5 (or AWCP5) is a self-contained instrument designed to measure and record acoustic returns from the water column moving through its field of view from the seabed during long unattended deployments. The AWCP5 is deployed as much as 600 m beneath the surface (the working depth limit of its pressure case), looking upward. It transmits an acoustic pulse of programmable duration, and then listens for the echo from targets in the water column up to a maximum range from the instrument. It then averages the return amplitudes into "bins" of a size specified by the user. The returns from groups of pings transmitted at intervals may also be averaged together to form average profiles at those intervals.

(The maximum range is determined by the size of an internal data buffer and the sampling rate: it is approximately 225m at 64 kHz sampling, 365 at 40 kHz and 730m at 20 kHz. The effective maximum range may be much less than the nominal maximum, depending on the acoustic frequency used by the instrument, as the receiver gain reaches its maximum value at about 100 metres range, and the echo strength will then decrease with range at a rate that is greater the higher the acoustic frequency.)

The Water Column Profiler also contains sensors for measuring:

- beam tilt from vertical on two axes
- date and time by means of a real-time clock
- water temperature by means of a thermistor

The tilt data allows the calculation of zenith distance from echo range, if the drag forces, exerted by local ocean currents, affect the AWCP orientation.

The AWCP may be programmed to start data collection immediately, or to wake up at a future time. It stores acquired data within its non-volatile CompactFLASH memory. Communication with the AWCP, and downloading of data, occurs via an RS232 interface through a bulkhead connector on the pressure housing or connector on the side of the housing. An alternative download method is to remove the instrument from its pressure case, eject the CompactFLASH and use a USB card reader to transfer the data to a PC.

Instrument Operation

(Note: The names of control parameters are denoted as *words in italic fonts.* The control parameters can be set in the Deploy Panel of the ASL AWCP5Link software – see ASL AWCP5Link Users Guide. They are also described in the Definition of Terms section that follows.)

The AWCP is capable of operating with up to 12 different settings, or phases, over a single deployment. A phase is a data collection sequence with a unique set of operating parameters. This means the instrument can, at predetermined times, change its operating parameters to optimise data collection for a particular purpose. The data collection sequence for each phase is as follows: (The definition of the terms used below follows this description.)

At times separated by the *PROFILE INTERVAL*, the internal echo sounder is turned on, a travel-time counter is started, and a sound pulse is transmitted for the length of time chosen via the *PING LENGTH* parameter. Following transmission, the instrument is idle for the length of time corresponding to the *LOCKOUT* range (normally 0). The lockout is entered as meters and an assumed sound speed of about 1460 m s^{-1} is used to convert the *LOCKOUT* distance into time. When the *LOCKOUT* time expires, the AWCP digitizes the returned acoustic signal strength at a sample frequency of one of 64/40/20 kHz (selected by the user). T he samples are stored in a ping buffer as data collection continues until *MAXIMUM RANGE* is reached. Note that although *MAXIMUM RANGE* is entered in meters, AWCP converts this to delay time using a sound speed of 1460 m s^{-1} On completion of data acquisition for a ping the AWCP firmware analyzes the contents of the ping buffer and averages the number of samples specified in the parameter *BIN SIZE* to give the averaged echo intensity for the desired bin. These bin averages are stored in a separate burst buffer. If a number of pings are to be averaged together to form a profile, this sequence will be repeated once every *PING PERIOD* until the number of *PINGS/PROFILE* is reached. After each ping a running average of each bin over all pings in the profile is performed. The standard deviation of the echo in each bin may also be optionally computed and stored. The result is then stored in the non-volatile FLASH memory. The AWCP then goes to sleep during the remainder of the *PROFILE INTERVAL*, waking to repeat the process at the next ping interrupt.

Notes:
Each ping in the group of pings determined by the *PINGS/PROFILE* occurs one *PING PERIOD* apart. The minimum *PING PERIOD* is 1 second. Setting the *PROFILE INTERVAL* equal to the *PING PERIOD* will result in continuous pinging at that period, with no time averaging of the returns, i.e. each profile will contain the data from a single ping. The *PROFILE INTERVAL* cannot be less than the *PING PERIOD*.

In the data record, each profile record is preceded by a header that includes the deployment name, the current date/time, and battery voltages and a record of readings from the auxiliary sensors (i.e. tilt), if present.

To retrieve the data when the deployment is complete, the user connects a personal computer (PC) serial port to the AWCP via a custom interface cable and uses the AWCP software to extract the data into DOS ASCII files. An included A/C adapter is required during downloading and / instrument configuration.

Definition of Terms

PROFILE INTERVAL: This is the time in seconds between profiles (or between pings if the profile interval has been set equal to the ping period); See Fig. 1.1

PINGS/PROFILE: This is the number of individual pings to be averaged for each burst. See Fig. 1.1

PING LENGTH: Length of the transmitted acoustic pulse in microseconds. See Fig. 1.1

PING PERIOD: Time between pings in a profile set. See Fig. 1.1

LOCKOUT RANGE: (User selectable from 0 to MAXRANGE –1 metre). This is the blanking distance after the pulse is transmitted to when the AWCP starts to listen for returns. Acoustic returns from objects within the LOCKOUT RANGE will not be detected by the instrument because the receiver circuitry is disabled for the equivalent time it takes

the transmitted pulse to travel to the objects and back to the instrument. See Fig. 1.2, where Target 1 will not be detected.

MAXIMUM RANGE: Distance to which the sounder listens for returns. Acoustic returns from objects further away than the MAXIMUM RANGE will not be "seen" by the instrument because the receiver circuitry will be disabled before the equivalent time it takes the transmitted pulse to travel to the objects and back to the instrument. This is a rough estimate and will be rounded down to the nearest bin based on the specified bin size. i.e. if bin size is equivalent to 4m, maximum range value of 30 would actually terminate at 28m. See Fig. 1.2,where target 3 will not be detected.

BIN SIZE: This describes the division of the water column into discrete "bins" that contain range-averaged samples. The actual number entered into the AWCP5Link software is the bin size in metres per bin. See Fig. 1.3.

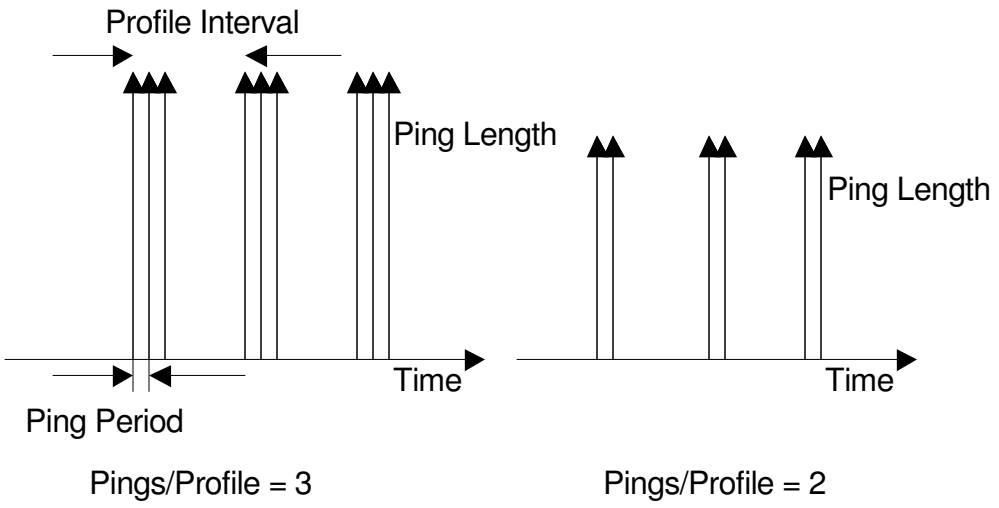


Fig. 1.1 Illustration of Profile Interval, Ping Period and Ping Length

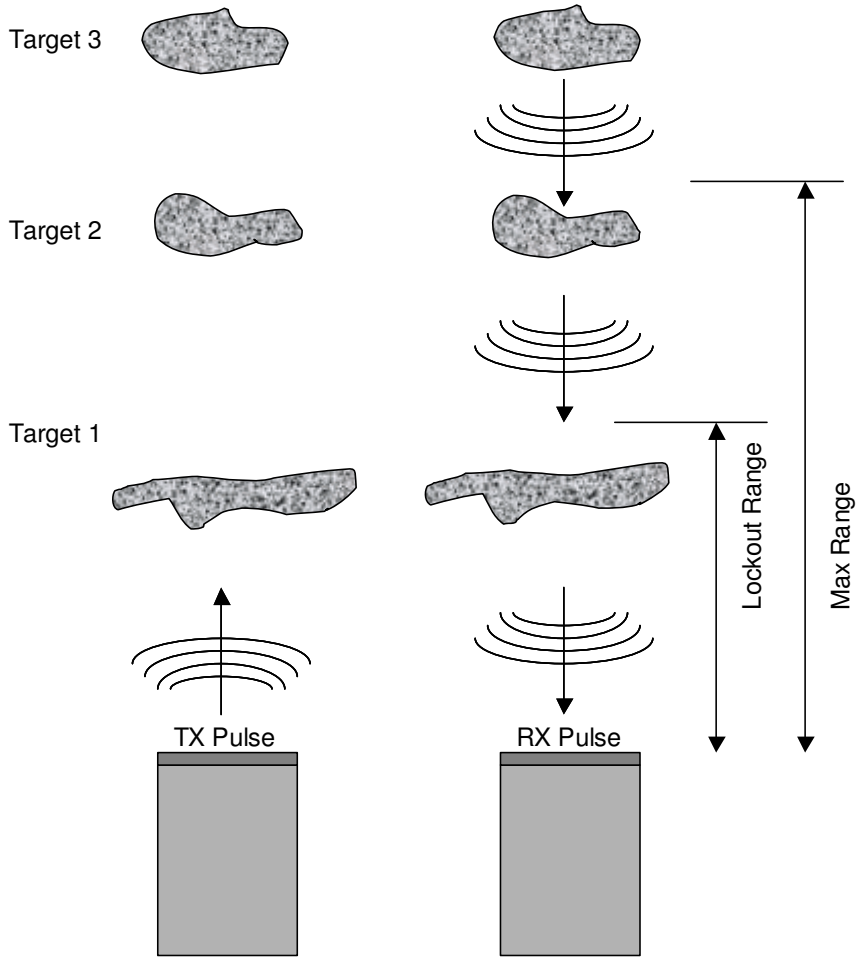


Fig. 1.2 Illustration of Lockout and Maximum Range

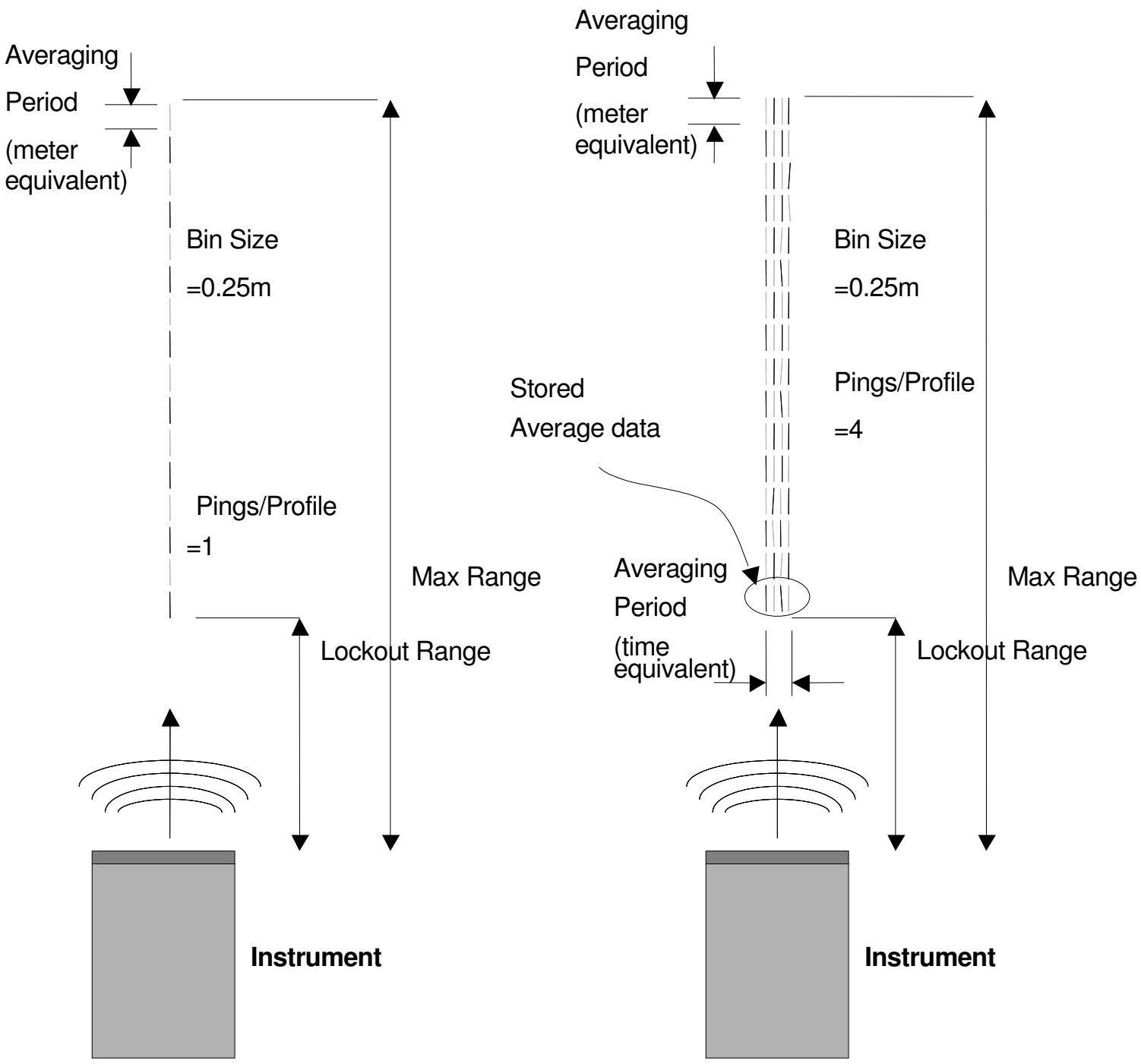


Fig. 1.3 Illustration of Bin Size and Averaging Concepts

1.3 Applications

Typical Installations of Profiler Product Family

Figure 1. AWCP in (a) a mooring cage and (b) in a bottom frame

Planning a Measurement Program

The planning of a successful AWCP deployment requires careful consideration of expected environmental conditions. The length of deployment, expected mooring motion, the surface-wave climate and the design of the mooring must all be taken into account. After consideration of these factors, a decision concerning the depth of deployment and the necessary sampling plan can be made.

An optimal observing schedule, sensitive to anticipated seasonal changes in ocean conditions might be designed within the constraints imposed by limited data storage and battery capacities. The parameter set for any phase can be completely independent of the other phases. Since planning within this framework is complex, the user software provides the capability to accomplish this task within the PC Windows-based AWCP5Link software (see Part 3 Section 4 and the AWCP5Link Users Guide). This tool re-calculates battery and memory use, on demand, as operating set-ups are changed interactively during the planning process. The program also saves the final parameter set in a file, which may be conveniently downloaded to the AWCP instrument by the AWCP5Link program as the operating parameter set.

Chapter
2

Installation

2.1 Equipment Inspection

Unpacking

When unpacking, use care to prevent physical damage to the transducer face and connectors. When handling any electronics modules, it is a good practice to follow proper electrostatic discharge (ESD) prevention measures.

Inventory

The AWCP should come with the following items:

1) AWCP complete with: Transducer holder/guard, Dummy Plugs and Anodes.

2) AWCP5Link Software envelope containing:

   - Software CD
   - Installation Instructions
   - Instruments Calibration Coefficient File

3) RS232 Interface Cable (5 pin Female connector) with A/C power adapter

4) Warranty Card.

5) Spares Kit Containing:

   - 2 SS Seal Screws
   - 2 ¼" jacking screws with Allen keys
   - 1 half inch wrench
   - 2 O-rings (one set)

6) AWCP Operators Manual and AWCP5Link Software Manual

7) External Acoustic Transducer (3/7/4 pin Female Connector depending on frequency)

8) Quick Start Sheets: Recovery, Deployment

Visual Inspection

To operate the ASL Water Column Profiler, the user needs to locate the following components on the exterior of the pressure case housing:

1) Acoustic transducer

2) Electrical bulkhead connector for serial interface and dummy plug

Operation of the AWCP also requires:

3) Surface communication cable (RS-232 Serial) with power adapter

4) AWCP5Link software package Installed on a Windows PC Computer

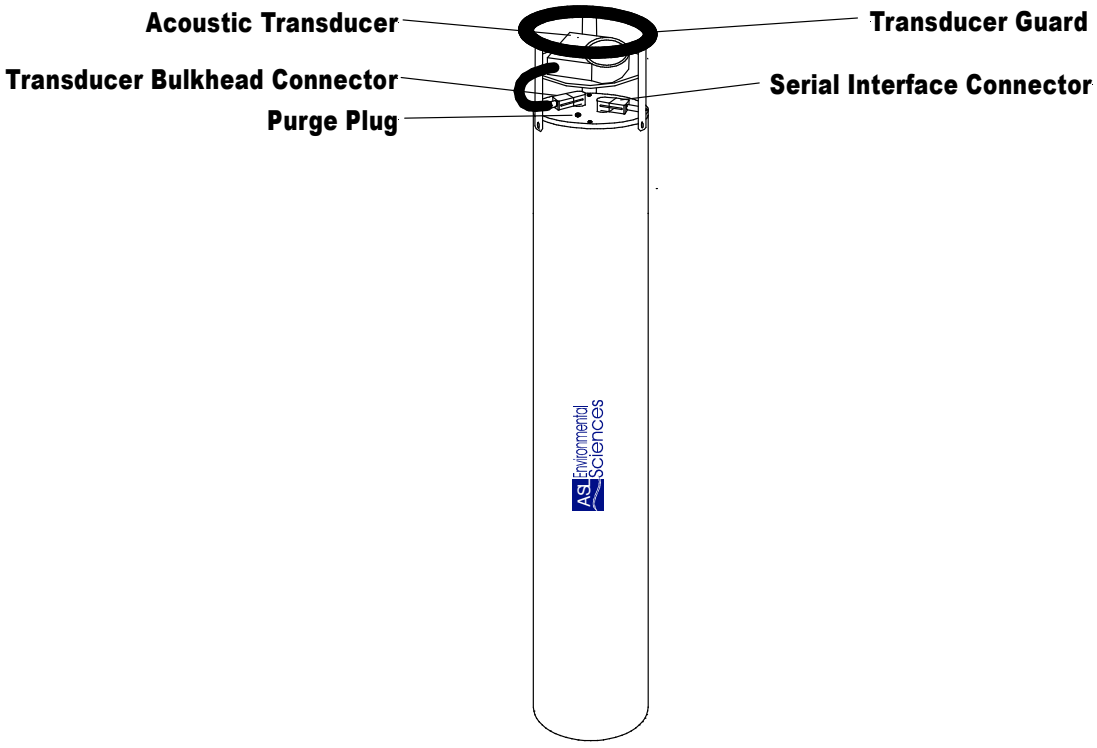


Figure 2.

Note If the unit is to be installed on a platform the instrument may be supplied in a small self-contained storage box with an external transducer. The battery pack and pressure case would not be needed, as power would be supplied by the platform itself.

2.2 Opening the Pressure Case

Remove the Purge Plug first! Injury or instrument damage may result if the purge plug is not removed prior to instrument disassembly. The Purge Plug is a ¼" bolt with a 7/16" hex head.

With the AWCP pressure case standing vertical on a level surface, unplug the transducer from the pressure case. Remove the three bolts that hold the End Cap and Transducer guard to the pressure case. (See Figure 3 below).

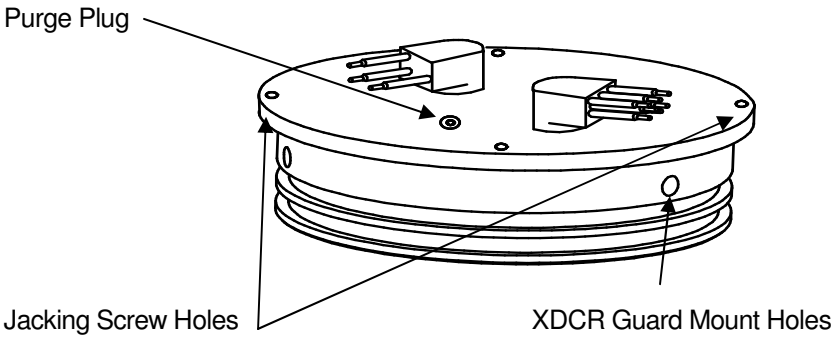
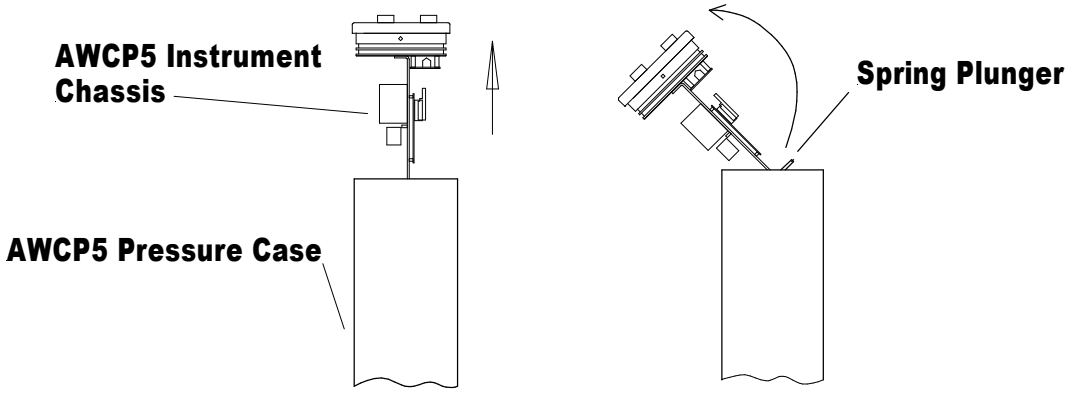


Figure 3

Use the jacking screws and Allen keys provided to evenly lift the end cap from the pressure case. Note there are 4 jacking hole positions on the end cap. A combination of any two can be used providing they are 180 degrees offset to one another on the end cap (across from one another). **Note: It is important to turn both jacking screws at the same time. The end cap should not lift from the pressure case at an angle.** Once the first set of O-rings has cleared the pressure case, the electronics chassis can be lifted out of the pressure case.

Note: This particular AWCP has been modified with spring plungers attached to the bottom mounting plate of the chassis. The modification was added to reduce chassis vibration during shipment and deployment. The following instructions list the methods used to insert and remove the chassis from the pressure case. This is done so that the O-ring surface of the pressure case is not damaged during deployment and recovery.

The unit is pulled directly out of the case until the bottom bracket approaches the o-ring surface. It is then rotated at a 45-degree angle (See Diagram Below) in order for the spring plungers to clear the O-ring surface.



Take care not to damage the O-rings as the instrument chassis moves past the upper end of the pressure housing. Although the battery pack may be connected, there is enough wire to permit raising the chassis sufficiently to unplug the 4-pin battery connector from the main controller board.

2.3 Battery Installation

Operation of the AWCP for underwater data collection requires installation and connection of a AWCP battery pack, or an external power source depending on its configuration and the users requirements. Replacement battery packs, in three sizes, can be ordered from ASL. Note that the AWCP unit is shipped from the factory with the battery pack **not connected.**

For bench testing of the AWCP and retrieval of data, the AWCP must be powered by an external power supply. Details of connecting to an external power supply are given in Section 3.4 of this manual.

Main Battery Pack

Use the AWCP5Link program to calculate the amount of battery power that will be required for the operating schedule desired for the AWCP deployment. The AWCP uses 2 battery supplies: a positive main supply (+13.5 V) and an echo sounder supply (15 V). The latter is separate from the main positive supply so that V_{TX}, and thus transmitted power, can be maintained at relatively constant value throughout a deployment. Note that transmitted power is proportional to the square of the supply voltage.

The battery pack is mounted to the bottom of the pressure case by slipping the battery pack over the mounting rod. The mounting rod is threaded to the bottom of the pressure case. Place the battery pack over the threaded rod and then place the flat fender washer, lock washer and wing nut onto the top of the threaded rod until the nut is snug on the top of the pack. **Do not use excessive force to tighten.** See Fig. 4 .

Battery / Powering Considerations

- *The AWCP is shipped with the battery pack disconnected from the main controller board. It is good practice to leave the pack disconnected until actual deployment. The instrument may auto-start during lab trials or shipping, thus discharging the battery pack.*
- *The instrument can communicate with the controlling PC without the battery pack being connected (or being discharged) when the serial cable with accompanying A/C adapter is used.*
- *If the instrument is left idle (for example on a bench-top) with a source of power (battery pack or A/C adapter) in place it may begin to operate after one hour. The data the instrument writes to FLASH will be need to be erased during actual deployment of the instrument.*

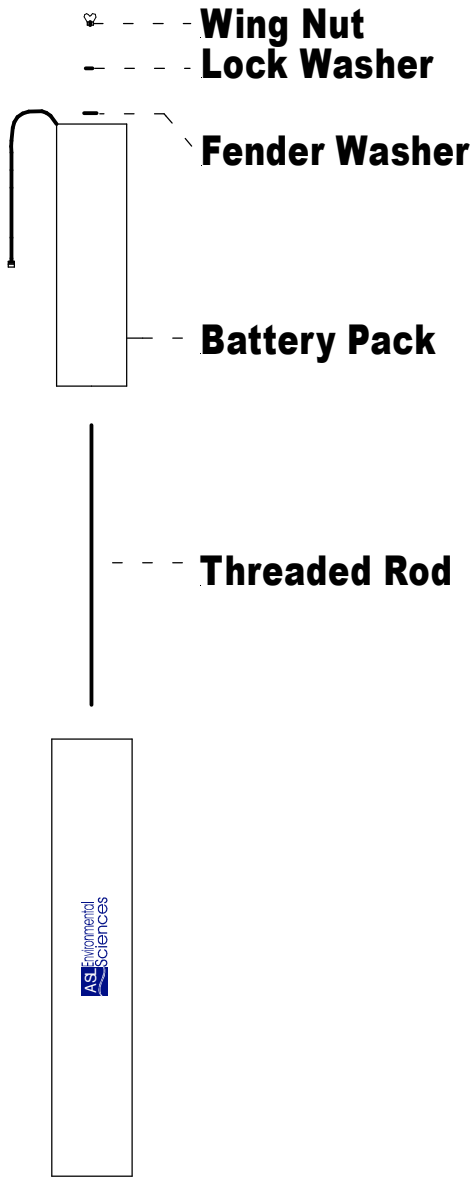


Figure 4 Battery Pack Installation

The battery connector has a square cross section and has orientation features that ensure it can only be plugged in correctly. The battery packs use alkaline cell technology and don't require any special disposal protocol. The photo in Figure 5 shows where the main battery plugs into the "digital" board.

Clock Battery

The AWCP also has a medium sized button style battery (3 volt type CR2032) located in a clip on the middle right-hand side of the Digital Board (See Figure 5). The red pull tab is for removal of the battery only! It's not an insulating strip as found in some consumer products to prevent battery drain before purchase.

This battery provides battery back-up for the real time clock only when the main battery pack is disconnected. The battery should be checked periodically (a ground reference test point is provided for this – see Fig. 5) and replaced when its voltage has dropped below 2.2 volts.

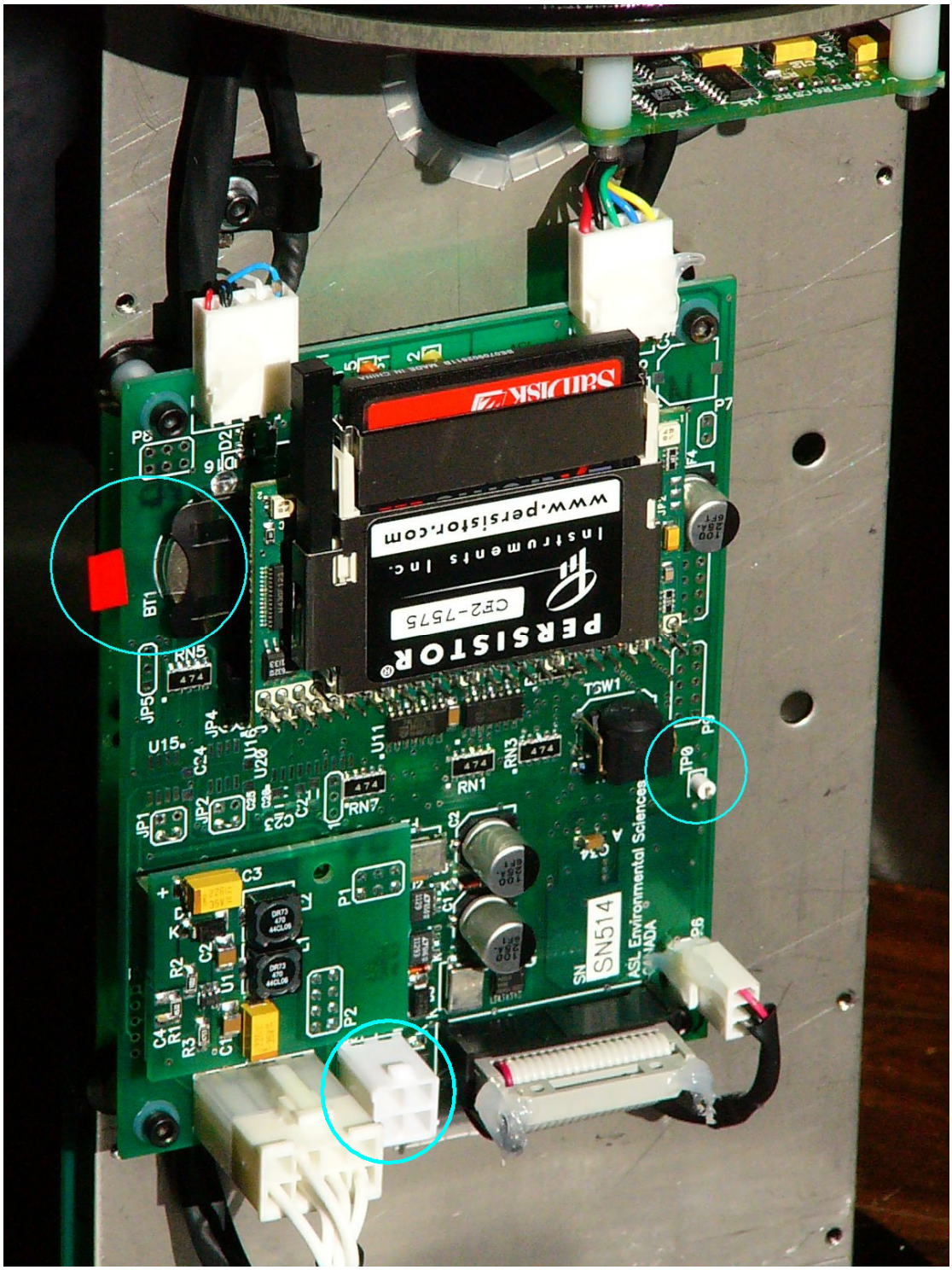


Figure 5 “Button” Battery Location, Ground Reference Test-Point and Main Battery Connector Locations

2.4 Closing the Pressure Case

O-ring Replacement and Inspection

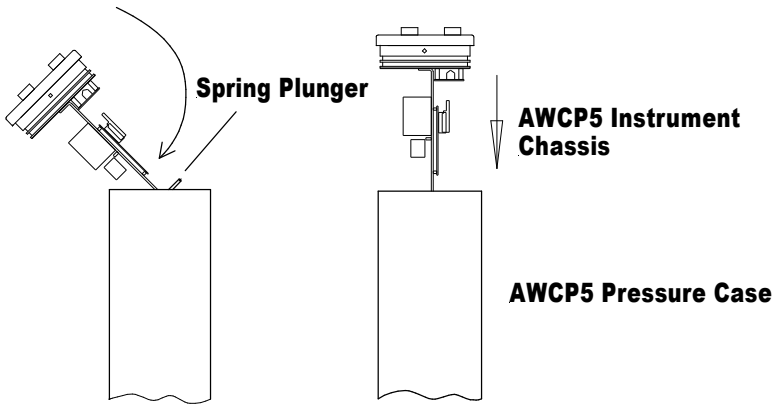
A successfully sealed pressure case and deployment will depend on the quality of the O-rings and following the correct installation procedure.

Note: It is recommended with each new deployment to use a new set of O-rings

O-ring inspection instructions follow:

- Perform a visual inspection on all O-rings. Each ring should be free of foreign matter, scratches, nicks and abrasions. Run your fingers around the entire circumference of the o-ring. If any defects are visible replace the o-ring immediately
- Remove, clean and inspect the o-ring groves on the end cap. The groves should also be free of foreign matter, scratches, indentations, built up grease and pitting. Run your fingernail across the surface of the grove. If you cannot feel a defect the damage may be minor. Otherwise the damage will need to be repaired.
- Lubricate the (removed) O-ring with Dow corning DC-111 lubricant. Apply the lubricant using latex gloves. Do not let any loose fiber or lint stick to the O-ring. **Don't simply apply lubricant to the surface of an in-situ O-ring. Don't over apply lubricant.**

Pull the battery cable through the hole in the base of the chassis and plug it in to the white header at the bottom of the digital board. As mentioned previously spring plungers were added to reduce chassis vibration. The reverse of the procedure shown above is now done to insert the chassis into the pressure case. (see Diagram Below). The unit should be placed in the pressure case at a 45-degree angle (See Diagram Below). Then straightened to a 90-degree angle once the spring plungers have cleared the O-ring surface



Align the end cap so that the holes on the pressure case line up with the holes on the end cap. Slowly place the electronics chassis into the pressure case. Push evenly on opposite sides of the end cap to seat it against the upper portion of the pressure case. Inspect the O-ring on the purge plug and place the plug back in to the end cap. **Note; The purge plug must be replaced before the instrument can be placed in the water**. Attach the

transducer to the Transducer guard using the SS Bolts and hardware provided. Attach the transducer guard to the pressure case using the bolts provided (5/16 x 1" SS see Figure 7) (Note; see anode installation sec. 2.5). See Figure 7 for a full assembly drawing. Plug the transducer connector in to the correct bulkhead connector on the end cap (3 Pin male connector). A light amount of silicone spray on the connector is recommended. **(See section E #4 Connector Maintenance)** The anodes should be checked and replaced if necessary to ensure adequate corrosion protection.

2.5 Anode Installation

A single anode is placed on the AWCP for corrosion protection. The anode protects the instrument from corrosion. Proper placement of the anode is very important. After anode placement the electrical continuity between the anode and all metallic components of the instrument must be verified. The required anode installation is shown in Figure 6.

The anode is held in place with a 5/16" x 18 stainless bolt. A **new** internal toothed washer from the spares kit must be added between the backside of a transducer guard leg and the pressure case. This assures proper electrical contact with the end cap, guard and pressure case. Figure 6 depicts how the anode attaches to the case. Stainless steel lock washers and flat washers are added to the bolts to secure them to the chassis.

All of the bolts are tightened into place and an continuity test is performed. Use a multi-meter to determine if there is any resistance between the bolt, sensor guard and anode. If there is a large resistance between these points, a proper connection has not been made and the anodes and washers must be repositioned. Remove one of the 5/16th bolts (not the one securing the anode) and verify continuity between the (exposed) internal tapped threads of the end cap and the anode. There is a tapped hole on the bottom of the pressure case. It's also recommended to verify electrical continuity between this tapped hole and the anode.

See Figure 6 for correct anode positions.

Figure 6 Anode Installation / Hardware Locator

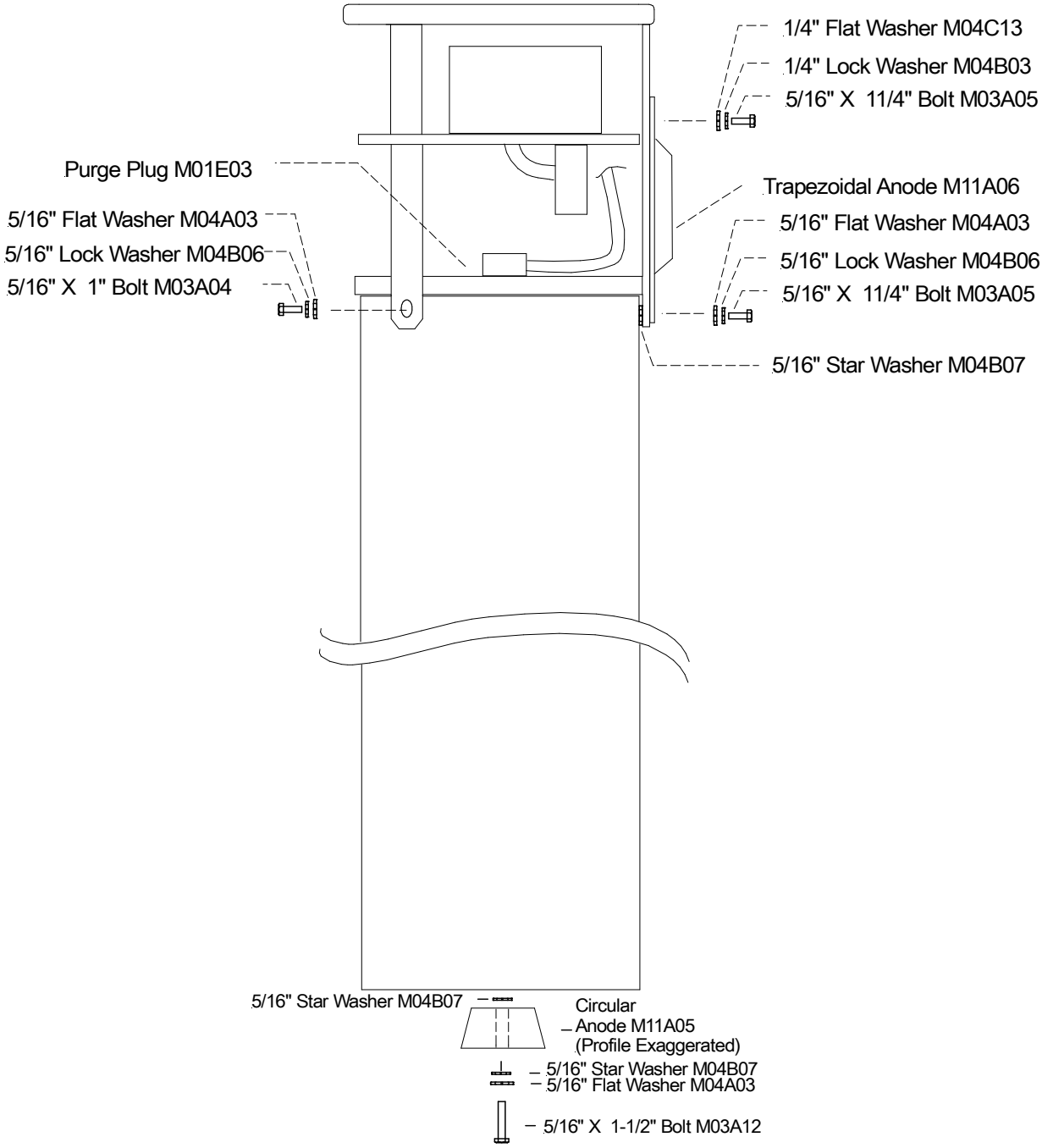


Figure 6 Anode Hardware

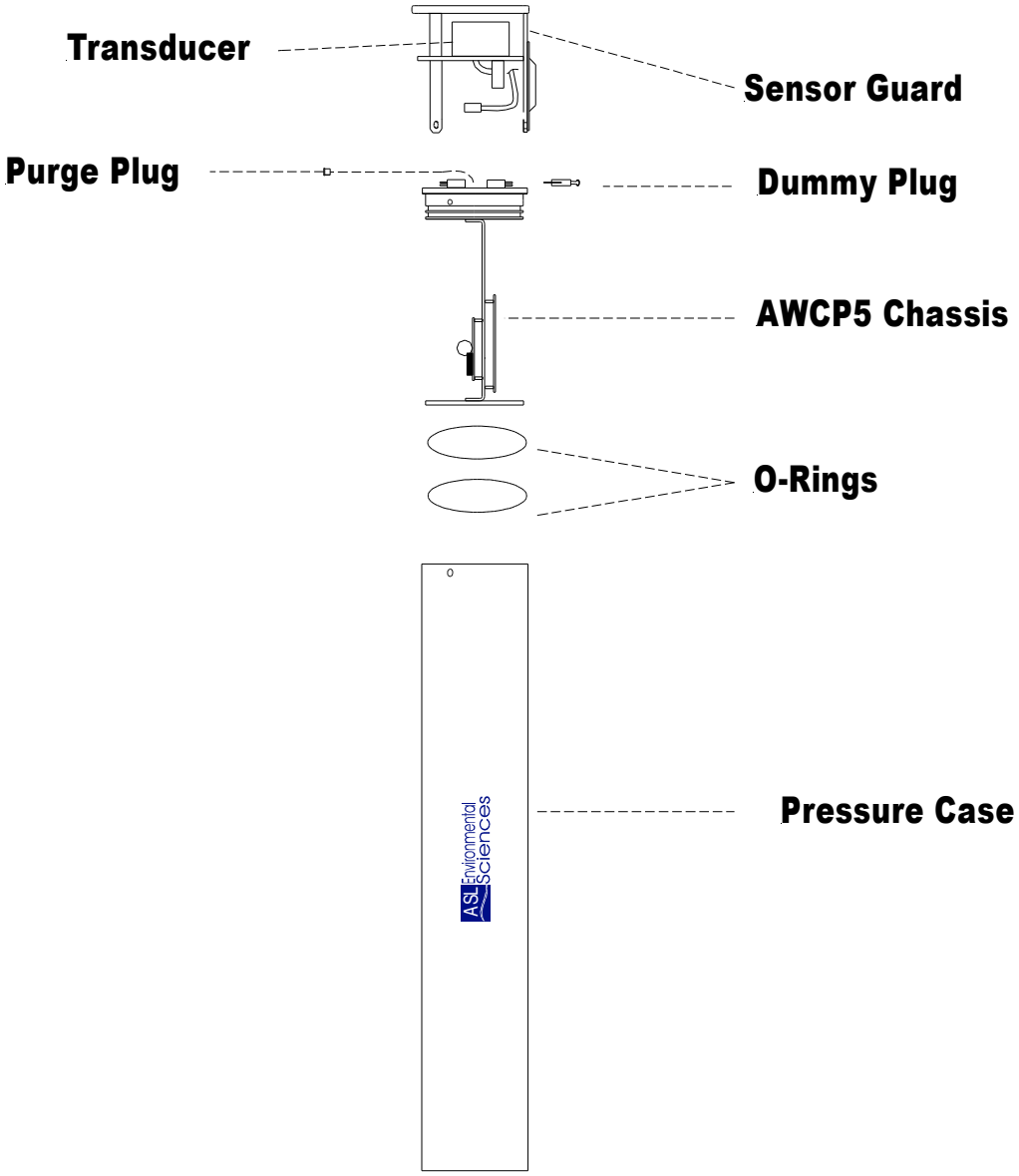


Figure 7 Full Instrument Assembly Drawing

Chapter

3

Operation

3.1 Starting the AWCP

Preparing the AWCP

Don't connect the battery in the pressure case until you are almost ready to deploy the instrument. If you are just getting familiar with the instrument, the supplied AC adapter should be used as a power source.

Connect the interface-power cable to the electrical bulkhead connector on the top of the AWCP end cap. There is only one way that the cable connector can attach to the bulkhead connector. Make sure the pins match up before pressing the cable into the connector. Note; The 5 pin male bulkhead connector is used to initiate communications with the AWCP. The other connector is always for the transducer.

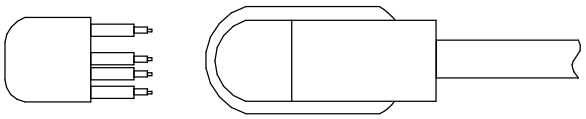


Figure 8

Plug the 9 pin "D-Sub" connector into the appropriate serial port on the computer (if available. Newer laptops may not have a serial port. If this is the case, use the supplied RS232/USB converter. You will need to install the driver for the converter and make a note of the assigned serial (COM) port. The COM port # can be determined from clicking through the following path:

My Computer/Properties/Hardware/Device Manager/Ports

Follow Figure 8 as a typical connection example. Start by plugging the black power adapter into an AC outlet.

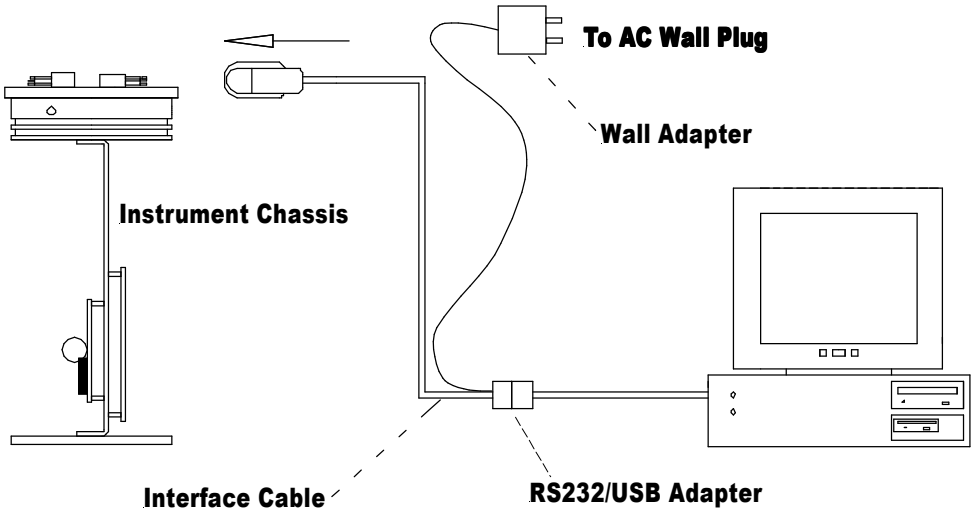


Figure 8 Instrument PC Communications Setup

Start the AWCP5Link Software and ensure that the COM port setting in the AWCP5Link software matches that of the COM port being used by the computer or RS232/USB adapter. The AWCP5Link COM port selection setting is located at the top of the "Preferences" tab.

Press the **End Deployment-Get Status** after switching back to the "Deploy" tab.

The AWCP5Link software will now attempt to detect the AWCP. Click "Yes" in the dialog box that pops up and watch for the prompt "Unit is in Standby mode" at the bottom left of the screen. Congratulations, you have just initiated communications with the AWCP.

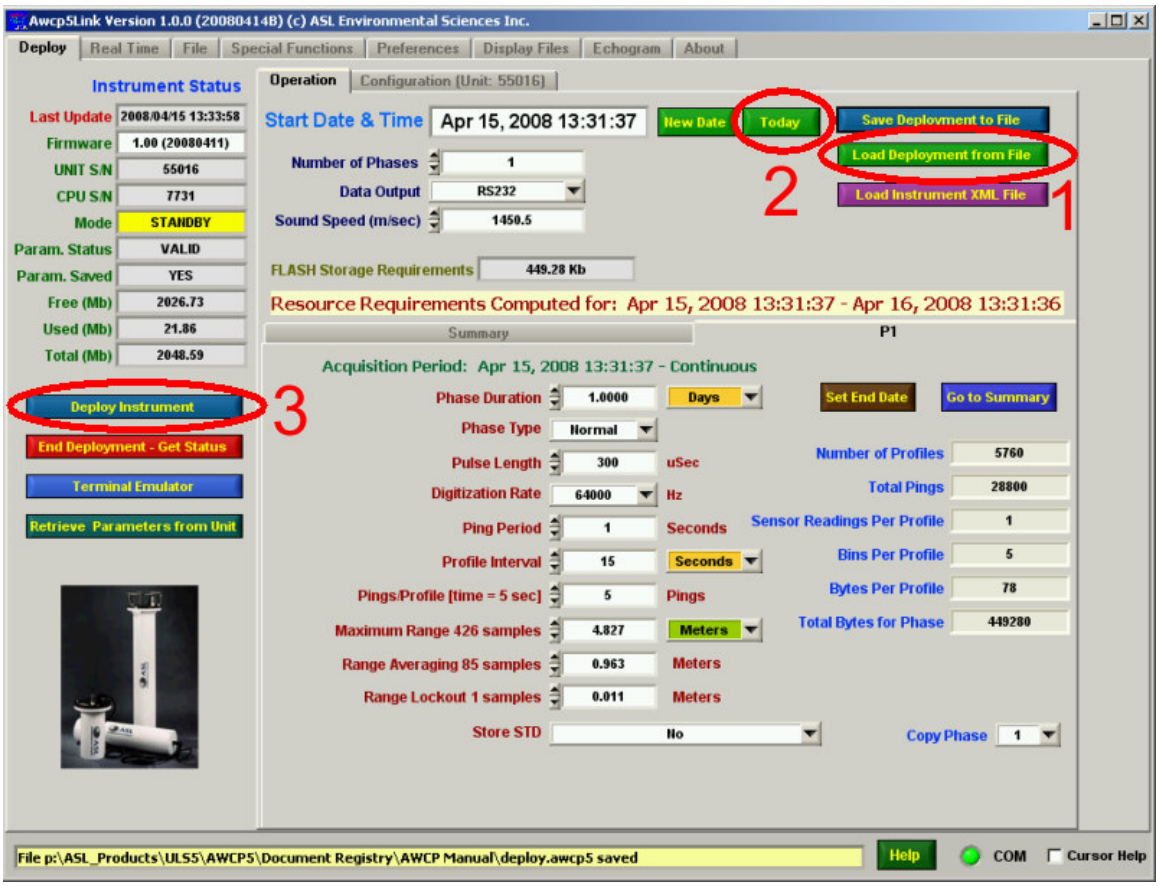
3.2 Communicating with the AWCP

Set AWCP Date/Time

Click the Special Functions tab to bring up the Show/Set Date/Time sub-tab. The usual protocol is to set the date and time of the PC or laptop to the desired local time. A portable GPS or one of the many "Atomic Clock" web sites are aids to accurately setting the PC time. To synchronize the AWCP internal clock to the PC's clock, push the blue **Set Unit to PC Date** button. Push the red **Cancel** button to move on to another task.

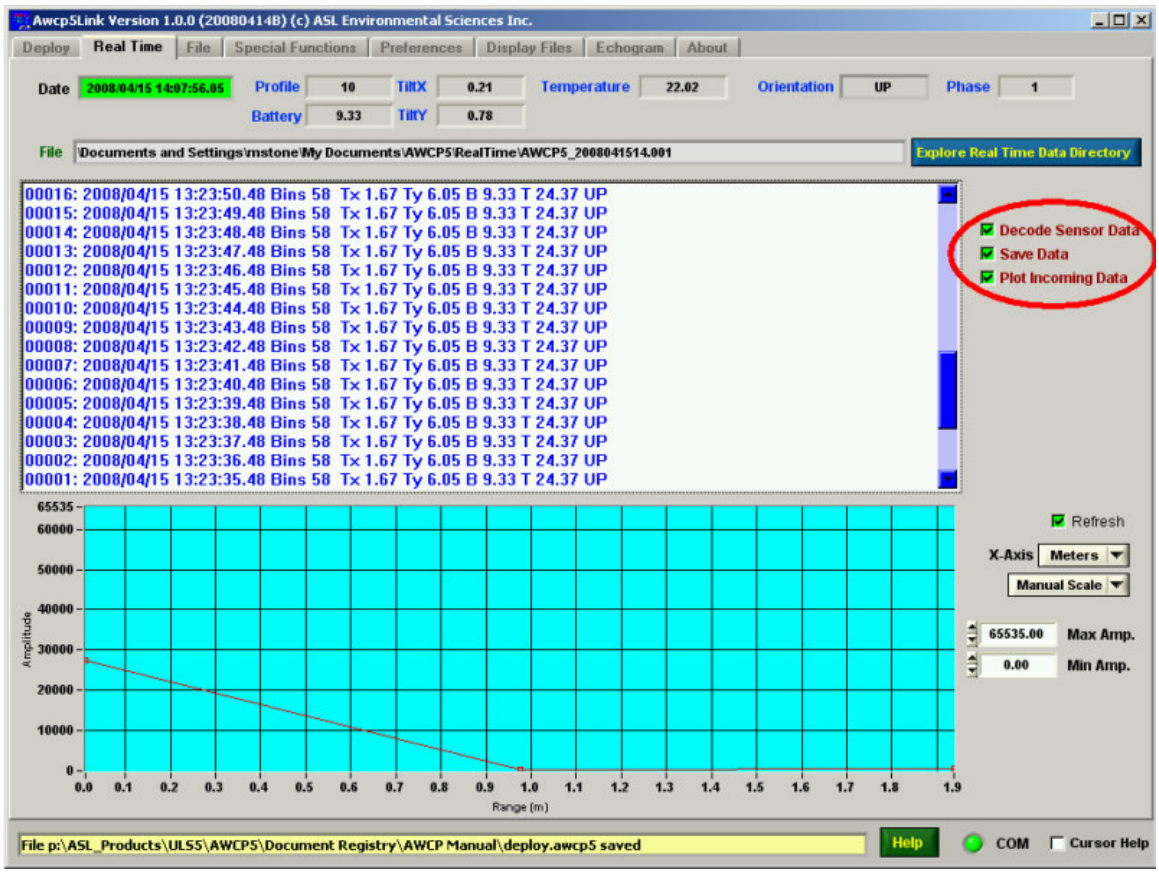
Sensor Utility and Bench testing

Load the file **deploy.awcp5** from the CD in order to start a test deployment. Do this from the **Deploy** tab- and then hit the green **Load Deployment from File** button. After hitting the green **Today** button use the blue **Deploy Instrument** to start a bench deployment. See below.



Screenshot 1

Switch to the **Real Time** tab to observe the sensors. You should see results similar to what's shown below.



Screenshot 2

The AWCP5Link Software manual provides much more detail regarding the operation of the AWCP.

Formatting the FLASH Memory

The CompactFLASH memory module should only be formatted in the instrument, never in an external "multi" card reader.

Format the FLASH using the **Format FLASH** button at the bottom right of the **File** tab.

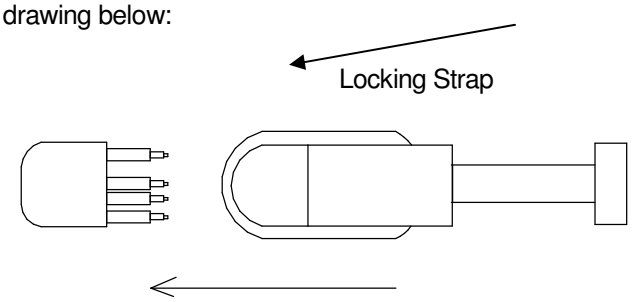
Preparing the Instrument for Deployment in the Ocean

The following steps ensure a successful deployment and data recovery.

- Leave the interface/lab cable connected to the instrument. The wall adapter MUST be plugged in to an A/C outlet to communicate with the instrument.
- Connect the internal battery to the "digital" board- connector is shown in Figure 5.
- Insert the instrument into the pressure case, taking care to align the radial holes in the pressure case and in the instrument end-cap.

- Insert and tighten the ¼" purge plug (seal screw).
- Attach the transducer mount and zinc anodes
- Set up the desired deployment parameters using WCP5Link
- Start the deployment
- Use an AM radio to confirm instrument operation by tuning it between stations and listening for a click each time a ping is sent. (The frequency to use on the AM radio depends on transducer frequency; try 600~900 kHz.)

Unplug the interface/lab cable and place the supplied dummy plug over the communication Bulkhead connector and attach the locking strap. **Note: there is only one way that the connector can be attached. Trying to force the connector in an incorrect manner may cause serious damage and affect the deployment**. See drawing below:



A light amount of silicon spray on the bulkhead connector and Transducer connector will make it easier to connect and remove the plug. The lubricant is also very important to provide a watertight seal during deployment. Consult Appendix E section 4 for more information on connector installation and maintenance. **Improper connector maintenance may seriously endanger a successful deployment.**

Re-confirm proper operation with the AM radio.

The AWCP is now ready for deployment. Considerations for deployment of the instrument include:

- The pressure case needs to be properly secured (see section 2.5 – Closing the Pressure Case). A sacrificial anode may need to be fastened to the instrument as required by the mooring system, to ensure adequate corrosion protection.
- A suitable mounting arrangement or underwater mooring system is used to support the instrument.

3.5 Mooring The AWCP

When mooring the AWCP in shallow water, it should be positioned sufficiently far beneath the water surface in order to minimize hazards. At depths greater than ~150 m data may not be obtained all the way to the surface, depending on the instrument frequency and the density of scatterers present because of signal attenuation over that distance. If the region of interest is deeper than the surface, that does not matter; if near-surface data are

desired, a shallower mooring may be required. In any event, the maximum working depth of the pressure case, 600m, must not be exceeded.

The mooring is best kept short and well buoyed (*e.g.* 4 Viny floats with 20 kg net buoyancy each), so that tilt of the instrument package in response to currents is small. Experience has shown that with the flotation suggested, the AWCP undergoes negligible vertical displacement in currents up to 0.5 m s^{-1}, and its tilt from the vertical remains within ±2°. Alternatively, a mooring frame can be used to hold the AWCP motionless on the seafloor.

3.6 Recovering the Data

Retrieving Data

Upon recovery of the instrument from the water, the raw data needs to be downloaded from the instrument. The instruments updates its FLASH memory once per hour, so in order not to lose the last hour of data the deployment needs to be "ended" properly. To do this, connect the AWCP to the computer as on deployment. The A/C power adapter for the interface cable will provide the power necessary to communicate with the instrument.

To halt data collection just hit the **End Deployment – Get Status** button in the main **Deploy** tab. The CompactFLASH memory can be downloaded over the instrument cable, but this method is very time consuming. It's usually a better idea to use a card-reader connected directly to a PC. Follow the step below:

- Disconnect the instrument/lab cable
- Carefully remove the instrument from the pressure case
- Disconnect the internal battery
- Carefully remove the FLASH memory card by pressing on the eject tab
- Use the card reader to transfer files to a PC
- **Don't format the FLASH card while it's in the PC card reader!**
- Re-insert the FLASH into the instrument (using figure 5 as a guide). Wear an anti-static wrist strap if available. Push the FLASH module back into its socket while supporting the Persistor computing module with your thumb along the back/long edge.

If you are recovering a small amount of data from a "short" deployment, you may not want to remove the instrument from its pressure case. If this is the case then:

- Connect the instrument / lab cable to the connector on the end-cap of the instrument.
- Make sure the AC adapter is plugged in.
- Hit the **End Deployment – Get Status** button in the main **Deploy** tab.
- Click on the **File** tab and hit the blue **Retrieve Data** Directory button.
- Highlight the desired files by clicking to the left of their filenames and then use the blue **Download Selected** button to create copies of the files on a PC that's connected via the serial cable to the instrument.

Decoding Data

Refer to the AWCP5Link manual for procedures to manipulate and display collected instrument data.

Chapter
4

Demobilizing the AWCP

4.1 Recovery and Cleaning

It is recommended that the AWCP be rinsed thoroughly with fresh water after a deployment. It may also be an opportune time to remove any biological growth that may have accumulated. The AWCP can then be removed from the mooring frame (if used) and stored in the supplied shipping case. Disconnect the battery as otherwise the unit will auto-start after one hour, and could drain the battery.

4.2 Removing the Battery Packs- Long Term Storage

It is recommended that the AWCP be stored with battery packs removed. This can be accomplished by reversing the installation procedure (Section 2.3).

Appendix

A

Appendix A. Trouble Shooting

1. Software will not communicate properly with AWCP.

    - Check Interface cable (RS232 Cable).
    - Check COM port setting in the software as well as the computer being used. If using a RS232/USB adapter, check the assigned COM port.
    - If communication still does not exist, check all internal wire harnesses and connectors on the AWCP. (Consult the factory)

2. Battery Pack will not fit over the rod.

    - Remove the rod and check to see if it is straight.
    - Determine if there is a blockage in the insertion hole of the battery pack.
    - Remove the rod from the pressure case. Place the battery pack in the case then insert the rod into the battery pack. Try to twist the rod into place.

3. RS232 communication cable will not fit on to the bulkhead connector.

    - Make sure pins are not bent on the bulkhead connector.
    - Make sure the female pins on the interface cable are not blocked in any way.

4. Instrument will not fit into the pressure case properly.

    - Make sure there are no wires protruding from the AWCP Chassis.
    - Check for any nicks or blockages on the O-rings.
    - Ensure O-rings are properly coated with O-ring sealant.

5. Unit has been reset during the Ocean Deployment

    - Check the pins on the bulkhead connector for any shorts or corrosion.
    - Check the seated O-ring on the bulkhead connector to determine if there has been any leak.

6. No data is recorded for a given Phase.

    - If a programmed Burst Interval was scheduled to be completed after a given phase change, the unit will wait for the burst interval to occur before starting the next scheduled phase change.

7. During a multi-phase deployment, the power was momentarily cut to the instrument.

    - This will cause the instrument to go into the auto deploy sequence. The unit will then wait for a 1-hour time interval, then immediately restart.

Appendix
B

Appendix B. Calibrations

Calibration Coefficients and Methods

1. Speed of Sound (m/s)

Integrated speed of sound of the water column from the AWCP to the water target, as estimated by the user.

2. Eclock (sec)

Measured period of microprocessor clock (value provided by ASL)

3. Tilt Coefficients

Tilt coefficients are measured by ASL by operating the AWCP at 20 different tilt angles, ranging from –20 degrees to + 20 degrees, as independently measured using a high precision digital tilt meter. The calibration coefficients are computed using a least squares fitting method to a third order polynomial equation.

E.1 Tilt X Coefficients

Calibration Coefficients:
X_a (degrees); X_b (degrees); X_c (degrees); and X_d (degrees)

$Tilt\_x\ (degrees) = X\_a + X\_b\ (N_X) + X\_c\ (N_X)^2 + X\_d\ (N_X)^3$

Where N_X is the measured output count (0 – 255) from the AWCP A/D output.

E.2 Tilt Y Coefficients

Calibration Coefficients:
Y_a (degrees); Y_b (degrees); Y_c (degrees); and Y_d (degrees)

$Tilt\_Y\ (degrees) = Y\_a + Y\_b\ (N_Y) + Y\_c\ (N_Y)^2 + Y\_d\ (N_Y)^3$

Where N_Y is the measured output count (0 – 255) from the AWCP A/D output.

Calibration Sheets for this AWCP Unit

Calibration (.cfg) files are stored in the instrument (non-volatile memory) and on the CDs that accompany the units. There is usually no need to reload the coefficients from the CD.

Appendix
C

Appendix C. Technical Information Notes

1. Installation Instructions for Connectors

1. When mating the connectors, there may be some difficulty due to trapped air. A slight wiggle of the connector back and forth while squeezing the air pocket with your index finger and thumb will help to "burp" out the trapped air. This is a good sign, since the trapped air indicates that the sealing faces of the connector are performing properly.
2. Be cautious that the back and forth motion is not too severe. This can lead to broken or intermittent contact between the conductors and the contacts.
3. Use of a dummy connector is always recommended. This will aid in keeping sealing surfaces clear of contamination and damage.

2. Maintenance Instructions for Connectors

A. Visual Examination of Connectors before Mating

1. Check for any debris that may be on any connector mating surfaces. This can hinder mating and cause damage to the sealing surfaces. Debris must be removed.
2. Check the connector sealing surfaces for any signs of scratches, nicks, cuts, or tears, which may lead to water intrusion. If any of these occur the connector should be replaced before continuing.
3. Verify that the correct contact configuration is being mated together. Mating a 4 contact male connector into a 3 contact female connector with extreme force could cause contact damage as well as punctures and tears along bond surfaces, which may not be apparent to the eye.

B. Lubrication of Connectors before Mating

1. Lubricate the connectors with a Silicone Spray before mating. This will allow the sealing surfaces to be mated without high friction forces, which could lead to damage to the sealing surface.
2. Spraying will also possibly remove any excess contaminants that may be left on the surfaces, which were not fully cleaned off.
3. Lubrication should be performed every time the connector is mated and unmated.
4. **Do not use WD-40 as a lubricant since it is made up of mineral spirits, which destroy chemical bonds.**

C. Sealing Mechanism of Neoprene Connectors

1. The sealing mechanism of these connectors is the inner diameter of the female connector and the outer diameter of the male connector.
2. The ring and groove seen on the connectors does not provide the sealing, instead the ring portion is a mechanical ring (m-ring) that helps to keep the connector mated. If the locking sleeve is left off the assembly or it has come unthreaded, the m-ring would mechanically keep the connectors mated.
3. The m-ring also provides a visual indication as to whether the connector set is fully mated or not. If the m-ring is not in the corresponding grove a lump will be visible on the female connector surface. This makes it very easy to see that the connector is not mated.

Appendix
D

Appendix D ASL Parts

Part	ASL Part Number
Assorted Parts	
RS232 Communication Cable with A/C power adapter	73A01A04
Five pin Dummy Plug for Bulkhead (Datata) Connector	E20Q33
Round Pressure Case Anode	M11A05
Transducer Guard	71A06A00
Trapezoidal Anode	M11A06
Batteries	
Full Pack (13.5V/15V Vmain/Ttx version)	72A01B01
¾ Pack (13.5V/15V Vmain/Ttx version)	72A01A04
Half Pack (13.5V/15V Vmain/Ttx version)	72A01A05
Real Time Clock Battery With Pull Tab	E33C02
Spares	
O- Ring Kit (AWCP Chassis, two required)	M08A03
Allen Key 1/8" (two required for instrument dis-assembly)	M10A04
½" Wrench	M10B01
¼" Nylon Tipped Jacking screw (2 minimum required)	M01B03
Quickstart deployment checklist	SU-500-AWCP-02-R00
Quickstart recovery checklist	SU-500-AWCP-01-R00
Real-time clock battery (CR1220 or equivalent)	N/A
5/16th Internal Tooth Star Washer	M04B04
7/16" Nut Driver	M10B03
Manuals	
AWCP5Link Operators Manual	
Software and documentation on CD-ROM	
AWCP Operator Manual (This Document)	

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