

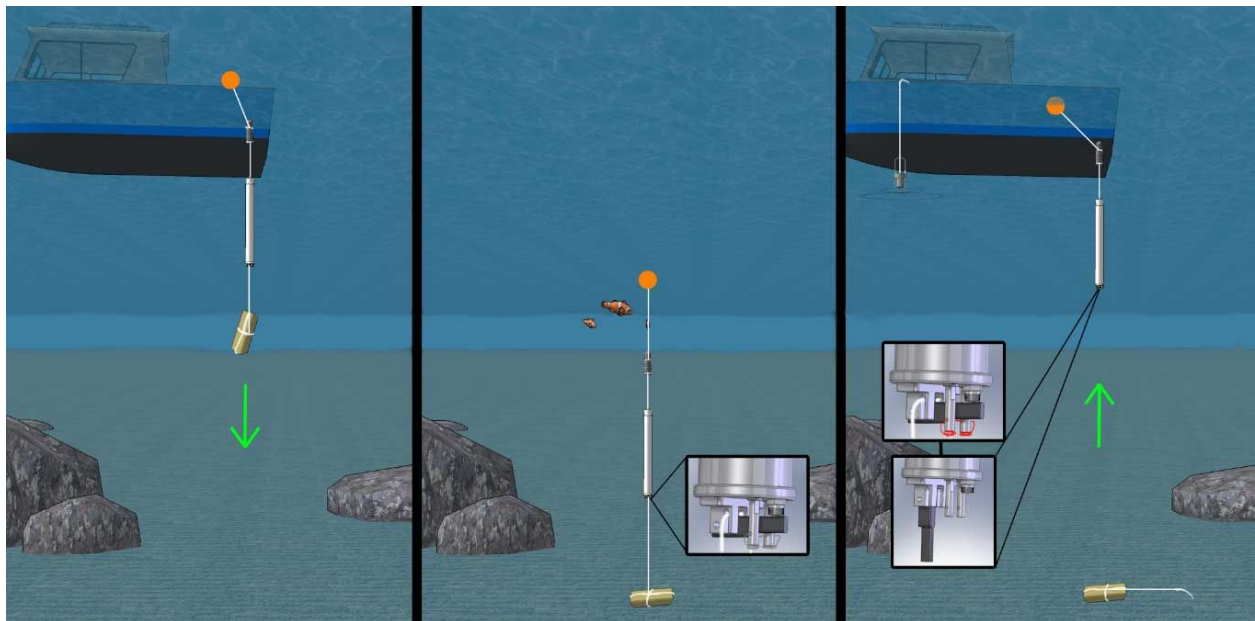
Acoustic Release Control System

The Acoustic Release Control unit (ARC), is designed to make it possible to secure a payload under a body of water for an extended period of time. The ARC unit is attached to the anchor weight on one side, and to the payload with a flotation device on the other. Once the ARC station is deployed underwater in the desired location, it remains there in a sleep mode awaiting commands from the surface.

Once the payload needs to be retrieved, the command is sent remotely from the surface to release the ARC unit with the payload from the sea-floor.

The system consists of at least two main components: the submerged ARC unit “holding” the payload in place under the body of water, and the Surface Transponder Module - or as commonly referred in this manual - the STM Surface station, functioning as a remote control.

The two-way communication between the ARC unit and the STM Surface station (when deployed to the sea-floor with the payload), is accomplished via acoustic sonar signals. The submerged ARC station is designed to respond to the commands sent to it from the surface, and it will report back various telemetry data such as unique self-ID, batteries status, current state of the operation, distance.



A logical schematic of the submerged components.

A single ARC submerged station is monitored and controlled by one of the STM surface stations. Desert Star Systems manufactures multiple STM surface stations specific to the application needed.

Customers have a choice of utilizing an STM surface station designed to be installed in a dry location on board a vessel, or a mobile unit that can be exposed to moisture.

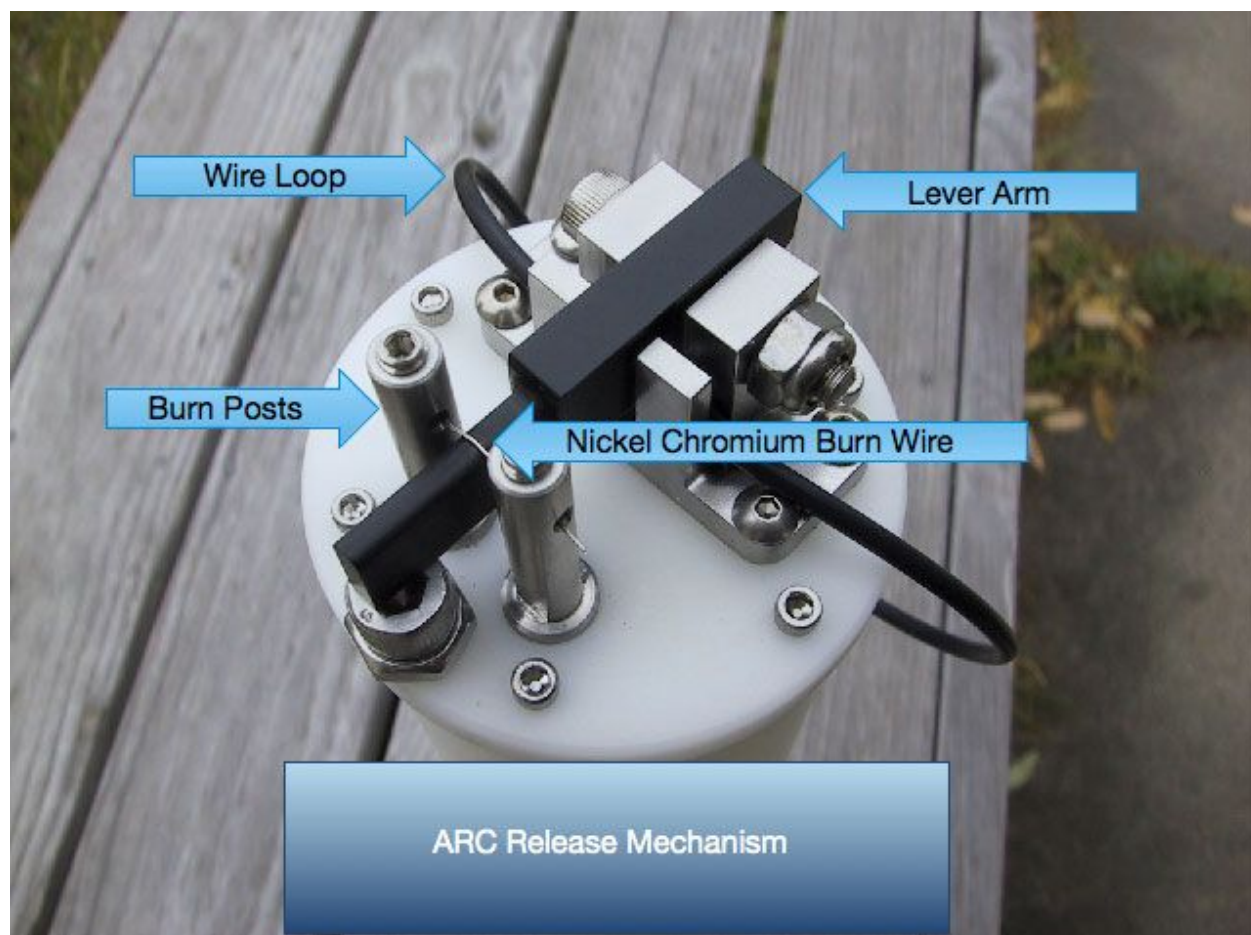
When it is desired to deploy an array of a multiple submerged ARC stations, the single STM surface unit can be used to manage the entire underwater array. The specifics of these applications will be described later in this manual.

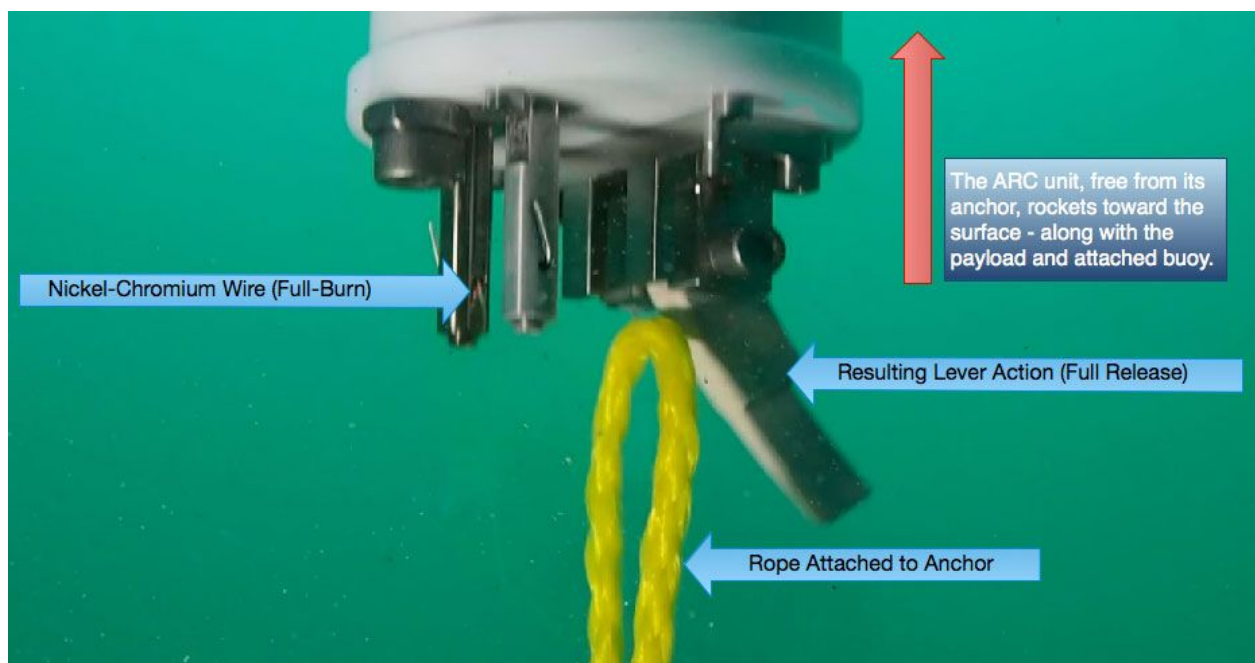
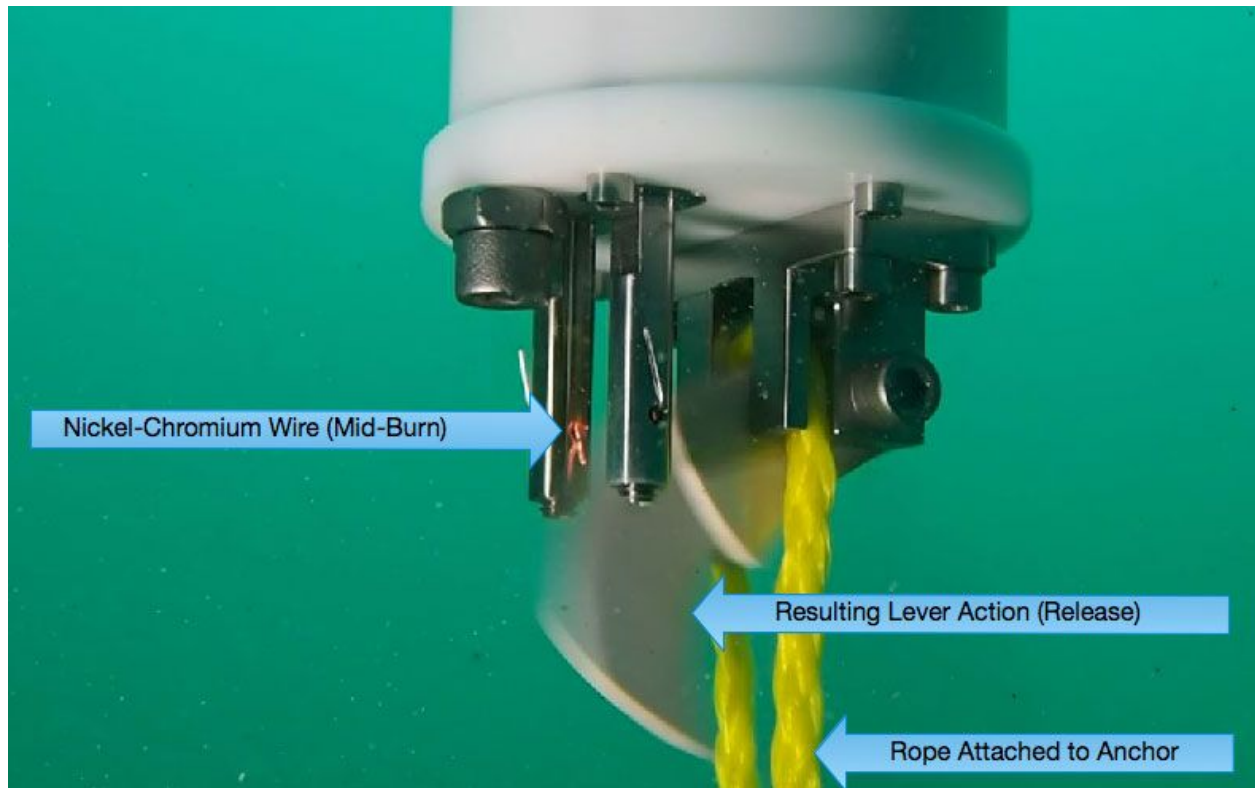
[PICTURE: A ship with a STM unit on board and a single submerged ARC unit at the sea-floor.]

[PICTURE: A ship at the surface with a single STM unit and a multiple ARC stations submerged under the vessel.]

1. How the ARC station releases from the anchor

The ARC station placed at the sea-floor uses a unique release mechanism designed exclusively by Desert Star Systems. Once the command is sent to the ARC station from the surface, the release is accomplished by “melting” an easily replaceable nickel-chromium wire and subsequently releasing a hinge lever. The hinge lever frees a wire-loop connected to the anchor, allowing the ARC station to surface - along with the payload. Please note, the anchor and the wire-loop will remain on the sea floor and by design are not expected to be retrieved.





Please make sure that you are familiar with a basic principle of the release mechanism, and the nickel-chromium wire replacement procedure so that ARC station can be redeployed after it has surfaced.

Once you understand the simplicity and reliability of the release mechanism of ARC station, we believe you will be confident in your ability to deploy your ARC station successfully many times over and over again.

Desert Star Systems engineers understand how critical and important your underwater mission is and this is why we would like to ask you to take special care in understanding the mechanics of the release mechanism to ensure your success in retrieving of the ARC station with the pay-load.

2. Installing/Replacing Nickel-Chromium Wire in the Release Mechanism

The following is the Desert Start System approved procedure to install/replace nickel-chromium wire within the release mechanism of the ARC unit. It is critical to follow this procedure closely in order to ensure proper function of the release mechanism. Deviation from this procedure may cause a malfunction of the release mechanism and failure of the ARC station to surface as expected by design.

In order to replace the nickel-chromium wire you will need the following set of tools and components:

1. **Nickel-Chromium wire**, also referred in this manual as “**release wire**”.
 1. Type: Nickel Chromium Alloy (60% nickel, 16% chromium, 24% iron)
 2. Length: ~2 in. needed for a single deployment.
 3. Gauge: 26 AWG
 4. Manufacturer: McMaster-Carr Part #8880K24 (1/4 lb spool)
 5. Desert Star Systems Part#: WIR00332
2. **Torque wrench with 5/64” Allen head**. Used to remove/re-install the pair of screws securing the nickel-chromium wire.
3. **3/16” crescent wrench**. Used for insure alignment of two metal posts. The nickel-chromium wire is secured between these two posts.
4. **Wire loop(s)**. Used to attached the anchor with the body of the ARC unit (***NOT included with purchase***).

NOTE: If you have any questions regarding the nickel-chromium wire and it's installation procedure, PLEASE GIVE US A CALL AT 1(831) 384-8000 and our technical support team will be happy to assist you.

The choice of the wire/cable is critical for the correct operation of the release mechanism! The wire loop(s) must be plastic coated stainless steel cable. The plastic coating is required so that if there is a tangle, the loop will not short-circuit the wire posts.

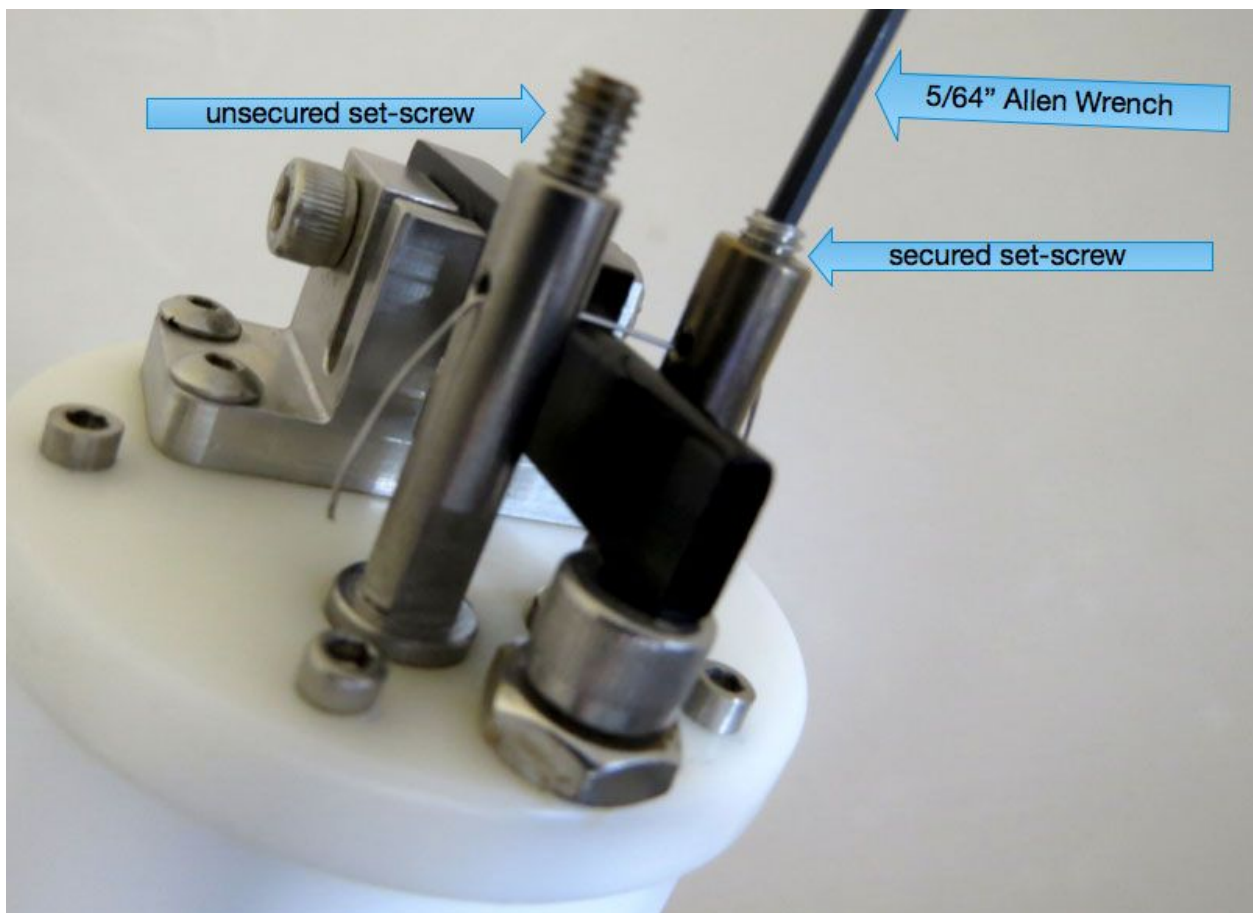
The total diameter (including the plastic coat) of the wire/cable has to be **NO MORE** than 1/8" (3.175mm) in order for the wire/cable to pass freely through the release mechanism assembly, once the release lever arm is opened.

Two ends of the cable should be crimped together into a loop. **The crimp bracket holding the ends of the loop together must be made out of stainless steel in order to prevent a dissimilar metal corrosion and a subsequent disconnect of the loop's ends.** During the loop's manufacturing, please ensure proper crimp placement over the cable ends. Pay close attention to the amount of force used to secure the crimp. Please make sure to use a proper crimping tools so that the loops ends are secured and the loop wire is capable of withholding the adequate amount of force.

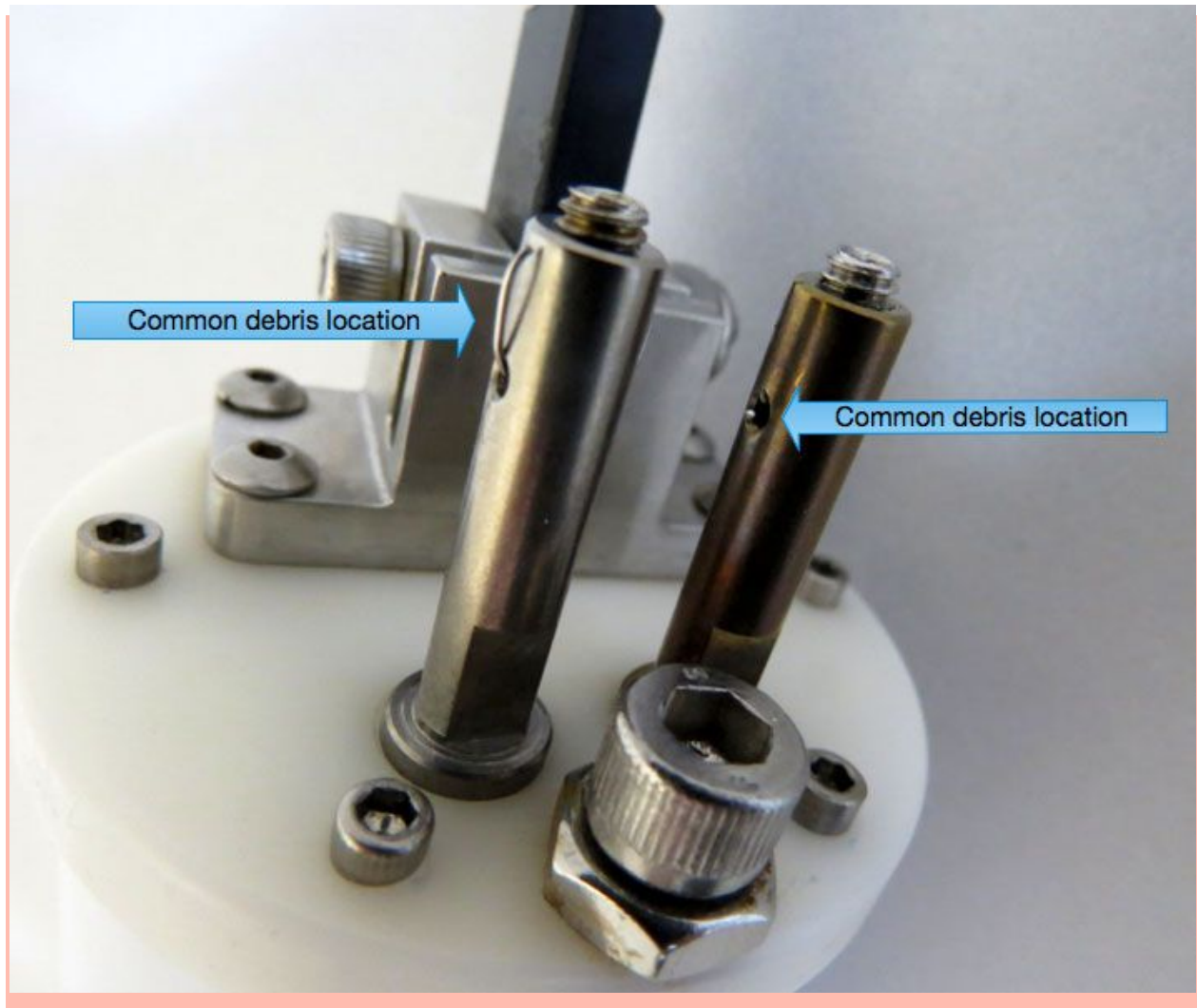
2.1 Follow this sequence in order to install/replace the nickel-chromium wire:

STEP 1:

Loosen the setscrews at the top of the two posts using a size 5/64" Allen wrench.



If the ARC unit was previously deployed, make sure to **remove any debris** or remains of the nickel-chromium cable left from the previous deployment, in the holes drilled through body the posts on their sides.



Make sure to inspect the holes in the posts. The holes must be clear, so that new nickel-chromium cable can be threaded through the sides of the posts.

STEP 2:

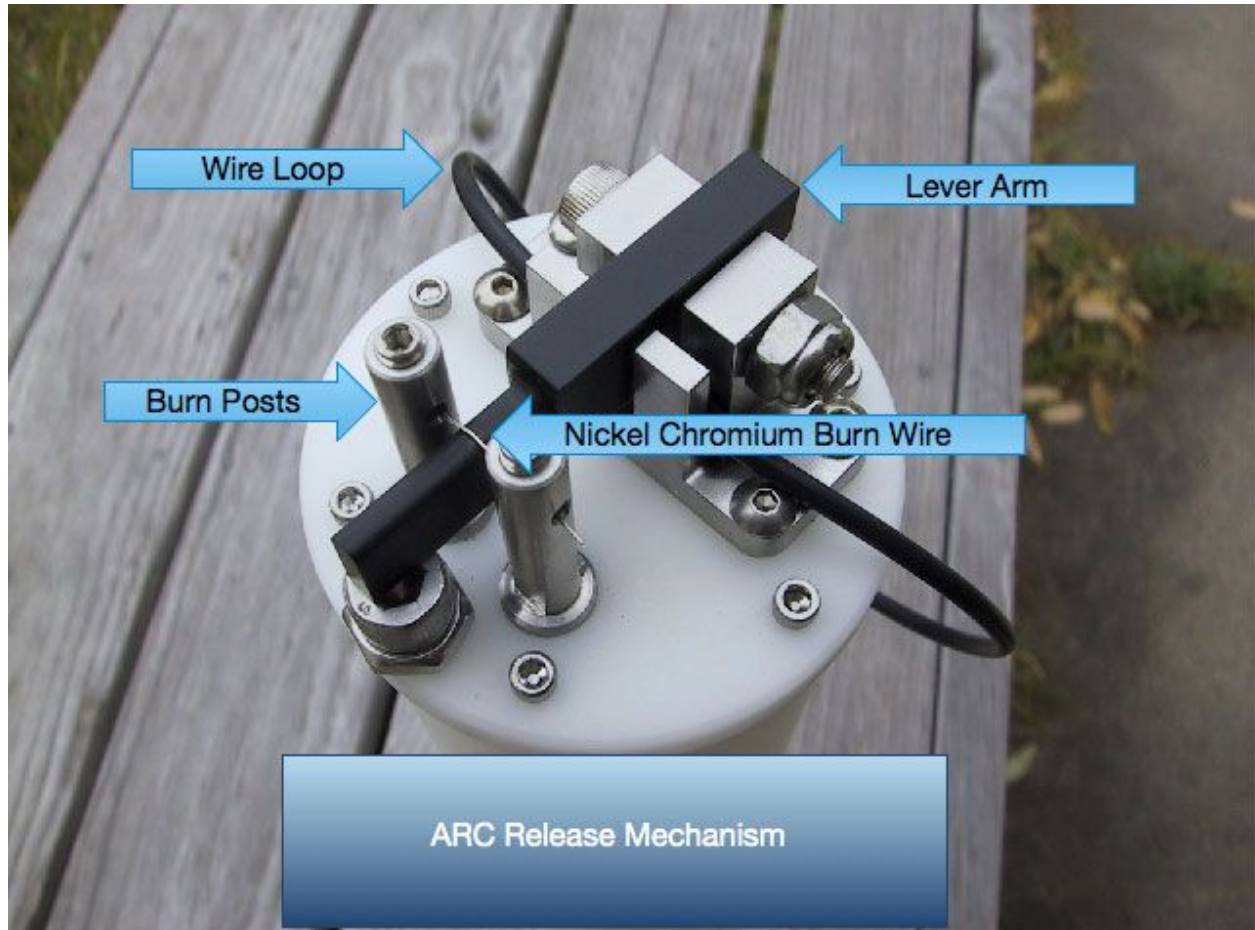
Move the lever arm in to open position so that the path for the anchor wire/cable loop is clear. Place the wire/cable anchor loop in the the designated path within the release mechanism assembly. Anchor weight attaches to this wire/cable loop.



[PICTURE shows the assembly with the lever arm in open position with the arrow indicating the direction the lever should be moved.]

STEP 3:

Once the anchor wire/cable is loaded in to the release assembly, move the lever arm in to a closed position locking the anchor wire/cable. When lever arm is placed in to closed position correctly, the end section of the lever arm will be right between two posts.

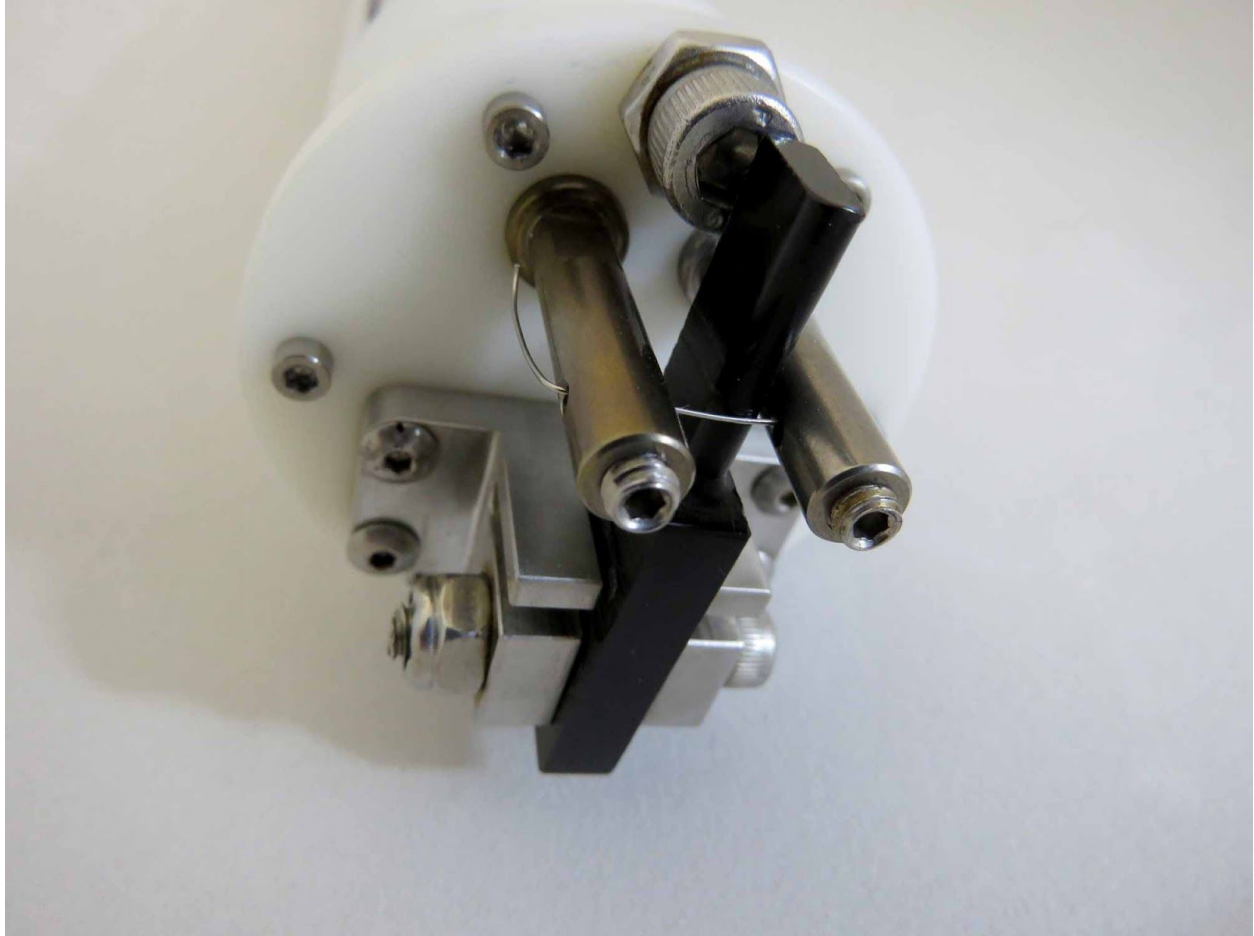


The assembly with the lever arm in closed position with the arrow indicating the direction the lever should be moved.

Identify two posts and anchor cable been locked in the release assembly.

STEP 4:

Insert the nickel-chromium wire from the outside of the post and through the hole in the post so that the nickel-chromium wire passes across the lever arm and out through the hole of the second post. When a nickel-chromium cable is threaded correctly, the end section of the lever arm will be “trapped” by the nickel-chromium cable between two posts.



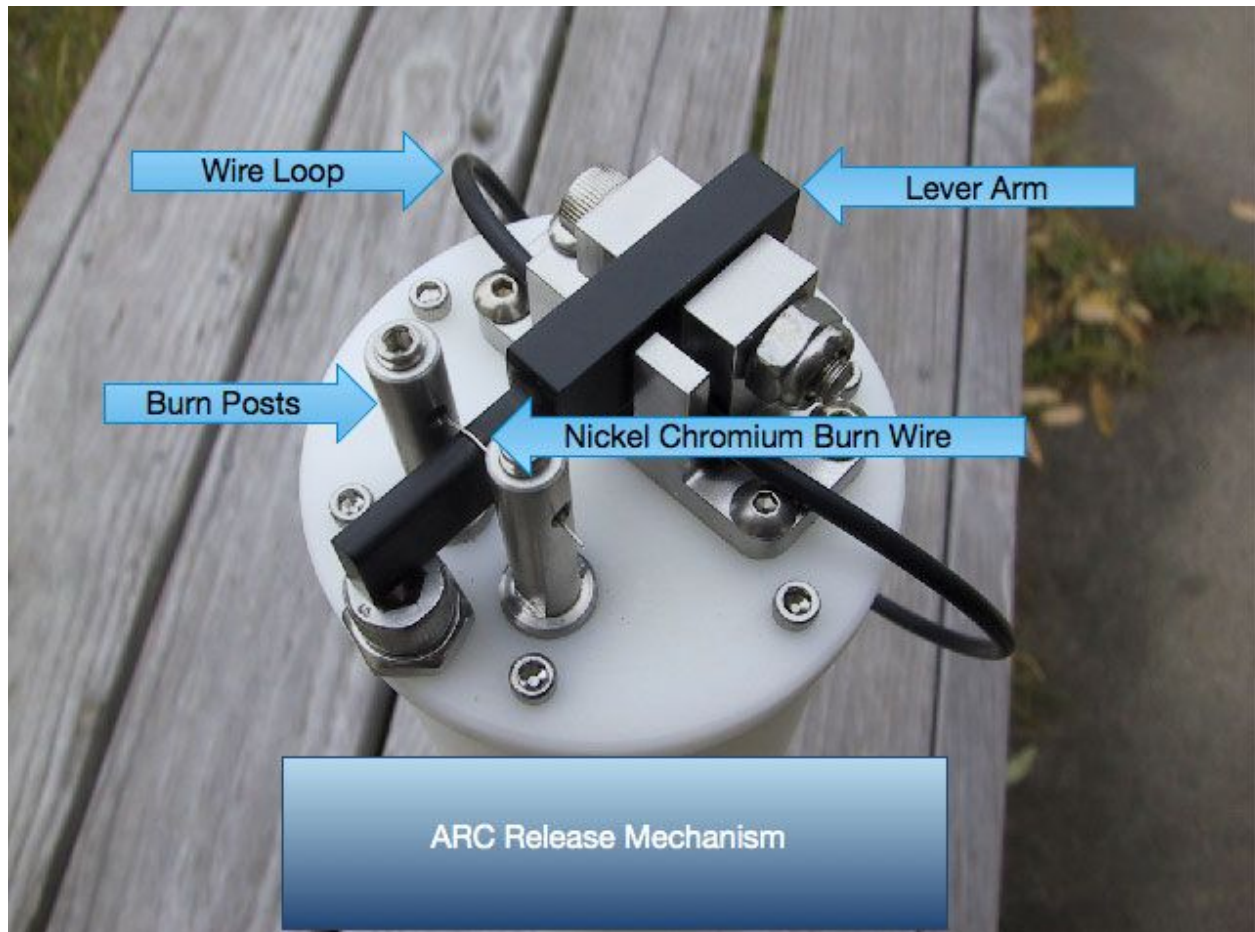
Two posts and the N-C wire path, with the end section of lever arm.

STEP 5:

Using the torque wrench set to the 4 inch-pound torque, tighten the screws in the posts securing nickel-chromium wire in place. While tightening the screws, make sure to hold the posts in alignment. Prevent the posts from turning out of the alignment, by using the 3/6" crescent wrench applied at the flat part of the posts. If posts do move only slightly out of the alignment, it is not a concern because each post sealed within the body of ARC unit by a rubber O-ring. Excessive turning or twisting the posts may cause a disconnect from the internal electronic components of ARC unit and should be avoided!

STEP 6:

Cut the excess of nickel-chromium wire, leaving about 1/8" on the side of the each post and bent towards the unit. This will help to remove the leftovers of the nickel-chromium wire when the ARC station has resurfaced so that it can be re-deployed.



The final correctly installed nickel-chromium wire

This concludes installation of the nickel-chromium wire in the release mechanism.

3. Installing/Changing the Batteries of an ARC Station

You have two options powering your Acoustic Release Control (ARC) station.

Please note that your ARC units will come pre-loaded with a standard alkaline battery configuration.

STANDARD OPTION

With the maximum total life time of 130 days, consists of eight (8), 1.5 volt 'AA' size batteries installed in two packs of four (4):

- Total number of batteries: eight (8);

- Type: Alkaline;
- Size: AA;
- Brand: Duracell;
- Model: MN-1500;
- Volts: 1.5 volt;
- Amps: 2.5 Ah.

In this battery configuration, the two battery packs are used as follows:

- First pack of four (4) Alkaline batteries is used to power the release mechanism and the sonar transmitter.
 - The life time of this pack is expected to be at least 520 days.
- The second pack of four (4) Alkaline batteries is used to power on-board microcomputer.
 - The life time of this pack is expected to be at least 130 days.

LONG DURATION OPTION

With the maximum total life time of 520 days. An extended battery option consist of four (4) 1.5 volt 'AA' size batteries installed in one pack, and the second pack of single Lithium D Cell battery.

- Total number of batteries: five (5)
 - Four (4) alkaline batteries:
 - Type: Alkaline;
 - Size: AA;
 - Brand: Duracell;
 - Model: MN-1500;
 - Volts: 1.5 volt;
 - Amps: 2.5 Ah.
 - One (1) Lithium D Cell battery:
 - Type: Lithium;
 - Size: 'D' cell;
 - Brand: Tadiran;
 - Model: TL-5930/F
 - Volts: 3.6 volt;
 - Amps: 18.5 Ah.

In this battery configuration, the two battery packs are used as follows:

- First pack of four (4) Alkaline batteries is used to power the release mechanism and the sonar transmitter.
 - The life time of this pack is expected to be at least 520 days.
- The second pack of a single Lithium D Cell battery is used to power on-board microcomputer.
 - The life time of this pack is expected to be at least 963 days.

Due to hazardous material regulations, the "Lithium D Cell" battery has to be purchased separately by the user. We are unable to re-sell this type of the battery directly to the consumer. However, you are able to use this type of the battery with our ARC station. The internal power connector receptacle installed in your ARC station is compliant with the power socket of the Tadiran TL-5930/F lithium 'D' cell battery. No modifications to the power connector is needed and the fully charged battery can be connected directly to ARC station.

For your consideration, the 'D' size Lithium Battery, suggested as a long duration battery option, is the subject of a Federal regulations under the U.S. Department Of Transportation. The Lithium type batteries classified as a 'Class 9 hazardous material' and must be transported accordingly. The improper handling and shipping such materials is a subject of significant fines as mentioned in above regulations. Please take all necessary precautions to comply with your local state and federal regulations when considering purchase of Lithium batteries.

3.1 Other Battery Configurations:

If your specific application of the ARC station requires a different battery configuration, then please feel free to call us at Desert Start Systems **+1(831) 384-8000**. We will gladly assist you and try to accommodate your specific requirements to power the ARC station.

3.2 Battery Installation

Once you have decided what battery configuration option is best suited for your specific application, please follow this procedure to install the batteries of your choice.

STEP 1:

Using a 3/32" Allen wrench, loosen and remove six (6) screws located at the top of the ARC station along the edge of the sonar transducer end-cap.



The side of the ARC station the sonar transducer end-cap is located and where the screws are.

STEP 2:

Once the six (6) screws are removed, carefully pull the sonar transducer end-cap out of the main ARC body, slightly twisting it back and forth while pulling away at the same time. **Take care to prevent a jerking motion** when the sonar transducer end-cap separates from the main body of the ARC station, so that the cable connecting the sonar transducer end-cap to the internal electronics does not get damaged.

STEP 3:

Locate the BLACK/WHITE cable with the connector used to link the sonar transducer end-cap to the internal electronic board. Disconnect it carefully. Make sure not to use excessive force when pulling the cable from the main housing of the ARC station. Put the sonar transducer end-cap aside.

STEP 4:

Pull the battery packs out one by one from the main body of the ARC station. Locate the BLACK/RED cable(s) connecting each battery pack to the electronic compartment of the ARC station. Each battery pack power cable has a plastic female/male type of connector. Use this connector to disconnect the battery pack from the power cable leading to ARC unit internal electronic components.

STEP 5:

Install batteries in to the battery pack holster making sure to insert each battery according to corresponding (+) and (-) polarity.

When inserting individual batteries, the negative (-) polarity side of the battery corresponds to the metal spring and the positive (+) side of the battery corresponds to the opposite side of the metal spring within the body of the battery pack.

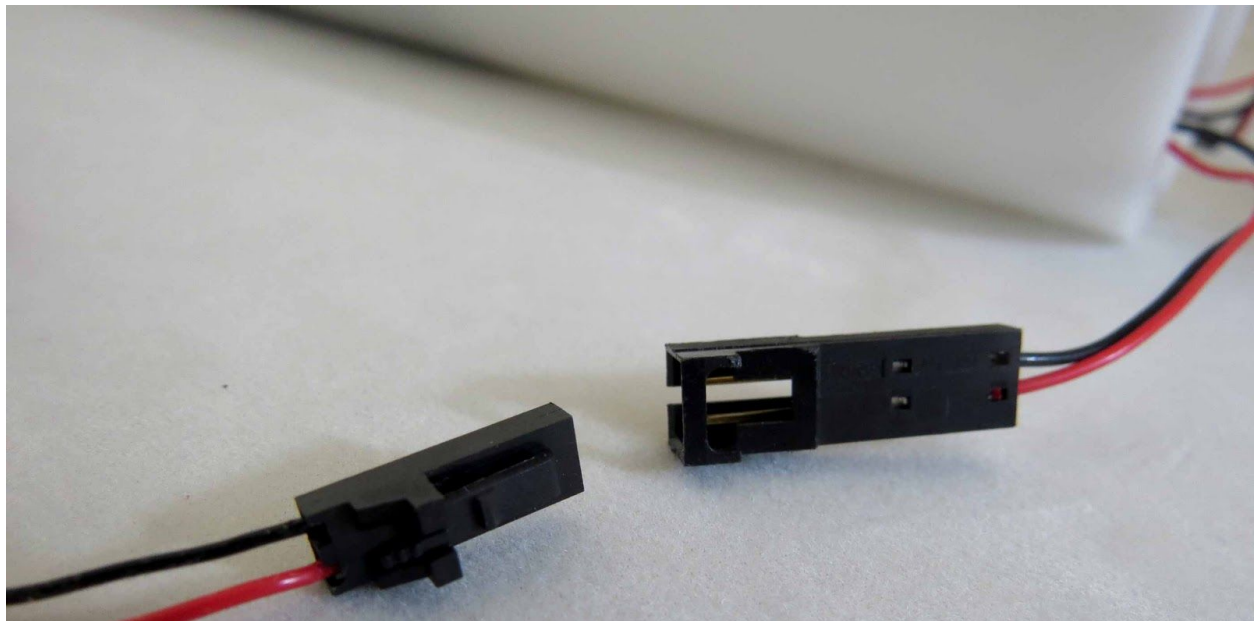


The battery pack with one installed AA battery and the empty section next to occupied section so that the metal spring is visible and marked with the arrow and the (-) sign while the opposite side marked with the arrow and the (+) positive sign.



STEP 5.1:

If you are using the Lithium battery, follow the instructions in Step 5 for the first battery pack. The Lithium battery connects directly to the power cable instead of the second battery pack loaded with AA type of batteries. Remove the second battery pack completely and store in a safe place for future use.



Battery pack connectors

STEP 6:

Once the battery packs are reconnected to their corresponding power cables, carefully insert each battery pack back into the body of the ARC station. Make sure to gently “tuck in” the battery connector cables so that they are not damaged or stressed.

STEP 7:

Locate the sonar transducer end-cap you removed earlier. Reconnect the sonar transducer end-cap to the corresponding WHITE/BLACK cable. Ensure that the connector on the cable from sonar transducer end-cap is inserted to the socket on corresponding cable firmly. Once the cable connection is made, carefully insert the excess cable back in to the body of ARC station using your fingers.

Before re-inserting the sonar transducer end-cap back in the body of the ARC station, please pay close attention to the condition of the rubber O-ring stretched around the inner edge of the sonar transducer end-cap. If you notice any debris or cracks in the structure of the rubber O-ring, pull it from its groove. Remove all the dirt and debris from the groove before re-installing the rubber O-ring. Please take special care handling the rubber O-ring because it is relatively fragile and can be damaged by sharp metal objects. Replace O-ring if it is necessary. If you determine that the O-ring needs to be replaced, contact Desert Star Systems LLC and ask for

Rubber O-ring, Manufacturer: Parker 2-130, Compound E515 (qty 1)

Desert Star Part#: ORI00058.

Before re-installing the rubber O-ring back to its groove on the sonar transducer end-cap, make sure to apply a thin film of silicone grease.

STEP 8:

With the rubber O-ring properly placed in its groove and stretched around the inner edge of the sonar transducer end-cap, push/snap the sonar transducer end-cap back into the housing of the ARC station.

When aligning and preparing to push the sonar transducer end-cap back in it's place, make sure the holes around the edges of the sonar transducer end-cap aligned to the the threads for the screws in the main housing of the ARC station. Pay close attention to the proper alignment in order to avoid twisting the sonar transducer end-cap once it is inserted in it's place. Excessive twisting of the sonar transducer end-cap once it is snapped in to the main housing, may damage the O-ring causing the subsequent water leak into the ARC station main body.

Make sure that no wires get jammed between the the rubber O-ring and the main housing of the ARC station.

STEP 9:

Once the sonar transducer end-cap is snapped in its place, re-insert the screws. Make sure to tighten the screws in the star-shaped pattern to ensure equal pressure applied to all sides of the sonar transducer end-cap. Tighten the screws to a snug fit.

Do not over tighten the screws.

Acoustic Release System Manual Part 2

4. Battery Life Expectancy

As discussed earlier, there is two options for powering an ARC unit.

- Option #1 Alkaline batteries only, will provide at least 130 days or ~ 4 months.
- Option #2 Alkaline plus Lithium batteries will provide at least 520 days or ~ 17 months.

This is the timeframe between the initial ARC deployment and the first retrieval of ARC unit back to the surface. After a 130 days or 520 days of uninterrupted presence under the water - depending on the type of your batteries - a new set of batteries MUST be installed.

If you are planning to execute multiple deployments and retrieval of the same ARC unit with the same battery (without installing new batteries) it is very important to take the following factors into consideration...

The battery energy consumed by an ARC unit consist of two parts: It takes energy to communicate with the surface, listen, process, execute and respond back to the commands send from the STM surface station, It also takes energy to execute the release from the anchor energizing the release mechanism.

On a set of an Alkaline only batteries, ARC unit capable to initiate about 700 release cycles. Each release cycle will require communication with the surface. The more time the ARC unit spends communicating with the surface, the more energy will be depleted from the batteries.

Use the following statistics in this table to estimate the number of release cycles and associated maximum communication time available per release cycle.

[TABLE] Show table with an estimated times. TBD

To extend the life of your batteries, be mindful of the number of communication cycles you initiate from the surface to an ARC unit underwater. Keep the number of those communication sessions and their duration to an absolute minimum.

With the nickel-chromium wire installed into the release assembly, new batteries connected, O-ring rubber gasket properly loaded, and sonar transducer end-cap secured, the ARC unit is now set and ready to communicate with the Surface Transponder Module (STM). The following section of this manual will guide you through the STM surface station functions and operations

5. Surface Transponder Module (STM)

The **Surface Transponder Module (STM)** (Model Number STM-3) facilitates a relay-converter function between a software running on the PC and the submerged ARC unit. The STM surface station receives the command sent to it from the PC and converts it into sonar acoustic signals. The sonar acoustic signals are then sent through the water to the ARC unit under the water. The ARC unit processes the commands it received and sends back a response. The STM surface station receives the response in the form of an sonar acoustic vibrations, converts them back in to digital signals and forwards them to the software running on a PC. The software displays the information received from the ARC unit on a PC's monitor.

The STM surface station is assembled as portable unit, with controls and connections located in its front panel.



The front panel of the STM surface station.

The STM surface station is equipped with the internal rechargeable battery for mobile operations when an external power source is not available. The power supplied to the STM surface station via power cable with a standard IEC 60320 - C13 coupler. External power charges the internal battery as well as providing a main power for the continues operation.



The standard power cable

The “PC” inlet facilitates a USB connection for the link to the PC running the “Acoustic Release Control” software.

The GPS inlet serves as a communication link to optional GPS unit for automated recording of the GPS coordinates at the time of the ARC unit(s) deployment. When the optional GPS unit is connected, the “Acoustic Release Control” software records the coordinates in a log file along with the unique Serial Number of the deployed ARC unit. The communication with the optional GPS unit is done via USB interface (For more information on the GPS unit, please see the GPS unit section).

The power switch controls the power distribution of the STM surface station:

- The neutral (middle) position of the switch is an “OFF” position.
- When the switch is flipped “up” - this is “ON” position and STM surface station is powered on.
- When power switch is flipped “down” - this is a charging mode, STM surface station does not receive power, and only battery charging circuits are energized.

The STM surface station equipped with a universal power supply is designed to operate with the input power of alternating current in a form of a sine wave. The acceptable input voltage range is 95 to 250 Volts. The acceptable frequency of alternating current range between 47 and 63 Hz.

When the STM surface station is operated onboard a vessel and an external power source is used to power the STM surface station, please take in consideration the quality of the AC input power source. The imperfections of the alternating current's sine wave and frequency may introduce undesirable "noise" into the circuits of the STM surface station causing signal distortion and decreasing the operating range of the sonar transducer. Whenever possible, consider avoiding use of onboard diesel generators or DC/AC converters unable to produce a "clean" sine wave of 63 Hz of AC current supplied to the STM surface station.

The STM surface station equipped with three sockets for connection of a sonar transducer(s). When only one sonar transducer is used, make sure to connect it to the socket marked "Sonar 1". The STM surface station is equipped with the three sonar transducer sockets because the STM-3 is a component in other systems designed by Desert Star Systems LLC. For more information regarding these systems please refer to our website (desertstar.com)

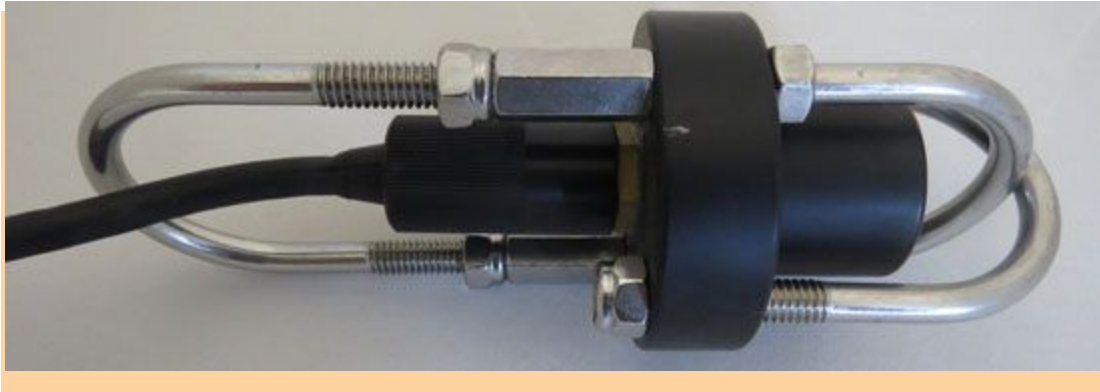
The STM surface station equipped with a STATUS LED located right below the power distribution switch. Status LED indicated the current state of operation of STM surface station. Refer to the table below for the STATUS LED blink patterns and their description.

Status LED Pattern	Description
LED is off	The surface station (STM) is OFF, or it is not running any application software, or the surface station is connected to DiveTerm for maintenance functions
LED is always ON	Not a valid blink pattern. A hardware problem may exist or the STM supply voltage may be below 7 volts
Single short blink once per second	STM is operating correctly

Double-blink once per second	A position fix has been received
Triple-blink once per second	STM self-test failed. May need repairs or maintenance
1/2 second on, 1/2 second off	STM not initialized. May need repairs or maintenance
1 second on, 1 second off	Charging of the surface station battery is under way
1 second on, 3 seconds off	Battery charging is complete
other blink patterns	The STM is not configured properly, please return to Desert Star Systems

The STM surface station is designed to work with a sonar transducer(s). The most common and simple application is an over-the-side sonar transducer connected to the STM surface station by the 50 ft cable (additional cable length options available upon request). When connecting the sonar transducer to the STM surface station make sure to insert the plug firmly in to the socket on the front panel and rotate the ring around the plug to secure it in the socket.

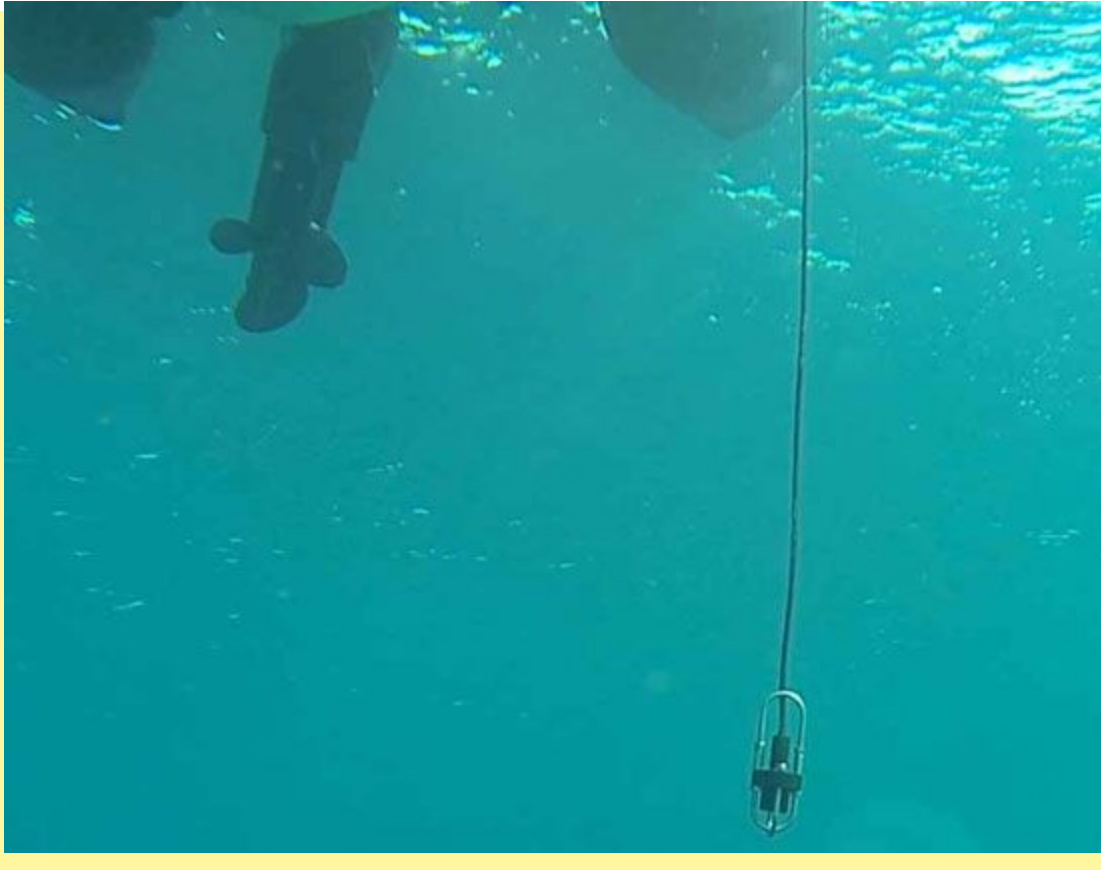
The over-the-side sonar transducer is encased in a protective metal cage. When operating a sonar transducer, never use its communication cable to lower it in to the water, or drag it behind the vessel. Please use a mounting cable or a rope directly attached to the protective cage of the transducer.



The over-the-side sonar transducer, supplied with your STM surface station, has a directional range of a 180 degrees. When the sonar transducer is pointed directly down it will be able to “hear” an incoming sonar signal from underneath it within 180 degrees. Consider attaching a weight to the protective cage of the sonar transducer in order to maintain its orientation (pointing directly down). To accomplish this, attach the weight on the opposite side of the communication cable on the cage surrounding the sonar transducer.

When deploying the sonar transducer overboard, please take into consideration the depth of the thermocline applicable to a large body of water. To improve the range and the clarity of the sonar signal, consider lowering your sonar transducer beyond two meters or ~6 feet depth from the surface. Generally, the deeper you are able to deploy your transducer, the better quality of the sonar signal the STM surface station will be able to “hear”.





The the sonar transducer with it's directional listening pattern.

When dragging the sonar transducer behind a vessel in motion is anticipated, please be aware of the limitations of the directional range the transducer able to receive. For a vessel in motion, it is recommended to use a Through-hull sonar transducer.

[PICTURE]

**A vessel with a through-hull transducer mounted on the bottom and the 90 degree range transducer able to “hear”
from.**

A Through-hull transducer, is the type of the transducer that is mounted on the bottom of the vessel with the directional 90 degrees beam shaped in a cone pattern.

Through-hull transducers are mounted through a hole drilled in the bottom of the boat and protrude directly into the water. This type of transducer generally provides the best performance for moving vessels.

Through-hulls are recommended for displacement hulls and boats with straight-shaft inboard engines. You'll also need a fairing block that allows the transducer to be mounted properly. Through-hull transducers must be installed with a fairing to ensure proper alignment and a secure fit.

Through-hull transducers must be positioned in front of the propeller, rudder, keel or anything else that may create turbulence. They must be mounted in a position that is always underwater and angled straight down.

When considering application of a through-hull transducer(s), please contact the Desert Star Systems customer service to discuss such applications. The STM surface station is equipped with a proprietary socket for a sonar transducer connection. Desert Start Systems will purchase the through-hull transducer(s) separately to meet your specific vessel requirements and perform custom-wiring so that transducer(s) can be plugged in to the STM surface station.

If your STM surface station came equipped with an optional GPS unit, make sure to connect the GPS unit to a power source as appropriate as well as connect the GPS unit to STM surface station. Make sure to keep GPS unit energized and connected to the STM surface station during the deployment of the ARC unit(s) in order to retain GPS coordinates of the deployment site.

6. Software Overview

Acoustic Release Control Software v1.0

The remote control of the ARC unit(s) is done via Desert Star Systems software - "Acoustic Release Control" is installed on the portable Personal Computer (PC) supplied by Desert Star Systems with your purchase. The software is custom written by the Desert Start System developers and designed specifically to facilitate the data management operations, between the PC, STM surface station, and the ARC underwater unit.

- Management role of the software includes:
 - Identifying each ARC unit by the unique Serial Number embedded in the ARC unit hardware
 - Keeping a list of all ARC deployment information, including:
 - Serial Number of the ARC station
 - Latitude/Longitude, (GPS coordinates of the launch site)
 - Comments entry field
 - Time and Date of the deployment
 - Range between ARC station and the STM's surface station sonar transducer
 - Battery charge status expressed %
 - Relating commands to the ARC station and receiving confirmations
 - Remote monitoring of the submerged ARC station including "Current status" of the station:

- Real-time reports of the station battery charge levels
- State of the release mechanism:
 - "arming the station/releasing the station/station released".
- Real-time distance between the ARC unit and the STM surface stations sonar transponder while the ARC station is deployed underwater and when it's on its way to the surface once released.

7. Software, STM, & USB Connectivity to the PC

Desert Star Systems will ship a PC along with the "Acoustic Release Control" software already installed. When you receive the PC, please power it up, and log-in to the Windows Operating System. If applicable, the default password for Desert Star Systems customer PCs who buy the ARC system is "**fish**" without the quotes. Please contact Desert Star Systems customer support if this is not the default password.

The STM surface station is designed to communicate with the PC via USB cable.

Please follow these steps to connect the STM surface station with the PC already running.

STEP 1:

Before making any connections, please make sure that the power switch on the front panel of the STM surface station is in the "OFF" position. The PC should be turned on with the Windows 8 Operating System fully booted and ready for the interaction with a user.

STEP 2:

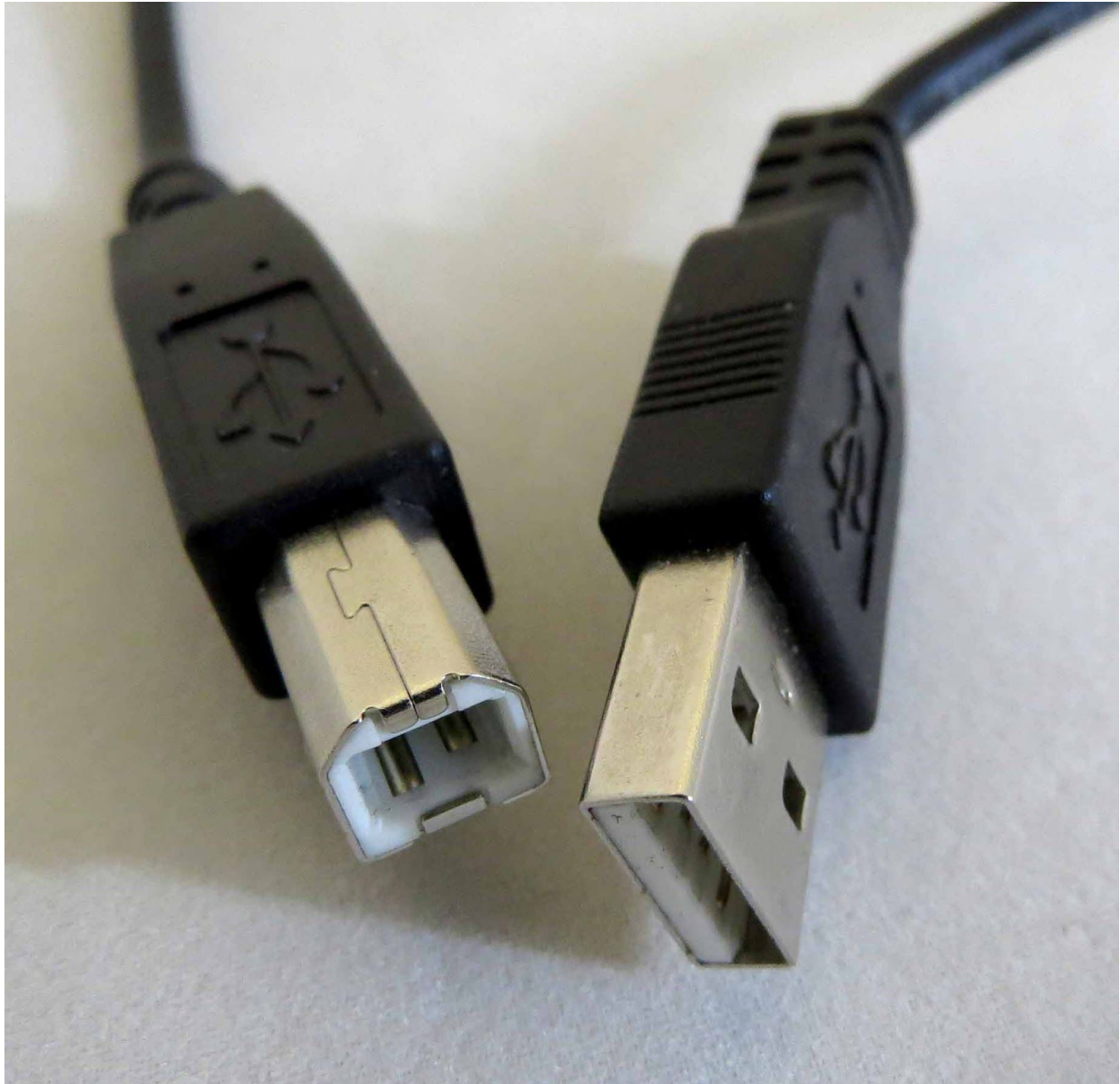
Locate the USB cable included. The STM surface station has a "Type-B" female USB port on the front panel. Insert the USB cable "Type-B" male connector in to the port on the front panel of STM surface station.



The STM unit and identified USB port on the front panel of the STM unit.

STEP 3:

Insert the other end of the USB cable with the USB “Type-A” connector in to one of the USB ports of the PC. The Windows 8 Operating System will detect USB device connected. Please allow Windows to finish its USB “mapping” procedure before continuing.



The drivers for the USB device should already be installed and working properly with your Desert Star Systems configured PC. If you have trouble completing further steps due to driver issues, please contact Desert Star Systems.

STEP 4:

Move the Power Switch into an “ON” position on the front panel of STM surface station. Pay attention to the blink pattern of the status LED located directly below the power switch. The STM surface station will go through an internal start-up cycle. During the start up, the LED will flash different patterns. Once the STM surface station is operational and ready to communicate with the

PC through a USB cable, the status LED will blink a steady pattern, approximately once every 1-2 seconds.

STEP 5:

It's time to run the "Acoustic Release Control" software. There will be a shortcut on the desktop named "Acoustic Release Control". Double-click on the shortcut to start the software.

STEP 5.1:

In case you are unable to locate the shortcut on your desktop, please press the "Windows" button on the keyboard (located next to the space bar) to bring up the "tiles" view of the Windows OS. Locate the "magnifying glass" search icon, click on it once and enter the key word: "Acoustic" in a search field. The Windows Operating System will locate the software and present you a list of matches. Look through the list, locate the "Acoustic Release Control.exe", navigate your cursor over it and double-click to start the software.

STEP 6:

Once you have initiated the "Acoustic Release Control" software, you will be presented with a main window. Please direct your attention to the bottom right corner of the window. Look for a field titled: "Current Status".

The "Current Status" field stating - "Surface Station Link Established" is an indication that your STM surface station is communicating with the PC via USB cable and the "Acoustic Release Control" software correctly. STM surface station is now operational and ready for the ARC unit(s) deployment sequence.

If the "Current Status" field states - "Surface Station Link Established", disregard STEP 6.1 and move on to the next section of this manual. Otherwise continue reading the following steps.

In case you are presented with an error message: "Unable To Open Surface Station Communications on COM Port 1!" upon "Acoustic Release Control" software start-up, it means that proper USB to Serial COM mapping procedure has to be done before you can continue.

Please follow these steps to identify the COM port number used for STM surface station connection by your Windows operating system in order to set the correct COM Port settings of "Acoustic Release Control" software.

[PICTURE]

The logical connection of components:

STM \longleftrightarrow USB port[(WIN COM PortX) \longleftrightarrow (ARC soft.COM PortX)]

STEP 6.1:

In order for the STM surface station to communicate with the PC via USB interface a correct COM port needs to be assigned to a USB device.

[PICTURE]

Please navigate to “Control Panel” of your Windows Operating System.

Under “Control Panel items locate “Device Manager”. Double-click the “Device Manager”. Once you are presented with the “Device Manager Window” and the list of the devices, please look through the list and click on the item “Ports (COM & LPT)”

Search

Everywhere ▾

control Panel



Control Panel



PC settings



AMD Catalyst Control Center



Default Programs



Control the computer without the mouse or keyboard



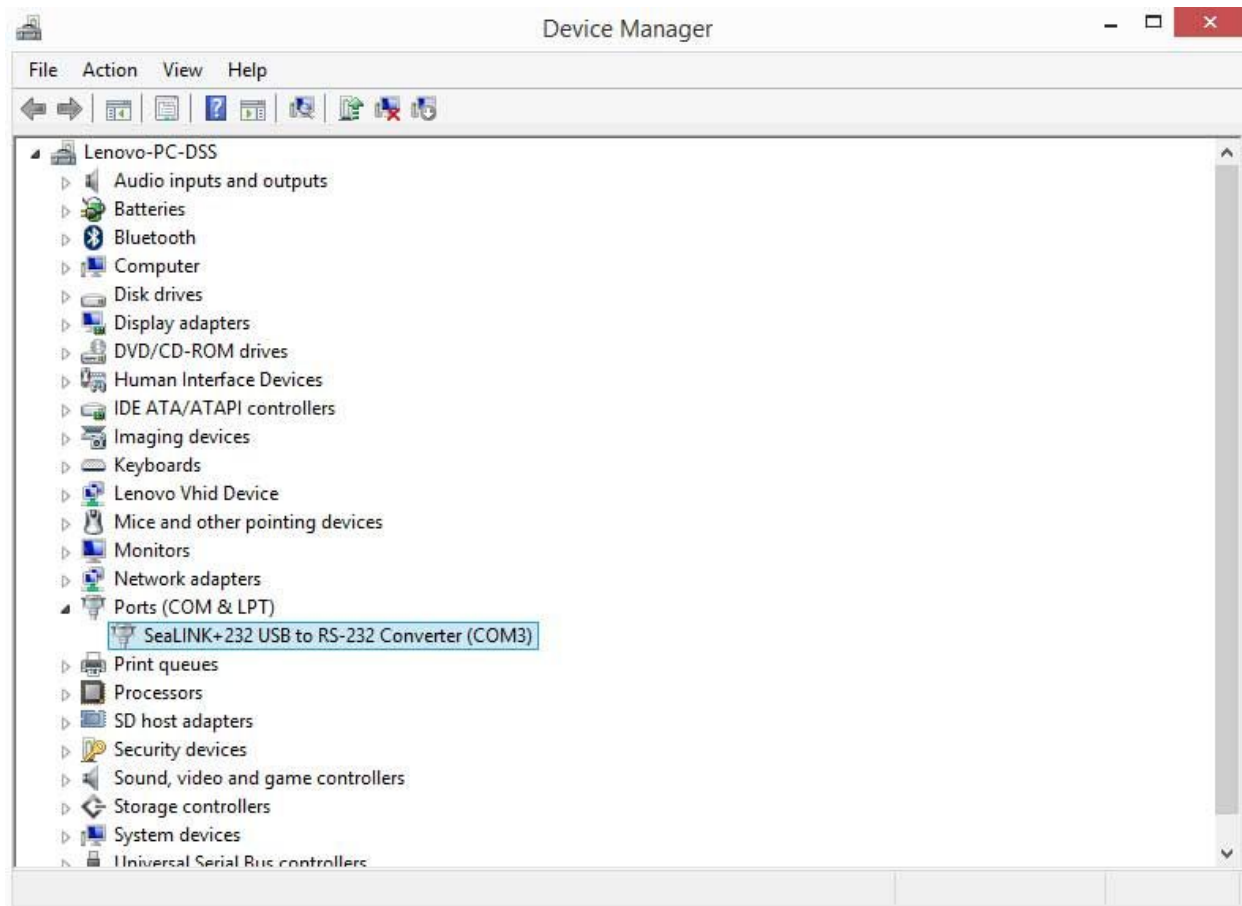
Change User Account Control settings



Set up USB game controllers

control

“Control Panel”→“Device Manager”→“Ports (COM & LPT)”



You will see under a “Ports (COM & LPT)” section a device named:

“SeaLINK+232 USB to RS-232 Converter (COM X)”

Please take a note of the COM port number listed at the end of the string. The number you are looking for is a COM number listed in parenthesis. This is the COM port number your STM surface station is connected to. This parameter must be set in “Acoustic Release Control” software.

Please run the “Acoustic Release Control” software. You may be presented with an error message “Unable to Open Surface Station Communications on COM Port 1 !” click “OK”.

Search

Everywhere ▾

Acoustic Release.exe



Acoustic Release.exe



Amazon



Add a language to this device



Rename your PC or join a domain



arc



ARC-1 Operators Manual

A

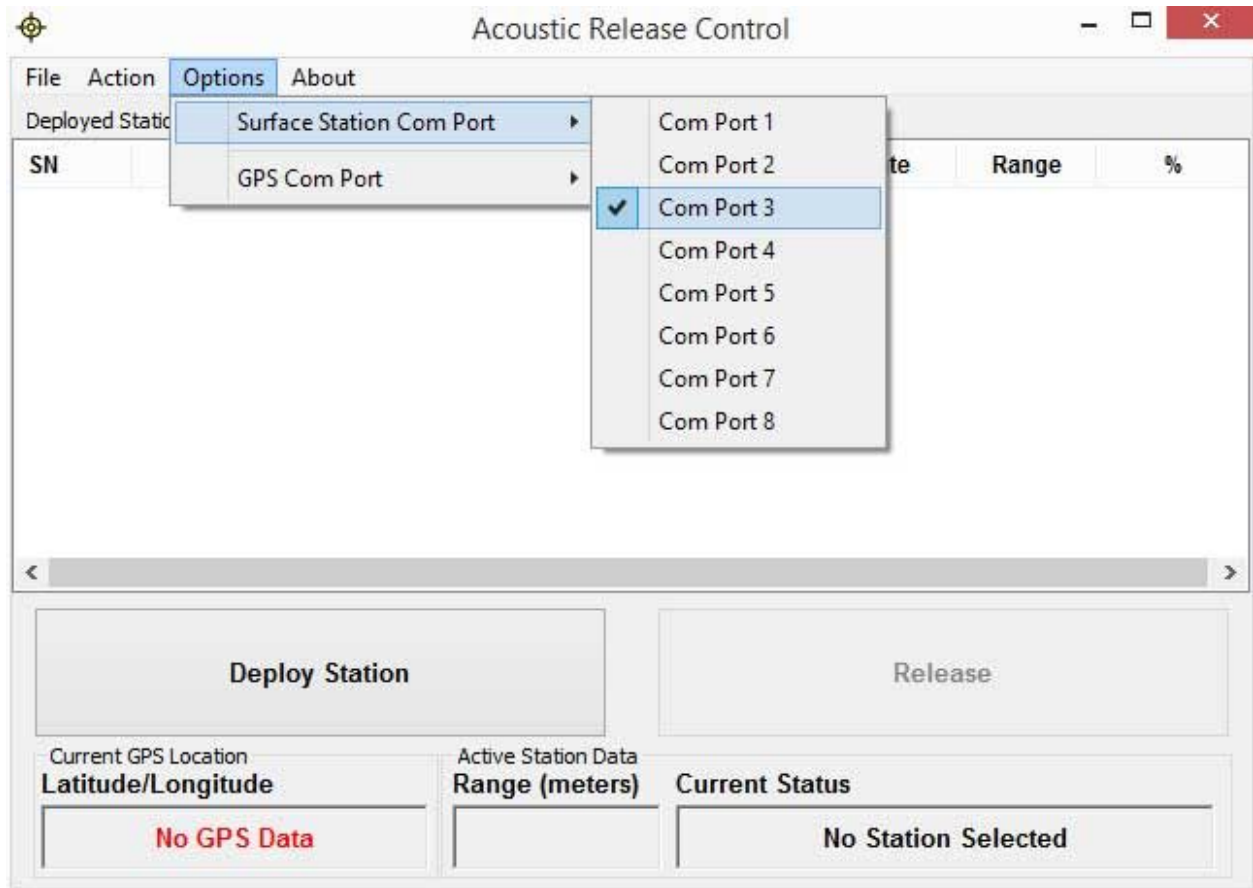
acoustic Release.exe



Now the correct COM port must be selected in “Acoustic Release Control” software. Navigate to the “Options” menu of the “Acoustic Release Control” software and click on “Options”.

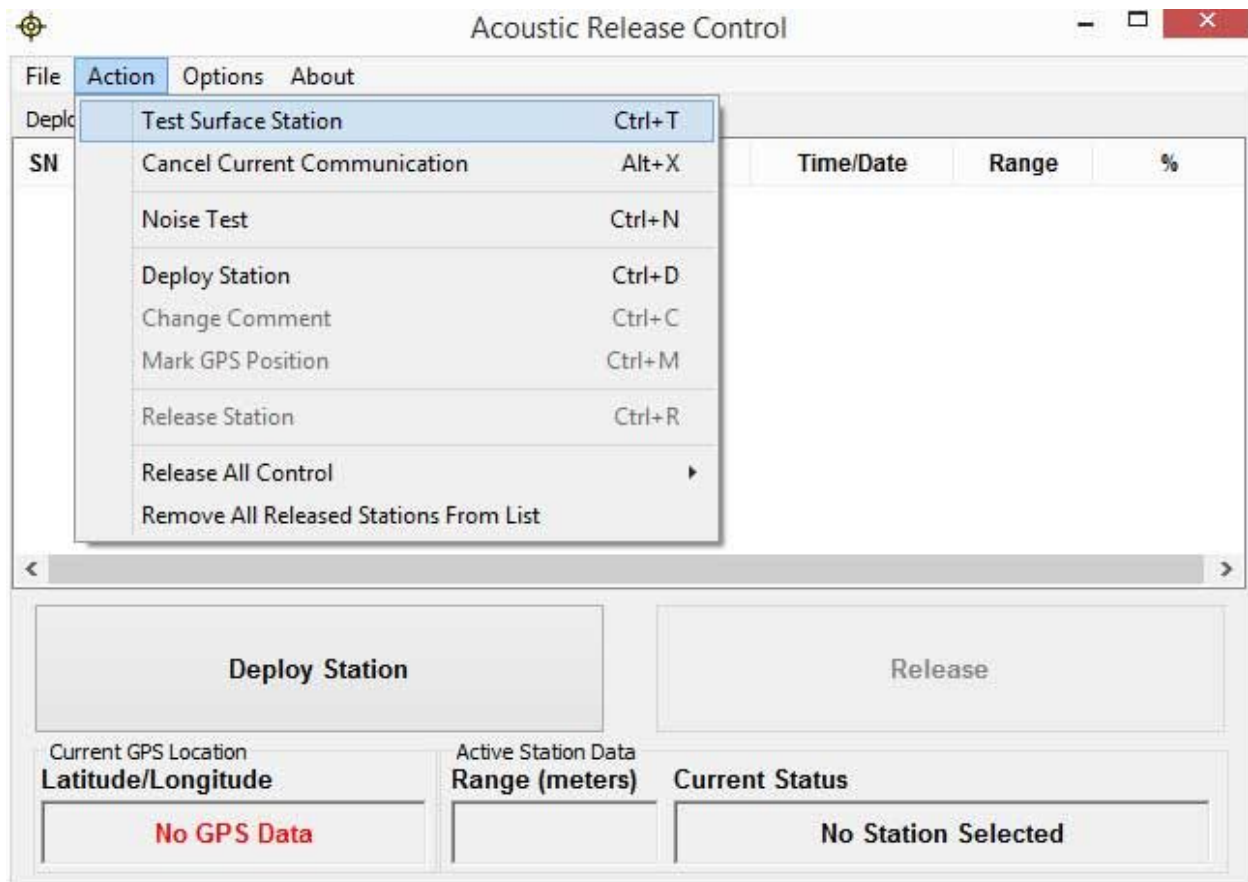
In the drop-down menu navigate to the “Surface Station COM Port” item. By doing so you will be presented with a list of Com Ports.

Recall the Com Port number you discovered earlier in “Device Manager” and select the “Com Port” number corresponding to the “Com Port” assigned to “SeaLINK+232 USB to RS-232 Converter (COM X)” in Windows Device Manager.



This will resolve the communication error message upon start up of the “Acoustic Release Control” software.

To verify, close the “Acoustic Release Control” software, and re-open it again. The error message will no longer appear.



Navigate to the “Action” menu of “Acoustic Release Control” software. Click on “Action” item to expand the sub-menu. In the presented sub-menu locate the item “Test Surface Station” and click on it.

Upon executing this action, the “Current Status” field at the bottom right corner of the “Acoustic Release Control” software will change from “No Station Selected” to display: “Surface Station Link Established”.

The “Current Status” field stating - “Surface Station Link Established” is an indication that your STM surface station is communicating with the PC via USB cable and the “Acoustic Release Control” software correctly. STM surface station is now operational and ready for ARC unit(s) deployment sequence. Move on to the next section.

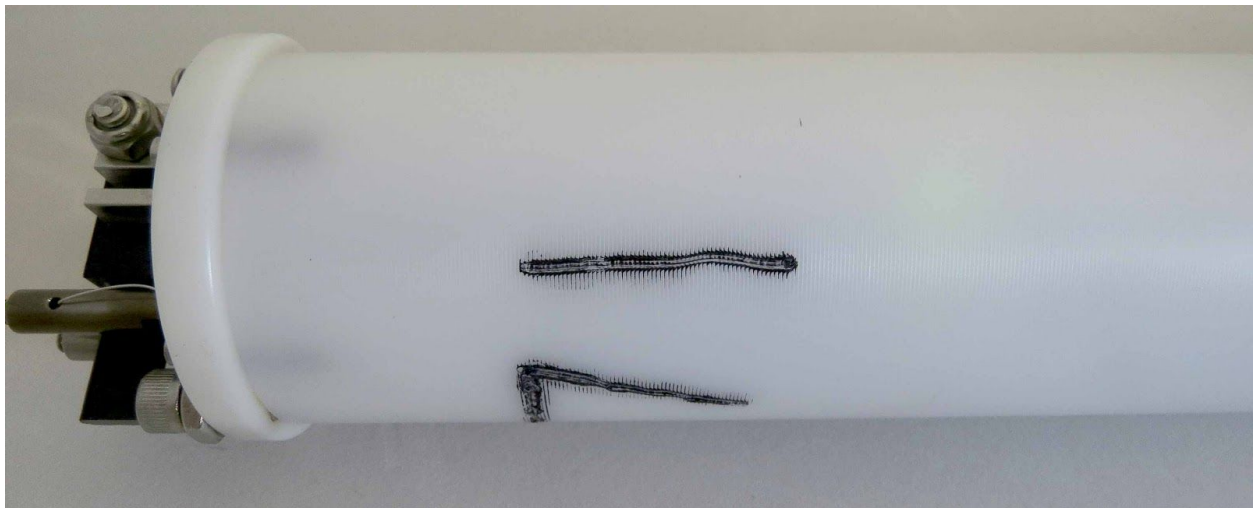
8. Preparing for the First Deployment

Before the first actual deployment of the ARC unit(s) underwater, the sonar communications between STM surface station and ARC unit(s) must be tested in order ensure successful deployment and retrieval of the ARC unit(s).

Please make sure that following testing procedure is done in a relaxed manner. Pay close attention to the testing procedure and allow yourself adequate time to execute the testing and understand the equipment.

Before you begin testing, the following assumptions are made: The ARC unit(s) have a set of a fresh batteries installed. The STM surface station is properly connected to PC and the “Acoustic Release Control” software is already running.

During the testing procedure, monitor the status LED of the ARC unit. The status LED is located inside the body of the ARC station and can be visualized in a dimmed environment, shade, or a dark room.



The location of the LED in ARC unit.

Status LED Pattern	Description
LED is off	ARC unit is in “sleep” mode, passively listening for the sonar commands or batteries are discharged
Single short blink	ARC unit is “awake” and standing by for commands
Double blink	ARC unit is sending/receiving sonar signals to/from the STM surface station

The ARC unit is programmed to enter a sleep mode if no active sonar communication signals are detected within 30 seconds since the last signal is “heard”.

STEP 1:

Begin by leaving the ARC unit untouched without any acoustic noise in its proximity. When the ARC unit is unable to detect any acoustic signals, it will enter a “stand-by” state to reduce the use of energy and extend the life of batteries.

STEP 2:

Locate the label attached to the body of ARC unit and copy its Serial Number for your record keeping in a safe place. It is recommended that you attach an additional label to the body of the ARC unit with your contact information and clear instruction how this unit can be returned to you in case erroneous ARC unit loss.

Take into consideration that biofouling (or other variables) may make your units' identifying label unreadable during/after deployment. It is strongly advised that you mark your ARC unit with your own identifying markers and numbering system before deployment. A common method is to use a simple wood-burning kit to *lightly* burn your identifying marks or serial number into the delrin housing of the ARC unit.

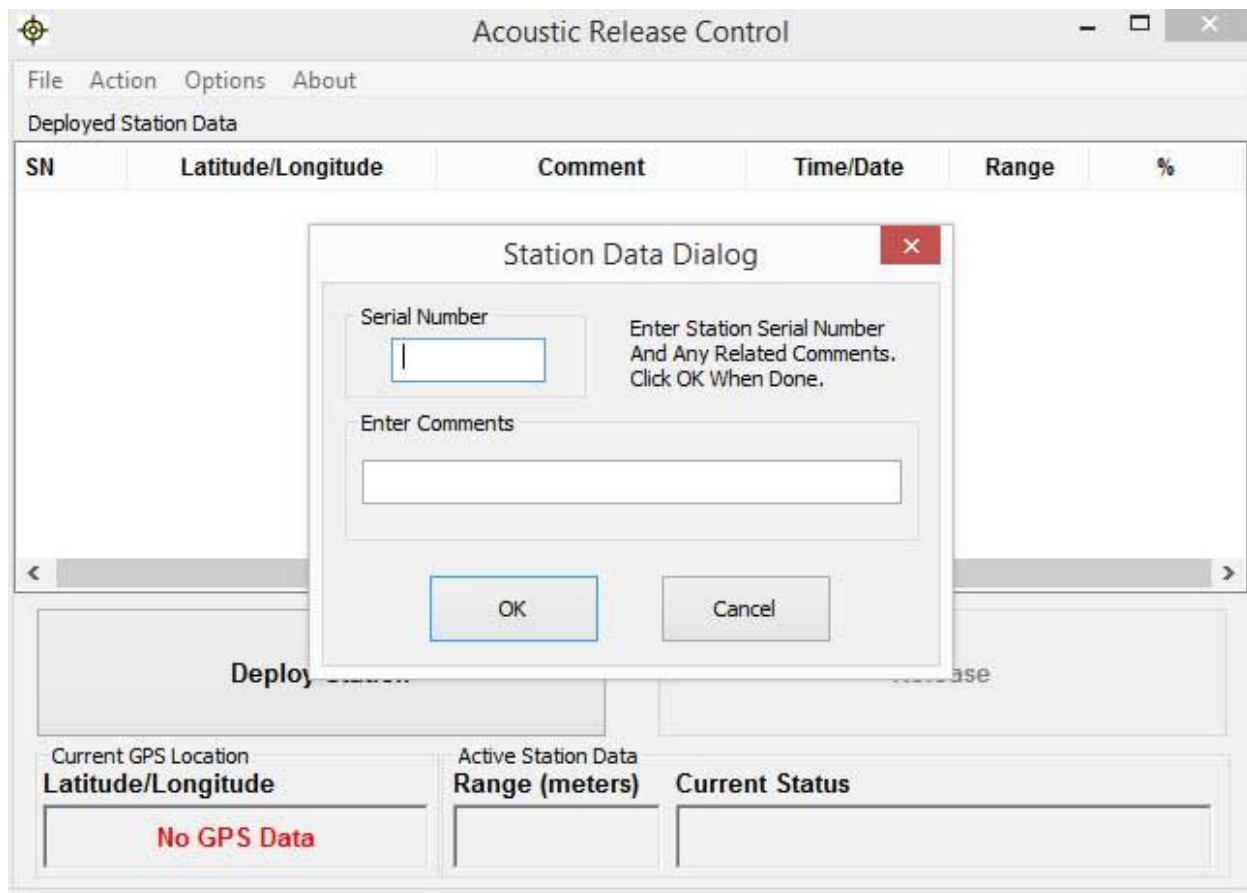
STEP 3:

Place the ARC unit into a plastic bucket filled with water so that the acoustic sonar transducer of the ARC unit is fully submerged. Place the sonar transducer connected to a STM surface station into the same bucket of water.

If using this bucket method to test your ARC unit, please keep in mind that the acoustic echoes may confuse the ARC unit, causing it to improperly function (the same thing can happen in a swimming pool or similar environment). For best results, test your unit in the environment you wish to deploy it, but ensure that you can retrieve the unit if communication fails by tying it off on a line via the titanium bracket located on the sonar transducer endcap.

STEP 4:

Using the “Acoustic Release Control” software, begin the ARC unit registration process by clicking on “Deploy Station” button. You will be presented with a “Station Data Dialog” window.



STEP 5:

Enter the unique Serial Number of the ARC unit to be tested into the “Serial Number” field. Enter the note with a brief description of the purpose of the ARC station in the comments field.

When utilizing free entry note field in the “Station Data Dialog” window DO NOT use a comma symbol “,”! Using the comma symbol in this field will corrupt formatting of the log file. Log file can be later exported for automated processing and it is critical to avoid using a comma symbol because the log file is written in a comma separated values format (.csv).

Verify that the information is entered correctly and click the “OK” button.

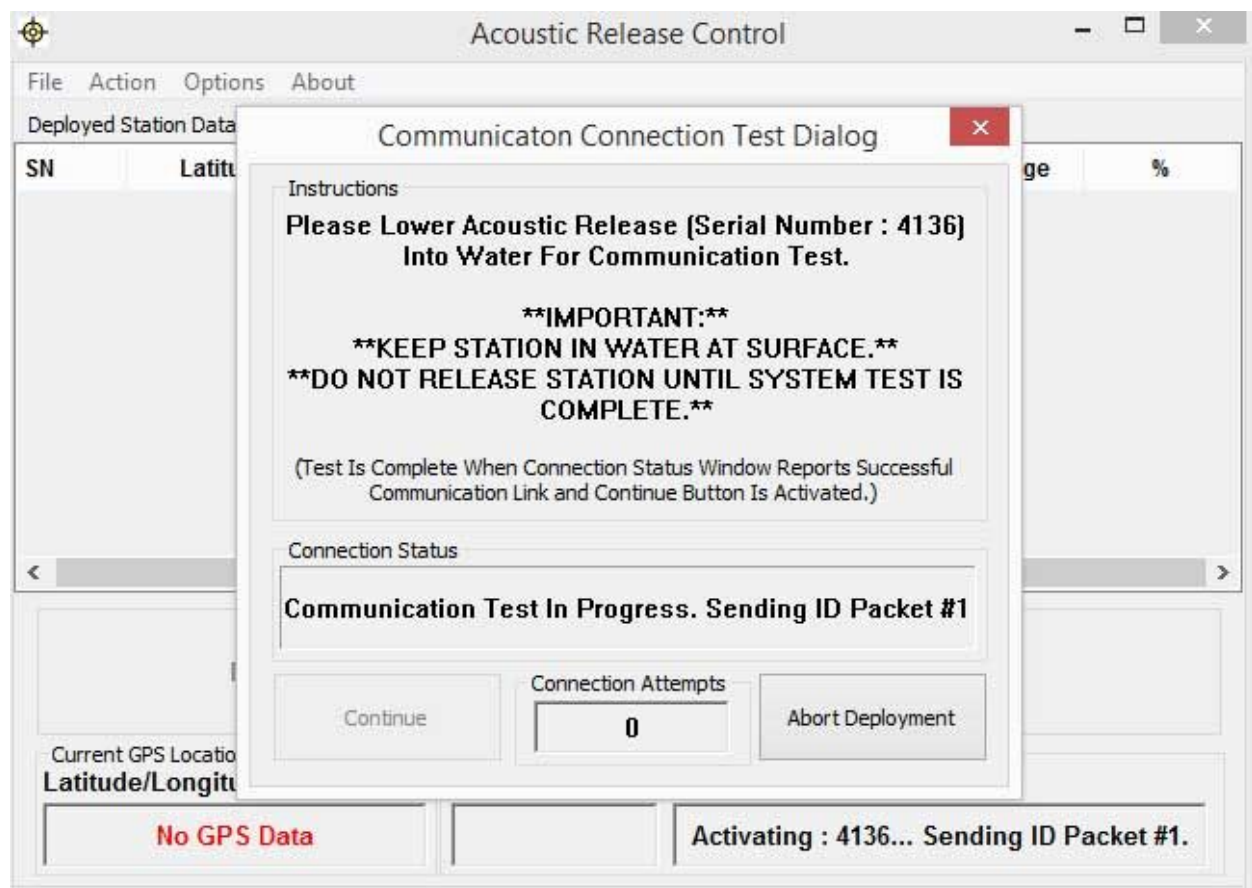
Make sure you are entering the correct Serial Number of the ARC unit. Every ARC unit has a unique Serial Number.

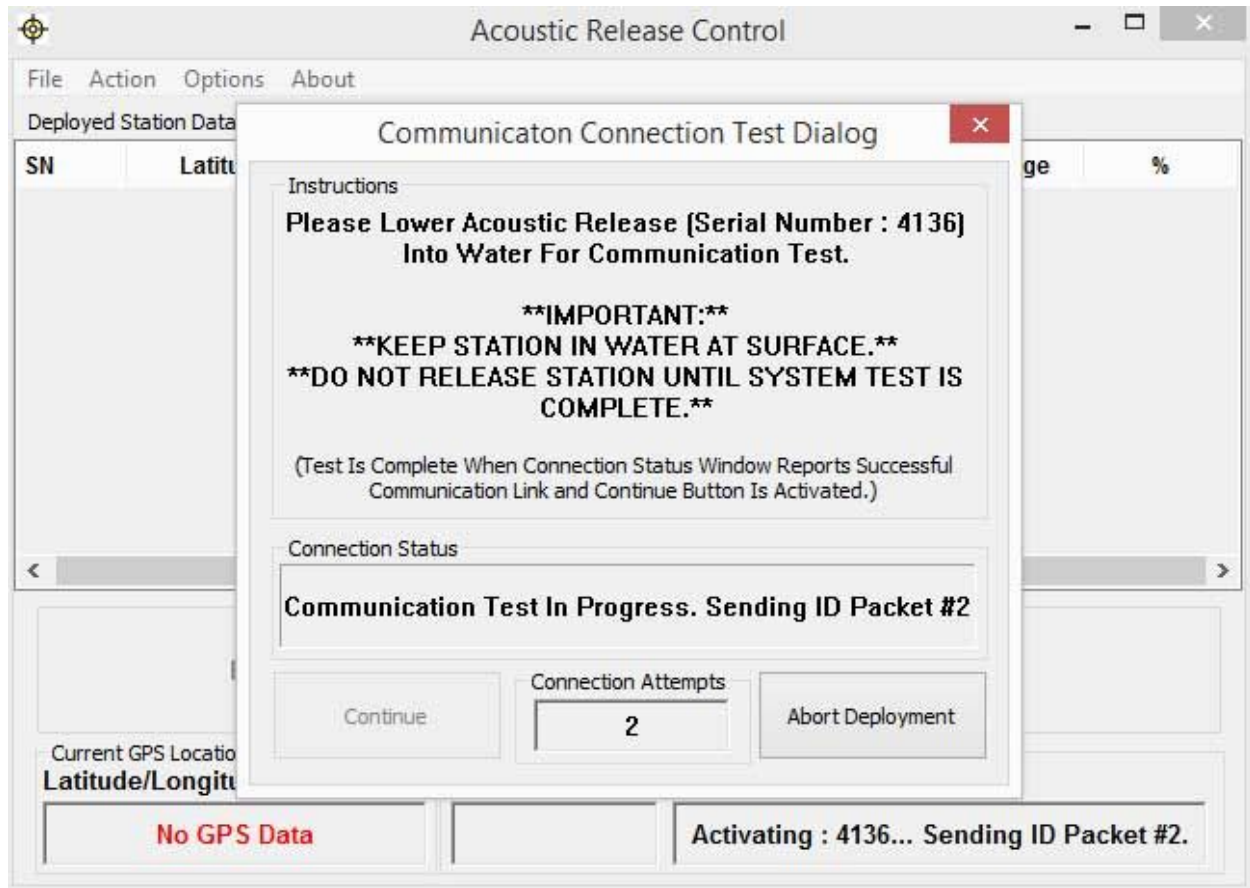
Mismatch of the serial number entered into the “Acoustic Release Control” software with the actual serial number of the

particular ARC unit will cause the ARC unit not to respond to the STM surface station effectively, leaving an operator unable to command and control the ARC unit.

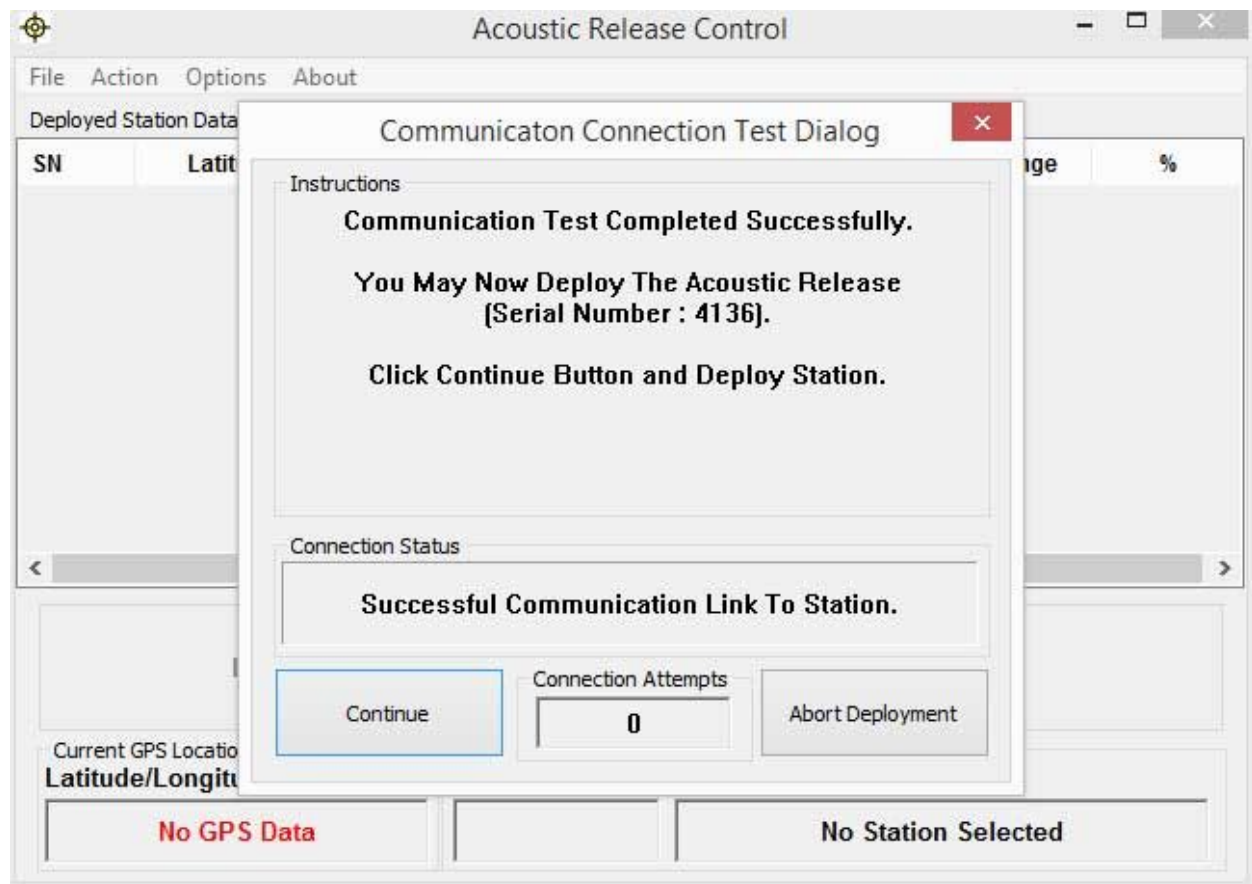
YOU HAVE TO KNOW EXACT SERIAL NUMBER OF THE DEPLOYED UNDERWATER ARC UNIT IN ORDER TO COMMUNICATE WITH IT.

Once you have entered the Serial Number, your comments, and clicked the “ok” button, the STM surface station will initiate a communication link with the ARC unit. You should monitor the status LED blinking pattern of the ARC unit to confirm that the communication is in progress (Double-blinks indicate successful communications). Meanwhile the software will present a new window titled “Communication Connection Test Dialog”. In this window the operator will be able to monitor the progress of a communication between ARC unit and the STM surface station. The “Connection Status” field will go through a various stages.






Please wait while communication is in progress. Upon successful completion of the communication test, the "Instruction" field will inform you of a successful test with an ARC unit and its Serial Number.



STEP 6:

Click "Continue" button. The ARC unit will be added to the main window's list.


Acoustic Release Control
—
□
×

File Action Options About

Deployed Station Data

SN	Latitude/Longitude	Comment	Time/Date	Range	%
4136	No GPS Data	note comments test	13:37:05 01/14...	0.000	100.0

Deploy Station

Release

Current GPS Location

Latitude/Longitude

No GPS Data

Active Station Data

Range (meters)

0.000 m

Current Status

Station Activated

If you are using a external GPS unit connected to the STM surface station, be aware of the GPS coordinate recorded along with the ARC unit you just tested. Since this is a pre-deployment test, if you are NOT at the actual deployment site, the GPS coordinates recorded are NOT valid and have to be corrected once you reach actual site of the deployment.

Acoustic Release Control

File Action Options About

Deployed Station Data

SN	Latitude/Longitude	Comment	Time/Date	Range	%
4136	3640.6696N/12145.7140W	-	15:42:04 01/26...	0.000	100.0

< >

Deploy Station Release

Current GPS Location Latitude/Longitude
3640.6701 N/12145.7141 W

Active Station Data Range (meters)
0.000 m

Current Status
Battery : 5.40 V, Release : 1.60 V

STEP 7:

Once the ARC station is listed in the “Acoustic Release Control” software, direct your attention to the “Current Status” field at the lower right corner of the window. You will have to evaluate the current battery status to decide if the battery powering ARC unit is charged to acceptable level.

The “Current Status” field will display two parameters reporting a condition of the battery of your ARC unit. Please use the following criteria for the battery charge evaluation:

Acoustic Release Control

File Action Options About

Deployed Station Data

SN	Latitude/Longitude	Comment	Time/Date	Range	%
4136	No GPS Data	note comments test	13:37:05 01/14...	0.000	100.0

< >

Deploy Station Release

Current GPS Location Latitude/Longitude: No GPS Data

Active Station Data Range (meters): 0.000 m

Current Status: Battery : 5.65 V, Release : 28.60 V

The “current status” field .

- The “Battery: X.XX V” states the current Voltage of the battery. This parameter must report at least 5.00 volts value. If this value shows less than 5.00 Volts STOP! DO NOT deploy the ARC unit. This is an indication that the batteries must be changed.
- The “Release: XX.XX V” states the Voltage necessary to trigger a release mechanism. This parameter must report at least 25.00 Volts value. If this value shows less than 25.00 Volts, STOP. DO NOT deploy the ARC unit. This is an indication that the battery must be changed.

If you need to change the batteries, please read the section of this manual guiding you on how to install/change the batteries of an ARC unit. Once the new batteries are installed, repeat the communications test.

- If the “Battery” Voltage reported at 5.00 Volts or more, AND the “Release” voltage reported at 25.00 Volts or more, this means battery charge levels are acceptable and the ARC unit is ready to be deployed underwater.
- This concludes the communication test between the ARC submergible unit and the STM surface station. The ARC unit is now listed as registered in the “Acoustic Release

Control” software, and ready to be deployed underwater once you reach the deployment site.

If you are planning to deploy your ARC unit(s) for more than one month under the water, the release mechanism of ARC unit can be spray-painted with an anti-fouling paint to prevent bio-fouling build-up.

9. Noise Test at the Deployment Site

Once you reach your targeted deployment site, it is critical to conduct a “Noise Test”.

The purpose of the conducting a noise test is to adjust the sensitivity of the STM surface station in relation to a specific noise profile of the vessel you will be using to deploy your ARC unit(s). Please note that “Noise Test” is conducted for a specific vessel. In the event your vessel previously profiled for the noise levels undergoes modifications impacting the amount of noise it may produce, it is recommended to conduct a “Noise Test” again.

Your vessel itself, electrical equipment, and the mechanical machinery operated onboard your vessel are expected to be the most likely source of sound pollution in the open waters. Conducting the noise test will help you to adjust the sensitivity of the STM surface station to optimize the quality of communication link.

Common sources of noise include natural biological noises (snapping shrimp, etc...) as well as running engines of vessels operating at your deployment site. The noise test will show if the noise level is high enough to interfere with communications between ARC unit and STM surface station.

Excessively high noise levels may prevent the ARC unit from entering the “sleep” mode, causing the battery of ARC underwater unit to drain prematurely.

It is very unlikely, but if the noise levels prove to be high enough to render communication impossible, a different deployment site should be considered.

To reduce the noise level, survey your deployment site for a possible source of noise. Turn off the engines of the vessel as well as any on-board diesel power generators. Turn off high-energy lights, strobe-lights, and radar navigation systems. Depth sounders, “fish finders,” and similar devices have been identified as a common source of interference. Please make sure to turn off all electrical hardware for the duration of STM surface station communication with the ARC unit(s). If your STM

surface station is receiving power from an external power source onboard the vessel, unplug the STM surface station from vessel's power source and allow the STM surface station to operate on the internal built-in battery.

Look for other man-made noise sources under your control and eliminate as appropriate.

Follow these steps to conduct the noise test and adjust the STM surface station sensitivity as necessary. Adjusting the sensitivity by raising the signal “Threshold Level” will reduce the receiving range of a STM surface station.

STEP 1:

Place the STM surface station’s sonar transponder overboard the vessel. Make sure to submerge the sonar transponder at least to 6 feet or 2 meters depth.

Make sure the sonar transponder meets the optimum orientation of being pointed directly down. When the sonar transducer is pointed directly down, it will be able to “hear” incoming sonar signal within a 270 degrees angle (to be safe, assume 180 degree angle).

Consider attaching a weight to the protective cage of the sonar transducer in order to maintain it in position pointing directly down. To accomplish this, attach a weight on the opposite side of the communication cable on the metal cage surrounding the sonar transducer.

[PICTURE]

A vessel with a sonar transducer deployed overboard, shows 6 feet distance between surface and submerged transducer. Shows orientation of transducer pointed directly down and the weight attached to its cage.

STEP 2:

Using the PC connected to STM surface station, run the “Acoustic Release Control” software. Navigate to and click on the “Action” item of the main menu. You will be presented with expanded submenu. Locate and click on the item “Noise Test”. This will initiate a noise test procedure and you will be presented with a new “Noise Test Dialog” window.

[PICTURE]

A screenshot of Noise Test

STEP 3:

Once you are presented with a “Noise Test Dialog” window, you will be able to see a graph representing the noise level received by the sonar transducer underneath your vessel.

When the noise level at your deployment site is very low, the graphical representation of the noise level will show no noise signal at all.

When a noise signal exists, you will be able to see it in a form of a color coded bar.

The default setting for the sensitivity of a STM surface station is 120 db.

Even if no noise is detected, we recommend leaving the “Threshold Level” slider set to 120 db.

Your goal is to adjust the incoming signal strength so that the graphical representation of the noise level does not exceed 120 decibels (db) level marked on the scale as a red line crossing the signal bar at 120 db.

When you move the “Threshold Level”, you are changing the sensitivity of the STM surface station. Find the “Threshold” when the color of the signal is displayed as green, transitioning into a yellow at the red line of a 120 db.

STEP 4:

Once you found the optimal position of the slider, let go of the “Threshold Level” slider and click on a “End Test” button.

[PICTURE]

The screenshot of the “Threshold Level” adjusted to an ideal setting.

Once you have clicked the “End Test” button, STM surface station will hold this setting in it’s memory.

Be advised that adjusting the “Threshold Level” to the maximum setting (corresponding to a slider position all the way to the right) will limit the range your STM surface station is capable of “hearing” sonar signals. However, it will limit interference allowing the STM surface station to have a clear communication with the ARC unit(s).

If your deployment site has a very low underwater noise, adjusting the “Threshold Level” slider to a minimum setting (all the way to the left) will increase the operating range of your STM surface station.

This concludes the sonar noise level survey of your deployment site and STM unit tuning.

10. Deployment of the ARC Unit(s)

Before you are ready to submerge the column of equipment into the water and deploy your payload with the ARC unit(s) to the sea-floor, you must verify if the payload together with the flotation device do not create excessive amount of force to “overload” the release mechanism causing it to trigger erroneous release.

In order to choose an optimal configuration of the flotation device sufficient to bring the payload of particular weight to the surface, while not exceeding the maximum force the ARC unit able to “hold” under the water, consider the following recommendations:

The recommended flotation type of device to be used with ARC unit and attached payload is a trawl or hard float. We recommend to use floats similar to a “Trawl Works” float Model #411.

The flotation device must be rated for a depth **exceeding the deployment depth** by significant safety margin. The maximum depth of the ARC unit is a 300 meters and the flotation device should have rating of at least 500 meters.

It is recommended to use a flotation device rated at about 15 lbs of buoyancy, plus buoyancy equaling the weight of your payload in water. For example, if your payload weighs 10 lbs submerged, use 25 lbs of flotation.

The ARC submersible unit designed to operate with the working load not to exceed 40 lbs or 18 Kilograms. The working load is measured IN WATER.

In order to evaluate the working load underwater, follow these steps:

10.1 Workload Evaluation

STEP 1:

Depending on the physical dimensions of your payload, use an appropriately sized body of water. This can be a bucket, small pool, a bathtub or the ocean.

STEP 2:

Use a weight measuring scale designed to measure an object's weight by suspending it under the scale. A typical mechanical fish-scale is acceptable for this evaluation. Suspend your payload attached to the scale and submerge it under the water so that the payload is completely under the surface of water.

STEP 3:

Take a reading of the scale and write it down. This is the weight of your payload in water.

STEP 4:

Locate the buoyancy rating of the flotation device you are planning to use. Typically it is printed on the flotation device or specified in its technical description. This rating may be listed in Pounds or Kilograms. For example, the buoyancy rating of a "Trawl Works" float Model #411 is rated at 18.5 lbs.

Use this formula to calculate the total weight to be held by ARC unit:

$(\text{Buoyancy rating of flotation device}) - (\text{Payload weight in water}) = \text{Total working load on ARC release mechanism.}$

When calculating, make sure to keep measurement units consistent, meaning if the buoyancy of a flotation device is rated in pounds, the weight of the payload must be measured also in pounds. If a buoyancy of a flotation device is rated in kilograms, the weight of the payload also must be measured in kilograms.

Ideally the result should be around 10lbs to 20 lbs, however 40lbs (18 Kilograms) can be safely tolerated. If the result exceeds this criteria, reduce the flotation device's buoyancy.

When considering the physical shape of the payload/flotation device, please take into account strong underwater currents that could cause excessive drag. If the physical shape is suboptimal, a strong surge in underwater current may cause an erroneous separation of the ARC unit and payload from the anchor.

When choosing an anchor, ensure that anchor weight must always exceed buoyancy of the equipment column (ARC unit, payload, flotation device) you are planning to deploy by a sufficient margin in order to keep the anchor in place. Use an anchor weight at least twice the total buoyancy of deployed column. **If you plan to use a significantly heavy anchor, take special care during the deployment.** When the assembled column is deployed overboard, a jerking motion of the heavy anchor thrown overboard may cause an unintended separation from the ARC unit.

The best way to ensure release mechanism of ARC unit is NOT overloaded, is to not to exceed the maximum weight held by ARC unit of 40lbs or 18 Kilograms measured under water.

Follow these steps to test if the payload with the flotation device you have chosen will be held down securely by the ARC unit:

10.2 Equipment Column Buoyancy Test

You will temporarily use:

1. A cable or a rope to ensure your anchor does not sink during evaluation;
2. Another cable or rope to ensure the equipment column does not float away in case an unintentional release occurs

Begin by attaching all components you are planning to deploy together into a column.

STEP 1:

Attach an anchor to the cable loop “loaded” into the release assembly of ARC unit as described earlier in this manual.

STEP 2:

[PICTURE]

Attach a cable or a rope with one end to the vessel and the other end to the anchor directly. Make sure to attach the cable/rope to the anchor itself and NOT the body of the ARC unit. If an unintentional release occurs, you will use this cable/rope to retrieve the anchor back to the vessels deck.

STEP 3:

Use the mounting bracket of the ARC unit to bind the ARC unit, the payload you are deploying, and the flotation device together.

The mounting bracket is located on the opposite side of the release mechanism of the ARC unit and it is integrated in to end-cap sonar transducer of the ARC unit. In a typical application the ARC's sonar transducer and mounting bracket will be pointing up towards the surface of the body of water.

[PICTURE]

Attach the payload and flotation device to the mounting bracket. Make sure to leave about one to two feet (0.3 to 0.6 meters) of space between the mounting bracket of the ARC unit and the payload / flotation device.

Attaching the payload / flotation device less than one foot or 0.3 meters away from ARC unit's mounting bracket will greatly reduce the range the ARC unit will be able to send and receive acoustic sonar signal.

STEP 4:

Attach another additional cable or rope to the equipment column via the mounting bracket. Fasten the other side of this cable to your vessel to ensure that the equipment column does not float away after unintentional release.

STEP 5:

Pick up the assembled equipment column carefully. Make sure the cable or rope attached to the anchor has free slack to accommodate the necessary distance to reach overboard without ANY pressure between the board of the vessel and the anchor. Lower the equipment column overboard into the open water. Control the rope or cable attached to the the anchor and begin carefully letting go of the cable/rope allowing the anchor to descend down under the water.

STEP 6:

While the anchor, carefully controlled by you, is descending down, the release mechanism of the ARC unit begins to experience pressure created by total sum of the water displacement force of a body of the ARC unit, the payload and the flotation device pulling up.

Continue descending the anchor down under the water until the equipment assembled into the column positions itself into a more or less vertical orientation.

When the equipment column is in the vertical orientation with the anchor down towards the seafloor and the flotation device now submerged under the water right at the surface, halt the descent of the anchor controlled by the rope/cable.

STEP 7:

This is a time to evaluate the situation.

When the weight of the payload and the size of a flotation device is adequate, the ARC unit release mechanism will hold the entire column under the water securely.

If they are inadequate, causing excessive force on a release mechanism, the nickel-chromium release cable will break, resulting in an unintended separation of the equipment column from the anchor.

If an unintended release occurs, the cable/rope you attached to the vessel from the equipment column via the mounting bracket will prevent the equipment from drifting away. Use the other cable/rope to retrieve the anchor back onto the vessel's deck.

Consider adjustment to the type flotation device and/or weight-size of the payload in order to reduce the force on the release mechanism.

Once adjustments are made, please re-test the equipment column by using the method above.

If the column is submerged so that the flotation device shows just below the surface of water, the release mechanism is withstanding the buoyancy force and securely holding the column pulled under the water, then your evaluation is done and the ARC station can be deployed in its current configuration.

STEP 8:

Slowly pull the anchor by the cable/rope back to the vessel's deck. Detach the safety cable/rope you used to control the anchor's descent. Detach the safety cable/rope you used to secure the equipment column.

10.3 Equipment Column Checklist

The following criteria must be met before you can continue!

- The ARC unit(s) have a set of a fresh batteries installed
- STM surface station is properly connected to a Personal Computer and the “Acoustic Release Control” software is already running
- Communication test between ARC unit and STM surface station was performed successfully
- The particular ARC unit you are about to deploy is registered in “Acoustic Release Control” software
- Battery charge levels are verified
- Noise survey test of the deployment site is conducted and the STM surface station noise “Threshold Level” is set for this particular site
- The Serial Number of the ARC unit(s) is written down
- Your own identifying marks have been implemented

If all the above steps are completed, only then execute the deployment procedure.

10.4 ARC Unit Deployment Procedure

STEP 1:

Slowly submerge the entire equipment column (**without safety cables/ropes attached**) under the surface of water and only then let go of it, allowing the ARC unit with the payload and flotation device to descend to the sea-floor. To ensure minimal stress on the release mechanism of the ARC unit, please slowly descend the anchor & ARC unit at the same time, if possible. By preventing the full weight of the anchor from being applied to the release mechanism in air you decrease the chance of a unintentional release.

DO NOT *throw* the anchor along with the rest of the column overboard. Forceful entry to the water may cause unintended separation of the anchor and the ARC unit.

STEP 2:

While the equipment column is sinking, utilize the “Acoustic Release Control” software to locate the unique serial number of the ARC unit you just deployed, place the mouse cursor over the record in the list of ARC units and single-click to highlight the row containing the serial number of the ARC unit. Once the correct ARC unit is selected/highlighted, click on “Deploy Station” button. This action will update the current GPS coordinated in the data record for this particular ARC unit. The “Acoustic Release Control” software will retain the recorded GPS coordinates so that you can locate the precise deployment site when you wish to retrieve the ARC unit.

If the unit is not already on your list, you may need to click the “Deploy Station” button in order to add the unit to the list.

If you do not have a GPS unit connected to the STM surface station, utilize any other stand alone GPS unit to obtain the GPS coordinates of the deployed ARC station. Make sure to keep a record of GPS coordinates and corresponding ARC unit serial numbers in a safe and secure place. **If you do not retain GPS coordinates of the deployed ARC unit, it will not be possible to locate a precise deployment site for the ARC unit retrieval!**

STEP 3:

Once enough time has passed from when you deployed the ARC unit and equipment column underwater, *and* you are certain that the ARC unit has now reached its destination, you should check the distance reading reported by the ARC unit back to the surface. To do so, use the personal computer and “Acoustic Release Control” software to look at the list of ARC units listed and locate the ARC unit you just deployed. Navigate the cursor over its record and double click on the record in

the list. This will send a status request from STM surface station to the ARC unit under the water. ARC unit in turn will respond with distance reading and battery charge levels. This information will be displayed in the lower portion of the “Acoustic Release Control” software window, under “Range” and “Current Status” fields.

This is also the time to verify your GPS record belonging to the ARC unit. Make sure that the GPS coordinates in the “Latitude/Longitude” field are in fact valid.

Even though the “Acoustic Release Control” software will retain the GPS coordinates of the deployed ARC units, we strongly recommend keeping a separate record with the Serial Number of the each ARC unit and corresponding set of GPS coordinates. Make sure that the second manual record kept separately from the software is in a secure location. In case of a theft, unforeseen hardware failure of PC, and/or data corruption, the second manual record of Serial Numbers with GPS coordinates will be your ONLY chance to locate and retrieve ARC units with their payload.

This concludes the deployment procedure. The ARC unit is now resting underwater.

11. ARC Unit Retrieval Procedure

When it is time to retrieve the payload you deployed underwater with the ARC unit, follow these steps to release the ARC unit from its anchor.

STEP 1

Navigate to the GPS coordinates of the particular ARC unit you wish to retrieve. Once you are at the location where the ARC unit was deployed, place the STM surface station’s sonar transponder overboard your vessel. Make sure to submerge the sonar transponder at least to 6 feet or 2 meters depth.

Make sure sonar transponder meets the optimum orientation: pointing directly down under the vessel. The over-the-board sonar transducer, supplied with your STM surface station, has a directional range of a 180 degrees. When the sonar transducer pointed directly down, it will be able to “hear” the incoming sonar signal from underneath it within a 180 degrees angle. Consider attaching a small weight to the protective cage of the sonar transducer, opposite the communication cable, in order to maintain its orientation pointing directly down.

[PICTURE]

A vessel with a sonar transducer deployed overboard, show 6 feet distance between surface and submerged transducer. Show orientation of transducer pointed directly down and the weight attached to its cage.

STEP 2

Using the PC connected to STM surface station, run the “Acoustic Release Control” software.

STEP 3

Locate the ARC unit you wish to retrieve on the list of deployed ARC units. Once you have visually looked through the list and located the ARC unit, double-click on it. This will cause the STM surface station to send a search and “awake” command to the underwater ARC unit.

Direct your attention to the “Current Status” field at the bottom right corner of the “Acoustic Release Control” software window.

The status field will display: “Activating: (Serial Number of the ARC unit)... Sending ID Packet #1.”

SN	Latitude/Longitude	Comment	Time/Date	Range	%
4136	No GPS Data	note comments test	13:37:05 01/14...	0.000	100.0

Deploy Station

Release

Current GPS Location
Latitude/Longitude
No GPS Data

Active Station Data
Range (meters)
0.000 m

Current Status
Activating : 4136... Sending ID Packet #1.

Once the ARC unit “hears” the sonar signal sent from the surface by the STM surface station, it will exit the “sleep” mode, shift into an active state, process the command it received, and send back a response confirming the activation.

Continue to watch the “Current Status” field. After a brief pause, the “Current Status” will change from “Activating...” to “Station Activated”.

A status of “Station Activated” means that the ARC unit successfully “heard” the commands, was able to interpret the signal, and exited the “sleep” mode.

SN	Latitude/Longitude	Comment	Time/Date	Range	%
4136	No GPS Data	note comments test	13:37:05 01/14...	0.000	100.0

Deploy Station

Release

Current GPS Location
Latitude/Longitude
No GPS Data

Active Station Data
Range (meters)
0.000 m

Current Status
Station Activated

As a confirmation, the ARC unit will respond back to the STM surface station with current diagnostic data. This data will be displayed in the “Current Status” field and will replace the “Station Activated” message with current battery charge levels. The “Range” field also will get updated and the distance from the STM surface station’s transponder and the ARC unit will be displayed.

Acoustic Release Control

File Action Options About

Deployed Station Data

SN	Latitude/Longitude	Comment	Time/Date	Range	%
4136	No GPS Data	note comments test	13:37:05 01/14...	0.000	100.0

< >

Deploy Station Release

Current GPS Location
Latitude/Longitude
No GPS Data

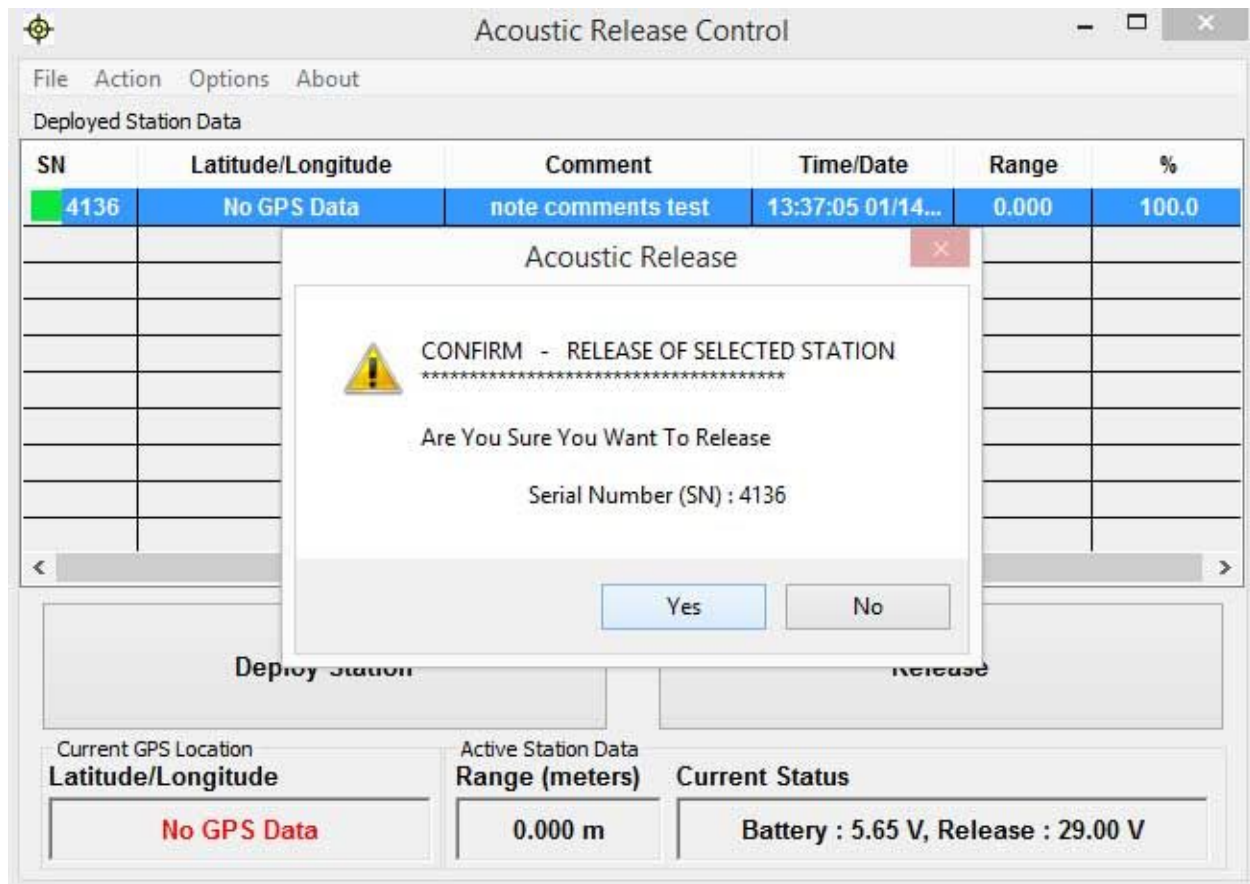
Active Station Data
Range (meters)
0.000 m

Current Status
Battery : 5.65 V, Release : 28.60 V

At this point you have established a communication line with your ARC unit deployed under the water.

STEP 4

If you wish to release the ARC unit with its payload from the anchor, click on the “Release” button. A confirmation window will be presented. Please pay close attention to the message in the window. It will display the Serial Number of the ARC unit you are about to release from its anchor. **Please double-check if this is in fact the ARC unit you wish to release to the surface.** Once you have confirmed the identity of the ARC unit you are about to bring up to the surface, go ahead and click the “YES” button to initiate the release sequence.



The confirmation window will disappear. Now direct your attention to the “Current Status” field. It will display: “Arming Station For Release. Please Wait.” Shortly thereafter this messages will be updated with: “Station Armed. Triggering Release”.




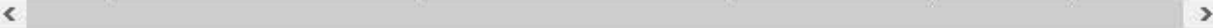
Acoustic Release Control



File Action Options About

Deployed Station Data

SN	Latitude/Longitude	Comment	Time/Date	Range	%
 4136	No GPS Data	note comments test	13:37:05 01/14...	0.000	100.0



Deploy Station

Release

Current GPS Location

Latitude/Longitude

No GPS Data


Active Station Data

Range (meters)

0.000 m


Current Status

Arming Station For Release. Please Wait.


Acoustic Release Control
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Deployed Station Data

SN	Latitude/Longitude	Comment	Time/Date	Range	%
 4136	No GPS Data	note comments test	13:37:05 01/14...	0.000	100.0

Deploy Station

Release

Current GPS Location

Latitude/Longitude

No GPS Data

Active Station Data


Range (meters)

0.000 m

Current Status


Station Armed. Triggering Release

The status field will finally display the message: “Station Release Command Acknowledged.” This means the ARC unit triggered its release mechanism and therefore should separate from the anchor and be on its way to the surface.


Acoustic Release Control
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File Action Options About

Deployed Station Data

SN	Latitude/Longitude	Comment	Time/Date	Range	%
 4136	No GPS Data	note comments test	13:39:29 01/14...	0.000	100.0

Deploy Station

Release

Current GPS Location

Latitude/Longitude

No GPS Data

Active Station Data

Range (meters)

0.000 m

Current Status

Station Release Command Acknowledged.

Monitor the “Range” field: the range should be rapidly decreasing indicating that ARC unit separated from anchor successfully and raising to the surface.

Acoustic Release Control

File Action Options About

Deployed Station Data

SN	Latitude/Longitude	Comment	Time/Date	Range	%
4136	No GPS Data	note comments test	13:39:29 01/14...	0.000	90.0

Deploy Station Release

Current GPS Location Latitude/Longitude: No GPS Data

Active Station Data Range (meters): 0.000 m

Current Status: Battery : 5.55 V, Release : 1.80 V

Monitor open waters around your vessel for signs of the [floatation device](#) attached to the ARC unit with its payload.

This concludes the retrieval procedure of an ARC unit.

12. ARC-1XD Technical Specifications

Summary

- 2.25" Diameter housing, approx. 21.5" long.
- Buoyancy: slightly negative.
- Capable of supporting a payload of 40 pounds (2X safety factor).
- Depth rating: 1000 feet.
- Powered by standard alkaline batteries.
- Battery life: 6 months (2X safety factor).
- Housed in serviceable Delrin and Noryl plastic housing with stainless steel release hardware.
- Transponder functions support ranging to the units.
- Station firmware can be upgraded through download, to support new functions.

- Standard Desert Star surface stations can be used as interrogators.

Load Ratings

Design strength of components (other than release wire): 200 lb

Factory acceptance load test (with 26AWG wire): 80 lb

Recommended pre-deployment load test: 50 lb

Rated maximum load: 40 lb

Recommended nominal load: 15 lb

Rated minimum load: 10 lb

Release Wire

The ARC-1 is specified for use with the following release wire only.

Material: Nickel Chromium Alloy (60% nickel, 16% chromium, 24% iron)

Gauge: 26 AWG

Supplier: McMaster-Carr Part #8880K24 (1/4 lb spool)

Desert Star Part #WIR00332

O-Ring Specifications

End caps: Parker 2-130, Compound E515 (qty 2).

Desert Star Part #ORI00058

Support Posts: Parker 2-010, Compound E515 (qty 2).

Desert Star Part #ORI00053

Battery Specification

Release and sonar transmitter battery: Four Duracell Model MN-1500 'AA' alkaline cells

Nominal battery life: 520 days

Microprocessor battery: Four rechargeable eneloop batteries

Nominal battery life: 630 days

- Note 1: Under laboratory conditions, assuming power consumption at maximum limit for factory acceptance testing (0.8 mA for microprocessor in sleep mode, less than 0.05 mA for sonar/release section in sleep mode).
- Note 2: We recommend putting a safety margin in for the battery life. A very conservative approach would be half of the expected life time of the battery. You should also take the environment into consideration; you have a better chance of draining the battery in a very noisy harbor then you would in an open ocean.