



ARM-2 & ARM-V Acoustic Release Modules



**Technical and Operator's Manual
1st Edition, December 2000**

Desert Star Systems LLC, 761 Neeson Rd. #9, Marina, CA 93933

(831) 384-8000 (831) 384-8062 fax www.desertstar.com

Table Of Contents

1. INTRODUCTION	4
2. CONNECTORS & PRESSURE COMPENSATOR	5
3. INSTALLATING THE RELEASE MODULE	5
4. ARMING THE RELEASE MODULE	6
5. TRIGGERING THE RELEASE MODULE	8
7. INSTRUMENT RECOVERY	9
8. TECHNICAL SPECIFICATIONS	10

1. Introduction

The ARM-2 and ARM-V acoustic release modules are designed for the automatic retrieval of baseline transponders and other instrumentation from the sea floor.

The ARM-2 mechanism is compatible with the RBS-2 baseline station. The ARM-V mechanism is designed for use with VISION series instruments, such as the Omnidirectional Acoustic Data Recorder (OADR).

The modules are self-contained, and are attached to their host instruments by support rods and short cable(s). They are pressure compensated, and rated at full ocean depth. The mechanism is based on a cam rotating to free a lever. An anchor weight is dropped, allowing the instrument to return to the surface.

While the ARM-2 contains a single release mechanism, the ARM-V houses two independent mechanisms. The trigger of either of these mechanisms will drop the anchor, providing an additional margin of safety.



ARM-2 Release Module For RBS-2 Station

Upon receipt of your release module, please verify that you have received these components.

ARM-2 Component Shipping List

- | | |
|------|--|
| 1 ea | Acoustic Release Module, part # ARM-2 |
| 1 ea | Trigger cable, part # CBL00001 |
| 8 ea | Threaded rods, 2.5" long, 3/8-16 SS, part # HDW00349 |
| 4 ea | Coupling nuts, 3/8-16 SS, part # HDW00350 |
| 8 ea | Locking nuts, 3/8-16 SS, part # HDW00351 |
| 1 ea | This manual |

ARM-V Component Shipping List

1 ea	Acoustic Release Module, part # ARM-V
2 ea	Trigger cable, part # CBL00000
4 ea	Connecting rods
16 ea	Mounting screws, ½" long, 10-24 SS, part # HDW00342
1 ea	This manual

2. Connectors & Pressure Compensator

The ARM-2 is equipped with one connector and one pressure compensator. The ARM-V contains two independent compartments and mechanisms, and is thus equipped with two compensators and two connectors.

The compensator of the modules serves to equalize the internal pressure with the pressure of the surrounding sea. The lack of differential pressure means that the release can be operated to full ocean depth.

The module is filled with a silicone fluid, GE Silicones part # SF96-50. This inert fluid is coupled through the compensator membrane to the surrounding sea water. Under normal conditions, the membrane should have a 'wrinkled' appearance, being neither moved fully in nor fully out. As the fluid contracts or expands with temperature changes, the membrane will move in or out.

The connector(s) on the ARM housing are used to trigger the release mechanism. In the case of the ARM-2, the connector must be linked to the RBS-2 multi-function connector using the CBL00001 trigger cable. The ARM-V uses two trigger cables, part # CBL00000 to link to the two matching connectors on the VISION instrument.

The connector specification and pin assignment is as follows.

Bulkhead Connector:	Subconn MCBH2F (main) MCBH2M (pod)
Cable Connector:	Subconn MCIL2M (main) MCIL2F (pod)

Pin	Signal
1	Release Trigger (switched to ground)
2	30 V Supply Voltage

3. Installing the Release Module

ARM-2 and ARM-V modules are normally connected to the host instrument by the factory. If you purchased the release module as an upgrade to an instrument already in your possession, follow these simple installation instructions.

- **ARM-2:** Remove the cage ring and post from the connector end-cap of the RBS-2. Thread one of the supplied rods into each of the post-holes on the RBS-2 end-cap and the ARM-2 end-cap. Thread a locking nut onto each of the rods. Thread one coupling nut onto the rods of either the RBS-2 or the ARM-2. Align the RBS-2 rods with the ARM-2 rods, and thread the coupling nut

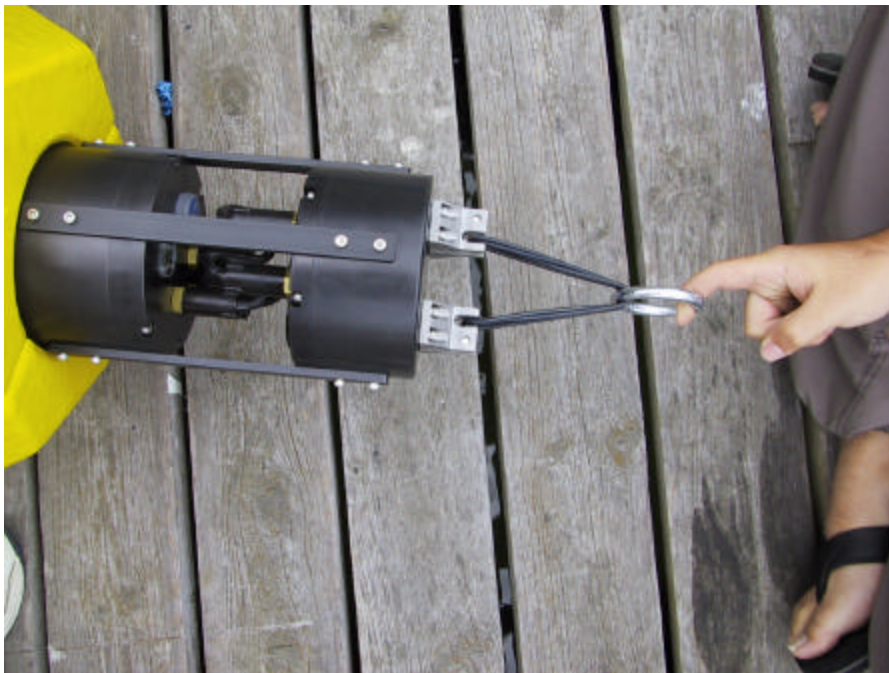
about half-way over the junction. Secure the coupling nut with the locking nut from both sides. Install and secure the trigger cable.

- **ARM-V:** Screw the four rods supplied with the module onto the side of the module, using two screws for each rod. Align the module with the VISION instrument such that the mounting holes in the rods match up with the holes on the VISION instrument, and the two connectors on the ARM-V are opposite (not aligned) with the matching connectors on the vision instrument. Install and secure both trigger cables on both ends.

4. Arming the Release Module

Arming the release mechanism involves securing an anchor weight to the module. The anchor weight must be sufficient to offset the flotation of the instrument. Heavier weights can be used to minimize drift of the instrument during descent and ascent, and to prevent movement on the sea floor due to surge.

The release mechanism operates by rotating a cam, which allows a lever to swing past. The barrier across a fork thus swings open, allowing a line to be released.



The Trigger Of Either Mechanism Of The ARM-V Will Release The Anchor

For the ARM-V, rig the release by running a loop through both mechanisms, and securing the anchor via a stainless steel ring (see picture). The objective is to ensure that the anchor will be dropped if either of the two mechanisms triggers.

The ARM-2 should be rigged such that a short flexible line connects the mechanism to the anchor line itself.

Closing the fork of the mechanism requires moving the cam to the open position so the lever can swing past. Do this by inserting a small screwdriver into the notch provided for this purpose on one side of the cam. You can also rotate the cam by pushing the screwdriver against the flat surface of the cam.

Here are a few more pointers:

- Check the pressure compensator (rubber membrane) before deployment. The compensator ensures that the mechanism will see no differential pressure. It will only work if the inside of the instrument is filled with oil. Under normal conditions, the membrane should neither stick all the way out, nor be able to be pressed in all the way or even most of the way (it should nominally be slightly in to slightly out). Press against the membrane with your finger but never with a sharp object or fingernail. If the oil level is low, the mechanism must be inspected and the oil needs to be topped off. Some loss of oil may be normal due to seepage past the dynamic O-ring of the shaft seal, however it may also indicate a problem (at the time of this writing, the mechanism was a new design – so no specific field data is available yet). We recommend you return the mechanism for service to Desert Star Systems. If that is not practical, use GE Silicone SF96-50 or a similar low-viscosity silicone fluid to top off the mechanism. Check carefully that no air bubbles remain.
- Use a short, smooth loop to run through the mechanism. Make sure there are no knots that could get jammed, preventing effective release. A strong O-ring does an excellent job, also providing shock absorption to prevent peak loads during deployment.
- Keep the anchor assembly short enough to prevent the instrument from getting caught in the anchor line itself. Yet, be aware that the sea floor is often very soft and a weight may sink deeply into the ground, dragging the instrument behind. The instrument may become stuck in the mud, or the mechanism jammed. We think that three feet of line may be about right.
- Round lead weights known as ‘salmon weights’ by fisherman make for excellent anchors. Try using a 30 lb or 50 lb weight.
- Don’t use polypropylene line. This yellow line is lighter than water, floats up and may get caught around the instrument.
- Any mechanism can fail. While the ARM-V has two redundant mechanisms, that still cannot ensure 100% reliability. We recommend the use of a galvanic release (corrosion wire) between the release module and the anchor weight as an additional safety.

5. Triggering the Release Module

Triggering of the release modules is controlled by electronic circuitry in the host instrument. Both timed triggers and triggers through acoustic commands from the surface are supported.

If you are operating a VISION series instrument, such as the OADR, refer to that instrument's Operator's Manual for details. Below is a description of the operation of the ARM-2 when mated to a RBS-2 transponder serving either as a baseline station or a mobile station.

To operate the ARM-2, your system must be equipped with this software:

- SmartDive V1.85 or later must run on the RBS-2 transponder and the STM surface station.
- DiveBase V1.93 or later must run on the surface station PC. You must run DiveBase Level 2. Release trigger is not supported in DiveBase-R and DiveBase Level 1.

Further, the RBS-2 station configuration must have the 'Release Mechanism' option set, to indicate that the instrument is now equipped with a release module. You can check this by connecting the transponder to DiveTerm, establishing a link and clicking on **Advanced->Display Station Data**. If not set, you must use a special 'factory' version of DiveTerm to enable this feature by clicking on **Advanced->Set Station Data**. Please contact Desert Star Systems for support.

Once enabled, the release mechanism will be triggered under two conditions:

- When one hour has passed since manual station activation and no **Mission Activate** command has been received. This time-out feature is a deployment abort safety function, in case the instrument has landed in a spot where communication with the surface is not possible.
- When a **Mission Abort** command has been received. This is the normal method to recover an instrument at the end of a mission.

The surface station issues the **Mission Activate** and **Mission Abort** command. The commands are actually special interrogate codes, similar to those used for normal mobile station interrogation by a surface station. Specifically, **Mission Activate** is the code for mobile station #10, and **Mission Abort** the code for station #11.

To enable you to issue these interrogate commands, you must define the existence of 11 mobile stations in the configuration file. Further, we recommend that you name station #10 **Activate** and station #11 **Abort**. This is done in the configuration file as well.

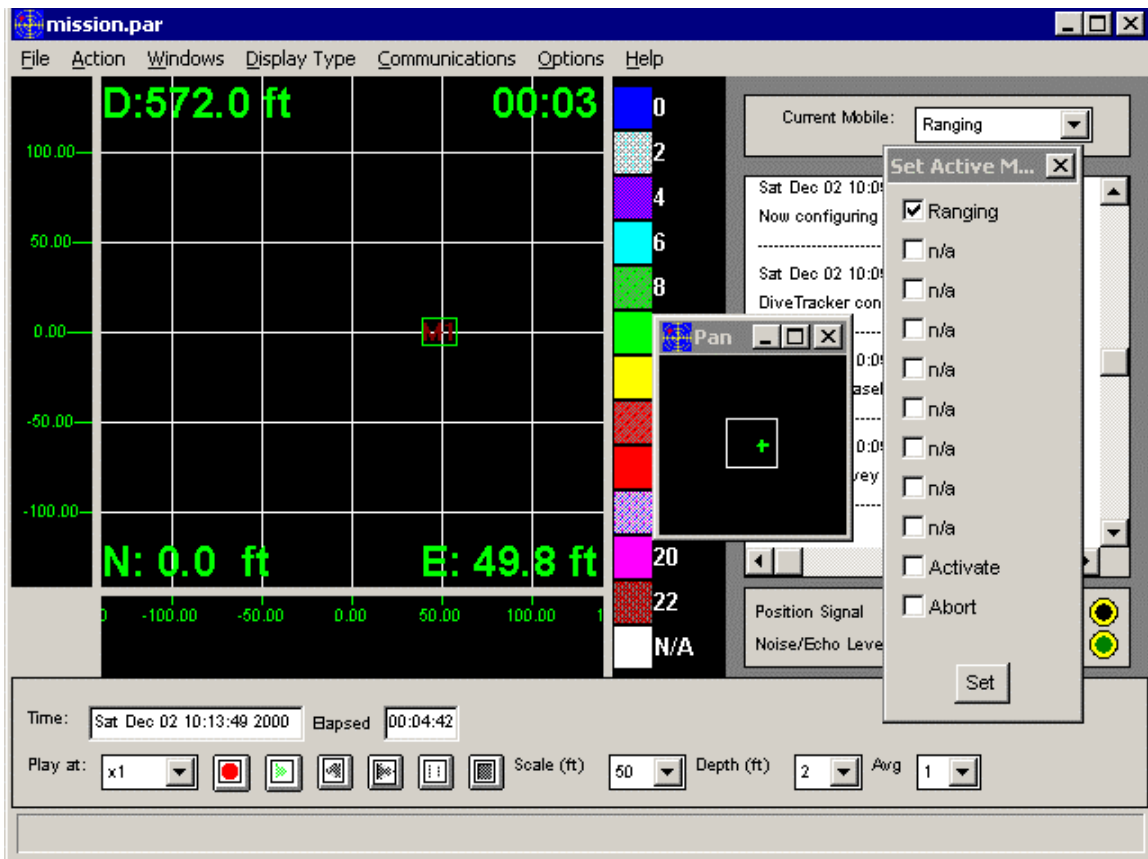
To issue a command, DiveBase must be in tracking mode. Then, click on **Communications->Select Active Mobile Station**. A list as shown in the screen dump below will appear. To issue a specific command, set the check mark on that command only, then hit the **Set** button.

The command will now be transmitted repeatedly by the surface station. The RBS-2 will accept a command after four consecutive receipts. If the command is **Mission Abort**, the RBS-2 will trigger the mechanism ten times. If more **Mission Abort** commands are received, more trigger events will follow.

We recommend leaving a command active for about two minutes, to give the RBS-2 plenty of chances for four consecutive receipts.

In summary, the mission procedure should be as follows:

- Activate the RBS-2 shortly before deployment.
- Follow the RBS-2 on the way to the sea floor by using regular interrogates (no check mark set in the Mobile Station list). Click on **Windows->System Status Window**. The system status window will indicate the distance to each RBS-2. *Note: The STM-10 will not interrogate in AquaMap modes if there is no successful baseline survey. Define a configuration file specifically for baseline deployment and recovery with non-zero baseline survey data. The system will accept this survey data without an actual baseline survey, and start interrogating.*
- After the baseline station(s) have settled, issue the **Mission Activate** command for about two minutes.
- Now, proceed with your regular survey, i.e. a baseline survey followed by standard tracking for AquaMap configurations.
- When you are ready to recover the baseline stations, issue the **Mission Abort** command for about two minutes.



DiveBase Screen With Command Selection List

7. Instrument Recovery

For deployment depths in excess of about 300 to 1000 meters (depending on conditions), we recommend to outfit the instrument with a strobe and RF beacon. These markers will aid in locating

the instrument once it is drifting on the surface. Suitable markers are available from Novatech Designs, Ltd. in Canada. See their web page at www.novatechdesigns.com for details.

8. Technical Specifications

Host Instrument (ARM-2):	RBS-2 baseline transponder
Host Instrument (ARM-V):	VISION series instruments such as OADR
Size (ARM-2):	140 mm L x 127 mm D incl. mechanism and connector
Size (ARM-V):	140 mm L x 152 mm D incl. mechanism and connector
Weight (ARM-2):	2500 g (in air) / 1300 g (in water)
Weight (ARM-V):	3300 g (in air) / 1700 g (in water)
Depth Rating:	unlimited
Operating Temperature:	0-40 degrees Celsius
Storage Temperature:	-20 to 40 degrees Celsius
Release Mechanism:	Two independent mechanisms on ARM-V, one mechanism on ARM-2
Release Method:	Solenoid driven rotating cam frees lever, which opens barrier across a 'fork'
Pressure Comp.:	Chamber filled with GE #SF96-50 silicone fluid, membrane pressure compensator
Max. Design Load:	15 kg per mechanism (30 kg total for ARM-V)
Breakage Threshold:	100 kg
Mechanism Control:	Controlled by circuitry in host instrument