AMAR G3 User Guide

Autonomous Multichannel Acoustic Recorder G3
User Manual and Technical Information

AMARlink 1.2

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JASCO APPLIED SCIENCES

Contents

About this Guide

Thank you for purchasing an Autonomous Multichannel Acoustic Recorder (AMAR) manufactured by JASCO Applied Sciences.

This guide instructs how to use the AMAR with the Comms Box and with AMARlink, the software application that accompanies the AMAR.

✓ **TIP** Please read this guide before using the AMAR. The AMAR is a complex and sophisticated instrument.

If you have suggestions for how to improve this user guide, please email Editorial-Team@jasco.com. JASCO is committed to continually improving the usability of its products and documentation. Your feedback is much appreciated.

Customer support

If you have questions about the AMAR or feedback about the AMAR, contact your JASCO customer representative or contact the JASCO head office:

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202–32 Troop Avenue
Dartmouth, NS B3B 1Z1
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Conventions used in this Guide

This Guide provides step-by-step instructions and, where applicable, the expected result. For example:

1 This is the first instruction.

This is the expected result of the first instruction.

2 This is the second instruction.

Screenshots or images appear beside the instruction to which they apply.

NOTE Notes give you extra information or clarification.

TIP Tips give you suggested actions for best performance or results.

CAUTION Cautions give you necessary information to prevent data loss, data corruption, or performance issues.

WARNING Warnings alert you to crucial information to prevent personal injury or damage to equipment.

References to other sections of this Guide are blue: Conventions used in this Guide on page iv.

AMARlink commands, buttons, and menu items are bold: **File** > **New AMAR**.

Filenames are shown in a different font: `putty.exe`.

For instructions with a command line, the text that you should type at the prompt is shown on a separate line with no punctuation:

```
cd /
```

Memory capacity is stated in mebibytes (MiB) and Gibibytes (GiB). These are equal to the binary definitions of the megabyte (MB) and gigabyte (GB), respectively: 1 MiB = 1024^2 bytes and 1 GiB = 1024^3 bytes.

1. Getting started

Chapter contents

This chapter describes basic information about the AMAR and instructs how to do basic operations with the AMAR:

Minimum system requirements

The minimum system requirements for the computer you use with AMARlink and the AMAR are:

- Operating system (Windows)
  - Windows 7, Service Pack 1
  - Oracle Java 6, build 21 or a higher build of Java 6 (e.g., Java 1.6.0_26)
- Operating system (Unix/Linux)—AMARlink has been tested with:
  - Ubuntu 10.04 with sun-java6-jre build 24, and
  - Ubuntu 12.04 with sun-java-6 build 35
- PATH system variable includes the path to `java.exe` and `javaw.exe`
- Core 2 Duo or Athlon X2 at 2.4 GHz
- 4 GiB RAM (2 GiB per CPU core recommended)
- 48 GiB hard disk space
- 100BASE-T Ethernet Interface
- External Storage Interface (e.g., USB 2+, Firewire, Ethernet)
- Sufficient external storage for recorded data.

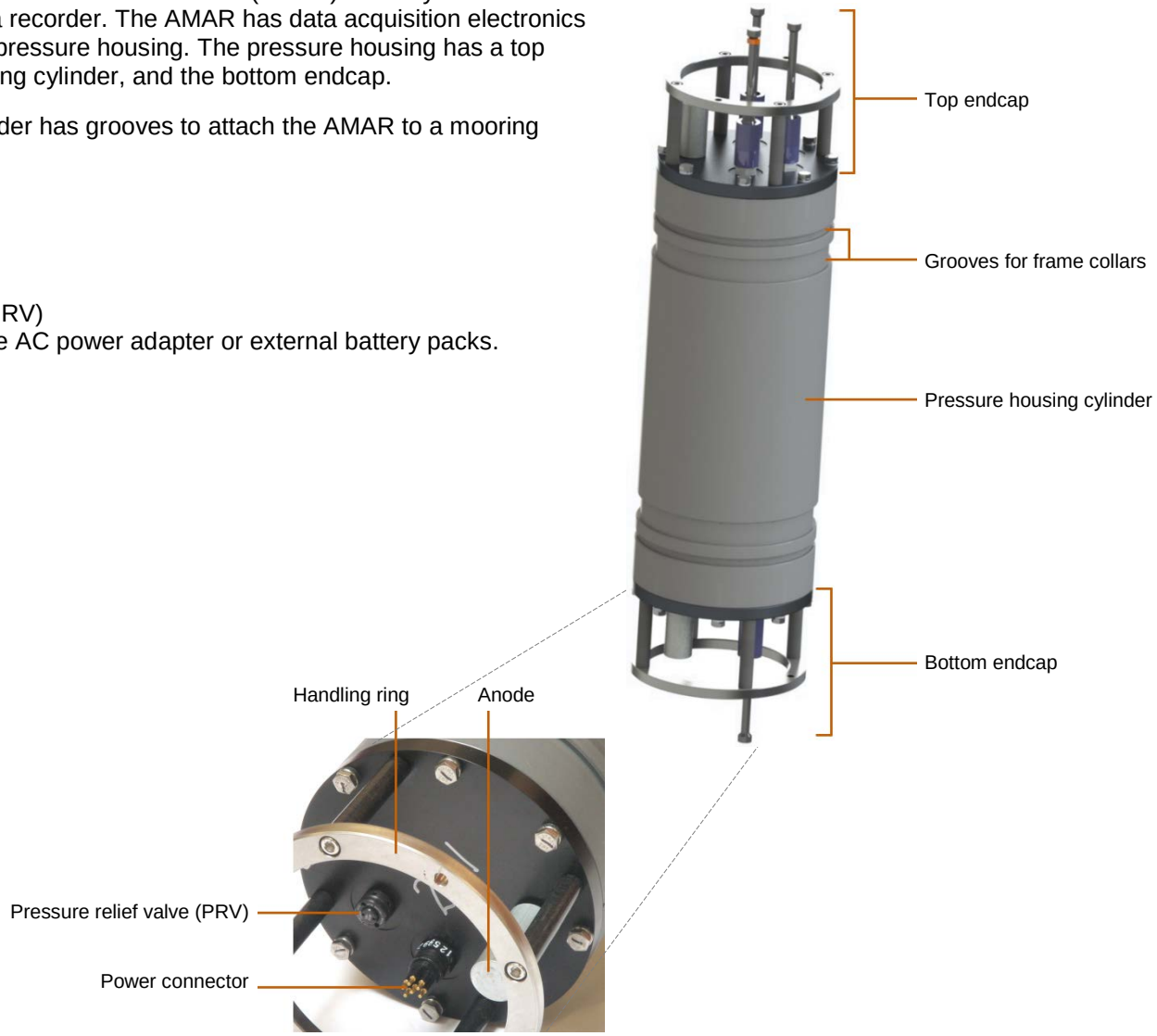
AMAR G3 overview

The Autonomous Multichannel Acoustic Recorder (AMAR) is a fully autonomous underwater sound and data recorder. The AMAR has data acquisition electronics housed within a watertight pressure housing. The pressure housing has a top endcap, the pressure housing cylinder, and the bottom endcap.

The pressure housing cylinder has grooves to attach the AMAR to a mooring frame.

The bottom endcap has:

- Handling ring
- Anode
- Pressure relief valve (PRV)
- Power connector for the AC power adapter or external battery packs.



About the top endcap assembly

The top endcap assembly of the AMAR has the top endcap of the pressure housing and a chassis. The chassis holds the AMAR circuit board and associated wiring on one side and a 9-cell battery pack on the other (not shown).

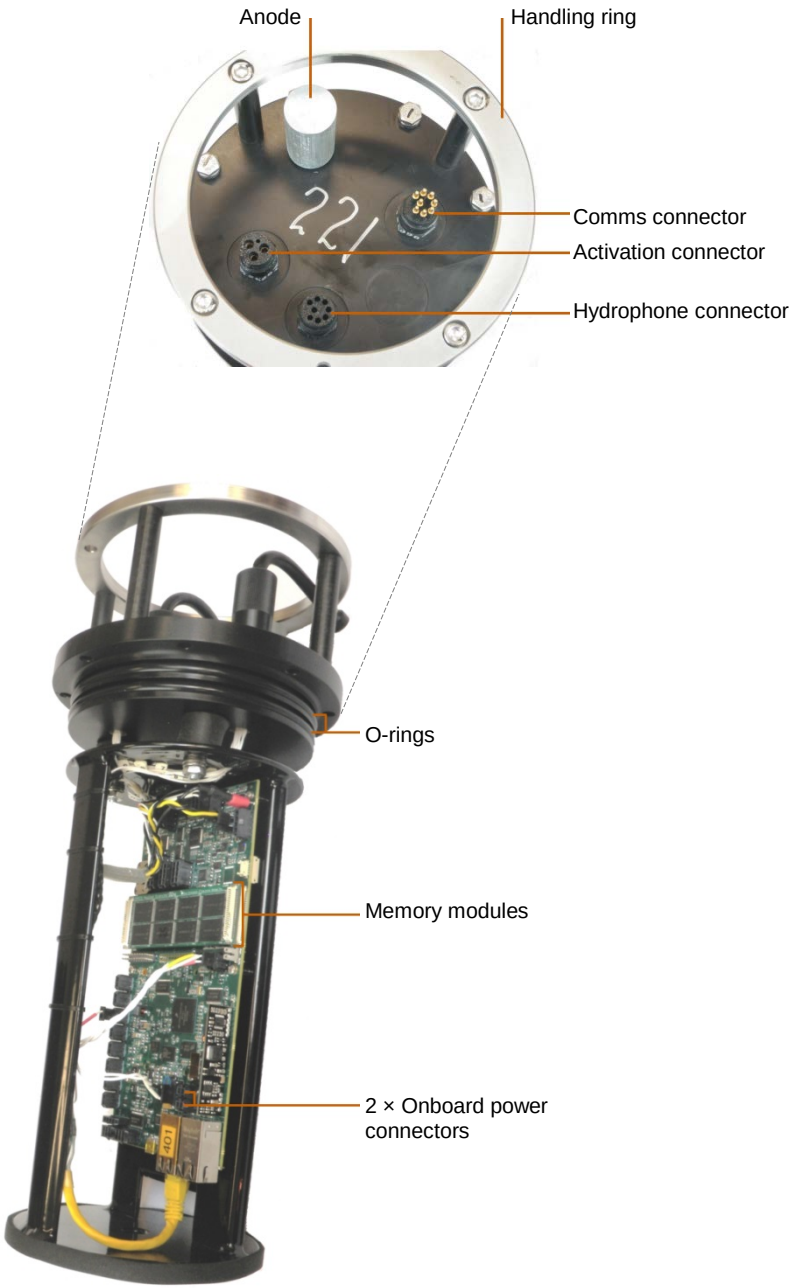
The top endcap has:

- 2 O-rings that form the watertight seal
- Anode
- Handling ring
- Connector for the Comms Box, 8-pin male
- Connector for the Activation Plug, 3-pin female
- Connector for the hydrophone, (usually) 8-pin female
- *Optional* connectors for other sensors (not shown).

The internal circuit board of the AMAR has two identical onboard power connectors to connect to the 9-cell battery pack and to the wire inside the AMAR pressure housing from the power connector on the bottom endcap.

About the memory modules

The internal circuit board has 1 or more memory modules. The memory modules store the recorded data on solid-state NAND flash memory. Memory modules have a capacity of 256 GiB. Up to 7 memory modules can be installed on the AMAR circuit board for a maximum capacity of 1792 GiB (or 1.75 TiB) of storage memory.



About the Activation Plug

The red-banded plug is the Activation Plug. The Activation Plug is the on/off switch of the AMAR. This Plug connects to the matching connector (called the Activation connector) on the AMAR top endcap. When connected to the AMAR, the Activation Plug turns on the AMAR. The Plug is a 3-pin male plug.

For related information, see:

- Turning on the AMAR on page 8
- Turning off the AMAR on page 11.

About the dummy plugs

The green-banded dummy plug protects the Activation connector on the top endcap when the Activation Plug is disconnected. Like the Activation Plug, this dummy plug is a 3-pin male plug.

The yellow-banded dummy plug protects the Comms connector when the Comms Box is disconnected and when the AMAR is being deployed. Like the Comms Box, this plug dummy is an 8-pin female plug.

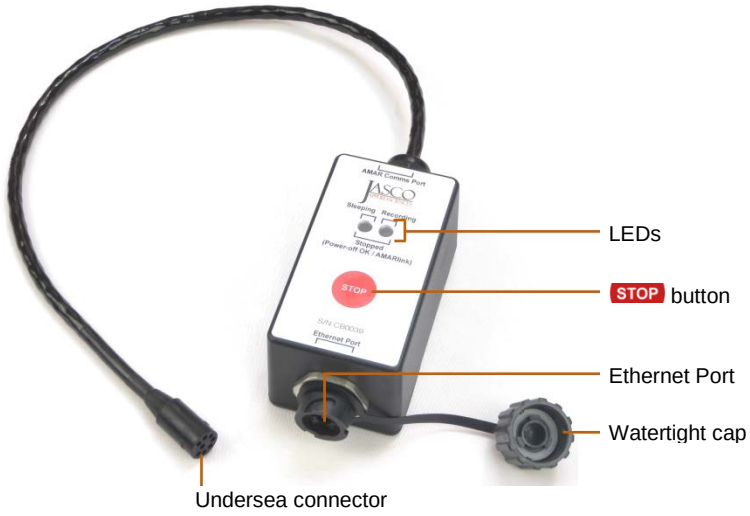
Each dummy plug connects to only one connector on the top endcap.

The dummy plug without a band protects the power connector when the AC power adapter or external battery packs are disconnected. This dummy plug is a 6-pin female plug.

About the Comms Box

The Comms Box has an undersea connector, an Ethernet Port with a watertight cap, 2 LEDs and a STOP button. The undersea connector connects to the matching connector (called the Comms connector) on the AMAR top endcap. The Ethernet Port connects to your computer with an Ethernet cable. The LEDs come on to indicate the status of the AMAR. The STOP button, when pressed and held for 2 seconds, stops the Recording Schedule.

The Comms Box has a watertight cap for the Ethernet Port. When the Ethernet Port is not in use, always close the watertight cap. Before closing the cap, make sure the silicone gasket is installed within the cap. The AMAR Comms Box is splash proof, not waterproof, so always store the Comms Box indoors.



WARNING Make sure the silicone gasket is in place inside the watertight cap of the Comms Box. And install the watertight cap onto the Ethernet Port when the Port is not in use. Without the gasket and cap, water can damage the Ethernet Port.

For related information, see:

- Connecting the Comms Box to the AMAR on page 7
- Stopping the Recording Schedule on page 9
- About the LEDs on the Comms Box on page 10
- Disconnecting the Comms Box from the AMAR on page 11
- Connecting the AMAR to your computer with the Comms Box on page 18
- Disconnecting the Comms Box from your computer on page 20
- Storing the Comms Box on page 78.

Connecting the Comms Box to the AMAR

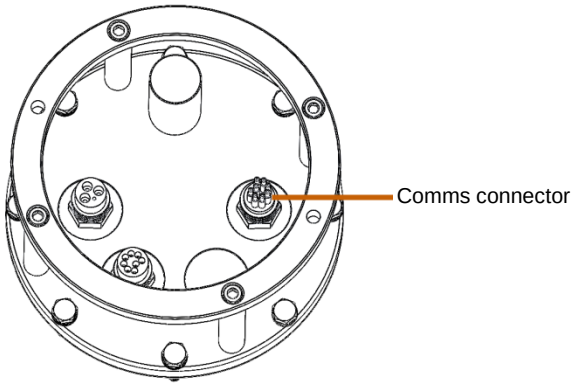
The undersea connector of the Comms Box connects to the matching connector (called the Comms connector) on the AMAR top endcap.

To connect the Comms Box to the AMAR and your computer:

1 On the AMAR top endcap, at the Comms connector:

a Remove the yellow-banded dummy plug from the connector.

b Connect the Comms Box to the connector. Make sure the Comms Box is plugged in all the way.



The Comms Box is now connected to the AMAR. The LEDs on the Comms Box come on to indicate the status of the AMAR.

✓ **TIP** Store all unused dummy plugs in a safe and dry location.

For related information, see:

- About the Comms Box on page 6
- Stopping the Recording Schedule on page 9
- About the LEDs on the Comms Box on page 10
- Disconnecting the Comms Box from the AMAR on page 11
- Connecting the AMAR to your computer with the Comms Box on page 18.

Turning on the AMAR

To turn on the AMAR, you need to install the red-banded Activation Plug onto its matching connector on the AMAR top endcap. When you turn on the AMAR, the AMAR will sleep for 5 seconds and then initiate the Recording Schedule. If you don't want the AMAR to start the Recording Schedule, stop the AMAR Recording Schedule as instructed in the next section.

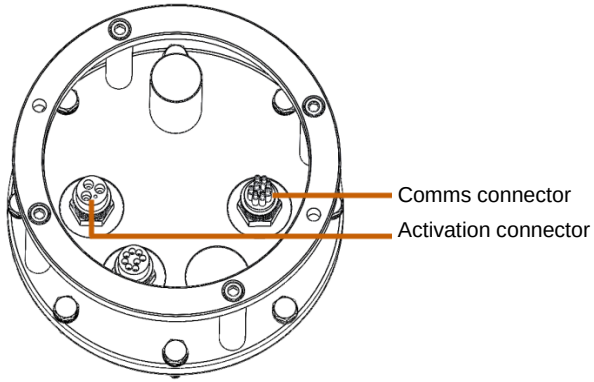
To turn on the AMAR:

1 (*Recommended*) Connect the Comms Box to AMAR as instructed on page 7.

2 Turn on the AMAR—On the AMAR top endcap, at the Activation connector:

a Remove the green-banded dummy plug to reveal the connector.

b Connect the red-banded Activation Plug to the connector to turn on the AMAR.



The AMAR turns on and sleeps for 5 seconds, and the green LED on the Comms Box comes on, indicating that the AMAR is sleeping.

3 You have a choice of what to do next:

If you want to:	Configure the AMAR	Record data
Do this:	Stop the Recording Schedule as instructed in the next section.	Do nothing. After 5 seconds, the AMAR initiates the Recording Schedule. The green LED goes off and the red LED comes on. 

For related information, see:

- About the Activation Plug on page 5
- About the LEDs on the Comms Box on page 10
- Turning off the AMAR on page 11
- Configuring the AMAR and using AMARlink on page 23.

Stopping the Recording Schedule

After you turn on the AMAR, you can stop the Recording Schedule with the Comms Box. You need to stop the Schedule if you want to connect to the AMAR with AMARlink or turn off the AMAR.

You can stop the Schedule at any time. If you stop the Schedule immediately after you turn on the AMAR (i.e., while the AMAR is sleeping for 5 seconds), the AMAR will not record any data and no recorded sessions will be created.

To stop the AMAR Recording Schedule:

1 Connect the Comms Box to AMAR as instructed on page 7.

2 On the Comms Box, press and hold the STOP button for 2 seconds until both LEDs come on.

The Recording Schedule stops. Both LEDs on the Comms Box come on. You can now connect to the AMAR with AMARlink or turn off the AMAR.

For related information, see:

- About the Comms Box on page 6
- About the LEDs on the Comms Box on page 10
- Disconnecting the Comms Box from the AMAR on page 11
- Connecting the AMAR to your computer with the Comms Box on page 18.

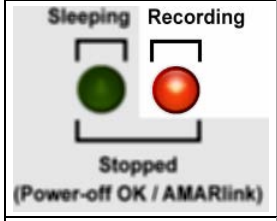
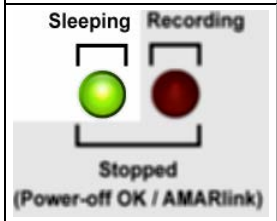
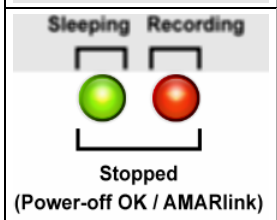
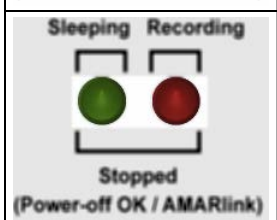
About the LEDs on the Comms Box

The AMAR Comms Box has 2 LEDs: a green LED on the left and a red LED on the right. When the Comms Box is connected to the AMAR, the LEDs on the Comms Box come on to indicate the AMAR's status. The labels above and below the LEDs describe what the LEDs mean when they come on:

- When the AMAR is recording, the red LED is on and the green LED is off.
- When the AMAR is sleeping, the green LED is on and the red LED is off.
- When the AMAR is stopped, both the red and green LEDs are on.
- When the AMAR is off (or the Comms Box isn't connected to the AMAR), both the red and green LEDs are off.

For related information, see:

- About the Comms Box on page 6
- Connecting the Comms Box to the AMAR on page 7
- Stopping the Recording Schedule on page 9
- Connecting the AMAR to your computer with the Comms Box on page 18.

If the LEDs come on like this:	The AMAR is:
	Recording
	Sleeping
	Stopped
	Off

Turning off the AMAR

To turn off the AMAR, you must first stop the Recording Schedule. After you stop the Schedule, you can turn off the AMAR by removing the Activation Plug.

To turn off the AMAR:

1 Connect the Comms Box to the AMAR as instructed on page 7.

2 Stop the Recording Schedule as instructed on page 9.

The Recording Schedule stops. Both LEDs on the Comms Box come on. You can now turn off the AMAR (or connect to the AMAR with AMARlink).

CAUTION Always stop the AMAR Recording Schedule before you turn off the AMAR. Stopping the Schedule before turning off the AMAR prevents potential loss of data.

3 Turn off the AMAR—On the AMAR top endcap, at the Activation connector:

a Disconnect the red-banded Activation Plug from the AMAR.

The AMAR turns off, and the LEDs on the Comms Box go off.

b Install the green-banded dummy plug to protect the connector.

You have successfully turned off the AMAR.

For related information, see:
- About the Activation Plug on page 5
- Turning on the AMAR on page 8.

Disconnecting the Comms Box from the AMAR

When the Comms Box is not connected to the AMAR, install the yellow-banded dummy plug onto the Comms connector on the AMAR top endcap to protect the connector.

Powering with external (AC) power

A 15 W AC power adapter (Phihong) is included with the AMAR to externally power the AMAR during setup and during data download. The AC power adapter connects to the power connector on the AMAR bottom endcap. When the power connector is not in use, install the dummy plug to protect the connector.

The AC power adapter is provided with one or more interchangeable AC clips, which are available for the following regions: US, UK, Brazil, India, China, Argentina, Europe, Australia, Korea, and IEC320 C8.

Power adapter with interchangeable AC clips

When to use external (AC) power:

- When the batteries are depleted and you want to connect to the AMAR with AMARlink, especially when:
  - Downloading data
  - Erasing data
- When working with the AMAR for long periods.

To power the AMAR with external (AC) power:

1 On the AMAR bottom endcap at the power connector:

a Remove the dummy plug from the power connector.

b Put the power adapter connector under the handling ring and connect the power adapter to the power connector.

2 Connect the power adapter plug to an AC power outlet.

CAUTION Always use *stable* external (AC) power when you download data. A power failure or brownout during data download can ruin the download.

TIP Using an uninterruptible power supply (UPS) is recommended.

WARNING Do not power the AMAR from a depleted battery pack when you erase the storage memory. A brownout or power failure during a memory erase can damage the memory beyond repair.

2. Connecting to the AMAR

Chapter contents

This chapter instructs how to connect to the AMAR with your computer so that you can use AMARlink:

This section also gives information related to connecting to the AMAR:

Requirements for connecting to the AMAR

To connect your computer to the AMAR, you need the following:

- ☐ Your computer meets the Minimum system requirements on page 2, notably:
  - ☐ Java 6 is installed
  - ☐ Your computer's PATH system variable includes the path to `java.exe` and `javaw.exe`.
- ☐ *Microsoft Windows Firewall* or any other firewalls are disabled (temporarily)
- ☐ The AMAR is turned on and the Recording Schedule is stopped as instructed on pages 8 and 9.

✓ **TIP** Work with the AMAR in a dry and enclosed space. If working with the AMAR for long periods, power the AMAR with stable AC power rather than with the batteries.

Installing AMARlink

AMARlink is distributed as a self-extracting `.jar` file. This file is usually called `amar-link-`*`x.x`*`-installer.jar`, where *`x.x`* is the AMARlink version number, for example, `amar-link-1.2-installer.jar`.

To install AMARlink on Windows:

- Double-click the `amar-link-`*`x.x`*`-installer.jar` file and follow the prompts.

To install AMARlink on Linux:

- In a console, type the following and follow the prompts:

```
java amar-link-1.2-installer.jar
```

Changing your computer's IP address

Before you can connect to the AMAR, you must first change the IP address of your computer to an IP address that is on the same subnet as the AMAR's IP address. The AMAR communicates with your computer using network protocol. When the AMAR is connected to the Comms Box and your computer, the AMAR forms a closed local area network with your computer. To form a network, the AMAR and your computer should be connected only to each other and not to any other network. Also, the AMAR and your computer must have IP addresses that are on the same subnet.

It is possible that you must disable the firewalls on your computer before you can connect to the AMAR.

All AMARs have a factory default IP address of 192.168.2.1 (on the 192.168.2.x subnet). So before you can connect to the AMAR for the first time, you must change your computer's IP address to 192.168.2.x, where x is any number between 2 and 255 (192.168.2.48 for example).

CAUTION Don't give your computer the same IP address as the AMAR. They must have *different* IP addresses on the same subnet.

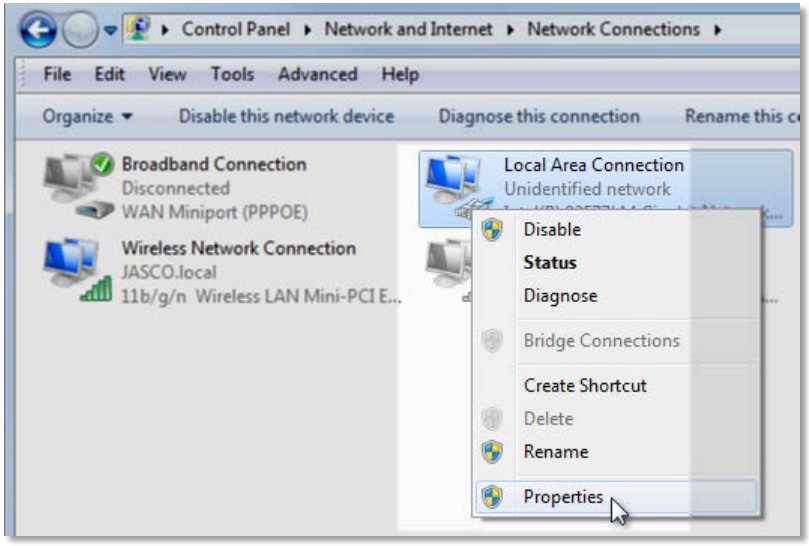
You can also connect the AMAR to an existing network using gateways, DHCP, and routing. Consult your IT department to connect the AMAR to an existing network.

To change your computer's IP address (Windows):

1. Make sure you have "Administrator" privileges on your computer. If not, speak to your IT department.
2. From the Start menu, choose **Control Panel**.
3. In the Control Panel, under Network and Internet, click **View network status and tasks**.

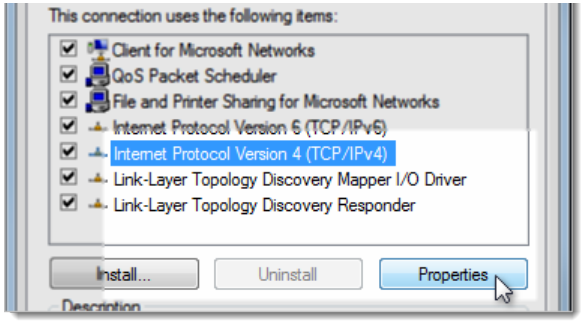
4 On the left menu bar of the Network and Sharing Center, click **Change adapter settings**.

5 In the Network Connections Window, right-click **Local Area Connection** and choose **Properties**.



6 In the Local Area Connection Properties window, select **Internet Protocol Version 4** and click **Properties**.

The Internet Protocol Version 4 Properties window appears.

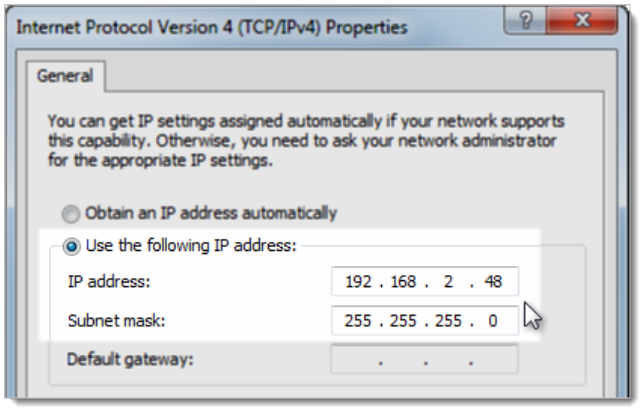


7 Before you change any of the settings, record the current settings displayed in the window or take a screenshot, because you may need to reinstate these settings later when you are done using the AMAR.

8 In the Internet Protocol Version 4 Properties window, select **Use the following IP address**.

9 Enter the new IP address for your computer. On delivery, all AMARs have a factory default IP address of 192.168.2.1 (on the 192.168.2.x subnet), so an IP address of **192.168.2.48**, for example, will work.

10 Enter **255.255.255.0** as the Subnet mask and click **OK**.



You have changed your computer's IP address to be on the same subnet as the AMAR's IP address. You can now connect to the AMAR.

NOTE When you are done using the AMAR, you may need to set your IP settings back to those that you recorded in Step 7.

Connecting the AMAR to your computer with the Comms Box

To connect the AMAR to your computer with the Comms Box:

1 Connect the Comms Box to the AMAR as instructed on page 7.

2 At the Ethernet Port of the Comms Box, turn the watertight cap counter-clockwise to open the cap.

3 Connect the Ethernet cable to the Ethernet Port of the Comms Box and to your computer.

The Comms Box is now connected to your computer. Proceed to Connecting to the AMAR with AMARlink on page 18.

Connecting to the AMAR with AMARlink

To connect your computer to the AMAR, you first have to change your computer's IP address to an IP address that is on the same subnet as the AMAR's IP address. To connect to the AMAR with AMARlink, you will *add* the new AMAR to AMARlink and specify the AMAR's IP address. AMARlink identifies each AMAR by its IP address.

To connect to an AMAR with AMARlink:

NOTE You may need to disable *Microsoft Windows Firewall* or any other active firewalls.

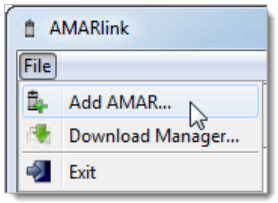
1 Connect the AMAR to your computer with the Comms Box as instructed on page 18.

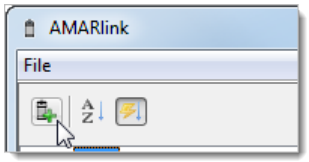
2 Turn on the AMAR as instructed on page 8 and immediately stop the Recording Schedule as instructed on page 9.

3 On your computer, double-click the AMARlink icon to open the AMARlink application.

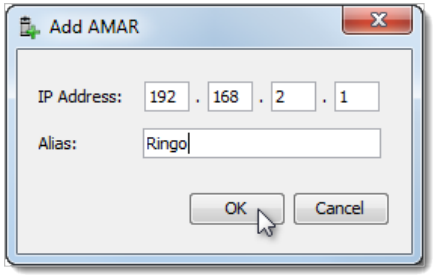
4 If you are connecting to the AMAR for the first time, add the AMAR to AMARlink:

a In the AMARlink window, choose **File** > **Add AMAR**.





b In the Add AMAR dialog box, enter the IP address of the AMAR.



NOTE All AMARs have a factory default IP address of 192.168.2.1.

c Enter an alias (i.e., screen name) to identify the AMAR, like Paul or Ringo (non-Beatles names also work; the AMAR serial number is a popular choice).

d Click **OK**.

A new AMAR icon appears in the Status pane. While AMARlink is connecting to the AMAR, the AMAR icon is blue. Once AMARlink is connected to the AMAR, the AMAR icon changes to green.

Once the AMAR icon changes to green, you are connected to the AMAR with AMARlink and you are ready to work with that AMAR.

5 In the Status pane, click the AMAR icon to work with that AMAR.

To configure the AMAR with AMARlink, see Chapter 3, Configuring the AMAR and using AMARlink on page 23.

For related instructions, see:

- Turning on the AMAR on page 8
- Refreshing an AMAR connection on page 42
- Renaming an AMAR on page 43
- Deleting an AMAR on page 44.

Disconnecting the Comms Box from your computer

When the Comms Box is not connected to your computer, always close the watertight cap. Before closing the cap, make sure the silicone gasket is installed within the cap.

Gasket inside the watertight cap

For related information, see:

- About the Comms Box on page 6
- Stopping the Recording Schedule on page 9
- About the LEDs on the Comms Box on page 10
- Disconnecting the Comms Box from the AMAR on page 11
- Storing the Comms Box on page 78.

Connecting to the AMAR through Telnet *(advanced operation)*

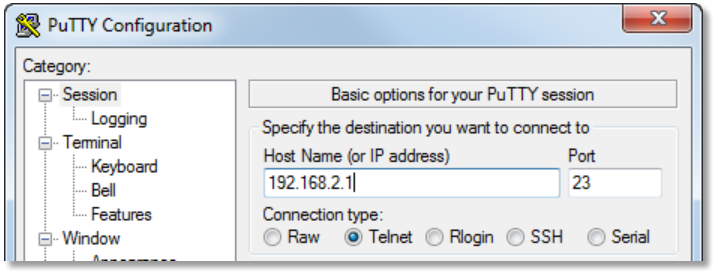
You need to connect to the AMAR through Telnet only to do advanced operations like upgrading the AMAR firmware (page 89). Before trying to connect to the AMAR through Telnet, connect to the AMAR through AMARlink first.

To connect to the AMAR through Telnet, you will use *PuTTY* rather than AMARlink. *PuTTY* is an SSH and Telnet client for Windows. *PuTTY* may be provided on the AMAR CD. Or you can download *PuTTY* from http://www.putty.org. *PuTTY* provides access to the AMAR command line so you can manually execute low-level AMAR commands.

To connect to the AMAR through Telnet:

1. If required, change your computer's IP address to an IP address that is on the same subnet as the AMAR's IP address.
2. Connect your computer to the AMAR with an Ethernet cable and the Comms Box.
3. Turn on the AMAR and stop the Recording Schedule.
4. Record the IP address of your AMAR, which is shown on the System Info tab of AMARlink.
5. From the AMAR CD, double-click the `PuTTY Serial Terminal.exe` file, or double-click the `putty.exe` file that you downloaded from http://www.putty.org.
6. If a security warning appears, click **Run**.

   The PuTTY Configuration window appears and displays the Session options.
7. In the PuTTY Configuration window:
   a. Under Connection type, select **Telnet**.
   b. Under Host Name (or IP address), enter your AMAR's IP address from Step 4 above.



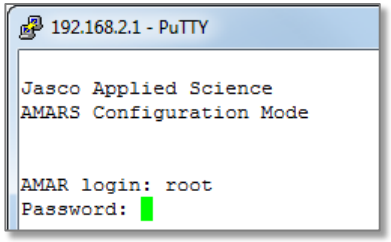
c (*Optional*) Under “Saved Sessions” enter a name for the session, such as “AMAR 1”, and click **Save** to save these settings to use again later.

d Click **Open**.

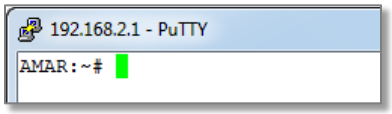
The PuTTY console window appears. You are now connected to the AMAR Configuration Mode..

8 At the AMAR login prompt, enter `root` and press Enter.

9 At the AMAR password prompt, enter `root` and press Enter.



The AMAR command line prompt appears. You are now connected to the AMAR command line through Telnet. To upgrade the AMAR firmware, see page 89.



For related instructions, see:
- Changing your computer’s IP address on page 15
- Connecting to the AMAR with AMARlink on page 18.

3. Configuring the AMAR and using AMARlink

Chapter contents

This chapter instructs how to configure the AMAR with AMARlink and how to use the remaining actions in AMARlink:

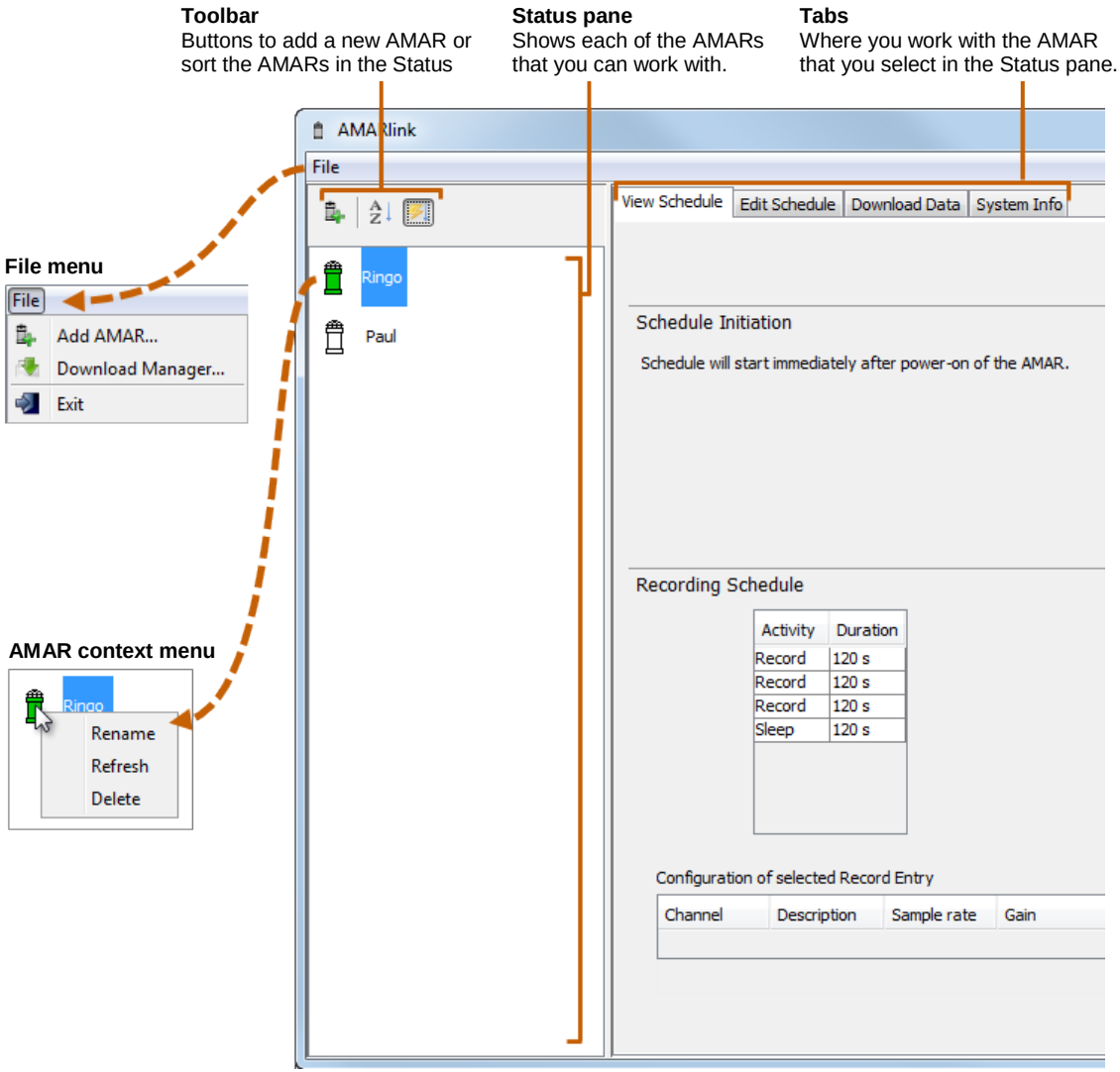
AMARlink overview

AMARlink is the software application that accompanies the AMAR(s).
You can use AMARlink to:

- View how the AMAR is setup to record (called the *Recording Schedule*)
- Configure the AMAR to record
- Download your recorded data
- Erase data from the AMAR storage memory.

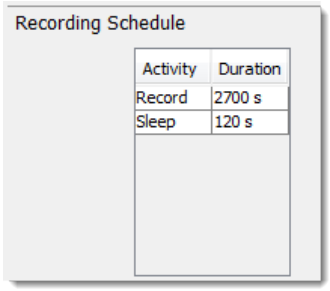
The AMARlink window has the File menu, the Toolbar, the Status pane and the View Schedule, Edit Schedule, Download Data, and System Info tabs. Right-click an AMAR icon to see the AMAR context menu.

For related information, see Minimum system requirements on page 2.



About Recording Schedules

The AMAR records data by executing a Recording Schedule. The Recording Schedule has an optional Initiation Date and Time. To configure how the AMAR will record data, you need to create or edit a Recording Schedule and then send that Schedule to the AMAR.



A Recording Schedule has one or more Entries. Each Entry is configured to either Record or Sleep. The AMAR will execute the Entries in the Schedule in order, for their specified duration. When all Entries in the Schedule have been executed, the AMAR executes the Schedule again from the beginning. The AMAR executes the Schedule again and again until the memory is full, the batteries are spent, or the recording is stopped.

Types of Recording Schedules

How the AMAR will record data depends on how many Entries and what type of Entries you add to the Recording Schedule:

Schedule type	Continuous	Simple Cycle *	Duty Cycle	Session Cycle
Example Recording Schedule	Activity: Record, Duration: ∞	Activity: Record, Duration: 3600 s	Activity: Record, Duration: 14400 s; Activity: Sleep, Duration: 72000 s	Activity: Record, Duration: 900 s; Activity: Record, Duration: 2700 s; etc.
Details	Records continuously in a single recorded session.	Records in 3600 s long recorded sessions.	Cycles between recording and sleeping.	Cycles through recording with different record configurations (you can add as many Entries as you like, including Sleep entries).
Data continuity	Truly continuous data (no gaps) stored as one recorded session.	0.5–2 s gap between the 3600 s long recorded sessions.	14400 s long recorded sessions, no data collected during sleep sessions.	0.5–2 s gap between recorded sessions, no data collected during sleep sessions.
Download capability	Stored as a single recorded session, so all data must be downloaded at once.	Individual 3600 s long recorded sessions can be downloaded separately.	Individual 14400 s long recorded sessions can be downloaded separately.	Individual recorded sessions can be downloaded separately.

✓ *** TIP** For continuous recording, a Simple Cycle Schedule is recommended. A Simple Cycle offers more download options than a Continuous Schedule.

For related information, see:
- What is a session? on page 63
- Configuring the AMAR to record data on page 27.

Configuring the AMAR to record data

To configure the AMAR, you need to connect to the AMAR with AMARlink as instructed in Chapter 2, Connecting to the AMAR starting on page 13.

For related information, see:
- Other Recording Schedule actions on page 34
- Other AMARlink actions on page 41.

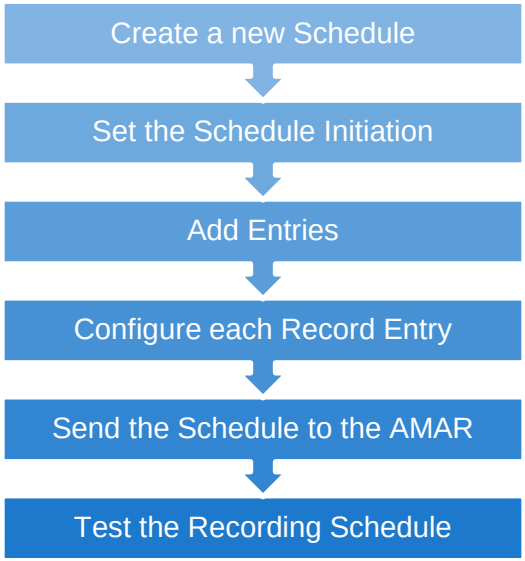
Overview of configuring the AMAR

The AMAR records data by executing a Recording Schedule. Configuring how the AMAR will record data is a multistep process of creating and editing a Recording Schedule. You will do all the steps in the process in the Edit Schedule tab of AMARlink. This subsection provides an overview of the process and the following subsections instruct how to complete each of the steps in the process.

To configure the AMAR to record data, you need to do the following, each of which is described in its own subsection below:

1. Create a new Recording Schedule as instructed on page 28
2. Set the Schedule Initiation date and time as instructed on page 28
3. Add one or more Entries to the Recording Schedule as instructed on page 29
4. Configure each Record Entry as instructed on page 30
5. Send the Recording Schedule to the AMAR as instructed on page 32
6. (*Recommended*) Do a test recording of a full iteration of the Recording Schedule before you deploy the AMAR as instructed on page 33.

For related information, see:
- About Recording Schedules on page 25
- Types of Recording Schedules on page 25
- About the Record Configuration options on page 31.

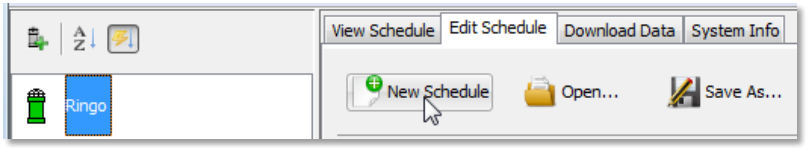


Creating a new Recording Schedule

To create a new Recording Schedule:

1 In the Status pane, click the AMAR icon of the AMAR you want to work with.

2 On the Edit Schedule tab, click **New Schedule**.



NOTE Any unsaved changes to the Schedule currently shown in the Edit Schedule tab will be lost.

The Edit Schedule tab shows the new blank Schedule that you created. Continue to the next section to set the Schedule Initiation.

Setting the Schedule Initiation

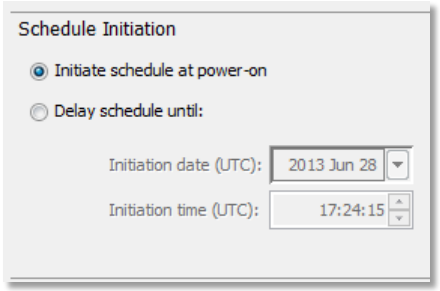
By default, when you turn on the AMAR the AMAR sleeps for 5 seconds and then starts the Recording Schedule. You have the option to delay the start of the Recording Schedule until a specified date and time in UTC. If you choose this option, the AMAR will sleep until the Initiation date and time and then start the Recording Schedule.

If the Initiation date and time have already passed when you turn on the AMAR, the AMAR will start the Recording Schedule after sleeping for 5 seconds. In other words, the AMAR will operate as if it were set to initiate the Schedule at power-on.

For related instructions, see Setting the time of the AMAR on page 47.

To set the Schedule Initiation:

- On the Edit Schedule tab, under Schedule Initiation, choose:
  - **Initiate schedule at power-on**
    When you turn on the AMAR, the AMAR will start the Recording Schedule.
  - **Delay schedule** and enter an Initiation date and time (in UTC)
    When you turn on the AMAR, the AMAR will sleep until the Initiation date and time and then start the Recording Schedule.



Adding an Entry to the Recording Schedule

You build a Recording Schedule by adding Entries to the Schedule. Each Entry is configured to either Record or Sleep. When you add an Entry to the Recording Schedule, the Entry is added to the end of the Schedule.

See Types of Recording Schedules on page 25 for the combinations of Entries to add to the Recording Schedule to achieve continuous recording, duty-cycled recording, etc.

To add an Entry to the Recording Schedule:

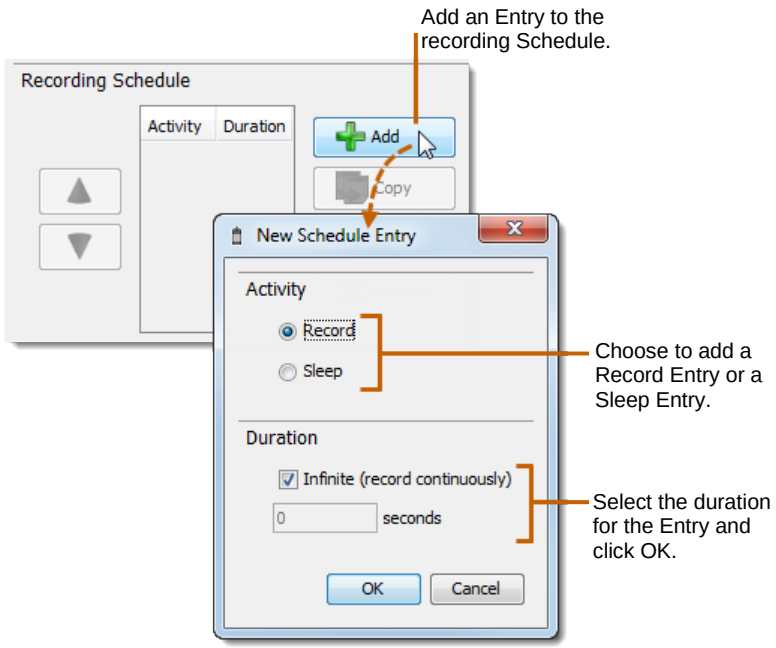
1 On the Edit Schedule tab, click **Add**.

2 In the New Entry dialog box, under Activity, choose:
- Record OR
- Sleep (used for duty cycling)

3 Under Duration, choose:
- Infinite (to record data continuously) OR
- Enter a duration in seconds

NOTE A duration of “Infinite” means the AMAR will record continuously. Any entries after an infinite Entry will not be executed.

4 Click **OK**.



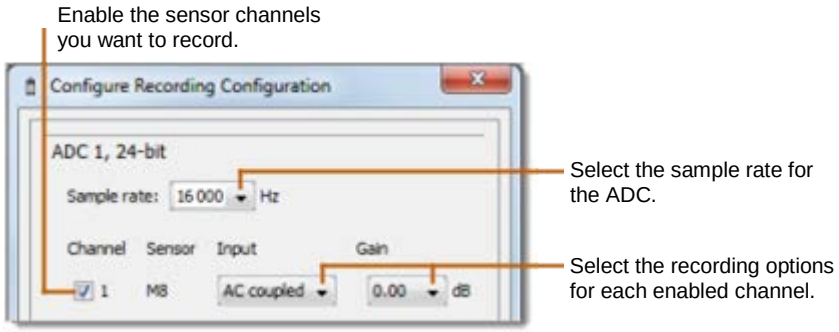
If you added a Sleep Entry, the dialog box closes and the Sleep Entry is added to the bottom of the Recording Schedule and you’re done.

If you added a Record Entry, the Configure Recording Configuration dialog box appears. Continue to Configuring a Record Entry in the next section.

For related information, see Editing an Entry in the Recording Schedule on page 36.

Configuring a Record Entry

When you add a new Record Entry to the Recording Schedule, or when you edit an existing Record Entry in the Recording Schedule, the Configure Recording Configuration dialog box appears. In this dialog box, you will configure how the AMAR will record data for the duration of the Record Entry.



To configure a Record Entry:

1 In the Configure Recording Configuration dialog box, select/enable the checkboxes of the sensor channels you want to record.

2 For each ADC with enabled channels, select the sample rate from the drop-down menu.

3 For each enabled channel, select the recording options from each of the drop-down menus. See About the Record Configuration options on page 31 for descriptions of the recording options.

4 Click **OK**.

The dialog box closes and the Record Entry is added to the bottom of the Recording Schedule.

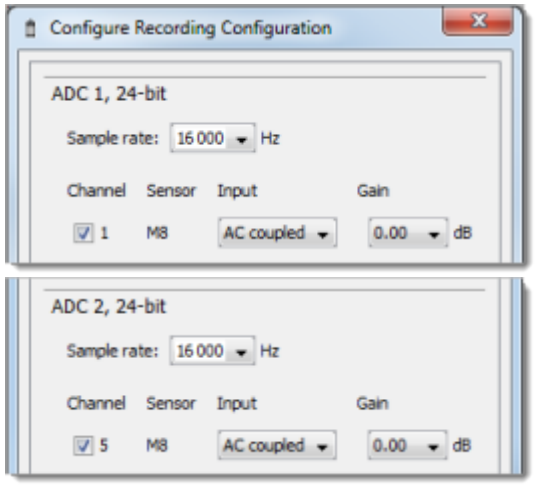
✓ **TIP** Once the Recording Schedule is to your liking, you have to send the Recording Schedule to the AMAR as instructed in Sending a Recording Schedule to the AMAR on page 32.

About the Record Configuration options

The Configure Recording Configuration dialog box shows the sensors that are physically installed on the AMAR. This section describes the recording options for sensors commonly installed on an AMAR.

ADCs 1 and 2, 24-bit

The AMAR has 2 analog-to-digital converters (ADCs). Each ADC can have up to 4 input channels. In the examples below, only 1 channel, connected to a GeoSpectrum™ M8 hydrophone, is shown.



For each ADC, you choose:

- Sample rate, in hertz, for all the enabled channels on that ADC (e.g., 16 000 Hz).

For each enabled channel, you choose:

- Input coupling: The electrical input coupling between the sensor and the electronics (AC or DC)
- Analog gain: The analog gain, in decibels, applied to the channel before the ADC (e.g., 6 dB).

CAUTION For sample rates of 64 000 Hz and higher, use a gain setting of 18.06 dB or lower. For high sample rates and gain settings of 24.08 dB or higher, the signal response at high frequencies is reduced with a single-pole low-pass response. See Technical Bulletin JS-TB0017 for details.

Temperature sensor

The AMAR has a temperature sensor on the internal circuit board. This sensor is part of the ISL12020 real-time clock. When Channel 25 is enabled, the AMAR records the temperature reading of the sensor at 1 second intervals.

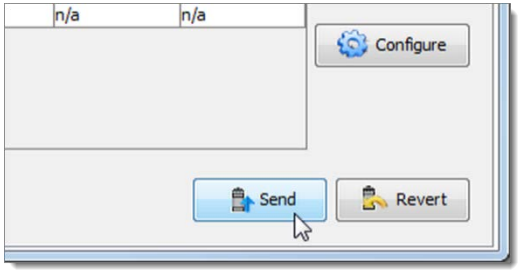
Sending a Recording Schedule to the AMAR

Once you have created and edited a Recording Schedule to your liking, you have to send the Recording Schedule to the AMAR for the Schedule to take effect.

The Send button is disabled (greyed out) when the Schedule currently shown in the Edit Schedule tab is the same as the Schedule currently loaded on the AMAR.

To send the Recording Schedule to the AMAR:

- On the Edit Schedule tab, click **Send**.



AMARlink sends the Recording Schedule to the AMAR, overwriting the Recording Schedule that is currently loaded on the AMAR. A dialog box appears when the Schedule is successfully loaded onto the AMAR.

✓ **TIP** Click the View Schedule tab to verify that the Schedule you just sent is now the Schedule currently loaded on the AMAR.

✓ **TIP** Do a test recording that is sufficiently long to span an entire iteration of the Recording Schedule before you deploy the AMAR to be sure that you configured the AMAR correctly. See Testing the Recording Schedule on page 33.

Testing the Recording Schedule

Before you deploy the AMAR, it is recommended that you do a test recording that is sufficiently long to span an entire iteration of the Recording Schedule to be sure that you configured the AMAR correctly.

To do a test recording:

1. On the View Schedule tab, add up the duration of all the Entries to determine how long it will take for 1 iteration of the Recording Schedule to execute. This length of time is your test duration.
2. Make sure that the Schedule Initiation is set to “Initiate schedule at power-on”.
3. Turn off the AMAR as instructed on page 11.
4. If your test duration is long, to conserve the battery power connect the AMAR to external (AC) power as instructed on page 12.
5. Turn on the AMAR as instructed on page 8 and let it execute the Recording Schedule for the test duration.
6. Periodically during the test, look at the LEDs on the Comms Box to make sure the AMAR is operating as expected. Refer to About the LEDs on the Comms Box on page 10.
7. After the AMAR has recorded for the test duration, stop the Recording Schedule as instructed on page 9.
8. Connect to the AMAR with AMARlink as instructed on page 18.
9. Download the data from the test recording as instructed on page 66.
10. Make sure the duration, enabled channels, sample rate, etc. of the data are as expected. If anything is not as it should be, edit the Recording Schedule and do another test recording.

Other Recording Schedule actions

This section describes all the actions in AMARlink you can do with Recording Schedules that are not already described in Configuring the AMAR to record data starting on page 27:

For related information, see:

- Configuring the AMAR to record data on page 27
- Other AMARlink actions on page 41.

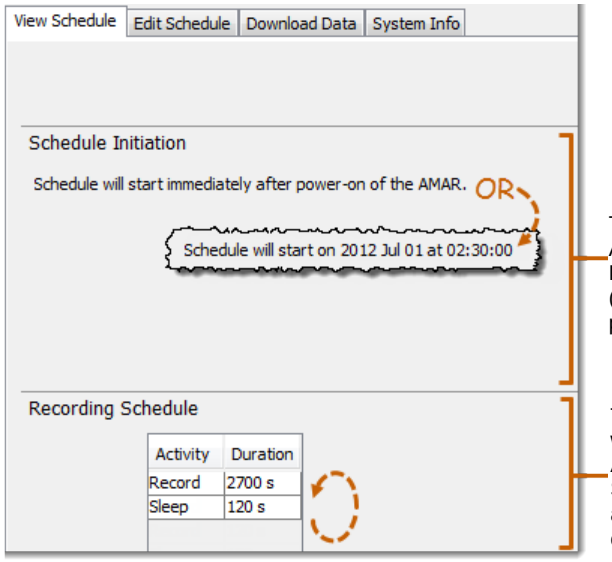
Viewing the Recording Schedule—Seeing how the AMAR is configured to record

You can view the Recording Schedule that is currently setup on the AMAR in the View Schedule tab of AMARlink. The AMAR will execute the Recording Schedule again and again until the AMAR is stopped or the batteries are depleted.

To view the Recording Schedule:

1 In the Status pane, click the AMAR icon of the AMAR you want to work with.

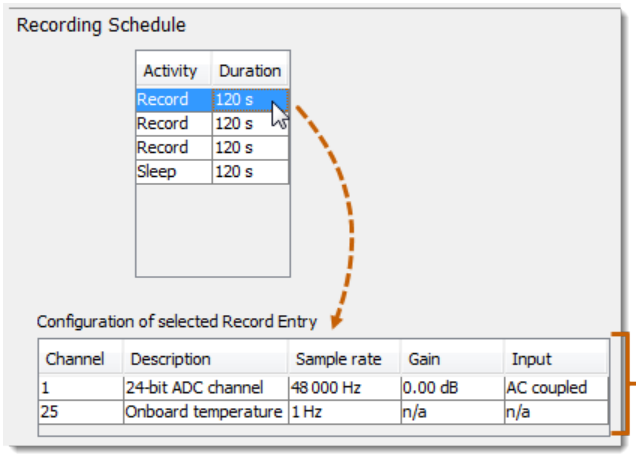
2 Click the **View Schedule** tab to view the Recording Schedule that is currently setup on the AMAR.



Tells you when the AMAR will execute the Recording Schedule (provided the AMAR is powered on).

Tells you how the AMAR will record data. The AMAR executes the Schedule again and again until it is stopped or runs out of batteries.

3 Click a Record Entry to see how that Entry is configured to record data.



Tells you how the selected Record Entry is configured to record data.

Editing an Entry in the Recording Schedule

You can change the activity, duration, or any part of the recording configuration of any Recording Schedule Entry by editing that Entry.

To edit an Entry within the Recording Schedule:

1 On the Edit Schedule tab, click the Entry that you want to edit.

2 You have two choices:

If you want to:	Edit the Activity and Duration:	Edit the Recording Configuration:
Do this:	Click **Edit** and continue to Step 3.	Click **Configure** and skip to Step 6.

3 In the Edit Entry dialog box, under Activity, choose:
- Record OR
- Sleep (used for duty cycling)

4 Under Duration, choose:
- Infinite (to record data continuously) OR
- Enter a duration in seconds

NOTE A duration of “Infinite” means the AMAR will record continuously. Any entries after an infinite Entry will not be executed.

5 Click **OK**.

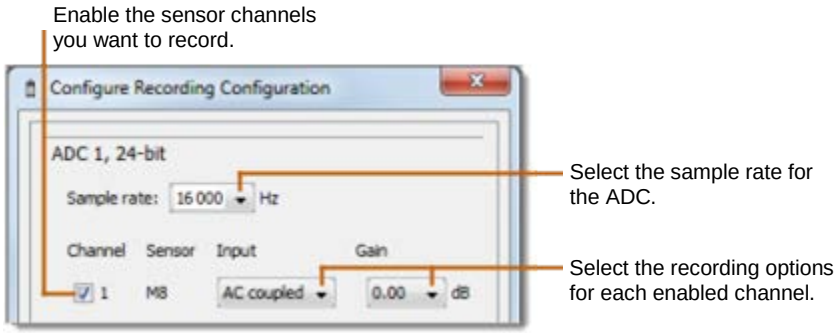
If you chose Sleep as the Activity, the dialog box closes and you’re done editing the Entry.

If you chose Record as the Activity, the Configure Recording Configuration dialog box appears. Continue to the next step.

6 In the Configure Recording Configuration dialog box, select/enable the checkboxes of the sensor channels you want to record.

7 For each ADC with enabled channels, select the sample rate from the drop-down menu.

8 For each enabled channel, select the recording options from each of the drop-down menus. See About the Record Configuration options on page 31 for descriptions of the recording options.



9 Click **OK**.

The dialog box closes and the Record Entry is now configured.

For related information, see Adding an Entry to the Recording Schedule on page 29.

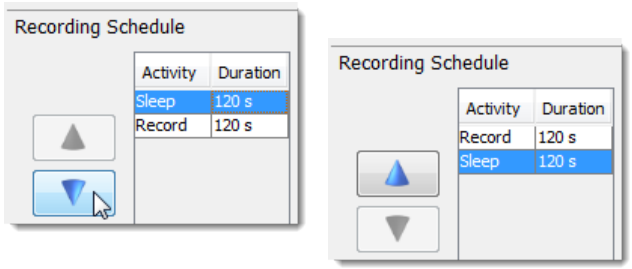
Moving an Entry within the Recording Schedule

When the Recording Schedule contains 2 or more entries, you can change the order of those entries by moving individual entries up or down within the Schedule.

To move an Entry within the Recording Schedule:

1 On the Edit Schedule tab, click the Entry that you want to move.

2 Click the up arrow to move the Entry up within the Schedule, or click the down arrow to move the Entry down within the Schedule.



Copying an Entry in the Recording Schedule

You can create an exact copy of an Entry in the Recording Schedule. The copy of the Entry will be added to the end of the Recording Schedule. You can copy a Record Entry or a Sleep Entry. When you copy an Entry, you are also given the option to edit the Entry in case you want to make the copied Entry different than the original Entry. The original Entry is left unchanged.

To copy an Entry within the Recording Schedule:

1 On the Edit Schedule tab, click the Entry that you want to copy.

2 Click **Copy**.

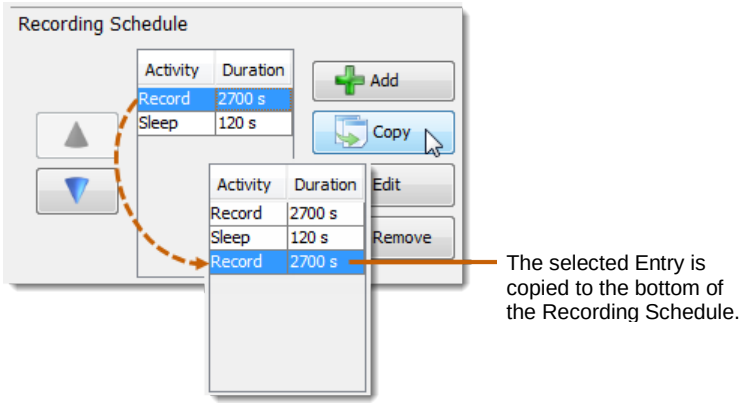
The Edit Schedule Entry dialog box appears, giving you the option to change the Activity or the Duration of the copied Entry.

3 Change the settings if you want, and then click **OK**.

The Configure Recording Configuration dialog box appears, giving you the option to change the recording configuration of the copied Entry.

4 Change the settings if you want, and then click **OK**.

The copied Entry is added to the bottom of the Recording Schedule.



Saving a Recording Schedule

Within AMARlink, you can save a Recording Schedule. You can open a saved Schedule to use again later, for example, at a later date or on another AMAR. You can save a Recording Schedule at any time, regardless of whether you have sent it to an AMAR.

When you save a Recording Schedule, AMARlink saves the Schedule to a Schedule Library. The Schedule Library exists within the AMARlink application on your computer.

✓ **TIP** To configure multiple AMARs to record exactly the same way, send the same saved Schedule to each AMAR.

To save the current Recording Schedule:

1 On the Edit Schedule tab, click **Save As**.

2 In the Save Schedule As dialog box, enter a Name for your Schedule and click **Save**.

Your Schedule is now saved in AMARlink's Schedule Library for later use.

Opening a saved Recording Schedule

Within AMARlink, you can save a Recording Schedule so you can open the Schedule to use again, for example, at a later date or on another AMAR.

To open a previously saved Recording Schedule:

1 On the Edit Schedule tab, click **Open**.

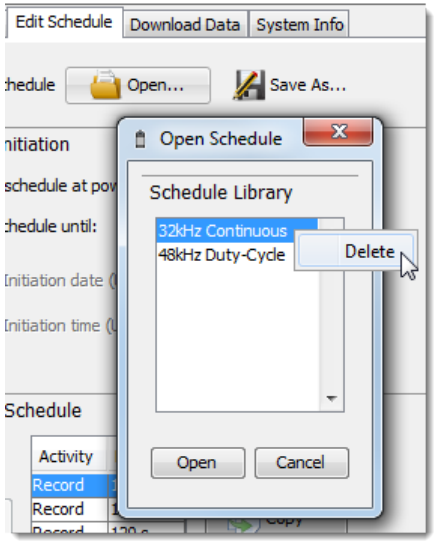
ⓘ **NOTE** Any unsaved changes to the current Schedule in the Edit Schedule tab will be lost.

2 In the Open Schedule dialog box, select a Recording Schedule from the Schedule Library and click **Open**.

The Edit Schedule tab displays the opened Schedule. You can now edit the Schedule or send it to the AMAR.

Deleting a saved Recording Schedule

Previously saved Recording Schedules can be deleted from the Schedule Library. You can delete a saved Recording Schedule in the Save Schedule As dialog box (while you're saving a Recording Schedule) or Open Schedule dialog box (while you're opening a saved Recording Schedule).



To delete a saved Recording Schedule:

- In the Save Schedule As dialog box, or in the Open Schedule dialog box, right-click the Recording Schedule and choose **Delete**.

Reverting the Recording Schedule

Reverting the Recording Schedule means abandoning any unsaved changes to the Schedule currently shown in the Edit Schedule tab, and reverting the Edit Schedule tab back to the Schedule that is currently loaded on the AMAR (i.e., the Schedule that you see in the View Schedule tab).

The Revert button is disabled (greyed out) when the Schedule currently shown in the Edit Schedule tab is the same as the Schedule currently loaded on the AMAR.

To revert the Recording Schedule:

- On the Edit Schedule tab, click **Revert**.

NOTE Any unsaved changes to the Recording Schedule currently shown in the Edit Schedule tab will be lost.

The Edit Schedule tab displays the Recording Schedule that is currently loaded on the AMAR.

Other AMARlink actions

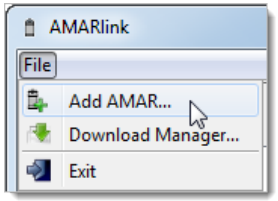
This section describes the remaining actions that you can do in AMARlink that aren't already described in Configuring the AMAR to record data on page 27 or Other Recording Schedule actions on page 34.

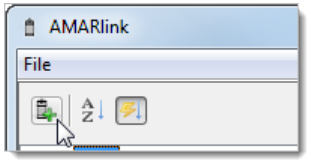
Connecting to a new AMAR with AMARlink

The first time you connect to an AMAR with AMARlink, you need to *add* the AMAR to AMARlink.

To add an AMAR to AMARlink:

1 In the AMARlink window, choose **File** > **Add AMAR**, or on the Toolbar click .



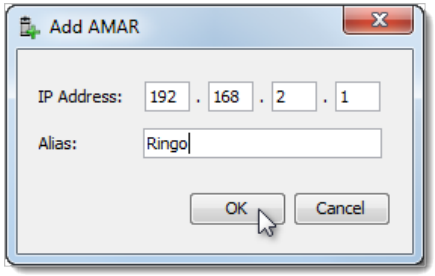


2 In the Add AMAR dialog box, enter the IP address of the AMAR.

NOTE All AMARs have a factory default IP address of 192.168.2.1.

3 Enter an alias (i.e., screen name) to identify the AMAR, like Paul or Ringo (non-Beatles names also work; the AMAR serial number is a popular choice).

4 Click **OK**.



A new AMAR icon appears in the Status pane. While AMARlink is connecting to the AMAR, the AMAR icon is blue. Once AMARlink is connected to the AMAR, the AMAR icon changes to green.

Once the AMAR icon changes to green, you are connected to the AMAR with AMARlink and you are ready to work with that AMAR.

Reconnecting to an AMAR with AMARlink

AMARlink remembers the AMARs that it connects to. You can quickly reconnect to an AMAR within AMARlink if the IP address of that AMAR is still the same.

To reconnect to an AMAR with AMARlink:

1 In the Status pane, click the AMAR icon of the AMAR you want to work with.

2 On the System Info tab, click **Connect**. Or, refresh the AMAR connection (see Refreshing an AMAR connection below).

AMARlink refreshes the connection to that AMAR and the color of the AMAR icon indicates the connections status of that AMAR.

Refreshing an AMAR connection

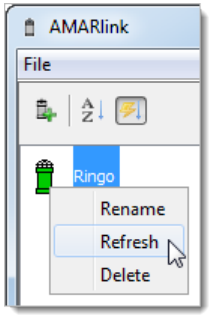
AMARlink connects to the AMAR through Ethernet. AMARlink updates the status of the Ethernet connection at approximately 15 minute intervals. So to make sure AMARlink is still connected to an AMAR, or to reconnect to an AMAR, you need to refresh the connection.

To refresh an AMAR connection to AMARlink:

1 In the Status pane, right-click the AMAR icon.

2 From the AMAR Context menu, choose **Refresh**.

AMARlink refreshes the connection to that AMAR and the color of the AMAR icon indicates the connections status of that AMAR.



Sorting the list of AMARs in the Status pane

The Status pane shows the AMAR icons of each of the AMARs that you can work with. The Toolbar has 2 buttons for sorting. This list of AMAR icons can be sorted as follows:

- Alphabetically by Alias with the button
- By connection status with the button.

Renaming an AMAR

The first time you connect to an AMAR with AMARlink, you have to specify an alias (or screen name) for that AMAR. You can change this alias at any time.

To change the alias of the AMAR:

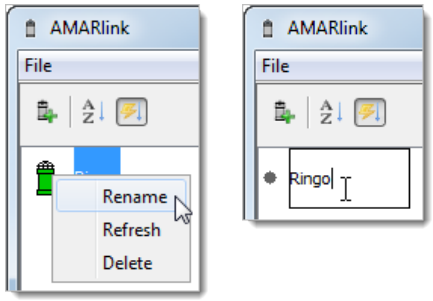
1 In the Status pane, right-click the AMAR icon.

2 Click **Rename**.

3 Enter a new alias into the field.

4 Press Enter.

The AMAR is renamed with the new alias.



Deleting an AMAR

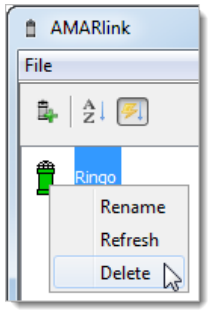
Deleting an AMAR from AMARlink removes any information stored within AMARlink about that AMAR and removes that AMAR's icon from the Status pane.

To delete an AMAR from AMARlink:

1 In the Status pane, right-click the AMAR icon.

2 From the context menu, choose **Delete**.

The AMAR and all cached information about that AMAR are deleted from AMARlink. The icon for that AMAR disappears from the Status pane.



Properties and advanced configuration

You can view the AMAR properties and do advanced configurations on the System Info tab of AMARlink.

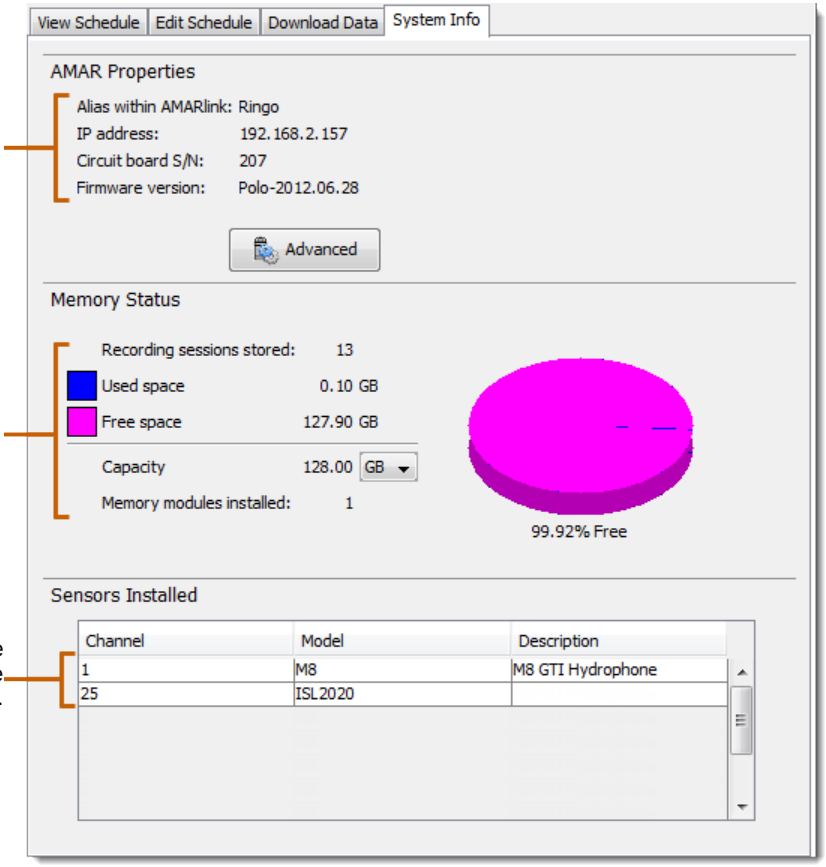
Viewing the System Info of the AMAR

AMARlink's System Info tab shows information about the AMAR that is selected in the Status pane. You can view the system information of an AMAR that is connected and online. AMARlink caches this system information. You can view the system information of an AMAR after it is disconnected.

The alias you gave the AMAR,
The IP address of the AMAR,
The serial number of the AMAR's internal circuit board,
The version of the firmware installed on the AMAR.

Number of recorded session stored on the AMAR,
The total memory space used by those recorded sessions,
The total free space left over,
The total capacity of the AMAR's storage memory,
Number of memory modules installed on the AMAR circuit board.

The sensors installed on the AMAR. This example shows a GeoSpectrum™ M8 hydrophone and the ISL12020 on-board temperature sensor.



Changing the AMAR's IP address

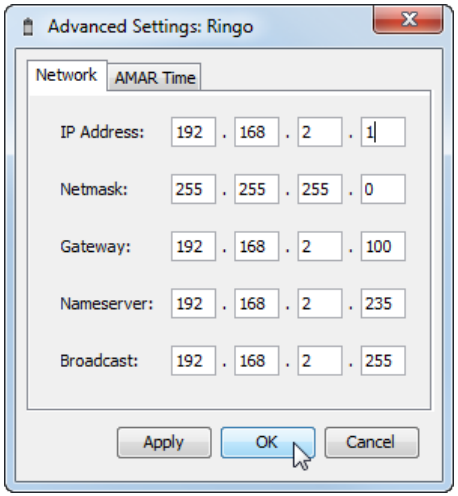
All AMARs have a factory default IP address of 192.168.2.1. If you own only 1 AMAR, you don't need to change the AMAR's IP address. If you own 2 or more AMARs, then you need to change their IP addresses so that each AMAR has a unique IP address. Unique IP addresses let AMARlink identify different AMARs.

To change the IP address of the AMAR:

1 In the Status pane, right-click the AMAR icon and choose **Refresh** to make sure the AMAR is still connected.

2 On the System Info tab, click **Advanced**.

3 On the Network tab of the Advanced Settings dialog box, enter the new IP address of the AMAR and the Netmask, Gateway, Nameserver, and Broadcast addresses for the network and click **OK**.



✓ **TIP** If you don't know what addresses to use, consult your IT department.

Setting the time of the AMAR

The AMAR uses an internal real-time clock (RTC) to initiate the Recording Schedule at the correct time (at the specified Initiation Time) and to time-stamp the recorded sessions. On occasion, you will have to reset the AMAR's internal clock if you want the time stamps to be correct.

The internal clock of the AMAR is always in Coordinated Universal Time (UTC). AMARlink sets the AMAR's internal clock by synchronizing the clock to your computer's time in UTC.

When to set the time of the AMAR:

- After you replace the RTC back-up battery on the internal circuit board, and
- After long periods of storage or deployment (because as with all RTCs, variations in ambient temperature can cause the clock time to drift).

To set the time of the AMAR:

1 Make sure your computer's clock is set to the right time.

NOTE Your computer clock's time zone doesn't matter. AMARlink sets the AMAR clock to UTC time.

2 In the Status pane, right-click the AMAR icon and choose **Refresh** to make sure the AMAR is still connected.

3 In AMARlink, on the System Info tab, click **Advanced**.

4 In the Advanced Settings dialog box, click the **AMAR Time** tab.

The AMAR Time tab shows the current date and time (in UTC) of the AMAR's internal clock.

5 Click **Synchronize**.

AMARlink sets the internal clock of the AMAR to the UTC time of your computer's clock.

6 Click **OK** to close the dialog box.

You have set the time of the AMAR to the UTC time of your computer's clock.

4. Recording and erasing data

Chapter Contents

This chapter contains the following instructions:

Starting a recording

When you turn on the AMAR, the AMAR sleeps for 5 seconds. Then the AMAR will either (A) initiate the Recording Schedule or (B) sleep until the Initiation Date and Time and then initiates the Recording Schedule. Whether the AMAR does A or B depends on how you the Recording Schedule is configured.

To start recording data with the AMAR:

1 If the AMAR is on, turn off the AMAR. Refer to Turning off the AMAR on page 11.

2 Turn on the AMAR. Refer to Turning on the AMAR on page 8.

CAUTION If power to the AMAR was disrupted while the AMAR was recording (power is disrupted if the batteries become depleted or if you turn off the AMAR before you stop the Recording Schedule), you must erase all sessions stored on the AMAR before recording new data. Erasing the data prevents write errors in future recordings.

Stopping a recording

To stop recording data with the AMAR:

- Stop the Recording Schedule with the Comms Box. Refer to Stopping the Recording Schedule on page 9.

Erasing data

All data recorded by the AMAR is saved in one or more recorded sessions. The only way to erase recorded sessions from the AMAR is to Erase All Sessions. Connect the AMAR to stable AC power or to a fresh unused battery pack when you erase the storage memory.

Erasing All Sessions from the AMAR cannot be undone, so download all valuable data from the AMAR before erasing the storage memory. The AMAR will not overwrite previous/old recordings stored in memory. If the storage memory is full, the AMAR won't record new data.

When to erase the recorded sessions stored on the AMAR:

- Before each deployment to maximize the storage memory available for new data
- If power to the AMAR was disrupted while the AMAR was recording (power is disrupted if the batteries become depleted or if you turn off the AMAR before you stop the Recording Schedule).

To erase the recorded sessions stored on the AMAR:

1 Connect the AMAR to stable AC power or with a fresh, unused battery pack.

WARNING Do not power the AMAR from a depleted battery pack when you erase the storage memory. A brownout or power failure during a memory erase can damage the memory beyond repair.

2 On the Download Data tab, click **Erase All Sessions**.

3 In the Warning dialog box, click **Erase**.

For related instructions, see:

- About the memory modules on page 4
- Powering with external (AC) power on page 12
- Battery replacement on page 80
- Recording and erasing data on page 48
- Downloading data on page 62.

5. Deploying and retrieving the AMAR

Chapter contents

This chapter contains the following instructions:

This chapter also contains the following checklists:

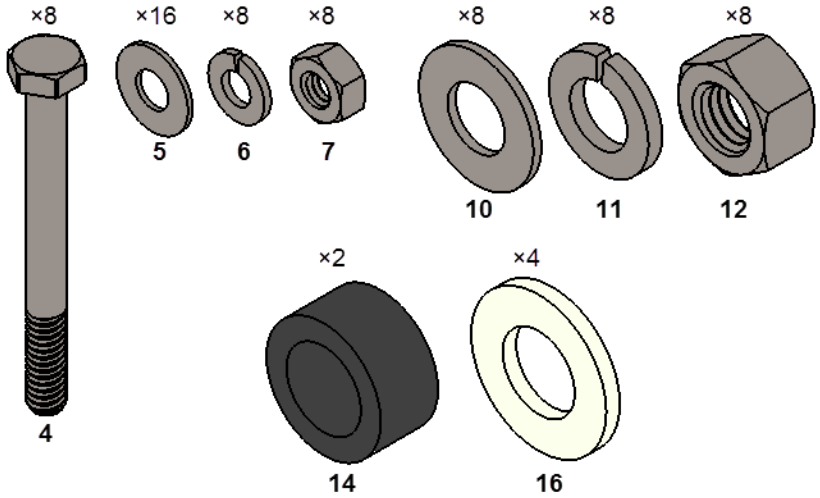
Assembling the Lightweight Frame

A Lightweight Frame is available for the AMAR. The Lightweight Frame provides attachment points to secure the AMAR to a mooring without applying any force to the endcaps of the pressure housing.

Lightweight Frames are available for various combinations of pressure housings. Assembly instructions are provided here for the Lightweight Frame for the AMAR and the 48-cell battery pack. Other variants of the Lightweight Frame are assembled in a similar way.

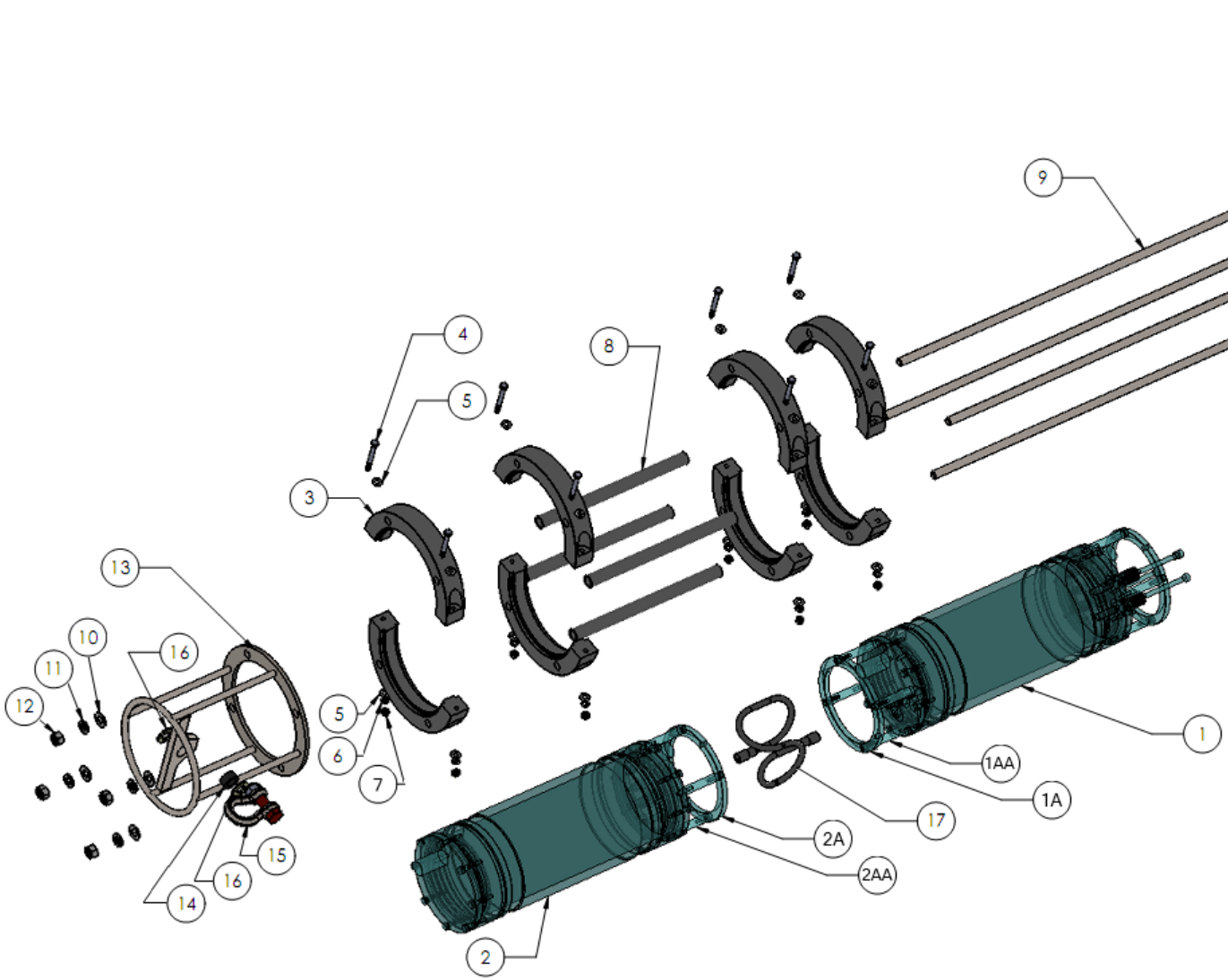
You will need the following to assemble the Lightweight Frame:

- Marine grade anti-seize lubricant (e.g., *Loctite*)
- Socket wrench
- Socket, 7/16″
- Socket, 3/4″
- Spanner wrench, 7/16″, open-ended
- Spanner wrench, 3/4″, open-ended
- Items listed in the bill of material (right, and the hardware is also pictured below).

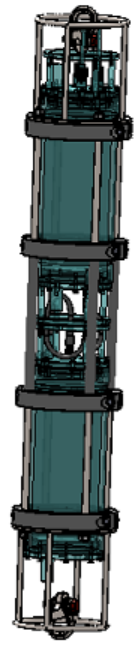


Bill of material for the Lightweight Frame for the AMAR and the 48-cell battery pack.

ID	Qty.	Part. No.	Description
1	1	5113	AMAR and pressure housing, PVC
1A	2		Handling ring on the AMAR
1AA	8		Handling ring spacer on the AMAR
2	1	5111	48-cell battery pack and pressure housing, PVC
2A	1		Handling ring on the battery pack
2AA	2		Handling ring spacer on the battery pack
3	8	5129	Standard collar, PVC
4	8	92186A552	Bolt, 1/4″, 316 SS
5	16	90107A029	Flat washer, 1/4″, 316 SS
6	8	92147A029	Lock washer, 1/4″, 316 SS
7	8	94804A029	Nut, 1/4″, 316 SS
8	4	5197	Housing spacer, PVC
9	4	5132	Structural rod, 316 SS
10	8	5195	Flat washer, 1/2″, 316 SS
11	8	92147A033	Lock washer, 1/2″, 316 SS
12	8	94804A340	Nut, 1/2″, 316 SS
13	2	5138	End bale, 316 SS
14	2	5135	Shackle bushing, rubber
15	2	5136	Shackle, 1/2″
16	4	95610A640	Flat washer, 16 mm, nylon
17	1	20282	Power cable



Lightweight Frame for the AMAR and the 48-cell battery pack



Lightweight Frame fully assembled

To assemble the Lightweight Frame for the AMAR and the 48-cell battery pack:

1 Install the standard collars (**3**): At each large groove on the pressure housings, place a pair of standard collars (**3**) around the pressure housing and secure them loosely with the bolts (**4**), 2 flat washers (**5**), lock washers (**6**), and nuts (**7**). Keep the nuts loose so that the collars are free to rotate around the pressure housing cylinder.

2 Align the pressure housings (**1**, **2**):

a On a workbench, align the handling ring (**1A**) on the bottom of the AMAR housing (**1**) with the handling ring (**2A**) on the top of the battery pack housing (**2**) such that the PRVs are aligned and the handling ring spacers (**1AA**, **2AA**) are aligned.

NOTE This orientation makes sure that the power connectors are not directly aligned and are thus easily accessible.

b Rotate the standard collars (**3**) around the pressure housings to align the holes in the standard collars (**3**) with the handling ring spacers (**1AA**, **2AA**).

NOTE This orientation makes sure you can still access the power connectors after the Lightweight Frame is fully assembled.

3 Thoroughly clean the threads on both ends of the 4 structural rods (**9**).

4 Install a structural rod (**9**):

a On one structural rod (**9**), place a flat washer (**10**) and a lock washer (**11**) over one of the threaded ends. Apply a dab of anti-seize lubricant to the top of the threads and loosely install a nut (**12**). Leave the nut near the top of the threads.

b Hold an end bale (**13**) in position at the top of the AMAR (**1**) and put the structural rod (**9**) through the hole in the end bale (**13**) and through the holes in the standard collars (**3**) on the AMAR.

c Hold one of the housing spacers (**8**) in position and continue to put the structural rod (**9**) through the housing spacer (**8**) and through the standard collars (**3**) on the battery pack housing (**2**).

d Hold the other end bale (**13**) in place at the bottom of the battery pack and put the structural rod (**9**) through the hole in the end bale (**13**).

e Place a flat washer (**10**) and a lock washer (**11**) over the thread. Apply a dab of anti-seize lubricant to the top of the thread and loosely install a nut (**12**) to hold the structural rod (**9**) in place.

5 Do Step 4 again with the other 3 structural rods (**9**).

✓ **TIP** If a structural rod (**9**) won't fit through the bottom end bale (**13**), loosen the nuts (**7**) on the 2 innermost collars (**3**) that are at the bottom of the battery pack and the top of the AMAR.

6 Tighten all the nuts starting from the middle of the frame:

a Tighten partway all the nuts (**12**) on the structural rods (**9**) so that the nuts hold the washers (**10**, **11**) and end bales (**13**) in place against the collars (**3**) but the lock washers (**11**) have not yet begun to flatten.

b Starting from the middle of the frame and working outwards, tighten all the nuts in the frame: tighten the 2 innermost collars (**3**), then tighten the 2 outermost collars (**3**), then fully tighten the 4 structural rods (**9**).

7 On each end bale, install a shackle bushing (**14**), 2 nylon flat washers (**16**), and a shackle (**15**).

8 Connect the battery pack (**2**) to the AMAR (**1**) with the power cable (**17**).

The lightweight frame is now assembled.

Calculating the memory capacity needed for a deployment

This section describes the details you must consider to calculate memory consumption and provides an example of a memory consumption calculation. This information was provided in Technical Bulletin JS-TB0008. A future version of AMARlink will have a memory consumption calculator.

Details to consider

The AMAR records data to flash memory that resides on 256 GiB memory modules. The quantity of memory consumed by recorded data depends on the Recording Schedule and the Record Entry Configurations. Memory is also consumed by metadata.

The AMAR records data in increments of memory (called stripes). These stripes have a fixed length (called the stripe length). So the memory consumed by a recorded session must always be rounded up to the nearest stripe length, which is 16 MiB for a 256 GiB memory module. This detail is very important for short Record Entries and for low sample rate Record Entries. Short and low sample-rate Entries consume a quantity of memory on the order of the stripe length. Some short and low sample-rate Entries can consume up to double the quantity of memory expected. This unexpected memory consumption makes the recording lifetime shorter than expected.

For example, a Record Entry of 60 seconds duration and configured for one 24-bit channel sampling at 4000 Hz produces 7 MiB of sampled data. This 7 MiB is rounded up to the nearest stripe length of 16 MiB, which is more than double. Similarly, one 24-bit channel sampling at 128 kHz takes 42.8 seconds to consume one 16 MiB stripe of a memory module. So a Record Entry with this configuration but a slightly longer duration of 45 seconds consumes two stripes, which is almost double the expected memory.

✓ **TIP** To maximize the efficiency of memory use, choose the duration of each Record Entry so that the recorded session consumes slightly less memory than a multiple of the stripe length of the memory module. Contact JASCO to help you compute the memory usage for your recording configurations.

Flash memory has bad memory blocks that are unusable. These bad blocks reduce the capacity of the flash memory and reduce the number of memory stripes that can be recorded. A conservative estimate of this reduction is 4%.

To calculate the memory capacity needed for a Recording Schedule, you must account for the following:

- Recording Schedule and Record Entry configurations:
  - Duration of Record Entries
  - Enabled channels
  - Bit depth
  - Sample rate.
- For each recorded session of data, 2% more memory is consumed by the session metadata
- The memory consumed by the data and metadata is rounded up to the nearest stripe length
- Add 4% more memory for bad memory blocks.

Example calculation

The following memory consumption calculation is for an example Recording Schedule. The numbers that are for this example Recording Schedule are shown in bold. To calculate the memory consumption for your Recording Schedule, replace the numbers shown in bold.

This example calculation is for a Recording Schedule that has the following 3 Entries (for a total duration of 680 s):

- Record Entry with a duration of 420 s:
  - 1 channel of 24-bit acoustic data sampled at 64 kHz
  - 1 channel of 32-bit temperature sensor data sampled at 1 Hz.
- Record Entry with a duration of 60 s:
  - 1 channel of 16-bit acoustic data sampled at 375 kHz
  - 1 channel of 32-bit temperature sensor data sampled at 1 Hz.
- Sleep Entry with a duration of 200 s.

The first Record Entry will consume:

$$\left(\mathbf{24}\,\mathrm{b}\cdot\frac{1\,\mathrm{B}}{8\,\mathrm{b}}\cdot\frac{\mathbf{64\,000}\,\mathrm{samples}}{1\,\mathrm{s}}+\mathbf{32}\,\mathrm{b}\cdot\frac{1\,\mathrm{B}}{8\,\mathrm{b}}\cdot\frac{\mathbf{1}\,\mathrm{sample}}{1\,\mathrm{s}}\right)\cdot\mathbf{420}\,\mathrm{s}\cdot 1.02\cdot\frac{1\,\mathrm{MiB}}{2^{20}\,\mathrm{B}}=\mathbf{78.444}\,\mathrm{MiB}$$

Rounded-up to the nearest stripe length of 16 MiB (for a 256 GiB memory module), this is **80 MiB**.

The second Record Entry will consume:

$$\left(\mathbf{16}\,\mathrm{b}\cdot\frac{1\,\mathrm{B}}{8\,\mathrm{b}}\cdot\frac{\mathbf{375\,000}\,\mathrm{samples}}{1\,\mathrm{s}}+\mathbf{32}\,\mathrm{b}\cdot\frac{1\,\mathrm{B}}{8\,\mathrm{b}}\cdot\frac{1}{1\,\mathrm{s}}\right)\cdot\mathbf{60}\,\mathrm{s}\cdot 1.02\cdot\frac{1\,\mathrm{MiB}}{2^{20}\,\mathrm{B}}=\mathbf{43.774}\,\mathrm{MiB}$$

Rounded-up to the nearest stripe length, this is **48 MiB** on a 256 GiB memory module.

The Sleep Entry consumes no memory. So a total of $80+48=$ **128 MiB** will be consumed by each 680 s cycle of the Recording Schedule.

Therefore, a deployment of 100 days would require the following quantity of memory:

$$\mathbf{100}\,\mathrm{d}\cdot\frac{86\,400\,\mathrm{s}}{1\,\mathrm{d}}\cdot\frac{\mathbf{128}\ \mathrm{MiB}}{\mathbf{680}\,\mathrm{s}}\cdot 1.04=\mathbf{1691407}\,\mathrm{MiB}\cdot\frac{1\,\mathrm{GiB}}{1024\,\mathrm{MiB}}=\mathbf{1652}\,\mathrm{GiB}$$

So a stack of seven 256 GiB memory modules is required.

For related information, see About the memory modules on page 4.

Checklist for transporting the AMAR

Before transporting or storing the AMAR or battery packs, always do the following:

- ☐ Turn off the AMAR (p11)
- ☐ Disconnect the Comms Box from the AMAR (p11)
- ☐ Install dummy plugs onto all unused connectors, including the yellow-banded dummy plug on the Comms connector and the green-banded dummy plug on the Activation connector
- ☐ Open the pressure relief valve and make sure the pressure is released (p96).

WARNING Open the pressure relief valve and make sure the pressure is released before you open, store, or transport the AMAR. If the AMAR was deployed, dangerous pressure build-up inside the pressure housing is possible.

Checklist for deploying the AMAR

For optimal performance, complete all items of this checklist before deploying the AMAR. The page numbers of the applicable instructions are provided for each item for ease of reference.

- ☐ Maintain and service the AMAR:
  - ☐ Service and inspect the O-rings of the opened endcap (p93)
  - ☐ Replace all the alkaline batteries (p80)
  - ☐ Replace the desiccant pack (p88)
  - ☐ Set the PRV venting pressure (p96)
  - ☐ Service all the underwater connectors (p101)
  - ☐ Do a visual inspection of all components (p102).
- ☐ Prepare the AMAR to record:
  - ☐ Configure the Recording Schedule (p27) and send the Schedule to the AMAR (p32)
  - ☐ Make sure the memory capacity (p56) and batteries are sufficient for your deployment duration
  - ☐ Do a test of the Recording Schedule (p33)
  - ☐ Erase the recorded sessions from the AMAR (p50)
  - ☐ (*Optional*) Do a calibration of the AMAR and hydrophone.
- ☐ Prepare the AMAR for deployment:
  - ☐ Turn on the AMAR and make sure the LEDs on Comms Box come on as expected (p8)
  - ☐ Disconnect the Comms Box from the AMAR (p11)
  - ☐ Install dummy plugs onto all unused connectors, including the yellow-banded dummy plug on the Comms connector
  - ☐ Attach the AMAR to the mooring
  - ☐ Make sure all hardware is tight and all cable connections are secure.

Checklist for retrieving the AMAR

- ☐ Clean dirt and biofouling—be careful to not damage the hydrophone
- ☐ Rinse with fresh water
- ☐ Stop the Recording Schedule (p9) and immediately turn off the AMAR (p11)
- ☐ Disconnect the Comms Box (p11)
- ☐ Install dummy plugs onto the Comms and Activation connectors
- ☐ Transport to a clean, dry area and provide stable power before turning on the AMAR and connecting with AMARlink.

CAUTION When you retrieve the AMAR, always STOP the recording schedule and turn off the AMAR. Provide stable power to the AMAR before you turn on the AMAR and connect to the AMAR with AMARlink.

6. Downloading data

Chapter contents

This chapter contains the following sections related to downloading data from the AMAR to your computer:

About downloading data

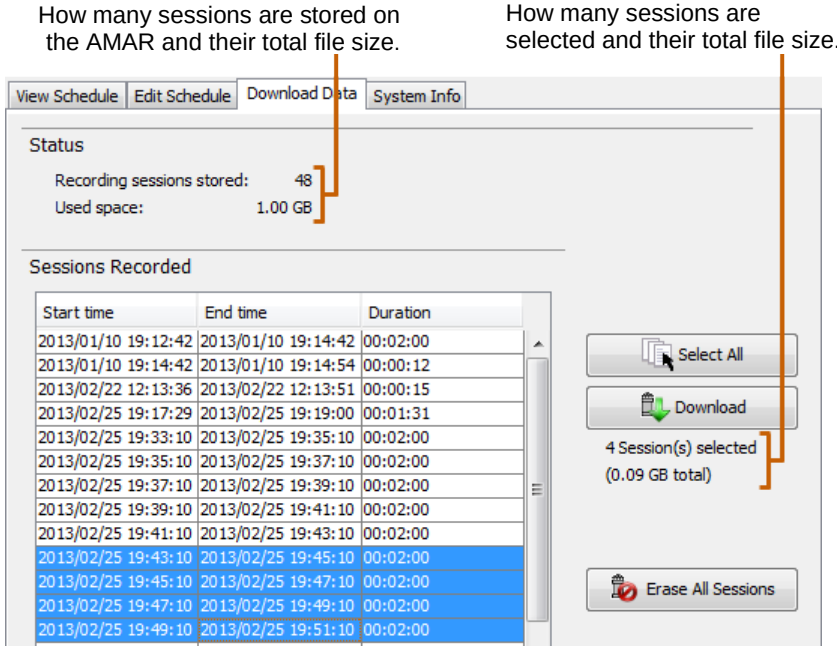
How long does downloading take?

How long it takes to download data depends on how much data you selected for download (i.e., the duration, sample rate, and number of enabled channels). A small quantity of data will be downloaded in a few seconds to download, whereas a large quantity of data, from six months of recording at 128 kHz for example, will need several days to be downloaded. It is recommended that the computer not be used for other tasks during the download.

What is a session?

Each execution of a Record Entry of the Recording Schedule is saved as a recorded *session*. You can view and download the recorded sessions from AMARlink's Download Data tab.

For related information, see Types of Recording Schedules on page 25.



Format of downloaded data

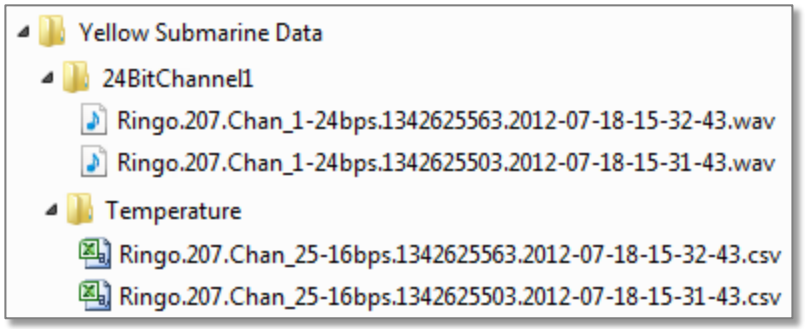
When you download recorded sessions from the AMAR, the data within those sessions are saved in a folder of your choice (called the master folder). Data from different types of sensors are saved as different types of files:

- Data from acoustic sensors are saved as WAV files
- Data from non-acoustic sensors, like the temperature sensor, are saved as CSV files.

Within the master folder, the data are separated into subfolders: one subfolder per channel. The filenames of the downloaded data have this structure:

`<AMAR alias>.<AMAR S/N>.<Channel>-<Bit-rate>.<Start time in UNIX time>.<Start time in UTC>.<extension>`

In the example shown right, the sessions were downloaded to a master folder called “Yellow Submarine Data” from an AMAR with an alias of “Ringo” and serial number of “207”. These data were recorded using a Simple Cycle Recording Schedule. This Recording Schedule had 1 Record Entry with a duration of 60 s. The first WAV file shown right, `Ringo.207.Chan_1-24bps.1342625563.2012-07-18-15-32-43.wav`, has a start time of 3:32:43 pm (h:m:s) on July 18, 2012.

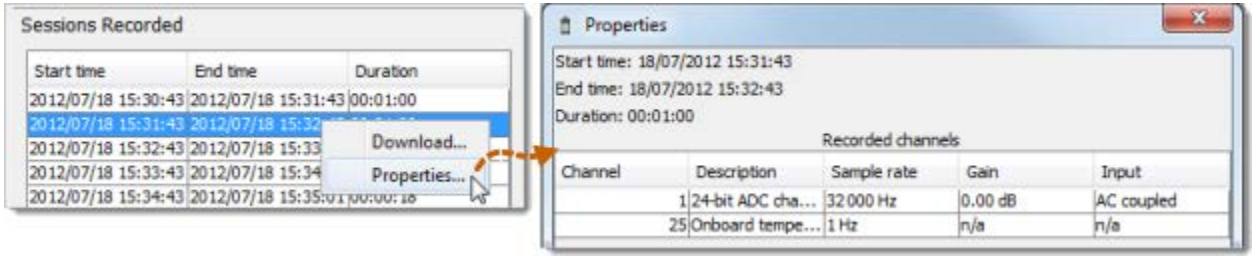


The acoustic data from a recorded session is saved as 1 or more WAV files. If a recorded session has a small quantity of data, all the data from that sessions will be saved in 1 WAV file. If a recorded session has a large quantity of data, the data will be split into 2 or more consecutive WAV files. The data are split into several WAV files so that the files are not prohibitively large.

For related instructions, see Downloading data on page 66.

Viewing the Record Configuration of a session

To view the Record Configuration of a recorded session, right-click the session and choose **Properties**.



Downloading data from the AMAR

Each execution of a Record Entry of the Recording Schedule is saved as a recorded *session*. You can view and download the recorded sessions from AMARlink's Download Data tab. Downloaded sessions are saved to a folder of your choice.

✓ **TIP** Work with the AMAR in a dry and enclosed space. If working with the AMAR for long periods, power the AMAR with stable AC power rather than with the batteries.

To download data, you need sufficient memory capacity to store the data that you download. The AMAR can store up to 1792 GiB of data if it has 7 memory modules installed.

ⓘ **NOTE** To download 1792 GiB of AMAR data, an external hard drive with a stated capacity of "2 TB" (which is equal to 1862 GiB) is insufficient.

You need the following items to download data from the AMAR:

- AC power adapter for the AMAR
- Uninterruptible power supply (UPS) (recommended)
- Sufficient memory capacity for the data—an external data storage device (e.g., an external hard drive) is often required
- Comms Box
- Ethernet cable
- Computer with AMARlink.

To download data from the AMAR:

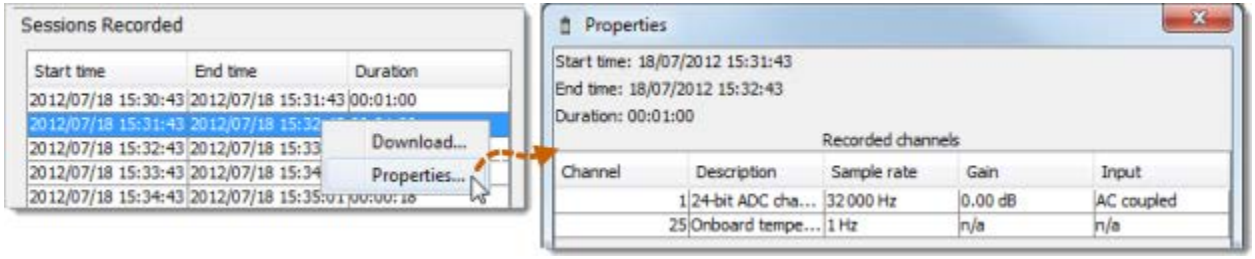
1 Connect the AMAR to stable external (AC) power as instructed on page 12.

! **CAUTION** Always use *stable* external (AC) power when you download data. A power failure or brownout during data download can ruin the download.

✓ **TIP** Using an uninterruptible power supply (UPS) is recommended.

2 Turn on and connect to the AMAR with AMARlink as instructed on pages 8 and 12.

3 (*Optional*) On the Download Data tab, to view the recording configuration of a recorded session right-click a session and choose **Properties**.



4 On the Download Data tab, select the recorded sessions you want to download:

To download:	*All* recorded sessions	*Specific* recorded sessions
Do this:	Click **Select-All** (or press Ctrl+A)	Click and drag to select one or more recorded sessions. Or, hold Shift to select a series of recorded sessions.

5 Make sure you have sufficient memory space for the recorded sessions you select. The size of the selected data is shown below the Download button.

CAUTION Make sure you have sufficient memory space before starting a download. Having insufficient memory to store the downloaded data can ruin the download.

NOTE A hard drive with a stated capacity of “2 TB” is insufficient to store

6 Click **Download**.

7 In the Download Settings dialog box, click **Browse**.

8 In the Open dialog box, browse to the folder where you want to put the data and click **Open**.

TIP Create a new folder for each AMAR and deployment.

9 In the Download Settings dialog box, click **OK**.

AMARlink starts to download the data to your computer. The Download Manager dialog box opens and shows the progress of the download.

TIP Tips for downloading data:

- Set the power options on your computer to high performance so the computer won't "go to sleep" if left unattended.
- It is recommended that the computer not be used for other tasks during the download.
- Make a copy of the downloaded data onto a second data storage device or onto an archival storage medium for backup.

NOTE In the Download Manager dialog box, you can:

- Click **Stop** to stop a download that is in progress.
- Click **Remove** to clear the progress of a completed download from the Download Manager progress list, or
- Click **Show in Folder** to open the destination folder where the downloaded recordings are located.

NOTE You can reopen the Download Manager at any time by choosing **File** > **Download Manager**.

For related information, see:

- About the memory modules on page 4
- About downloading data on page 63
- Checklist for downloading data on page 70
- Recording and erasing data on page 48
- Erasing data on page 50.

Downloading from multiple AMARs simultaneously

In AMARlink, you can download data from up to 4 AMARs with 1 computer (if your computer has sufficient processing power and memory). To download data from multiple AMARs, use one instance of the AMARlink application to initiate all the downloads. The downloads will be faster, however, if you use a separate computer and Comms Box for each AMAR.

CAUTION Do not open a new instance of the AMARlink application for each download. Use one instance of AMARlink to initiate downloads from up to 4 AMARs.

For related information, see:

- About downloading data on page 63
- Checklist for downloading data on page 70.

Checklist for downloading data

For optimal performance, complete all items of this checklist before you download data from the AMAR. The page numbers of the applicable instructions are provided for each item for ease of reference. This checklist assumes your computer is already setup and is capable of connecting to the AMAR with AMARlink.

Before and during the download:

- ☐ Your data storage device has sufficient capacity to store all the data
- ☐ The AMAR, computer, data storage device, etc. are connected to stable external (AC) power (p12)—using an uninterruptible power supply (UPS) is recommended
- ☐ Set the power options on your computer to high performance so the computer won't "go to sleep" if left unattended
- ☐ (*Recommended*) Do not use your computer for other tasks during the download.

After the download:

- ☐ Make sure the downloaded files span the entire duration of the recording(s)
- ☐ Near the beginning, middle, and end of the recording(s), make sure the acoustic data and sensor data are present and there are no obvious faults in the recordings
- ☐ Apply your own quality checks to the data.
- ☐ (*Recommended*) Make a copy of the downloaded data onto a second data storage device or onto an archival storage medium for backup.

For related information, see:

- About downloading data on page 63
- Downloading data from the AMAR on page 66.

7. Maintaining and Servicing the AMAR

Chapter contents

This chapter begins with 3 general sections related to maintaining and servicing the AMAR and its parts:

The remaining maintenance sections are listed in alphabetical order by part name:

Maintenance Schedules

For optimal performance, the AMAR and the AMAR battery packs must be maintained periodically.

WARNING Always stop the Recording Schedule and turn off the AMAR before you open the pressure housing or do maintenance activities.

Do the following activities at the given intervals for all AMARs and AMAR battery packs:	Refer to page:
Each time you close a pressure housing	
Service and inspect the O-rings of the opened endcap	93
Each deployment	
All activities listed above	
Replace all the alkaline batteries	80
Replace the desiccant pack	88
Inspect and service the pressure relief valve (PRV)	96
Set the venting pressure of the pressure relief valve (PRV)	97
Service the underwater connectors	101
Visually inspect all components	102
Yearly	
All activities listed above	
Replace and inspect the O-rings on the endcap(s) typically opened—the top endcaps	93
Replace the RTC backup battery	99
Every 5 years	
All activities listed above	
Replace and inspect the O-rings on all endcaps—both the top and bottom endcaps	93

Opening the pressure housing

The pressure housing of the AMAR or the battery packs are opened by removing the top endcap assembly from the pressure housing cylinder. The bottom endcap generally does not need to be opened, except for periodic maintenance.

Open the pressure housing in a clean, dry environment. The housing should be dry.

Overview:

To open an AMAR pressure housing or a battery pack pressure housing, you will need to:

1. Open the pressure release valve (PRV) to make sure all pressurized gases vent from the housing
2. Remove the top endcap assembly from the pressure housing canister
3. Disconnect the power connector from the AMAR circuit board.

You need the following tools to open the pressure housing of the AMAR or a battery pack:

- Electrostatic discharge (ESD) protection
- PRV tool (inside a 3/8” socket for better grip if desired)
- Spanner wrench, 7/16”.

To open a pressure housing:

1 If the AMAR is on, stop the Recording Schedule and turn off the AMAR. Refer to Turning off the AMAR on page 11.

WARNING Always stop the Recording Schedule and turn off the AMAR before you open the pressure housing or do maintenance activities.

2 If you’re opening a battery pack pressure housing, unscrew and remove the anode from the bottom endcap.

3 Put the pressure housing on the floor so that the PRV is up: put the AMAR housing on the floor upside-down; put the battery pack housing on the floor right-side up.

4 By hand with the PRV tool unscrew the PRV core by turning the core counter-clockwise until you hear a release of air from the PRV.

WARNING Open the pressure relief valve and make sure the pressure is released before you open, store, or transport the AMAR. If the AMAR was deployed, dangerous pressure build-up inside the pressure housing is possible.

5

If you are sure the pressure has been released, or if the AMAR hasn't been deployed since it was last opened, do this:	If the AMAR has been deployed and you are unsure if the pressure has been released, do this:
Place the pressure housing on the floor right-side up to access the top endcap. Continue to Step 4.	**a** Place the pressure housing on the floor right-side up to access the top endcap. **b** Loosen the eight (8) endcap bolts part way. This lets the interior pressure push the endcap out of the pressure housing cylinder. If the endcap doesn't rise on its own, pull the endcap out of the pressure housing cylinder until the seal is broken. **c** Once you are certain that all pressurized gas has escaped from the pressure housing cylinder, continue to Step 4. Also, service the PRV and make sure it is working properly before you deploy the pressure housing.

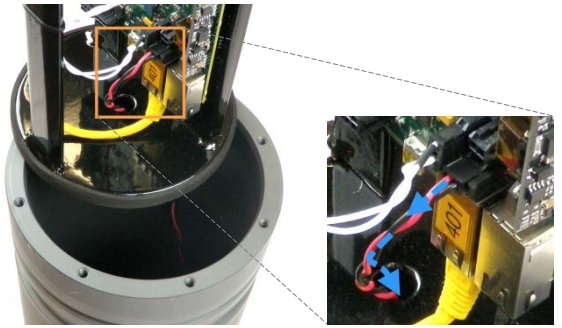
6 With a 7/16" spanner wrench, loosen and remove the 8 bolts from the top endcap.

7 With your feet, steady the pressure housing flat on the floor. With two hands, keep the top endcap assembly vertical and slowly pull the assembly out of the pressure housing cylinder.

WARNING Pull the assembly out of the housing slowly and straightly to prevent damage to the O-ring surface inside the housing.

WARNING Use ESD protection when you move or touch the top endcap assembly or the circuit board. A person carrying even a small static charge can severely damage a circuit board by ESD.

8 For the AMAR, rest the top endcap assembly on the top of the pressure housing cylinder, disconnect the red and black twisted wires from the power connector at the bottom of the AMAR circuit board, and let the wires fall through the hole at the bottom of the endcap assembly.



9 Place the top endcap assembly on a grounded anti-static mat.

You have successfully opened the pressure housing by removing the top endcap assembly from the pressure housing cylinder.

Closing the pressure housing

You need the following tools to close the pressure housing of the AMAR or battery packs:

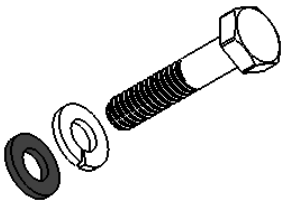
- Electrostatic discharge (ESD) protection
- O-ring cleaning supplies
- Fresh desiccant pack
- Pressure release valve (PRV) tool (inside a 3/8” socket for better grip if desired)
- Torque screwdriver set to 12.5 in·lbs with 7/16” socket.

To close the pressure housing:

1. Inspect and service the O-rings as instructed on page 93.
2. Make sure the pressure housing cylinder is free of debris (silica gel particles, metal shavings, battery chemicals, etc.), which could clog the pressure release valve.
3. If you are mobilizing the AMAR for a deployment, do the following before closing the pressure housing:
   a. Replace the desiccant pack as instructed on page 88.
   b. Replace the internal 9-cell battery pack as instructed on page 81.
4. By hand with the PRV tool, unscrew the PRV core by turning the core counter-clockwise until it is loose but won’t fall out.
5. Gently guide the top endcap assembly into the pressure housing, ensuring that no wires are caught or pinched.
6. Align the holes in the endcap with the holes on the pressure housing and firmly press the top endcap into the pressure housing, seating the O-rings.

   You should hear air vent from the PRV. If not, inspect the PRV for damage or debris as instructed on page 96.

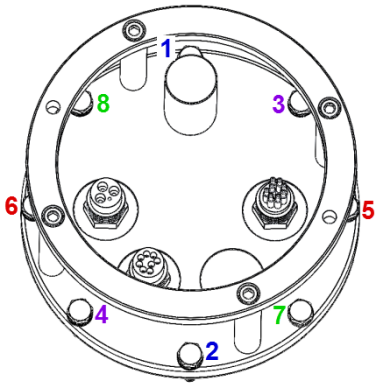
7 By hand, install the 8 black nylon washers, 8 lock washers, and 8 bolts on the top endcap until finger tight.



WARNING Make sure a nylon washer is between each lock washer and the endcap before you tighten the bolts. Without the nylon washers, it is possible to scratch the anodizing on the endcap.

8 With a torque screwdriver, apply a torque of 12.5 in·lbs (1.41 N·m) to one of the bolts.

9 Apply the same 12.5 in·lbs (1.41 N·m) of torque to the remaining bolts in the alternating order shown in the diagram at right.



10 Do Steps 8 and 9 again to make sure each bolt is tightened to a torque of 12.5 in·lbs (1.41 N·m).

11 If you are mobilizing the pressure housing for a deployment, set the PRV for the desired venting pressure as instructed on page 96.

You have closed the pressure housing. You can now lift the AMAR with the handling ring on the top endcap.

Storing the AMAR and the Comms Box

Before transporting or storing the AMAR or battery packs, always do the following:

- ☐ Turn off the AMAR
- ☐ Disconnect the Comms Box from the AMAR
- ☐ Install dummy plugs onto all unused connectors, including the yellow-banded dummy plug on the Comms connector and the green-banded dummy plug on the Activation connector
- ☐ Open the pressure relief valve and make sure the pressure is released.

WARNING Open the pressure relief valve and make sure the pressure is released before you open, store, or transport the AMAR. If the AMAR was deployed, dangerous pressure build-up inside the pressure housing is possible.

Storing the Comms Box

The AMAR Comms Box is splash proof, not waterproof. Always store the Box indoors or in a sheltered area.

For related information, see:

- About the Comms Box on page 6
- Disconnecting the Comms Box from the AMAR on page 11
- Disconnecting the Comms Box from your computer on page 20.

Storing long term

Before storing the AMAR or battery packs long term, remove all the alkaline batteries. Recorded Sessions stored on the AMAR are not lost when you remove the batteries.

Anode replacement

Each endcap of the AMAR and the external battery packs has a threaded zinc anode. These anodes protect the metal parts of the endcap from corrosion.

You need the following items to replace an anode:

- New zinc anode
- Vice grips / locking pliers.

When to replace the anode:

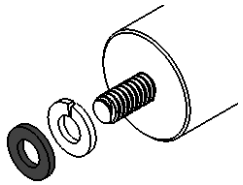
- For short deployments of a few days or less, any quantity of anode is sufficient protection for the metal components.
- For deployments of a week or longer, replace the anode if it is eroded.

For related information, see Maintenance Schedules on page 72.

To replace an anode:

1 Turn the old anode counter-clockwise to remove it. If you can't turn the anode by hand, use vice grips to turn it.

2 Put a lock-washer and a flat nylon washer on the threaded part of the new anode.



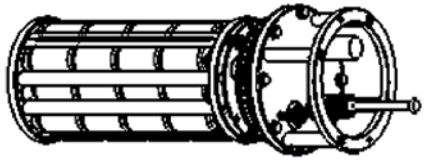
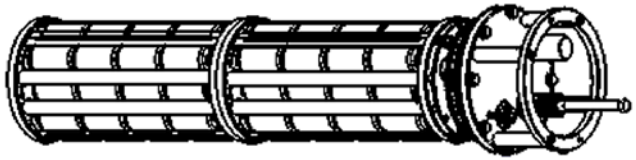
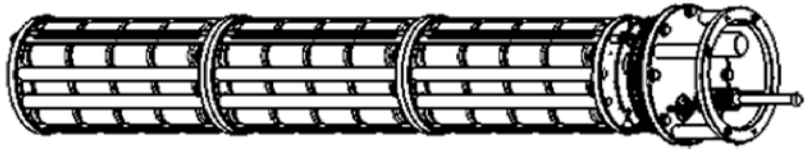
WARNING Make sure the nylon washer is between the lock washer and the endcap before you tighten the anode. Without the nylon washer, it is possible to scratch the anodizing on the endcap.

3 Turn the new anode clockwise to install it onto the endcap.

Battery replacement

About the AMAR battery packs

The AMAR is powered by alkaline D-cell batteries in any of the following battery packs:

Inside the AMAR pressure housing	
9-cell battery pack	
In separate pressure housings	
48-cell battery pack (1 battery cage)	
96-cell battery pack (2 battery cages)	
144-cell battery pack (3 battery cages)	

The 9-cell battery pack is mounted to the top endcap assembly of the AMAR. The 48-cell, 96-cell, and 144-cell battery packs are external to the AMAR, and each has its own pressure housing.

When to replace the batteries

Replace all the alkaline batteries before each deployment. Replace the internal 9-cell battery pack and the batteries within each external battery pack. For related information, see Maintenance Schedules on page 72.

Replacing the 9-cell battery pack

You need the following tools to replace the 9-cell battery pack:

- Electrostatic discharge (ESD) protection
- Side cutters
- 3 cable ties
- New 9-cell battery pack.

To replace the 9-cell battery pack:

1 Open the AMAR pressure housing as instructed on page 73 and place the top endcap assembly on a grounded anti-static mat.

WARNING Always stop the Recording Schedule and turn off the AMAR before you open the pressure housing or do maintenance activities.

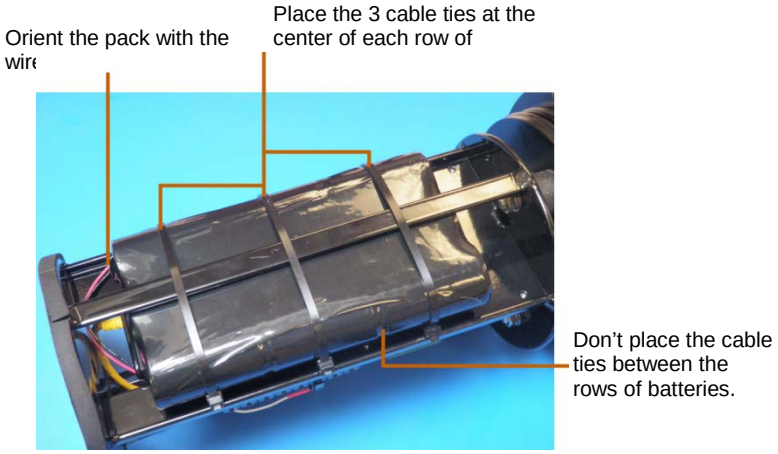
WARNING Use ESD protection when you move or touch the top endcap assembly or the circuit board. A person carrying even a small static charge can severely damage a circuit board by ESD.

2 Disconnect the old battery pack from the AMAR circuit board.

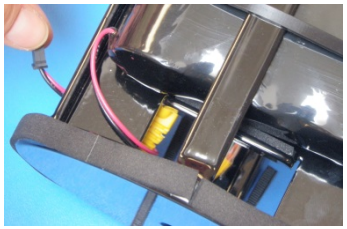
3 Cut the cable ties and remove the old battery pack from the endcap assembly.

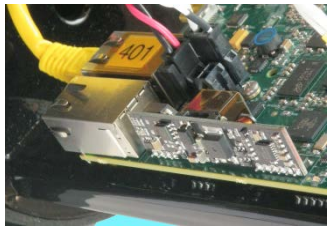
4 With the wires at the bottom, place the new battery pack onto the endcap assembly.

5 With 3 cable ties placed at the center of each row of batteries, secure the battery pack to the assembly. Don’t place the cable ties between the rows of batteries.



6 Run the battery pack wires through the center of the assembly and connect the wires to the power connector on the circuit board.





WARNING Make sure the wires are located where they will not be pinched or damaged when the assembly is put back into the pressure housing cylinder.

7 Put the top endcap assembly into the pressure housing cylinder and close the AMAR pressure housing as instructed on page 76.

You have successfully replaced the 9-cell battery pack of the AMAR.

For related information, see About the top endcap assembly on page 4.

Replacing the batteries in an external battery pack

The batteries in the external battery packs are arranged in *battery cages*. Each battery cage contains 48 alkaline D-cell batteries, arranged in 12 stacks of 4 batteries each. Each external battery pack contains 1, 2, or 3 battery cages.

The negative (−) end of the battery cages is at the top of the top endcap assembly and the positive (+) end is at the bottom.

The batteries are held within a battery cage by 3 removable supports. Each support has a black support bracket and a long stainless steel support bolt. To change the batteries in a battery cage, you need to remove 1 of the supports and loosen the other 2 supports.

✓ **TIP** For optimal performance of the AMAR:

- Replace all the D-cell batteries before each deployment
- Before installation, do a voltage test of each new battery individually to make sure they have the same voltage
- Don't mix new and old batteries
- Use batteries of the same make/model and from the same carton.

You need the following tools to replace and do a voltage test of the batteries in a battery cage:

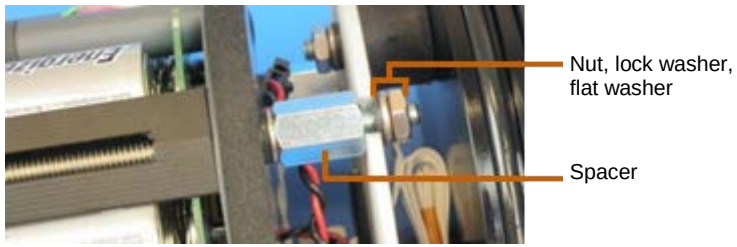
- Electrostatic discharge (ESD) protection
- 48 alkaline D-cell batteries
- 2 × Spanner wrench, 7/16"
- Digital multi-meter.

To replace the batteries in a battery cage:

1 Open the battery pack pressure housing as instructed on page 73 and place the top endcap assembly on its side on a grounded anti-static mat.

2 Remove the top endcap from the battery cage:

a At the top/negative (−) end of the battery cage, remove the nut, lock washer, and flat washer from each of the 3 spacers.

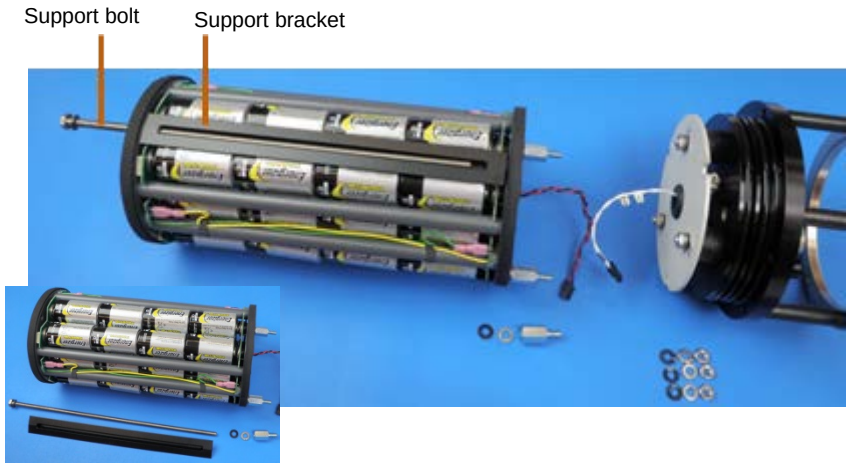


b Separate the top endcap from the battery cage and disconnect the white wire of the top endcap from the red and black wires of the battery cage.

3 Open the battery cage:

a Remove the spacer, lock washer, and flat washer from one of the support bolts of the battery cage.

b At the bottom/positive (+) end of the battery cage, slide out and remove the support bolt and remove the support bracket.



c Loosen slightly the spacers on the other 2 support bolts.

4 Remove all the old batteries.

5 Inspect the battery cage wiring for pinches or nicks, and make sure all glue is holding and all connections are intact.

6 Install 48 new alkaline D-cell batteries into the battery cage, one row at a time, with the positive (+) end of all batteries oriented toward the bottom/positive (+) end of the battery cage. As you install the batteries, make sure the springs on the circuit boards sit squarely against the batteries.

WARNING Do not install batteries backwards or mix them with other battery types. They may explode or leak causing injury or equipment damage. Replace all the batteries at the same time.

7 For the 96-cell and 144-cell battery packs, do Steps 4 through 6 again for the remaining battery cages. Be extra careful to install all batteries oriented the right way because you can't do a voltage test of individual stacks of batteries in the upper battery cages of the 96-cell and 144-cell battery packs.

8 Close the battery cage:

a Re-install the support bracket onto the battery cage and slide in and install the support bolt.

b Loosely install the flat washer, lock washer, and spacer onto the support bolt.

c Tighten evenly the 3 spacers so that the battery plates remain flat and are not bent or deformed.

9 Do a voltage test of each of the 12 stacks of batteries in the battery cage as instructed in the following section.

10 Attach the top endcap to the battery cage:

a Reconnect the white wire of the top endcap to the red and black wires of the battery cage.

WARNING Make sure the wires are located where they will not be pinched or damaged when the assembly is put back into the pressure housing cylinder.

b Attach the top endcap to the battery cage by installing a flat washer, lock washer, and nut onto each of the 3 spacers. Tighten the 3 nuts evenly.

11 Put the top endcap assembly into the pressure housing cylinder and close the battery pack pressure housing. Refer to Closing the pressure housing on page 76.

You have replaced and done a voltage test of the batteries in the battery cage(s) of the external battery pack.

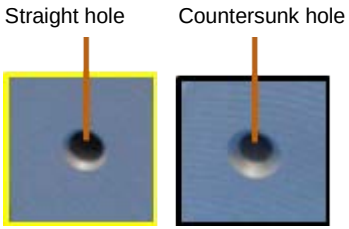
Testing the voltage of an external battery pack

After loading the batteries into a battery cage, you should do a voltage test to make sure all the batteries are oriented correctly and that all electrical contacts are made.

For the 48-cell battery pack, you can measure the voltage of each of the 12 stacks of batteries.

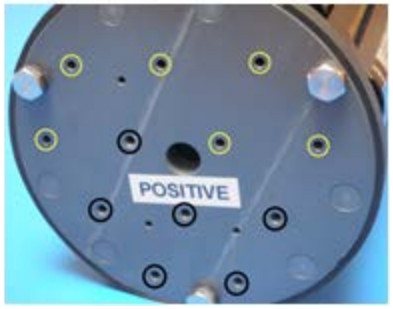
For the 96-cell and 144-cell battery packs, you can measure the voltage of the stacks of batteries only for the bottom battery cage. For the remaining battery cages above, you can only measure the voltage of the entire cage.

The bottom/positive (+) end of the battery cage has 12 test points. Six of the test points are inside straight holes. And six of the test points are inside countersunk holes.



For the 48-cell battery pack and the bottom battery cage of the 96-cell and 144-cell battery packs, to do a voltage test of the stacks of batteries you will measure the voltage between the following test points:

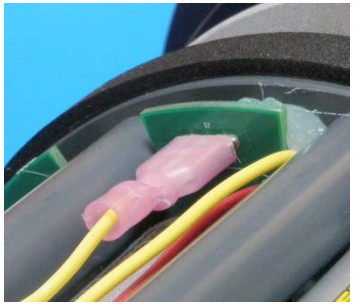
For this terminal on the top/negative (–) battery board:	Measure each of these points on the bottom/positive (+) end of the battery cage:	The expected voltage (V_{DC}) is:
J1 (at the yellow wire)	Test points in straight holes—there are 6	6.4
J2 (at the black wire)	Test points in countersunk holes—there are 6	6.4
J2 (at the black wire)	J6 (at the red wire) on the bottom/positive (+) battery board	12.8



To do a voltage test of a battery cage:

1 For the 48-cell battery pack and the bottom battery cage of the 96-cell and 144-cell battery packs, measure voltage of each stack of batteries in the cage:

a With a digital multi-meter, measure the voltage between the J1 terminal (at the yellow wire) on the top/negative (−) battery board and one of the test points inside a straight hole on the bottom/positive (+) end of the battery cage. Make sure the voltage is approximately 6.4 V_{DC}. If the voltage is less than 5 V_{DC}, one of the batteries in the stack is possibly backward and you must re-install the batteries and do a voltage test again.



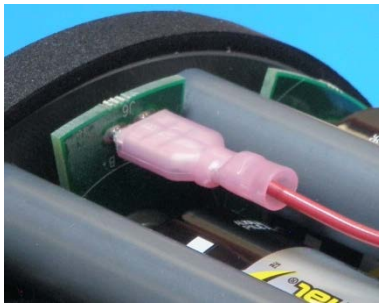
b Do Step 1a again for the 5 remaining test points inside straight holes.

c Measure the voltage between the J2 terminal (at the black wire) on the top/negative (−) battery board and one of the 6 countersunk holes on the bottom/positive (+) end of the battery pack. Make sure the voltage is approximately 6.4 V_{DC}. If the voltage is less than 5 V_{DC}, one of the batteries in the stack is possibly backward and you must re-install the batteries and do a voltage test again.

d Do Step 1c again for the 5 remaining countersunk holes.

2 For all battery cages in the battery pack, do a voltage test of the entire cage:

a Measure the voltage between the J2 terminal (at the black wire) on the top/negative (−) battery board and the J6 terminal (at the red wire) on the bottom/positive (+) battery board. Make sure the voltage is approximately 12.8 V_{DC}. If the voltage is less than 11 V_{DC}, one of the batteries in the stack is possibly backward and you must re-install the batteries and do a voltage test again.



3 Go back to Step 10 of Replacing the batteries in an external battery pack on page 83.

Desiccant pack replacement

The desiccant pack inside the AMAR pressure housing removes excess moisture from the air. This prevents the moisture from condensing onto the circuit board. The desiccant pack is attached to the top endcap assembly, above the 9-cell battery pack, with a cable tie.

WARNING Make sure the desiccant pack is secure. A loose pack can move and possibly compromise the O-ring seal.

When to replace the desiccant pack:

- Before each deployment. For related information, see Maintenance Schedules on page 72.

Firmware upgrades

JASCO provides periodic upgrades to the AMAR firmware as a `.zip` archive file. Updating the firmware can't be done through AMARlink. To upgrade the AMAR firmware, you must access the AMAR's command line through Telnet. And then you must transfer the firmware from your computer to the AMAR through TFTP.

This procedure assumes that you have already successfully connected your computer to the AMAR through AMARlink (and that the AMAR and your computer have IP addresses on the same subnet).

You need the following to upgrade the AMAR firmware:

- TFTP client and server installed and running on your computer (you can download *TFTPd32* or *TFTPd64* from http://tftpd32.jounin.net/)
- Telnet client such as *PuTTY*
- Firmware upgrade file (usually a `.zip` archive file).

To upgrade the AMAR firmware:

✓ **TIP** Before upgrading the firmware, read all the steps of this procedure and contact JASCO if you need assistance. We know this procedure can be difficult. We are developing an easier procedure to upgrade the firmware. When the development is complete, we will upgrade this guide with the new procedure and notify you.

1 Change your computer's IP address so that it's on the same subnet as the AMAR's IP address as instructed on page 15. Record your computer's new IP address.

2 Record the IP address of the AMAR. You will need it to connect to the AMAR through Telnet in Step 8.

✓ **TIP** Before you upgrade the firmware, download and backup your recorded data and then erase the recorded sessions stored on the AMAR.

! **CAUTION** The firmware upgrade may overwrite the Recording Schedule that is currently stored on the AMAR. To prevent losing your Recording Schedule, in AMARlink save the Recording Schedule to the Schedule Library before you upgrade the firmware (see Saving a

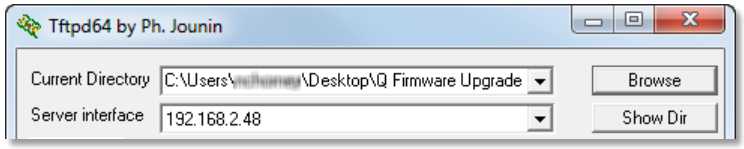
Recording Schedule on page 39). After the firmware upgrade, you can open the saved Schedule and send the Schedule to the AMAR.

3 Unzip the firmware upgrade archive file to a folder on your computer (called the *upgrade folder*). Record the pathname of the upgrade folder.

4 Configure your TFTP client to access the upgrade folder from Step 3. In *TFTPd64* this is done as follows:

a Click **Browse**.

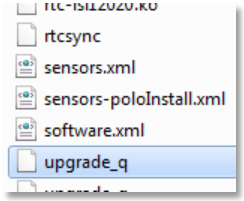
b In the Browse For Folder dialog box, navigate to and select the upgrade folder from Step 3 and click **OK**.



The pathname of the upgrade folder appears in the Current Directory field and your computer's IP address appears in the Server interface field. You have successfully configured the TFTP client.

5 Keep the TFTP client window visible so you can monitor the transfers, but you are done with it for now.

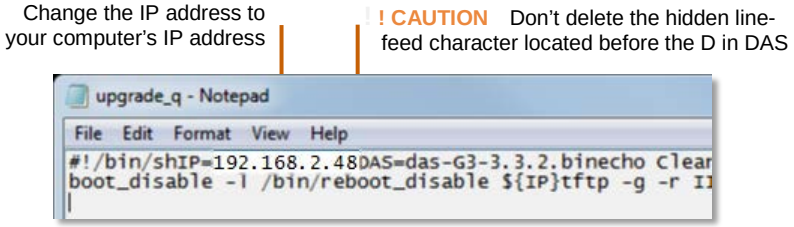
6 In Windows Explorer, open the upgrade folder and identify the upgrade file. The upgrade file is named `upgrade_x`, where *x* is the name of the firmware version. For example, the upgrade file for the 2013.02.25 (Q) firmware release is `upgrade_q`.



7 If the IP address of your computer is NOT 192.168.2.48, then:

a From the upgrade folder, open in a text editor the `upgrade_x` file from Step 6. Use *Notepad* or *Notepad++*. Do not use *WordPad*. *WordPad* adds unwanted carriage-return characters to the file. With these carriage returns, the AMAR can't interpret the file correctly.

b Near the start of the `upgrade_x` file, delete `192.168.2.48` and enter the IP address of your computer.



! **CAUTION** Don't delete the hidden line-feed character that is before the `D` in `DAS`.

c Save and close the `upgrade_x` file.

8 Connect to the AMAR through Telnet, using `root` as the AMAR login and `root` as the password, as instructed in Connecting to the AMAR through Telnet on page 21.

9 Transfer the files in the upgrade folder from your computer to the AMAR through TFTP:

a At the AMAR prompt, change to the root directory of the file system:

```
cd /
```

b Copy the installation script to the AMAR through TFTP:

```
tftp –g –r upgrade_x –l upgrade_x <IP>
```

where *x* is the name of the firmware version from Step 6, and `<IP>` is the IP address of your computer from Step 1. For example:

```
tftp –g –r upgrade_q –l upgrade_q 192.168.2.48
```

10 Execute the upgrade file:

a Make the upgrade file executable:

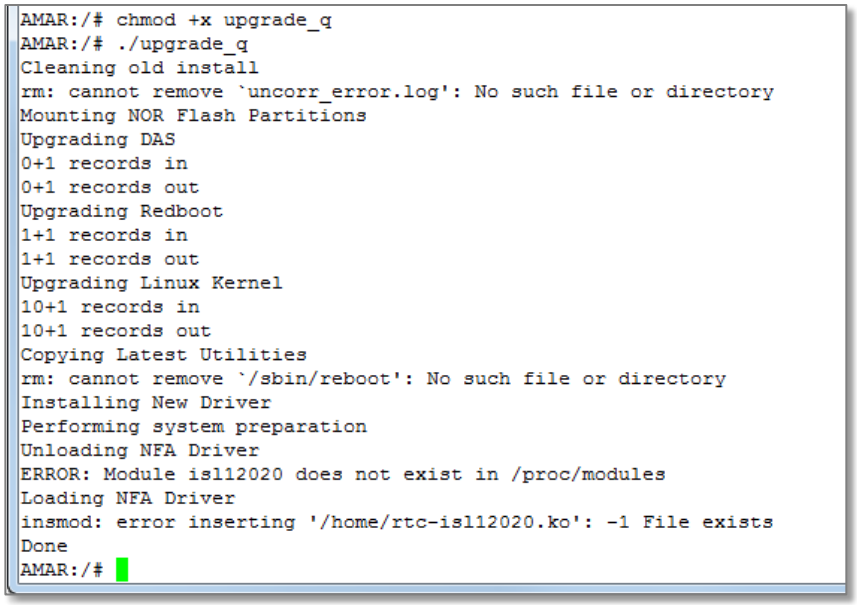
```
chmod +x upgrade_x
```

b Execute the upgrade file:

```
./upgrade_x
```

The upgrade will take 2 or 3 minutes during which time the AMAR will print messages to the *PuTTY* window and transfer the remaining files from the upgrade folder to the AMAR through TFTP. The TFTP client will show the progress of these transfers as they happen.

When the upgrade is complete, the AMAR prints the message “Done” to the *PuTTY* window.



11 Once the upgrade is complete, exit the Telnet connection:

```
exit
```

The Telnet connection to the AMAR exits and the *PuTTY* window closes.

12 Restart the AMAR and check the firmware version:

a Turn off the AMAR.

b Turn on the AMAR and stop the Recording Schedule.

c Connect to the AMAR with AMARlink.

d In AMARlink, on the System Info tab, the Firmware version should match the expected version that you just upgraded to. If it doesn't, contact JASCO for assistance.

You have successfully upgraded the AMAR firmware. The Recording Schedule stored on the AMAR is configured to Sleep indefinitely.

O-ring servicing and inspection

The O-rings are a simple but critical component of the watertight pressure housing. The AMAR has 2 O-rings on each top endcap. The O-rings are installed in seating grooves. The O-rings form a seal against the O-ring surface, which is the inner surface of the pressure housing cylinder.

To remain reliable, O-rings must be serviced regularly, including cleaning, inspection, and lubrication.

The lubricant itself isn't a sealant, but prevents the O-ring from drying out and lets the O-ring stretch and contract freely. Although most silicone-based lubricants are non-toxic, wear gloves when using lubricant or wash your hands afterward to avoid spreading lubricant to other surfaces or persons. Consult the applicable material safety data sheet before you use any lubricants.

When removing an O-ring, don't use sharp metal tools, because sharp edges may damage the O-ring or its seating groove. When you service the O-rings, you must inspect the O-ring seating groove and the O-ring surface for nicks, scratches, deformities, or other damage, which can compromise the watertight seal of the pressure housing. If the O-ring seating grooves or surfaces are damaged, contact JASCO for assistance.

You need the following tools to service the O-rings:

- Electrostatic discharge (ESD) protection
- Cleaning solution: mixture of dish soap and water
- Fibreless wipe/cloth (e.g., *Kimberly-Clark Kimwipes*)
- Lint-free swab
- Silicone-based lubricant (e.g., *Parker Super O-Lube*)
- Vinyl or latex gloves.

When to replace the O-rings:

- Every 2 years, or sooner if the O-rings are damaged or worn. For related information, see Maintenance Schedules on page 72.

To service an O-ring:

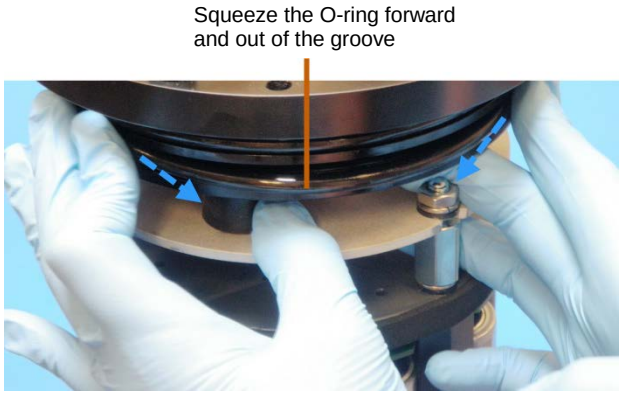
1 Open the AMAR pressure housing as instructed on page 73 and place the top endcap assembly on a grounded anti-static mat.

WARNING Always stop the Recording Schedule and turn off the AMAR before you open the pressure housing or do maintenance activities.

WARNING Use ESD protection when you move or touch the top endcap assembly or the circuit board. A person carrying even a small static charge can severely damage a circuit board by ESD.

2 (*Optional*) Remove the endcap from the endcap assembly to access the O-rings more easily (this is not pictured).

3 With gloved hands, squeeze the O-ring forward until the O-ring extends from the seating groove and you can hold it.



4 Remove the O-ring from the endcap assembly.

5 Clean the O-ring with the cleaning solution and fibreless wipe.

6 Inspect the clean O-ring for nicks, cracks, or other damage. If damaged, replace with an identical O-ring and return to Step 2.

7 Clean the O-ring seating groove and O-ring surface with the cleaning solution and lint-free swab.

8 Visually inspect the O-ring seating groove and the O-ring surface for nicks, scratches, deformities, or other damage. If the O-ring seating grooves or surfaces are damaged, contact JASCO for assistance.

9 With gloved hands, place a small drop of lubricant between your thumb and index finger.

10 Pull the O-ring between your fingers to spread the lubricant lightly and evenly over the entire O-ring surface. Only a light coating is required, just enough that the O-ring is shiny. Meanwhile, visually and tactilely inspect the O-ring for damage (nicks, splitting, etc.) and replace the O-ring if necessary.

WARNING Do not over-lubricate the O-rings. Excess lubricant can attract debris and compromise the seal.

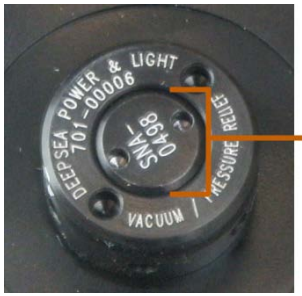
11 Re-install the O-ring into the O-ring seating groove. Run your finger around the O-ring to make sure the ring is installed evenly within the groove.

You have successfully serviced and inspected the O-rings.

Pressure relief valve (PRV) maintenance

Each pressure housing is fitted with a Pressure Relief Valve (PRV, DeepSea Power & Light) on one of the endcaps. The PRV is on the bottom endcap of the AMAR and on the top endcap of the battery packs. This section includes excerpts from the PRV User Manual by DeepSea Power & Light (www.deepsea.com/prv2.php).

The PRV is a one-way air valve that lets pressurized gases vent from the pressure housing. After an AMAR pressure housing is deployed and retrieved, the PRV prevents dangerous pressure build-up within the housing by venting pressurized gasses.



Core of the PRV

Inspecting and servicing the pressure relief valve

When to inspect and service the PRV:

- Before each deployment. For related information, see Maintenance Schedules on page 72.

To inspect and service the PRV:

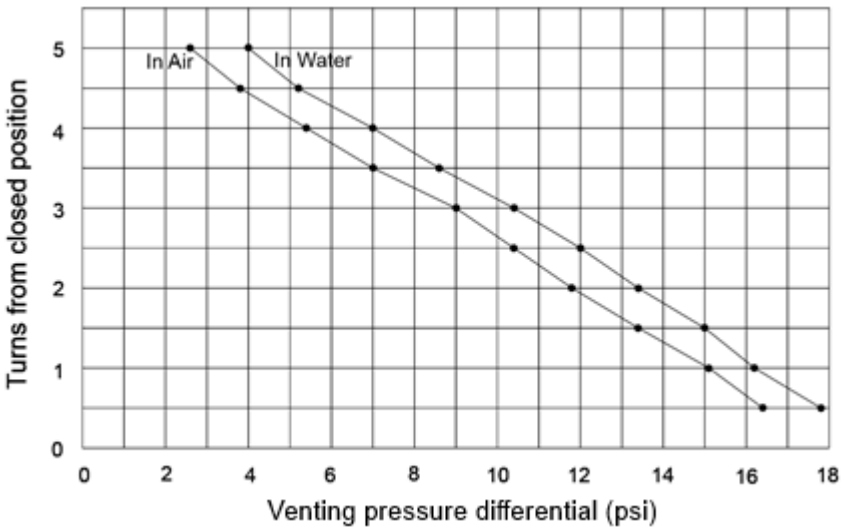
1. By hand with the PRV tool (placed within a 3/8” socket if desired), gently turn the PRV core counter-clockwise and remove the core from the PRV.
2. Visually inspect the following for damage or debris:
   - **a** Inside the PRV.
   - **b** The O-ring inside the PRV.
   - **c** The O-ring surface on the PRV core.
3. Remove any debris with a lint-free swab.
4. Replace the O-ring if it is damaged.
5. Make sure the O-ring is properly lubricated.

The PRV tool inside a 3/8” socket

For more information about O-rings, see O-ring servicing and inspection on page 93.

Setting the venting pressure of the pressure relief valve

The venting pressure of the PRV (i.e., the pressure differential at which the PRV will vent) is set by the number of turns made to the PRV core away from the closed position. The pressure differential at which the PRV will vent is shown at right as a function of the number of counter-clockwise turns away from the closed position of the PRV core. Note, 1 psi = 6.895 kPa. The factory setting of the PRV is 4.5 turns for a venting pressure of approximately 27 kPa (approximately 4 psi).



The pressure differential at which the Pressure Release Valve will vent, in air and in water, as functions of the number of turns away from closed of the PRV core (www.deepsea.com/pdf/manual/Manual_PRV.pdf).

CAUTION If the venting of internal pressure includes debris (silica gel particles, metal shavings, battery chemicals, etc.) the PRV may fail in one of two ways:

- Debris may clog the PRV and prevent the PRV from venting
- Debris may prevent the PRV from resealing when the venting of excess pressure stops.

When to set the PRV venting pressure:

- Before each deployment. For related information, see Maintenance Schedules on page 72.

To set the PRV venting pressure:

1 By hand with the PRV tool (placed within a 3/8” socket if desired), install the PRV core and gently turn the core clockwise to full stop. Do not overtighten the core.

The PRV tool inside a 3/8” socket

2 Refer to the Venting Pressure Chart above to correlate the number of turns to the desired setting in pounds per square inch (psi). Refer to Curve 1 for in air settings and Curve 2 for in water settings.

3 Slowly turn the PRV core counter-clockwise the appropriate number of turns to achieve the desired cracking pressure setting.

NOTE The factory default setting of the PRV is four and a half (4.5) turns from the closed position. With this setting, the PRV will vent at a pressure differential of approximately 27 kPa (4 psi) in air and 35 kPa (5 psi) in water.

You have set the venting pressure of the PRV. If the pressure inside the housing exceeds the ambient pressure outside the housing by more than the venting pressure differential, the pressurized gas will vent through the PRV.

RTC backup battery replacement

When the AMAR isn't connected to a battery pack or to external (AC) power, the RTC draws power from a lithium coin cell backup battery installed on the internal circuit board.

You need the following items to replace the RTC backup battery:

- Electrostatic discharge (ESD) protection
- 3 V lithium coin cell battery, size CR2032
- Soft, non-conductive tool (like the end of a small cable-tie).

When to replace the RTC backup battery:

- Every 2 years. For related information, see Maintenance Schedules on page 72.

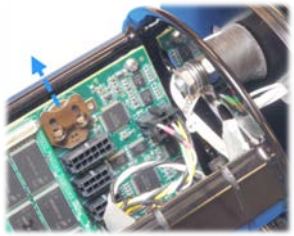
To replace the RTC backup battery:

1 Open the AMAR pressure housing as instructed on page 73 and place the top endcap assembly on a grounded anti-static mat.

WARNING Always stop the Recording Schedule and turn off the AMAR before you open the pressure housing or do maintenance activities.

WARNING Use ESD protection when you move or touch the top endcap assembly or the circuit board. A person carrying even a small static charge can severely damage a circuit board by ESD.

2 Use a soft, non-conductive instrument to remove the lithium coin cell battery from the circuit board.



3 Install the new lithium battery cell onto the circuit board.

4 Put the top endcap assembly into the pressure housing cylinder and close the AMAR pressure housing as instructed on page 76.

5 Turn on the AMAR, and with AMARlink set the time of the AMAR to the current date and time as instructed on page 47.

You have successfully replaced the RTC backup battery.

Underwater connector servicing

The endcaps of the pressure housings for the AMAR and battery packs are fitted with underwater bulkhead connectors that connect to the Comms Box, the Activation Plug, a hydrophone or other sensors, external battery packs, or the AC power adapter. These underwater connectors seal the individual pins to provide safe connection and disconnection in wet conditions. When not in use, these connectors on the endcaps are protected by mating dummy plugs.

To make sure a proper seal, minimize wear, and maximize lifetime, all male and female underwater connectors on the AMAR or its accessories should be serviced periodically. This includes the connectors on the following:

- ☐ All endcaps
- ☐ Hydrophone or other sensors
- ☐ Comms Box
- ☐ Activation Plug
- ☐ Dummy plugs
- ☐ AC power adapter
- ☐ Battery pack cables.

When to service the underwater connectors:

- Before each deployment. For related information, see Maintenance Schedules on page 72.

To service the underwater connectors:

- On first use and anytime the rubber sealing surfaces appear dry, apply dielectric grease to the male and female connectors (*Dow Corning 4 Electrical Insulating Compound* is recommended)
- Make sure the connectors are free of dirt and excess grease.

CAUTION Wear gloves when you use dielectric greases to avoid contamination of other surfaces or persons. Always consult the Material Safety Data Sheet (MSDS) before using any chemical product such as dielectric grease.

Visual Inspection

Before each deployment of an AMAR and any external battery packs, visually inspect all the external components of the pressure housings for wear, corrosion, or damage and replace them if necessary. These components include but are not limited to:

- ☐ Pressure housing
- ☐ Pressure relief valve (PRV)
- ☐ Anodes
- ☐ Hydrophone cage
- ☐ Handling ring
- ☐ Hardware: Nuts, bolts, washers, nylon washers, etc.
- ☐ Cables of hydrophone or other sensors
- ☐ Activation Plug
- ☐ Dummy plugs
- ☐ Tethers that secure dummy plugs, hydrophones, or the Activation Plug.

For related information, see Maintenance Schedules on page 72.

8. Troubleshooting

Connection and status problems

Problems connecting with an AMAR usually stem from settings on your computer, and not from the AMAR itself.

Symptom	Problem	Solution	Refer to
Can't connect to AMAR within AMARlink	The IP address of your computer is not be within the same subnet (192.168.2.x) as the IP address of the AMAR (192.168.2.1).	Change your computer's IP address to a unique IP address that is on the same subnet as the AMAR's IP address.	Changing your computer's IP address on page 15 or consult your IT department.
	The IP address of your Computer is the same as the IP address of the AMAR	Change your computer's IP address to an IP address that is on the same subnet as the AMAR's IP address and that is different than the AMAR's IP address.	Changing your computer's IP address on page 15 or consult your IT department.
AMAR appears offline within AMARlink	Your Interface Computer and AMAR are not connected through the Comms Box.	Check that all connections to the Comms Box are secure.	Turning on the AMAR on page 8.
	The AMAR is turned off.	Turn on the AMAR, by installing the Activation Plug, and stop the Recording Schedule.	Turning on the AMAR on page 8.
	The network connection needs to be refreshed.	Disable and re-enable the Local Area Connection of your computer.	n/a
Both LEDs on the Comms Box are off unexpectedly	The Comms Box isn't fully connected to the AMAR.	Disconnect and re-connect the Comms Box from the AMAR. Make sure the Comms Box is plugged in all the way.	Turning on the AMAR on page 8.
	The batteries are depleted so the AMAR is off.	Stop the Recording Schedule and turn off the AMAR. Connect the AMAR to stable external (AC) power before turning on the AMAR again.	Turning off the AMAR on page 11 and Powering with external (AC) power on page 12.

Symptom	Problem	Solution	Refer to
PuTTY window closes when you try to connect to the AMAR through Telnet	The AMAR is off.	Turn on the AMAR, stop the Recording Schedule, and then try to connect again.	Turning on the AMAR on page 8.
	The AMAR isn't connected to your computer.	Disconnect and re-connect all connections between the computer, the Ethernet cable, the Comms Box, and the AMAR. Then try to connect to the AMAR through Telnet again.	Connecting to the AMAR with AMARlink on page 18.
	The IP address you entered for the AMAR is wrong.	In the PuTTY Configuration window, make sure the IP address entered in the Host Name field matches the IP address of your AMAR.	Step 7 in Connecting to the AMAR through Telnet on page 21.
	Your computer's IP address and the AMAR's IP address are on different subnets.	Change the IP address of your computer to be on the same subnet as the AMAR's IP address.	Changing your computer's IP address on page 15.

Configuration Problems

Symptom	Problem	Solution	Refer to
Sensor is missing from the Record Entry Configuration dialog box	AMARlink was not correctly configured for the AMAR. Because the AMAR can be customized to work with different sensors, AMARlink must also be customized to be able to configure those sensors.	If this is the first time you are connecting to an AMAR with a new sensor and that sensor is missing from the Record Entry Configuration dialog box of AMARlink, then contact JASCO for assistance.	Customer support on page iii.

9. Glossary

AC alternating current. E.g., provided by a wall power outlet.

Activation Plug An undersea connector plug that is the on/off switch of the AMAR. A male plug with 3 pins and labelled with a red band.

Activity Operational state of the AMAR for a given Entry in the Recording Schedule—either Record or Sleep.

ADC analog to digital converter. Converts the analog signal from a sensor, like a hydrophone, to a digital signal to be recorded.

AMAR Autonomous Multichannel Acoustic Recorder.

AMARlink Software for using the AMAR, provided on a CD.

anode A sacrificial piece of zinc that will corrode before the metal it is touching.

b bit. Basic unit of digital information.

B byte. Unit of digital information equal to 8 bits (1 B = 8 b).

battery cage A mechanical apparatus that holds 48 alkaline D-cell batteries, arranged in 12 stacks of 4 batteries each. Each external battery pack contains 1, 2, or 3 battery cages.

battery pack, 9-cell A pre-packaged, shrink-wrapped pack of 9 alkaline D-cell batteries arranged 3 by 3. Attaches to the top endcap assembly of the AMAR to power the AMAR.

battery pack, external Has a top endcap and 1, 2, or 3 battery cages. Has its own pressure housing.

Comms Box A communications/control box that connects your Interface Computer to the AMAR. The Comms Box has LEDs and a STOP button. The LEDs come on to show the status of the AMAR. Press and hold the STOP button for 2 seconds to stop the AMAR Recording Schedule.

Computer Your laptop or personal computer that meets the Minimum system requirements on page 2.

CSV comma separated values. A CSV file is a text file. The lines in the text file have data values that are separated by commas. You can view CSV file in a text viewer like *Notepad* or in a spreadsheet application like *MS Excel*.

DC direct current. Power supplied by a battery is direct current.

dummy plug Dummy plugs are included with the AMAR to protect the connectors on the top endcap during deployment and storage. The dummy plugs are identified by coloured bands:

- The yellow dummy plug is for the Comms connector. The plug is female with 8 pins.
- The green dummy plug is for the Activation connector. The plug is male with 3 pins.

See also Activation Plug.

Duration Property of an Entry in the Recording Schedule. Specifies how long the Entry will execute for.

duty-cycled A Recording Schedule is said to be duty-cycled if the AMAR records for some of the time and sleeps for the rest of the time. For example, you could have the AMAR record for 15 min of every hour and sleep for the remaining 45 min of every hour. Use a duty-cycled recording Schedule to extend the deployment lifetime of the AMAR. *See also* session-cycled.

Entry *See* Record Entry; Sleep Entry.

ESD Electrostatic discharge. A sudden flow of electric current between two objects caused by electrical shorting, dielectric breakdown, or contact between two objects with different charges. A person carrying even a small static charge can severely damage a circuit board by ESD.

ESD protection Tools employed at a workstation to prevent ESD to sensitive electronics, including circuit boards. For example, grounded anti-static mats, grounded conductive wrist straps.

G3 Generation three.

GiB gibibyte. 1 GiB = 1024^3 bytes. Equal to the binary definition of the gigabyte (GB) as opposed to the decimal definition of 1000^3 bytes.

Initiation Date/Time Property of a Recording Schedule. The (optional) date and time when the Recording Schedule will begin, provided the AMAR is turned on.

IP Internet Protocol.

LED light-emitting diode. The Comms Box has 2 LEDs that come on to indicate the status of the AMAR.

MiB mebibyte. 1 MiB = 1024^2 bytes. Equal to the binary definition of the megabyte (MB) as opposed to the decimal definition of 1000^2 bytes.

Memory Module Solid-state flash memory component on the AMAR internal circuit board, measuring approximately 10 cm × 5 cm, with 256 GiB of storage memory for storing the recorded data.

O-ring seating groove Groove within a top or bottom endcap that holds an O-ring.

O-ring surface Inner surface of a pressure housing cylinder against which the O-rings of an endcap touch and form a watertight seal when the pressure housing is closed.

Pressure Relief Valve (PRV) The one-way purge valve on the top endcap of the AMAR that prevents pressure from building-up inside the AMAR pressure housing.

Record Configuration *See* Record Entry Configuration.

Record Entry Configuration Property of a Record Entry. Specifies how data will be recorded during that Record Entry—which channels are enabled and the recording options of each channel.

Record Entry An Entry in the Recording Schedule during which the AMAR will record. Has a specified duration and Record Configuration.

Recording Schedule Specifies how the AMAR will record data. Has an optional Initiation Date/Time and one or more Entries. *See also* Entry.

Recorded Session The data resulting from each execution of a Record Entry.

RTC real-time clock. The internal clock of the AMAR. The RTC is always set to Coordinated Universal Time (UTC), not local time.

Schedule *See* Recording Schedule.

Schedule Library The library within AMARlink where you can save Recording Schedules to be used again later.

Session *See* Recorded Session.

session cycled A Recording Schedule is said to be session-cycled if the AMAR records with one Record Configuration for some of the time and another Record Configuration for some or all of the remaining time. For example, you could have the AMAR record for 15 min of every hour at 64 kHz and record for the remaining 45 min of every hour at 32 kHz (the latter configuration consumes less power and storage memory). Use a session-cycled recording Schedule to extend the deployment lifetime of the AMAR. *See also* duty-cycled.

Sleep Operational Activity of the AMAR during which the AMAR is in a low-power state and does not record data.

Sleep Entry An Entry in the Recording Schedule during which the AMAR will sleep. Has a specified duration. *See also* Sleep.

S/N serial number.

Status pane The leftmost panel of the AMARlink window where you choose which AMAR you want to work with.

TFTP Trivial File Transfer Protocol.

UPS uninterruptible power supply (UPS). An electrical appliance that provides backup battery power when the input power source, usually a wall power outlet, fails.

UTC Coordinated Universal Time.

WAV Waveform Audio File Format.