

Sample Only
For a complete AMAR user manual,
contact support@jasco.com

AMAR G4 ACE User Manual

**Autonomous Multichannel Acoustic Recorder G4 Acetal Housing
Operation and Maintenance Instructions**

AMARlink 4.4.3

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About this manual

Thank you for purchasing an AMAR G4 (Autonomous Multichannel Acoustic Recorder Generation 4) manufactured by JASCO Applied Sciences. This manual instructs how to use the AMAR and its software, AMARlink.

✓ **TIP** Read this manual before using the AMAR.

Technical Support

If you have questions or feedback about the AMAR or this user manual, contact JASCO Technical Support:

@ Email: support@jasco.com (or go to www.jasco.com/support)

Or, contact your JASCO customer representative or the JASCO head office:

☎ Phone: +1-902-405-3336 (Monday to Friday, 9:00–17:00 Atlantic Time)







📠 Fax: +1-902-405-3337



✉ Mail: JASCO Applied Sciences
202–32 Troop Avenue
Dartmouth, NS B3B 1Z1
Canada


1 Getting started


Minimum system requirements

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

- Operating system:
 -  Windows 7 or 10 with Java Runtime Environment (64-bit version if running on a 64-bit operating system, 32-bit version otherwise)
 -  Linux/Unix—AMARlink has been tested and qualified with Ubuntu 12.04 with java 1.7.0_45
- 4 GB RAM
- 100BASE-T Ethernet Interface
-  2 GB hard disk space
-  Wi-Fi network adapter
-  External storage devices with sufficient capacity for recorded data
-  Devices for transferring data from the SD memory cards to external storage (via USB 3.0 is recommended).

 **NOTE**  You must install Java before installing AMARlink. Go to <https://java.com/download> to download and install the latest version of Java.

 **TIP** For fast, easy data transfers contact JASCO to learn about our Data Transfer System, which can simultaneously transfer 10 memory cards to 2 hard drives at fast transfer speeds.

 **NOTE** With the AMAR G4, you must use AMARlink version 4.4.3 or higher.

AMAR overview

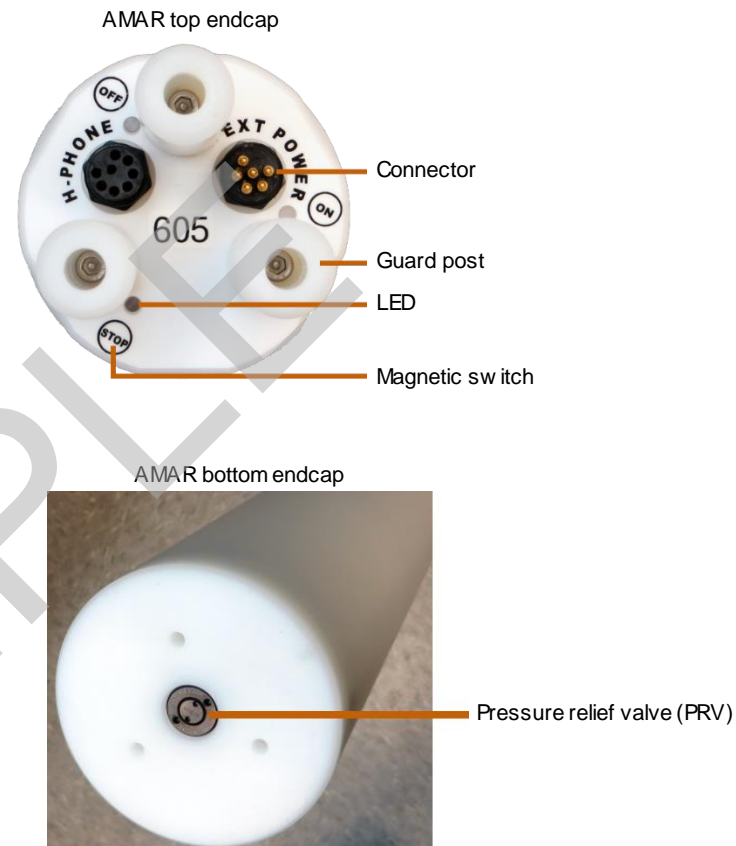
The Autonomous Multichannel Acoustic Recorder (AMAR) is a fully autonomous underwater sound and data recorder. The AMAR has data acquisition electronics in a watertight pressure housing.

The pressure housing consists of a top endcap, a pressure housing cylinder, and a bottom endcap.

The top endcap has:

- Underwater connectors:
 - External Power Connector: connects to the AC power adapter or an External Battery Pack
 - Hydrophone Connector: connects to the hydrophone
 - (*Optional*) Additional connectors for other sensors (not shown)
- Three guard posts to protect the connectors
- Three status LEDs, one next to each post, described on page 4
- Three magnetic switches (ON, OFF, and STOP) positioned around the top endcap, described on page 3.

The bottom endcap has a pressure relief valve (PRV) described on page 31. Also, hydrogen combiner pellets have been permanently installed inside the bottom endcap. These combiner pellets mitigate the risk of hydrogen buildup inside the pressure housing in the event that the alkaline batteries off-gas or rupture inside the sealed housing. See www.vacuumenergyinc.com/batteries for more information.



About the magnetic switches

The AMAR has three magnetic switches: ON, OFF, and STOP. These switches are located along the outside rim of the top endcap and are labelled accordingly. To activate a switch, hold a magnet against the switch for at least 3 seconds.

A relatively strong magnet is required to activate the magnetic switches. Not all magnets will work. A sufficiently strong magnet is provided with the AMAR.

About the dummy plugs

The dummy plugs are underwater connector plugs that protect the underwater connectors when they are not in use. Each dummy plug connects to its matching underwater connector on the AMAR. Always install dummy plugs onto the connectors when they are not in use.

For related information, see [Using the underwater connectors](#) on page 33.

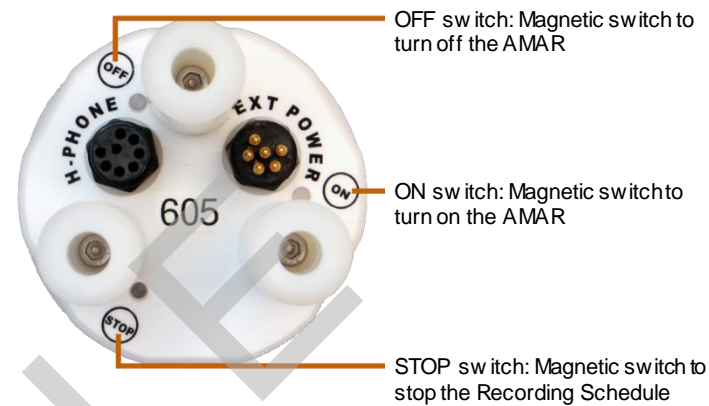
About the AMAR memory

The AMAR G4 saves the recorded data to SD memory cards. You can use between 1 and 20 cards of varying capacities (32, 128, 512 GB, etc.) to suit your requirements. Using twenty 512 GB cards gives a total physical memory capacity of 10 TB (i.e., 10 240 GB).

The AMAR G4 captures a lot of data very quickly, and not all SD cards have sufficiently high write speeds for use with the AMAR G4. Only the SD cards supplied by JASCO have been thoroughly tested for speed and reliability with the AMAR G4. Also, the cards must be formatted in a specific way. So only use the memory cards supplied by JASCO with your AMAR.

For related information, see:

- [How long does it take to transfer data?](#) on page 41
- [Memory card removal and installation](#) on page 50.



About the LEDs on the AMAR

There are 3 status LEDs on the top endcap of the AMAR. When the AMAR is powered on, these LEDs come on to indicate the status of the AMAR:

- Blue LED: AMAR is powered on.
- Red (and blue) LED: AMAR is recording.
- Green (and blue) LED: AMAR is sleeping.
- All 3 LEDs: AMAR is stopped (and ready to connect with AMARlink).

After the AMAR has been powered on for 10 minutes, the LEDs go off to conserve power.

To re-activate the LEDs to check the AMAR's status:

- Hold the magnet over the ON switch for at least 3 seconds.

The LEDs come on to indicate the status of the AMAR as described above.

After the AMAR has been powered on for 10 minutes, the LEDs go off again to conserve power.

NOTE While the AMAR is executing the Recording Schedule, if the batteries become (nearly) depleted or the memory becomes full, the AMAR will stop the Recording Schedule and go to sleep.



If the LEDs look like this:	The AMAR is:
	Turning on
	Recording
	Sleeping
	Stopped
	Off, or has been powered on for more than 10 minutes and the LEDs went off

About the External Battery Packs

Each External Battery Pack contains 50 C-cell alkaline batteries. You connect the POWER OUT connector of the Battery Pack to the EXT POWER connector of the AMAR. Several External Battery Packs can be daisy-chained together by connecting the POWER IN connector of one pack to the POWER OUT connector of another pack.

Turning on the AMAR and starting a recording

The AMAR is designed to automatically start recording data after it's turned on, without a separate command to "start" a recording. So once you have configured the AMAR appropriately, you just turn on the AMAR to start recording. If you want to work with the AMAR without recording data, turn on the AMAR as instructed here and then immediately stop the Recording Schedule as instructed in the next section.

To turn on the AMAR:

- Hold the magnet over the ON switch for at least 3 seconds.

The blue LED comes on as the AMAR powers up. Then the green LED comes on as the AMAR sleeps for up to 15 seconds.

After the ~15 seconds of sleep, the AMAR initiates the Recording Schedule. The blue LED stays on, and the red or green LED comes on to indicate the status of the AMAR as described on page 4.

When the AMAR is powered on and recording, the LEDs turn off after 10 minutes to conserve power.



Stopping the Recording Schedule

After you turn on the AMAR, you can stop the Recording Schedule at any time. You must stop the Schedule if you want to connect to the AMAR with AMARlink.

To stop the AMAR Recording Schedule:

- Hold the magnet over the STOP switch for at least 3 seconds.

The red LED goes off, and the green LED comes on and goes off while the Recording Schedule is stopping.

When all three LEDs have come on, the Schedule is stopped, and you can now connect to the AMAR with AMARlink.

- NOTE** When the AMAR is powered on and stopped, it uses a lot of power. If left in this state for a long time, it may drain the batteries.



Turning off the AMAR

To turn off the AMAR:

- Hold the magnet over the OFF switch for at least 3 seconds.

(If applicable) The blue LED flashes while the AMAR stops the Recording Schedule.

The AMAR turns off, and all the LEDs on the AMAR go off.

(If applicable) Wait at least 5 seconds for the AMAR to power down completely before turning it on again.



Connecting to external AC power

A 15 W AC power adapter is included with the AMAR to connect the AMAR to an external AC power outlet. The AC power adapter connects to the External Power Connector on the AMAR. When connecting the AMAR to external AC power, use only the supplied power adaptor. When the External Power Connector is not in use, install the dummy plug to protect the connector.

- ✓ **TIP** If using possibly unstable AC power (e.g., from a vessel or generator), you must use an uninterruptible power supply (UPS) between the AMAR power adapter and the AC power outlet.

When to use external AC power:

- When erasing data
- When upgrading the AMAR firmware
- When the batteries are depleted, and you want to connect to the AMAR with AMARlink
- When you want to conserve battery power while you configure the AMAR
- When working with the AMAR for long periods.

- ⓘ **NOTE** When the AMAR is connected to both an internal battery and to AC power, the AMAR will consume some power from the internal battery first.



Power adapter with interchangeable AC clips

2 Configuring the AMAR and using AMARlink

AMARlink overview

AMARlink is the software that accompanies the AMAR. With AMARlink, you can configure the AMAR and download small amounts of data.

The screenshot shows the AMARlink application window with several annotated parts:

- Menus:** Do common tasks. (Points to the File and Help menus)
- Toolbar:** Buttons to add a new AMAR and to sort the AMARs in the Status pane. (Points to the toolbar icons)
- AMAR options menu:** Right-click an AMAR icon for options. (Points to a context menu for the 'Ringo' AMAR icon, listing: Rename, Refresh, Disconnect, Delete)
- Status pane:** Select the AMAR you want to work with. (Points to the 'Ringo' AMAR icon)
- Tabs:** Work with the AMAR that you select in the Status pane. (Points to the 'View Schedule', 'Edit Schedule', 'Download Data', and 'System Info' tabs)

The main interface displays the following information:

- View Schedule:** Edit Schedule | Download Data | System Info
- Schedule Initiation:** Schedule will start on 2015 Oct 21 at 07:28:00
- Recording Schedule:**

Activity	Duration
Record	3600 s

Total Duration: 3600 s
- Estimated Lifetimes:**
 - Battery 1: 48 Cell
 - Battery 2: None
 - Battery lifetime: 69d
 - Memory lifetime: 656d 9h
- Configuration of selected Record Entry:**

Channel	Sensor	Sample rate	Input	Gain

3 Deploying and retrieving the AMAR

Checklist for transporting and storing AMAR equipment

Before transporting or storing the AMAR or related equipment (including External Battery Packs, and batteries), always do the following. The page numbers of the applicable instructions are given in parenthesis.

- Turn off the AMAR (p6)
- Install dummy plugs on all unused connectors
- Open the PRV, and make sure the pressure is released (p31)
- Close the pressure housing to protect the O-rings from damage and debris (p49)
- Follow all guidelines in [Storing, transporting and handling the AMAR and related equipment](#) on page 28, including:
 - Keep the internal temperature of pressure housings between -18 and $+55$ °C ($20-22$ °C optimally):
 - Do not store the units at temperatures higher than 55 °C or lower than -18 °C
 - Do not expose the units to direct sunlight
 - Use controls during storage and transport (especially in hot climates) to make sure the temperature inside the housings is always between -18 and $+55$ °C ($20-22$ °C optimally)
 - For optimal battery life, store equipment and batteries in a dry place at normal room temperature
 - Before storing equipment long term, remove all alkaline batteries.

4 Downloading, transferring, and erasing data

How to get your data off the AMAR

There are two ways to retrieve data from the AMAR:

- **To retrieve large amounts of data:** remove the memory cards from the AMAR as instructed on page 50 and use your computer to transfer the data to one or more external storage devices. If your computer doesn't have a built-in SD card slot, then we recommend one or more SD-to-USB 3.0 card readers. To store the data, we recommend using 3 TB SATA drives, each of which can fit five 512 GB memory cards worth of data.

For fast, easy data transfers contact JASCO to learn about our Data Transfer System, which can simultaneously transfer 10 memory cards to 2 hard drives at fast transfer speeds.

- **To retrieve small amounts of data:** download individual files with AMARlink as instructed on page 43.

- ! **CAUTION** In the unlikely event that a memory card is corrupted, do not use the Windows data recovery or formatting tools, as some data may be lost. Instead, contact JASCO [Technical Support](#) for assistance in recovering your data.

How long does it take to transfer data?

The AMAR can store a lot of data. A full set of twenty 512 GB memory cards holds 10 TB (equal to 10240 GB!). Transferring this much data can take a long time. For example, transferring one 512 GB memory card takes about 1.6 h. So

5 Maintaining and servicing the AMAR

Opening the pressure housing

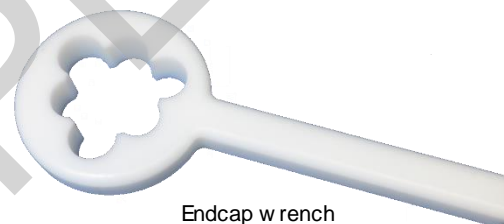
You open the pressure housing of an AMAR G4 or External Battery Pack by unscrewing and removing the top endcap assembly from the pressure housing cylinder. Make sure the housing is dry before you open it.

The following items are necessary to open the pressure housing of an AMAR or External Battery Pack:

- Electrostatic discharge (ESD) protection
- Endcap wrench (provided with your AMAR).

To open a pressure housing:

- 1 If the housing has been deployed since it was last opened, you must complete the Safe Handling Procedure in [Safely handling the AMAR and External Battery Packs after retrieval](#) starting on page 36.
- ! **WARNING** You must complete the Safe Handling Procedure starting on page 36 for each pressure housing before opening it.
- 2 If the AMAR is on, turn off the AMAR as instructed on page 6.
- 3 If the pressure housing contains alkaline batteries, move the AMAR to a suitable workspace:
 - No ignition sources present (e.g., lit cigarettes, naked lights, open flames, static charges, and spark-causing equipment including portable power tools).
 - A clean, dry, and well-ventilated area



Endcap w rench

Glossary

AC alternating current. For example, from a wall power outlet.

AMAR Autonomous Multichannel Acoustic Recorder.

AMARlink Software for using the AMAR.

computer Your laptop or personal computer that meets the [Minimum system requirements](#) on page 1.

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 *Microsoft Excel*.

d days.

dB decibel. A logarithmic unit.

DC direct current.

Download Manager A tool in AMARlink that shows a chronological list of your data downloads and lets you work with them.

dummy plug An underwater connector plug that protects an underwater connector when not in use.

endcap wrench

Entry A Recording Schedule has one or more Entries. Each Entry consists of an activity (record or sleep) and a duration (in seconds). Record Entries also have a Record Entry Configuration. See *also* Record Entry, Recording Schedule, 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. See *also* ESD protection.

ESD protection Tools used to prevent ESD to sensitive electronics, like circuit boards. E.g., grounded anti-static mats and grounded, conductive wrist straps.

G4 Generation four.

GB gibibyte. 1 GB = 1024³ bytes. Equal to the binary definition of the gigabyte and not the decimal definition of 1000³ bytes.

h hours.

Hz hertz. Basic unit of frequency. Equal to 1 cycle per second.

internal battery A battery pack containing 10 alkaline C-cells that is installed inside the AMAR pressure housing on the bottom of the top endcap assembly.

IP Internet Protocol. A communications protocol that allows internetworking of devices.

KB kibibyte. 1 KB = 1024 bytes. Equal to the binary definition of the kilobyte and not the decimal definition of 1000 bytes.

KB/s kibibytes per second. Unit of rate of data transfer or throughput.

LED light-emitting diode.

MB mebibyte. 1 MB = 1024² bytes. Equal to the binary definition of the megabyte and not the decimal definition of 1000² bytes.

memory card An SD memory card with sufficient read/write speed and with appropriate formatting to work with the AMAR G4.

memory retaining rod A small threaded rod that runs through the memory card circuit boards and is intended to prevent the cards from popping out of their slots when the AMAR is subjected to shock or vibration.

O-ring seating groove Groove in a top endcap that holds an O-ring.