Naval Information Warfare Center PACIFIC

SEAVISION

Automatic Identification System (AIS) Demo

Instructor Information Sheet 1.0

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AIS Hardware Demo Learning Objectives

Upon successful completion of this lesson, the student will be able to:

- Become familiar with hardware components of a commercial AIS system
- Receive hands-on experience operating AIS units on the following topics:
  - Comparing the different types of AIS hardware
  - Transmitting and receiving AIS data
  - Configuring AIS settings
  - Visualizing AIS data

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Instructor objectives for this demo, below are a list of topics for the instructor to cover:

- Comparison of AIS hardware
  - Transceiver/transponder vs receive-only
  - Functionality of Class A vs Class B vs receiver
- AIS position report from a vessel
  - Dynamic vs Static messages and their frequency of transmission
- Different AIS applications
  - AIS onboard vessel
  - AIS on land stations
- Displaying AIS position reports
  - Using map-based software (AMEC AIS viewing software)
  - Using SeaVision
- AIS hardware built-in protective features from unauthorized changes

History of AIS Hardware

- AIS was originally developed by the International Maritime Organization (IMO) as a standard which would help vessels to avoid collisions
- In 2000, the IMO made Class A AIS hardware mandatory for large vessels
- AIS systems, including Satellite AIS receiver systems, are becoming an essential tool for Maritime Domain Awareness (MDA) efforts

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- Initially designed in 1990s purely for collision avoidance
- AIS hardware is seen as a complement to the vessel's RADAR system.
- Class B hardware is designed for smaller vessels that are not part of the mandatory Class A requirement category.
- Class B is a voluntary position reporting system that is gaining wider acceptance among recreational vessels.

AIS Hardware Components – Class A

Class A Transceiver Hardware

- VHF Antenna
- GPS antenna (for Transmitting)
- Electric power (12 VDC or 100-240 VAC when used with a power supply)

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- Class A is a required self-reporting hardware equipment for all large vessels (>300 gross tons) and all passenger vessels. The requirement is to have 1 Class A AIS unit per vessel. Transmission output power is 12 Watts. It's a commercially available item made by many manufactures of marine electronics.
    - Note the minimum required connections

AIS Hardware Components – Class B

Class B Transceiver Hardware

- VHF Antenna
- GPS antenna (for Transmitting)
- Electric power (12 VDC or 100-240 VAC when used with a power supply)

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- Class B is a lower-cost, low-power basic functionality AIS transceiver. Output power is 2 Watts. The unit has no target display capability (display function possible via software apps on a PC, tablet, or a mobile device).
    - Note the minimum required connections

AIS Hardware Components – Receiver Only

- AIS receiver
- Personal computing device
- VHF antenna
- Electric power
  - (12 VDC or USB power)

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- Receivers (those that receive only and do not transmit) are very simple to set up and are typically installed at coastal sites for vessel tracking. An external device (PC, tablet, or smartphone) is needed to visualize the data.
- Build your own sensor site in under 10 min
- An AIS receiver + PC + VHF antenna = Coastal Monitoring station

AIS Hardware Setup

Class Requirements

- Sufficient space
  - Preferred outdoor and open sky
- Outlets for electrical power
- Separate students into teams
  - 2 teams for Class A AIS transponder
  - 2 teams for AIS receiver
  - Rotate teams so everyone gets hands-on experience on transponder and receiver

Hardware Requirements

- 2 sets AIS Class A
  - Transponder
  - AC power kit
  - GPS antenna + cable
  - VHF antenna + cable
- 2 sets AIS receiver
  - Receiver
  - AC power kit
  - Laptop + USB cable (connect to receiver)
- Optional – 1 Set AIS Class B

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- This Demo can be done in a regular classroom environment, but it is best when conducted in an outdoor, open-sky environment due to VHF transmissions and required GPS reception. If done indoors, place GPS and VHF antennas outside a window. VHF antennas should be placed physically apart and not touch the VHF antenna from another unit.
- IMPORTANT – During hardware setup, the power cable to the AIS transponder unit should always be connected last (after making VHF antenna connections). During hardware teardown, the power cable should always be removed first. In Short: the power cable should be the last in and the first out.
- **IMPORTANT – Class A AIS transponders should be manually adjusted to low-power mode upon power up**. This can be done in the settings menu on the device (the process will vary per manufacturer). The display will show 1W for low-power mode and 12W for normal operation mode. **To minimize RF exposure, the VHF antenna of the transponder must be vertically separated from the operators/audience.**

AIS Transponder Student Team Activities

1. Connect, power up, and become familiar with unit setup.
2. Monitor other nearby vessels.
3. Configure AIS settings:
   - MMSI
   - Vessel Name
   - Call Sign
   - Vessel Type
   - Destination
   - Navigational Status
4. Verify the transponder is sending position reports.
5. Use AIS transponder's interface to send text message to another transponder.
6. (Optional) If located near an AIS sensor site, verify the data transmitted from the transponder appears in SeaVision.
7. (Optional) Can you explain the information flow from transponder to SeaVision?

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- When the training location is near a coast/port (~12 miles), the devices will receive AIS messages. Have students select one of the vessels and inspect the AIS data.
- If the AIS demo is conducted in a location far from the coast/port, the Class A transponders will detect each other if you have 2 units for the demonstration.
- Have students change the identity of the Class A units (MMSI, name, type, etc.) and see how long it takes for the receiver and the other Class A to receive the update.

AIS Receiver Student Team Activities

1. Looking at vessels received by the device, what information is available?
2. What are the differences between dynamic and static position reports?
3. Without talking to the transmitter team, identify the following information from their transponder:
   - MMSI
   - Vessel Name
   - Call Sign
   - Vessel Type
   - Destination

If real AIS targets are available:

4. Use an AIS receiver to select 3 real vessels and identify:
   - MMSI
   - Vessel Name
   - Vessel Type
   - Destination
5. For the same 3 vessels, use SeaVision to identify:
   - IMO number
   - Last 2 port calls
   - Registered owner and Operator
   - Display a 15-day history trail

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- In the AMEC software used for viewing AIS positions, information such as names/IMO/call sign/etc. will be blank until a static message is transmitted by the vessel. It usually takes around 5 minutes to receive a static message.

AIS Hardware Demo Summary

- AIS Hardware Setup
  - Vessel-based AIS transponder and configuring essential information
  - Coastal monitoring station for local vessel monitoring and tracking
- AIS Operation
  - Identify nearby vessels in near real-time
  - Identify vessel information change
  - Understand how AIS information is collected and displayed in SeaVision
  - Understand the importance of information sharing

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Questions?