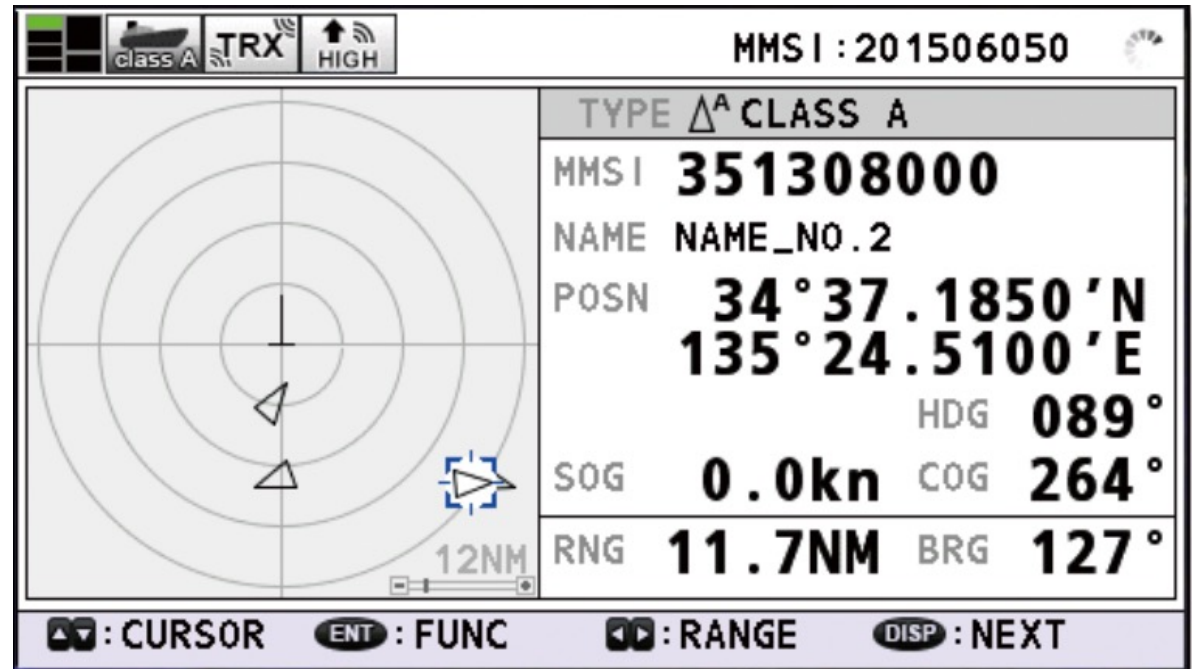


AIS for the Racing Sailor

Blane Boynton

Chicago Tartan 10 Fleet Captain

13 January 2024



Agenda

- Intro to AIS
- Equipping with AIS
- Using AIS
- Q&A



Intro to AIS

What is AIS?

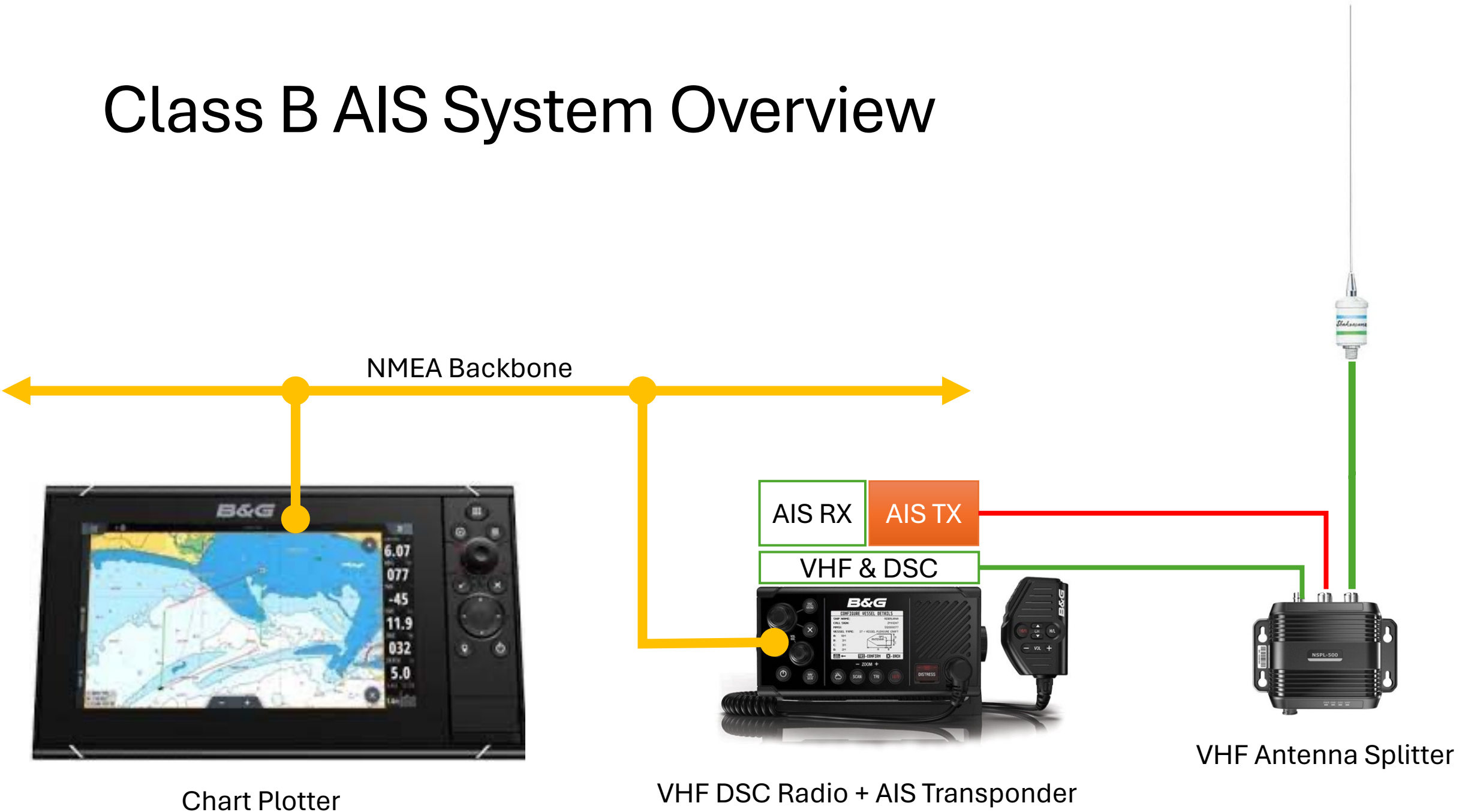
The Automated Identification System uses a combination of GPS, a VHF Radio and an AIS Transponder to receive and transmit information about maritime vessels.

Class A – 12W TX, Range 20+ NM

Class B – 2W-5W TX, Range 8-15 NM



Class B AIS System Overview



AIS vs VHF + DSC

- **VHF with DSC:** your position is reported only with a DISTRESS signal. A Marine Mobile Service Identifier (MMSI) is transmitted along with your DISTRESS and GPS location to aide Search and Rescue authorities
- **AIS – Receive Only:** allows you to see other vessel's positions and display them on your chart plotter. You can also receive AIS signals from ATONs
- **AIS – Transceiver:** your vessel position is reported every 30s – 3 mins allowing others to see you

Equipping with AIS

Powering the Installation

- **25W VHF radio** consumes **~6A** of current while transmitting.
- AIS does not increase the current required but does increase the frequency of transmission. A vessel transmitting AIS consumes energy from its batteries faster than one without.
- Your DSC VHF radio should be installed on circuit with a **10A** fuse or greater.
- Check applicable ABYC standards to ensure safety.



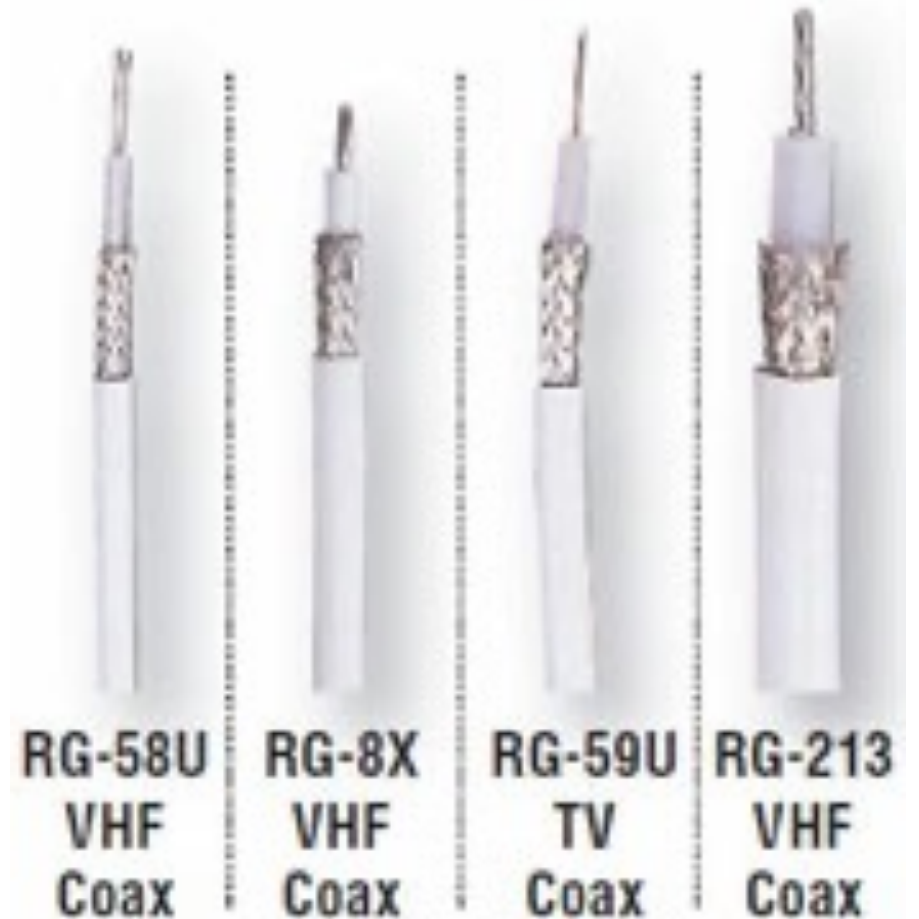
Choosing the right VHF Antenna

- Marine VHF Radios operate from: 156.025-157.425 MHz
- AIS operates @ 162 MHz
- VHF Antennas are tuned for Channel 16 @ 156.8 MHz
- To ensure AIS performance **a VHF/AIS antenna is advised**, they are center-tuned @ 159 MHz.



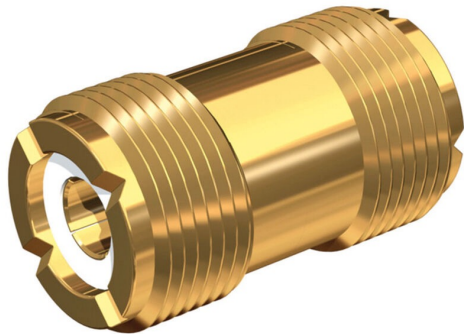
Picking the right VHF Coax Cable

- The cable you use, along with the number of connections has a big impact on your VHF and AIS performance
- Use PL-259 connectors with a PL-258 female/female barrel for deck pass-thru, be mindful of the cable bend radius
- DO NOT solder, splice or otherwise jury-rig your VHF Coax cable, connectors or antenna
- Your life may depend on this cable



Calculating Cable Loss

Your installation must have less than 40% power loss, or 2.2185 dB



Example PL-258 F/F Barrel

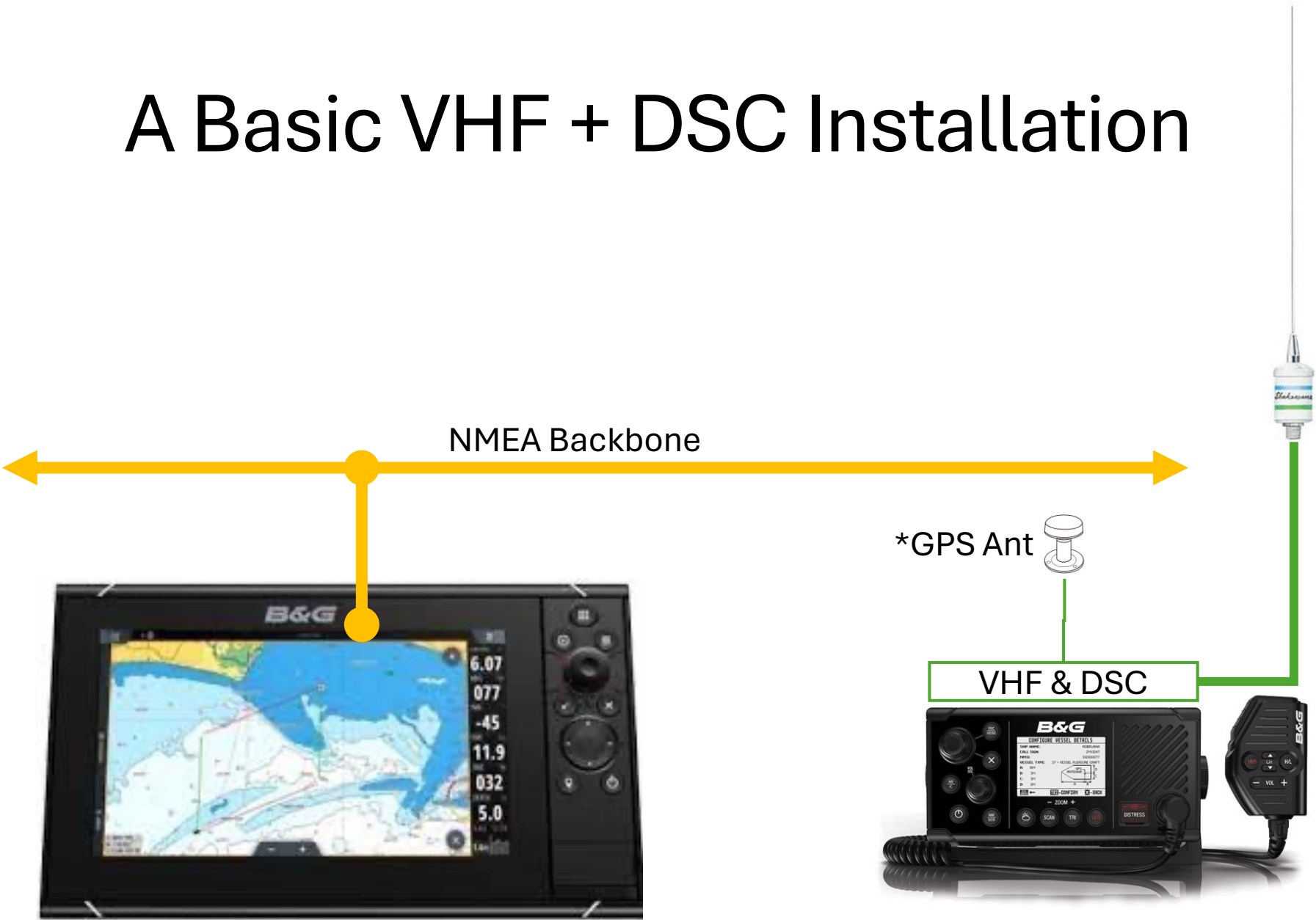
| CHICAGO YACHT CLUB RACE TO MACKINAC® *** WINTRUST *** | | Chicago Mackinac Safety Requirements VHF Coax Loss Calculator | |
|---|-----------------------|--|-----------------------|
| COAX TYPE | Max Length In Feet | Enter Length of Coax Segment in Decimal Feet | Segment Loss in dB |
| RG-58 | 38.53 | | |
| RG-8X | 47.73 | 46.00 | 2.14 |
| LMR-LW200 | 54.52 | | |
| LMR-LW240 | 71.92 | | |
| RG-213 | 88.98 | | |
| RG-8 | 88.98 | | |
| RG-8/U | 88.98 | | |
| LMR-LW400 | 141.06 | | |
| Max Loss Allowed 2.2185 dB (40%) | | Total Loss (dB): | 2.14 |

Installing the Antenna Correctly

- Placement of your antenna has a big impact on your VHF and AIS performance
- The proper placement is atop the mast
- Connections should be clean and water-tight, consider using dielectric grease
- Add strain relief for your coax cable and Loctite the antenna body to bracket nut



A Basic VHF + DSC Installation



NMEA Backbone

*GPS Ant

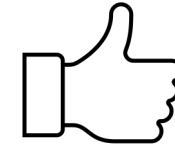
VHF & DSC

Chart Plotter

VHF DSC Radio

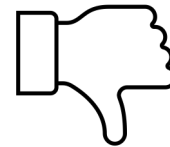
Add AIS RX Only

The easy route is to replace your VHF DSC radio and your antenna.



Pros:

- + Replace one box
- + Replace antenna
- + Share one antenna
- + No splitter needed
- + ~\$500



Cons:

- RX Only
- TX Upgrade Painful

NMEA Backbone



Chart Plotter



VHF DSC + AIS Radio



Bill of Material – Add AIS RX Only



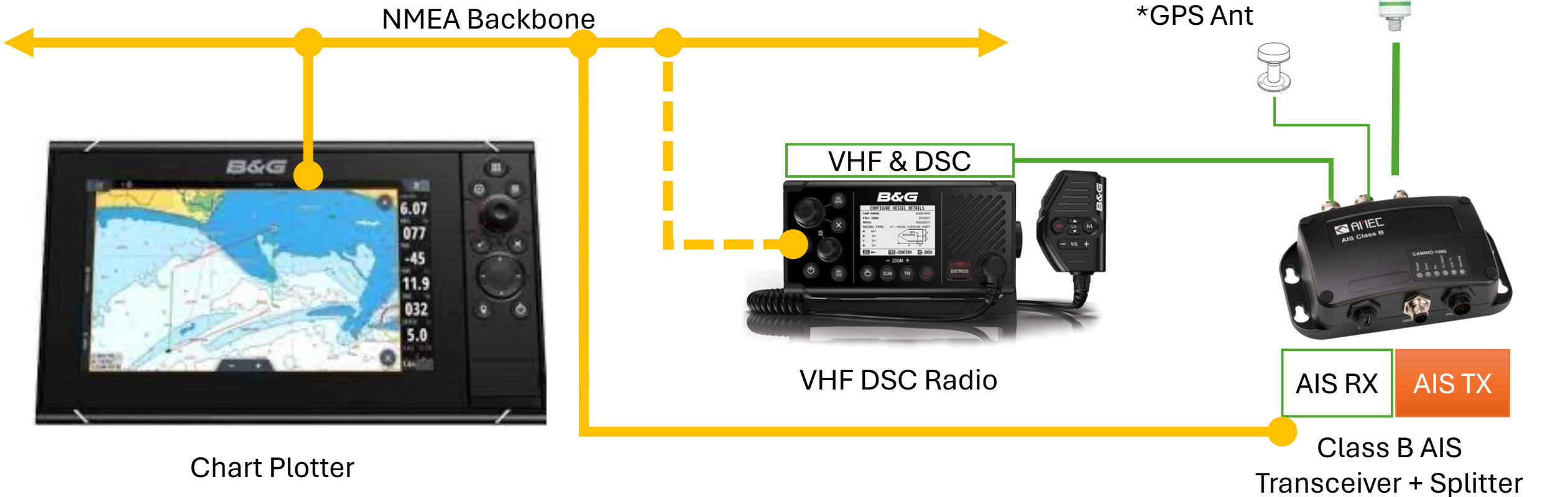
Standard Horizon Matrix GX2400
Price: \$399.99



GAM SS-2 Mini
Price: \$99.95

Add Class B AIS Transceiver w Splitter

Keep your VHF + DSC and add an AIS Class B transceiver with integrated splitter



Bill of Material – Add AIS RX + TX



[AMEC Camino-108S Class B AIS Transponder
With Antenna Splitter](#)

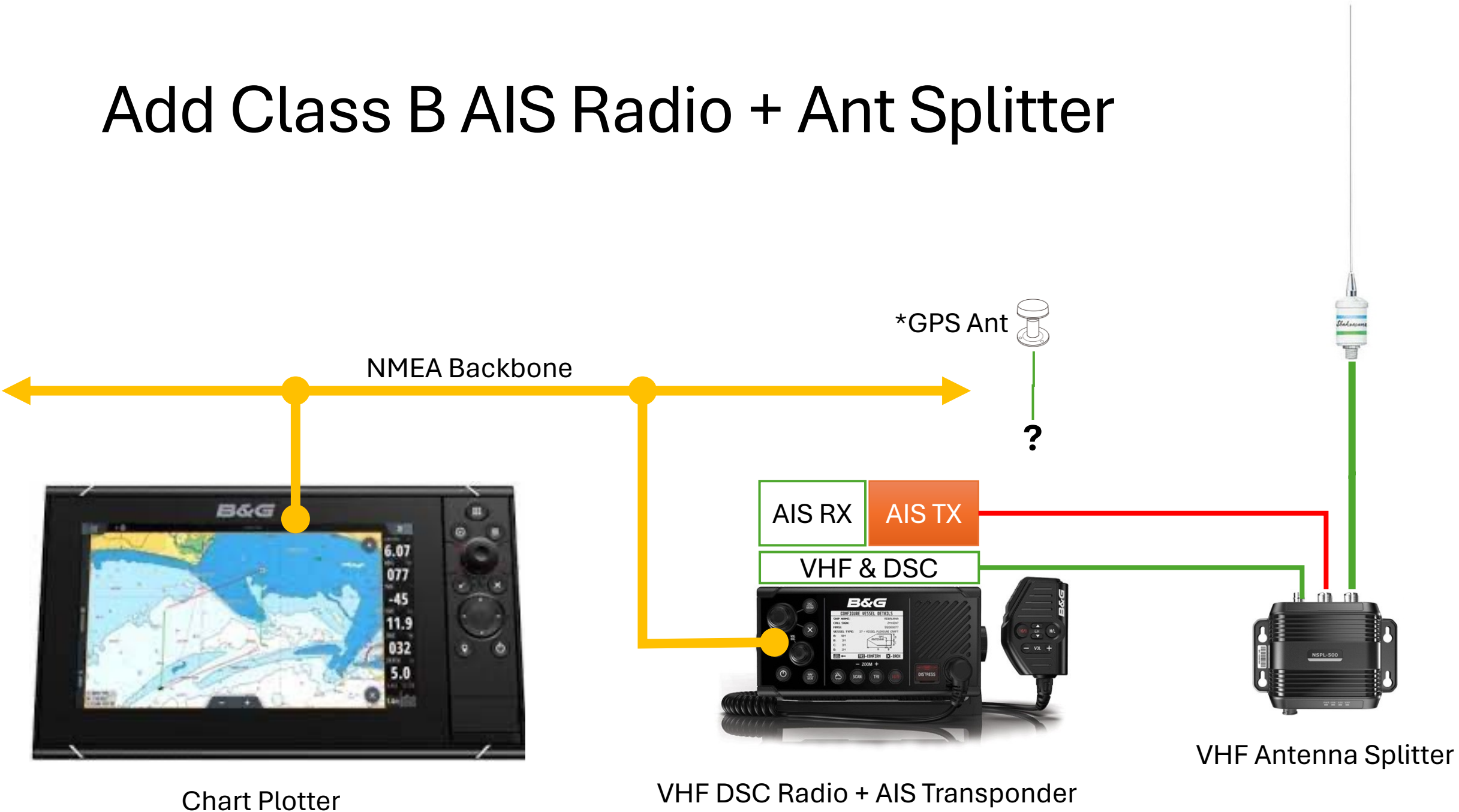
Price: \$779.99



[GAM SS-2 Mini](#)

Price: \$99.95

Add Class B AIS Radio + Ant Splitter



Bill of Material – Add AIS Radio, Splitter & Antenna



[B&G V60-B](#)
[VHF+DSC, AIS RX+TX](#)

Price: \$1199



[B&G NSPL-500](#)
[Antenna Splitter](#)

Price: \$279



[GAM SS-2 Mini](#)

Price: \$99.95

AIS Install Options






\$

\$\$

\$\$\$

| Component | AIS RX Only | AIS RX/TX Option 1 Transceiver | AIS RX/TX Option 2 Radio Integrated |
|--------------------------------------|--------------|-----------------------------------|--|
| AIS DSC Radio | \$399 | -- | -- |
| AIS/VHF Antenna | \$99 | \$99 | \$99 |
| Class B AIS Tranceiver w Splitter | -- | \$779 | -- |
| Class B AIS Radio | -- | -- | \$1199 |
| Antenna Splitter | -- | -- | \$279 |
| Cable & Connectors | \$50-100 | \$50-100 | \$50-100 |
| Total Budget | \$598 | \$978 | \$1677 |

Using AIS

| | |
|---|--|
|  | Sleeping AIS target (not moving or at anchor) |
|  | Moving and safe AIS target with course extension |
|  | Dangerous AIS target, illustrated with bold line. A target is defined as dangerous based on the TCPA settings. |
|  | Lost AIS target. When no signals have been received within a limit, a target is defined as lost. The target symbol represents the last valid position of the target before the reception of data was lost. |
|  | Selected AIS target, activated by selecting a target symbol |

AIS Primary Uses

- **Increased Situational Awareness:** the benefit is for you and for other vessels around you.
- **Increased “Visibility”:** for sailing yachts that typically have a small radar signature
- **Lots of “Target” Data:** Speed, Bearing, Distance, Closest Point Approach, etc.

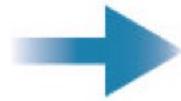
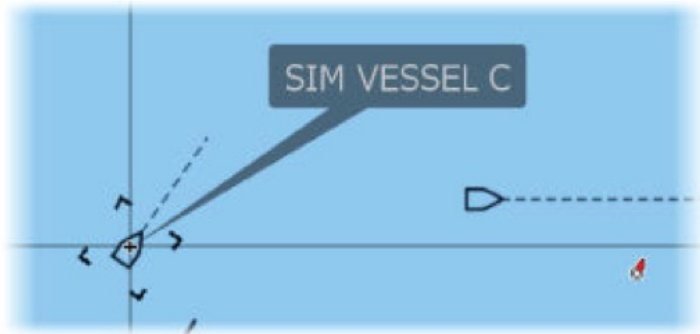


AIS for Crew Overboard

- The Chicago Mac race requires all competitors to carry a Crew Overboard AIS Beacon.
- Your AIS Receive function will receive all AIS COB events within range.
- A COB's chance of rescue is highest from her own vessel or a vessel nearby, do your part!



Typical AIS Target Display



AIS VESSEL DETAILS

SIM VESSEL C (MMSI: 321042541)

Callsign: NZL1122
IMO: 789
AIS Class: A
Type: Unknown
Length (m): 12.2
Beam (m): 6.1

Status: Safe
NavStatus: Under engine
Draught (m): 0.9
Latitude: N 25°45.842'
Longitude: W 80°06.978'
Accuracy: High (10m)
ROT (°/s): 0.0
SOG (kn): 10.00
COG (°M): 032
Heading (°M): 042
Destination: MIAMI
ETA: 04/11/2008 09:30

Bearing (°M): 096
Distance (NM): 1.73
CPA (NM): 0.86
TCPA (hrs): PAST

Call

Strategic Use While Racing

- AIS can tell you about the conditions ahead by showing vessel data from targets up the field
- AIS can help you plot a course to intercept a target vessel or fleet
- AIS Transmit can be disabled (while permitted) – “Silent Mode”



Q&A

Resources

- Chicago-MAC CMSR (2023) - <https://cycracetomackinac.com/assets/documents/2023-CMSR-Monohull-Official-Final.pdf>
- BoatUS MMSI Application - <https://www.boatus.com/mmsi/mmsi/obtainmmsi#!>
- Millitech Marine – <https://www.milltechmarine.com>
- WM Coaxial Cable Advisor - <https://www.westmarine.com/west-advisor/Coaxial-Cable.html>
- [GAM Mini SS-2 VHF/AIS Antenna](#) – 159 MHz Center Tune

AIS Static Data Programming Form

A form like this will be required when you order your AIS transponder, these data are typically programmed in by your reseller.

You can [access this form here](#)

| AIS Static Data Programming Log (Please Print) | | | |
|--|---|--|---|
| Vessel Owner: | | Programming Date: | |
| MMSI Registered To: | | AIS Model #: | |
| Vessel Name: | | AIS Serial #: | |
| Address: | | Phone #: | |
| | | E-Mail: | |
| Step | Description | Result | Comments |
| 1 | Copy of FCC Ships Station License with MMSI and Call Sign. (If applicable) | | Required for vessels that sail internationally |
| | Copy of MMSI Registration from Boat US, Sea Tow, US Power Squadron, or Other. (If applicable) | | Acceptable for vessels on domestic voyages only |
| 2 | Record the following information on this document (* = required) | | |
| | *MMSI number: | | |
| | *Vessel Name (20 characters) | | |
| | Call Sign (if applicable) | | |
| 3 | Determine position of GPS antenna on vessel Round distance to the nearest meter | | |
| | A Distance from bow to the GPS antenna | _____ meters | |
| | B Distance from stern to the GPS antenna | _____ meters | |
| | C Distance from port side to the GPS antenna | _____ meters | |
| | D Distance from starboard side to GPS antenna | _____ meters | |
| 4 | Determine type of Vessel and record | | See Vessel Type Description Below |
| Company Name: | | As vessel Owner or Captain, I certify that the above vessel identification information is correct and valid. | |
| Technician Name: | | Name: | |
| Signature: _____ | | Signature: _____ | |
| Date: _____ | | Date: _____ | |
| Step | Vessel Type # | Vessel Type Description | |
| 4 | 30 | Vessel - Fishing | |
| | 31 | Vessel - Towing | |
| | 32 | Vessel - Towing and the length of the tow exceeds 200 m or the breadth exceeds 25 m | |
| | 33 | Vessel - Engaged in dredging or underwater operations | |
| | 34 | Vessel - Engaged in diving operations | |
| | 35 | Vessel - Engaged in military operations | |
| | 36 | Vessel - Sailing | |
| | 37 | Vessel - Pleasure craft | |
| | 38 | Vessel - Reserved for future use | |
| | 39 | Vessel - Reserved for future use | |
| | 50 | Pilot Vessel | |
| | 51 | Search and Rescue vessels | |
| | 52 | Tugs | |
| | 53 | Port tenders | |
| | 54 | Vessels with anti-pollution facilities or equipment | |
| | 55 | Law enforcement vessels | |
| | 56 | Spare - for assignments to local vessels | |
| | 57 | Spare - for assignments to local vessels | |
| | 58 | Medical transports (as defined in the 1949 Geneva Conventions and Additional Protocols) | |
| 59 | Ships according to RR Resolution No. 18 (Mob-83) | | |

WARNING: It is a violation of the rules of the Federal Communications Commission to input an MMSI that has not been properly assigned to the end user, or to otherwise input any inaccurate data in an AIS Transponder.

Send completed form to: programming@cwrdistribution.com

AIS Static Data Programming Log
FLIBS