United States Coast Guard

Automatic Identification System (AIS)
AISMiner (v4.0) User Manual

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1 AISMINER OVERVIEW

The AISMiner application allows a user to monitor, filter, and analyze live and archived AIS (§ Appendix A) data. The application is designed to accept and process AIS data formatted in either R&DC proprietary or NMEA v4.0 protocol. This document describes setup and use of the AISMiner version 4.0 application.

The AISMiner application was originally developed by the R&DC as an AIS analysis tool to study and evaluate NAIS (§ Appendix A) performance, operational condition, ship movement, and vessel traffic information. Throughout the NAIS Increment 1 (I-1) deployment process (2005 – 2008), the application expanded, from its original design as an AIS analysis tool, to a monitoring tool used to check and validate I-1 site and NAIS network performance. Following USCG acquisition of the NAIS I-1 network in 2008, the application again expanded to support custom analyses tailored to meet specific requirements of NAIS operators. As efforts to acquire the NAIS Increment 2 (I-2) network advance, the application will continue to expand and change to meet the needs of USCG and NAIS Sustainment and Operational community.

Note: When viewing this document in print, the actual colors of highlighted or outlined areas of an image may appear different than stated colors.

1.1 Document Navigation Tip

Microsoft Word 2007 provides an easy way to return to a previous spot in a document after clicking a hyperlink. To enable this feature follow these steps:

1. Click the Customize Quick Access Toolbar button (red outline – Figure 1), then select the More Commands menu item.

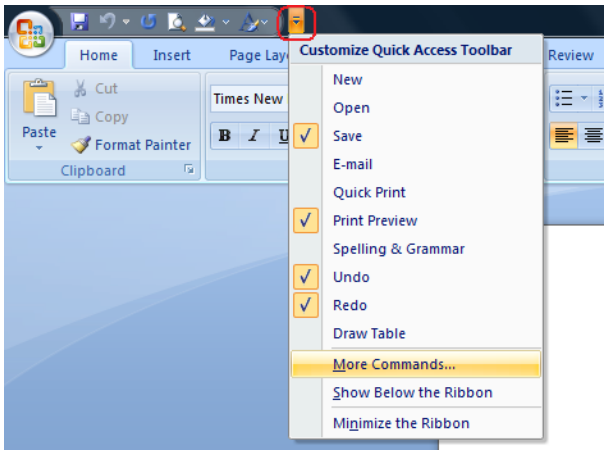

Figure 1. Navigation Tip – customize quick access toolbar button.

2. Click the Popular Commands dropdown button and select All Commands (red outline – Figure 2).

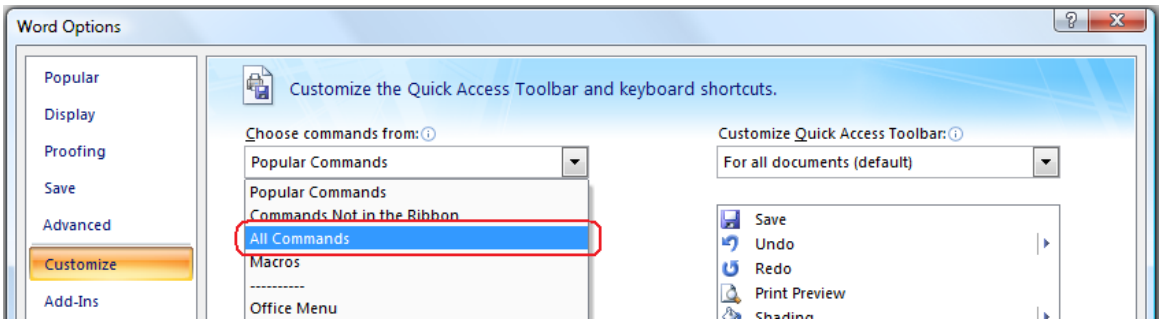

Figure 2. Navigation Tip – popular commands dropdown button.

3. Using the Add button (blue outline – Figure 3), add the Back (red outline – Figure 3) and Forward command buttons to the Quick Access Toolbar list.

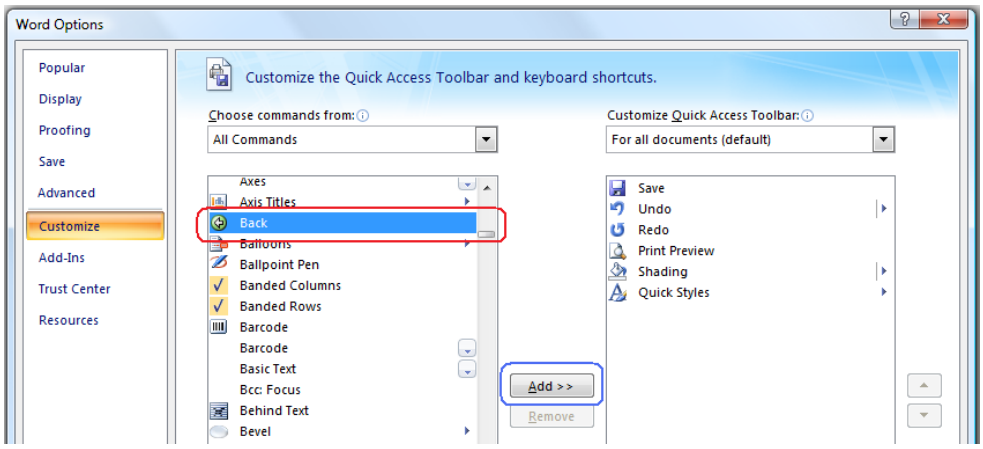

Figure 3. Navigation Tip – quick access toolbar list.

4. To save your changes to the Quick Access Toolbar (red outline – Figure 4), and exit the Word Options window, click the Ok button.

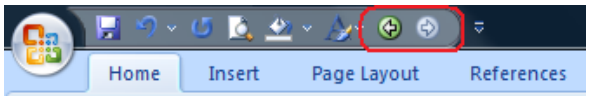

Figure 4. Navigation Tip – quick access toolbar.

Note: The Forward and Back buttons work the same as those of a web browser.

2 AIS OVERVIEW

The Automatic Identification System (AIS) is a shipboard broadcast system that is capable of automatically providing information about a ship to other ships and coastal authorities. It allows ships to easily track, identify, and exchange navigation information from one another or shore based units. AIS uses Self-Organizing Time Division Multiple Access (SOTDMA) technology to provide the ship's identity, type, position, course, speed, navigational status and other safety-related information for collision avoidance, security and Vessel Traffic Services (VTS) reporting. All AIS-equipped stations in the vicinity continually update this information, near real-time.

The AIS device transmits a VHF signal containing AIS message data. The message is in NMEA 0183 format. A land based receiver site using AISSource (§ Appendix A) software tags and retransmits the AIS message. The AISSource software tags each message with the receiver ID and the time of reception. The modified message is then transmitted, via the Internet, to an AIS server, which distributes it to connected AISUser (§ Appendix A) clients.

Note: The time of reception is the local time of the computer that is running AISSource measured in seconds elapsed since midnight on January 1, 1970.

2.1 How AIS Works

AIS operates as a dual channel transponder in the VHF maritime band, and is capable of handling more than 4,500 reports per minute. Each AIS unit receives information simultaneously on two separate Time Division Multiple Access (TDMA) receivers and alternates transmissions on two independent frequency channels using a single TDMA transmitter. A marine electronic communications link enables communication between AIS and the shipboard display and sensor systems. Position and timing information is obtained from a global navigation satellite system (GPS) receiver, but heading, course, speed over ground, and other inputs are obtained electronically from shipboard equipment.

The AIS transponder normally works continuously in a self-determining mode, regardless of operating area. The transmitter uses a 9.6 kb Gaussian Minimum Shift Keying (GMSK) modulation, a form of Frequency Modulation (FM), over 12.5 or 25 KHz channels. Frames group the transmission, each frame equals one (1) minute and is divided into 2250 slots. Each AIS unit determines its own transmission schedule (slot) and may use up to five consecutive slots for one (1) continuous transmission. For example, a position report from one AIS station fits into one of 2250 time slots and a Safety Related Broadcast message uses up to five slots. Figure 5 below provides an illustration of AIS transmission for 1 Channel.

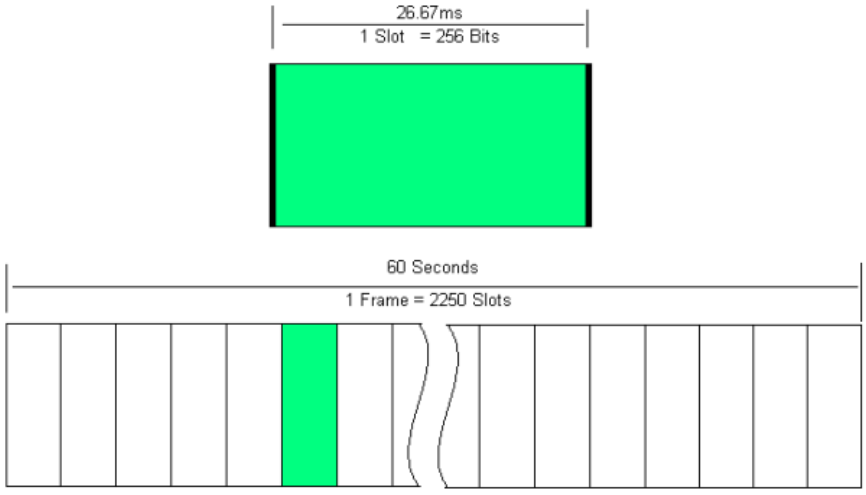

Figure 5. AIS – transmission slots.

The International Maritime Organization (IMO) performance standard requires that the ship reporting capacity be no less than 2000 per minute. AIS provides 4500 time slots per minute, 2250 slots on each channel, and when the system is in a ship-to-ship mode it can be overloaded by 400 to 500% through sharing of slots. While overloaded, only targets further away are subject to dropout. For ships closer than 8 to 10 nautical miles (NM), throughput is still close to 100%. Because AIS is a VHF application, the system coverage range varies with atmospheric conditions and the height of the antenna. A typical value to be expected at sea is 20 nautical miles without the help of a repeater station.

2.2 Modes of Operation

AIS uses three modes of operation. The system is usually used in the default mode, Autonomous and Continuous, and is only switched to/from other modes as directed by a competent authority.

- **Autonomous and continuous**: A station operating in Autonomous and Continuous mode is continuously receiving and automatically resolving scheduling conflicts with other stations by determining its own schedule for transmitting its position.
- **Assigned**: A station operating in the Assigned mode uses a transmission schedule assigned by a competent authority's base or repeater station.
- **Polled**: Stations operating in Polled mode automatically respond to Interrogation messages (message 15) from a ship or competent authority without conflicting with operations in the other two modes. The response is transmitted on the channel where the Interrogation message was received.

2.3 AIS Messages

AIS uses two types of messages, Functional and System Management. Functional messages provide information about the ship or station. System Management messages supply necessary information to maintain the system. Some messages contain both functional and system management information. All AIS messages contain a message Identifier, Repeat Indicator and have an

associated priority. Because of message priority and message content usefulness, all messages are not transmitted at the same interval. Messages with lower priority or static information are not transmitted as often as high priority messages with changing information. The faster a ship's information changes, the more frequently the message that contains that information is transmitted. Table 1 below briefly describes all 26 AIS messages.

Table 1. List of AIS messages.

message ID	Name	Description	Priority	Category	Operating Mode	Mobil/ Base
AS = Assigned. AU = Autonomous. B = transmitted by base station F = Functional message.			F/S = Functional and System Management message. IN = Interrogation/Polled mode. M = transmitted by mobile station. S = System Management message.			
1	Position Report	Scheduled position Report	1	F/S	AU	M
2	Position Report	Assigned Scheduled position Report	1		AS	M
3	Position Report	Special position report, response to interrogation	1	F/S	AU	M
4	Base Station Report	Position, UTC, Date and current Slot number of base station	1	F/S	AS	B
5	Static and Voyage Related Data	Scheduled static and voyage related vessel data report	4	F	AU, AS	M
6	Binary Addressed message	Binary data for addressed communication	4	F	AU, AS, IN	M/B
7	Binary Acknowledgement	Acknowledgement of received addressed binary data	1	S	AU, AS, IN	M/B
8	Binary broadcast message	Binary data for broadcast communication	4	F	AU, AS, IN	M/B
9	Standard SAR Aircraft Position Report	Position Report for airborne stations involved in Search and Rescue (SAR) operations	1	F/S	AU, AS	M
10	UTC/Date inquiry	Request Universal Time Coordinated (UTC) and date	3	F/S	AU, AS, IN	M/B
11	UTC/Date Response	Current UTC and date if available	3	F/S	AU, AS, IN	M
12	Addressed Safety Related messages	Safety related data for addressed communication	2	F	AU, AS, IN	M/B
13	Safety Related Acknowledgement	Acknowledgement of received addressed safety related message	1	S	AU, AS, IN	M/B
14	Safety Related Broadcast message	Safety related data for broadcast communication	2	F	AU, AS, IN	M/B
15	Interrogation	Request for a specific message type (can result in multiple responses from one or several stations)	3	F	AU, AS, IN	M/B
16	Assignment Mode Command	Assignment of a specific report behavior by competent authority using a base station	1	F/S	AS	B

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17	DGNSS Broadcast Binary message	Differential Global Navigation Satellite Systems (DGNSS) corrections provided by a base station	2	F	AS	B
18	Standard Class B Equipment Position Report	Standard Position Report for Class B Shipborne Mobile Equipment to be used instead of messages 1, 2, 3	1	F/S	AU, AS	M
19	Extended Class B Equipment Position Report	Extended Position Report for Class B Shipborne Mobile Equipment; contains additional static information	1	F/S	AU, AS	M
20	Data Link Management message	Reserve slots for base station(s)	1	S	AS	B
21	Aids-to-Navigation Report	Position and Status Report for Aids-to-Navigation	1	F/S	AU, AS, IN	M/B
22	Channel Management	Management of channels and transceiver modes by a base station	1	S	AS	B
23	Group Assignment Command					
24	Class B 'CS' Static Data Report	Used by Class B 'CS' shipborne Mobile Equipment				
25	Single slot binary message	Short unscheduled binary data transmission	4	F	AU	M/B
26	Multiple slot binary message with communication state	Scheduled binary data transmission	4	F	AU	M/B

Each message is designed to perform a unique task and has a transmission schedule that is determined by that task. Even if the priority, category, operating mode, and base/mobile properties are the same, the transmission schedule may not be. For example messages 1, 9, and 18 are position reports but have different tasks and transmitting schedules. Message 1 (Position Report) is output periodically by a mobile station as determined by its dynamic information rate of change. Message 9 (Standard SAR Aircraft Position Report) is used as a position report for aircraft involved in Search and Rescue (SAR) operations and has a default-reporting interval of 10 seconds. Message 18 (Standard Class B Equipment Position Report) is output periodically and autonomously as is messages 1, 2, and 3, but is used by Class B shipborne mobile equipment and is transmitted in two slots once every 6 minutes. Other messages are only output as a result of a request for additional information. Message 19 (Extended Class B Equipment Position Report) is used when allocated by

message 18, and message 11 (UTC/Date Response) is transmitted as a result of a UTC Request message (message 10).

AIS stations can request messages by using the Interrogation message (message 15) to request a specific message. The type of platform to which the interrogation is directed limits the number of message requests. A Class A shipborne mobile station can be interrogated for messages 3 and 5. A Class B shipborne mobile station can be interrogated for messages18 and 19. An airborne mobile station can be interrogated for message 9. A mobile station mounted on an Aids-to-Navigation can be interrogated for message 21 and a base station can be interrogated for messages 4, 17, 20 and 22.

2.3.1 Class B'CS' Messages

Class B AIS equipped vessels have a different message structure. A new technology was developed called 'Carrier-Sense TDMA (CSTDMA). This system requires the Class B'CS' AIS vessels to listen to the AIS network to determine if the network is free of activity, and, only if the network is free, can it transmit its information. This allows Class B vessels to use the AIS without interfering with Class A operations. Specifics of message types and their usage are in described in IEC 62287 Ed. 1.

2.4 Reporting Rate

The rate at which an AIS station reports is dependent on the surrounding navigation situation. The different information types are applicable for different time periods. Voyage related and static information is updated every 6 minutes, when data has been amended, or on request. Table 2 and 3 below provide dynamic information update intervals for Class A and Non-Class A AIS units. Safety related messages are updated as required.

Table 2. Class A – message reporting intervals.

Dynamic Condition		Reporting Interval
Anchored or Moored	< 3 knots	3 minutes
Anchored or Moored	> 3 knots	10 seconds
Underway	< 14 knots	10 seconds
Underway and Changing Course	< 14 knots	3 1/3 seconds
Underway	14 - 23 knots	6 seconds
Underway and Changing Course	14 - 23 knots	2 seconds
Underway	> 23 knots	2 seconds

Table 3. Non Class A – message reporting intervals.

Condition		Reporting Interval
Class B	< 2 knots	3 minutes
Class B	2 – 14 knots	30 seconds
Class B	14 - 23 knots	15 seconds
Class B	> 23 knots	5 seconds
Search and Rescue Aircraft	Airborne	10 seconds
Aids to Navigation		3 minutes
AIS Base Station		10 seconds

The reporting rates in tables 2 and 3 above are changed during the synchronization process. When a mobile station determines that it is the station on which synchronization is being performed, it's reporting rate increases to once every 2 seconds. A base station's report rate increases to once every 3 1/3 seconds when it detects it is being used for synchronization.

2.5 AIS Systems

The two main types of AIS systems are the AIS base station and the Class A shipborne station. The base stations provide the means to perform system control and maintenance. The Class A shipborne station is required on commercial vessels meeting the requirements set forth by the IMO. The other AIS systems are the Class B shipborne station for vessels that are not required to carry AIS, Search and Rescue Aircraft, and Aids to Navigation.

2.5.1 AIS Base Station

Base Stations act as information centers providing text messages, meteorological or hydrological information, navigation information, and position of other vessels. The Base Station also provides system time synchronization and Differential Global Navigation Satellite System (DGNSS) corrections. Message management and assignment mode command functions are performed by the Base Stations.

2.5.2 Class A

Class A shipborne mobile equipment is used on all vessels meeting the IMO AIS carriage requirement, described below:

- Each self-propelled vessel of 65 feet or more in length, engaged in commercial service (including fishing).
- Each towing vessel of 26 feet or more in length and more than 600 horsepower.
- Each vessel of 100 gross tons or more carrying one or more passengers for hire.
- Each passenger vessel certified to carry 50 or more passengers for hire.

Each Class A station broadcasts the following information every 2 to 10 seconds while underway, and every 3 minutes when anchored or moored:

- **MMSI number**: unique identification.
- **Navigation status**: 0 - under way using engine; 1 - at anchor; 2 - not under command; 3 - restricted maneuverability; 4 - constrained by draft; 5 – moored; 6 – aground; 7 - engaged in fishing; 8 - under way sailing.
- **Rate of turn right or left**: 0 to 720 degrees per minute (input from rate-of-turn indicator if available).
- **Speed over ground**: 1/10 knot steps from 0 to 102 knots.
- **Position accuracy**: 1 = High, 0 = Low.

- **Latitude**: to 1/10000 minute (±90 degrees, North = positive, South = negative).
- **Longitude**: to 1/10000 minute (±180 degrees, East = positive, West = negative).
- **Course over ground**: relative to true north to 1/10th degree.
- **True heading**: 0 to 359 degrees derived from gyro input.
- **Time stamp**: UTC second when the report was generated (0-59).

The Class A station also broadcasts the following static information every 6 minutes:

- **IMO number**: unique identification (1 – 999999999; 0 = not available = default).
- **Call sign**: international call sign assigned.
- **Name**: name of ship.
- **Type of ship and cargo**: 0 = not available.
- **Dimensions/reference for position**: reference point for reported position and dimension of ship in meters (Figure 6).

Distance is in meters

A & B = 0 – 511m

C & D = 0 – 63m, 63 if > 63m

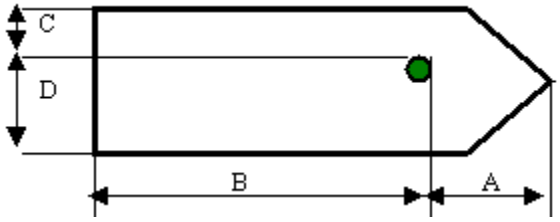


Figure 6. AIS – position/dimension message reference point.

The point in the center represents the location of the position-fixing device.

- **Type of position fixing device**: 0 - Undefined (default); 1 – GPS; 2 – GLONASS; 3 - Combined GPS/GLONASS; 4 - Loran-C'; 5 – Chayka; 6 - Integrated Navigation System; 7 - surveyed.
- **Estimated time of arrival**: estimated Time of Arrival in UTC (MMDDHHMM).
- **Draft of ship**: in 1/10 meter.
- **Destination**: 20 characters are provided (at master's discretion).

2.5.3 Class B

Class B equipment provides AIS functionality for vessels that do not align with IMO Class A AIS carriage requirements. The International Electro-technical Commission (IEC) is developing standards for Class B equipment development. The Class B position report message (message 18) is similar to the position report message for Class A vessels. The major difference is that the Class B position report does not contain navigational status or rate of turn.

2.5.4 Search and Rescue Aircraft

The AIS equipment used for search and rescue aircraft is similar to the AIS shipborne equipment. It is used to provide position reports for aircraft involved in SAR operations. SAR aircraft equipment is designed to improve SAR operations and uses message 9 (Standard SAR Aircraft Position Report) when involved in SAR operations. The reporting rate for this message is once every 10 seconds.

2.5.5 Aids to Navigation

Shore-based stations providing the locations of Aids to Navigation (AtoN) provide a more secure navigational picture for approaching vessels. AIS also provide an enhanced method of real time monitoring and control of the ATN equipment. AIS use message 21 (Aids-to-Navigation Report) to supply type, name, position, dimensions, and Off-Position Indicator of the ATN.

3 INSTALLATION

To install AISMiner, follow these steps:

1. Create a directory on your network or hard drive to hold the application and support files.
2. Unzip the installation file to this directory.
3. From the installation directory, open the Flexgrid folder.
4. From the Flexgrid folder, copy the 'MSFLXGRD.OCX' file to your system directory:
    - For Win95 or 98 this is C:\windows\system.
    - For Win2k or NT this is C:\WINNT\system32.
    - For XP or Vista this is C:\windows\system32.

    Note: Depending on your system configuration, you may require administrative account privileges to complete steps 4 through 7.
6. Open the start menu and click 'Run'. In Vista this command is not visible by default. To access the Run window in Vista, follow these steps:
    - Right click on Vista Orb Start button.
    - Select “Properties” on the context menu.
    - Select the “Start Menu” tab in the window shown.
    - Click the “Customize” button that is enabled.
    - From the list provided, scroll to the “Run Command” and click the checkbox next to it. For the Classic Start menu this will read “Display Run.”
    - Click the OK button.
7. In the Run dialog box, copy or type the following command:
    - **Windows 95 or 98**: “regsvr32 \windows\system\Msflxgrd.ocx.”
    - **Windows NT or 2000**: “regsvr32 \WINNT\system32\Msflxgrd.ocx.”
    - **Windows XP or Vista**: “regsvr32 \windows\system32\Msflxgrd.ocx.”
8. Click the Ok button to complete the MSFlexGrid ActiveX control registration process.
9. To place an application shortcut icon on your desktop, from the installation directory right click the AISMiner.exe file. In the pop-up context menu, select Send To then select the Desktop (create shortcut) menu item.
10. Follow steps outlined in section 4 below to configure AISMiner initialization files for application runtime.

3.1 Requirements

AISMiner is compatible with Windows 95/98/NT/2000/XP and Vista. The application’s main interface uses the MSFlexGrid ActiveX control to display processed message data. The control must be registered on the hosting machine for data to display. To accept and read live AIS data, an internet connection is required.

4 SUPPORT FILES

During runtime AISMiner uses four support files: two initialization files ('AISMiner.ini' and 'Filters.ini'); and, two information files ('BaseInfo.txt' and 'VesselList.txt'). If, at application start-up, the AISMiner.ini support file is missing, AISMiner displays an error message (Figure 7) informing the user that the file will automatically be created. When the user clicks the OK button AISMiner shuts down, creates the missing file, and then restarts. If, at application startup, one of the remaining support files is missing AISMiner creates the file during runtime, when an application feature utilizing the file is accessed, or during application shutdown.

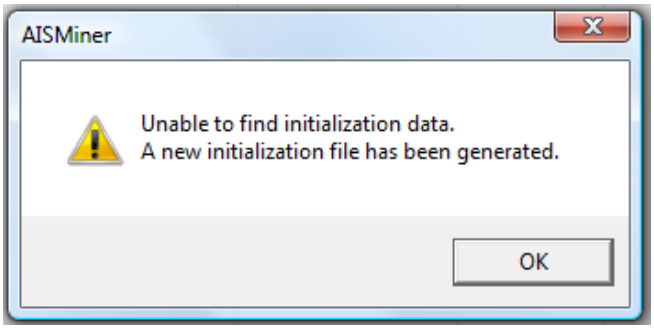


Figure 7. AISMiner – missing support file error message.

4.1 AISMiner INI File

4.1.1 Settings and Values

Following is a list of AISMiner INI file settings with a description of each setting and its' default value.

4.1.1.1 Allow BaseInfo Update

Default Value: True

If set to True, AISMiner overwrites the BaseInfo.txt file (§ 4.3), during application shutdown, with receiver identification information read from the file during application startup and all new receiver identification information processed during runtime.

If set to False, AISMiner does not overwrite the BaseInfo.txt file during application shutdown. Note that a value of False should be used when running multiple AISMiner applications concurrently and more than one application references the same BaseInfo.txt file. This is because of the way that AISMiner works with the BaseInfo.txt file. At application startup, it reads and stores in memory all existing receiver information from the file. During runtime it compares processed receiver identifications against its internal list and adds new receivers to this list. At application shutdown, it deletes the contents of the BaseInfo.txt file and overwrites the file with its internal list (sorted numerically). If more than one AISMiner application references the same BaseInfo.txt file during runtime, then the application that shuts down last will overwrite any new receiver identification information from other instances of AISMiner.

4.1.1.2 Auto Output Directory

Default Value: C:\AISMinerAutoOut

Important: The *Auto Output Directory* setting is only used by AISMiner when the application is started using a command line with an operational mode setting of two (2). Also, AISMiner will attempt to create any missing subdirectories specified in the *Auto Output Directory* path.

The *Auto Output Directory* setting is used to set a log file output directory path following data processing. For example, if AISMiner opens log file 20100505.log for input, then the output files (20100505.csv and 20100505_RcvrStats.csv) will be placed in the directory listed in this setting (AISMinerAutoOut). If left blank, the output files are lost [from memory] following application shutdown.

Note: The *Auto Output Directory* setting is used in conjunction with the *Auto Source Directory* setting.

4.1.1.3 Auto Source Directory

Default Value: C:\Logs

Important: The *Auto Source Directory* setting is only used by AISMiner when the application is started using a command line with an operational mode setting of two (2).

The *Auto Source Directory* setting is used to set a log file input directory path for data processing. AISMiner searches the directory specified in this setting for log files named using the preceding days date (e.g., 20100505.log). The application first searches the directory, specified in this setting, for subdirectories following the naming structure year (e.g., 2010), then month (e.g., 05), then filename (e.g., 20100505.log). If the search fails, AISMiner searches by month then filename. For example, "C:\Logs\2010\05\20100505.log" directory path is searched first. If the year folder is not found, AISMiner performs a second search starting with the month folder "C:\Logs\05\20100505.log".

Note: The *Auto Source Directory* setting is used in conjunction with the *Auto Output Directory* setting.

4.1.1.4 BaseInfo Directory

Default Value: [blank]

Sets the directory path to the BaseInfo.txt file (§ 4.3) used by AISMiner at application startup. If left blank, AISMiner will look for and use the BaseInfo.txt file in the application working directory.

Note: Do not include trailing slashes in the directory path.

4.1.1.5 Destination IP

Default Value: 127.0.0.1

Sets the target address of a processed data output stream. The *Destination IP* setting is used in conjunction with the *Destination Port* setting.

For example, to send the processed data output stream to a FinCen server, the setting would read "nais.uscg.mil.fincen". The port on the FinCen server where the data is sent is defined in the *Destination Port* setting. If the *Destination IP* setting is set to 0 (zero), AISMiner will host connections (i.e., other applications can create a connection to its host machine).

4.1.1.6 Destination Port

Default Value: 0

Sets the destination port of a processed data output stream. The *Destination Port* setting is used in conjunction with the *Destination IP* setting.

For example, to send a processed data output stream to a FinCen server, the *Destination IP* setting would read "nais.uscg.mil.fincen" and the *Destination Port* value would be a port number on that server (e.g., 1234). If the *Destination IP* setting is set to zero (0), then the *Destination Port* value serves as the port number on the local machine held open for connecting applications. A *Destination Port* value of 0 (zero) suppresses this function.

Note: For a complete list of setting values, and associated application response, see Table 4 below.

4.1.1.7 Last View

Default Value: 0

This setting is used by AISMiner during application shutdown to store the active table view (§ 5.2). This setting should not be edited directly by a user.

4.1.1.8 Location Name

Default Value: Uninitialized

Sets an application location name; used by AISMiner when connecting to remote servers (e.g., RDC - New London).

Note: Do not use special symbols (i.e., %^&*) or quotation marks when creating an application location name.

4.1.1.9 Log data in Live Mode

Default Value: False

If set to True, AISMiner records all data received to a log file when operating in live data mode (§ 5.1.1). The location of the log file is specified using the setting *LogDir*.

If set to False, data is not recorded, only processed.

4.1.1.10 LogDir

Default Value: C:\AISMinerLogs

Sets the directory path where log files are saved when operating in live data mode (§ 5.1.1). If left blank, log files are not generated; regardless if the setting *Log data in live mode* is set to True.

4.1.1.11 Rcvr View
Default Value: 5701

This setting is used by AISMiner to store configuration values set using the Receiver View Editor window (§ 5.3.3). This setting should not be edited directly by a user.

4.1.1.12 Reference Receiver ID
Default Value: rLoggerTime

Timestamps generated at the same time by different NAIS equipment often do not match. During data processing, AISMiner compares this settings value against the (equipment) "source ID" field in an AIS message. If the values match, then the message's timestamp field value is used to populate the Reference Time field in the AISMiner table view.

For example, if the message contains "/s:rLoggerTime,c:123456789/" and the *Reference receiver ID* value is "rLoggerTime", then the Reference Time field will contain the timestamp value "123456789". The timestamp "123456789" remains valid in the Reference Time field until updated by another message with the specified "source ID". Timestamp values from processed messages with other source ID values are not posted to the Reference Time field.

Note: NAIS equipment timestamps are incremented in one second intervals.

4.1.1.13 Remote Source IP
Default Value: ds2.rdc.uscg.gov

The IP address or URL of remote host machine for establishing a live AIS data feed connection.

4.1.1.14 Remote Source port
Default Value: 31419

The port number on remote host machine for establishing a live AIS data feed connection.

4.1.1.15 Replace Spaces
Default Value: True

If set to True, AISMiner will replace all spaces in the message fields call sign, vessel name, and destination with an underscore character.

If set to False, AISMiner does not perform the replace function.

4.1.1.16 Show Extra Label Info
Default Value: False

If set to True, a fully qualified application working directory path is shown in the application's main window title bar.

If set to False, the application working directory name is shown in the application's main window title bar.

4.1.1.17 Start in Live Mode
Default Value: False

If set to True, AISMiner starts in live data mode (§ 5.1.1).

4.1.1.18 User Name
Default Value: Uninitialized

Sets a user login name; used by AISMiner when connecting to remote servers (e.g., John Doe).

Note: Do not use special symbols (i.e., %^&*) or quotation marks when creating a user login name.

4.1.1.19 Utilize Internal Receiver
Default Value: False

If set to True, AISMiner uses internal receiver and timetag information when processing VDX messages that do not contain this information.

4.1.1.20 View 1
Default Value: 0

This setting is used by AISMiner during application shutdown to store user configuration values for the View #1 menu item. This setting should not be edited directly by a user.

4.1.1.21 View 2
Default Value: 0

This setting is used by AISMiner during application shutdown to store user configuration values for the View #2 menu item. This setting should not be edited directly by a user.

4.1.1.22 View 3
Default Value: 0

This setting is used by AISMiner during application shutdown to store user configuration values for the View #3 menu item. This setting should not be edited directly by a user.

4.1.1.23 View 4
Default Value: 0

This setting is used by AISMiner during application shutdown to store user configuration values for the View #4 menu item. This setting should not be edited directly by a user.

4.1.2 Example – Configure AISMiner INI file for Reading Live Data

To configure the AISMiner INI file for reading live AIS data, follow these steps:

1. From the AISMiner application directory, open the "AISMiner.ini" file using a text editor such as Notepad.

2. Set the *Remote Source IP* and *Remote Source Port* settings (red highlight - Figure 8) to the IP address and port number of the computer sending AIS data. This information is available from the system administrator supplying the live data feed.

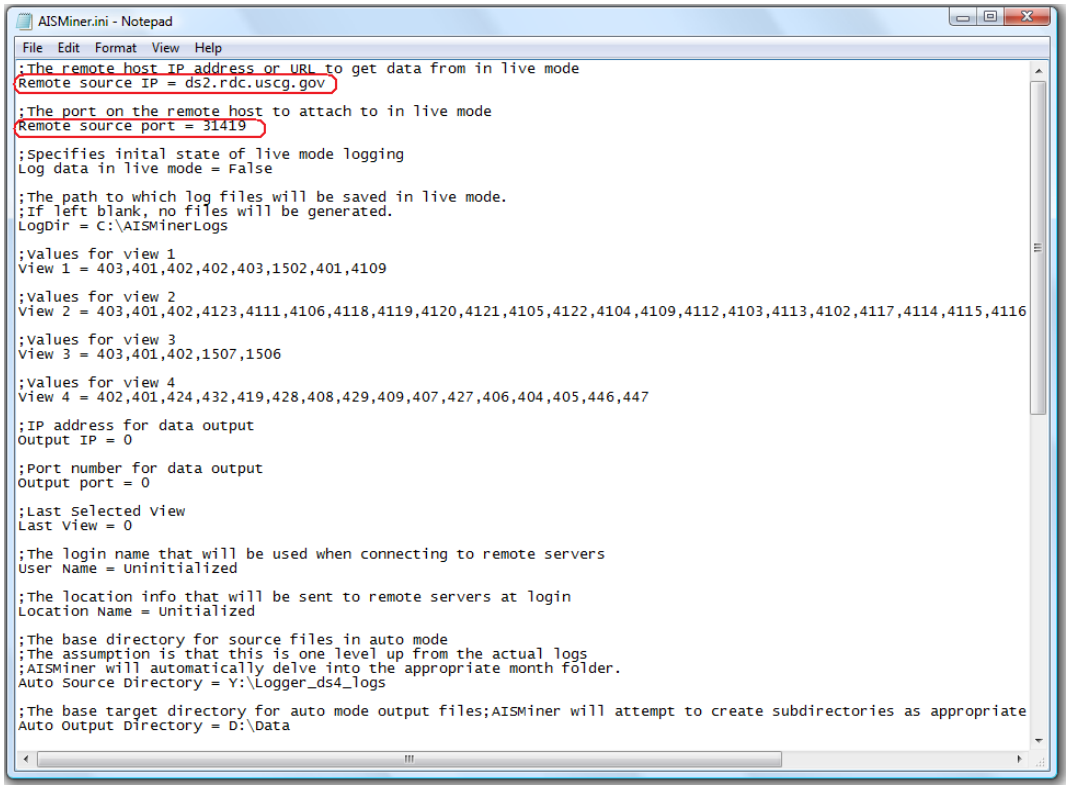


Figure 8. AISMiner INI File – remote source settings.

Note: The *Remote Source IP* value can be in either Internet Protocol version 4 (IPv4) or Universal Resource Locator (URL) format. IPv4 addresses are usually written in dot-decimal notation. Below are examples of IP addresses in IPv4 and URL formats:

- IPv4 - 192.168.20.18.
- URL - http://www.navcen.uscg.gov/enav/ais/default.htm.

3. Set the *Destination IP* and *Destination Port* settings (red highlight - Figure 9) to the IP and port number of the target machine of the output data stream. Note, the default *Destination IP* address value of 127.0.0.1 and the default *Destination Port* value of 0 sets the local machine (application host) as the target machine.

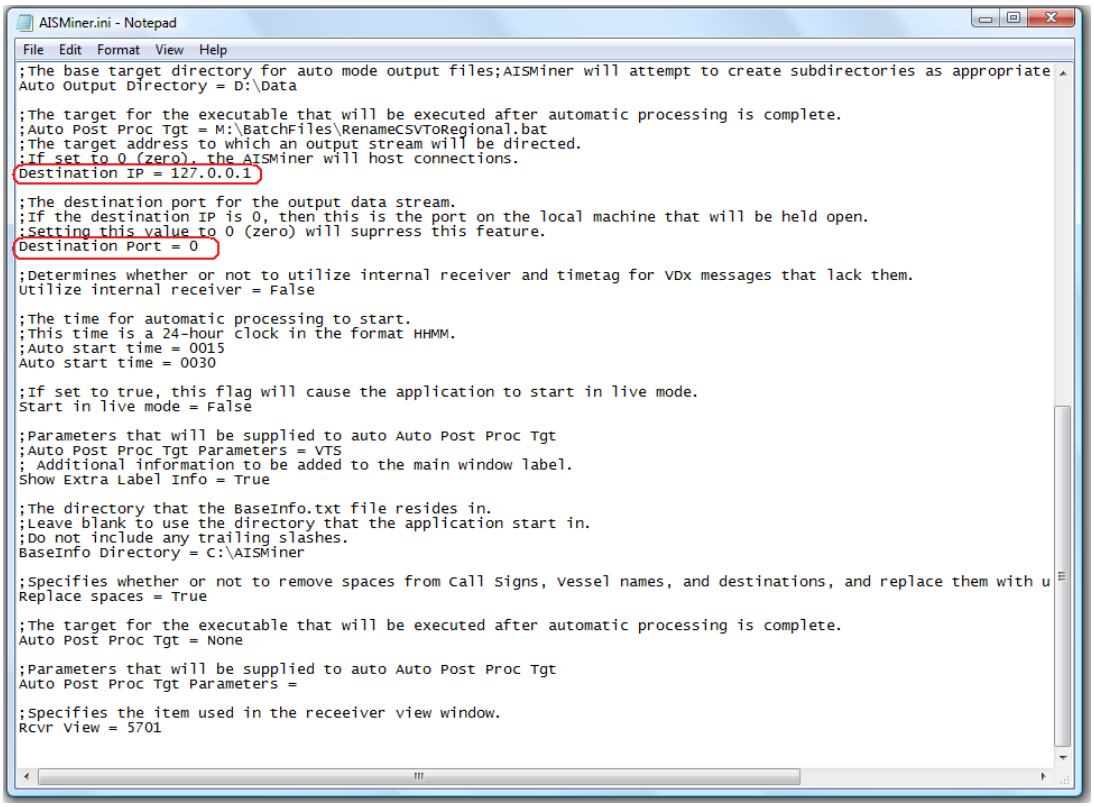


Figure 9. AISMiner INI File – destination settings.

Note: The *Destination IP* and *Destination Port* setting values control how AISMiner processes expanded position information from messages 1, 2, 3, and 5. Table 4 below lists acceptable values for these settings, and how they are used by AISMiner.

Table 4. AISMiner INI file – destination IP and destination port setting values.

Destination IP	Destination Port	How Setting Values are Applied
n/a	Value of zero (0)	No attempt is made to connect to a remote host. No connections to AISMiner are permitted.
Non-zero value	Non-zero value	AISMiner attempts to connect to the IP address specified in the *Destination IP* setting. The value of the *Destination Port* setting is the local port that AISMiner uses to export the data. No connections to AISMiner are permitted.
Value of zero (0)	Non-zero value	AISMiner does not attempt to connect to a remote host. AISMiner listens on the port specified in the *Destination Port* setting.

4. Set the *LogDir* setting to the location (path) where AISMiner log files will be saved. If the directory does not exist, AISMiner creates the folder and adds a new log file for the current days live data.
5. Set the *Log data in live mode* setting to True to log data while in live mode.
6. Set the *User Name* and *Location Name* settings to values applicable to your organization. AISMiner uses this information to generate an identifier for server login (red outline - Figure 10).

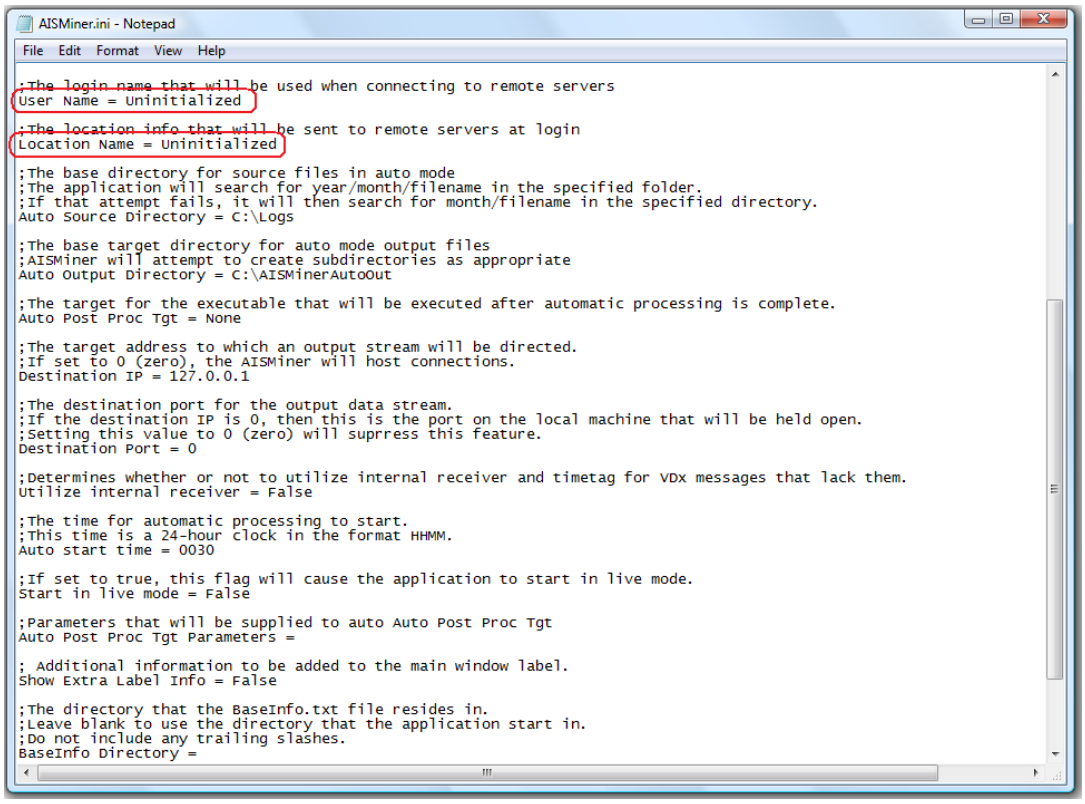


Figure 10. AISMiner INI File – user name and location name settings.

4.2 Filters INI File

The Filters INI file (Filters.ini) stores values set using the Filter Editor window (§ 5.3.1). At application start-up, AISMiner uses the file to restore values set during the previous runtime session. This file is not intended to be edited directly by a user.

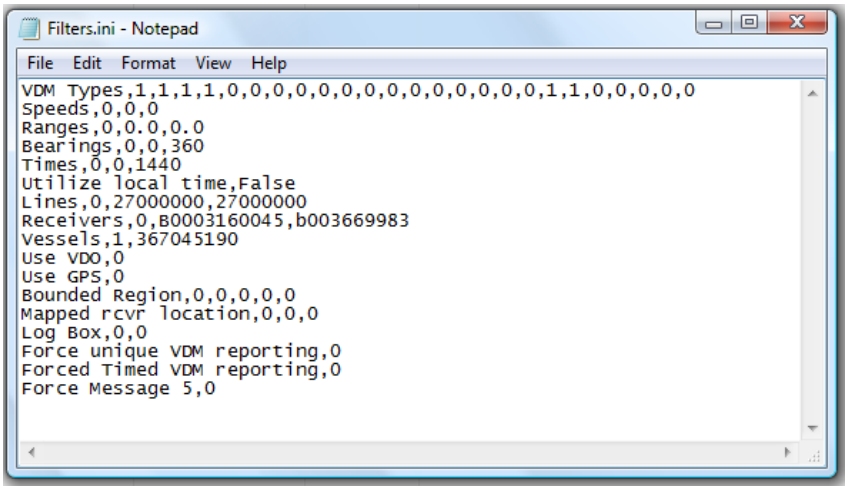


Figure 11. AISMiner – filters INI file example.

4.3 Base Information File

The Base Information file "BaseInfo.txt" contains information about known land based receiver stations. During application shutdown, AISMiner creates the file if it doesn't exist or appends new station information, collected during data processing, to the end of the file if it does exist. If AISMiner does not receive base information for a station in a processed data sentence, the distance and bearing fields in the output data sentence are left blank. Each line in the Base Information text file represents a station, and contains the following five fields.

Note: In figure 12 below, the first three lines show fully identified stations, while the last two lines show default information added by AISMiner when station information is not available.

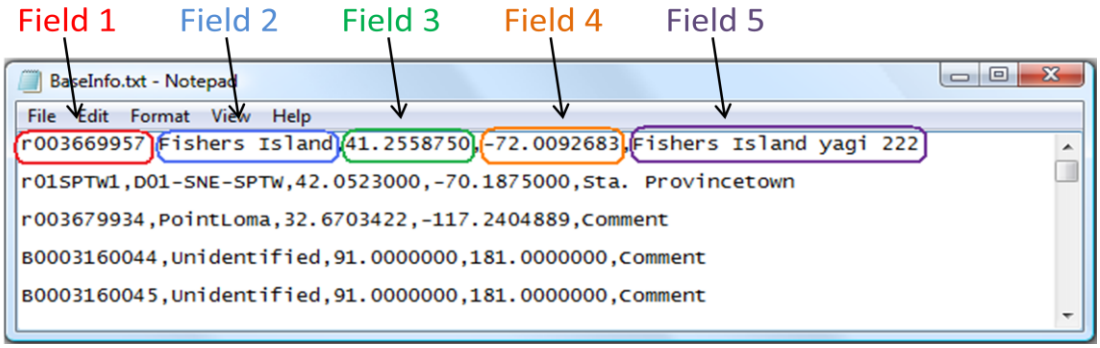


Figure 12. AISMiner – base information file example.

- **Field 1**: Receiver identification number. Each receiver is issued a unique identification number. If AISMiner processes a message from an unknown receiver, it adds the identification number to the Base Information file and enters default information for the remaining fields (lines 4 and 5 in Figure 12 above).

- **Field 2**: Name of receiver station. This field must exist, but does not have to contain a value. AISMiner version 4.0 does not use the value in this field, but needs the field placement to maintain correct field sequence.

- **Field 3**: Latitude of receiving station. The latitude is shown in decimal degrees between 90 and -90. Positive numbers indicate northerly latitudes and negative numbers indicate southerly latitudes. AISMiner disregards this field if the value is greater than 90. Distance and bearing sentence field values are not calculated when the latitude is outside the expected values.

- **Field 4**: Longitude of receiving station. The longitude is shown in decimal degrees between 180 and -180. Positive numbers (0 to180) indicate easterly longitudes and negative numbers (0 to -180) indicate westerly longitudes. AISMiner disregards this field if the value is greater than 180. Distance and bearing sentence field values are not calculated when the latitude is outside the expected values.

- **Field 5**: Optional comment field.

4.4 Vessel List File

The Vessel List file (VesselList.txt) contains information about known vessels. AISMiner uses the information in this file to cross-reference the name of a vessel with the vessel ID (i.e., MMSI number) for each processed message that does not contain a vessel name. Every AIS message contains a vessels MMSI number, but only messages 5 and 19 contain the vessel name field. If a vessel name is retrieved from the Vessel List file, the name is shown in the table view followed by three asterisk symbols (red outline - Figure 13).

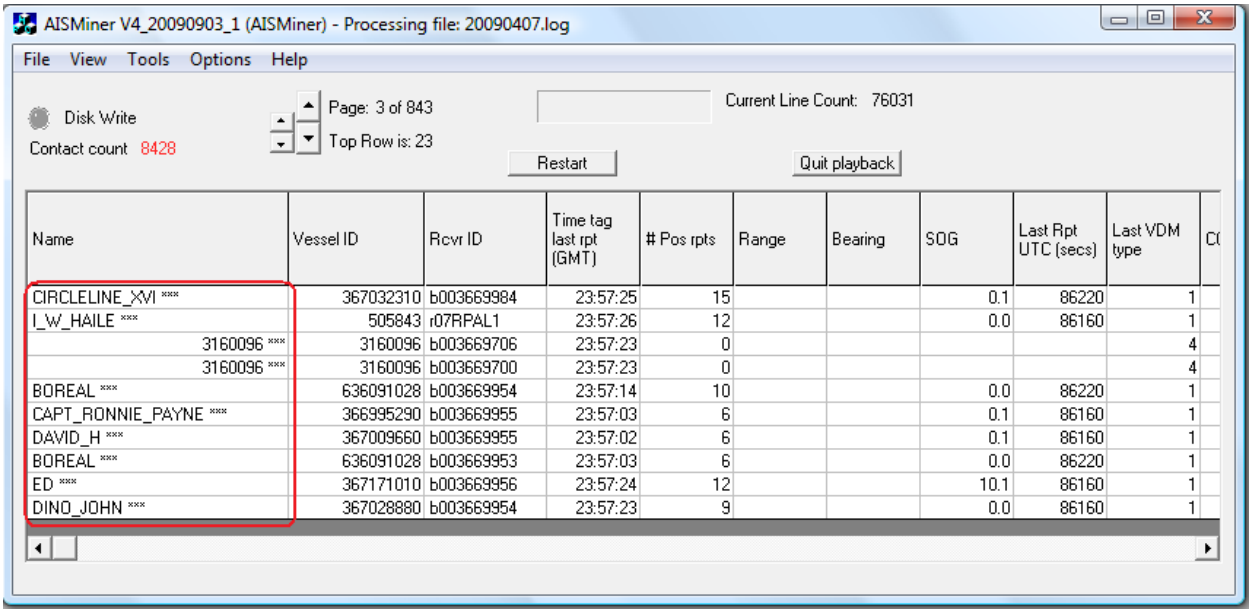


Figure 13. AISMiner – vessel names retrieved from vessel list file.

The first time AISMiner is started it creates the Vessel List file and saves it to the application directory. Each time a new vessel ID, not in the master list, is processed the vessel ID and associated vessel name are added to the list. If a vessel name is not available from the processed message, the vessel ID is used as the vessel name when added to the list.

Each subsequent time AISMiner is run, at startup it populates the table view with all the vessel names from the Vessel List "lookup" file followed by three asterisk symbols. As new vessel ID's are read from processed message data, they are added to the lookup file list and table view. If a message with the vessel name (message 5 or 19) for a known vessel is received and processed, the three asterisk symbols are removed from the vessel name in the table view for the remainder of that application session.

At application shutdown, all vessel names and vessel ID's processed during that session, not already in the Vessel List file, are added to the list (Figure 14). If, at application shutdown, the Vessel List file does not exist, or has been moved from its application startup location, AISMiner creates the file using vessel names and vessel ID's processed during that session.

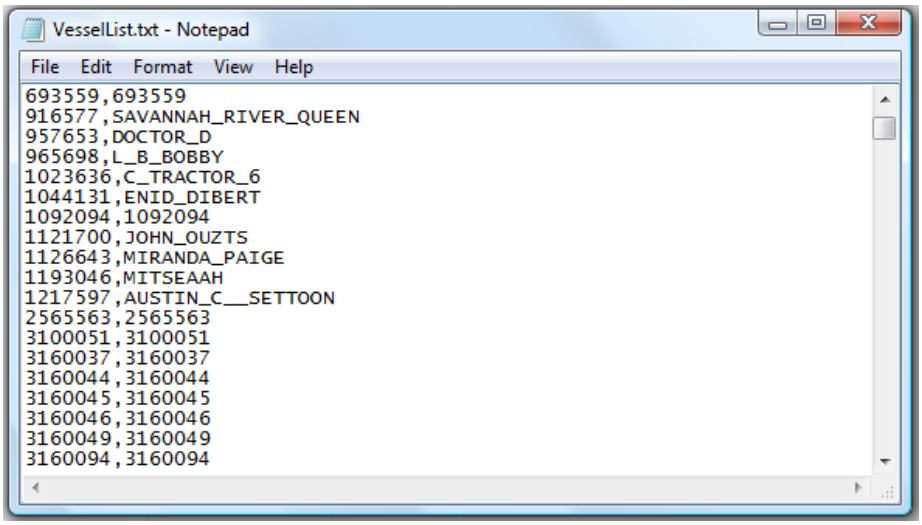


Figure 14. AISMiner – vessel list file example.

5 MAIN INTERFACE – MENU

Depending on choices made during application installation (§ 3), you can start AISMiner by double clicking the desktop shortcut icon or navigating to the application directory and double click the AISMiner.exe file.

At start-up, the application's main interface is shown (Figure 15).

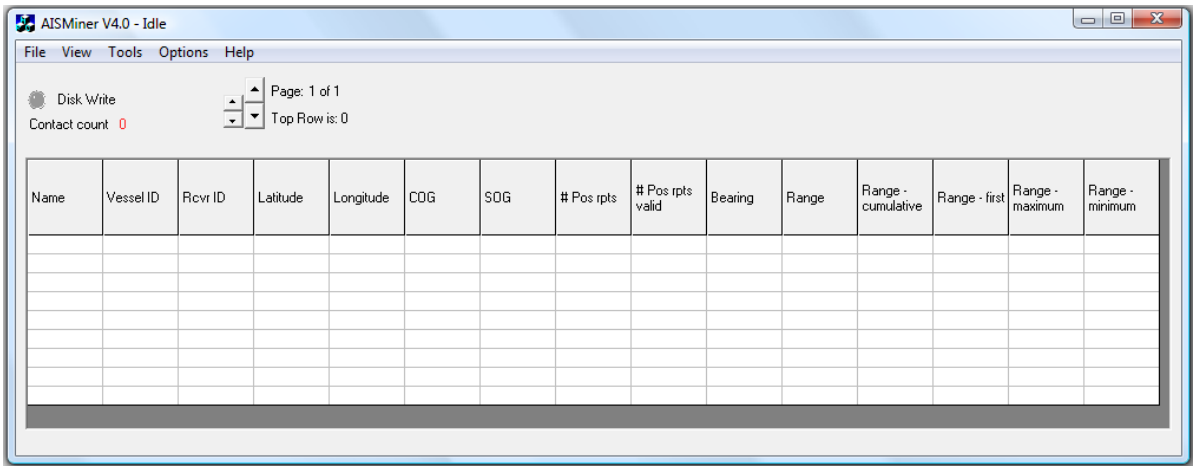


Figure 15. AISMiner – main interface.

The following subsections provide a description of application functions and features and are organized based on the menu structure of the main interface.

5.1 File

Menu Items:

- Read live data.
- Filter live data.
- Open file.
- Print display to file.
- Export.
    - Generate Filtered Output
    - Extract as Viewed
    - Extract as Viewed (fresh data)
    - Generate PRDC sentences
    - Convert to Sim format
    - Echo and Expand
- Exit.

5.1.1 Read Live Data

The *Read Live Data* menu item, in conjunction with configuration settings in the AISMiner INI file (§ 4.1), is used to establish a connection to and begin processing of a live AIS data stream. Processing live AIS data is referred to as **live data mode**.

Figure 16 below illustrates data flow to AISMiner in live data mode, and output to users following data processing. In the illustration, AIS message data is being transmitted by search and rescue (SAR) aircraft, Class A and Class B vessels. When an aircraft or vessel is within VHF range of a receiver site the transmitted messages are received by the site's antennas and processed by the site controller computer. During processing, the site controller computer runs a separate application, named AISSource, which appends the receiver ID and time stamp fields and values to each message. If the receiver (antenna) provides signal strength data, this field and value is also appended to each message. AISSource then sends the message data to AISMiner via the internet. AISMiner processes the data based on user defined settings. The user can then output the data using one of five Export menu options (§ 5.1.5).

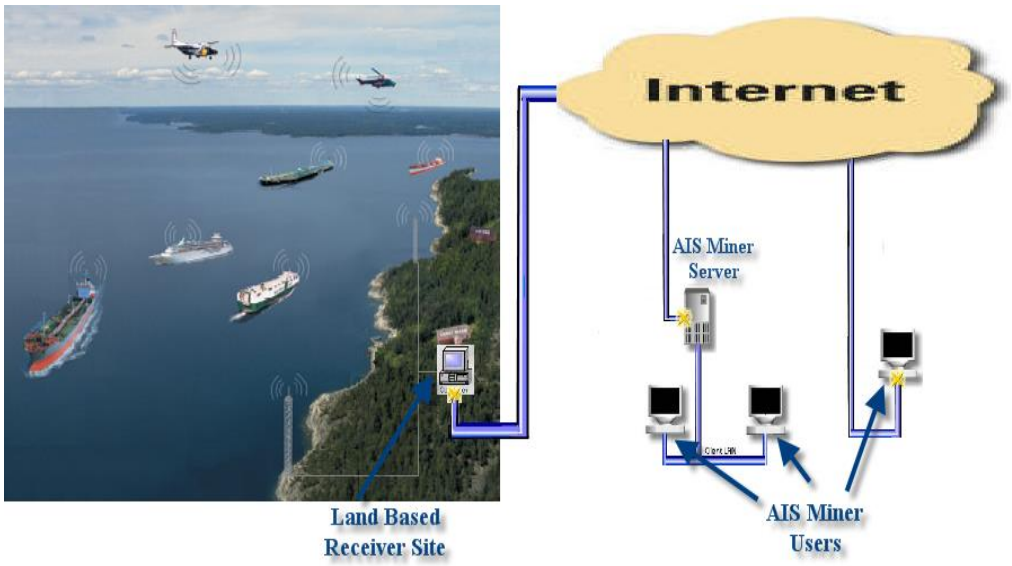


Figure 16. Live data mode data flow.

Figure 17 below shows an example of AISMiner in live data mode. Note that while in live data mode the text "Reading Live Data" (yellow outline – Figure 17) is displayed in the windows titlebar. Also, shown in the upper left area of the main interface are the *Disk Write* and *Contact count* indicators (blue outline – Figure 17). The *Disk Write* indicator blinks red when live data is being saved to a log file. The *Contact count* indicator changes from black to red text and increments by one for each new contact received.

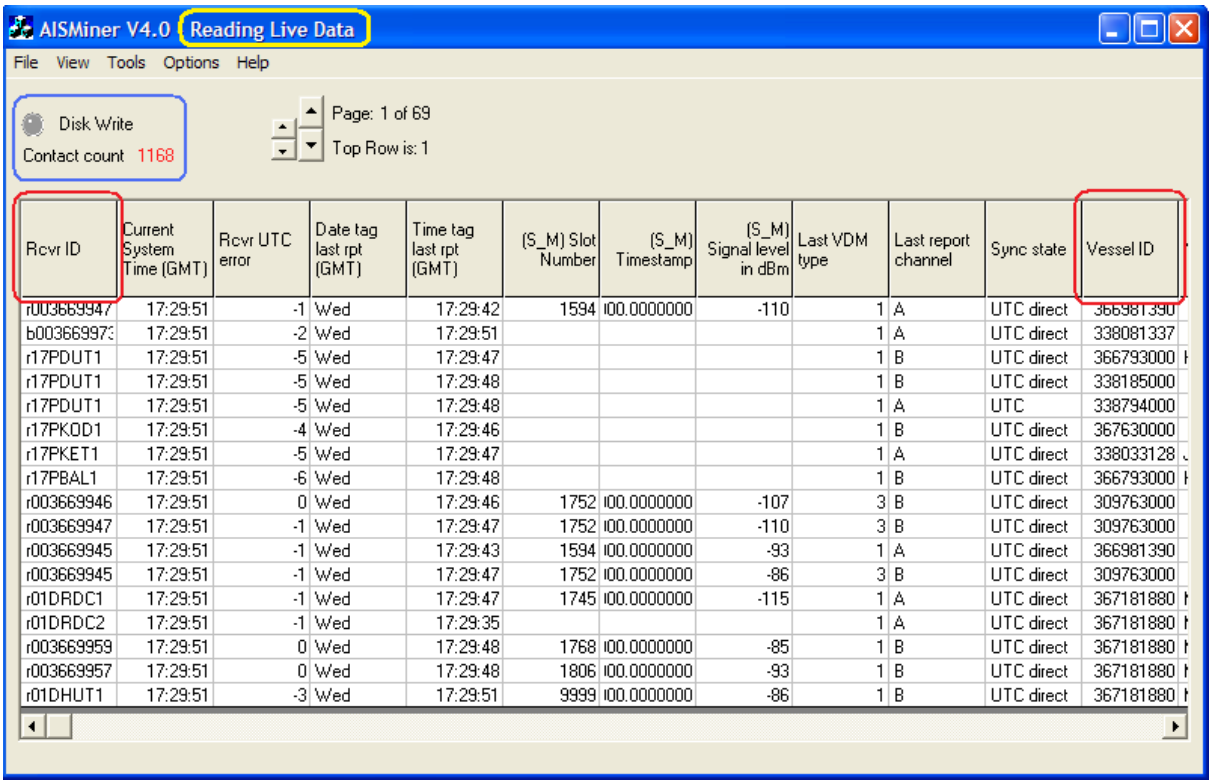
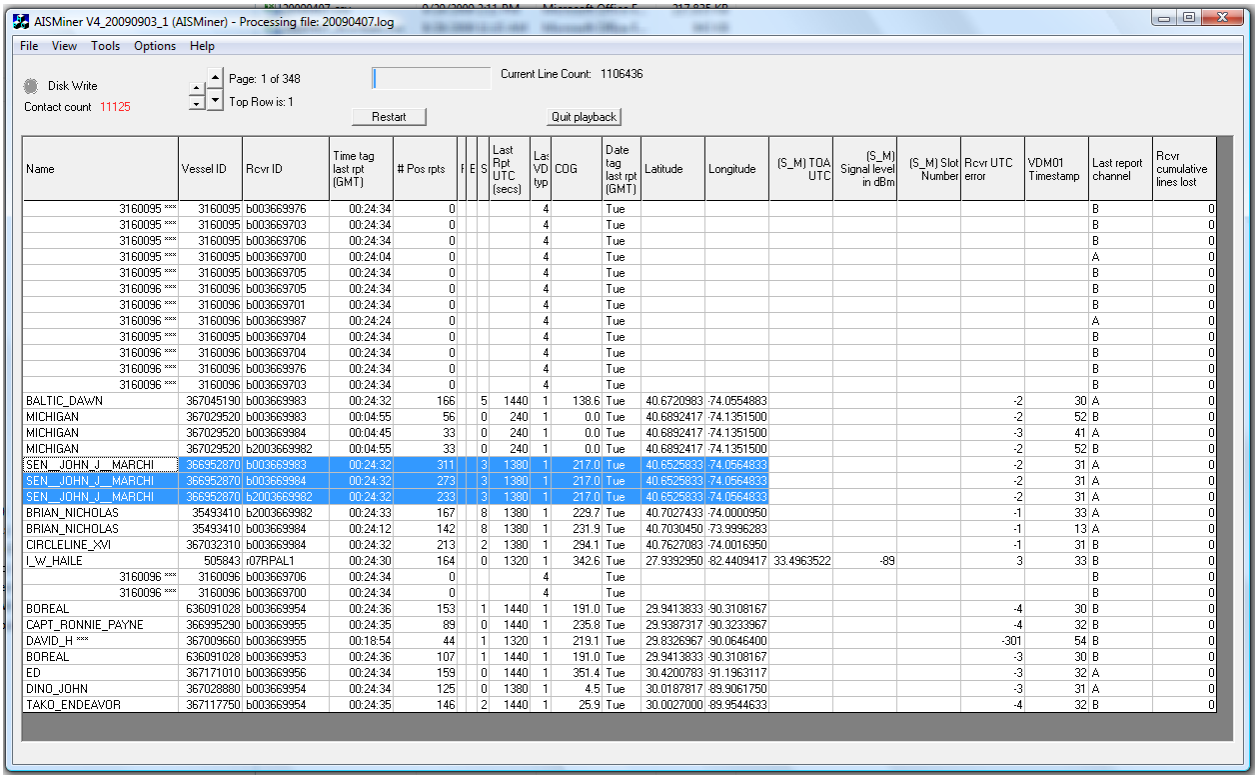


Figure 17. AISMiner – live data mode.

During live data mode, AISMiner uses a table view to display processed message data. Each row of the table view represents the pairing of a single receiver with a single vessel (contact) using the Rcvr ID and Vessel ID message fields (red outline – Figure 17 above). As newer data (receiver/vessel message data with a more recent timestamp) are processed, the Name, Vessel ID, and Rcvr ID fields in the table view remain constant and the remaining row fields are updated based on values from newer message data.

The blue highlighted area in figure 18 below show an example of a single vessel broadcast which was received by three different receivers at the same time. This illustrates the pairing of a single receiver with a single vessel for each row of the table view.



Name	Vessel ID	Rcvr ID	Time tag last rpt (GMT)	# Pos rpts	f	E	S	Last Rpt UTC (secs)	Las VD typ	COG	Date tag last rpt (GMT)	Latitude	Longitude	(S_M) TOA UTC	(S_M) Signal level in dBm	(S_M) Slot Number	Rcvr UTC error	VDM01 Timestamp	Last report channel	Rcvr cumulative lines lost
3160095 ***	3160095	b003669976	00:24:34	0					4		Tue								B	0
3160095 ***	3160095	b003669703	00:24:34	0					4		Tue								B	0
3160095 ***	3160095	b003669706	00:24:34	0					4		Tue								B	0
3160095 ***	3160095	b003669700	00:24:04	0					4		Tue								A	0
3160095 ***	3160095	b003669705	00:24:34	0					4		Tue								B	0
3160096 ***	3160096	b003669705	00:24:34	0					4		Tue								B	0
3160096 ***	3160096	b003669701	00:24:34	0					4		Tue								B	0
3160096 ***	3160096	b003669987	00:24:24	0					4		Tue								A	0
3160095 ***	3160095	b003669704	00:24:34	0					4		Tue								B	0
3160096 ***	3160096	b003669704	00:24:34	0					4		Tue								B	0
3160096 ***	3160096	b003669976	00:24:34	0					4		Tue								B	0
3160096 ***	3160096	b003669703	00:24:34	0					4		Tue								B	0
BALTIC_DAWN	367045190	b003669983	00:24:32	166		5		1440	1	138.6	Tue	40.6720983	-74.0554883				-2	30	A	0
MICHIGAN	367029520	b003669983	00:04:55	56		0		240	1	0.0	Tue	40.6892417	-74.1351500				-2	52	B	0
MICHIGAN	367029520	b003669984	00:04:45	33		0		240	1	0.0	Tue	40.6892417	-74.1351500				-3	41	A	0
MICHIGAN	367029520	b2003669982	00:04:55	33		0		240	1	0.0	Tue	40.6892417	-74.1351500				-2	52	B	0
SEN__JOHN_J__MARCHI	366952870	b003669983	00:24:32	311		3		1380	1	217.0	Tue	40.6525833	-74.0564833				-2	31	A	0
SEN__JOHN_J__MARCHI	366952870	b003669984	00:24:32	273		3		1380	1	217.0	Tue	40.6525833	-74.0564833				-2	31	A	0
SEN__JOHN_J__MARCHI	366952870	b2003669982	00:24:32	233		3		1380	1	217.0	Tue	40.6525833	-74.0564833				-2	31	A	0
BRIAN_NICHOLAS	35493410	b2003669982	00:24:33	167		8		1380	1	229.7	Tue	40.7027433	-74.0000950				-1	33	A	0
BRIAN_NICHOLAS	35493410	b003669984	00:24:12	142		8		1380	1	231.9	Tue	40.7030450	-73.9996283				-1	13	A	0
CIRCLELINE_XVI	367032310	b003669984	00:24:32	213		2		1380	1	294.1	Tue	40.7627083	-74.0016950				-1	31	B	0
I_W_HAILE	505843	r07RPAL1	00:24:30	164		0		1320	1	342.6	Tue	27.9392950	-82.4409417	33.4963522	-89		3	33	B	0
3160096 ***	3160096	b003669706	00:24:34	0					4		Tue								B	0
3160096 ***	3160096	b003669700	00:24:34	0					4		Tue								B	0
BOREAL	636091028	b003669954	00:24:36	153		1		1440	1	191.0	Tue	29.9413833	-90.3108167				-4	30	B	0
CAPT_RONNIE_PAYNE	366995290	b003669955	00:24:35	89		0		1440	1	235.8	Tue	29.9387317	-90.3233967				-4	32	B	0
DAVID_H ***	367009660	b003669955	00:18:54	44		1		1320	1	219.1	Tue	29.8326967	-90.0646400				-301	54	B	0
BOREAL	636091028	b003669953	00:24:36	107		1		1440	1	191.0	Tue	29.9413833	-90.3108167				-3	30	B	0
ED	367171010	b003669956	00:24:34	159		0		1440	1	351.4	Tue	30.4200783	-91.1963117				-3	32	A	0
DINO_JOHN	367028880	b003669954	00:24:34	125		0		1380	1	4.5	Tue	30.0187817	-89.9061750				-3	31	A	0
TAKO_ENDEAVOR	367117750	b003669954	00:24:35	146		2		1440	1	25.9	Tue	30.0027000	-89.9544633				-4	32	B	0

Figure 18. AISMiner – live data mode contact information.

In figure 19 below, the field values in each table row, for each Rcvr ID/Vessel ID pairing, are updated as data with a newer timestamp is processed. This shows that the relationship between a single receiver and a single vessel remains constant in the table view during data updates.

SEN__JOHN_J__MARCHI	366952870	b003669983	00:24:32	311		3	1380	1	217.0	Tue	40.6525833	-74.0564833
SEN__JOHN_J__MARCHI	366952870	b003669984	00:24:32	273		3	1380	1	217.0	Tue	40.6525833	-74.0564833
SEN__JOHN_J__MARCHI	366952870	b2003669982	00:24:32	233		3	1380	1	217.0	Tue	40.6525833	-74.0564833
SEN__JOHN_J__MARCHI	366952870	b003669983	00:31:45	371		3	1740	1	248.0	Tue	40.6438333	-74.0710833
SEN__JOHN_J__MARCHI	366952870	b003669984	00:31:45	331		3	1860	1	248.0	Tue	40.6438333	-74.0710833
SEN__JOHN_J__MARCHI	366952870	b2003669982	00:31:45	288		3	1860	1	248.0	Tue	40.6438333	-74.0710833

Figure 19. AISMiner – live data mode contact information update.

5.1.1.1 Example - Read Live Data

AISMiner can be used as a data log tool or as an analysis tool. Log files can be viewed using AISMiner or TransView[1]. Analysis (csv) files can be analyzed using Microsoft Excel. The following example demonstrates use of AISMiner as a data log tool.

Note: For an example of using AISMiner as an analysis tool, see section 8.

[1] U.S. Government developed and owned application used to display AIS track data.

1. Start AISMiner.
2. From the *View* menu item select *Default* (Figure 20).

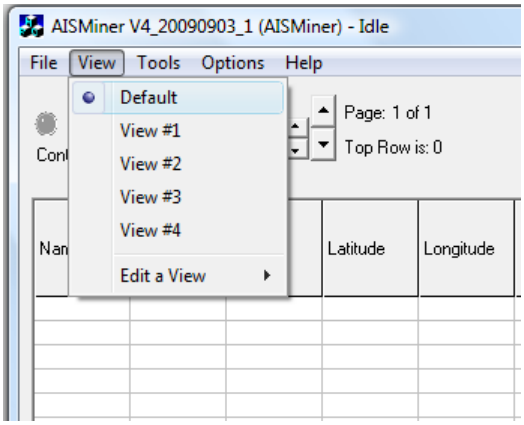


Figure 20. AISMiner – default menu item.

3. From the *Tools* menu item verify that *Apply Selected Filters* is not checked (Figure 21).

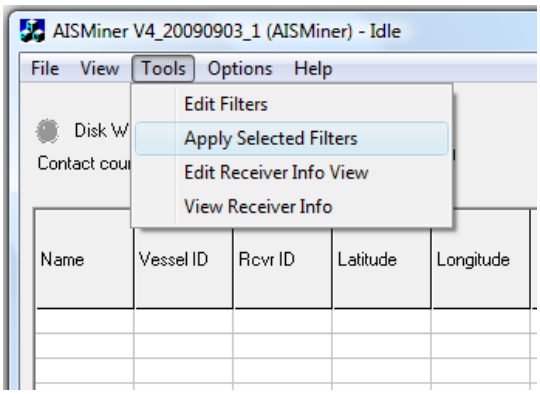


Figure 21. AISMiner – apply selected filters menu item.

4. From the *Options* menu item verify that *Enable Live Mode Logging* is checked (Figure 22).

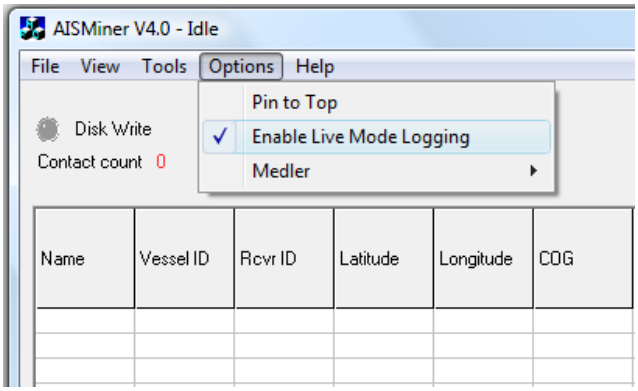


Figure 22. AISMiner – enable live mode logging menu item.

5. From the *File* menu item select *Read Live Data* (Figure 23).

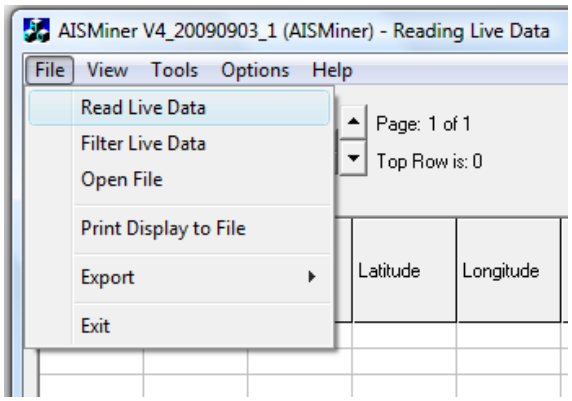
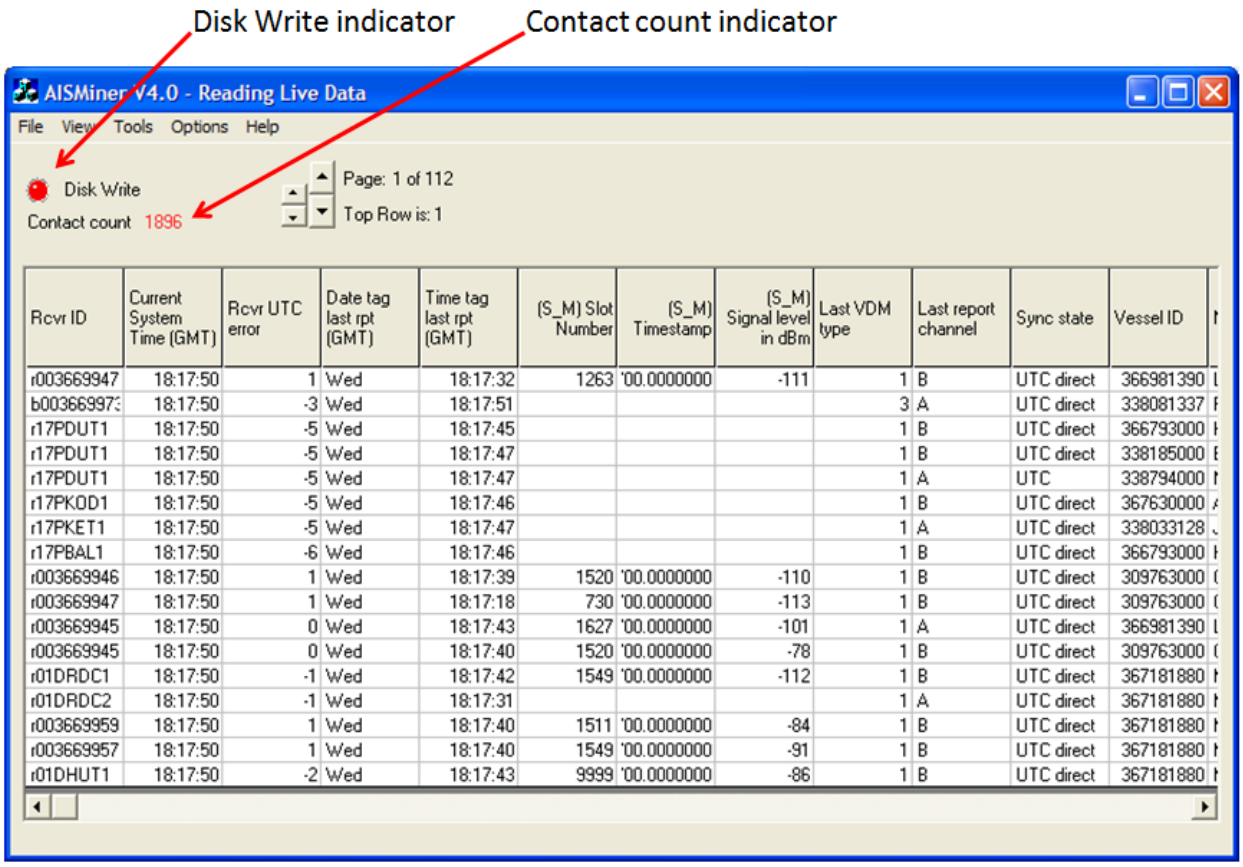


Figure 23. AISMiner – read live data menu item.

Within a few seconds AISMiner starts processing the live data steam. During processing the *Disk Write* indicator flashes red and the *Contact count* indicator increments by one for each new contact (vessel) processed by AISMiner (Figure 24).



Rcvr ID	Current System Time (GMT)	Rcvr UTC error	Date tag last rpt (GMT)	Time tag last rpt (GMT)	(S_M) Slot Number	(S_M) Timestamp	(S_M) Signal level in dBm	Last VDM type	Last report channel	Sync state	Vessel ID
r003669947	18:17:50	1	Wed	18:17:32	1263	'00.0000000	-111	1	B	UTC direct	366981390
b003669973	18:17:50	-3	Wed	18:17:51				3	A	UTC direct	338081337
r17PDUT1	18:17:50	-5	Wed	18:17:45				1	B	UTC direct	366793000
r17PDUT1	18:17:50	-5	Wed	18:17:47				1	B	UTC direct	338185000
r17PDUT1	18:17:50	-5	Wed	18:17:47				1	A	UTC	338794000
r17PKOD1	18:17:50	-5	Wed	18:17:46				1	B	UTC direct	367630000
r17PKET1	18:17:50	-5	Wed	18:17:47				1	A	UTC direct	338033128
r17PBAL1	18:17:50	-6	Wed	18:17:46				1	B	UTC direct	366793000
r003669946	18:17:50	1	Wed	18:17:39	1520	'00.0000000	-110	1	B	UTC direct	309763000
r003669947	18:17:50	1	Wed	18:17:18	730	'00.0000000	-113	1	B	UTC direct	309763000
r003669945	18:17:50	0	Wed	18:17:43	1627	'00.0000000	-101	1	A	UTC direct	366981390
r003669945	18:17:50	0	Wed	18:17:40	1520	'00.0000000	-78	1	B	UTC direct	309763000
r01DRDC1	18:17:50	-1	Wed	18:17:42	1549	'00.0000000	-112	1	B	UTC direct	367181880
r01DRDC2	18:17:50	-1	Wed	18:17:31				1	A	UTC direct	367181880
r003669959	18:17:50	1	Wed	18:17:40	1511	'00.0000000	-84	1	B	UTC direct	367181880
r003669957	18:17:50	1	Wed	18:17:40	1549	'00.0000000	-91	1	B	UTC direct	367181880
r01DHUT1	18:17:50	-2	Wed	18:17:43	9999	'00.0000000	-86	1	B	UTC direct	367181880

Figure 24. AISMiner – live data logging.

Note: If AISMiner encounters a problem with the data steam connection, an error message is shown. Dismissing the error message causes AISMiner to close. To fix the problem, check the internet connection and *Remote source IP* setting (§ 4.1.1.13) in the AISMiner INI file.

When AISMiner is running in live data mode, a new log file is created at midnight local time each new day, and a new month folder is created on the first day of each month. The new log file and folder are created in the directory listed in the AISMiner INI file setting *LogDir* (§ 4.1.1.10).

5.1.2 Filter Live Data

The *Filter Live Data* menu item, like the *Read Live Data* menu item (§ 5.1.1), is used to establish a connection to and begin processing of a live AIS data stream. The difference between these two features is that *Filter Live Data* feature first checks to see that data filters have been set; based on settings defined in the Filter Editor window (§ 5.3.1 and § 5.3.2). To configure AISMiner to read live data, see section 4.1.2.

5.1.2.1 Example – Filter Live Data

1. Start AISMiner.
2. From the *View* menu item select *Default*.
3. From the *Tools* menu item verify that *Apply Selected Filters* is checked.

   Note: Failure to perform this step causes a warning message to display at step 5 (Figure 25).

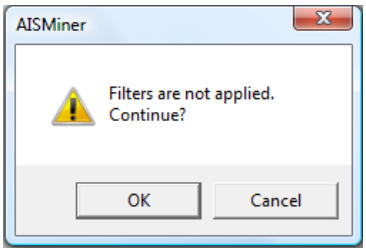


Figure 25. AISMiner – filter live data warning message.

4. From the *Options* menu item verify that *Enable Live Mode Logging* is checked.
5. From the *File* menu item select *Filter Live Data* (Figure 26).

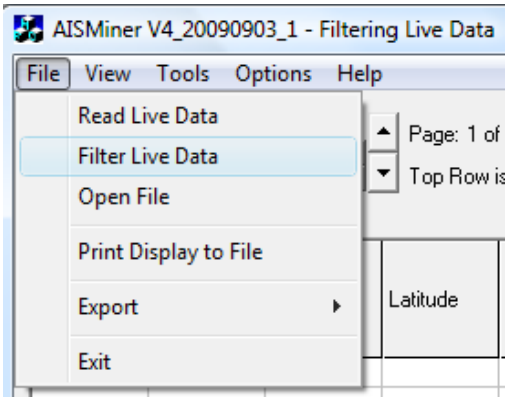


Figure 26. AISMiner – filter live data menu item.

Within a few seconds AISMiner starts processing the live data steam. During processing the *Disk Write* indicator flashes red and the *Contact count* indicator increments by one for each new contact (vessel) processed by AISMiner.

Note: If AISMiner encounters a problem with the data stream connection, an error message is shown. Dismissing the error message causes AISMiner to close. To fix the problem, check the internet connection and *Remote source IP* setting (§ 4.1.1.13) in the AISMiner INI file.

When AISMiner is left running in live data mode, a new log file is created at midnight local time each new day, and a new month folder is created on the first day of each month. The new log file and folder are created in the directory listed in the AISMiner INI file setting *LogDir* (§ 4.1.1.10).

5.1.3 Open file

The *Open File* menu item is used to open a log file for processing. Processing data in this manner is referred to as **saved data mode**. A log file created by AISMiner, or another application such as TransView, can be opened in saved data mode. Figure 27 below shows AISMiner default view in saved data mode.

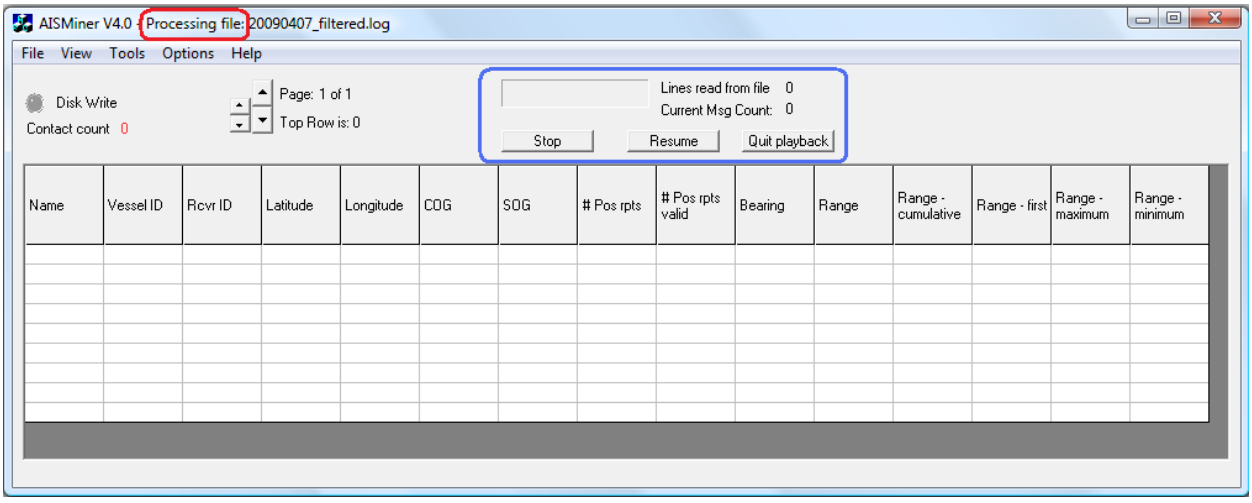


Figure 27. AISMiner – saved data mode default view.

Several main interface changes occur when AISMiner is in saved data mode. The window title includes the words "Processing file" (red outline – Figure 27 above) along with the name of the log file. In addition, a progress bar and several controls for working with a static dataset are added to the main interface (blue outline – Figure 27 above).

During file processing, the Stop and Resume buttons act as toggle buttons. The Stop button changes between Stop and Restart. The Stop button is used to stop processing of a file at the current line number. Data that was processed before the Stop button was clicked is displayed in the table view, but no further processing is performed. The Restart button resets the interface to an initial start state and clears the table view of processed data.

The Resume button toggles between Resume and Pause. Resume and Pause are used to stop and restart processing from the current line number.

The Quit playback button exits saved data mode and removes playback controls from the main interface.

5.1.3.1 Example – Read Saved Data

The following example demonstrates AISMiner working in saved data mode.

Note: If you do not have a log file to work with, follow steps outlined in § 5.1.1.1 to create and save a log file on your computer.

1. Start AISMiner.
2. From the *View* menu item select *Default* (Figure 20 above).
3. From the *Tools* menu item verify that *Apply Selected Filters* is checked (Figure 21 above). Note this step is optional.
4. From the *File* menu item select *Open File* (Figure 28).

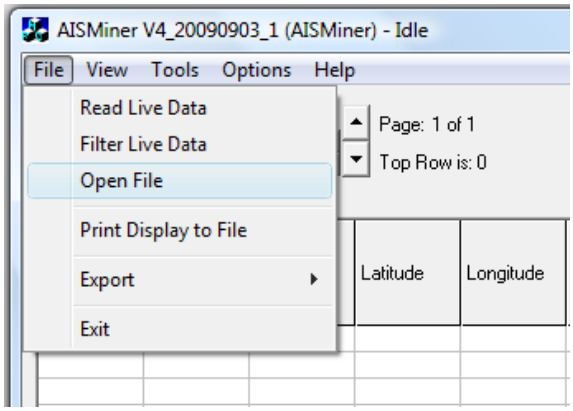


Figure 28. AISMiner – open file menu item.

5. Using the Open file window, navigate to and open a saved log file. Log files are kept in the directory listed in the AISMiner INI file setting *LogDir* (§ 4.1.1.10).
6. Click the Resume button to begin playback of the saved log file (blue outline - Figure 29). Note that the *Contact count* indicator increments by one for each new contact (vessel) processed (green outline – Figure 30), and the Resume button changes to Pause (blue outline – Figure 30). The *Lines read from file* indicator increments by one for each log file message sentence processed (orange outline – Figure 30), the *Current Msg Count* indicator increments by one for each log file message group processed (purple outline – Figure 30), and the progress bar updates during the playback process (red outline – Figure 30).

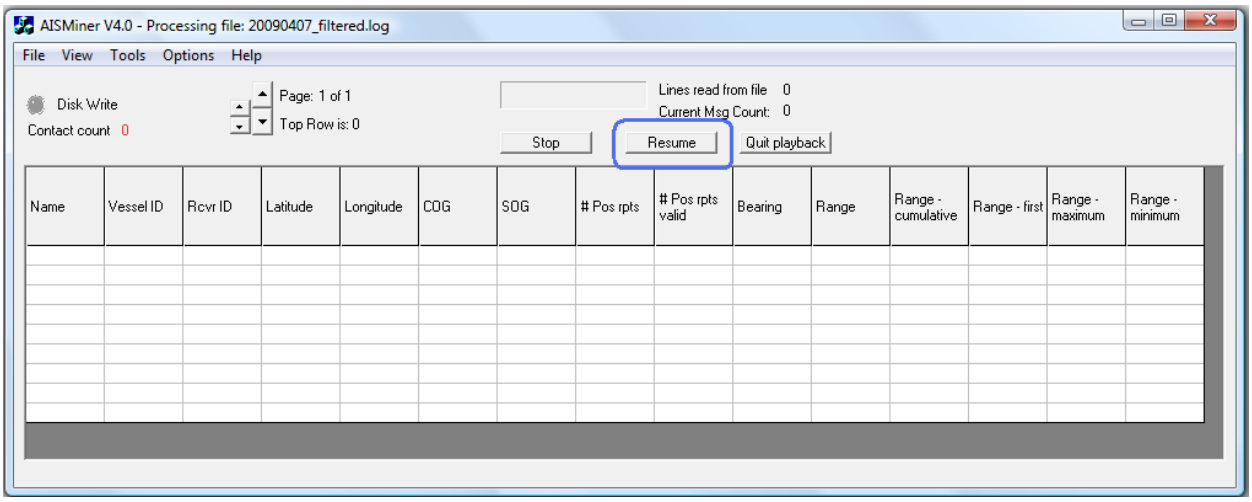


Figure 29. AISMiner – resume playback button.

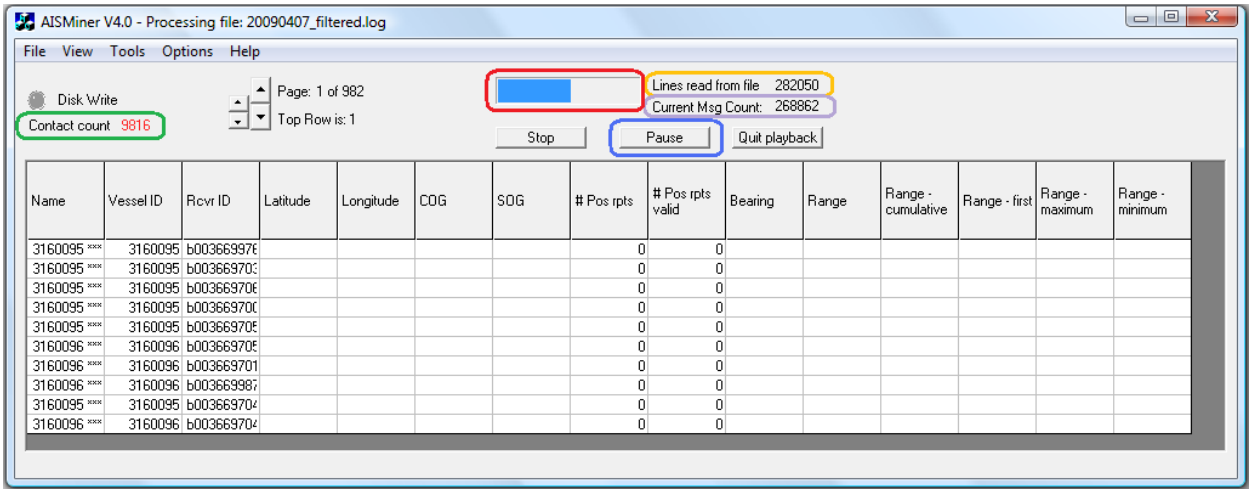


Figure 30. AISMiner – playback of saved log file.

Note: The table view display may not update while AISMiner is processing a log file. If the *Contact count* indicator is updating, AISMiner is processing the log file.

7. Click the Pause button to pause log file processing. Note that the Pause button changes to Resume and file processing stops at the *Lines read from file* number.
8. Click the Resume button to restart file processing at the *Lines read from file* number.
9. Click the Stop button to stop log file processing. Note that the Stop button changes to Restart (blue outline – Figure 31).

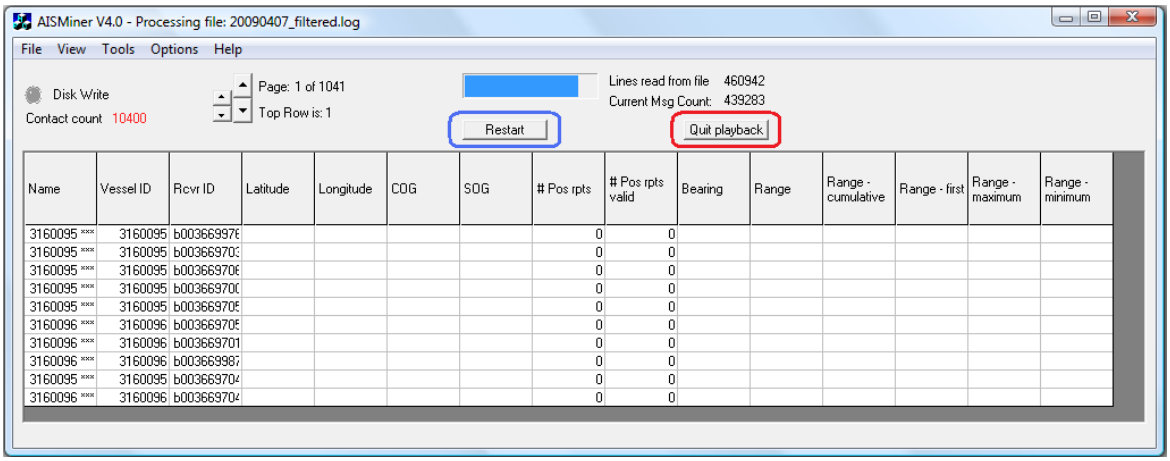


Figure 31. AISMiner – restart playback button.

10. Click the Restart button to reset AISMiner to a beginning state (blue outline - Figure 31 above).
11. Click the Quit playback button (red outline - Figure 31 above). The playback controls are removed from the main interface.

    Note: After clicking the Quit playback button the table view may update to show a subset of processed messages. Data shown is a result of the way AISMiner processes saved log files. It reads and processes a log file in sections. When the Restart button was last clicked, AISMiner automatically read and processed a section of the log file, starting at position zero, in the event that the Resume button was next clicked. If the Quit playback button is instead clicked, the table view automatically updates to show pre-processed messages in memory.
12. When AISMiner completes processing the log file a message is shown notifying the user (Figure 32).

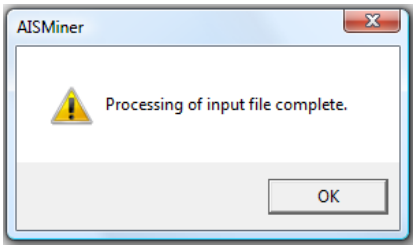


Figure 32. AISMiner – data file processing complete message.

5.1.4 Print Display to File

The *Print Display to File* menu item is used to save processed data to a local or network directory. It works in both live and saved data mode. The data is saved as an Excel '.csv' file. Only data shown in the table view are saved (i.e., data filtered based on settings in the Filter Editor window, and fields shown based on settings in the View Editor window). The csv file created contains all message data available from the table view, not just data shown on the current page of the table view. Note that this does not include all processed [vessel contact] message data, only the most recently processed data viewable in the table view. The output file row count equals the *Contact count* value when the feature is used. To access this feature, from the *File* menu item select *Print Display to File*.

5.1.4.1 Example – Print Display to File

The following example demonstrates use of the *Print Display to File* feature.

1. Start AISMiner.
2. From the *View* menu item, select *View #1*.
3. From the *Tools* menu item verify that *Apply Selected Filters* is checked.
4. From the *File* menu item select *Open File*.
5. Using the Open file window, navigate to and open a saved log file. Log files are kept in the directory listed in the AISMiner INI file setting LogDir (§ 4.1.1.10).
6. To populate the table view with data, click the Resume playback button followed by the Pause playback button (Figure 29 and 30 above).
7. From the *File* menu item, select *Print Display to File* (Figure 33).

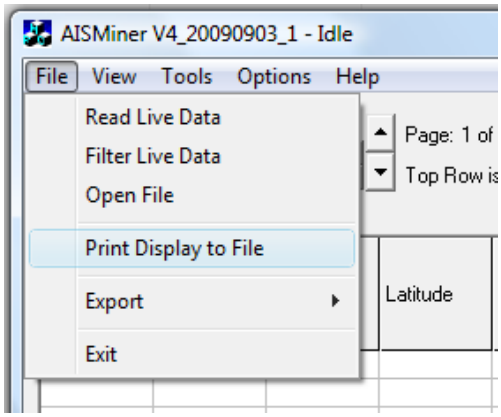


Figure 33. AISMiner – print display to file menu item.

8. In the Save File window, enter the file name "PrintDisplayToFileTest1.csv" and click the Save button.
9. Using Microsoft Excel, navigate to and open the "PrintToFileTest1.csv" file. Note, depending on your version of Excel, you may need to change the open file selection to "All Files" to view files with a csv extension.
10. Scroll through the contact records and verify that the fields and data shown are the same as in (View #1) table view. Note that the csv file record count equals the AISMiner *Contact count* (plus one for the header row).

5.1.5 Export

The *Export* menu item provides six menu options for working with saved log files (Figure 34).

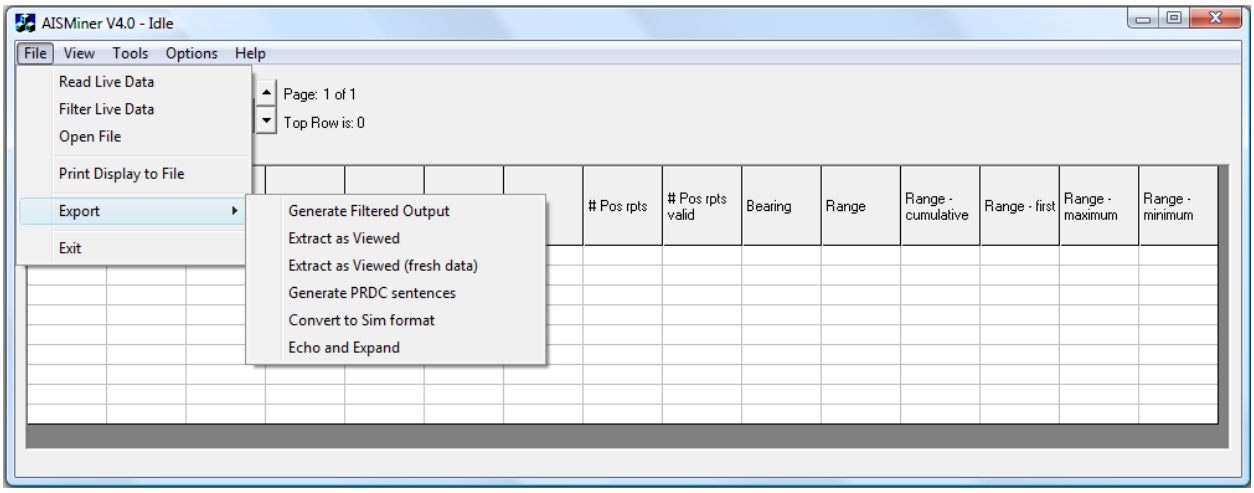


Figure 34. AISMiner – export menu options.

Table 5 below lists the output file formats for each of the *Export* menu options.

Table 5. Export menu item – file format options.

Option Name	Output File Type	Filter Settings Apply	Output Compatible With
Generate Filtered Output	.log	Yes	AIS Miner
Extract as Viewed	.csv	Yes	Excel
Extract as Viewed (fresh data)	.csv	Yes	Excel
Generate PRDC sentences	.log	Yes	AIS Miner
Convert to SIM Format	.amo	Yes	UAIS Simulation
Echo and Expand	.csv	Yes	Excel

5.1.5.1 Generate Filtered Output

The *Generate Filtered Output* menu item creates a filtered version of a saved log file based on user defined settings.

Note: See section 5.3.1 for information on filtering data using the Filter Editor window.

5.1.5.1.1 Example – Generate Filtered Output

The following example demonstrates the *Generate Filtered Output* feature.

1. Start AISMiner.
2. From the *View* menu item, select *Default*.
3. To open the Filter Editor window, from the *Tools* menu item select *Edit Filters*.

4. Using the Filter Editor radio buttons, disable all filters except the Receivers filter. For demonstration purposes, select only two receivers from the Receivers section. In this example receivers r003669957 and r003669959 are used. Click the Ok button to save the changes and close the window.
5. From the *Tools* menu item verify that *Apply Selected Filters* is checked.
6. From the *File* menu item select *Export* then *Generate Filtered Output*.
7. Using the Open file window, navigate to and open a saved log file. Log files are kept in the directory listed in the AISMiner.ini file setting LogDir (§ 4.1.1.10).
8. In the Save As window, enter the file name "GenerateFilteredOutputTest1.log" and click the Save button. By default the file is saved to the application directory.
9. Click the Resume playback button to begin processing of the filtered output file. Note that the *Disk Write* indicator blinks red (red outline – Figure 35), the *Contact count*, *Lines read from file*, and *Current Msg Count* indicators begin to increment (blue outline – Figure 35), and the table view updates with contact information.

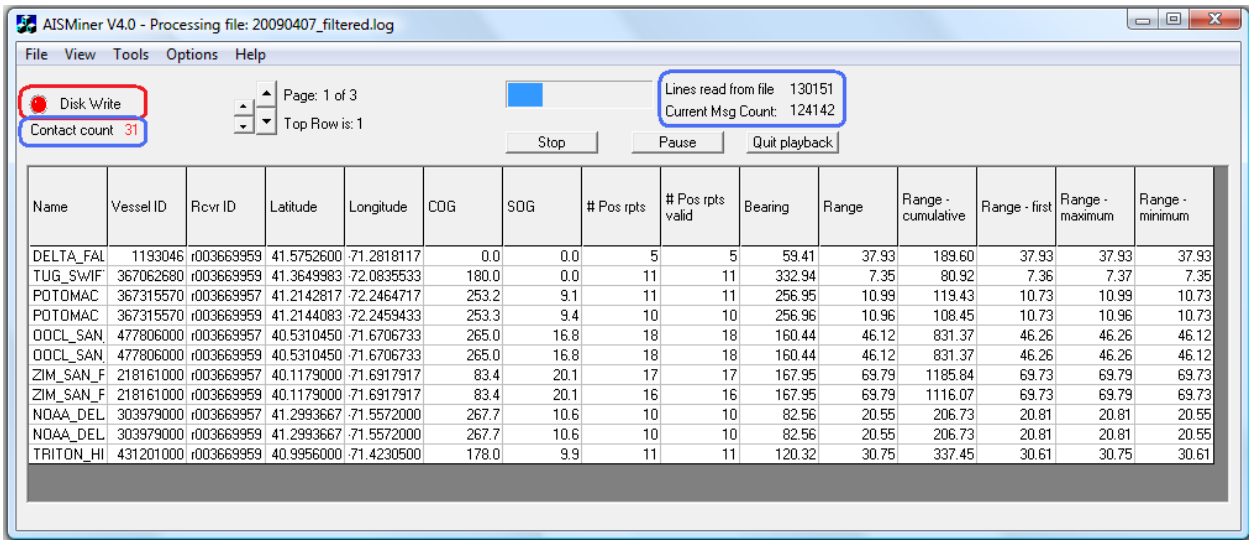


Figure 35. AISMiner – generate filtered output processing.

10. Allow AISMiner a few seconds to process part of the log file then click the Stop playback button.
11. Using Notepad, navigate to the application directory and open the filtered log file "GenerateFilteredOutputTest1.log". Figure 36 below shows an example of a filtered log file. Note that only message data from the two receivers selected in step 4 above was saved to the file (red outline – Figure 36).

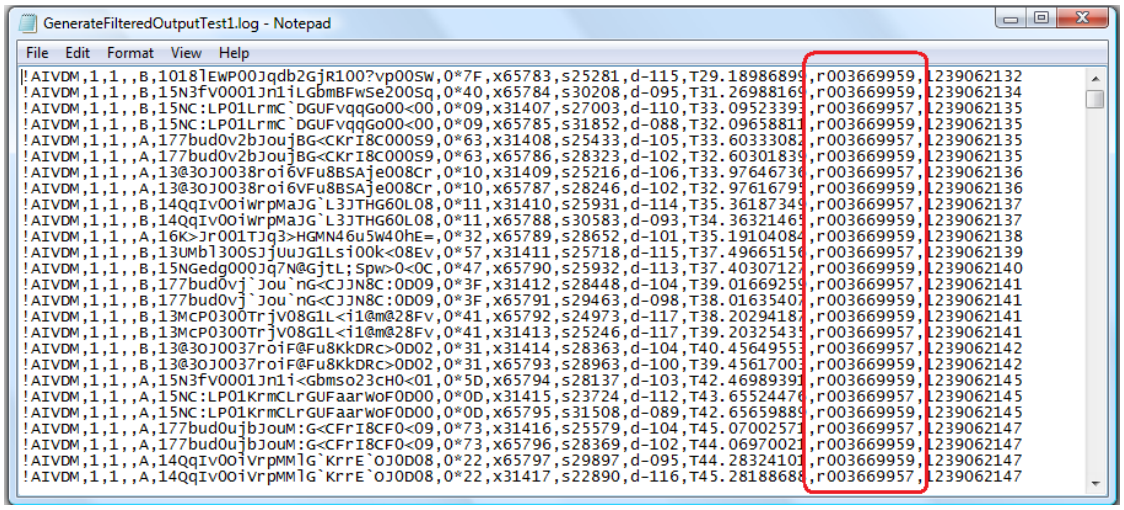


Figure 36. Notepad – generate filtered output file.

12. Click the Restart then Resume playback buttons to restart the Generate Filtered Output process. Allow the process to run until completion. Once complete, a notification message is shown (Figure 37).

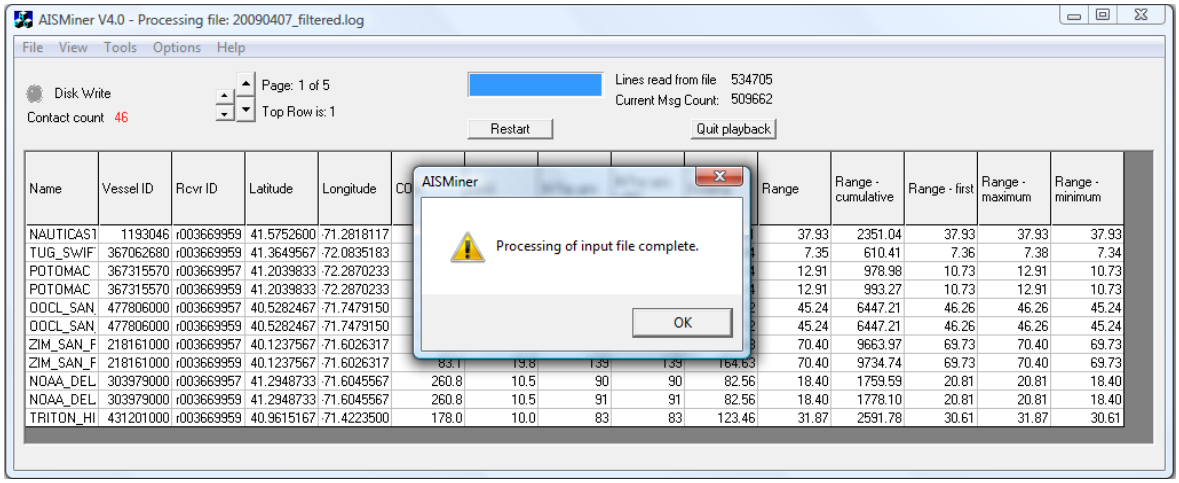


Figure 37. AISMiner – processing complete notification message.

5.1.5.2 Extract as Viewed

The *Extract as Viewed* menu item is used to save processed data to a local or network directory. The data is saved as an Excel 'csv' file. The feature only works in saved data mode. Like the *Print Display to File* feature (§ 5.1.4), only filtered data (based on settings in the Filter Editor window), and fields shown in the table view (based on settings in the View Editor window), are saved to the csv output file. Unlike the *Print Display to File* feature, the csv file created is based on all processed message data, not just the most recently processed message data shown in the table view.

Table 6 below shows an example of the record-field data population, in the csv output file, for a single contact/receiver pairing using the *Extract as Viewed* feature. In the example, the table columns *Last VDM type*, *VDM01 Latitude (degs)*, *VDM02 Latitude (degs)*, and *VDM04 Latitude*

(degs) represent fields shown in the AISMiner table view. In the example, a contact transmitted ten messages to a receiver; which were processed by AISMiner. The message type for each transmitted message is shown in the column *Last VDM type*.

The message type for record number one (yellow shading – Table 6) is VDM01. Using the *Extract as Viewed* feature, the field *VDM01 Latitude (degs)*, in record number one, would be populated with data from the message, but not the fields *VDM02 Latitude (degs)*, and *VDM04 Latitude (degs)* as a VDM01 message does not contain data for these two fields.

The message type for record number two (green shading – Table 6) is VDM02. Using the *Extract as Viewed* feature, the field *VDM01 Latitude (degs)*, in record number two, would be populated with the same data from record number one. The field *VDM02 Latitude (degs)*, in record number two, would be populated with data read from the record number two VDM02 message. The field *VDM04 Latitude (degs)* would not be populated as messages number one and two do not contain data for this field.

The message type for record number three (no shading – Table 6) is VDM03. Using the *Extract as Viewed* feature, the field *VDM01 Latitude (degs)*, in record number three, would be populated with the same data from record number one. The field *VDM02 Latitude (degs)*, in record number three, would be populated with the same data from record number two. The *VDM04 Latitude (degs)* field would not be populated as messages number one, two, and three do not contain data for this field.

The message type for record number four (peach shading – Table 6) is VDM04. Using the *Extract as Viewed* feature, the field *VDM01 Latitude (degs)*, in record number four, would be populated with the same data from record number one. The field *VDM02 Latitude (degs)*, in record number four, would be populated with the same data from record number two. The field *VDM04 Latitude (degs)*, in record number four, would be populated with data read from the record number four VDM04 message.

The message type for record number five (blue shading – Table 6) is VDM01. Using the *Extract as Viewed* feature, the field *VDM01 Latitude (degs)*, in record number five, would be populated with new data read from the record number five VDM01 message. The field *VDM02 Latitude (degs)*, in record number five, would be populated with the same data from record number two. The field *VDM04 Latitude (degs)*, in record number five, would be populated with same data from record number four.

This process is repeated for each of the five remaining records. To best understand the unique output format of the *Extract as Viewed* feature, a practical knowledge of AIS message field data is needed. Also, the example in table 6 below uses distinct (VDM) message fields. If the table view field selection in AISMiner contains "general" message fields (fields included in more than one message type), then a record-field will be populated with updated "general" field data each time a message containing the "general" field data is processed.

Note: See section 5.1.5.3 - *Extract as Viewed (fresh data)* for a comparison to the *Extract as Viewed* feature.

Table 6. Extract as viewed menu item – record field population example.

Column Fields in AISMiner Table View	Last VDM Type	VDM01 Latitude (degs)	VDM02 Latitude (degs)	VDM04 Latitude (degs)
Contact [message] record # 1	1	Populated		
2	2	Populated (with data from record # 1)	Populated	
3	3	Populated (with data from record # 1)	Populated (with data from record # 2)	
4	4	Populated (with data from record # 1)	Populated (with data from record # 2)	Populated
5	1	Populated (updated with current message data)	Populated (with data from record # 2)	Populated (with data from record # 4)
6	2	Populated (with data from record # 5)	Populated (updated with current message data)	Populated (with data from record # 4)
7	1	Populated (updated with current message data)	Populated (with data from record # 6)	Populated (with data from record # 4)
8	1	Populated (updated with current message data)	Populated (with data from record # 6)	Populated (with data from record # 4)
9	2	Populated (with data from record # 8)	Populated (updated with current message data)	Populated (with data from record # 4)
10	4	Populated (with data from record # 8)	Populated (with data from record # 9)	Populated (updated with current message data)

Note: In addition to the standard output file, the feature also produces a separate csv file which includes statistical information about all receivers in the processed dataset. This file is specific to R&D Center analyses and is named "XXX_RcvrStats.csv".

5.1.5.2.1 Example – Extract as Viewed

The following example demonstrates the *Extract as Viewed* feature.

1. Start AISMiner.
2. From the *View* menu item, select *Edit a View* then *View #1*.
3. To open the View Editor window, from the *View* menu item go to *Edit a View* and select *View #1*.
4. Click the General Info radio button (red outline - Figure 38) then using the Add button (blue outline – Figure 38), select and add the fields *Vessel ID*, *Rcvr ID*, and *Last VDM type* to the *Items in current view* list (green outline – Figure 38).

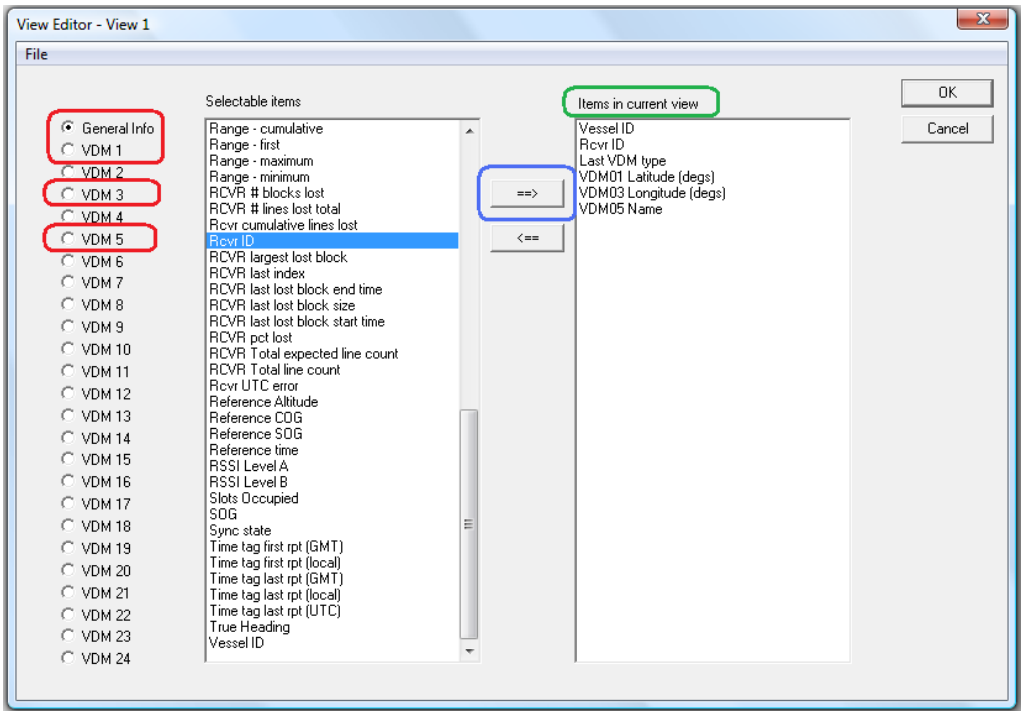


Figure 38. AISMiner – view editor window.

5. Click the VDM 1 radio button and add the field *VDM01 Latitude (degs)* to the *Items in current view* list.
6. Click the VDM 3 radio button and add the field *VDM03 Longitude (degs)* to the *Items in current view* list.
7. Click the VDM 5 radio button and add the field *VDM05 Name* to the *Items in current view* list.
8. Click the Ok button to close the View Editor window and update the table view in AISMiner (Figure 39).

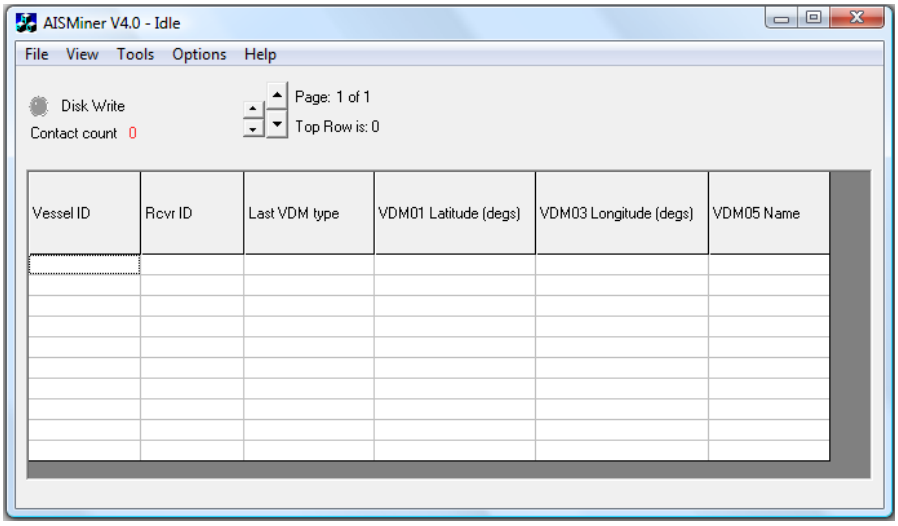


Figure 39. AISMiner – custom table view.

9. From the *Tools* menu item verify that *Apply Selected Filters* is checked. Note this step is optional.
10. From the *File* menu item select *Export* then *Extract as Viewed*.
11. Using the Open file window, navigate to and open a saved log file. Log files are kept in the directory listed in the AISMiner INI file setting LogDir (§ 4.1.1.10).
12. In the Save As window, enter the file name "ExtractAsViewedTest1.csv" and click the Save button. By default the file is saved to the application directory. Note that a separate file, named "ExtractAsViewedTest1_RcvrStats.csv" is also created and saved by default.
13. Click the Resume playback button to begin processing of the csv output file.
14. Depending on the size of the saved log file, allow AISMiner to process the complete log file, or allow AISMiner a few seconds to process part of the log file then click the Stop playback button followed by the Quit playback button.
15. Using Microsoft Excel, navigate to and open the 'ExtractAsViewedTest1.csv" output file. Note, depending on your version of Excel you may need to change the open file selection to "All Files" to view files with a csv extension. To view results as shown in table 6 above, sort (A to Z) first by the *Vessel ID* column then *Rcvr ID*. Figure 40 below shows an example of the csv output file.

N17

	A	B	C	D	E	F
1	Vessel ID	Rcvr ID	Last VDM type	VDM01 Latitude (degs)	VDM03 Longitude (degs)	VDM05 Name
2	316003663	b003669704	1	49.3056867		
3	316003663	b003669704	1	49.3058067		
4	316003663	b003669704	3	49.3058067	-123.1172733	
5	316003663	b003669704	5	49.3058067	-123.1172733	SEASPAN_CORSAIR
6	316003663	b003669704	3	49.3058067	-123.1175483	SEASPAN_CORSAIR
7	316003663	b003669704	3	49.3058067	-123.117625	SEASPAN_CORSAIR
8	316003663	b003669704	3	49.3058067	-123.1177783	SEASPAN_CORSAIR
9	316003663	b003669704	3	49.3058067	-123.1178933	SEASPAN_CORSAIR
10	316003663	b003669704	3	49.3058067	-123.118275	SEASPAN_CORSAIR
11	316003663	b003669704	1	49.30633	-123.118275	SEASPAN_CORSAIR
12	316003663	b003669704	1	49.306475	-123.118275	SEASPAN_CORSAIR
13	316003663	b003669704	1	49.3066333	-123.118275	SEASPAN_CORSAIR

Figure 40. Excel – extract as viewed csv output file.

5.1.5.3 Extract as Viewed (fresh data)

The *Extract as Viewed (fresh data)* menu item is used to save processed data to a local or network directory. The data is saved as an Excel 'csv' file. The feature only works in saved data mode. Like the *Print Display to File* feature (§ 5.1.4), only filtered data (based on settings in the Filter Editor window), and fields shown in the table view (based on settings in the View Editor window), are saved to the csv output file. Unlike the *Print Display to File* feature, the csv file created is based on all processed message data, not just the most recently processed message data shown in the table view.

Table 7 below shows an example of the record-field data population, in the csv output file, for a single contact/receiver pairing using the *Extract as Viewed (fresh data)* feature. In the example, the table columns *Last VDM type*, *VDM01 Latitude (degs)*, *VDM02 Latitude (degs)*, and *VDM04 Latitude (degs)* represent fields shown in the AISMiner table view. In the example, a contact

transmitted ten messages to a receiver; which were processed by AISMiner. The message type for each transmitted message is shown in the column *Last VDM type*.

The message type for record number one (yellow shading – Table 7) is VDM01. Using the *Extract as Viewed (fresh data)* feature, the field *VDM01 Latitude (degs)*, in record number one, would be populated with data from the message, but not the fields *VDM02 Latitude (degs)*, and *VDM04 Latitude (degs)* as a VDM01 message does not contain data for these two fields.

The message type for record number two (green shading – Table 7) is VDM02. Using the *Extract as Viewed (fresh data)* feature, the field *VDM01 Latitude (degs)*, in record number two, would be empty. This is because the VDM02 message does not contain *VDM01 Latitude (degs)* field data and, unlike the *Extract as Viewed* feature (§ 5.1.5.2), the *VDM01 Latitude (degs)* field data from record number one are not used to populate this field in record number two. The field *VDM02 Latitude (degs)*, in record number two, would be populated with data read from the record number two VDM02 message. The field *VDM04 Latitude (degs)* would not be populated as a VDM02 message does not contain data for this field.

The message type for record number three (no shading – Table 7) is VDM03. Using the *Extract as Viewed (fresh data)* feature, the fields *VDM01 Latitude (degs)*, *VDM02 Latitude (degs)*, and *VDM04 Latitude (degs)*, in record number three, would be empty. This is because the VDM03 message does not contain *VDM01 Latitude (degs)*, *VDM02 Latitude (degs)*, or *VDM04 Latitude (degs)* field data and, unlike the *Extract as Viewed* feature, the applicable field data from records number one and two are not used to populate these fields in record number three.

The message type for record number four (peach shading – Table 7) is VDM04. Using the *Extract as Viewed (fresh data)* feature, the fields *VDM01 Latitude (degs)*, and *VDM02 Latitude (degs)* in record number four, would be empty. This is because the VDM04 message does not contain *VDM01 Latitude (degs)* or *VDM02 Latitude (degs)* field data and, unlike the *Extract as Viewed* feature, the applicable field data from records number one and two are not used to populate these fields in record number four. The field *VDM04 Latitude (degs)*, in record number four, would be populated with data read from the record number four VDM04 message.

The message type for record number five (blue shading – Table 7) is VDM01. Using the *Extract as Viewed (fresh data)* feature, the field *VDM01 Latitude (degs)*, in record number five, would be populated with data from this message, but not the fields *VDM02 Latitude (degs)*, and *VDM04 Latitude (degs)* as a VDM01 message does not contain data for these two fields and, unlike the *Extract as Viewed* feature, the applicable field data from records number two and four are not used to populate these fields in record number five.

This process is repeated for each of the five remaining records. To best understand the unique output format of the *Extract as Viewed (fresh data)* feature, a practical knowledge of AIS message field data is needed. Also, the example in table 7 below uses distinct (VDM) message fields. If the table view field selection in AISMiner contains "general" message fields (fields included in more than one message type), then a record-field will be populated with updated "general" field data each time a message containing the "general" field data is processed.

Note: See section 5.1.5.2 - *Extract as Viewed* for a comparison to the *Extract as Viewed (fresh data)* feature.

Table 7. Extract as viewed (fresh data) menu item – record field population example.

Column Field in AISMiner Table View	Last VDM Type	VDM01 Latitude (degs)	VDM02 Latitude (degs)	VDM04 Latitude (degs)
Contact [message] record # 1	1	Populated		
2	2		Populated	
3	3			
4	4			Populated
5	1	Populated (updated with current message data)		
6	2		Populated (updated with current message data)	
7	1	Populated (updated with current message data)		
8	1	Populated (updated with current message data)		
9	2		Populated (updated with current message data)	
10	4			Populated (updated with current message data)

Note: In addition to the standard output file, the feature also produces a separate csv file which includes statistical information about all receivers in the processed dataset. This file is specific to R&D Center analyses and is named "XXX_RcvrStats.csv".

5.1.5.3.1 Example – Extract as Viewed (fresh data)

The following example demonstrates the *Extract as Viewed (fresh data)* feature.

1. Start AISMiner.
2. From the *View* menu item, select *Edit a View* then *View #1*.
3. To open the View Editor window, from the *View* menu item go to *Edit a View* and select *View #1*.
4. Click the General Info radio button then using the Add button, select and add the fields *Vessel ID, Rcvr ID,* and *Last VDM type* to the *Items in current view* list.
5. Click the VDM 1 radio button and add the field *VDM01 Latitude (degs)* to the *Items in current view* list.
6. Click the VDM 3 radio button and add the field *VDM03 Longitude (degs)* to the *Items in current view* list.
7. Click the VDM 5 radio button and add the field *VDM05 Name* to the *Items in current view* list.

8. Click the Ok button to close the View Editor window and update the table view in AISMiner.
9. From the *Tools* menu item verify that *Apply Selected Filters* is checked. Note this step is optional.
10. From the *File* menu item select *Export* then *Extract as Viewed (fresh data)*.
11. Using the Open file window, navigate to and open a saved log file. Log files are kept in the directory listed in the AISMiner INI file setting LogDir (§ 4.1.1.10).
12. In the Save As window, enter the file name "ExtractAsViewedFreshDataTest1.csv" and click the Save button. By default the file is saved to the application directory. Note that a separate file, named "ExtractAsViewedFreshDataTest1_RcvrStats.csv" is also created and saved by default.
13. Click the Resume playback button to begin processing of the csv output file.
14. Depending on the size of the saved log file, allow AISMiner to process the complete log file, or allow AISMiner a few seconds to process part of the log file then click the Stop playback button followed by the Quit playback button.
15. Using Microsoft Excel, navigate to and open the 'ExtractAsViewedFreshDataTest1.csv" output file. Note, depending on your version of Excel, you may need to change the open file selection to "All Files" to view files with a csv extension. To view results as shown in table 7 above, sort (A to Z) first by the *Vessel ID* column then *Rcvr ID*. Figure 41 below shows an example of the csv output file.

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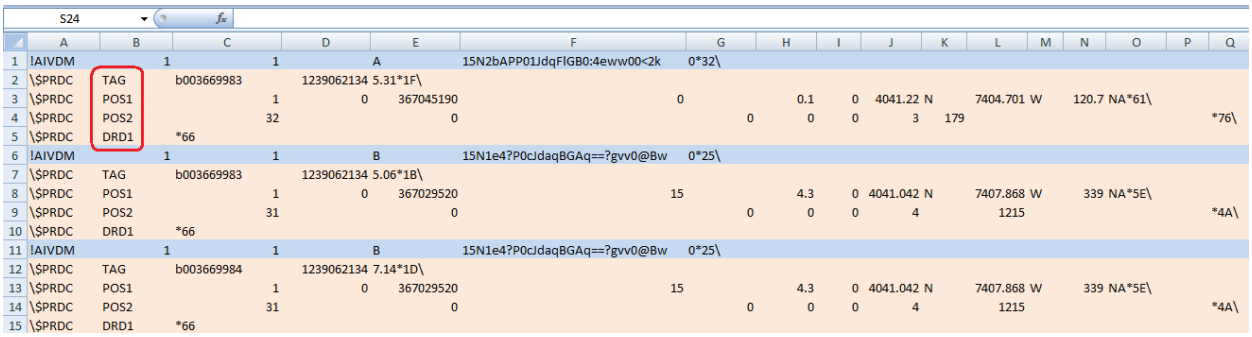
	A	B	C	D	E	F
1	Vessel ID	Rcvr ID	Last VDM type	VDM01 Latitude (degs)	VDM03 Longitude (degs)	VDM05 Name
2	316003663	b003669704	1	49.3056867		
3	316003663	b003669704	1	49.3058067		
4	316003663	b003669704	3		-123.1172733	
5	316003663	b003669704	5			SEASPAN_CORSAIR
6	316003663	b003669704	3		-123.1175483	
7	316003663	b003669704	3		-123.117625	
8	316003663	b003669704	3		-123.1177783	
9	316003663	b003669704	3		-123.1178933	
10	316003663	b003669704	3		-123.118275	
11	316003663	b003669704	1	49.30633		
12	316003663	b003669704	1	49.306475		
13	316003663	b003669704	1	49.3066333		

Figure 41. Excel – extract as viewed (fresh data) csv output file.

5.1.5.4 Generate PRDC Sentences

The *Generate PRDC Sentences* menu item is used to add expanded position data to message types 1, 2, 3, and 5. The feature works with saved log files. The additional information is formatted in Proprietary Research and Development Center (PRDC) format. Figure 42 below shows an output log file, opened in Excel, using this feature. The processed message sentence data (blue highlight – Figure 42) is written first in the output sentence, followed by the expanded sentence data (peach highlight – Figure 42). When field data is not included in the original message, the field appears blank or the letters "NA" are shown in the expanded section of the output sentence.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	!AIVDM		1	1		A	15N2bAPP01JdqFlGB0:4eww00<2k	0*32\									
2	\$PRDC	TAG	b003669983		1239062134	5.31*1F\											
3	\$PRDC	POS1		1	0	367045190	0		0.1	0	4041.22	N	7404.701	W	120.7	NA*61\	
4	\$PRDC	POS2		32		0		0	0	0	3	179					*76\
5	\$PRDC	DRD1	*66														
6	!AIVDM		1	1		B	15N1e4?P0cJdaqBGAq==?gvv0@Bw	0*25\									
7	\$PRDC	TAG	b003669983		1239062134	5.06*1B\											
8	\$PRDC	POS1		1	0	367029520	15		4.3	0	4041.042	N	7407.868	W	339	NA*5E\	
9	\$PRDC	POS2		31		0		0	0	0	4		1215				*4A\
10	\$PRDC	DRD1	*66														
11	!AIVDM		1	1		B	15N1e4?P0cJdaqBGAq==?gvv0@Bw	0*25\									
12	\$PRDC	TAG	b003669984		1239062134	7.14*1D\											
13	\$PRDC	POS1		1	0	367029520	15		4.3	0	4041.042	N	7407.868	W	339	NA*5E\	
14	\$PRDC	POS2		31		0		0	0	0	4		1215				*4A\
15	\$PRDC	DRD1	*66														

Figure 42. Excel – generate PRDC sentences output log file.

Following is an explanation of each expanded position statement type (red outline – Figure 42 above). The statement types are TAG, POS1, POS2, DRD1, SVD1, and SVD2.

TAG: Receiving (Base) Station and Time Tag for received AIS data.

Provides the identity of the AIS [base] station, which received the associated message, and the date and time of message reception. Also, the distance between the transmit vessel and receiving station at time of transmission is included when available (i.e., the VDM sentence contains vessel position information). A TAG sentence immediately follows all "!AIVDM" sentences sent from a receiving station.

Sentence Structure:

$PRDC,TAG,a,b,c*hh

Example:

$PRDC,TAG,r003669971,1051761221,49.83*1C

Sentence Parameters:

- $P: Proprietary identifier of NMEA 0183 sentence.
- RDC: NMEA registered identifier of USCG R&DC.
- TAG: Statement type identifier. The TAG sentence provides the receiving source identifier and time of AIS message reception.
- a: Receiver identifier.
- b: Time stamp from receiving station at receipt of VDM sentence. Formatted as seconds elapsed since midnight on Jan 1, 1970.
- c: Distance from receiving station in nautical mile.
- *: Identifier denoting the following two characters as a checksum.
- hh: Two character checksum (x Or) value. Applies to all message data between '$' and second '*' exclusive.

Note: When data is not available a null field is shown. Two field delimiters (commas) without a separating space represent a null field.

POS1: Decoded AIS position report data.

Provides the decoded and scaled values for the first thirteen parameters of ITU messages 1, 2, and 3. See POS2 statement type for the remaining fields.

Sentence Structure:

$PRDC,POS1,a,b,c,d,e,f,g,h,i,j,k,l,m*hh

Example:

$PRDC,POS1,1,0,248143000,0,0,14.1,0,4031.220,N,7144.903,W,268.0,269.0*79

Sentence Parameters:

- $P: Proprietary identifier of NMEA 0183 sentence.
- RDC: NMEA registered identifier of USCG R&DC.
- POS1: Statement type identifier. The POS1 sentence yields the majority of the decoded content of ITU messages 1, 2, or 3.
- a: User ID (MMSI Number).
- b: Navigational status (0-15).
- c: Rate of Turn (+rot) = right turn, (-rot) = left turn (float).
- d: Speed Over Ground (SOG) in knots.
- e: Position accuracy.
- f: Latitude in degrees minutes decimal minutes.
- g: Latitude direction (N/S).
- h: Longitude in degrees minutes decimal minutes.
- i: Longitude direction (E/W).
- j: Course Over Ground (COG) in degrees.
- k: True Heading in degrees (integer)
- *: Identifier denoting the following two characters as a checksum.
- hh: Two character checksum (x Or) value. Applies to all message data between '$' and second '*' exclusive.

POS2: Decoded AIS position report data.

Provides the decoded and scaled values for the last five parameters of ITU messages 1, 2, and 3. See POS1 statement type for the first thirteen fields.

Sentence Structure:

$PRDC,POS2,a,b,c,d,e,f,g,h,i,j,k,l,m,n*hh

Example:

$PRDC,POS2,1,0,,0,0,0,2,,2249,,,,,*59

Sentence Parameters:

- $P: Proprietary identifier of NMEA 0183 sentence.
- RDC: NMEA registered identifier of USCG R&DC.
- POS2: Statement type identifier. The POS2 sentence provides remaining decoded fields content of ITU messages 1, 2, or 3.
- a: Time Stamp in seconds (0-59).
- b: Positioning system problem indicator.[1]
- c: Regional application (0-15).
- d: Spare (0-1).
- e: RAIM flag (0-1).
- f: Sync state.[2]
- g: SOTDMA slot timeout.[3]
- h: SOTDMA received stations.[4]
- i: SOTDMA slot number.[5]
- j: SOTDMA UTC time - formatted as "hhmm."[6]
- k: SOTDMA slot offset.[7]
- l: ITDMA slot increment.[8]
- m: ITDMA number of slots.[9]
- n: ITDMA keep flag (T/F).[10]
- *: Identifier denoting the following two characters as a checksum.
- hh: Two character checksum (x Or) value. Applies to all message data between '$' and second '*' exclusive.

1. The Positioning System Problem Indicator is determined by the values of 61-63 as contained in the Time Stamp data in the VDM sentence. This field is set to null if no problems are reported, i.e. a value below 61 is contained in the time stamp data in the VDM sentence:
   M = Manual input mode.
   E = Estimated (dead reckoning) mode.
   N = Inoperative - not valid.
2. The Sync State is a component of the ITDMA and SOTDMA Communications States and identifies the type of TDMA synchronization be used by the AIS equipment. It may consist of the following values:
   0 = UTC direct. (See ITU-R M.1371-3 sec 3.1.1.1)
   1 = UTC indirect. (See ITU-R M.1371-3 sec 3.1.1.2)
   2 = Station is synchronized to a base station. (See ITU-R M.1371-3 sec 3.1.1.3)
   3 = Station is synchronized to another station based upon the highest number of received station. (See ITU-R M.1371-3 sec 3.1.1.4)
3. The Slot Time-out is a component of the SOTDMA Communications State (ITU messages 1 and 2) and specifies the number of frames remaining until a new slot is selected. This field is null for the ITDMA Communications State found in ITU message 3. The range of data is from 0 to 7.
4. The Received Stations field is a component of only the SOTDMA Communications State (ITU messages 1 and 2) and specifies the number of other AIS units which are currently being received. This field shall contain data only when the SOTDMA Slot Time-out field is set to 3, 5, or 7, and shall be null otherwise. The range of data is from 0 to 16383.
5. The Slot Number field is a component of only the SOTDMA Communications State (ITU messages 1 and 2) and specifies the slot number used for this transmission. This field shall contain data only when the SOTDMA Slot Time-out field is set to 2, 4, or 6, and shall be null otherwise. The range of data is from 0 to 2249.
6. The UTC field is a component of only the SOTDMA Communications State (ITU messages 1 and 2) and specifies the hour and minute of the current frame. Units of seconds are not provided. This field shall contain data only when the SOTDMA Slot Time-out field is set to 1 and shall be null otherwise.
7. The Slot Offset field is a component of only the SOTDMA Communications State (ITU messages 1 and 2) and specifies relative jump to the slot in which transmission will occur during the next frame. This field shall contain data only when the SOTDMA Slot Time-out field is set to 0 and shall be null otherwise.
8. The Slot Increment field is a component of only the ITDMA Communications State (ITU message 3) and specifies the offset to the next slot to be used. This field shall contain data only when this is an ITDMA Communications State (ITU message 3) and shall be null otherwise.
9. The Number of Slots field is a component of only the ITDMA Communications State (ITU message 3) and specifies the number of consecutive slots for reserve. This field shall contain data only when this is an ITDMA Communications State (ITU message 3) and shall be null otherwise.

10. The Keep Flag field is a component of only the ITDMA Communications State (ITU message 3) and is set to T for True if the slot remains allocated for one additional frame, otherwise the field is set to F for False. This field shall contain data only when this is an ITDMA Communications State (ITU message 3) and shall be null otherwise.

Note: A null field indicates data not available. A forward slash "/" character at the beginning of a line indicates that the sentence is continued from the previous line. A forward slash "/" character at the end of a line indicates that the sentence is continued on the next line.

DRD1: Data derived from decoded AIS position report data (POS1 and POS2).

Provides additional data derived from the basic information contained in the AIS broadcast and information provided by the AIS receiving station.

Sentence Structure:
$PRDC,DRD1,a*hh

Example:
$PRDC,DRD1,1051761221*62

Sentence Parameters:

- $P: Proprietary identifier of NMEA 0183 sentence.
- RDC: NMEA registered identifier of USCG R&DC.
- DRD1: Statement type identifier. The DRD1 sentence contains derived information.
- a: Reconstructed Navigation Solution Time of the vessel position reported in the associated AIS VDM sentence. Seconds elapsed since midnight January 1, 1970 GMT. This is an integer field. This field will be null when the value is not available (i.e., AISMiner does not have enough raw AIS data to derive this information, such as when the first vessel report is received.)
- *: Identifier denoting the following two characters as a checksum.
- hh: Two character checksum (x Or) value. Applies to all message data between '$' and second '*' exclusive.

SVD1: Decoded AIS ship static and voyage data.

Provides decoded and scaled values for the first seven parameters of ITU message 5. See the SVD2 statement type for the remaining eleven fields.

Sentence Structure:
$PRDC,SVD1,a,b,c,d,e,f,g,h*hh

Example:

$PRDC,SVD1,5,0,248143000,0,248143000,WDD4003,BOCA_GRANDE,52*2D

Sentence Parameters:

- $P: Proprietary identifier of NMEA 0183 sentence.
- RDC: NMEA registered identifier of USCG R&DC.
- SVD1: Statement type identifier. The SVD1 sentence yields the first seven parameters from ITU message 5.
- a: message ID (5).
- b: Repeat indicator.
- c: User ID (MMSI number).
- d: AIS version indicator (0 – 3).
- e: IMO number (from message Type 5).
- f: Call sign (1 – 7 characters).
- g: Vessel name (1 – 20 characters).
- h: Ship and cargo type number.
- *: Identifier denoting the following two characters as a checksum.
- hh: Two character checksum (x Or) value. Applies to all message data between '$' and second '*' exclusive.

SVD2: Decoded AIS ship static and voyage data.

Provides the decoded and scaled values for the last eleven parameters of ITU message 5. See the SVD1 statement type for the first seven fields.

Sentence Structure:

$PRDC,SVD2,a,b,c,d,e,f,g,h,i,j,k*hh

Example:

$PRDC,SVD2,112,252,28,15,1,2406,122003.44,34.5,PT_EVERGLADES,1,0*6B

Sentence Parameters:

- $P: Proprietary identifier of NMEA 0183 sentence.
- RDC: NMEA registered identifier of USCG R&DC.
- SVD2: Statement type identifier. The SVD2 sentence yields the last eleven parameters from ITU message 5.

- a: Pos. ref. point distance, "A," from bow [1] (0 to 511 m).
- b: Pos. ref. point distance, "B," from stern [1] (0 to 511 m).
- c: Pos. ref. point distance, "C," from port beam [1] (0 to 63 m).
- d: Pos. ref. point distance, "D," from starboard beam [1] (0 to 63 m).
- e: Type of electronic position fixing device.[2]
- f: ETA date formatted as “ddmm”.
- g: ETA time.
- h: Draft.
- i: Destination (1 – 20 characters).
- j: DTE (0=available 1=not available).
- k: Spare bit.
- *: Identifier denoting the following two characters as a checksum.
- hh: Two character checksum (x Or) value. Applies to all message data between ‘$’ and second ‘*’ exclusive.

1. These are the four dimensions from the bow, stern, port beam, and starboard beam to the horizontal reference point on the ship for which the current "position reports" are valid. The sum of A + B is the length of the ship in meters, and the sum of C + D is the width of the ship in meters. Refer to the ITU-R M.1371 message 5, "Reference Point for reported position and Dimensions of Ship." If the reference point of "reported position" is not available, but the dimensions of the ship are available: A = C = 0 and B > 0 and D > 0. If neither the reference point for the reported position nor the dimensions of the ship are available: A = B = C = D = 0 (default). Use of a null field for A, B, C, and/or D indicates that the previously entered dimension for that parameter is unchanged. In many cases, the ship's reference point for "reported position" will be the location of the positioning antenna.

   Distance is in meters

   A & B = 0 – 511m

   C & D = 0 – 63m, 63 if > 63m

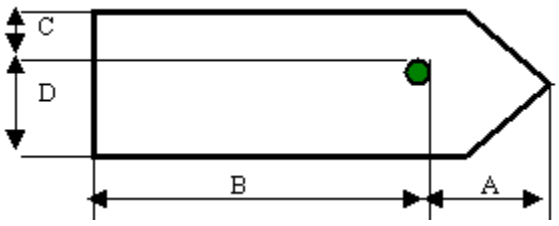


Figure 43. AIS – position/dimension message reference point.

2. The type of electronic position fixing device is as follows:
   1 = GPS
   2 = GLONASS
   3 = combined GPS/GLONASS
   4 = Loran-C
   5 = Chayka
   6 = Integrated navigation system.
   7 = Surveyed
   8-15 = Not currently defined.

5.1.5.4.1 Example – Generate PRDC Sentences

The following example demonstrates the *Generate PRDC Sentences* feature.

1. Start AISMiner.
2. From the *File* menu item select *Export* then *Generate PRDC Sentences*. Note that it is not necessary to adjust the table view or filter editor settings as this will not affect the output file.
3. Using the Open file window, navigate to and open a saved log file. Log files are kept in the directory listed in the AISMiner INI file setting LogDir (§ 4.1.1.10).
4. In the Save File window, enter the file name "GeneratePRDCSentencesTest1.log" and click the Save button. By default the file is saved to the application directory.
5. Click the Resume playback button to begin processing of the filtered output file.
6. Depending on the size of the saved log file, allow AISMiner to process the complete log file, or allow AISMiner a few seconds to process part of the log file then click the Stop playback button followed by the Quit playback button.
7. Using Notepad or Microsoft Excel, navigate to and open the "GeneratePRDCSentencesTest1.log" output file. Note, depending on your version of Excel, you may need to change the open file selection to "All Files" to view files with a csv extension. Figure 44 below shows an example of the output log file in Notepad.

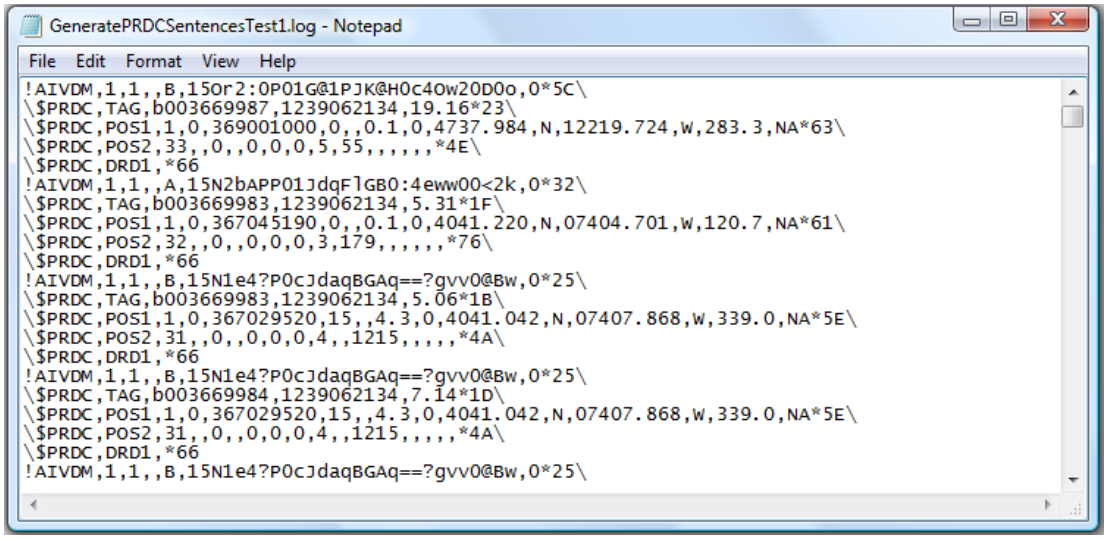


Figure 44. Notepad – generate PRDC sentences output log file.

5.1.5.5 Convert to SIM Format

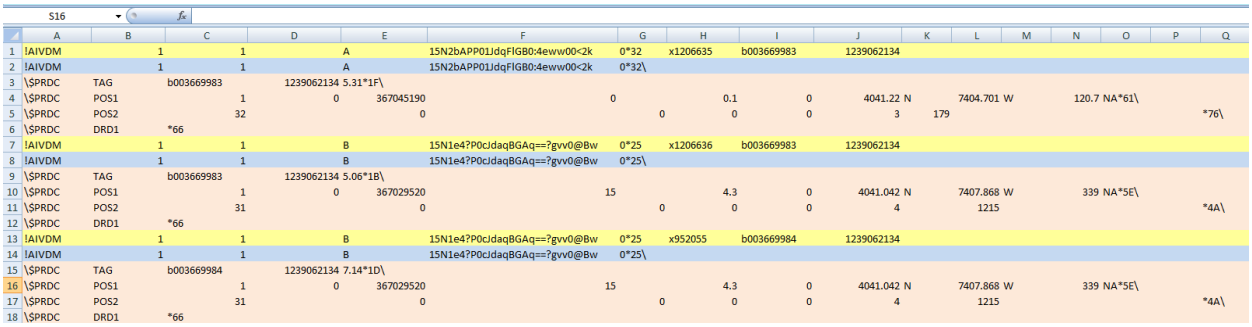
Important: The *Convert to SIM Format* menu feature is considered obsolete, and has been replaced by *Extract as Viewed*.

Universal Automatic Identification System (UAIS) Simulation is a simulation application developed by the R&D Center, and used to model the AIS for analysis purposes. When originally developed, UAIS Simulation only read data custom formatted by AISMiner, and saved with an "amo" file extension. The newest version of UAIS Simulation reads Microsoft Excel "csv" files, which AISMiner outputs using the *Extract as Viewed* menu item.

5.1.5.6 Echo and Expand

The *Echo and Expand* menu item, similar to the *Generate Filtered Output* (§ 5.1.5.1) feature, is used to append AISMiner processed message data to original message data to form a single message sentence. The feature works with saved log files and outputs an Excel csv file. Only fields from the active table view in AISMiner are included in the output file's dataset. The original message sentence data (yellow highlight – Figure 45) is written first in the output sentence, followed by the processed sentence (blue highlight – Figure 45), and finally the expanded sentence data (peach highlight – Figure 45). When field data is not included in the original message, the field appears blank or the letters "NA" are shown in the expanded section of the output sentence.

Note: This application feature is used mainly by the R&D Center for internal analysis work.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	!AIVDM		1	1	A	15N2bAPP01JdqFlGB0:4eww00<2k	0*32	x1206635	b003669983	1239062134							
2	!AIVDM		1	1	A	15N2bAPP01JdqFlGB0:4eww00<2k	0*32\										
3	\$PRDC	TAG	b003669983	1239062134	5.31*1F\												
4	\$PRDC	POS1	1	0	367045190	0		0.1	0	4041.22	N	7404.701	W	120.7	NA*61\		
5	\$PRDC	POS2	32	0		0	0	0	3	179						*76\	
6	\$PRDC	DRD1	*66														
7	!AIVDM		1	1	B	15N1e4?P0cJdaqBGAq==?gvv0@Bw	0*25	x1206636	b003669983	1239062134							
8	!AIVDM		1	1	B	15N1e4?P0cJdaqBGAq==?gvv0@Bw	0*25\										
9	\$PRDC	TAG	b003669983	1239062134	5.06*1B\												
10	\$PRDC	POS1	1	0	367029520	15		4.3	0	4041.042	N	7407.868	W	339	NA*5E\		
11	\$PRDC	POS2	31	0		0	0	0	4	1215						*4A\	
12	\$PRDC	DRD1	*66														
13	!AIVDM		1	1	B	15N1e4?P0cJdaqBGAq==?gvv0@Bw	0*25	x952055	b003669984	1239062134							
14	!AIVDM		1	1	B	15N1e4?P0cJdaqBGAq==?gvv0@Bw	0*25\										
15	\$PRDC	TAG	b003669984	1239062134	7.14*1D\												
16	\$PRDC	POS1	1	0	367029520	15		4.3	0	4041.042	N	7407.868	W	339	NA*5E\		
17	\$PRDC	POS2	31	0		0	0	0	4	1215						*4A\	
18	\$PRDC	DRD1	*66														

Figure 45. Excel – echo and expand output csv file.

5.1.5.6.1 Example – Echo and Expand

The following example demonstrates the *Echo and Expand* feature.

1. Start AISMiner.
2. From the *File* menu item select *Export* then *Echo and Expand*. Note that it is not necessary to adjust the table view as this will not affect the output file.
3. Using the Open file window, navigate to and open a saved log file. Log files are kept in the directory listed in the AISMiner INI file setting LogDir (§ 4.1.1.10).
4. In the Save File window, enter the file name "EchoAndExpandTest1.log" and click the Save button. By default the file is saved to the application directory.
5. Click the Resume playback button to begin processing of the filtered output file.

6. Depending on the size of the saved log file, allow AISMiner to process the complete log file, or allow AISMiner a few seconds to process part of the log file then click the Stop playback button followed by the Quit playback button.
7. Using Microsoft Excel, navigate to and open the "EchoAndExpandTest1.csv" output file (Figure 45 above). Note, depending on your version of Excel, you may need to change the open file selection to "All Files" to view files with a csv extension.

5.1.6 Exit

Updates all application support files with changes made during the open application session and closes the AISMiner application.

5.2 View

Menu Items:

- Default.
- View # (1 through 4).
- Edit a view.
    - View # (1 through 4)

AISMiner displays processed message data using a spreadsheet style table view. A user can view data using the application's default view or one of four user defined views. At application start-up, AISMiner reads view settings saved in the AISMiner INI file and opens with the last used view. At application shutdown, AISMiner saves changes made to user defined views to this INI file.

Important: Other than the *Extract as Viewed* and *Extract as Viewed (fresh data)* save operations, table fields (column headers) shown in a view do not affect data saved during an *Export* (§ 5.1.5) file operation. All field data, which are part of original messages, are saved.

5.2.1 Default

The *Default* menu item sets the table view to a standard view. This view cannot be customized by a user.

5.2.2 View # (1 - 4)

The *View #* menu items set the table view to a custom view defined by a user. Custom views are created using the View Editor window.

5.2.3 Edit a View

The *Edit a View* menu item opens the View Editor window. Creating custom views is done using the View Editor window. The View Editor window is made up of table view fields, which are associated with fields from AIS message types.

5.2.3.1 Example – Edit a View

The following example provides instructions for creating a custom view using the View Editor window. Note that user defined views can be edited at anytime in either live or saved data mode.

1. Start AISMiner.
2. From the *View* menu item select *View #1*.
3. From the *File* menu item select *Open File*.
4. To open the View Editor window, from the *View* menu item go to *Edit a View* and select *View #1* (Figure 46).

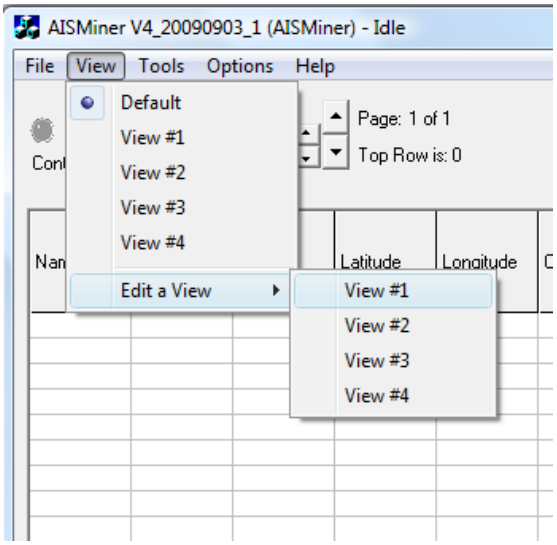


Figure 46. AISMiner – edit a view sub-menu items.

5. To display a list of data fields not specific to an AIS message, in the View Editor window click the General Info radio button (red outline - Figure 47).

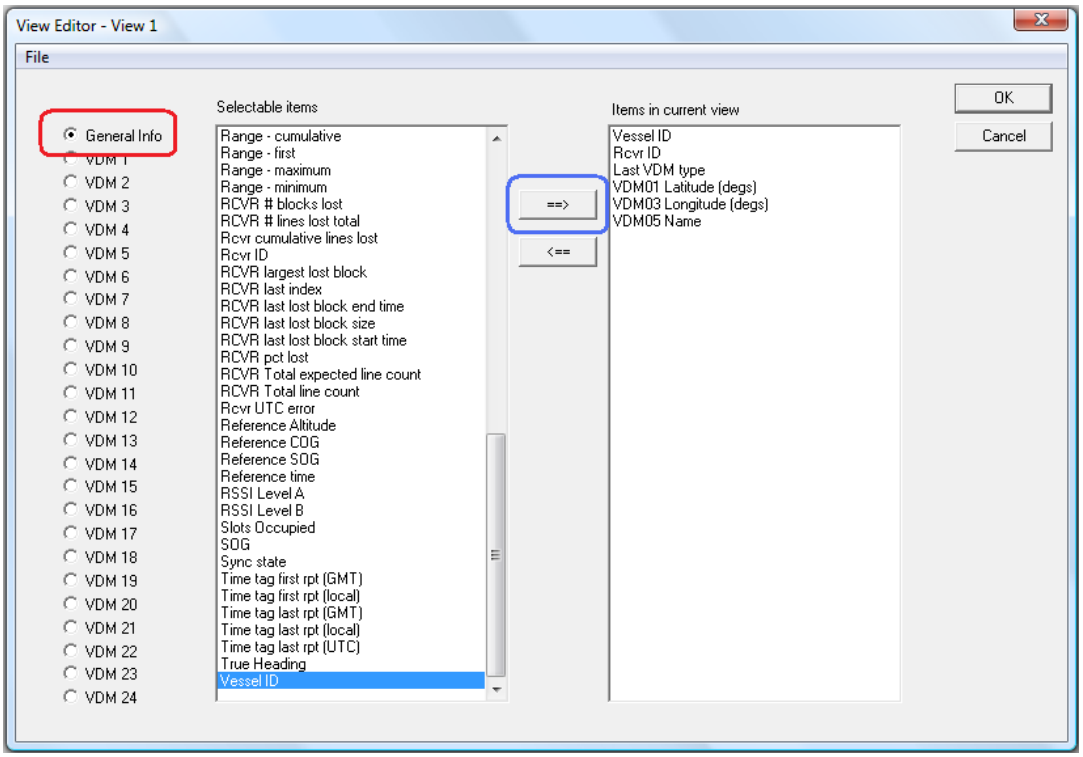


Figure 47. AISMiner – view editor window.

6. Using the Add button (blue outline – Figure 47 above), select and add fields to the *Items in current view* list.
7. Repeat step six using fields from different radio button items (e.g., VDM 1 through 24).
8. Click the Ok button to close the View Editor window and update the table view in AISMiner (Figure 48). Selected fields appear in the table view in the order shown in the *Items in current view* list. To change the order, use the Add and Remove buttons. For more control over the order of fields, click on a field in the *Items in current view* list to highlight it then click on a field in the *Selectable items* list and add it to the *Items in current view* list. Note that it appears before the highlighted field selected in the *Items in current view* list.

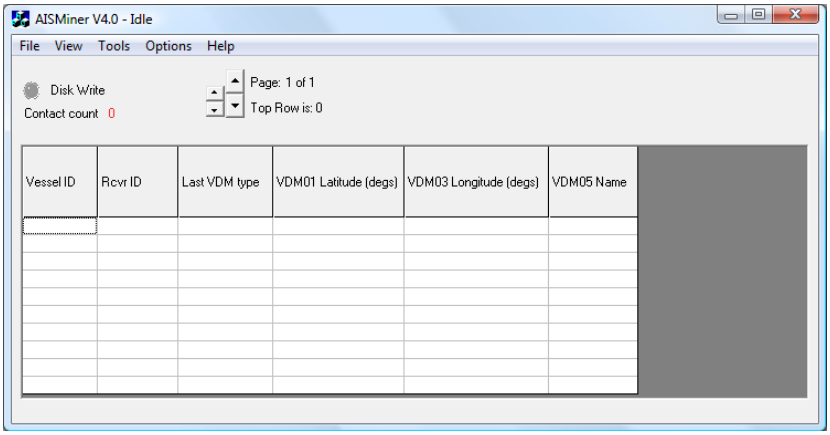


Figure 48. AISMiner – custom table view.

5.3 Tools

Menu Items:

- Edit filters.
- Apply selected filters.
- Edit receiver info view.
- View receiver info.

5.3.1 Edit Filters

The *Edit Filters* menu item opens the Filter Editor window. AISMiner provides the option to filter data in both live and saved data mode. Creating custom data filters is done using the Filter Editor window. The Filter Editor window is made up of the following nine main sections (blue outline – Figure 49):

- Statement types.
- Receivers.
- Vessels.
- Bounded region.
- Speed.
- Range.
- Bearing.
- Time (UTC).
- Line number.

Filter control (i.e., true/false, on/off) for each section is governed by selecting one of three radio buttons (green outline – Figure 49). When the Allow Selected radio button is selected (true), only messages with field values meeting parameters set in that section are processed. When the Disallow Selected radio button is selected (false), all messages, except those with field values meeting parameters set in that section, are processed. When the Disable Filter radio button is selected (off), message data filtering for that section is not performed. Filter testing is executed in the following order:

1. If not disabled, by Line Number;
2. If not disabled, by Statement Types;
3. If not disabled, by Receivers;
4. If not disabled, by Vessels;

5. If not disabled, by Bounded Region;
6. If not disabled, by Bearing;
7. If not disabled, by Range;
8. If not disabled, by Speed;
9. If not disabled, by Time (UTC).

Important: It is important to understand the effect of filter execution order when performing custom data filtering. For example, if the main objective of a custom data filter is to view specific vessels during a specific time period, then, at a minimum, all filter sections executed before the Vessels section (i.e., Line Number, Statement Types, and Receivers) should be disabled. If the objective is to only view specific vessels during a specific time period, then all sections, other than Vessels and Time (UTC), should be disabled.

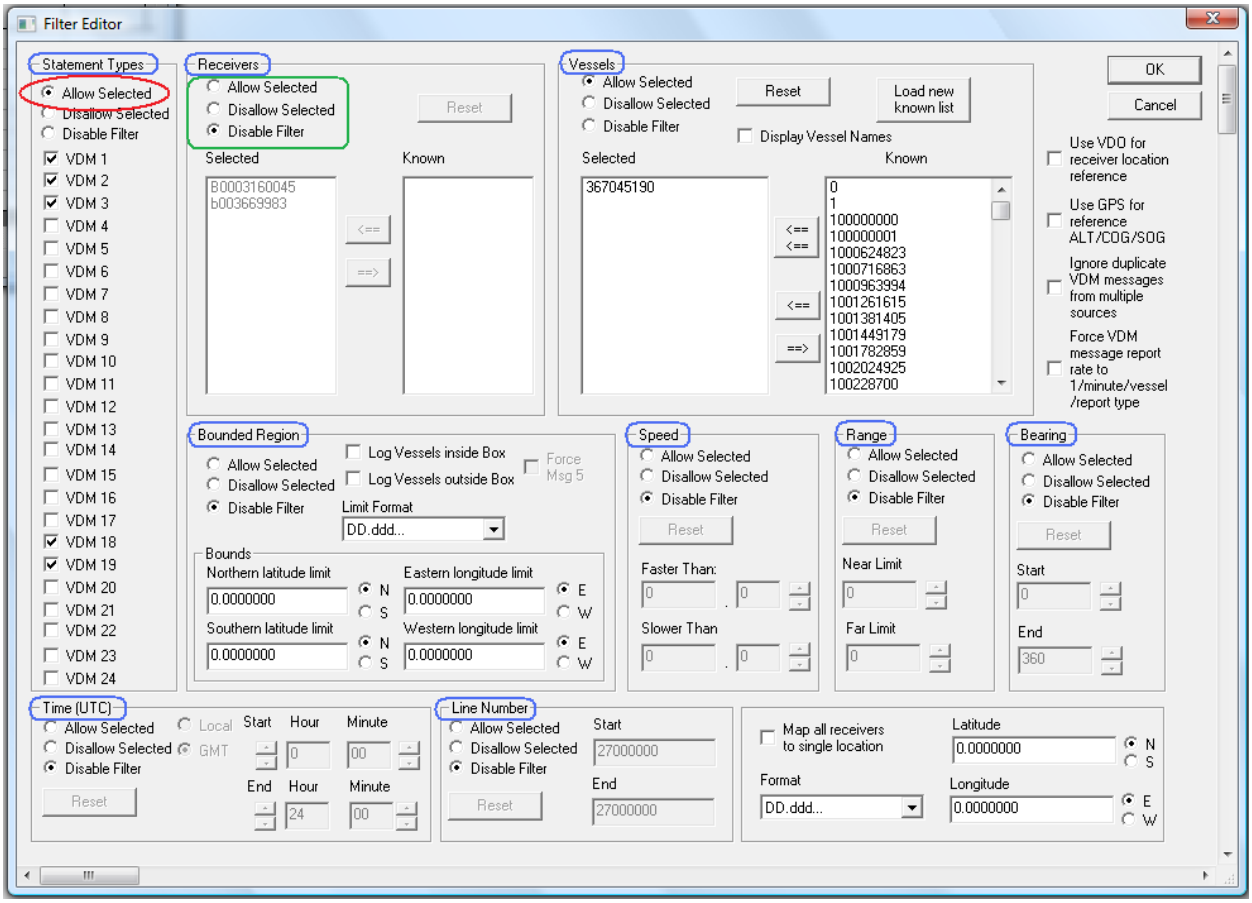


Figure 49. AISMiner – filter editor window.

5.3.1.1 Example – Edit Filters

The following example demonstrates a three step filter operation in saved data mode.

1. Start AISMiner.
2. From the *View* menu item select *Default*.
3. From the *Tools* menu item verify that *Apply Selected Filters* is not checked.
4. From the *File* menu item select *Open File*.
5. Using the Open file window, navigate to and open a saved log file. Log files are kept in the directory listed in the AISMiner INI file setting LogDir (§ 4.1.1.10).
6. To populate the Filter Editor window (Figure 49 above) *Known* Receivers and Vessel lists, click the Resume button. After a few seconds click the Stop button to stop data processing.
7. To open the Filter Editor window, from the *Tools* menu item select *Edit Filters*.
8. In the Statements Types section, click the Allow Selected button (red outline – Figure 49 above). Leave the default VDM message selections checked.
9. In the Receivers section (Figure 50), click the Allow Selected button. Using the Add button (blue outline - Figure 50), move a receiver from the *Known* list to the *Selected* list.

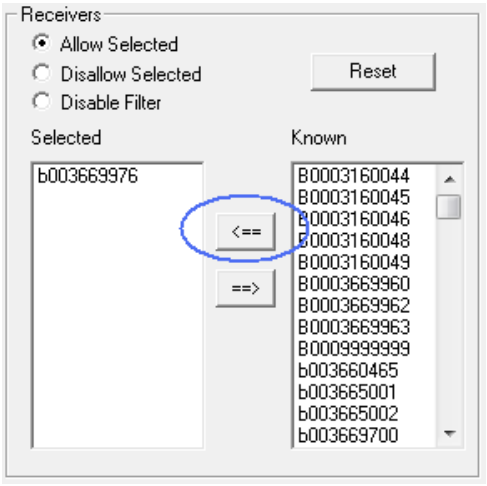


Figure 50. AISMiner – filter editor window – receivers section.

10. In the Speed section (Figure 51), click the Allow Selected button. Using the up and down arrow buttons, change the *Faster Than* value to 2.5 knots and the *Slower Than* value to 99.0 knots. Note that the values can also be typed directly into the textbox.

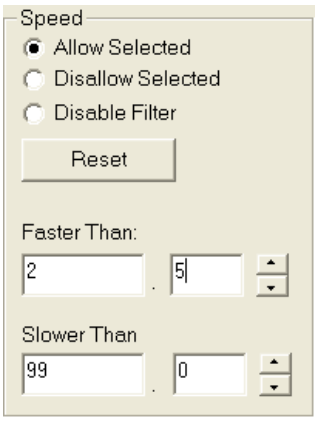
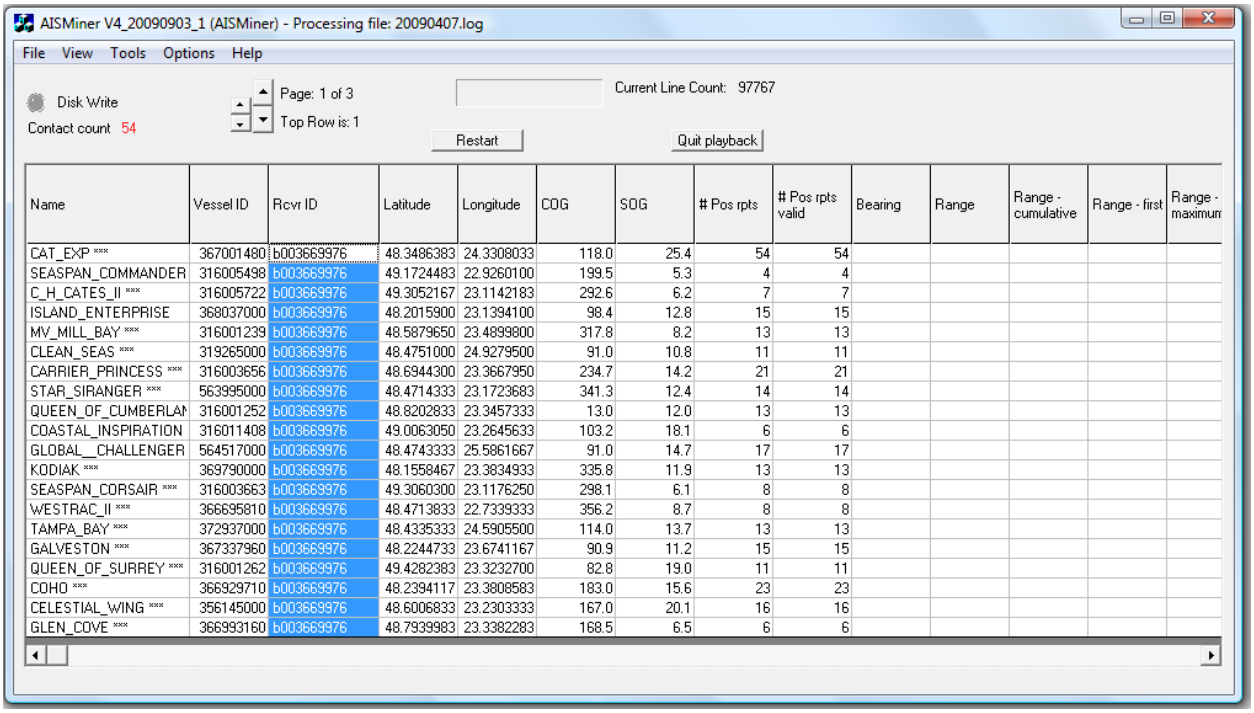


Figure 51. AISMiner – filter editor window – speed section.

11. Confirm that all other sections have Disable Filter radio button selected.
12. To close the Filter Editor window and save custom filter settings, click the Ok button.
13. To apply the filter settings to the open log file, from the *Tools* menu item select *Apply Selected Filters*.
14. To view filtered results (Figure 52), click the Restart then Resume playback buttons.



Name	Vessel ID	Rcvr ID	Latitude	Longitude	COG	SOG	# Pos rpts	# Pos rpts valid	Bearing	Range	Range - cumulative	Range - first	Range - maximum
CAT_EXP ***	367001480	b003669976	48.3486383	24.3308033	118.0	25.4	54	54					
SEASPAN_COMMANDER	316005498	b003669976	49.1724483	22.9260100	199.5	5.3	4	4					
C_H_CATES_II ***	316005722	b003669976	49.3052167	23.1142183	292.6	6.2	7	7					
ISLAND_ENTERPRISE	368037000	b003669976	48.2015900	23.1394100	98.4	12.8	15	15					
MV_MILL_BAY ***	316001239	b003669976	48.5879650	23.4899800	317.8	8.2	13	13					
CLEAN_SEAS ***	319265000	b003669976	48.4751000	24.9279500	91.0	10.8	11	11					
CARRIER_PRINCESS ***	316003656	b003669976	48.6944300	23.3667950	234.7	14.2	21	21					
STAR_SIRANGER ***	563995000	b003669976	48.4714333	23.1723683	341.3	12.4	14	14					
QUEEN_OF_CUMBERLAN	316001252	b003669976	48.8202833	23.3457333	13.0	12.0	13	13					
COASTAL_INSPIRATION	316011408	b003669976	49.0063050	23.2645633	103.2	18.1	6	6					
GLOBAL_CHALLENGER	564517000	b003669976	48.4743333	25.5861667	91.0	14.7	17	17					
KODIAK ***	369790000	b003669976	48.1558467	23.3834933	335.8	11.9	13	13					
SEASPAN_CORSAIR ***	316003663	b003669976	49.3060300	23.1176250	298.1	6.1	8	8					
WESTRAC_II ***	366695810	b003669976	48.4713833	22.7339333	356.2	8.7	8	8					
TAMPA_BAY ***	372937000	b003669976	48.4335333	24.5905500	114.0	13.7	13	13					
GALVESTON ***	367337960	b003669976	48.2244733	23.6741167	90.9	11.2	15	15					
QUEEN_OF_SURREY ***	316001262	b003669976	49.4282383	23.3232700	82.8	19.0	11	11					
COHO ***	366929710	b003669976	48.2394117	23.3808583	183.0	15.6	23	23					
CELESTIAL_WING ***	356145000	b003669976	48.6006833	23.2303333	167.0	20.1	16	16					
GLEN_COVE ***	366993160	b003669976	48.7939983	23.3382283	168.5	6.5	6	6					

Figure 52. AISMiner – filtered data.

Note: Viewing a log file using custom filter settings does not change the underlying data.
Note: See section 5.1.5.1 to generate and save a filtered log file.

5.3.2 Apply Selected Filters

The *Apply Selected Filters* menu item is used to apply filter settings, set using the Filter Editor window (§ 5.3.1), to data being processed. The menu selection functions as an on/off switch. Click the *Apply Selected Filters* menu item once to turn the feature on (indicated by a check mark), and a second time to turn it off. *Apply Selected Filters* is accessed from the *Tools* menu item (Figure 53).

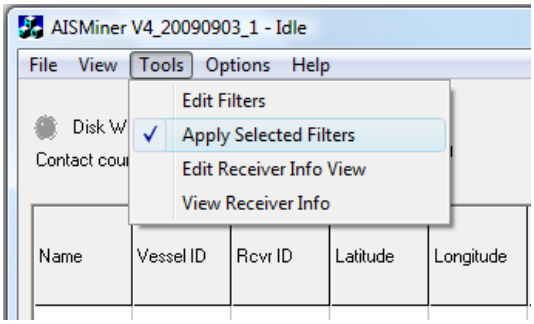


Figure 53. AISMiner – apply selected filters menu item.

5.3.3 Edit Receiver Info View

The *Edit Receiver Info View* menu item opens the Receiver View Editor window. This window is used to edit which fields, and in what order, are shown in the Receiver View window (§ 5.3.4). Changes made using the Receiver View Editor window remain constant through separate application sessions.

5.3.3.1 Example – Edit Receiver Info View

The Receiver View window table view can be edited at anytime in either live or saved data mode. The following example provides instructions for editing the table view in saved data mode.

1. Start AISMiner.
2. From the *File* menu item select *Open File*.
3. Using the Open file window, navigate to and open a saved log file. Log files are kept in the directory listed in the AISMiner INI file setting LogDir (§ 4.1.1.10).
4. To open the Receiver View Editor window, from the *Tools* menu item select *Edit Receiver Info View* (Figure 54).

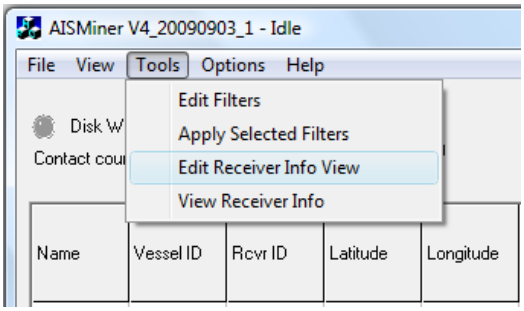


Figure 54. AISMiner – edit receiver info view menu item.

5. Using the Add button (red outline – Figure 55), select and add new fields to the *Items to view* list.

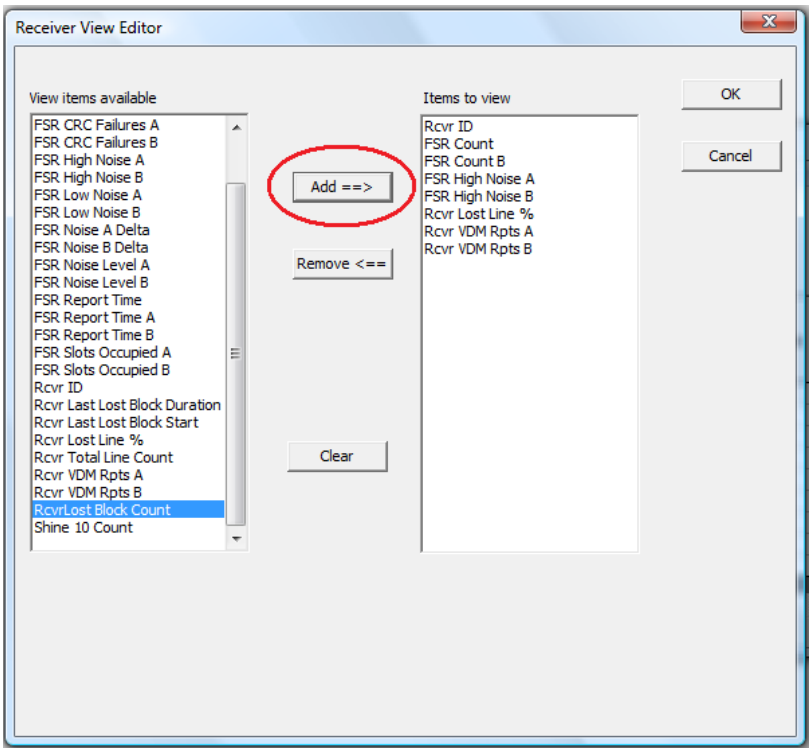


Figure 55. AISMiner – receiver view editor window.

6. Click the Ok button to close the Receiver View Editor window and update the table view in Receiver View window. Selected fields will appear in the Receiver View window in the order shown in the *Items to view* list. To change the order, use the Add and Remove buttons. For more control over the order of fields, click on a field in the *Items to view* list to highlight it then click on a field in the *View items available* list and add it to the *Items to view* list. Note that it appears before the highlighted item selected in the *Items to view* list.

Note: See section 5.3.4 - View Receiver Info to see saved changes in the Receiver View window.

Note: See section 7 - Receiver View Window – Table View for a description of each field listed in the Receiver View Editor window.

5.3.4 View Receiver Info

The *View Receiver Info* menu item opens the Receiver View window (Figure 56). This window uses a spreadsheet style table view to displays receiver specific information from a live or saved dataset. To customize the Receiver View window table view, follow instructions outlined in section 5.3.3 - Receiver View Editor window.

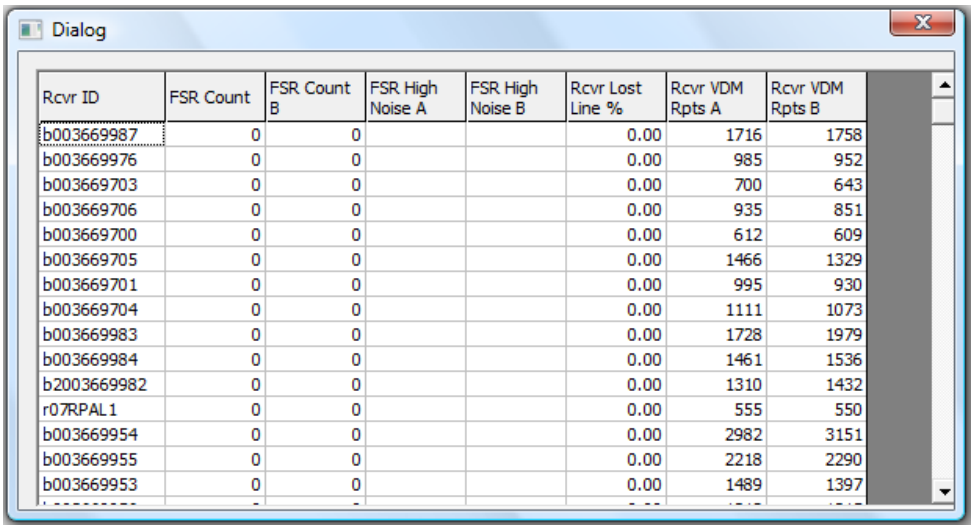


Figure 56. AISMiner – receiver view window.

5.4 Options

Menu Items:

- Pin to top.
- Enable live mode logging.

5.4.1 Pin to Top

The *Pin to Top* menu item is used to keep the AISMiner application on top of all other open applications. The menu selection functions as an on/off switch. Click the *Pin to Top* menu item once to turn the feature on (indicated by a check mark), and a second time to turn it off. *Pin to Top* is accessed from the *Options* menu item (Figure 57).

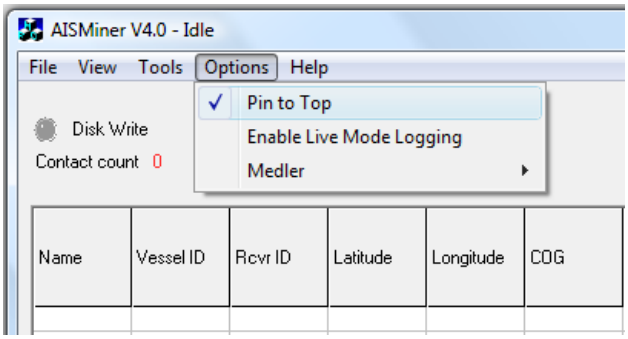


Figure 57. AISMiner – pin to top menu item.

5.4.2 Enable Live Mode Logging

The *Enable Live Mode Logging* menu item is used to save data, processed from a live AIS data stream, to a daily log file. The data saved remains in original form. The feature works while AISMiner is simultaneously processing a live data stream using filters and other application settings. The menu selection functions as an on/off switch. Click the *Enable Live Mode Logging* menu item

once to turn the feature on (indicated by a check mark), and a second time to turn it off. Saved log files can be opened for processing by AISMiner or viewed using Transview. This feature works in conjunction with the AISMiner INI file setting *Log data in live mode* (§ 4.1.1.9). Figure 58 below shows a [unprocessed] log file saved using this feature.

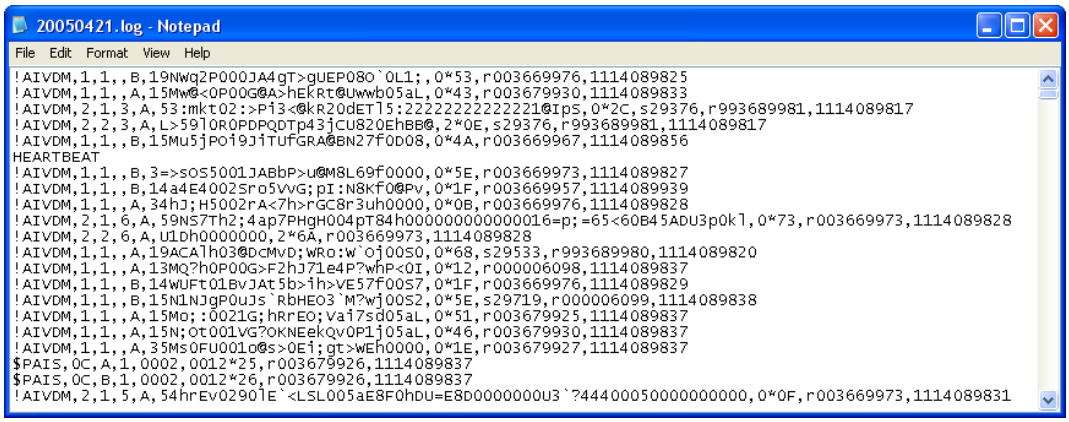


Figure 58. Notepad – live mode log file.

5.4.3 Medler

The *Medler* menu item provides three menu options for controlling the playback speed of saved log files (Figure 59).

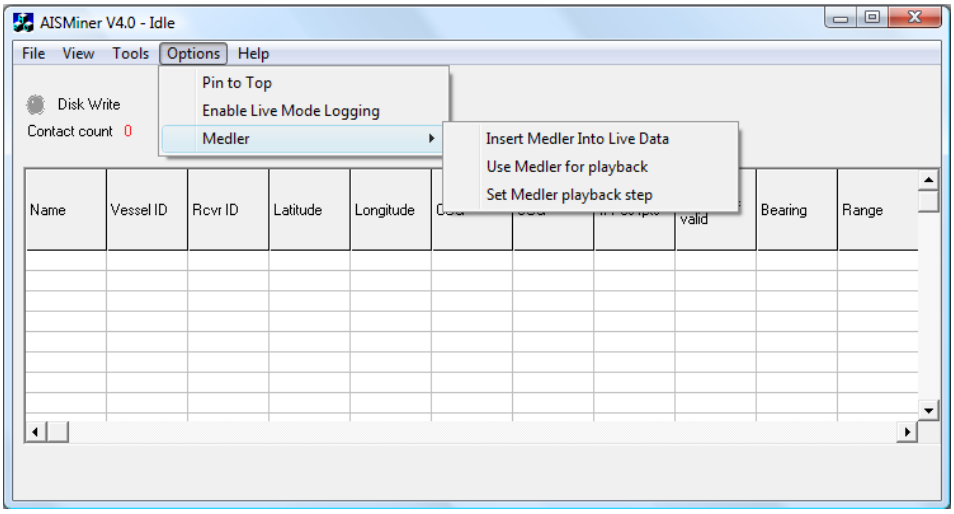


Figure 59. AISMiner – Medler menu options.

5.4.3.1 Insert Medler Into Live Data

The *Insert Medler Into Live Data* menu item is used to insert a time tag and source ID, formatted to TAG Block, after the last TAG Block and prior to the start of a NMEA sentence on the first line of each message group in a live data stream. The Tag Block data serves as a marker when using the *Use Medler for playback* feature (§ 5.4.3.2). This step is necessary to provide an accurate and consistent playback of saved data.

Due to variances between (AISSource) message time stamps from different receiver sites, messages received only a second apart from different receivers could have time stamps indicating that they

were received by AISSource several seconds apart; though their order in the live data stream would be sequential. The *Insert Medler Into Live Data* feature adjusts for this potential discrepancy by placing a separate timestamp at the end of the first sentence of each message group based on time of message receipt by AISMiner.

For example:
Message 1 has a timestamp of 10:00:00 and was received by AISMiner at 10:00:03
Message 2 has a timestamp of 10:00:05 and was received by AISMiner at 10:00:04
Message 3 has a timestamp of 10:00:02 and was received by AISMiner at 10:00:05

Assuming playback at normal speed (real-time), message 1 would display first in AISMiner table view, at the playback time of (00:00:00), followed by message 2 at (00:00:01), and then message 3 at (00:00:02).

Original "live" message sentence:
/g:1-2-7,s:receiver1,c:123456789*60//s:receiver2,c:123456790*2E/!AIVDM.....\r\n
/g:2-2-7*6A/$ARVSI...\r\n

Same sentence with Medler timestamp added:
/g:1-2-,s:receiver1,c:123456789*60//s:receiver2,c:123456790*2E//s:AISMiner,c:123456791*02/
!AIVDM.....\r\n
/g:2-2-7*6A/$ARVSI...\r\n

5.4.3.1.1 Example – Insert Medler Into Live Data

The following example demonstrates the *Insert Medler Into Live Data* feature.

1. Start AISMiner.
2. From the *View* menu item select *Default*. Note that this step is optional.
3. From the *Options* menu item verify that *Enable Live Mode Logging* is checked.
4. From the *Options* menu item select *Medler* then verify that *Insert Medler Into Live Data* is checked (Figure 60).

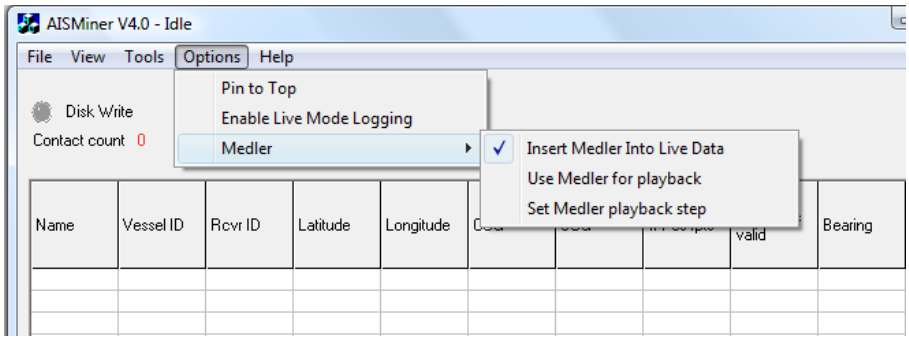


Figure 60. AISMiner – insert Medler into live data menu item.

5. From the File menu item select Read Live Data. Within a few seconds AISMiner starts processing the live data steam.
6. To stop the Read Live Data process, from the *File* menu item select *Exit*.

5.4.3.2 Use Medler for Playback

The *Use Medler for playback* menu item is used to playback a saved log file, marked with Medler timestamps (§ 5.4.3.1), at a set multiple of real-time. The feature mimics the fast forward capability of video/audio components. The "fast forward" multiplier is set using the Medler Step Editor window (§ 5.4.3.3). For example, to view one hour of real-time data in ten minutes you would set the playback step value to 6. This instructs AISMiner to display six seconds worth of log file data for every one second of real-time.

5.4.3.2.1 Example – Use Medler for Playback

The following example demonstrates the *Use Medler for playback* feature. Note that this example requires use of the saved log file created in example 5.4.3.1.1 - *Insert Medler Into Live Data* above**.**

1. Start AISMiner.
2. From the *View* menu item select *Default*.
3. From the *Tools* menu item verify that *Apply Selected Filters* is checked. Note that this step is optional.
4. From the *File* menu item select *Open File*.
5. Using the Open file window, navigate to and open the log file saved in example 5.4.3.1.1 above. Log files are kept in the directory listed in the AISMiner INI file setting *LogDir* (§ 4.1.1.10).
6. From the *Options* menu item select *Medler* then verify that *Use Medler for playback* is checked (Figure 61).

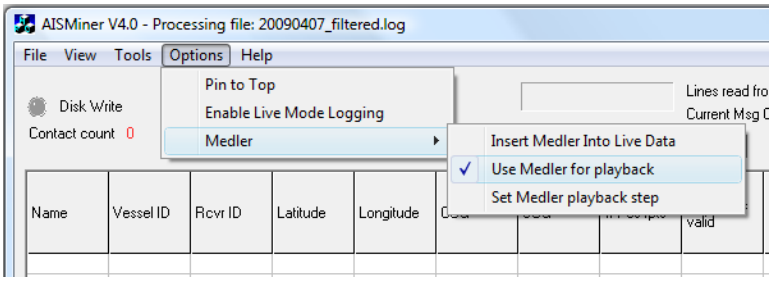


Figure 61. AISMiner – use Medler for playback menu item.

7. To open the Medler Step Editor window, from the *Options* menu item select *Medler* then click *Set Medler playback step*.
8. Using the Medler Step Editor window, change the default value from 1 to 3. Click the Ok button to save your changes.
9. Click the Resume button to begin "three-time" fast forward playback of the saved log file.

5.4.3.3 Set Medler Playback Step

The *Set Medler playback step* menu item opens the Medler Step Editor window. This window is used to set the "fast forward" multiplier playback speed of a saved log file created using the *Insert Medler Into Live Data* feature (§ 5.4.3.1). The Medler Step Editor window is used in conjunction

with the *Use Medler for playback* feature (§ 5.4.3.2). Changes made using the Medler Step Editor window do not remain constant through separate application sessions.

5.4.3.3.1 Example – Set Medler Playback Step

The following example provides instructions for editing the Medler step value.

1. Start AISMiner.
2. To open the Medler Step Editor window, from the *Options* menu item select *Medler* then click *Set Medler playback step* (Figure 62).

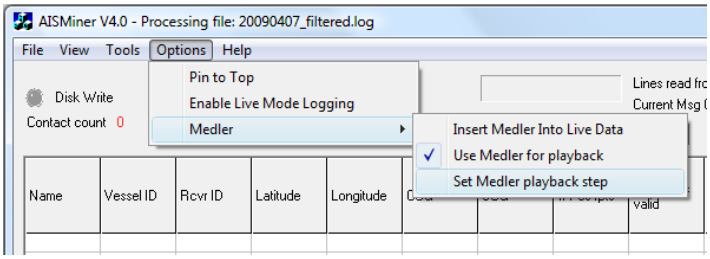


Figure 62. AISMiner – set Medler playback step menu item.

3. Using the Medler Step Editor window, change the Medler step (default) value from 1 to 3 (Figure 63). Click the Ok button to save your changes.

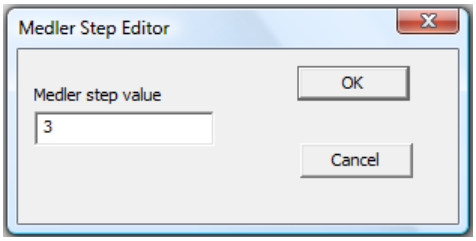


Figure 63. AISMiner – Medler step editor window.

5.5 Help

Menu Items:

- About.

5.5.1 About

Displays the About AISMiner window (Figure 64).

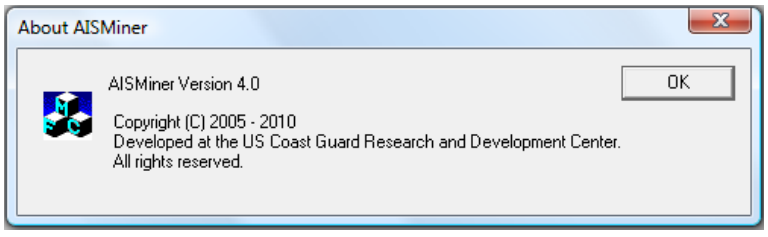


Figure 64. AISMiner – about window.

6 MAIN INTERFACE - TABLE VIEW

Following is a list of fields, in alphabetical order, and their associated definitions, viewable in the table view of the AISMiner main interface.

Note: See section 5.2 for information on how to customize the table view of AISMiner main interface.

Important: For fields displaying values calculated over a period of time, in live data mode the period of time consists of one day beginning at midnight local machine time. In saved data mode, the period of time spans the length of the dataset.

6.1 Addressed Flag

Report Unit: 0 or 1

The *Addressed flag* field is used to indicate whether the message is a broadcast message or an addressed message. The format is: 0 = broadcast geographical area message = default; 1 = addressed message (to individual stations).

6.2 Addressed Station ID 1

Report Unit: Number

The MMSI number of an addressed station listed in message 22.

6.3 Addressed Station ID 2

Report Unit: Number

The MMSI number of an addressed station listed in message 22.

6.4 Age of Pos Rpt

Report Unit: Seconds

The *Age of Pos Rpt* field displays the number of seconds elapsed since the last position report from a contact. The value is calculated by comparing the time value from the message time tag with local machine time and determining the difference.

For example, if local machine time reads 1330 on 2 January, 2010 and the message time tag reads 1329 on 1 January, 2010 this field displays a value of 60, ignoring the difference in dates.

6.5 Aid to Nav Type

Report Unit: Number

The *Aid to Nav Type* field is used in message 21 to distinguish what type of aid to navigation is used. The format is 0 = not available = default; 1-15 = fixed aid to navigation; 16-31 = floating aid-to-navigation.

6.6 AIS Version

Report Unit: Number

The *AIS Version* field is used in message 5 to indicate the station's compliance with the current AIS version. The format is: 0=station compliant with AIS edition 0; 1-3 = station compliant with future AIS editions 1, 2, and 3.

6.7 Altitude (GNSS)(m)

Report Unit: Number

The *Altitude (GNSS)(m)* field is used when a receiver site is aboard an airplane. The altitude of the receiver site measured in meters above mean sea level (as derived from GNSS) is displayed in the *Altitude (GNSS)(m)* field. The format is: 0-4094 m, 4095 = not available, 4094 = 4094 meters or higher.

6.8 Application ID

Report Unit: Number

The *Application ID* field shows the first 16 bits of binary message data. The *Application ID* field is used to indicate if the message is for regional or local application. It is also used for local testing and to identify when the message has global relevance. Note that for messages 25 and 26 this field may be blank depending on the *Binary data flag* field value. If the *Binary data flag* field has a value of zero (0), the *Application ID* field will be blank.

Note: For a more comprehensive description, see NMEA 0183 v4.0.

6.9 Beam

Report Unit: Meters

The measurement of a vessel at its widest point from side to side is its beam. The *Beam* field value is displayed in meters between 0 and 126. This value is extracted from the *Dimension/Reference for Position* field of message 5 and the *Dimension of Ship/Reference for Position* field of message 19.

6.10 Bearing

Report Unit: Integer

Bearing is the horizontal direction from the land based receiver site to the contact. The position of the land based receiver site and a valid position report are required for AISMiner to calculate bearing. When both are present, a bearing calculation is performed and the *Bearing* field value is updated.

6.11 Binary Data Flag

Report Unit: Number (1 or 0)

The *Binary data flag* field specifies whether the binary data in messages 25 and 26 are unstructured or coded as defined by the sixteen bit application identifier contained within the message.

Note: For a more comprehensive description, see NMEA 0183 v4.0.

6.12 Bit Count

Report Unit: Integer

The *Bit count* field contains the total number of bits in a message. It is used to verify that the number of bits in a message is equal to the [message] bit size specified in NMEA 0183 v4.0.

6.13 Call Sign

Report Unit: Text

A call sign is a unique combination of letters and numbers assigned to a radio communication user to identify a station. Each contact has an associated call sign, which is displayed in the *Call Sign* field. The *Call Sign* field value is updated when a message 5 is processed.

6.14 Cargo Type

Report Unit: Text

The type of cargo that a contact is carrying is displayed in the *Cargo Type* field. The *Cargo Type* field value is updated when a message 5 or 19 is processed. If a message 5 or 19 has not been processed, the contact's *Cargo Type* field is left blank.

6.15 Channel A

Report Unit: Number

The *Channel A* field displays the Channel A number for a designated area. The value is read from message type 22.

6.16 Channel A Bandwidth

Report Unit: 0 or 1

The format is 0 = default (as specified by channel number), 1=12.5 kHz bandwidth.

6.17 Channel B

Report Unit: Number

The *Channel B* field displays the Channel B number for a designated area. The value is read from message type 22.

6.18 Channel B Bandwidth

Report Unit: 0 or 1

The format is 0 = default (as specified by channel number), 1=12.5 kHz bandwidth.

6.19 COG

Report Unit: 1/10° increments (≥ 0 < 360)

Course Over Ground (COG) is the direction a contact is moving over the earth's surface. Messages 1, 2, 3, 18, and 19 contain COG information. The *COG* field is reported in 1/10° increments, from 0 to 359.9.

6.20 Cumulative Range

Report Unit: Nautical Miles

The *Cumulative Range* field value is determined by taking the sum of all range values, calculated in a receiver/vessel pairing over a period of time, and dividing by the total number of range calculations.

6.21 Current System Time (GMT)

Report Unit: HH:MM:SS

The *Current System Time (GMT)* field displays the local machine time converted to GMT.

6.22 Current System Time (local)

Report Unit: HH:MM:SS

The *Current System Time (local)* field displays the local machine time.

6.23 Current System Time (POSIX)

Report Unit: Number

The *Current System Time (POSIX)* field displays the number of seconds elapsed since midnight, January 1, 1970 GMT.

6.24 Date Tag First Rpt (GMT)

Report Unit: Day of the Week

The *Date tag first rpt (GMT)* field displays the day of the week part of the time tag of the first vessel report for a given day. During processing, AISSource assigns a Coordinated Universal Time (UTC) formatted time tag to each message received. AISMiner converts this UTC value to Greenwich Mean Time (GMT) before displaying the date part in the *Date tag first rpt (GMT)* field. A new day begins at midnight local time. This field is updated when a message 1, 2, 3, 4, 9, 11, 18, 19, or 21 is processed.

Note: See also Time tag first rpt (GMT).

6.25 Date Tag First Rpt (local)

Report Unit: Day of the Week

The *Date tag first rpt (local)* field displays the day of the week part of the time tag of the first vessel report for a given day. During processing, AISSource assigns a Coordinated Universal Time (UTC) formatted time tag to each message received. AISMiner converts this UTC value to local (host) machine time before displaying the date part in the *Date tag first rpt (local)* field. A new day begins at midnight local time. This field is updated when a message 1, 2, 3, 4, 9, 11, 18, 19, or 21 is processed.

Note: See also Time tag first rpt (local).

6.26 Date Tag Last Rpt (GMT)

Report Unit: Day of the Week

The *Date tag last rpt (GMT)* field displays the day of the week part of the time tag of the last vessel report for a given day. During processing, AISSource assigns a Coordinated Universal Time (UTC) formatted time tag to each message received. AISMiner converts this UTC value to Greenwich Mean Time (GMT) before displaying the date part in the *Date tag last rpt (GMT)* field. A new day begins at midnight local time. This field is updated when a message 1, 2, 3, 4, 9, 11, 18, 19, or 21 is processed.

Note: See also Time tag last rpt (GMT).

6.27 Date Tag Last Rpt (local)

Report Unit: Day of the Week

The *Date tag last rpt (local)* field displays the day of the week part of the time tag of the last vessel report for a given day. During processing, AISSource assigns a Coordinated Universal Time (UTC) formatted time tag to each message received. AISMiner converts this UTC value to local (host) machine time before displaying the date part in the *Date tag last rpt (local)* field. A new day begins at midnight local time. This field is updated when a message 1, 2, 3, 4, 9, 11, 18, 19, or 21 is processed.

Note: See also Time tag last rpt (local).

6.28 Day

Report Unit: Number

The *Day* field displays the UTC day value from a report. It is read from messages 4 and 11. A base station periodically transmits message 4. A mobile station transmits message 11 only in response to interrogation by a message 10. The format for the *Day* field is 1-31, with 0 used when UTC day information is not available in the report.

6.29 Destination

Report Unit: Text

The *Destination* field displays the name of a vessels next immediate port location. This field is updated when a message type 5 is processed.

6.30 Destination ID

Report Unit: Number

Message types 6 and 12 are addressed message types, and are sent to specific destination stations. Message types 7 and 13 are acknowledgement messages to the addressed message types 6 and 12. The fields labeled *Destination ID*, *Destination ID 1*, *Destination ID 2*, *Destination ID 3*, and *Destination ID 4* are used in this message interchange. The *Destination ID* field is used by message type 6 and 12, and contains the MMSI number of the destination station. Message types 7 and 13 use the fields *Destination ID 1*, *Destination ID* 2, *Destination ID 3*, and *Destination ID 4*. The acknowledgement message types 7 and 13 contain the same MMSI number listed in the sending stations *Destination ID* field. Note that for message types 25 and 26 this field may be blank depending on the *Destination Indicator* field value. If the *Destination Indicator* field value is zero (0), the *Destination ID* field will be blank.

Note: For a more comprehensive description, see NMEA 0183 v4.0.

6.31 Destination ID 1

Report Unit: Number

See *Destination ID* field description.

6.32 Destination ID 2

Report Unit: Number

See *Destination ID* field description.

6.33 Destination ID 3

Report Unit: Number

See *Destination ID* field description.

6.34 Destination ID 4

Report Unit: Number

See *Destination ID* field description.

6.35 Destination ID A

Report Unit: Number

The *Destination ID A* field displays the MMSI number of a destination (target) receiver. Receivers which also transmit, such as those aboard vessels, are assigned MMSI numbers. This value is part of message 16. Message type 16 is transmitted by a base station, to target receiver(s), when it is operating as a controlling agent.

6.36 Destination Indicator

Report Unit: Number (1 or 0)

Applicable to messages 25 and 26, the *Destination Indicator* field indicates whether or not there will be a value in the *Destination ID* field.

6.37 Dimension (A, B, C, and D)

Report Unit: Meters

The *Meters* field displays the dimensions of a ship. A ship's dimensions are reported in message 5. For class B vessels, the dimensions are reported in messages 19 and 24 part B. The following figure shows how a ship's dimensions are measured.

Distance is in meters

A & B = 0 – 511m

C & D = 0 – 63m, 63 if > 63m

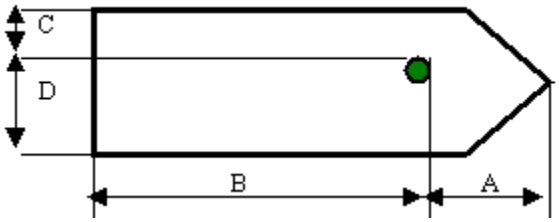


Figure 65. AIS – reference point dimensions.

6.38 Draught

Report Unit: Meters

The draught of a vessel is measured as the vertical distance between the waterline and the keel. Draught is measured in 1/10 meter increments from 0 to 25.5 meters. The *Draught* field is updated when a message 5 is processed.

6.39 Elapsed Time Since Last Pos Rpt

Report Unit: HH:MM:SS

The *Elapsed time since last pos rpt* field displays the length of time elapsed since the last position report from a contact. This field is updated when a message with position information is processed.

6.40 ETA

Report Unit: Month/Day @ Time (UTC)

The time which a vessel is expected to arrive at a destination location is referred to as Estimated Time of Arrival (ETA). ETA is displayed in UTC time as month, day, hours, and minutes. The format for the displayed time is MM/DD @ HH:MM. The *ETA* field value is read from message 5.

6.41 Hour

Report Unit: 0-24

The *Hour* field displays the UTC hour value from a report. It is read from messages 4 and 11. A base station periodically transmits message 4. A mobile station transmits message 11 only in response to interrogation by a message 10. The format for *Hour* is 0-23, with 24 used when UTC hour information is not available in the report.

6.42 IMO

Report Unit: Number

The *IMO #* field displays the contacts (vessels) IMO number assigned by the International Maritime Organization.

6.43 Keep Flag

Report unit: Number (0 or 1)

The *Keep flag* field displays the state of the Keep Flag parameter, specified in the ITDMA communications state (see ITU-R M.1371-3, section 3.3.7.3.2). This field is part of VDM messages 3 and 18. This field is set to (1) when True and (0) when False.

6.44 Last Report Channel

Report Unit: Number

The *Last report channel* field displays the channel designation (A or B) that a ship used for message transmission.

6.45 Last Report Timetag (Age)

Report Unit: Number

The *Last Report Timetag (Age)* field displays the difference in seconds between a message time tag and the current time on the local machine. This field dynamically updates as time passes.

6.46 Last Report Timetag (Arrival Delta)

Report Unit: Number

The *Last Report Timetag (Arrival Delta)* field displays the difference in seconds between a message time tag and the time on the local machine when the message was received by AISMiner. This field remains static as time passes.

6.47 Last Rpt UTC (secs)

Report Unit: Number

The *Last Rpt UTC (secs)* field displays the total number of seconds that have elapsed since the last vessel report. The value in calculated using the minutes and hours of a message's UTC time. The

time is displayed in seconds to the whole minute past midnight. This field information is read from the data portion of the SOTDMA message packet when the Slot Time Out equals 1. This field value is updated when the Slot Time Out for messages 1, 2, 3, 4, 9, 11, or 18 equals 1.

6.48 Last VDM type

Report Unit: Number

The *Last VDM type* field displays the ID parameter from the most recently processed VDM message for a contact.

6.49 Latitude

Report Unit: Deg

The *Latitude* field displays the latitude position, in decimal degrees, of a contact at time of message transmission. Messages 1, 2, 3, 4, 11, 17, 18, and 19 contain a contact's latitude position. The *Latitude* field is updated each time AISMiner processes a message containing Latitude.

6.50 Latitude (degs)

Report Unit: Deg

The *Latitude (degs)* field displays the latitude position, in decimal degrees, of a contact at time of message transmission. Messages 1, 2, 3, 4, 11, 17, 18, and 19 contain a contact's latitude position. The *Latitude (degs)* field is specific to each VDM message type, and is updated only upon receipt of the specified message type.

6.51 Latitude 1

Report Unit: Deg/Min/Sec

Message 23 is transmitted by a base station to command VHF Data Link (VDL) parameters (rules) for a geographical area defined in the message. It provides notification to vessels within the defined area of VDL "rules" applying to vessel broadcasts. The Latitude 1 parameter of message 23 contains the upper right corner (north-east) of the defined area. The parameters are +/- 90 degrees, North = positive, South = negative.

6.52 Latitude 2

Report Unit: Deg/Min/Sec

Message 22 is transmitted by a base station to command VHF Data Link (VDL) parameters (rules) for a geographical area defined in the message. It provides notification to vessels within the defined area of VDL "rules" applying to vessel broadcasts. The Latitude 2 parameter of message 22 contains the upper right corner (south-west) of the defined area. The parameters are +/- 90 degrees, North = positive, South = negative.

6.53 Length

Report Unit: Meters

The overall distance of a vessel from back to front is its length. The *Length* field is displayed in 1 meter increments. The field is updated when a message 5, 19, and 24 (part B) is processed.

6.54 Line # First Pos

Report Unit: Number

The *Line # first pos* field displays the line number in the log file of the first position report from a contact. When AISMiner is in live data mode this field displays zero (0).

6.55 Line # First Valid Pos

Report Unit: Number

The *Line # first valid pos* field displays the line number in the log file of the first position report from a contact. A valid position report contains course over ground, speed over ground, latitude and longitude information. When AISMiner is in live data mode this field displays zero (0).

6.56 Line # Max Range

Report Unit: Number

The *Line # max range* field displays the line number in the log file of the maximum contact reception distance. When AISMiner is in live data mode, or reception distance cannot be calculated, this field displays zero (0).

6.57 Local OS Clock (UTC)

Report Unit: Seconds

The *Local OS Clock (UTC)* field displays the number of seconds elapsed since midnight GMT. The counter resets to zero each new day. A new day starts at midnight local machine time.

6.58 Longitude

Report Unit: Deg/Min/Sec

The *Longitude* field displays the longitude position, in decimal degrees, of a contact at time of message transmission. Messages 1, 2, 3, 4, 11, 17, 18, and 19 contain a contact's longitude position. The *Longitude* field is updated each time AISMiner processes a message containing longitude information.

6.59 Longitude (degs)

Report Unit: Deg

The *Longitude (degs)* field displays the longitude position, in decimal degrees, of a contact at time of message transmission. Messages 1, 2, 3, 4, 11, 17, 18, and 19 contain a contact's longitude position. The *Longitude (degs)* field is specific to each VDM message type, and is updated only upon receipt of the specified message type.

6.60 Longitude 1

Report Unit: Deg/Min/Sec

Message 23 is transmitted by a base station to command VHF Data Link (VDL) parameters (rules) for a geographical area defined in the message. It provides notification to vessels within the defined area of VDL "rules" applying to vessel broadcasts. The Longitude 1 parameter of message 23 contains the upper right corner (north-east) of the defined area. The parameters are +/- 180 degrees, East = positive, West = negative.

6.61 Longitude 2

Report Unit: Deg/Min/Sec

Message 22 is transmitted by a base station to command VHF Data Link (VDL) parameters (rules) for a geographical area defined in the message. It provides notification to vessels within the defined area of VDL "rules" applying to vessel broadcasts. The Longitude 2 parameter of message 22 contains the upper right corner (south-west) of the defined area. The parameters are +/- 180 degrees, East = positive, West = negative.

6.62 Minute

Report Unit: Number

The *Minute* field displays the UTC Minute value of a report. It is read from messages 4 and 11. A base station periodically transmits message 4. A mobile station transmits message 11 only in response to interrogation by a message 10. The format for *Minute* is 0-59; a value of 60 is shown when UTC minute information is not available in the report.

6.63 Month

Report Unit: Number

The *Month* field displays the UTC Month value of a report. It is read from messages 4 and 11. A base station periodically transmits message 4. A mobile station transmits message 11 only in response to interrogation by a message 10. The format for *Month* is 1-12; a value of 0 is shown when UTC minute information is not available in the report.

6.64 Name

Report Unit: Text

The *Name* field displays the name of a contact transmitting an AIS message. The contact name may be read from an AIS message or retrieved from the VesselList.txt file. A name, displayed in the table view, followed by three asterisk symbols indicates that it was read from the VesselList.txt file. A name displayed not followed by three asterisk symbols indicates that it was read from a message 5 or 19. If the first message of the day from a contact is not a message 5 or 19 and the name is not in the VesselList.txt file, AISMiner will display the vessels MMSI number in the *Name* field followed by three asterisk symbols. Once a contact's message 5 or 19 is processed the vessel's MMSI number, or retrieved name, is replaced in the table view with the contact's name from the message.

6.65 Nav Solution Date (GMT)

Report Unit: Week Day, DayMonthYear

AISSource attaches a time tag to all messages. The time tag is formatted to UTC; which is seconds elapsed since midnight, January 1, 1970 GMT. To correct for receiver time "drift", during processing AISMiner adjusts the message time tag. The *Nav solution date (GMT)* field displays the adjusted time, formatted as the day of the week, day, month, and year of message broadcast (e.g., Tuesday 19Jan2010).

6.66 Nav Solution Time (GMT)

Report Unit: hr:min:sec

AISSource attaches a time tag to all messages. The time tag is formatted to UTC; which is seconds elapsed since midnight, January 1, 1970 GMT. To correct for receiver time "drift", during processing AISMiner adjusts the message time tag. The *Nav solution time (GMT)* field displays the adjusted time, formatted as the time of the day of the Nav solution time (e.g., 01:04:57).

6.67 Nav Solution Time (UTC)

Report Unit: Seconds

The *Nav Solution Time (UTC)* field displays the vessels Navigation Solution Time of a position report in seconds since midnight, January 1, 1970 GMT. This field is updated when a position report message is processed.

6.68 Nav Status

Report Unit: Text

The *Nav Status* field displays the following contact navigational information: whether the contact is underway using engines or sails; moored; anchored or run aground; and, when the contact is limited in its ability to maneuver. This field is updated when a message 1, 2, or 3 is processed.

6.69 Number of Slots

Report Unit: Number

The *Number of slots* field displays the number of VDL slots occupied by the [contact] message.

6.70 Offset 1

Report Unit: Number

The *Offset 1* field displays the offset (difference) from the slot number that a message 20 was received on to the first slot number reserved.

6.71 Part Number

Report Unit: 0 or 1

The *Part number* field displays which part of message 24 is being processed. Message 24 is transmitted as two separate messages (Part A and Part B). Part B is transmitted within 1 minute of Part A. This field is formatted as follows: Part A = 0; and, Part B = 1. Message 24 is used by Class B shipborne mobile equipment.

6.72 Pos Accuracy

Report Unit: 0 or 1

The *Pos Accuracy* field values are either 0 or 1. 1 = High accuracy (<10m; differential mode of e.g. DGNSS receiver). 0 = low accuracy (>10m; autonomous mode of e.g. global navigation satellite system (GNSS) receiver or of other electronic position fixing device).

6.73 Pos Fix Type

Report Unit: Text

Many vessels have multiple equipment sources supplying position information. Each position fixing device's output is an input to the AIS unit. The *Pos fix type* field displays the type of device which supplied the position values of a broadcast message. Global Positioning System (GPS), Global Navigation Satellite System (GLONASS), Loran-c, Chayka, and Integrated Navigation System are the types of electronic position fixing devices that could supply the position information. This field is updated when a message 4, 5 or 21 is processed.

6.74 Pos Report Period (secs)

Report Unit: Seconds

The *Pos report period (secs)* field displays the time between the first position report received each day, by a contact, and the most current contact position report. This field is updated each time a position report is received.

6.75 Pos Report Rate (#/[pos rpt period/60])

Report Unit: Number

The *Pos report rate (#/[pos rpt period/60])* field displays the number of contact position reports received per minute. The field value is determined by dividing *# Pos rpts* by *Pos report period (secs)* value. This field is updated each time a contact position report is processed.

6.76 # Pos Rpts

Report Unit: Number

AISMiner keeps track of the number of position reports received and displays it in *# Pos rpts* field. The field value is the cumulative total of messages 1, 2, 3, 4, 9, 11, 18, 19, and 21 for a contact on a given receiver. When a contact is received on multiple receivers, the *# Pos rpts* value is calculated independently for each receiver.

6.77 # Pos Rpts Valid

Report Unit: Number

A valid position report is a position report that contains valid latitude, longitude, course over ground, and speed over ground. Latitude is valid when it is greater than –90° and less than 90°. Longitude is valid when it is greater than –180° and less than 180°. Course Over Ground must be between 0 and 360 degrees and Speed Over Ground must be a positive value to be valid. The *# Pos rpts valid* field value is the total number of valid position reports from messages 1, 2, 3, 9, 18, and 19.

6.78 Power

Report Unit: 0 or 1

The *Power* field displays the power value from message 22. Message 22 is used to command the VHF data link parameters for the geographical area designated in the message. The format for Power is: 0 = high (default), 1 = low.

6.79 Quiet Time

Report Unit: Number (0 – 15)

The *Quiet time* field displays the length of time elapsed between transmission of a message 18 or 24 by a Class B station. This is in response to a message 22 command. Field values are: 0 (default - no quiet time commanded); and, 1 – 15 (quiet time of 1 to 15 minutes).

6.80 RAIM Flag

Report Unit: 0 or 1

The *RAIM flag* field displays the RAIM (Receiver Autonomous Integrity Monitoring) flag value of an electronic position fixing device. Acceptable values are formatted as follows; 0 = RAIM not in use (default); and, 1 = RAIM in use.

6.81 Range

Report Unit: Nautical Miles

The *Range* field displays the distance in NM between a contact's message broadcast and the receiver's location. AISMiner stores the latitude and longitude location of receivers in the Baseinfo.txt file. When the receiver's position is known, AISMiner uses this information to calculate the current distance of each new contact message.

Note: AISMiner is unable to accurately calculate distances when the land based receiver site and the contact are in different hemispheres and the closest E/W transition is at 180 degrees.

6.82 Range - Cumulative

Report Unit: Nautical Miles

The *Range – cumulative* field displays a summation of all calculated range values, over a period of time, from a receiver/vessel pairing in a processed dataset. This field is updated with each new message.

6.83 Range - First

Report Unit: Nautical Miles

The *Range – first* field displays the distance in NM between a contact's first message broadcast and the receiver's location. AISMiner stores the latitude and longitude location of receivers in the Baseinfo.txt file. When the receiver's position is known, AISMiner uses this information to calculate the distance of the first contact message in a processed dataset.

Note: All distance calculations are planar and are rounded up.

6.84 Range - Maximum

Report Unit: Nautical Miles

The *Range – maximum* field displays the maximum distance in NM between a contact's message broadcasts and a receiver's location. The maximum distance is calculated by comparing the value in *Range* field to the value in *Range - maximum* field each time a new contact distance value is calculated. When the value in the *Range* field is greater than the value in the *Range - maximum* field the value in *Range - maximum* field is updated.

6.85 Range - Minimum

Report Unit: Nautical Miles

The *Range – minimum* field displays the minimum distance in NM between a contact's message broadcasts and a receiver's location. The minimum distance is calculated by comparing the value in *Range* field to the value in *Range - minimum* field each time a new contact distance value is calculated. When the value in the *Range* field is greater than the value in the *Range - minimum* field the value in *Range - minimum* field is updated.

6.86 RCVR # Blocks Lost

Report Unit: Number

The *RCVR # blocks lost* field displays the number of blocks of messages lost by a receiver over a period of time. A block consists of one or more messages. Some receivers insert index numbers into their messages. By counting the index numbers, AISMiner can determine if messages have been lost.

6.87 Rcvr Cumulative Lines Lost

Report Unit: Number

The *Rcvr cumulative lines lost* field displays the number of lines of data lost from a receiver over a period of time. Note that a message can consist of more than one line of data.

6.88 RCVR # Lines Lost Total

Report Unit: Number

The *RCVR # lines lost total* field displays the same information as the *Rcvr cumulative lines lost* field described above.

Note: The *RCVR # lines lost total* field will be removed from the next version of AISMiner.

6.89 Rcvr ID

Report Unit: Text

The *Rcvr ID* field displays the unique identification value of a receiver. Land based receiver sites use AISSource software to process and retransmit AIS messages. Each receiver at a site is connected to the site controller computer, running AISSource, through a serial port connection. Each serial port has a unique identifier number assigned to it, in the AISSource.ini file, by the AISSource administrator. The unique identifier number serves as the identification number for the receiver attached to that port, and is referred to as the Receiver ID. The Receiver ID number is appended to each AIS message received on that port.

6.90 Rcvr Largest Lost Block

Report Unit: Number

The *RCVR largest lost block* field displays the highest number of lines lost in a single block by a receiver. Some receivers insert index numbers into their messages. By counting the index numbers, AISMiner can determine if messages have been lost. A block consists of one or more messages.

6.91 Rcvr Last Index

Report Unit: Number

The *Rcvr last index* field displays the index number of the last message sent by a receiver to AISSource which was not lost. Some receivers insert index numbers to their messages. By counting the index numbers, AISMiner can determine if messages have been lost.

6.92 Rcvr Last Lost Block End Time

Report Unit: hr:mm:ss

The *Rcvr last lost block end time* field displays the end [transmission] time of the last block of lost messages. Some receivers insert index numbers into their messages. By counting the index numbers, AISMiner can determine if messages have been lost. A block consists of one or more messages.

For example, a message received at 13:40:00 with an index number of (100) followed by another message received at 13:45:00 with an index number of (109) would show a value of 13:45:00 in this field.

6.93 Rcvr Last Lost Block Size

Report Unit: Number

The *Rcvr last lost block size* field displays the number of lines lost from the last block of messages. Some receivers insert index numbers into their messages. By counting the index numbers, AISMiner can determine if messages have been lost. A block consists of one or more messages.

6.94 Rcvr Last Lost Block Start Time

Report Unit: hr:mm:ss

The *Rcvr last lost block start time* field displays the start (transmission) time of the last block of lost messages. Some receivers insert index numbers into their messages. By counting the index numbers, AISMiner can determine if messages have been lost. A block consists of one or more messages.

For example, a message received at 13:40:00 with an index number of (100) followed by a message received at 13:45:00 with an index number of (109) would show a value of 13:40:00 in this field.

6.95 Rcvr Pct Lost

Report Unit: Percentage

The *Rcvr pct lost* field displays the percentage of lost messages over a period of time. Some receivers insert index numbers into their messages. By counting the index numbers, AISMiner can determine if messages have been lost. .

For example, if AISMiner receives (1000) messages over the period of a day and, through index counting, shows a loss of (100) messages, this field will display a value of 10%.

6.96 RCVR Total Expected Line Count

Report Unit: Number

The *RCVR Total expected line count* field displays the total number of lines of message data expected over a period of time. Some receivers insert index numbers into their messages. By counting the index numbers, AISMiner can determine if messages have been lost. A message consists of one or more lines.

For example, if at 12:00:00 AISMiner receives a message with an index count of 100 and at the end of that day 11:59:59 AISMiner receives a message with an index count of 1000, this field will display a value of 900.

6.97 Rcvr Total Line Count

Report Unit: Number

The *Rcvr Total line count* field displays the total number of message lines received. Some receivers insert index numbers into their messages. By counting the index numbers, AISMiner can determine if message lines have been lost. A message consists of one or more lines.

6.98 Rcvr UTC Error

Report Unit: Seconds

The *Rcvr UTC error* field displays the difference between time of message transmission and the time stamp attached by AISSource. This value is calculated using time information contained within messages 1, 2, 4, 9, 11, and 18. This field is updated when the Slot Timeout value for a message 1, 2, 4, 9, 11, or 18 is (1).

6.99 Received Stations

Report Unit: Number

The *Received stations* field displays the number of stations being received by the transmitting station.

6.100 Reference Altitude

Report Unit: Meters

The *Reference Altitude* field is used when a receiver site is aboard an airplane. The altitude of the receiver site measured in meters above mean sea level is displayed in this field. The altitude value is read from the onboard GPS unit. The format is: 0-4094 m, 4095 (not available).

6.101 Reference COG

Report Unit: 1/10° increments (≥ 0 < 360)

The *Reference COG* field displays the Course Over Ground (COG) direction a mobile receiver site is traveling across the earth's surface. This field information is read from the site's GPS unit.

6.102 Reference SOG

Report Unit: Knots

The *Reference SOG* field displays the Speed Over Ground (SOG) a mobile receiver site is traveling across the earth's surface. This field information is read from the site's GPS unit.

6.103 Repeat Indicator

Report Unit: Number

The *Repeat indicator* field displays the number of times a message has been repeated. This value is contained within every AIS message.

6.104 Report Period

Report Unit: Seconds

The *Report period* field displays the time difference in seconds between the first report received each day and the most current report. This field is updated each time a new report is processed.

6.105 Report Period (secs)

Report Unit: Seconds

The *Report period (secs)* field displays the time difference in seconds between the first message 4 report received each day and the most current message 4 report. This field is updated each time a new message 4 report is processed.

6.106 Report Rate

Report Unit: Number

The *Report rate* field displays the number of reports received per minute over a report period. The field value is calculated by dividing the total number of reports processed by the report period. This field is updated each time a new message is processed.

6.107 Report Rate A

Report Unit: Reports/Minute

The *Report rate A* field displays the number of reports, transmitted on Channel A, received per minute over a report period. The field value is calculated by dividing the total number of reports, transmitted on Channel A, processed by the report period. This field is updated each time a new message, transmitted on Channel A, is processed.

6.108 Report Rate B

Report Unit: Reports/Minute

The *Report rate B* field displays the number of reports, transmitted on Channel B, received per minute over a report period. The field value is calculated by dividing the total number of reports, transmitted on Channel B, processed by the report period. This field is updated each time a new message, transmitted on Channel B, is processed.

6.109 Reporting Interval

Report Unit: Number (0 – 15)

The *Reporting interval* field displays the report rate, assigned by a base station operator and, commanded by a message 23 broadcast. A base station operator can define a geographic area and command AIS units, on vessels navigating within this defined area, to report messages at rates different than those built into these units.

6.110 # Reports

Report Unit: Number

Count of reports received over a period of time.

6.111 # Reports A

Report Unit: Number

Total of all messages transmitted on Channel A from a contact. When the channel in the VDM statement is Channel A, the *# reports A* field is incremented by one.

6.112 # Reports B

Report Unit: Number

The *# reports B* field is the total of all messages transmitted on Channel B from a contact. When the channel in the VDM statement is Channel B, the *# reports B* field value is incremented by one.

6.113 # Rpts Total

Report Unit: Number

The *# rpts total* field displays the total number of messages received over a period of time.

6.114 Retransmit Flag

Report Unit: 0 or 1

The *Retransmit flag* field displays whether or not a message has been retransmitted. The field values are: 0 = not retransmitted (default); 1 = retransmitted.

6.115 ROT

Report Unit: Degrees per Minute

The *ROT* field displays a vessel's Rate Of Turn (ROT), which is how fast a contact is changing course. ROT is reported as the number of degrees per minute from 0 to 720. When the rate of turn is more that 720° per minute, it is indicated as greater than 720°. When the rate of turn is negative, the contact is turning to its port. When it is positive, the contact is turning to its starboard. The *ROT* field is updated when a message 1, 2, or 3 is processed.

6.116 RSSI Level A

Report Unit: Number

The *RSSI Level A* field displays receiver signal strength of messages transmitted on Channel A. Signal strength is added to all messages when received by a receiver which provides signal strength information. The RSSI Level A field of an AIS message is populated with signal strength when the message is transmitted on Channel A. Because signal strength measurement is not consistent between receiver manufacturers, this value must be converted manually. The value from the RSSI Level A field of an AIS message is converted by AISMiner to decibels using the manufacturer's calibration curve.

6.117 RSSI Level B

Report Unit: Number

The *RSSI Level B* field displays receiver signal strength of messages transmitted on Channel B. Signal strength is added to all messages when received by a receiver which provides signal strength

information. The RSSI Level B field of an AIS message is populated with signal strength when the message is transmitted on Channel B. Because signal strength measurement is not consistent between receiver manufacturers, this value must be converted manually. The value from the RSSI Level B field of an AIS message is converted by AISMiner to decibels using the manufacturer's calibration curve.

6.118 (S_M) Cumulative dBm

Report Unit: dBm

Shine Micro receiver information.

6.119 (S_M) Signal Level in dBm

Report Unit: dBm

Shine Micro receiver information. Shine Micro receiver appends a signal report to each VDM sentence.

6.120 (S_M) Slot Number

Report Unit: Number

Shine Micro receiver information. Shine Micro receiver appends the slot number to the end of each VDM sentence.

6.121 (S_M) Timestamp

Report Unit: Number

Shine Micro receiver information. Shine Micro receiver appends a timestamp to each VDM sentence.

6.122 (S_M) TOA UTC

Report Unit: Number

Shine Micro receiver information. Time Of Arrival report in seconds from UTC zero (0).

6.123 (S_M) Total # dBm Reports

Report Unit: Number

Shine Micro receiver information. Count of *(S_M) Signal level in dBm* reports received.

6.124 Second

Report Unit: Number

The *Second* field displays the UTC Second value of a report. It is read from messages 4 and 11. A base station periodically transmits message 4. A mobile station transmits message 11 only in

response to interrogation by a message 10. The format for *Second* is 0-59, with 60 used when UTC second information is not available in the report.

6.125 Sequence

Report Unit: Number (0-3)

Message types 6 and 12 are addressed message types, and are sent to specific destination stations. Message types 7 and 13 are acknowledgement messages to the addressed message types 6 and 12. The acknowledgement message fields labeled *Sequence #, Sequence #1, Sequence #2, Sequence #3,* and *Sequence #4* are used in this message interchange to acknowledge receipt of an addressed message. The *Sequence #* field displays the Sequence number field value from the acknowledgement message.

Note: For a complete description, see ITU-R M.1371-3 5.3.1 Annex 2.

6.126 Sequence #1

Report Unit: Number

See Sequence # field description.

6.127 Sequence #2

Report Unit: Number

See Sequence # field description.

6.128 Sequence #3

Report Unit: Number

See Sequence # field description.

6.129 Sequence #4

Report Unit: Number

See Sequence # field description.

6.130 Ship Type

Report Unit: Text

The *Ship type* field displays the contact vessel type description reported in messages 5 and 19. Possible values include: cargo; tanker; and, passenger.

6.131 Slot Increment

Report Unit: Number

The *Slot increment* field displays the offset to the next slot to be used, or zero (0) if no further transmission, for messages containing an ITDMA communication state.

Note: For a complete description, see ITU-R M.1371-3 3.3.7.3.2 Annex 2.

6.132 Slot Number

Report Unit: Number

The *Slot number* field displays the slot number used for this transmission. This applies to messages containing an SOTDMA communication state when the Slot Timeout is 2, 4, or 6.

Note: For a complete description, see ITU-R M.1371-3 3.3.7.2.3 Annex 2.

6.133 Slot Offset

Report Unit: Number

The *Slot offset* field displays the offset to the slot in which transmission will occur during the next VDL frame. This applies to messages containing an SOTDMA communication state when the Slot Timeout is zero (0).

Note: For a complete description, see ITU-R M.1371-3 3.3.7.2.3 Annex 2.

6.134 Slot Timeout

Report Unit: Number

The *Slot timeout* field displays the number of frames remaining until a new slot is selected. This applies to messages containing an SOTDMA communication state.

Note: For a complete description, see ITU-R M.1371-3 3.3.7.2.2 Annex 2.

6.135 SOG

Report Unit: Knots

Speed Over Ground (SOG) is a measurement of the speed a contact is traveling over the earth's surface. The *SOG* field is reported in 1/10 knot increments, from 0 to 102.2. When a contact is traveling faster than 102.2 knots it is reported as 102.2 knots. The *SOG* field is updated when a message 1, 2, 3, 18, or 19 is processed.

6.136 SOG (kt)

Report Unit: Knots

Speed Over Ground (SOG) is a measurement of the speed a contact is traveling over the earth's surface. The *SOG (kt)* field is reported in 1/10 knot increments, from 0 to 102.2. When a contact is traveling faster than 102.2 knots it is reported as 102.2 knots. The *SOG (kt)* field is updated when a message 1, 2, 3, 18, or 19 is processed.

6.137 Station Type

Report Unit: Number

The *Station Type* field displays the station designation number reported in message type 23. Designation numbers are: 0 = all types of mobiles; 1 = reserved for future use; 2 = all types of Class B mobile stations; 3 = SAR airborne mobile stations; 4 = AtoN station; 5 = Class B"CS" shipborne mobile station; 6 = inland waterways; 7 to 9 = regional use; and, 10 to 15 = reserved for future use.

6.138 Sync State

Report Unit: Number

The *Sync state* field displays a number corresponding to the type of time synchronization used by the transmitting station. This field is updated when a message containing a SOTDMA communication state is processed.

Note: For a complete description, see ITU-R M.1371-3 3.3.7.2.2 Annex 2.

6.139 Text

Report Unit: Text

Message type 14 is used for broadcasting safety related information. The *Text* field displays the safety related information within this message. This field is updated when a message type 14 is processed.

6.140 Timestamp

Report Unit: Number

The *Timestamp* field displays the UTC second when the report was generated by the vessels electronic position system. 0-59 = time value, 60 = not available, 61 = positioning system in manual input mode, 62 = electronic position system operating in dead reckoning mode, 63 = positioning system inoperative.

6.141 Time Tag First Rpt (GMT)

Report Unit: hr:min:sec

The *Time tag first rpt (GMT)* field displays the time part of the time tag of the first vessel report for a given day. During processing, AISSource assigns a UTC formatted time tag to each message received. AISMiner converts this UTC value to GMT before displaying the time part in the *Time tag first rpt (GMT)* field. A new day begins at midnight local machine time. This field is updated when a message 1, 2, 3, 4, 9, 11, 18, 19, or 21 is processed.

Note: See also Date tag first rpt (GMT).

6.142 Time Tag First Rpt (local)

Report Unit: hr:min:sec

The *Time tag first rpt (local)* field displays the time part of the time tag of the first vessel report for a given day. During processing, AISSource assigns a UTC formatted time tag to each message received. AISMiner converts this UTC value to local (host) machine time before displaying the time part in the *Time tag first rpt (local)* field. A new day begins at midnight local machine time. This field is updated when a message 1, 2, 3, 4, 9, 11, 18, 19, or 21 is processed.

Note: See also Date tag first rpt (local).

6.143 Time Tag Last Rpt (GMT)

Report Unit: hr:min:sec

The *Time tag last rpt (GMT)* field displays the time part of the time tag of the last vessel report for a given day. During processing, AISSource assigns a UTC formatted time tag to each message received. AISMiner converts this UTC value to GMT before displaying the time part in the *Time tag last rpt (GMT)* field. A new day begins at midnight local machine time. This field is updated when a message 1, 2, 3, 4, 9, 11, 18, 19, or 21 is processed.

Note: See also Date tag last rpt (GMT).

6.144 Time Tag Last Rpt (local)

Report Unit: hr:min:sec

The *Time tag last rpt (local)* field displays the time part of the time tag of the last vessel report for a given day. During processing, AISSource assigns a UTC formatted time tag to each message received. AISMiner converts this UTC value to local (host) machine time before displaying the time part in the *Time tag last rpt (local)* field. A new day begins at midnight local machine time. This field is updated when a message 1, 2, 3, 4, 9, 11, 18, 19, or 21 is processed.

Note: See also Date tag last rpt (local).

6.145 Time Tag Last Rpt (UTC)

Report Unit: hr:min:sec

The *Time tag last rpt (UTC)* field displays the time part of the time tag of the last vessel report for a given day. During processing, AISSource assigns a UTC formatted time tag to each message received. AISMiner displays this UTC value in the *Time tag last rpt (UTC)* field. A new day begins at midnight local machine time. This field is updated when a message 1, 2, 3, 4, 9, 11, 18, 19, or 21 is processed.

Note: A value of 60 = not available, 61 = positioning system in manual input mode, 62 = electronic position system operating in dead reckoning mode, 63 = positioning system inoperative.

6.146 Transitional Zone Size

Report Unit: Nautical Miles

The *Transitional zone size* field displays the size of a transition zone. A transition zone is defined as: a zone where a vessel goes from one broadcast region to the next. This field is updated when a message type 22 is processed.

6.147 True Heading

Report Unit: Integer (≥ 0 < 360)

The *True Heading* field displays the compass direction of a vessel (contact). In figure 66 below the vessel Heading is 240°, but because of wind or ocean currents pushing at it, it's actual forward direction (COG) is 260°. This field is updated when a message 1, 2, 3, 18, or 19 is processed. The Heading value is reported in 1° increments, from 0 to 359.

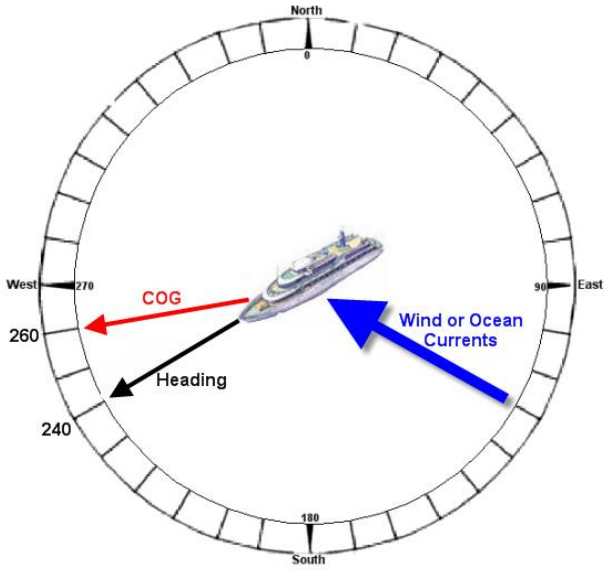


Figure 66. Heading and course over ground example.

6.148 Tx Mode

Report Unit: Number (0 – 3)

The *Tx mode* field displays the Transmit mode designation value from message type 23.

6.149 Tx/Rx Mode

Report Unit: Number (0 – 3)

The *Tx/Rx Mode* field displays the Transmit/Receive mode designation value from message type 22.

6.150 UTC Hour/Minute

Report Unit: hh:mm

The *UTC hour/minute* field displays the UTC hour/minute value contained within the SOTDMA communication state where the Slot Timeout is (1).

Note: For a complete description, see ITU-R M.1371-3 3.3.7.2.3 Annex 2.

6.151 UTC Hour/Minute (CS)

Report Unit: hh:mm

The *UTC hr/min (CS)* field displays the UTC hour/minute value contained within message types 4 and 11.

6.152 Vendor ID

Report Unit: Text

The *Vendor ID* field displays the AIS unit's unique identification assigned by the unit's manufacturer. This field is updated when a message type 24 is processed.

6.153 Vessel ID

Report Unit: Number

The *Vessel ID* field displays a vessel's MMSI number.

6.154 Year

Report Unit: Year

The *Year* field displays the UTC Year value of a report. It is read from messages 4 and 11. A base station periodically transmits message 4. A mobile station transmits message 11 only in response to interrogation by a message 10. The format for *Year* is 1-9999, with 0 used when UTC year information is not available in the report.

7 RECEIVER VIEW WINDOW - TABLE VIEW

Following is a list of fields, in alphabetical order, and their associated definitions, viewable in the table view of the AISMiner Receiver View window.

Note: See section 5.3.3 for information on how to customize the table view of the Receiver View window.

Important: For fields displaying values calculated over a period of time, in live data mode the period of time consists of one day beginning at midnight local machine time. In saved data mode, the period of time spans the length of the dataset.

7.1 FSR Count

Report Unit: Number

The *FSR Count* field displays the total number of Frame Summary Report (FSR) messages received, per receiver, over a period of time.

7.2 FSR Count A

Report Unit: Number

The *FSR Count A* field displays the total number of Channel A FSR messages, received per receiver, over a period of time.

7.3 FSR Count B

Report Unit: Number

The *FSR Count B* field displays the total number of Channel B FSR messages, received per receiver, over a period of time.

7.4 FSR CRC Failures A

Report Unit: Number

The *FSR CRC Failures A* field displays the total number of Cyclic Redundancy Check (CRC) failures reported for Channel A, per receiver, over a period of time.

7.5 FSR CRC Failures B

Report Unit: Number

The *FSR CRC Failures B* field displays the total number of CRC failures reported for Channel B, per receiver, over a period of time.

7.6 FSR High Noise A

Report Unit: Number

The *FSR High Noise A* field displays the highest reported noise level for Channel A, per receiver, over a period of time.

7.7 FSR High Noise B

Report Unit: Number

The *FSR High Noise B* field displays the highest reported noise level for Channel B, per receiver, over a period of time.

7.8 FSR Low Noise A

Report Unit: Number

The *FSR Low Noise A* field displays the lowest reported noise level for Channel A, per receiver, over a period of time.

7.9 FSR Low Noise B

Report Unit: Number

The *FSR Low Noise B* field displays the lowest reported noise level for Channel B, per receiver, over a period of time.

7.10 FSR Noise A Delta

Report Unit: Number

The *FSR Noise A Delta* field displays the difference between the highest and lowest reported noise level for Channel A, per receiver, over a period of time.

7.11 FSR Noise B Delta

Report Unit: Number

The *FSR Noise B Delta* field displays the difference between the highest and lowest reported noise level for Channel B, per receiver, over a period of time.

7.12 FSR Noise Level A

Report Unit: Number

The *FSR Noise Level A* field displays the last reported noise level for Channel A per receiver.

7.13 FSR Noise Level B

Report Unit: Number

The *FSR Noise Level B* field displays the last reported noise level for Channel B per receiver.

7.14 FSR Report Time

Report Unit: hh:mm:ss

The *FSR Report Time* field displays the receipt time of the last FSR message per receiver.

7.15 FSR Report Time A

Report Unit: hh:mm:ss

The *FSR Report Time A* field displays the receipt time of the last FSR message for Channel A per receiver.

7.16 FSR Report Time B

Report Unit: hh:mm:ss

The *FSR Report Time B* field displays the receipt time of the last FSR message for Channel B per receiver.

7.17 FSR Slots Occupied A

Report Unit: Number

The *FSR Slots Occupied A* field displays the number of slots reported as being used by the last FSR for Channel A per receiver.

7.18 FSR Slots Occupied B

Report Unit: Number

The *FSR Slots Occupied B* field displays the number of slots reported as being used by the last FSR for Channel B per receiver.

7.19 Rcvr ID

Report Unit: Text

The *Rcvr ID* field displays the unique identification value of a receiver.

7.20 Rcvr Last Lost Block Duration

Report Unit: hh:mm:ss

The *Rcvr Last Lost Block Duration* field displays the elapsed time between receipt of two messages with non-sequential index numbers. Some receivers insert index numbers into their messages. By counting the index numbers, AISMiner can determine if messages have been lost. A block consists of one or more messages.

7.21 Rcvr Last Lost Block Start

Report Unit: hr:mm:ss

The *Rcvr Last Lost Block Start* field displays the start (transmission) time of the last block of lost messages. Some receivers insert index numbers into their messages. By counting the index

numbers, AISMiner can determine if messages have been lost. A block consists of one or more messages.

For example, a message received at 13:40:00 with an index number of (100) followed by a message received at 13:45:00 with an index number of (109) would show a value of 13:40:00 in this field.

7.22 Rcvr Lost Line %

Report Unit: Percentage

The *Rcvr Lost Line %* field displays the percentage of lines of data lost, per receiver, over a period of time. Some receivers insert index numbers into their messages. By counting the index numbers, AISMiner can determine if lines of data have been lost. A message consists of one or more lines.

7.23 Rcvr Total Line Count

Report Unit: Number

The *Rcvr Total Line Count* field displays the total number of message lines received, per receiver, over a period of time. Some receivers insert index numbers into their messages. By counting the index numbers, AISMiner can determine if message lines have been lost. A message consists of one or more lines.

7.24 Rcvr VDM Rpts A

Report Unit: Number

The *Rcvr VDM Rpts A* field displays the total number of VDM messages received on Channel A, per receiver, over a period of time.

7.25 Rcvr VDM Rpts B

Report Unit: Number

The *Rcvr VDM Rpts B* field displays the total number of VDM messages received on Channel B, per receiver, over a period of time.

7.26 Rcvr Lost Block Count

Report Unit: Number

The *RCVR Lost Block Count* field displays the number of blocks of messages lost, per receiver, over a time period. A block consists of one or more messages. Some receivers insert index numbers into their messages. By counting the index numbers, AISMiner can determine if messages have been lost.

7.27 Shine 10 Count

Report Unit: Number

The *Shine 10 Count* field displays the total number of proprietary Shine Micro Message 10 messages received, per receiver, over a period of time.

8 EXAMPLE DATA ANALYSIS

AISMiner can be used to isolate and extract AIS data for many different types of analyses. In the following example AISMiner and Microsoft Excel are used to calculate the maximum and mean contact distances for two receivers at the [R&DC] Fishers Island, NY site.

1. Start AISMiner.
2. To open the View Editor window, from the *View* menu item select *Edit a View* then click *View #4*.
3. To populate the *Selectable items* list with fields not associated with a particular VDM sentence, click the General Info radio button (red outline – Figure 67).
4. Use the Add arrow button to add the following fields to the *Items in current view* list.
    - Vessel ID.
    - Receiver ID.
    - # Pos rpts valid.
    - Range – cumulative.
    - # Pos rpts.
    - Range – minimum.
    - Range.
    - Range – maximum.
    - Bearing.
    - SOG.
    - Range – first.
    - COG.
    - Latitude.
    - Longitude.
    - Nav solution time (GMT).
    - Nav solution date (GMT).

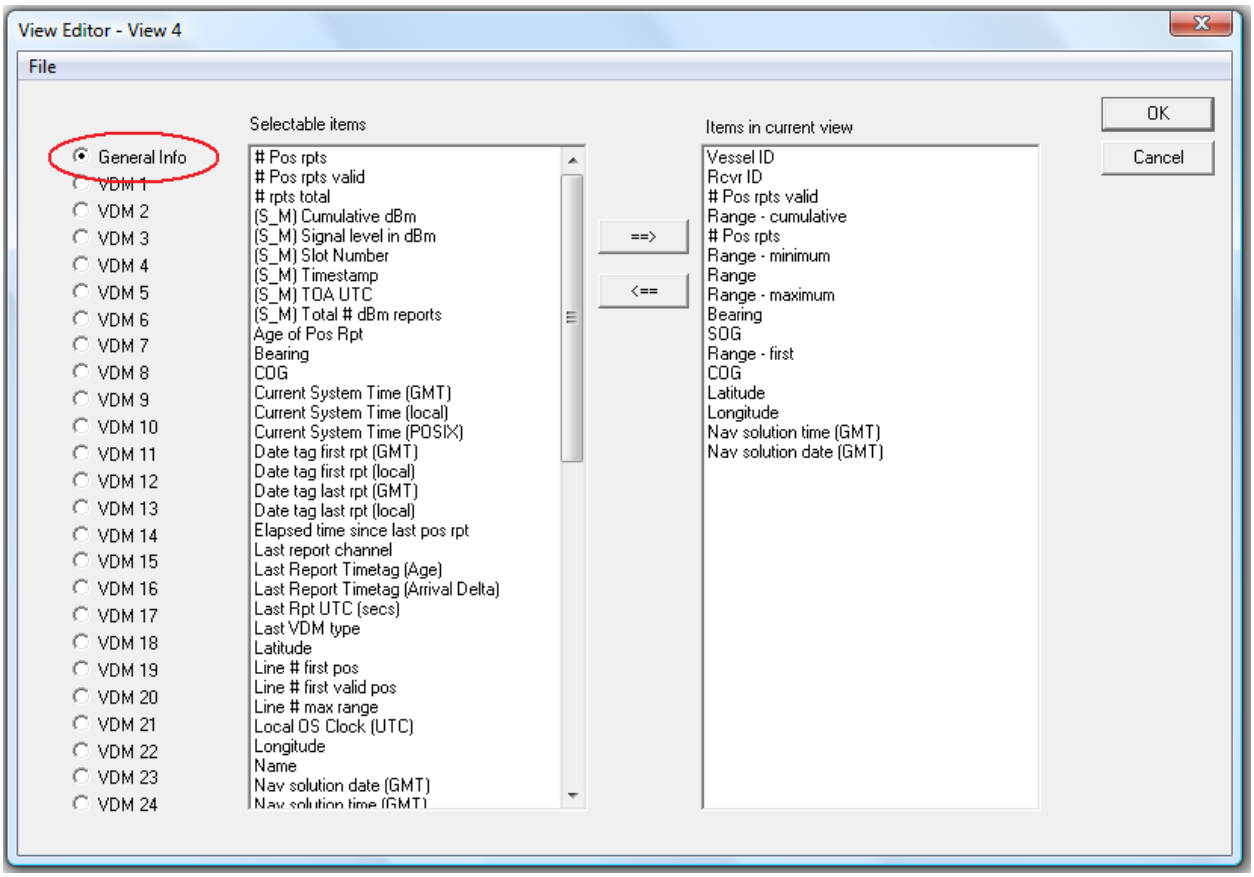


Figure 67. AISMiner – view editor window.

5. Click the Ok button to close the View Editor window and save the changes.
6. From the *View* menu item, select *View #4*. Note that the table view field names change to match the View Editor list.
7. To open the Filters Editor window (Figure 68), from the *Tools* menu item select *Edit Filters*.
8. On the Speed filter (orange outline - Figure 68), click the Allow Selected button and set *Faster Than* to .5 and *Slower Than* to 30.
9. On the Range filter (green outline - Figure 68), click the Allow Selected button and set *Near Limit* to 0 and *Far Limit* to 250.
10. On the Time (UTC) filter (purple outline - Figure 68), click the Allow Selected button and set the *Start time* to 6:00 and the *End time* to 12:00.
11. On the Receivers filter (blue outline - Figure 68), click the Allow Selected button. Using the Add button (red outline - Figure 68), add the following two Fishers Island, NY receivers to the *Selected* list, or any two receivers from a site of your choice.
    - r003669957.
    - r003669959.

Note: If you have not already opened a saved log file using AISMiner, follow these steps to populate the Receivers section *Known* list:

- From the *File* menu item select *Open File*.
- Using the Open file window, navigate to and open a saved log file. Log files are kept in the directory listed in the AISMiner.ini file setting LogDir (§ 4.1.1.10).
- From the main interface, click the Resume button. After a few seconds click the Stop button to stop data processing.

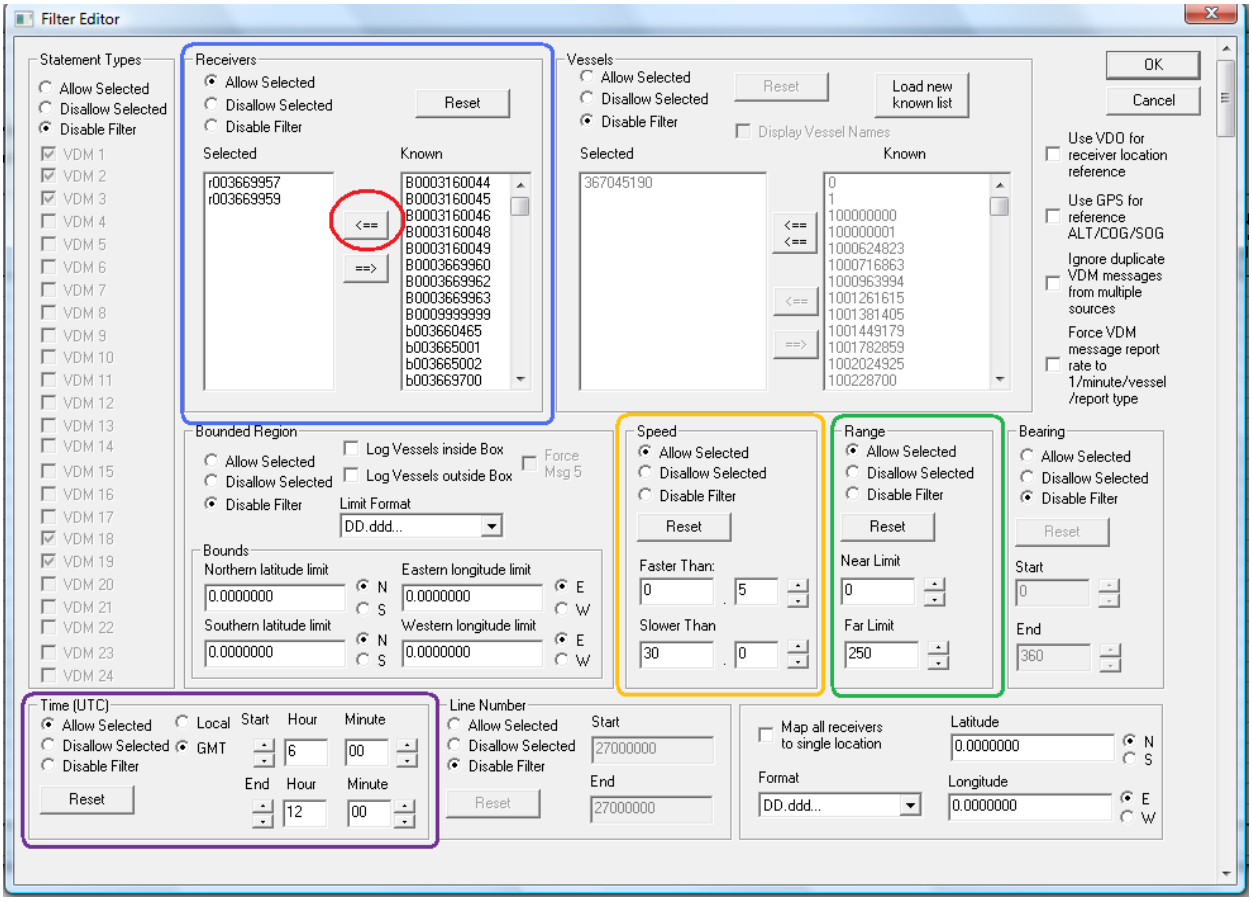
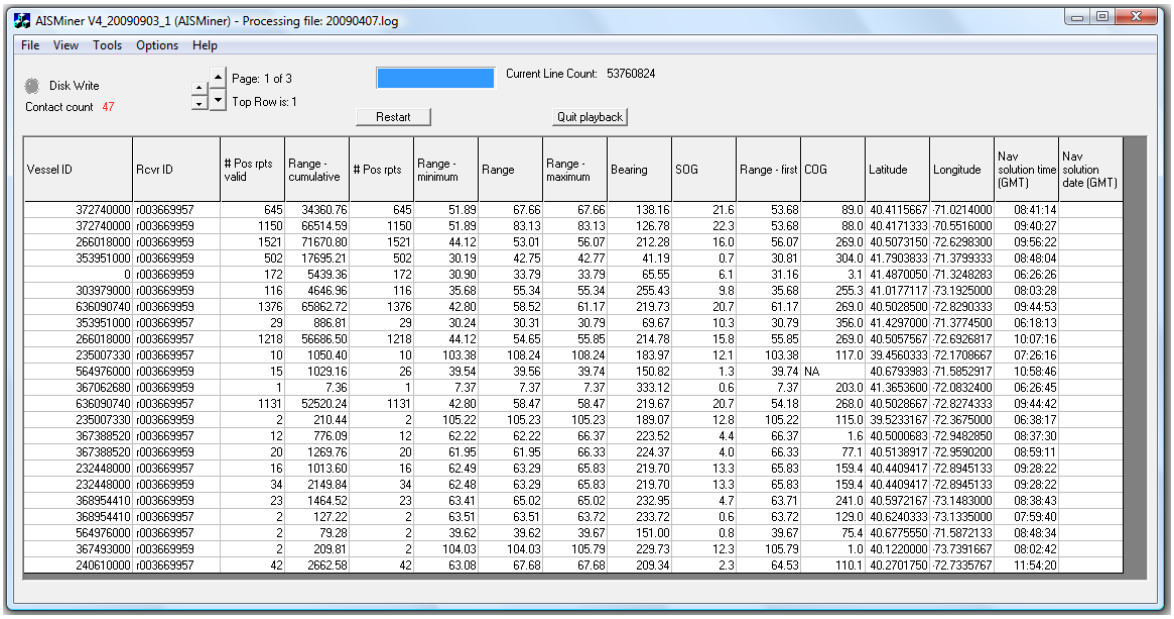


Figure 68. AISMiner – filter editor window example settings.

12. To close the Filter Editor window and save the changes, click the Ok button.
13. From the *Tools* menu item, verify that *Apply Selected Filters* is checked.
14. From the *File* menu item, select *Export* then *Generate Filtered Output*.
15. Using the Open file window, navigate to and open a saved log file. Log files are kept in the directory listed in the AISMiner.ini file setting LogDir (§ 4.1.1.10).
16. In the Save File window, change the file name to "AnalysisFilterTest1.log" and click the Save button.

17. To start the analysis filtering process, from the main interface click the Resume playback button. A notification message displays following completion of the Generate Filtered Output process.

18. Figure 69 below shows results of the custom filter process. To save the results to file for analysis, follow the steps outlined in section 5.1.5.2.1 (Example – Extract as Viewed), using the "AnalysisFilterTest1.log" saved log file. Note that final results are dependent on the log file used.



Vessel ID	Rcvr ID	# Pos rpts valid	Range - cumulative	# Pos rpts	Range - minimum	Range	Range - maximum	Bearing	SOG	Range - first	COG	Latitude	Longitude	Nav solution time (GMT)	Nav solution date (GMT)
372740000	r003669957	645	34360.76	645	51.89	67.66	67.66	138.16	21.6	53.68	89.0	40.4115667	-71.0214000	08:41:14	
372740000	r003669959	1150	66514.59	1150	51.89	83.13	83.13	126.78	22.3	53.68	88.0	40.4171333	-70.5516000	09:40:27	
266018000	r003669959	1521	71670.80	1521	44.12	53.01	56.07	212.28	16.0	56.07	269.0	40.5073150	-72.6298300	09:56:22	
353951000	r003669959	502	17695.21	502	30.19	42.75	42.77	41.19	0.7	30.81	304.0	41.7903833	-71.3799333	08:48:04	
0	r003669959	172	5439.36	172	30.90	33.79	33.79	65.55	6.1	31.16	3.1	41.4870050	-71.3248283	06:26:26	
303979000	r003669959	116	4646.96	116	35.68	55.34	55.34	255.43	9.8	35.68	255.3	41.0177117	-73.1925000	08:03:28	
636090740	r003669959	1376	65862.72	1376	42.80	58.52	61.17	219.73	20.7	61.17	269.0	40.5028500	-72.8290333	09:44:53	
353951000	r003669957	29	886.81	29	30.24	30.31	30.79	69.67	10.3	30.79	356.0	41.4297000	-71.3774500	06:18:13	
266018000	r003669957	1218	56686.50	1218	44.12	54.65	55.85	214.78	15.8	55.85	269.0	40.5057567	-72.6926817	10:07:16	
235007330	r003669957	10	1050.40	10	103.38	108.24	108.24	183.97	12.1	103.38	117.0	39.4560333	-72.1708667	07:26:16	
564976000	r003669959	15	1029.16	26	39.54	39.56	39.74	150.82	1.3	39.74	NA	40.6793983	-71.5852917	10:58:46	
367062680	r003669959	1	7.36	1	7.37	7.37	7.37	333.12	0.6	7.37	203.0	41.3653600	-72.0832400	06:26:45	
636090740	r003669957	1131	52520.24	1131	42.80	58.47	58.47	219.67	20.7	54.18	268.0	40.5028667	-72.8274333	09:44:42	
235007330	r003669959	2	210.44	2	105.22	105.23	105.23	189.07	12.8	105.22	115.0	39.5233167	-72.3675000	06:38:17	
367388520	r003669957	12	776.09	12	62.22	62.22	66.37	223.52	4.4	66.37	1.6	40.5000683	-72.9482850	08:37:30	
367388520	r003669959	20	1269.76	20	61.95	61.95	66.33	224.37	4.0	66.33	77.1	40.5138917	-72.9590200	08:59:11	
232448000	r003669957	16	1013.60	16	62.49	63.29	65.83	219.70	13.3	65.83	159.4	40.4409417	-72.8945133	09:28:22	
232448000	r003669959	34	2149.84	34	62.48	63.29	65.83	219.70	13.3	65.83	159.4	40.4409417	-72.8945133	09:28:22	
368954410	r003669959	23	1464.52	23	63.41	65.02	65.02	232.95	4.7	63.71	241.0	40.5972167	-73.1483000	08:38:43	
368954410	r003669957	2	127.22	2	63.51	63.51	63.72	233.72	0.6	63.72	129.0	40.6240333	-73.1335000	07:59:40	
564976000	r003669957	2	79.28	2	39.62	39.62	39.67	151.00	0.8	39.67	75.4	40.6775550	-71.5872133	08:48:34	
367493000	r003669959	2	209.81	2	104.03	104.03	105.79	229.73	12.3	105.79	1.0	40.1220000	-73.7391667	08:02:42	
240610000	r003669957	42	2662.58	42	63.08	67.68	67.68	209.34	2.3	64.53	110.1	40.2701750	-72.7335767	11:54:20	

Figure 69. AISMiner – custom analysis results.

19. Close AISMiner.

20. Using Microsoft Excel, navigate to and open the "AnalysisFilterTest1.csv" file created during step number 18. Note, depending on your version of Excel, you may need to change the open file selection to "All Files" to view files with a csv extension.

21. Using the Excel sort function, perform a custom sort first by Receiver ID, then Vessel ID, and finally Range. Note the Sort window shown in figure 70 below is from Excel 2007.

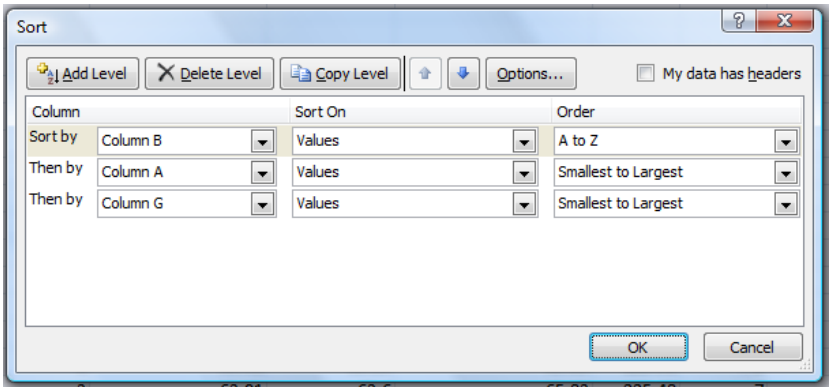


Figure 70. Excel – sort window.

22. Click the OK button.

23. Using the Excel Subtotal function, change the *At each change in* dropdown box to Rcvr ID; change the *Use function* dropdown box to Average; and, in the *Add subtotal to* list, uncheck any checked box and check the Range checkbox.

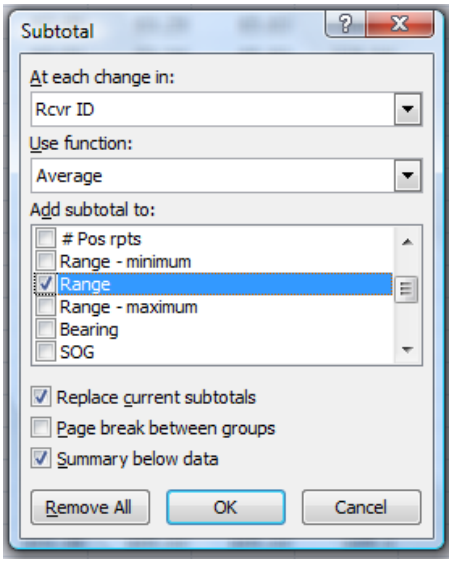
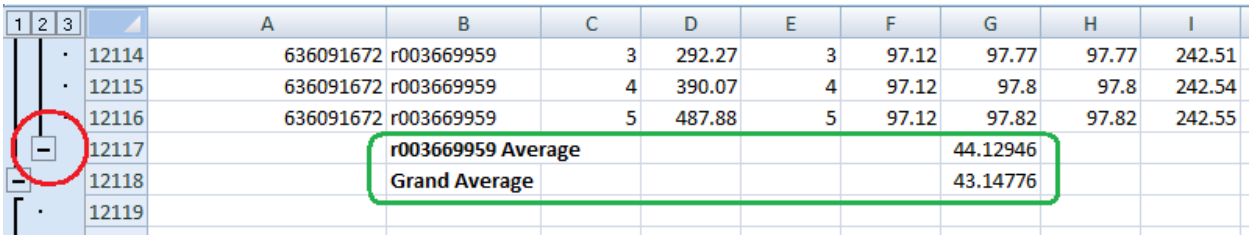


Figure 71. Excel – subtotal window – average analysis.

24. Click the OK button.

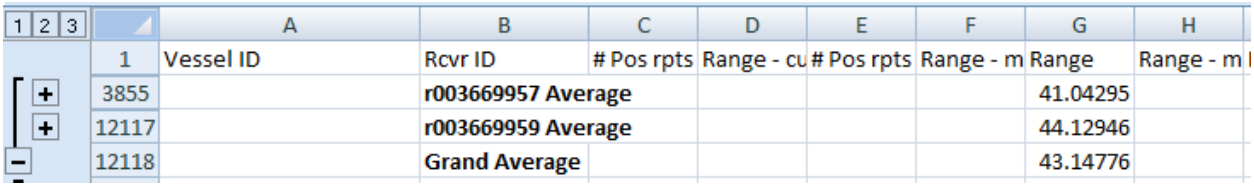
25. Scroll to the bottom of the dataset and click the minus symbol in line with the receiver average (red outline – Figure 72).



	A	B	C	D	E	F	G	H	I
12114	636091672	r003669959	3	292.27	3	97.12	97.77	97.77	242.51
12115	636091672	r003669959	4	390.07	4	97.12	97.8	97.8	242.54
12116	636091672	r003669959	5	487.88	5	97.12	97.82	97.82	242.55
12117		**r003669959 Average**					44.12946		
12118		**Grand Average**					43.14776		
12119									

Figure 72. Excel – subtotal results.

26. Click all subsequent minus symbols in line with receiver average until your final view appears similar to figure 73 below.



	A	B	C	D	E	F	G	H
1	Vessel ID	Rcvr ID	# Pos rpts	Range - cu	# Pos rpts	Range - m	Range	Range - m
3855		**r003669957 Average**					41.04295	
12117		**r003669959 Average**					44.12946	
12118		**Grand Average**					43.14776	

Figure 73. Excel – receiver average analysis results.

27. Create a new worksheet and copy the Average values to the new worksheet.

28. Using the Excel Subtotal function, change the *Use function* dropdown box to Count; in the *Add subtotal to* list, uncheck the Range checkbox and check the #Pos rpts checkbox.

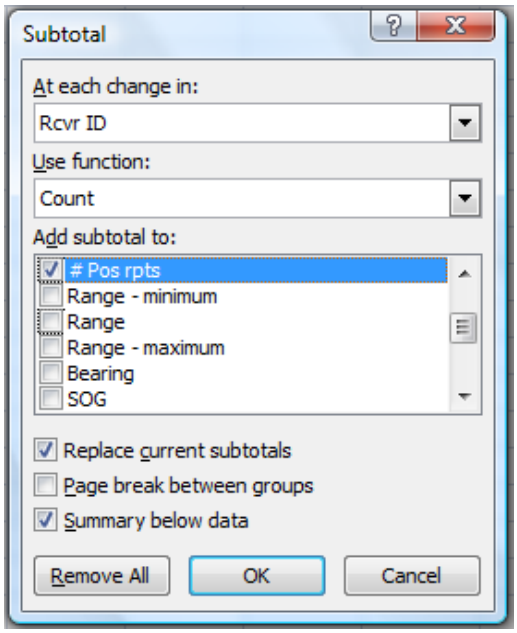


Figure 74. Excel – subtotal window – count analysis.

29. Click the OK button.

30. Scroll to the bottom of the dataset and click the minus symbol in line with the receiver count and all subsequent minus symbols in line with receiver count until your final view appears similar to figure 75 below.

	A	B	C	D	E	F	G
1	Vessel ID	Rcvr ID	# Pos rpts	Range - cu	# Pos rpts	Range - m	Range
3855		**r003669957 Count**			3853		
12117		**r003669959 Count**			8261		
12118		**Grand Count**			12114		

Figure 75. Excel – receiver count analysis results.

31. Copy the Count values to the new worksheet created in step 27.

	A	B	C	D	E	F	G	H
1	Vessel ID	Rcvr ID	# Pos rpts vali	Range - cumul	# Pos rpts	Range - mini	Range	Range - m
2								
3		r003669957 Count			3853			
4		r003669957 Average					41.04294835	
5		r003669959 Count			8261			
6		r003669959 Average					44.12945648	
7		Grand Count			12114			
8		Grand Average					43.14775632	

Figure 76. Excel – receiver average and count analysis results.

32. Using the Excel Subtotal function, change the *Use function* dropdown box to Max; in the *Add subtotal to* list, uncheck the #Pos rpts checkbox and check the Range checkbox.

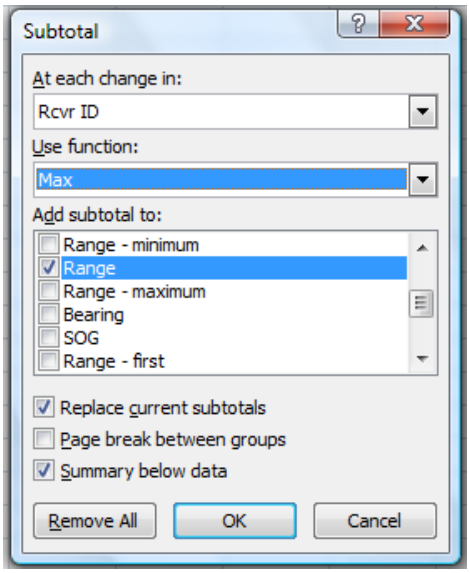


Figure 77. Excel – subtotal window – max analysis.

33. Click the OK button.
34. Scroll to the bottom of the dataset and click the minus symbol in line with the receiver max and all subsequent minus symbols in line with receiver max until your final view appears similar to figure 78 below.

	A	B	C	D	E	F	G	H
1	Vessel ID	Rcvr ID	# Pos rpts	Range - cu	# Pos rpts	Range - m	Range	Range - m
3855		**r003669957 Max**					108.24	
12117		**r003669959 Max**					105.79	
12118		**Grand Max**					108.24	

Figure 78. Excel – receiver max analysis results.

35. Copy the Max values to the new worksheet created in step 27 so that your results appear as shown in figure 79 below.

	A	B	C	D	E	F	G	H
1	Vessel ID	Rcvr ID	# Pos rpts vali	Range - cumul	# Pos rpts	Range - mini	Range	Range - m
2		r003669957 Max					108.24	
3		r003669957 Count			3853			
4		r003669957 Average					41.04294835	
5		r003669959 Max					105.79	
6		r003669959 Count			8261			
7		r003669959 Average					44.12945648	
8		Grand Max					108.24	
9		Grand Count			12114			
10		Grand Average					43.14775632	

Figure 79. Excel – receiver average, count, and max analysis results.

Figure 79 above shows the Average and Maximum AIS broadcast reception distance for two receivers at the Fishers Island, NY site during a six hour period on 7 April, 2009.

9 AUTOMATED DATA PROCESSING

Several commonly used application features for processing AIS data can be executed indirectly using a batch file. This can be beneficial when performing log file data processing on a regularly scheduled basis. The following sections describe the steps involved in creating batch files used for automated data processing.

Following is a list of batch file commands recognized by AISMiner:

- 0: Zero character. Instructs AISMiner to execute the *Extract as Viewed* application feature (§ 5.1.5.2).
- 1: Instructs AISMiner to execute the *Generate Filtered Output* application feature (§ 5.1.5.1).
- 2: Instructs AISMiner to execute the *Extract as Viewed* application feature using the previous days log file.
- 3: Instructs AISMiner to execute the *Filter Live Data* application feature (5.1.2).
- -i: Instructs AISMiner that what follows this command is the data input file path.
- -o: Instructs AISMiner that what follows this command is the data output file path.
- -m: Instructs AISMiner that what follows this command is the mode of operation designation (i.e., 0, 1, 2, or 3).
- -w: Instructs AISMiner that what follows this command is the application's support files working directory path.

Important: Using a batch file command, other than those described above, will cause AISMiner to automatically shutdown.

Figure 80 below shows an example [batch file] line statement for each of the four automated modes of operation; and one using the *working directory* feature (described below).

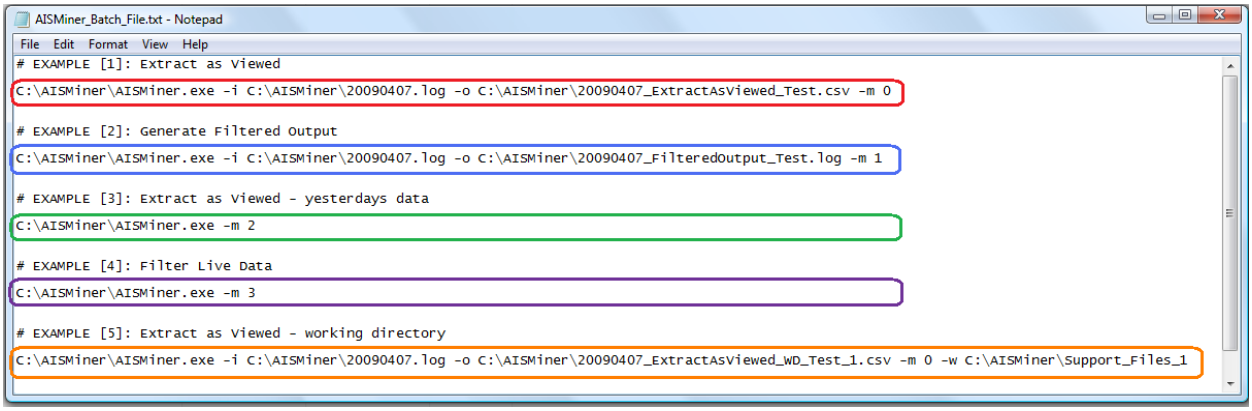


Figure 80. Automated Data Processing – example [1] batch file.

9.1 Example [1]: Extract as Viewed

Following is a breakdown of the example line statement used to call the *Extract as Viewed* application feature (red outline – Figure 80 above).

- "C:\AISMiner\AISMiner.exe": Application path to the AISMiner executable file.
- -i: Instructs AISMiner that what follows this command is the data input file path.
- "C:\AISMiner\20090407.log": Path and name of log file for input data processing.
- -o: Instructs AISMiner that what follows this command is the data output file path.
- "C:\AISMiner\20090407_ExtractAsViewed_Test.csv": Path and name of data output file. Note that the output file extension must be 'csv' when using the *Extract as Viewed* feature.
- -m: Instructs AISMiner that what follows this command is the mode of operation designation.
- 0: Zero character. Instructs AISMiner to execute the *Extract as Viewed* application feature.

Enter the above line statement (red outline – Figure 80 above) in a text editor such as Notepad using file paths and names that match that of your computer. Note that a space is required between each line statement section. Save the file using the 'bat' file extension. To run the batch file, double click on it. This action starts the AISMiner application in system memory (a graphical user interface is not shown), and begins the input data file processing event. Just as if you had run the *Extract as Viewed* feature using the application menu selection, only filtered data (based on settings in the Filter Editor window), and fields shown in the table view (based on settings in the View Editor window), are saved to the output file. Note that for Filter Editor window (§ 5.3.1) settings to be applied, the *Apply Selected Filters* menu item (§ 5.3.2) needs to have been set (checked) during the last application session.

9.2 Example [2]: Generate Filtered Output

Following is a breakdown of the example line statement used to call the *Generate Filtered Output* application feature (blue outline – Figure 80 above).

- C:\AISMiner\AISMiner.exe": Application path to the AISMiner executable file.
- -i: Instructs AISMiner that what follows this command is the data input file path.
- "C:\AISMiner\20090407.log": Path and name of log file for input data processing.
- -o: Instructs AISMiner that what follows this command is the data output file path.
- "C:\AISMiner\20090407_FilteredOutput_Test.log": Path and name of data output file.
- -m: Instructs AISMiner that what follows this command is the mode of operation designation.
- 1: Instructs AISMiner to execute the *Generate Filtered Output* application feature.

Enter the above line statement (blue outline – Figure 80 above) in a text editor such as Notepad using file paths and names that match that of your computer. Note that a space is required between each line statement section. Save the file using the 'bat' file extension. To run the batch file, double click on it. This action starts the AISMiner application in system memory (a graphical user interface is not shown), and begins the input data file processing event. Just as if you had run the *Generate Filtered Output* feature using the application menu selection, only filtered data (based on settings in the Filter Editor window) are saved to the output file. Note that for Filter Editor window (§ 5.3.1) settings to be applied, the *Apply Selected Filters* menu item (§ 5.3.2) needs to have been set (checked) during the last application session.

9.3 Example [3]: Extract as Viewed – Yesterdays Data

Following is a breakdown of the example line statement used to call the *Extract as Viewed – yesterdays data* application feature (green outline – Figure 80 above).

- "C:\AISMiner\AISMiner.exe": Application path to the AISMiner executable file.
- -m: Instructs AISMiner that what follows this command is the mode of operation designation.
- 2: Instructs AISMiner to execute the *Extract as Viewed* application feature using the previous days log file.

Unlike the *Extract as Viewed* feature, the *Extract as Viewed – yesterdays data* feature input and output data files are not defined in the batch file line statement. Instead, the application reads these values from settings in the AISMiner INI support file (§ 4.1).

The setting *Auto Source Directory* defines the directory path for input data files. Within this directory, AISMiner checks for a folder named Year and a sub-folder named Month. If the Year folder is not found, it defaults to the Month folder. Within the Month folder, AISMiner checks for the previous days log file using the naming convention four-digit-year/two-digit-month /two-digit-day (e.g., 20100315.log).

The setting *Auto Output Directory* defines the directory path for output data files. The output files are named the same as the input log files, but with the 'csv' file extension (e.g., 20100315.csv).

Enter the above line statement (green outline – Figure 80 above) in a text editor such as Notepad using file paths and names that match that of your computer. Note that a space is required between each line statement section. Save the file using the 'bat' file extension. To run the batch file, double click on it. This action starts the AISMiner application in system memory (a graphical user interface is not shown), and begins the input data file processing event. Just as if you had run the *Extract as Viewed* feature using the application menu selection, only filtered data (based on settings in the Filter Editor window), and fields shown in the table view (based on settings in the View Editor window), are saved to the output file. Note that for Filter Editor window (§ 5.3.1) settings to be applied, the *Apply Selected Filters* menu item (§ 5.3.2) needs to have been set (checked) during the last application session.

9.4 Example [4]: Filter Live Data

Following is a breakdown of the example line statement used to call the *Filter Live Data* application feature (purple outline – Figure 80 above).

- "C:\AISMiner\AISMiner.exe": Application path to the AISMiner executable file.
- -m: Instructs AISMiner that what follows this command is the mode of operation designation.
- 3: Instructs AISMiner to execute the *Filter Live Data* application feature.

The *Filter Live Data* feature is used to establish a connection to and begin processing of a live AIS data stream. The feature operates the same as the *Filter Live Data* menu item (§ 5.1.2). To configure AISMiner to read live data, see section 4.1. The AISMiner INI file setting *LogDir* defines the directory path for output data files. The output files are named using the naming convention four-digit-year/two-digit-month /two-digit-day (e.g., 20100315.log).

Enter the above line statement (purple outline – Figure 80 above) in a text editor such as Notepad using file paths and names that match that of your computer. Note that a space is required between each line statement section. Save the file using the 'bat' file extension. To run the batch file, double click on it. This action starts the AISMiner application in system memory (a graphical user interface is not shown), and begins the live AIS data stream processing event. Just as if you had run the *Filter Live Data* feature using the application menu selection, only filtered data (based on settings in the Filter Editor window) are saved to the output file. Note that for Filter Editor window (§ 5.3.1) settings to be applied, the *Apply Selected Filters* menu item (§ 5.3.2) needs to have been set (checked) during the last application session.

9.5 Example [5]: Extract as Viewed – Working Directory

Following is a breakdown of the example line statement used to call the *working directory* application feature (orange outline – Figure 80 above).

- "C:\AISMiner\AISMiner.exe": Application path to the AISMiner executable file.
- -i: Instructs AISMiner that what follows this command is the data input file path.
- "C:\AISMiner\20090407.log": Path and name of log file for input data processing.
- -o: Instructs AISMiner that what follows this command is the data output file path.
- "C:\AISMiner\20090407_ExtractAsViewed_WD_Test_1.csv": Path and name of data output file. Note that the output file extension must be 'csv' when using the *Extract as Viewed* feature.
- -m: Instructs AISMiner that what follows this command is the mode of operation designation.
- 0: Zero character. Instructs AISMiner to execute the *Extract as Viewed* application feature.

- -w: Instructs AISMiner that what follows this command is the application's support files working directory path.
- "C:\AISMiner\Support_Files_1": Directory path containing the application support files to use during execution of the designated mode of operation.

A powerful tool of Automated Data Processing is the *working directory* feature. This feature allows a user to direct AISMiner to use specific application support files when executing a mode of operation from a batch file line statement. Using this feature, a user can execute the same mode of operation more than once on the same data input file, with each execution call using different support files; each with settings configured to meet specific requirements for the data output file. As shown in figure 81 below, this feature capability can be mixed and matched between support files and modes of operation. Note that this feature only works with saved log files (operation modes 0-2).

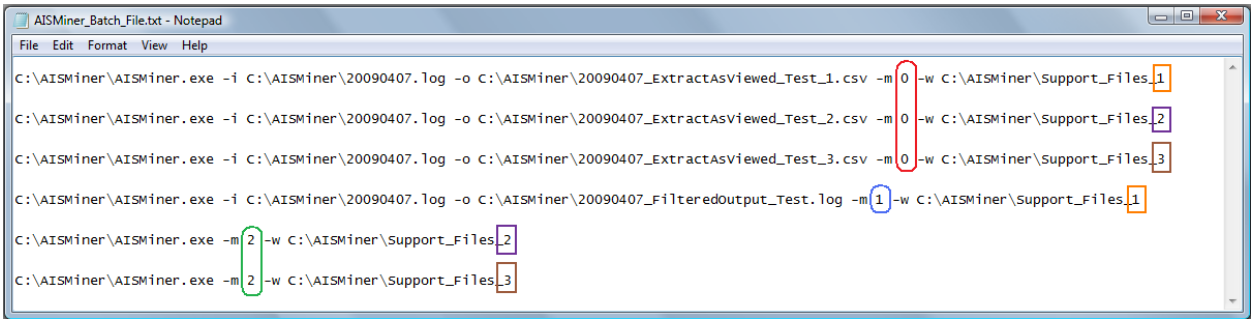


Figure 81. Automated Data Processing – example [2] batch file.

The following example demonstrates the Automated Data Processing *working directory* feature:

1. Under the "C:\AISMiner\" application directory create two folders; named "Support_Files_1" and "Support_Files_2."
2. Start AISMiner.
3. Using the Filter Editors window (§ 5.3.1), edit the Bounded Region section to filter for data from the U.S Northeast region.
4. Click the Ok button to close the window and save the changes to the Filters.ini support file.
5. Navigate to the application directory and copy the support files AISMiner.ini; BaseInfo.txt; VesselList.txt; and, Filters.ini (which contains the custom Northeast region filter settings from step 3 above), to the "Support_Files_1" folder.
6. Using the Filter Editors window, edit the Bounded Region section to filter for data from the U.S Southwest region.
7. Click the Ok button to close the window and save the changes to the Filters.ini support file.
8. Navigate to the application directory and copy the support files AISMiner.ini; BaseInfo.txt; VesselList.txt; and, Filters.ini (which contains the custom Southwest region filter settings from step 6 above), to the "Support_Files_2" folder.
9. From the Tools menu item verify that Apply Selected Filters is checked.

10. To close AISMiner, from the File menu item, select Exit.
11. Using Notepad, enter the following two line statements using file paths and names that match that of your computer. Note that a space is required between each line statement section.
    - "C:\AISMiner\AISMiner.exe -i C:\AISMiner\20090407.log -o C:\AISMiner\20090407_ExtractAsViewed_WD_Test_1.csv -m 0 -w C:\AISMiner\Support_Files_1."
    - "C:\AISMiner\AISMiner.exe -i C:\AISMiner\20090407.log -o C:\AISMiner\20090407_ExtractAsViewed_WD_Test_2.csv -m 0 -w C:\AISMiner\Support_Files_2."
12. Save the file using the 'bat' file extension.
13. To run the batch file, double click on it. This action starts the AISMiner application in system memory (a graphical user interface is not shown), and begins the input data file processing event. The processing event will execute twice; once for each line statements entered in step 11 above.
14. Navigate to the "C:\AISMiner\" application directory.
15. Using Excel, open the two data output files; "20090407_ExtractAsViewed_WD_Test_1.csv" and "20090407_ExtractAsViewed_WD_Test_2.csv." Note that the records in each file correspond to region filters set in step 3 and 6 above.

By setting a batch file to run each day at a regularly scheduled time, using log files automatically generated by AISMiner from a live AIS data stream, the time spent by a user executing application features manually can be greatly reduced. This can be of great benefit to those responsible for development of daily performance analysis data used to populate the NAIS Analysis website.

APPENDIX A. LIST OF TERMS AND ABBREVIATIONS

AIS	**Automatic Identification System:** The Automatic Identification System is a system used by ships and Vessel Traffic Services (VTS) principally for identification and locating vessels. AIS provides a means for ships to electronically exchange ship data including: identification, position, course, and speed, with other nearby ships and VTS stations. This information can be displayed on a screen or an ECDIS display. AIS is intended to assist the vessel's watchstanding officers and allow maritime authorities to track and monitor vessel movements.
AISSource	AISSource is a software application designed to manage AIS data. It serves as a means of communication between AIS data input devices and AIS servers. Data from AIS sensors (e.g., AIS base station, VHF antenna) are received, processed, and distributed to AIS servers. The distribution process is controlled through settings defined in the applications initialization file.
AISUser	AISUser is a software application designed to manage the distribution of AIS data. The application receives AIS data from an AIS server and distributes the data to end user applications. User defined settings in the application initialization file control the distribution process.
AIVDM	**AIVDM**: [AI] NMEA mobile identifier for class A and B AIS station. [VDM] Very High Frequency (VHF) Data Link Message.
AtoN	**Aids to Navigation:** Marker or device that provides a vessel operator with location information. This can encompass lighthouses, buoys, various markers, daybeacons, and fog signals.
Chayka	**Chayka**: Russian terrestrial radio navigation system, similar to LORAN-C. It is also run on 100 kHz and is described like LORAN-C by its GRI.
COG	**Course Over Ground:** The current direction (in degrees) that a vessel is actually traveling.
COMMS	Abbreviation for Communications.
Contact	AIS equipped vessel whose transmission (broadcast) has been received by an AIS receiver.
CSTDMA	**Carrier Sense Time Division Multiple Access:** See International Telecommunications Union (ITU) Standard 1371.
dBm	**dBm**: The power ratio in decibels (dB) of the measured power referenced to one milliwatt (mW)
degs	Abbreviation for Degrees.
DGNSS	**Differential Global Navigation Satellite Systems:** [GNSS] Standard generic term for satellite navigation systems that provide autonomous geo-spatial positioning with global coverage.
ETA	**Estimated Time of Arrival:** Measure of when a ship is expected to arrive at a specified location.
FM	**Frequency Modulation:** In telecommunications, FM conveys information over a carrier wave by varying its frequency.
GLONASS	**Global Navigation Sputnik System**: A radio-based satellite navigation system developed by the former Soviet Union and now operated for the

	Russian government by the Russian Space Forces.
GMSK	**Gaussian Minimum Shift Keying**: A continuous-phase frequency-shift keying modulation scheme. It is similar to standard minimum-shift keying (MSK); however the digital data stream is first shaped with a Gaussian filter before being applied to a frequency modulator.
GMT	**Greenwich Mean Time:** Mean solar time at the Royal Observatory in Greenwich, London.
GPS	**Global Positioning System:** A satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense.
ID	Abbreviation for Identification.
IEC	**International Electrotechnical Commission:** A not-for-profit, non-governmental international standards organization that prepares and publishes International Standards for all electrical, electronic, and related technologies. Marine equipment required under the "Safety Of Life At Sea" Treaty must comply with IEC test standards.
IMO	**International Maritime Organization:** Formerly known as the Inter-Governmental Maritime Consultative Organization (IMCO), it was established in 1948 through the United Nations to coordinate international maritime safety and related practices. Changes to its SOLAS Treaty essentially impact all commercial vessels that conduct international voyages.
INI	Abbreviation for Initialization.
IP	**Internet Protocol**: A protocol used for communicating data across a packet-switched internetwork using the Internet Protocol Suite, also referred to as TCP/IP.
IPv4	**Internet Protocol Version 4**: A connection-less protocol to be used on packet-switched Link Layer networks (e.g., Ethernet). It operates on a best effort delivery model, in that it does not guarantee delivery, nor does it assure proper sequencing, or avoid duplicate delivery. These aspects, including data integrity, are addressed by an upper layer transport protocol (e.g., Transmission Control Protocol). IPv4 provides only header integrity achieved with a checksum.
ITDMA	**Incremental Time Division Multiple Access**: See ITU standard 1371.
ITU-R	**International Telecommunications Union – Radiocommunications:** One of the three sectors (divisions or units) of the International Telecommunication Union (ITU) and is responsible for radio communication. Its role is to manage the international radio-frequency spectrum and satellite orbit resources and to develop standards for radiocommunications systems with the objective of ensuring the effective use of the spectrum.
kHz	**Kilo Hertz**: Unit of frequency.
kt	**Knot**: A unit of speed equal to one nautical mile per hour, which is equal to exactly 1.852 km/h and approximately 1.151 mph.
LAN	**Local Area Network**: A computer network covering a small physical area, like a home, office, or small group of buildings, such as a school, or an airport. The defining characteristics of LANs, in contrast to wide-area networks (WANs), include their usually higher data-transfer rates, smaller

	geographic area, and lack of a need for leased telecommunication lines.
lat	**Latitude**: An angular measurement in degrees (marked with °) ranging from 0° at the equator (low latitude) to 90° at the poles (90° N or +90° for the North Pole and 90° S or −90° for the South Pole).
lon	**Longitude:** The east-west angle, referenced to the center of the Earth as vertex, between the intersections with the equator of the meridian through the location in question and the prime meridian.

Loran-C	**LOng RAnge Navigation**: Terrestrial radio navigation system using low frequency radio transmitters that uses multiple transmitters (multilateration) to determine the location and speed of the receiver. The current version of LORAN in common use is LORAN-C, which operates in the low frequency portion of the EM spectrum from 90 to 110 kHz.
MMSI	**Maritime Mobile Service Identification:** MMSI numbers are unique identification numbers issued to all commercial vessels which are subject to Safety of Life at Sea (SOLAS) regulations. MMSI numbers are issued by International Telecommunications Union (ITU). MMSI numbers are used by AISMiner to uniquely identify a contact (vessel).
NAIS	**Nationwide Automatic Identification System:** USCG project to develop, install and support a nationwide system to detect, identify, track and exchange information with Automatic Identification System (AIS)-equipped vessels operating in or approaching U.S. waters for Maritime Domain Awareness (MDA) and enhanced U.S. Coast Guard (USCG) and DHS operational mission performance. Implemented over three increments: The first establishes an AIS-receive only capability in the nation's most critical ports and coastal areas; the second provides full receive and transmit capability for the entire U.S. coastline nationwide and the third extends the nationwide receive coverage out to 2000 nautical miles (NM).
Nav	Abbreviation for Navigation.
NMEA	**National Marine Electronics Association:** A not-for-profit, non-governmental organization that prepares and publishes electrical and data standards for the data interface of marine electronic devices such as AIS transceivers, GPS receivers, sonar, anemometers, gyrocompass, autopilot, and many other types of instruments. NMEA standards have been adopted by the IEC for use with marine equipment required under the SOLAS Treaty.
POS	Abbreviation for Position.
PRDC	**Proprietary Research and Development Center**: [P] Proprietary identifier of NMEA 0183 sentence. [RDC] NMEA registered identifier of USCG R&D Center. [PRDC] Designation used to identify proprietary messages to meet requirements of the R&D Center.
RAIM	**Receiver Autonomous Integrity Monitoring**: A technology developed to assess the integrity of Global Positioning System (GPS) signals in a GPS receiver system.
RCVR	Abbreviation for (AIS) Receiver.
RDC	**Research and Development Center**: Organizational unit of the USCG under the office of Acquisition.
ROT	**Rate Of Turn**: A measurement of how fast a contact is changing course. In AISMiner, ROT is reported as the number of degrees per minute (between 0 and 720).
RSSI	**Received Signal Strength Indicator**: A measurement of the power present in a received radio signal.
SAR	**Search And Rescue**: USCG mission; to search for and recover survivors of sea vessels in distress.
secs	Abbreviation for Seconds.

SIM	Abbreviation for Simulation.
SOG	**Speed Over Ground**: The speed of a vessel relative to the ground.
SOLAS	**Safety of Life at Sea:** A global treaty protecting the safety of commercial ships, their crew, and passengers. It prescribed numbers of lifeboats and other emergency equipment along with safety procedures.
SOTDMA	**Self-Organizing Time Division Multiple Access**: The term Self-organizing describes that VHF Data Link (VDL) Mode 4 uses a protocol, VDL Mode 4 Interface Protocol (VIP), that does not require a ground infrastructure because of the synchronization to UTC. Time Division Multiple Access (TDMA) divides the VHF channel into frames, which furthermore is subdivided into a vast number of time slots. TDMA gives the opportunity for every station to use the whole bandwidth for the, with respect to time, non-overlapping signals. A challenge with this method is to take care of the time synchronization. In VDL Mode 4 the time slots are synchronized to UTC and every slot is an opportunity for a station to transmit.
TAG	**Transport, Annotate, and Group** [Block]: See NMEA 0183 v4.0 section 7.
TDMA	**Time Division Multiple Access:** A channel access method for shared medium networks. It allows several users to share the same frequency channel by dividing the signal into different time slots.
TOA	**Time of Arrival:** A precise measurement of the time when a radio signal is detected. A common time reference is Universal Time.
TransView	U.S. Government developed and owned application used to display AIS track data.
URL	**Uniform Resource Locator: A** subset of the Uniform Resource Identifier (URI) that specifies where an identified resource is available and the mechanism for retrieving it.
USCG	**United States Coast Guard:** Law enforcement and maritime safety agency of the U.S. Government under the Department of Homeland Security.
UTC	**Coordinated Universal Time** (**UTC):** A time standard based on International Atomic Time (TAI) with leap seconds added at irregular intervals to compensate for the earth's slowing rotation
VDM	**VHF Data Link Message**: See NMEA 0183 v4.0 section 9.2.
VDO	**VHF Data Link Own Vessel Report:** See NMEA 0183 v4.0 section 9.2.
VHF	**Very High Frequency:** The radio frequency range from 30 MHz to 300 MHz. Frequencies immediately below VHF are denoted High Frequency HF, and the next higher frequencies are known as Ultra high frequency (UHF). Common uses for VHF are FM radio broadcast, television broadcast (together with UHF), Amateur Radio, marine communications, air traffic control communications and terrestrial navigation systems (VOR in particular).
VTS	**Vessel Traffic Services:** In the U.S., a marine traffic monitoring and waterways management system operated by the USCG. Typical VTS systems use radar, closed-circuit television, VHF radio, and AIS to track vessel movements and provide navigational safety in a limited geographical area.

APPENDIX B. REFERENCES

1. National Marine Electronics Association. NMEA 0183 Standard v4.0 for Interfacing Marine Electronic Devices.

2. International Telecommunication Union. Radiocommunication Study Group 8 Document 8/BL/5-E (ITU-R M.1371-3).

3. International Electrotechnical Commission. Project number IEC 62287 Ed 1 (11 March 2005).

4. AISMultiServer User's manual, version 1.1.3 - October 2007.