



# **N2KTranslator User Manual**

**Manual Rev: October 2021  
Version 1.3.6**

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## 1. Overview

N2KTranslator is a Windows application that sends NMEA 2000 PGN messages over an **Actisense NGT-1-USB** gateway converter. It works in conjunction with the BCG Enhanced Radar Graphical User Interface (GUI) or Maritime Simulation Tool (MaST). The BCGGUI2/MaST software must be of v3.2.26 or later for N2KTranslator to function correctly. The GUI/MaST is used to select the radar landmass database, the ownship position, and other simulated objects (e.g. targets). The GUI sends all ownship and AIS information via a network connection to N2KTranslator. N2KTranslator will then reformat this data into the respective NMEA 2000 PGN message before sending out on the specified COM port.

## 2. Setup

N2KTranslator needs two files provided by Actisense to run. These are the **Actisense API CS Wrapper.dll** and **ActisenseComms.dll** files that are used to communicate with the **Actisense** gateway converter. The GUI does not have to run on the same PC as N2KTranslator. N2KTranslator can be started up with any **gui.ini** file that is renamed by passing it in as a command line argument. Below are the sections and entries needed for N2KTranslator and the GUI/MaST software to communicate.

*Note: This is an example configuration and all values will be unique for the installed system.*

### [Timing]

PeriodAISStatic=300

- Time (in seconds) it takes to update static AIS information.

PeriodAISNavaid=180

- Time (in seconds) it takes to update ATON AIS information.

PeriodAISUpdate=0

- Time (in seconds) it takes to update AIS positional information.

PeriodAISUpdateX=0

- Time (in seconds) it takes to update AIS "Class B" positional information.

PeriodAISBaseStation=10

- Time (in seconds) it takes to update AIS Base Station information.

PeriodAISUpdateLR=100

- Time (in seconds) it takes to update AIS Long-Range Broadcast information.

### [Nav aids]

GPSDatumLatOffset=0.0

- Static latitude offset value for PGN 129044 - Datum.

GPSDatumLonOffset=0.0

- Static longitude offset value for PGN 129044 - Datum.

GPSDatumAltOffset=0.0

- Static altitude offset value for PGN 129044 – Datum.

LocalZoneHours=5

- Static hour offset value for PGN 129033 – Local Time Offset.

LocalZoneMinutes=0

- Static minute offset value for PGN 129033 – Local Time Offset.

GPSHDOP=1.0

- Static HDOP value for PGN 129539 – GNSS DOPs.

GPSGRSMODE=0

- Range residual mode for PGN 129540 – GNSS Sats in View.

SendSat=Yes

- Sends satellite data for PGN 129540 – GNSS Sats in View, and PGN 129542 – GNSS Pseudorange Noise Statistics.

DefaultSatellitesTracked=5

- Indicates the default number of GPS satellites that are tracked for PGN 129029 – GNSS Position Data.

Satellite##=346,73,2,43,-7.0,+2.6,1.0,05,025

- Sets simulated satellite motion and other characteristics. ## is the satellite's ID number (1-96). The nine fields that follow are:
  - 1) Initial Azimuth - integer, from 0 to 359
  - 2) Initial Elevation - integer, from 0 to 89
  - 3) Position Fix Dimensions - integer, either 2 or 3
  - 4) Initial SNR Value - integer, 0 to 99
  - 5) Azimuth Change Rate - float, change as degrees per period
  - 6) Elevation Change Rate - float, change as degrees per period
  - 7) SNR Change Rate - float, SNR change per period
  - 8) SNR Max Value - float, max value of SNR
  - 9) Failure Ratio - float, percent of time that signal fails (0-100)

### **[Config]**

Ownships=1

- Maximum number of ownships allowed in an exercise.

Targets=100

- Maximum number of targets allowed in an exercise.

Nav aids=Yes

- Supports navigation aids such as depth for PGN 128267 – Water Depth.

PitchRoll=Yes

- Allows GUI to set pitch/roll parameters for PGN 127257 – Attitude.

DSCLog=Yes

- Allows GUI to send DSC messages for PGN 129808 – DSC Call Information.

AISAllowBFT=Yes

- Allows the sending of BFT messages for PGN 129795 – AIS Addressed Binary Message, PGN 129797 – AIS Binary Broadcast Message, PGN AIS Single Slot Binary Message, and PGN 129812 – AIS Multi Slot Binary Message. For additional BFT configuration setup, refer to the GUI documentation.

AllowASM367=Yes

- Allows the sending of ASM messages to update the environmental PGN data.
  - PGN 130313 – Humidity:
    - DAC 1: FID 31 Meteorological/Hydrographic data message.
  - PGN 130314 – Actual Pressure & PGN 130315 – Set Pressure:
    - Air Pressure & Water Pressure:
      - DAC 1: FID 26 Environmental message (weather report).
      - DAC: 1: FID 31: Meteorological/Hydrographic data message. (Air pressure only)
      - DAC: 367: FID: 33 Environmental message (weather report).
  - PGN 130316 – Temperature, Extended Range:
    - Air Temperature & Water Temperature:
      - DAC 1: FID 26 Environmental message (weather report).
      - DAC: 1: FID 31: Meteorological/Hydrographic data message.
      - DAC: 367: FID: 33 Environmental message (weather report).

AllowWaterTemp=Yes/No

- To change the water temperature, set this to **Yes** to change it from only the Navaid's window. When set to **No** it can only be changed from the ASM messages shown above.

AISVersionIndex=2

- This sets the AIS Version field for PGN 129794 – AIS Class A Static and Voyage Related Data.

### [ShipHandling]

N2KOS#=N2K\_ETHER/127.0.0.1/9001

- IP address and port that GUI/MaST sends OS# data to N2KTranslator.

N2KAISOS#=N2KAIS\_ETHER/127.0.0.1/9011

- IP address and port that GUI/MaST sends AIS data for OS# to N2KTranslator.

N2KOS#SID=0

- Source ID number (0-252) of NGT-1 adapter on the CAN bus for a specific OS.

ConfigAddr=127.255.255.255@0.0.0.0

- The second IP address (after the '@' symbol) sets the bind IP address used by N2KTranslator. By default, it binds to INADDR\_ANY.

ConfigPort=6000,6001

- Configurer receive/transmit ports that are also used by N2KTranslator in order to receive a configuration reload packet.

### [MRS]

AllowMagneticVariation=Yes

- Allows magnetic variation to be set for each OS for PGN 127258 – Magnetic Variation.

MagneticVariationEpoch=2015

- Chooses the World Magnetic Model (WMM) to be used for automatic magnetic variation.  
*Note: Depending on what WMM is being used, the simulator must also contain updated WMM files in the c:\GUI\Magdata directory. Only 2015 and 2020 are currently supported.*

PortN2KForOS#=COM3

- COM port that N2KTranslator sends NMEA 2000 PGN messages out on for OS#.

### [Serial]

COM#=115200,n,8,1

- COM port # where you can specify baud rate for connection. Default should be 115200 for Actisense gateway converter. Data bits, parity, and stop bits are not used here. But GUI/MaST software also reads this entry.

### [SimConfig]

GuiLocalHost=Yes

- Determines if N2KTranslator will shut down when the GUI/MaST shuts down.

### 3. N2KTranslator Window

There is one main window provided by the N2KTranslator application that initially appears as show below in Figure 1 below.

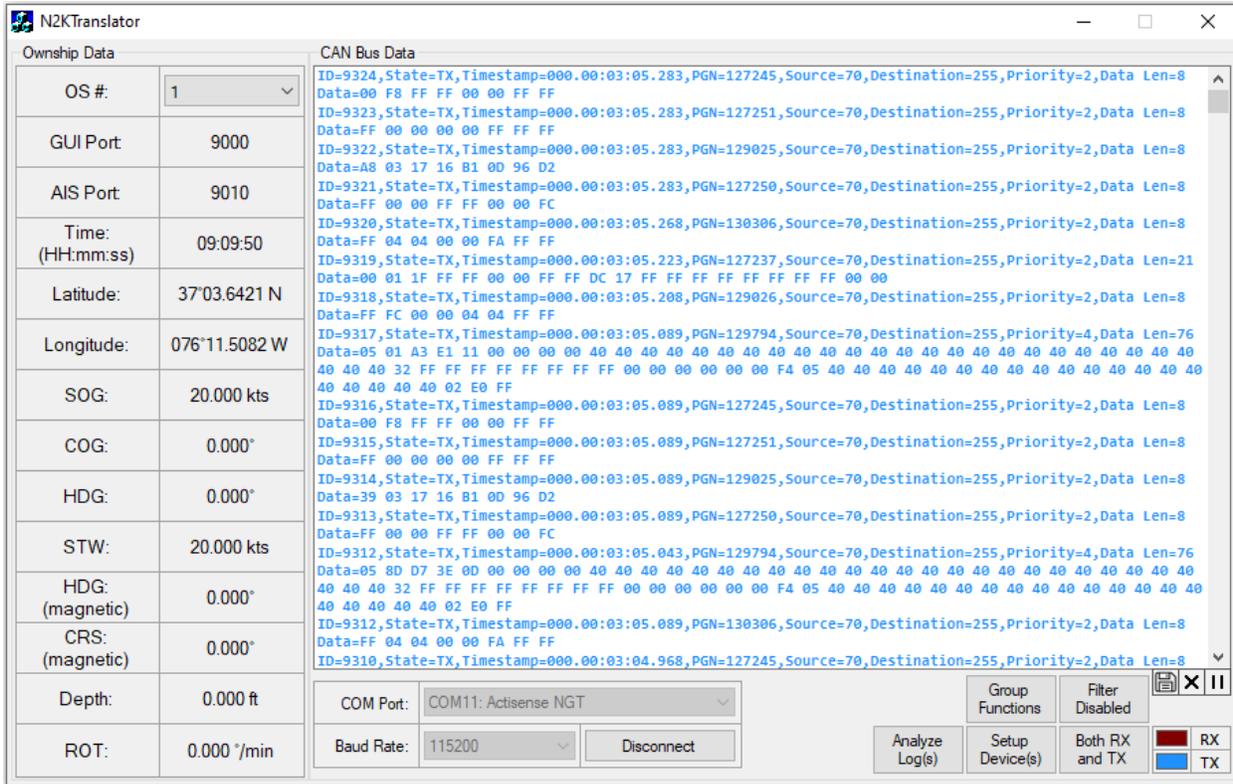


Figure 1 – N2KTranslator Application

In the **Ownship Data** section, you can view incoming ownship data from GUI/MaST. There is a drop down list that allows the selection of different ownships that are in the scenario. The drop down list is populated for each ownship that has a **PortN2KForOS#** in the used **.ini** file.

For debugging purposes, there is the **CAN Bus Data** window that shows all incoming and outgoing data packets over the specific COM port for the ownship selected. Error messages will also appear in this window with grey text. You can choose to view only received packets, only transmitted packets or both by using the button in the bottom right to the left of the color legend. This window can also be cleared or paused and played by the two buttons above the color legend. There is a save log button to the left of the clear button which can be used to save the current log data as either a **\*.txt** N2KTranslator log file or a **\*.csv** file. An additional debug feature is the ability to change COM port connections for each ownship during simulation. You can press the **Disconnect** button to enable the **Serial Port** and **Baud Rate** drop down lists for editing. Press the **Connect** button to reestablish the new COM port connection after making the necessary changes.

By selecting a PGN within the **CAN Bus Data** window, it will pop-up a **PGN Breakdown** window of the highlighted PGN as shown in Figure 2:

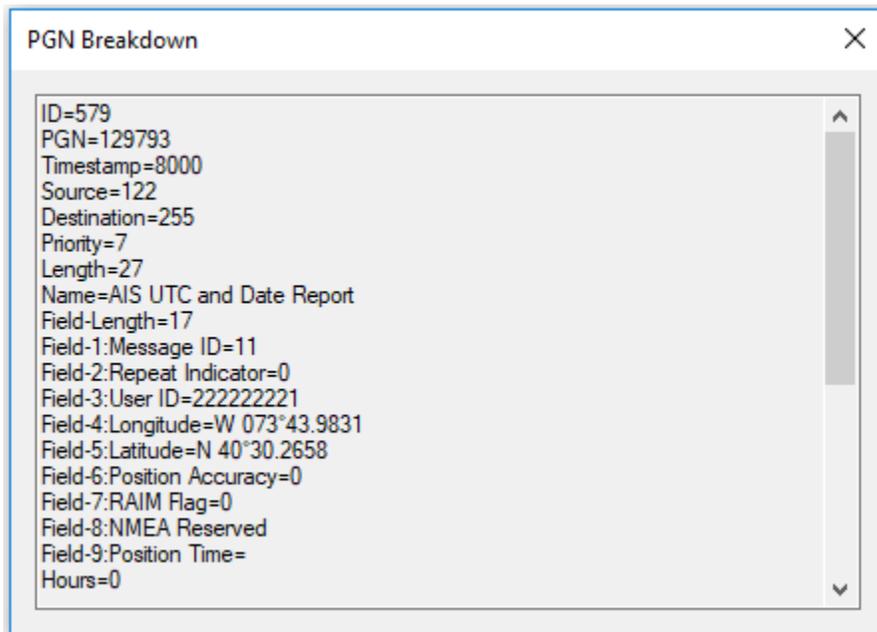


Figure 2 – PGN Breakdown Window

There is a way to filter on specific PGNs by pressing the **Filter Disabled/Enabled** button. Doing so will pop-up the **PGN Filter Setup** window as shown below in Figure 3. Here you can disable/enable the filtering process at the top using the checkbox. In the list below that is where all supported PGNs can be selected/de-selected for filtering. Press **OK** to confirm changes or **Cancel** to revert back to original settings.

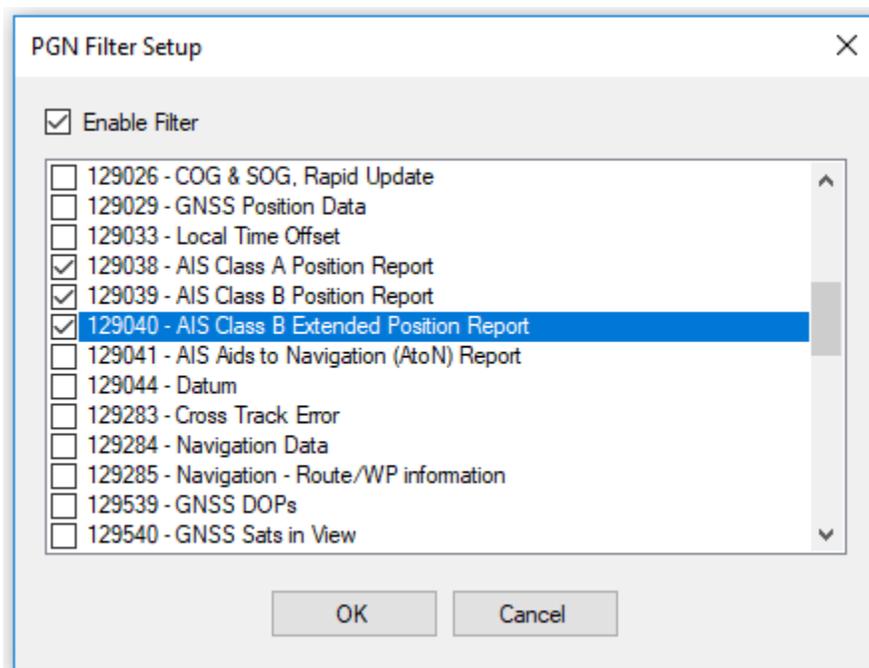


Figure 3- PGN Filter Setup Window

#### 4. Group Functions Setup

There is a separate window for configuring and sending the PGN 126208 out over the CAN bus as shown below in Figure 4. This can be accessed by pressing the **Group Functions** button on the main dialog. The user can choose to send a **Request** or **Read Fields** group function only. The sending of a **Command** or **Write Fields** group function is currently not supported. Next, specify the PGN and the destination ID for the NMEA 2000 device that will be receiving the message. Depending on what PGN is selected, the number of fields along with the field number of each slot can be designated. Use the plus and minus buttons within the white box to add/remove fields. The field numbers can be set in any order. Each field value is extracted from the last NMEA 2000 buffer and shown in a readable format. Certain PGNs can have multiple buffers stored for each unique MMSI number; use the drop down next to the **Number of Pairs** control to select what MMSI data is to be used. When sending the **Read Fields** group function, if the PGN is a proprietary PGN then two additional drop downs will appear for the **Manufacturer's Code** and **Industry Group** that must be set appropriately. Press the **Send** button to transmit the configured group function. The user will be alerted if there are any parameter errors when trying to send the group function.

Group Functions Setup

Group Function Code: Request Message PGN: 129038 - AIS Class A Position Report Destination ID: 68

Number of Pairs: 2 User ID: 300000001 Send

Field #:	Field Value:	Field #:	Field Value:
3	User ID=300000001	10	SOG=4.996 kts

- +

Figure 4- Group Functions Setup Window

Here is a breakdown of the supported features of the complex PGN 126208:

- Transmission of the **Request/Read Fields** group functions.
- Transmission of the **Read Fields Reply** group function upon receiving a **Read Fields** group function message.
- Transmission of the **Acknowledge** group function with error codes upon receiving any **Command** or **Write Fields** group functions or from receiving a **Request** or **Read Fields** group function that contained errors.
- Receiving a **Request** group function and responding back with the last buffered PGN.

## 5. Device(s) Setup

There is a feature for toggling on/off the output of any of the supported PGNs. The purpose of this feature is to allow for the simulation of specific NMEA 2000 devices. This can be accessed by pressing the **Setup Device(s)** button on the main dialog to open the window as shown below in Figure 5. There is static device called **custom** that cannot be deleted and will be initially set as the default startup device with all supported PGNs selected. The default device is indicated by the asterisk (\*) character in the device drop-down list. In order to change the default startup device, press the **Set as Default** button in the bottom left corner with the correct device selected. Upon making any changes to a device, the device drop-down list will highlight yellow to indicate unsaved changes have been made. Press the **Save** button to confirm any changes. To create a new device, select the **custom** device, then edit the PGNs to however they are needed and finally press the **Save As...** button that will pop-up a window to set the device name with a max limit of 30 characters. To delete any configured devices, press the **Delete** button with the device selected; a pop-up window to confirm deletion will need to be acknowledged too. To change the active device, it is as easy as selecting it in device drop-down list and pressing the **OK** button.

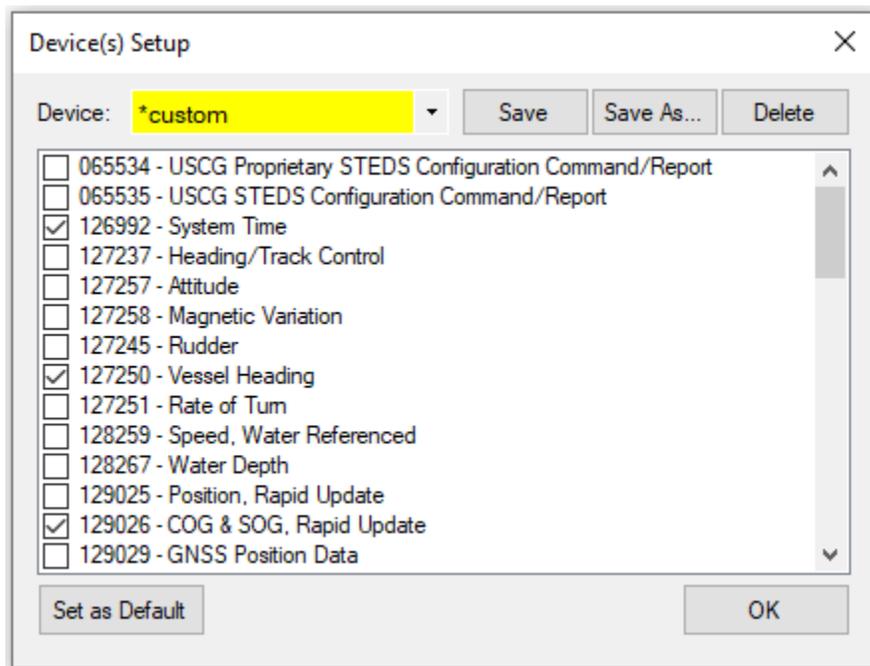


Figure 5 – Device(s) Setup Window

## 6. Analyze Log(s)

This window is used to decode SIN2 log files that contain the **.log** file extension and N2KTranslator log files that contain the **.txt** file extension. When a log file is selected using the **Browse...** button, a progress bar as shown below in Figure 6 will appear while the selected file loads. This pop-up window has a **Cancel** button for terminating the loading of the log file early. If pressed, any already loaded log entries will be displayed.

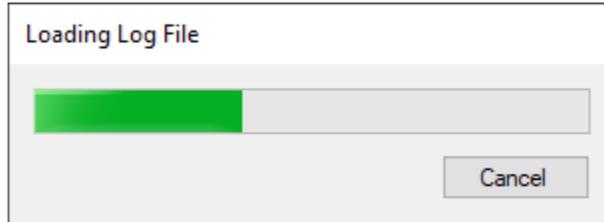
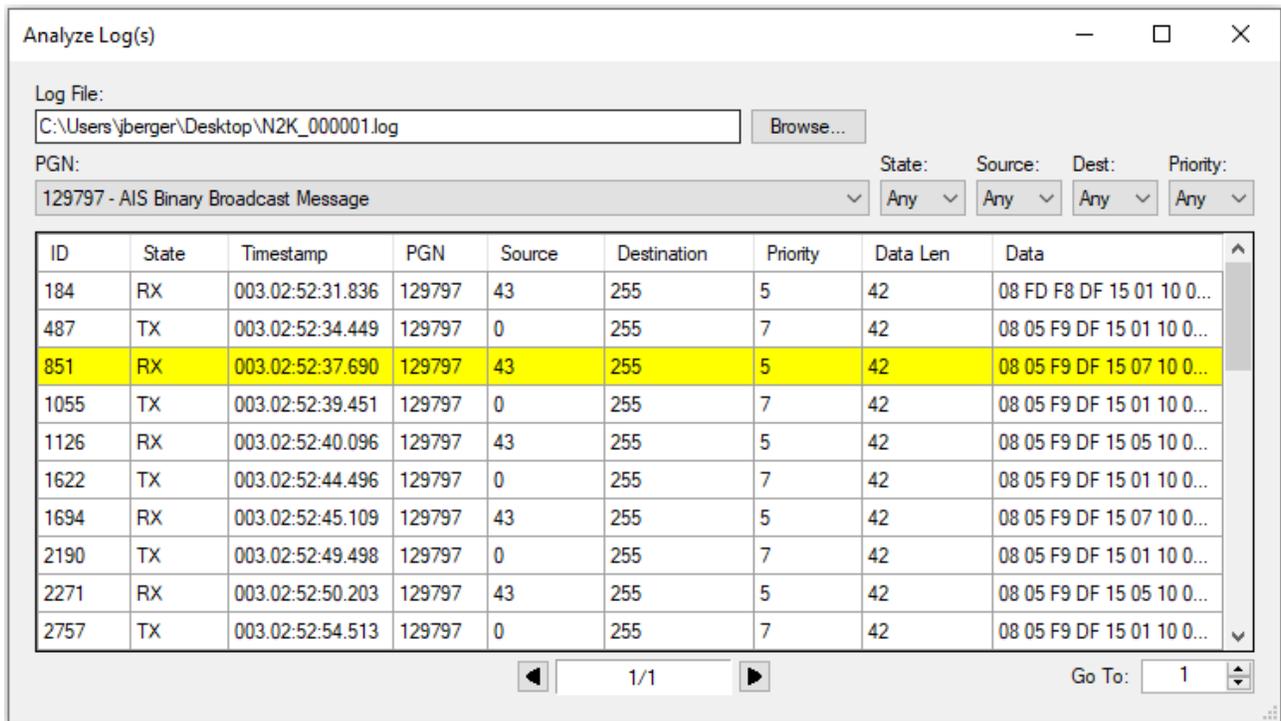


Figure 6 - Loading Progress Bar

This log analyzer tool can handle large log files by holding up to fifty-thousand log entries per page to maximize filtering efficiency. The current page can be filtered by the **PGN**, **RX/TX state**, **source ID**, **destination ID**, and **priority** drop down lists. When any of these filters are changed, the page will automatically be adjusted to show only the log entries based off the new filter parameters. In addition, the column headers can be pressed to filter the log entries in ascending mode or pressed again for descending mode of that column. When more than one (1) page exists, the previous and next buttons that are located at the bottom of the window can be used to move between pages; the **Go To** field can be adjusted to directly skip to a page. Lastly, when a log entry is selected from the table, it will highlight yellow and pop-up the **PGN Breakdown** window with the data decoded for each PGN field.

A screenshot of the "Analyze Log(s)" window showing a table of log entries with columns for ID, State, Timestamp, PGN, Source, Destination, Priority, Data Len, and Data. The entry with ID 851 is highlighted in yellow. The window also includes a "Log File" field, a "Browse..." button, and filter dropdowns for PGN, State, Source, Dest, and Priority. At the bottom, there are navigation buttons and a "Go To" field set to 1.

ID	State	Timestamp	PGN	Source	Destination	Priority	Data Len	Data
184	RX	003.02:52:31.836	129797	43	255	5	42	08 FD F8 DF 15 01 10 0...
487	TX	003.02:52:34.449	129797	0	255	7	42	08 05 F9 DF 15 01 10 0...
851	RX	003.02:52:37.690	129797	43	255	5	42	08 05 F9 DF 15 07 10 0...
1055	TX	003.02:52:39.451	129797	0	255	7	42	08 05 F9 DF 15 01 10 0...
1126	RX	003.02:52:40.096	129797	43	255	5	42	08 05 F9 DF 15 05 10 0...
1622	TX	003.02:52:44.496	129797	0	255	7	42	08 05 F9 DF 15 01 10 0...
1694	RX	003.02:52:45.109	129797	43	255	5	42	08 05 F9 DF 15 07 10 0...
2190	TX	003.02:52:49.498	129797	0	255	7	42	08 05 F9 DF 15 01 10 0...
2271	RX	003.02:52:50.203	129797	43	255	5	42	08 05 F9 DF 15 05 10 0...
2757	TX	003.02:52:54.513	129797	0	255	7	42	08 05 F9 DF 15 01 10 0...

Figure 7 - Analyze Log(s) Window

## 7. Supported PGNs

The following PGNs are currently processed by N2KTranslator:

<b>PGN</b>	<b>Description</b>
059904	ISO Request
060928	ISO Address Claim
065534	USCG Proprietary STEDS Configuration Command/Report
065535	USCG STEDS Configuration Command/Report
126208	Request/Command/Acknowledge Group Function
126992	System Time
126993	Heartbeat
126996	Product Information
127237	Heading/Track Control
127245	Rudder
127250	Vessel Heading
127251	Rate of Turn
127257	Attitude
127258	Magnetic Variation
128259	Speed, Water Referenced
128267	Water Depth
129025	Position, Rapid Update
129026	COG & SOG, Rapid Update
129029	GNSS Position Data
129033	Local Time Offset
129038	AIS Class A Position Report
129039	AIS Class B Position Report
129040	AIS Class B Extended Position Report
129041	AIS Aids to Navigation (AtoN) Report
129044	Datum
129283	Cross Track Error
129284	Navigation Data
129285	Navigation – Route/WP information
129539	GNSS DOPs
129540	GNSS Sats in View
129541	GPS Almanac Data
129542	GNSS Pseudorange Noise Statistics
129793	AIS UTC and Date Report
129794	AIS Class A Static and Voyage Related Data
129795	AIS Addressed Binary Message
129796	AIS Acknowledge
129797	AIS Binary Broadcast Message
129798	AIS SAR Aircraft Position Report
129800	AIS UTC/Date Inquiry
129801	AIS Addressed Safety Related Message
129802	AIS Safety Related Broadcast Message
129808	DSC Call Information
129809	AIS Class B “CS” Static Data Report, Part A
129810	AIS Class B “CS” Static Data Report, Part B

129811	AIS Single Slot Binary Message
129812	AIS Multi Slot Binary Message
129813	AIS Long-Range Broadcast Message
130064	Route and WP Service – Database List
130065	Route and WP Service – Route List
130066	Route and WP Service – Route/WP – List Attributes
130067	Route and WP Service – Route – WP Name & Position
130068	Route and WP Service – Route – WP Name
130069	Route and WP Service – XTE Limit & Navigation Method
130074	Route and WP Service – WP List – WP Name & Position
130306	Wind Data
130313	Humidity
130314	Actual Pressure
130315	Set Pressure
130316	Temperature, Extended Range

## 8. Shutdown

When an exercise is stopped and as long as the system is configured for NMEA2K, the GUI/MaST application will pop-up a message asking if the user wishes to save all NMEA 2000 log data. If **Yes** is selected, the user will be able to save the log data for each configured ownership as either a **\*.txt** N2KTranslator log file or a **\*.csv** file. N2KTranslator can shut down automatically by using the ini entry of **GuiLocalHost** as explained above in section 2. To manually close N2KTranslator, click the X button at the upper right-hand corner of the window.