

MwSimTerm NMEA Simulator Contents



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Main

MwSimTerm

Program provides several main functions:

1: [Terminal](#) for viewing incoming data through SERIAL and TCP / UDP ports.

With e.g. timing, logging, filtering of incoming data and their checksums.

Functions to simulate and view radar pictures send to Maris [VDR](#).

2: A dynamic NMEA simulator

Any NMEA message can be created and saved with dynamic fields with data from the virtual ship.

Data and files can be send to serial, TCP (server/client) or UDP ports.(multicast included).

Included full featured dynamic targets which can be used for AIS, TTM and TTD.

AIS Messages 1, 4, 5, 9, 12, 14, 18, 19, 21, 24A and 24B. (max 10000) are supported.

Tracked Target Message (max 1500)

Track Target Data Message (max 1023)

Tender Track data. \$PNAVT,... . defined by navtec GmbH (max 9)

3 : A virtual ship with NFU, Manual, Rate, Autopilot, Track and Route control.

Virtual ship's data like heading, position etc are parsed in the dynamic NMEA messages.

A rough chart for locating the ship and route included.

4 : Remote items are mainly focused on the [Imtech](#) integrated bridge but very useful on other bridges.

Servers can be controlled remotely from the laptop: Reboot, clear events, VNC etc.

5 : Navigation [calculations](#).

6 : Network [speed test](#).

Online help is provided (this file) and many buttons and functions have tooltip help.

Program can be used in Lab for testing or on board for engineers to quickly test equipment.

The focus is on Nmea 0183 data for which an MS Access [database](#) is included with many predefined messages (Static and dynamic)

Requirements:

WXP SP3, Windows 7/8, and all MS servers above W2000

[Microsoft Dotnet framework](#) 4.0

IPV6 is not supported.

In the support directory framework and MsAccess database engine are available.

Program runs auto in 64 or 32 bits mode, depending on your system.

Program can be started from the **commandline** with a saved simulation [configuration](#) filename as the argument. E.g. **MwSimTerm blueline.ini**

Note: blueline.ini must exist in the ...\\programdirectory\data directory.

Program does not require an installation. It can run from an usb stick.

For W7 and higher: do not copy the files to the program files directory

Any recommendation is appreciated.

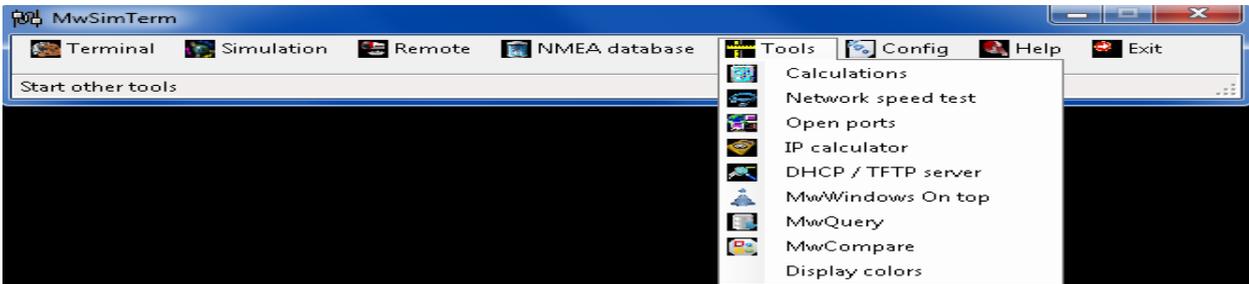
Maarten van den Berg

mailto://mberg@mountainware.nl

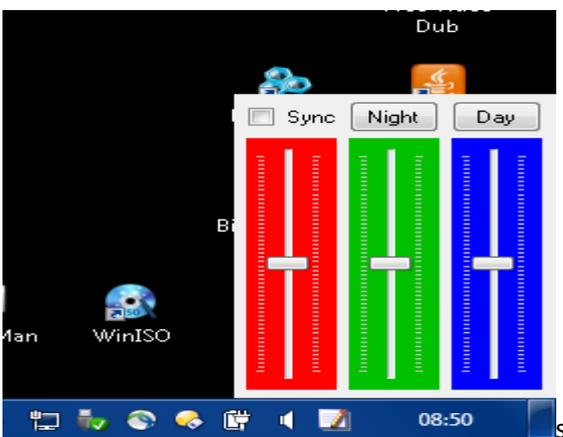
Main Window

From startup window, main functions are selected.

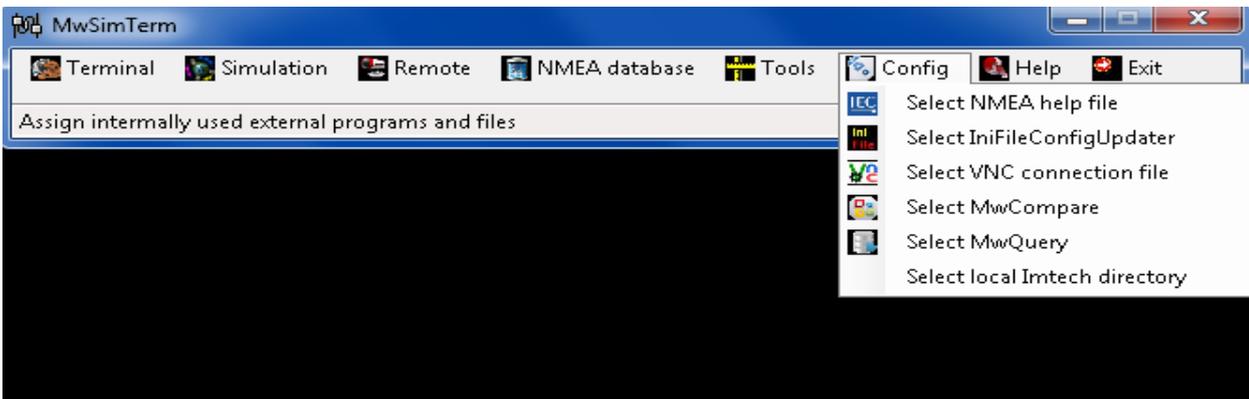
From menu Tools some useful included external programs can be started.



Display colors can toggle local system in day/night mode.



Assigning the location of special files is done under Menu Config .



For some commands on the [remote](#) page a **Local working Imtech directory** is required.

[Remote](#) page uses a local Imtech directory to edit .ini files, start watchio, simulate SMC, run IniFileConfigUpdater etc.

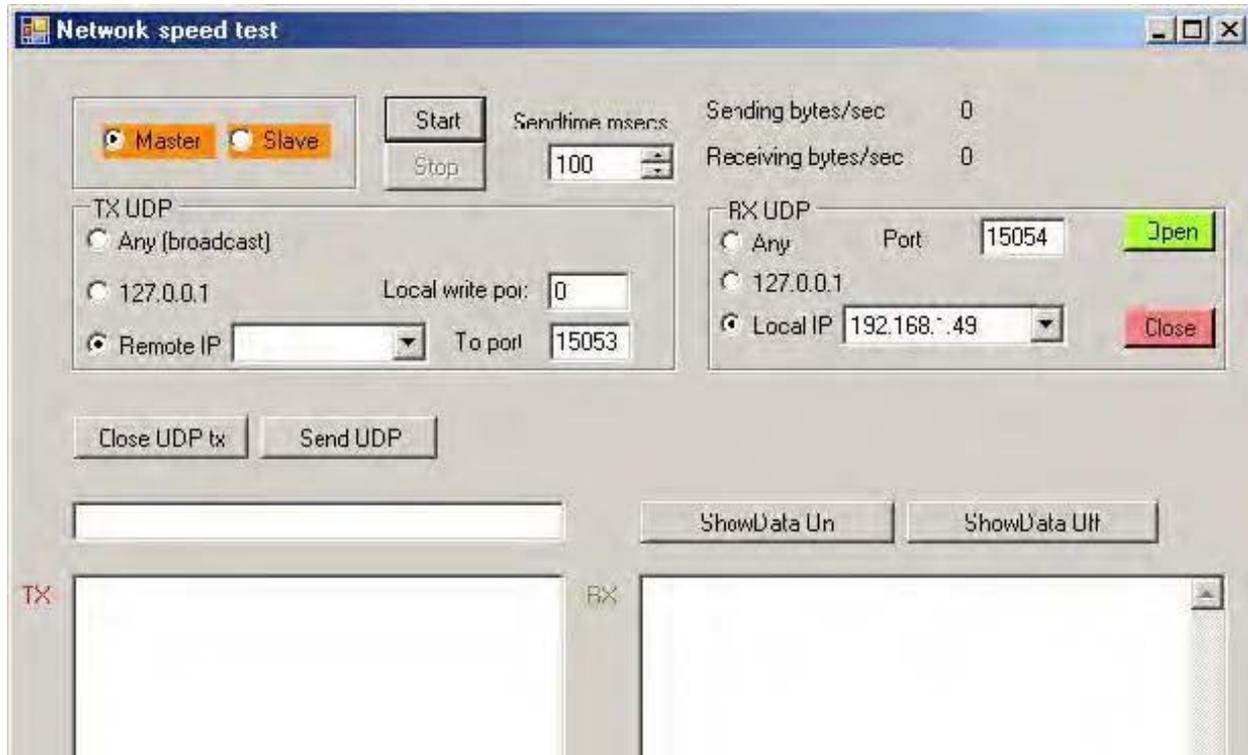
By default this will be d:\Imtech but any directory on your system can be used. Assigned directory is written on caption bar of the remote page.

Be aware that the local Imtech directory structure is different from latest Imtech structure on the remotes.

All binaries which are needed are copied to one Bin directory. Remotes have now several Bin dirs.

NetworkSpeedTest

Speed over network cable and or switch can be roughly tested.



100Mb/s Full Duplex should be able to transfer 8-10 million bytes per second both directions. sendtime 3-4 millisecc. 100Mb/s Half Duplex should be able to transfer 4-5 million bytes/sec. Sendtime 7 millisecc. Higher transfer rates than 3 or 2 millisecc need a fast pc.

Be careful on a fully running bridge, created network traffic will systems to become unresponsive

One system should be configured as **master**, and one, at the other end of the line, as **slave**.

Use different UDP ports for sending and transmitting.

The Master sends every configurable time sequence in millisecond about 32600 bytes over the line. The Slave just sends them back.

Use the Start and Stop button to start the speed test

ShowData On and Off only functions at time interval of 100 millisecc or more, otherwise it will be turned off.

Data send and received will be shown in the textboxes.

Send UDP and Close UDP tx as well as Open and Close at RX UDP pane can be used for a simple manual test.

NMEA Database

In the database any NMEA message can be created

Three tables are available: Message, Talker and Message Fields Description.

Database is an Access mdb. Name is nmea.mdb.

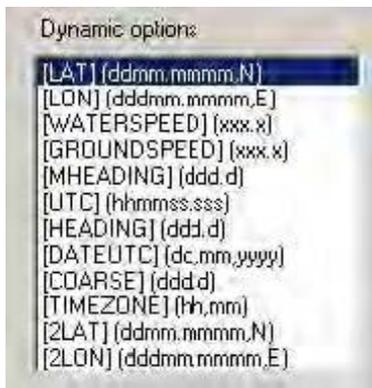
The purpose is that under simulation these messages (in example or dynamic field) can be send through serial or udp/tcp ports.

Any message and talker can be entered.

In the example field a static message can be filled in.

MESSAGE	DESCRPT	FORMAT	EXAMPLE	DYNAMIC
FUL	FUEL CONSUMPTION RATE IN ...	FUL,XXXXX	FUL,1550.6	
GGA	GPS2 without DGPS	GGA,HHMMSS.SS...	GGA,131233.15,525...	GGA,[UTC],[2LAT],[2...
GGA	GPS1 without DGPS	GGA,HHMMSS.SS...	GGA,131233.15,525...	GGA,[UTC],[LAT],[L...
GGA	GPS2 with DGPS	GGA,HHMMSS.SS...	GGA,131233.15,525...	GGA,[UTC],[2LAT],[2...
GGA	GPS1 with DGPS	GGA,HHMMSS.SS...	GGA,131233.15,525...	GGA,[UTC],[LAT],[L...
GIM	GEOGRAPHIC INITIALIZATION	GIM,SS	GIM,VALUE,DEFB	

If the cursor enters the dynamic field the available **dynamic options** are shown. right click in this list to copy a dynamic item to clipboard.



FORMAT: VBW,SAA.AA,SBB.BB,C,SDD.DD,SEE.EE,C
 EXAMPLE: VBW,10.03,A,09.87,A
 DYNAMIC: VBW,[WATERSPEED],00.00,A,[GROUNDSPEED],00.00A

Any sentence which have one of the dynamic options included will be filled by real data from the virtual ship under [simulation](#).

Pay attention: some dynamic options include more than one field of a sentence, like LAT, LON, DATEUTC and TIMEZONE.

The database contains ready to use dynamic examples of following messages: **HDT, ROT, HDM, GGA, GLL, ZDA, VTG, VHW, VBW**

Several date/time options are available.

The message fields description table contains already descriptions for the most common messages.

Its actually a better description for all the separate fields in a sentence and this memo field is shown when you edit a message under [simulation](#).

[\[MHEADING\]](#) will be heading + magnetic deviation. (can also be used for a second gyro.)

The screenshot shows the 'Nmea database' application window. At the top, there are 'Database' and 'Help' buttons. Below that is a navigation bar with 'Message', 'Talker', and 'Message Fields description' tabs. The main area contains input fields for 'ID: 11', 'Message: GGA', and 'Field Number: 6'. A 'Memo' field contains a list of GPS quality indicators: 0 = fix not available or invalid, 1 = GPS SPS mode, fix valid, 2 = differential GPS, SPS mode, fix valid, 3 = GPS PPS mode, fix valid, 4 = Real Time Kinematic. Satellite system used in RTK mode with fixed integers, and 5 = Float RTK. Satellite system used in RTK mode with floating integers.

IC	Message	FieldNumber	Memo
1	GGA	0	Global positioning system (GPS) fix data
2	GGA	1	UTC of position hhmmss.ss,
7	GGA	2	Latitude IIII.II,
8	GGA	3	N/S latitude
9	GGA	4	Longitude yyyyy.yy
10	GGA	5	Longitude E/W/
11	GGA	6	NOTE 1 GPS quality indicator 0 = fix not available or invalid 1 =
12	GGA	7	Number of satellites in use, 00-12, may be different from the numb
13	GGA	8	Horizontal dilution of precision

Message field descriptions are not required. Might be easy under simulation.

If a new message is entered follow these rules: Fieldnumber 0 must be the message type e.g. HDT. All fields in the HDT message should be filled in and having subsequent fieldnumbers.

Note: [MHEADING] is magnetic heading for which an offset can be given on the ships parameter tab. [MHEADING} can also be used for a second gyro instead of a magnetic compass. [2LAT] and [2LON] can be used for the second GPS. An offset can be given for gps2 on the ships parameter tab.

Datagrid:

System searches for field data beginning with the keys pressed in the datagrid. Clicking on a header of a field will sort the grid on that field.

Remote

Remote servers can be controlled from the laptop

Important items before using the commands:

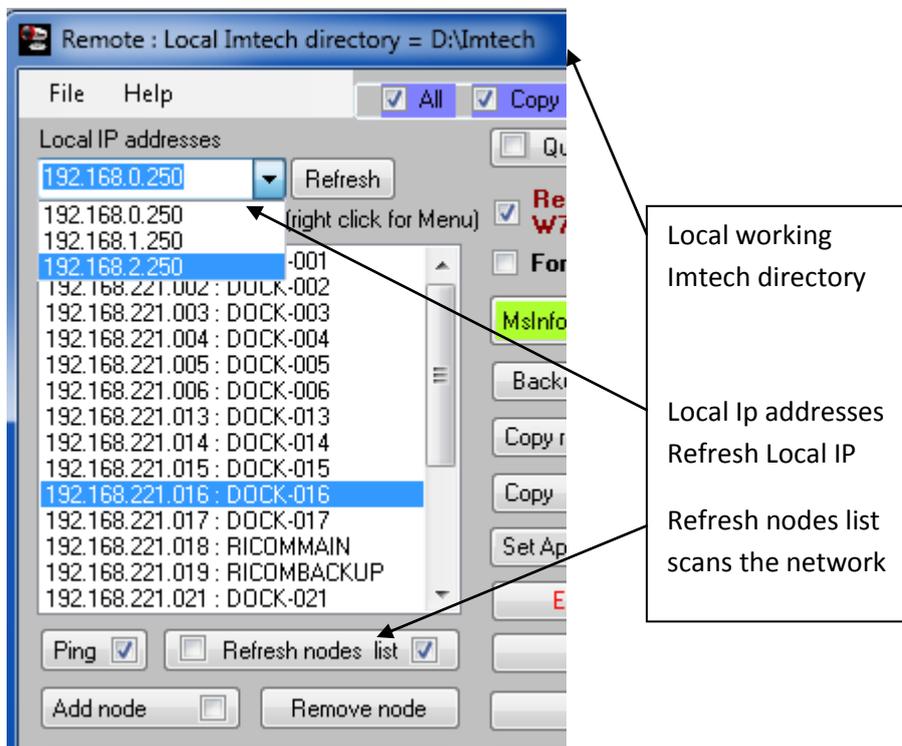
- 1 Select the [local Imtech directory](#) on your system.
- 2 Select the [OS running](#) on the remote nodes.
- 3 Select [remote administrator](#), password and share name.

When opening this window the program first detects the local IP addresses in the system. Then for each local IP address it scans the network for other nodes by the ping process. It assumes that the subnet mask =255.255.255.0.

So network scanning is done if a local IP=192.168.1.20 for all nodes from 192.168.1.0 till 192.168.1.254 After finding nodes (IP addresses) an attempt is made to resolve their hostnames.

Resolving hostnames takes about 10 seconds for each node.(see ping -a <ipaddress>)

Correct username and password of a remote administrator are necessary to resolve hostnames)



The nodes list shows **IP address : Hostname** (if this can be resolved).

To save some time when opening this window, the nodes list can be saved to a file. (...data\<ship>.list)

If this file exists when opening this window the network scan is skipped.

The last saved or opened nodes.list file will be auto opened. (menu File)

The saved filename gets a .list extension. Default username and password are also saved in the nodes list Through the button **Refresh nodes list** the scan is done again, with the option to scan only the selected network instead of all available sub networks.

Manually a node can be added or changed. **KEEP THE CORRECT FORMAT. IPaddress : Hostname**

If the remote servers are very busy, a hostname might not be resolved, press the button once more.

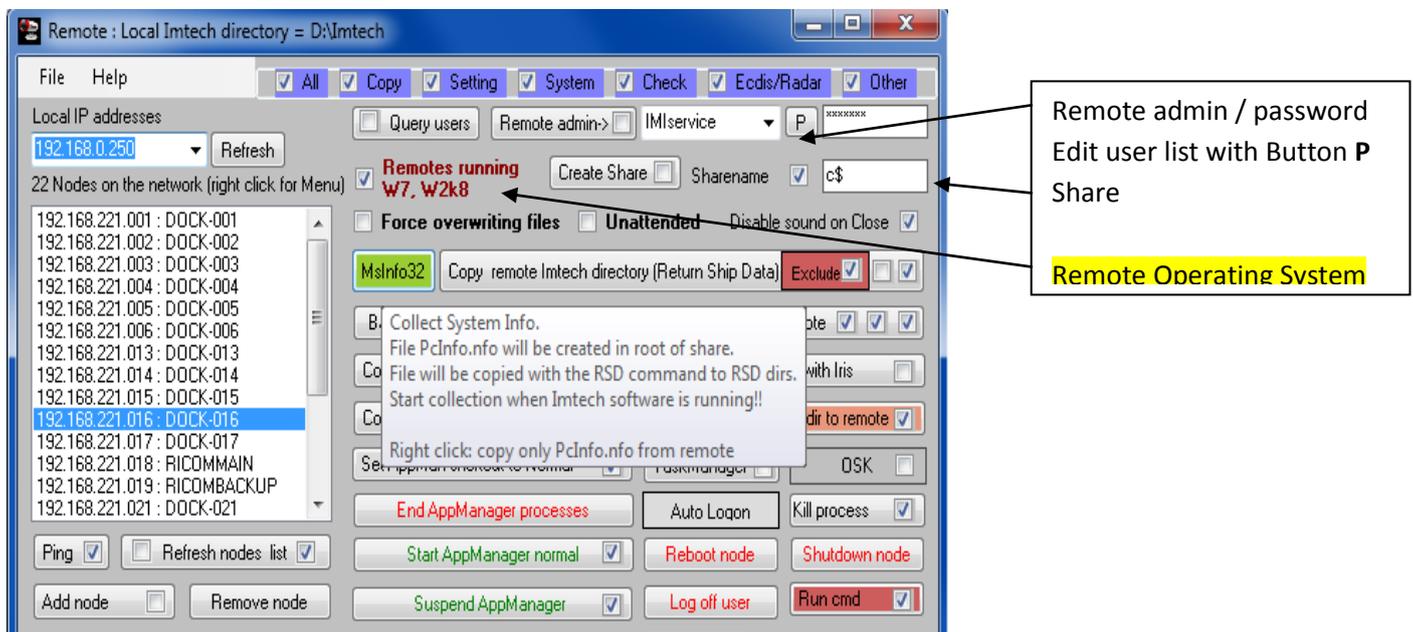
The ping process is set to 50ms timeout. All commands are done on the highlighted nodes in the list.

More than one can be selected at the same time. (keep Shift or Ctrl pressed with a left mouse click)

Some commands only take the first selected node.

Always a ping is send first to the node to check if it's still alive.

The checkboxes on the command buttons add another option. Move the mouse over the checkbox to see the **tooltip** help for the function of it.



Due to many buttons on this form, the blue checkboxes at the top can make some logical selections.

Before using any commands, select if the remotes run Wxp or W7. **Commands behave different.**

Also select or type in the **username** and password of an **administrator** and the **Sharename** of the drive where the Imtech directory is located. Normally this will be **D\$** for Wxp and **C\$** for Windows 7.

Some commands need to access another share, **C\$**, like ecdis4k charts share on Wxp systems.

For all commands the selected user must be an administrator to gain access to the remote system.

Some Imtech bridges use different username and passwords for each node. These usernames and passwords can be retrieved from a local Unimacs.mdb database by the **Query users** button.

The unimacs.mdb must first be [copied from](#) a remote node.

The **Remote admin** button shows the remote users. The program automatic uses the queried remote users for each node if the checkbox is checked on the button. (Only Wxp)

If a node does not exists in the remote users list then the default username and password is used.

Some commands need to know the remote logged on user E.g. "Set Appman shortcut" and "Auto logon". An additional user list will be shown from where that user must be selected and same button must be clicked again.

Best is first to query the unimacs database before using any commands if nodes with different users exists.

Some commands can only be executed from the remote node itself, therefore a MwSimTerm directory is created on the remote nodes and a executable is copied there. Remove this dir when finished.

Program assumes that the Imtech directory on the remote nodes is in the root of the share!!

Before copying to and from nodes, a local non persistent drive mapping is made to the node which is disconnected afterwards.

Most processes can be cancelled by the **ESC key**.

The command "**Create local drive mappings**" creates non persistent drive mappings which can be used and removed manually under windows explorer.

All commands do not need manual drive mappings.

Some commands open the **Mw Browse for folder** window to select a directory where files will be copied to or from.

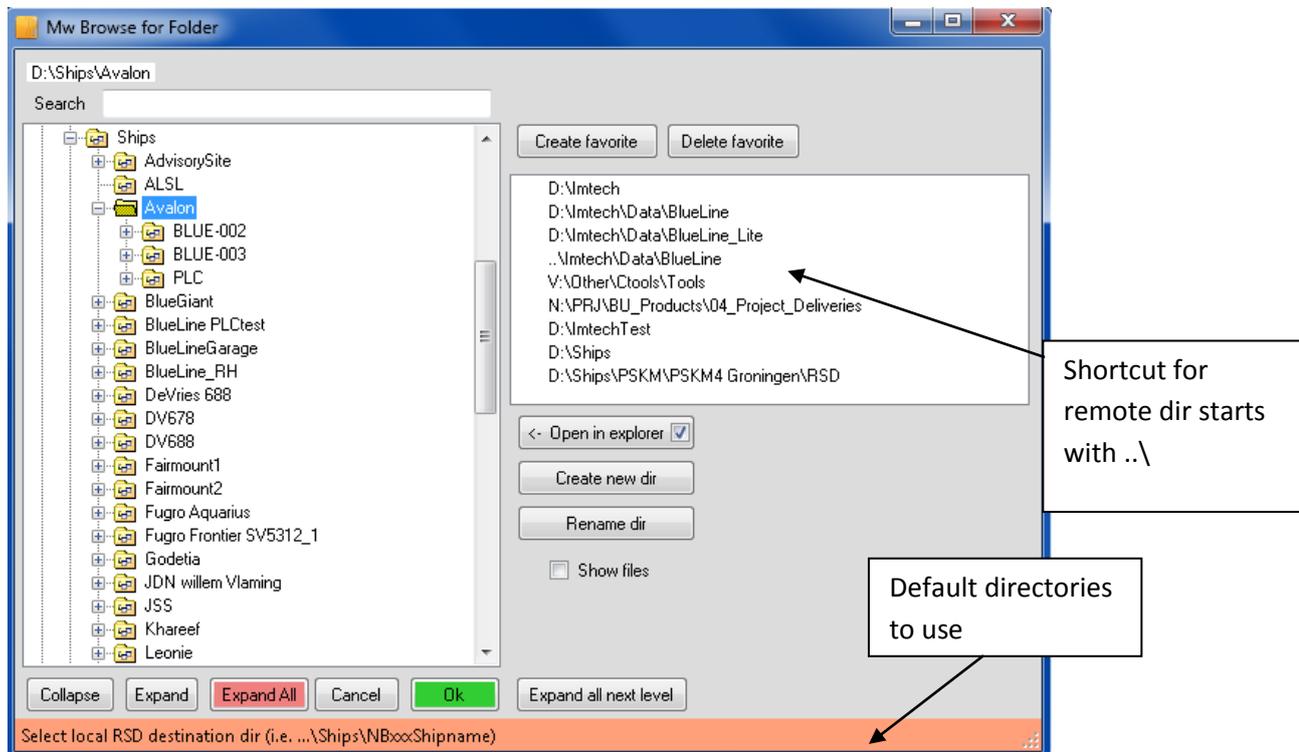
In the status bar an example is given where to copy from or to by default.

To save time browsing the directory tree every time, Favorite shortcuts to directories can be created and deleted. (...data\Shortcuts.lst).

Shortcuts to remote drives start with **..**

Double clicking or pressing the Enter key on a shortcut searches the tree for that directory.

See the tooltip help at the buttons to fast navigate the tree.



Errors:

When an error occurs, a message box is shown and the command process halts. If the error is important one must accept the messagebox and process continues afterwards, Non important errors will be shown in a messagebox which times out automatic. Clicking on this messagebox keeps this error message box visible.

All errors will be written to the log file.

The commands uses sometimes other programs which sometimes leave an error and/or a result message when they terminate.

These messages can be logged also. Check menu **Help-Show extended result messages**.

It is not always very clear what these messages mean. Anyway, you will know that something went wrong.

Windows 7 authentication is sometimes very slow, specially if remote system is busy. Commands can time out and nothing will happen without notice. Just use the command again.

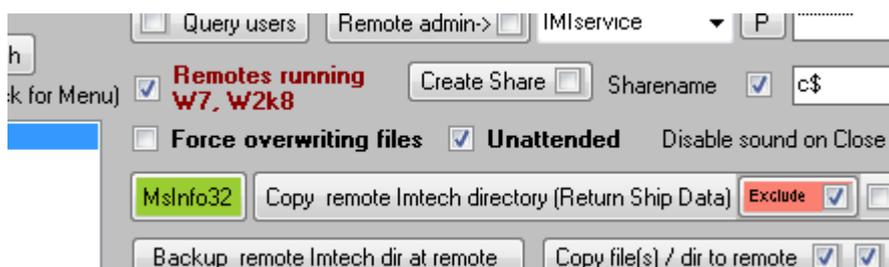
A warning can be shown that the same user can only log in once. This occurs if another connection is still available from the local system to the remote system. Start a cmd prompt and type: net use
To delete a connection: type net use <connection> /delete e.g. net use 192.168.208.35\c\$ /delete
Sometimes the local system must be rebooted.

Locally running W7 and getting invalid password message "specified password is not correct" when mapping a remote share: run: **secpol.msc** on your laptop.

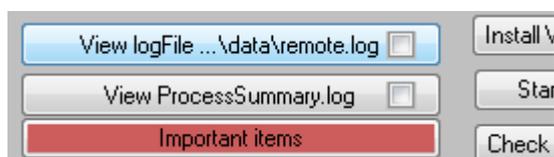
Go to Local Policies | Security Options and choose the "Network Security: LAN Manager Authentication Level" Set it to **"Send LM & NLTM, use NTLMv2 session if negotiated"**

See [Preparation](#) if other commands fail.

Unattended mode

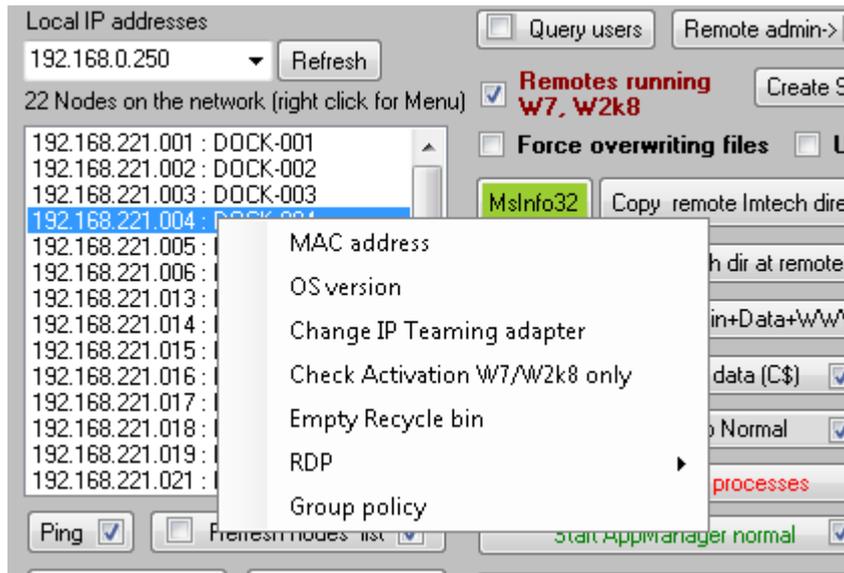


In unattended mode (checked), all copy commands and some others run through all selected nodes, no message boxes appear when errors occur. If an error occurs in unattended mode, these are written to the Process Summary Log file. So getting the RSD for 60 nodes, check unattended and have a coffee. Afterwards, check the summary log file.



THE BUTTONS and Menu's:

Right click on the node list for some rarely used commands.



“Mac address”

One might need to ping the node first.

“Change IP Teaming adapter”:

Useful if temporarily the team must be set to dhcp for e.g. activating windows through the internet. Only one system a time can be set.

To speed up things:

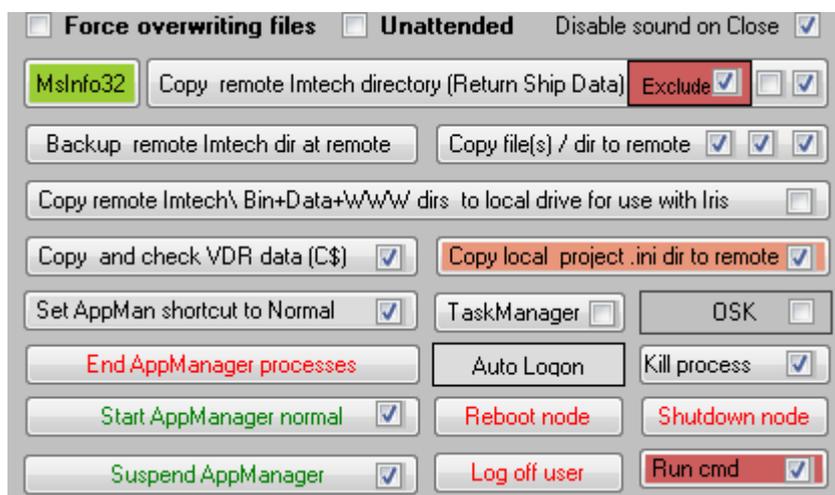
Better have two Nics connected to laptop, one on the dhcp server network, the other on the unimcas network.

Start MwSimterm twice in remoting, each one with a different local IP address listed.

Note:Windows need then some time to organize its arp cache etc with multihomed node.

“RDP”

Can be enabled, disabled or started. Might be useful if VNC fails. Do not leave it enabled.



"Copy remote Imtech directory (Returned Ship Data)"

Use this command to return ships data to the office.

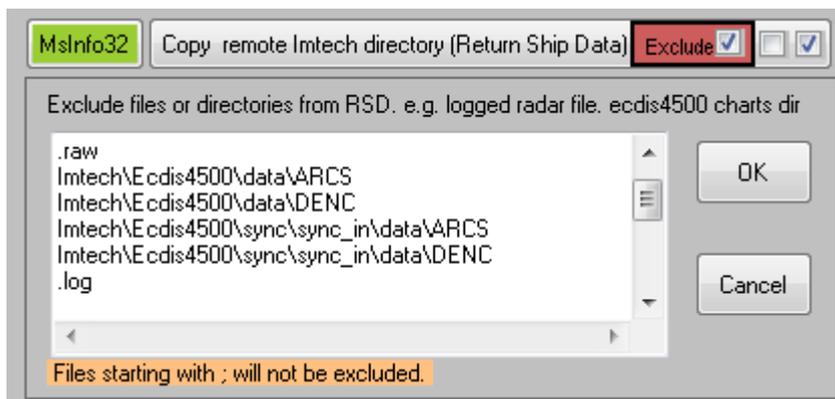
Select a local subdir where the remote [imtech](#) directory will be copied to:

In the selected directory, a subdirectory is created with the [hostname](#) of the IP address, taken from the nodes list. The system copies the complete remote Imtech directory and [the file PCInfo.nfo](#) to this directory and if exists the SMC folder (for very older systems) Only newer and updated files are copied (except if **force overwriting files is checked**), file attributes will remain as on the server. Manually only a local shipname directory needs to be created, the nodenames directories are automatic created.



Left an example after copying where the [hostname](#) could not be resolved.

The **Exclude** button on this button shows a list of files and/or directories which can be excluded. The Ecdis4500 stores charts under the Imtech dir and the radar4500 has a high playbackfile.(.rd3) in the arpaserver dir. The checkbox can disable the exclude list, so all files are copied.



"MsInfo32"

Collects system data information (takes 1-2 minutes) and saves this in the root of the share in file PCInfo.nfo.

Collect data when Imtech software is running. **This data file is required in the RSD.**

Right mouse click enables copying this file separately to local directory. See above.

"Backup remote Imtech at remote"

A copy of the Imtech directory is made in the root of the share, named "Copy of Imtech + date_time".

"Copy files /dir to remote"

Select a local file(s) or directory, then the destination directory to copy to. Files/dir will be copied to same location at all selected nodes. If directory path does not exist at remote it will be created.

Some options are available by checkboxes. See their tooltip.

"Copy remote Imtech\ Bin+Data+WWW dirs to local drive dir for use with Iris"

Better take files from SMC server1. Most files are necessary to run Iris locally for autopilot tuning, also the Unimacs.mdb is copied.

The Imtech\Data\<Project> directory can be used to edit .ini files locally.

see tooltip help for the checkbox.

The [exclude](#) list applies here and the local Bin, Data and WWW directories will be cleared first.

Note: Structure in local Imtech dir is different from the remote nodes.

All required binaries are copied to one Bin dir. Remotes now have several bin directories

"Copy local ships ini dir to remote dir" If data is locally changed by e.g. IniFileConfigUpdater.exe, this ...data\<project> directory can be copied back to the servers. First select local source directory, than the destination dir.

"Only dirs/files which exists remote" checkbox prevents that unnecessary files (like model.ini files) which might exist in the local directory are copied to the remote data\<project> directory.

"Copy and check VDR data" Copies smonitor dir and some config files from the maris vdr directory and verifies if smonitor is set to slave etc.

"Set AppManager shortcut"

Sets the shortcut in startmenu to normal or maintenance mode. Select the user from the popup list and press button again. Esc cancels the command when list is visible.

"End AppManager" and "Kill process" End Appmanager ends the Application manager and related processes gracefully. Kill process might be useful sometimes to kill a remote process for debugging.

"Suspend App manager"

Application manager forces unknown applications to the background. Also often in maintenance mode. To prevent this, Suspend the App manager. Afterwards the app manager can be resumed (checkbox)

"TaskManager" shows the taskmanager on the remote. Optional the taskmanager from sysinternal can be started. (ProcessExplorer)

"OSK" shows on screen keyboard on the remote. Optional the Wxp osk can be started. W7 does not allow its own OSK to be started remotely.

"Autologon"

Sets the autologon user in the registry. Select the user and password from the popup list.

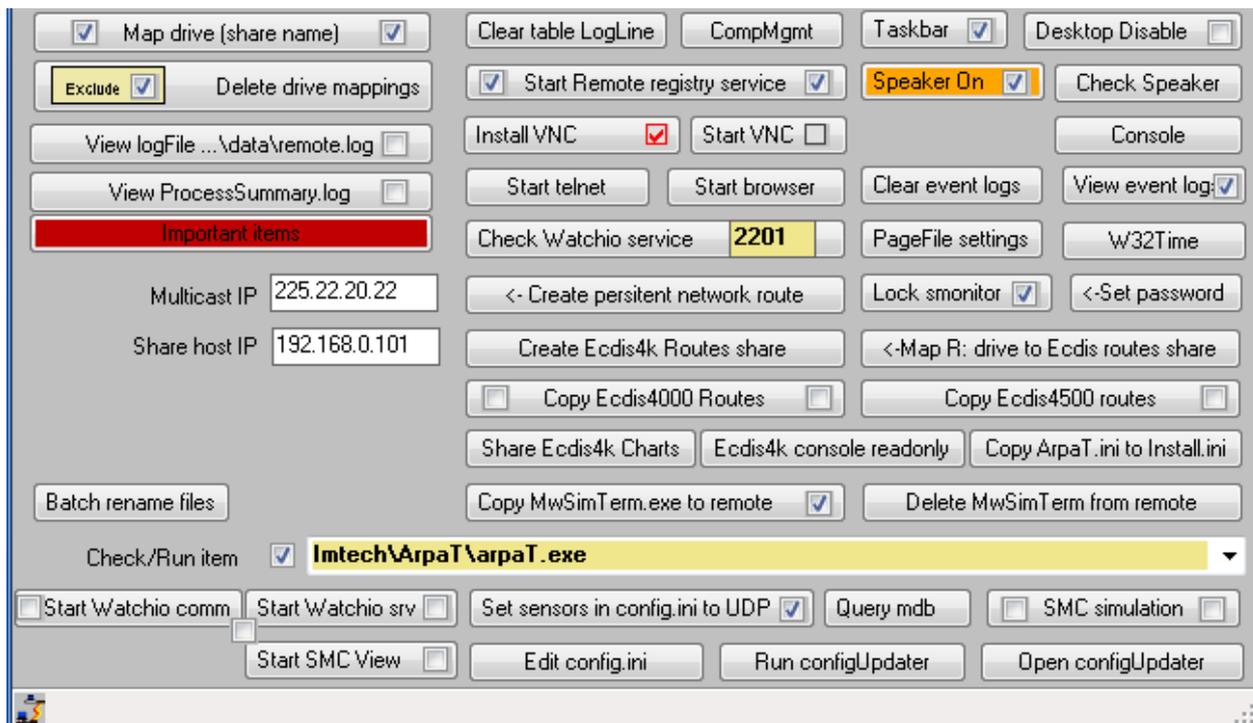
"Run cmd"

First select the cmd file on your local system, this file will be copied to the remote share\Mwsimterm directory and started under **the logged on user account**.

Checked will select the file and edit it, unchecked will start the process.

“Log off”

Logs off the current user and the login screen appears afterwards on the remote.



Local functions below yellow line dropdown box.
Start Watchio's and SMCView create a .cmd file in support dir if they do not exist and executes these.

“Map drive(share name)” Creates locally a drive mapping to the share. Optional map on IP or DNS name

“Delete drive mappings” Deletes the local drive mappings to other nodes. Optional a file can be edited to skip drives to disconnect. (close and open Remote window after editing this file)

“Clear table Logline” Clears the log database of the system manager

“CompMgmt” Start computer management console locally of the remote. Some functions are blocked by OS.

Taskbar Shows or hides the remotes taskbar

“Desktop enable / disable” Enables or disables the remote's desktop. Select the user from the popup list. Reboot or log off user after this command.

“Start remote registry service” Starts or stops the service. Optional the Watchio service.

“Speaker on/off” Toggles the speaker at remote on or off.

“Check speaker” plays a sound at remote.

“VNC install and start”

VNC can be installed on the remote servers. For Wxp without password, for W7 with the standard password.

To start VNC, a .vnc file in the support directory is executed, (see tooltip help how to create it)

“Console” Starts a remote cmd window locally.

“View log file” and “View ProcessSummary log”

See [errors](#) and [unattended](#)

“Start Telnet and Start browser” Opens a telnet or the default browser to the nodes IP.

“Clear event Logs” Clears the remotes windows application and system logs.

“View event Logs” Shows all warning and error events of remote

“Check watchio service” Opens a browser to IP address and the port number

“PageFile setting” for older systems, initial should be the same as maximum size.

“W32 Time” for older systems. Now Meinberg NTP server and clients are running.

“Create persistent network route” This was necessary on nodes with more than one NIC which run ArpaT to prevent that ArpaT multicast requests are send on the second NIC. If this route is not added to the systems it might happen that ArpaT cannot find the radar server due to other network configurations. The default Multicast IP address can be changed if necessary. It does no harm if this command is used by accident on other servers.

To delete a route, open a command prompt window and type: route delete 225.22.20.22

To view all routes type: route print To add a persistent route manually type:

```
route add -p 225.22.20.22 192.168.0.102
```

(192.168.0.102 = Local IP address (the gateway) which the multicast request uses to access the network, this is different for each node!..)

“Lock Smonitor and Set password” Actually only necessary at systems with ecdis4000.

Lock smonitor partly prevents that the user can change the configuration.

Set password uses the user password.

“Create Ecdis4k routes shares” On Blueline systems, a common Routes (Voyage plans) directory for Ecdis4000 is normally provided for the user.(\\blue-001\d:\Routes) Then for each node running Ecdis4000, a drive mapping must be created, also on the node which holds the share. Per default the R drive is used.

“Copy routes” Copy all routes to or from remote system. Use this when upgrading system.

Note: Copy ecdis4500 routes only can make a backup. Restoring must be done at the ecdis4500 route manager.

“Share Ecdis4k charts” C:\charts directory must be shared, the ENC and ARCS database can then be copied to that node, so cd's need to be read at one node only. It might be necessary to change the share name to C\$.

“Ecdis4k console readonly” write protect the default console in ecdis4k, so user cannot change

them.

"Important items" This is just a text file (...\\Data\\ImportantItems.txt) where important (the ones you always forget) items can be saved.

"Copy MwSimTerm.exe to remote" MwSimTerm directory will be created in the root of the [share](#).

"Only Terminal part" copies only the terminal functionality, not the simulator and requirements directory.

"Check/run item" (use right mouse button in this combobox for its context menu)

Typed in text can be added or removed from the list, they are saved in ...\\Data\\Check.lst and automatic restored when opening this window.

"Check version" can check file versions and keys in .ini files. Type a **filename** with an extension to retrieve file version info. Type a **filename.ini:section:key** to retrieve the key setting. (**filename, section and key must be separated by a colon :**) e.g.

Imtech\\Data\\BlueLine\\UMArpaS1Plugin.ini:WIOAdapter.ArpaServer.NMEA.VDM:SendDelay

"Run this text as cmd on remote" will execute the text on the remote.

Note: this can be executed as the [user](#) or as the logged on user account. (**checkbox**)

Executable must exist on remote.

"Check service state" shows state of the service(s). Just enter the first chars of the display/service_name in the textbox. e.g Imtech

Will show all services states starting with the name Imtech.

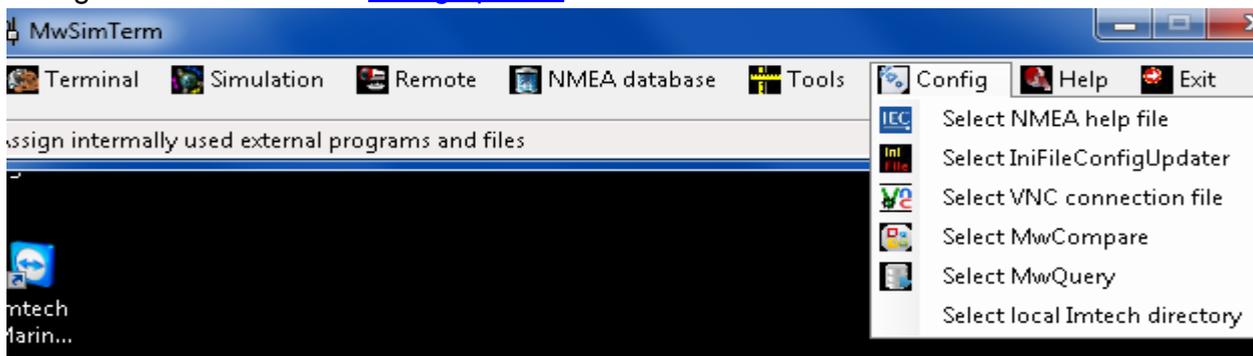
"Check if process is running" Give process name without extension. e.g. frmX instead of frmX.exe

Local commands from here:

"Edit config file", "Run ConfigUpdater", and "Open configupdater"

Default directory for location of config.ini is D:\\Imtech\\Data but can be changed.

Assign the location of the [config updater](#) executable first.



Open config updater just opens the IniFileConfigUpdater.exe and manually the update process can be carried out.

Run ConfigUpdater runs the process automatic. It uses the data files in the directory where the

config.ini was selected.

“Start WatchIO’s and SMCView”

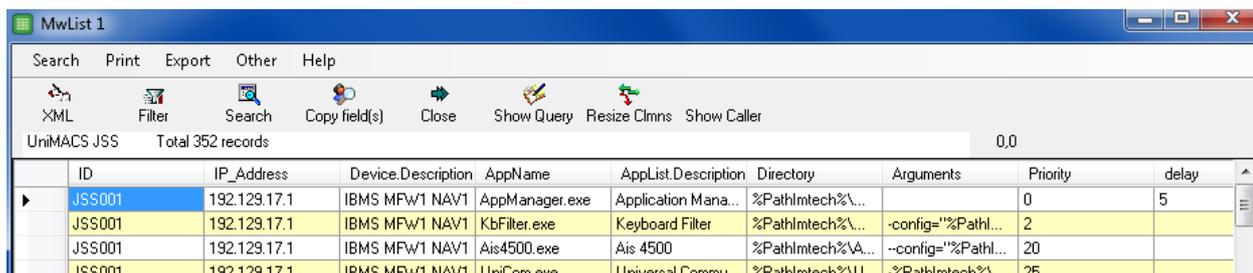
These commands will start the applications locally, first a .cmd file will be created in the support directory if it does not exist and this file is executed. For different ships, a different path to data files is necessary. So, if working at a different project, first check create cmd file checkbox. This needs to be done once for each button for the same project.

Required to be able to use iris locally.

First copy [the Imtech directory from](#) SMC1 or SMC2 to local system

“Query mdb” opens a local unimacs.mdb and shows which and how applications are started with other relevant info, or the Hatteland monitor dimming comport.

First copy [the Imtech directory from](#) SMC1 or SMC2 to local system



The screenshot shows the MwList 1 application window. The title bar reads 'MwList 1'. The menu bar includes 'Search', 'Print', 'Export', 'Other', and 'Help'. The toolbar contains icons for 'XML', 'Filter', 'Search', 'Copy field(s)', 'Close', 'Show Query', 'Resize Clmns', and 'Show Caller'. Below the toolbar, it says 'UniMACS JSS' and 'Total 352 records'. The main area is a table with the following columns: ID, IP_Address, Device.Description, AppName, AppList.Description, Directory, Arguments, Priority, and delay. The table contains four rows of data.

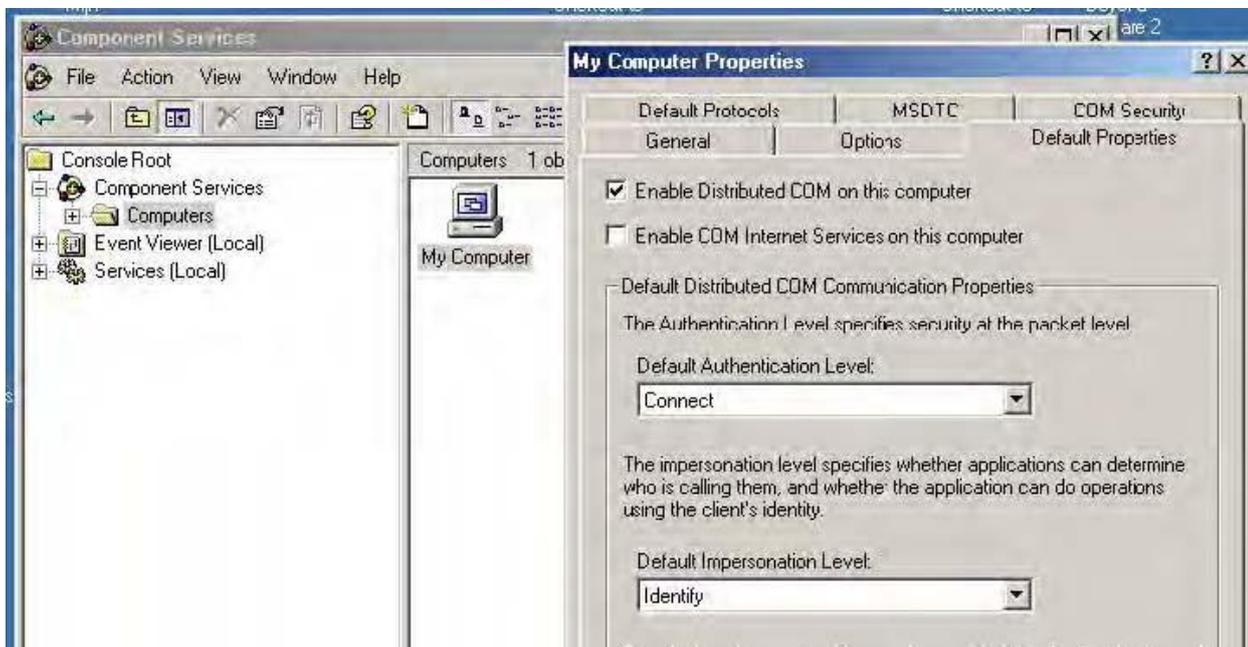
ID	IP_Address	Device.Description	AppName	AppList.Description	Directory	Arguments	Priority	delay
JSS001	192.129.17.1	IBMS MPW1 NAV1	AppManager.exe	Application Mana...	%PathImtech%\...		0	5
JSS001	192.129.17.1	IBMS MPW1 NAV1	KbFilter.exe	Keyboard Filter	%PathImtech%\...	-config="%Pathl...	2	
JSS001	192.129.17.1	IBMS MPW1 NAV1	Ais4500.exe	Ais 4500	%PathImtech%\A...	--config="%Pathl...	20	
JSS001	192.129.17.1	IBMS MPW1 NAV1	UniCom.exe	Universal Commu	%PathImtech%\U...	--config="%Pathl...	25	

“SMC Simulation” SMC can be simulated local. There are differences with older and newer version. Newer versions need the install CD, older version the N drive. Follow directions on the screen carefully.

Preparation

Some commands use WMI, which uses DCOM. When receiving an "access denied 0x80070005" message check your local DCOM configuration. Control panel, admin tools, component services, computer, right click My computer, Enable distributed com.

or See MSDN site: subject [Securing a Remote WMI Connection](#). WMI access to another computer can be checked through `wmimgmt.msc`.



Extended remote access at other computers must be allowed for Wxp This is enabled under local security policies at the remote nodes. Select for sharing and security model the classic type **Also the RPC and Remote registry service must be enabled and running and the firewall off.**



Windows 7 must have following registry key which enables the admin shares:

HKLM\SOFTWARE\Microsoft\Windows\CurrentVersion\Policies\system

Dword: LocalAccountTokenFilterPolicy=1 .

Simulator

The simulator sends configured data to selected serial or tcp / udp ports.

The data (ASCII encoding) can be static or dynamic NMEA messages, and/or ascii or binary files.

The pre configured dynamic fields in NMEA messages are filled real time with data from the virtual ship, like position, heading, speed, time etc.

All controllable targets (max 10000) update their position and course each transmission depending on their course, rate and speed.

Each [serial](#) or [tcp](#) / [udp](#) port can send several NMEA messages and/or files.

The screenshot shows the Simulation software interface. The main window is titled "Simulation" and contains a "Port/Data tree" on the left, a "chart" window on the right, and a "Route" window at the bottom. The "Route" window displays a table of waypoints with the following data:

Waypoint	WaypointName	Type	Latitude	Longitude	Course	CourseChg	Distance	Speed	W/heelDve	Radius	Rate	XteLeft	XteRight	La
2	WP_003	RL	5149.98 N	00431.00 E	86.6	28.6	0.5	10	346.1	0.51	18.7	185.2	185.2	0.9
3	WP_004	RL	5149.42 N	00431.90 E	127.2	40.0	0.70	10	632.1	0.5	19.1	185.2	185.2	0.9
4	WP_005	RL	5148.47 N	00431.53 E	193.3	69.1	0.99	10	686.1	0.5	19.1	185.2	185.2	0.9
5	WP_006	RL	5148.46 N	00430.07 E	263.4	73.1	0.9	10	288.3	0.51	18.7	185.2	185.2	0.9
6	WP_007	RL	5149.04 N	00428.66 E	303.6	34.2	1.05	10	664.3	0.5	19.1	185.2	185.2	0.9
7	WP_008	RL	5149.97 N	00429.02 E	15	71.4	0.86	10	0	0	0	185.2	185.2	0.9

First add a [serial](#), [tcp](#) or [udp port](#) by right clicking the Port/Data tree or through menu Config.

The screenshot shows the Simulation software interface with the "Config" dialog box open. The "Port/Data tree" on the left shows a list of ports, including "UDP 2255 Tx" and "UDP 2256 Tx". The "Config" dialog box has the following settings:

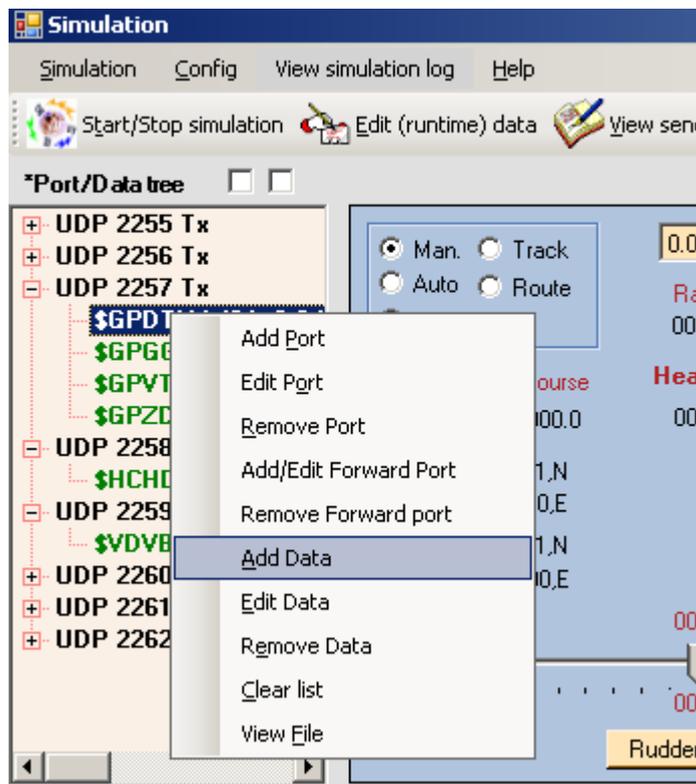
- OK button (green)
- Cancel button (red)
- Serial (radio button, unselected)
- Udp (radio button, selected)
- Tcp (radio button, unselected)
- Receive data (checkbox, unselected)
- IP section:
 - Local IP: 0.0.0.0
 - Local port: 0
 - Dest IP: 255.255.255.255
 - Dest port: 2256
 - Multicast server (checkbox, unselected)
- 0.0.0.0 = Any, 127.0.0.1 = Localhost, 255.255.255.255 = Broadcast
- Limit transmission speed to chars/s. (Baudrate/10) 0

[TCP](#) ports can start server and client sessions.

[UDP](#) can be used as [multicast](#) server or client.

Limit transmission speed can be usefull if at the receiving device the data is send out by a serial port. e.g. Moxa Nport. So no buffer overflow will occur.

Then add data to a port for transmission. (right click the port).



Data can be a NMEA message, a file (Ascii or binary), simulated targets. (AIS, TTM, Tender Track data, Tracked Target Data) or some special binary data.



The value in **Transmit freq** is the send interval of a NMEA message, row in a file or a target message.

The Forward port can be used to send same data to two different ports, or transmit the received data from the main port to the Forward port.

Virtual dynamic controllable AIS, TTM and TTD targets can be created by clicking the AIS, TTM or TTD radio button.

TTD can be Tender track data(navtec GmbH) or radar tracked target data.

The first row is automatic added and is the AIS VDO message. This contains own ships navigation data. It is not used for TTM or TTD messages.

Up to 10000 targets can be added. First 1500 apply for TTM, first nine for TTD(tender track)(1023 for TTD radar Tracked Target Data)

Added targets are positioned on range and relative bearing from current own ships position and heading. The required settings can be randomly selected or not.

MMSI, Shipname and other ships data are auto generated but can be changed by left click on cell in grid. See [Message summary PAGE 93 Rec. ITU-R M.1371-3 manual \(AIS stuff\)](#)

AIS Messages 1, 2, 3, 4, 5, 9, 12, 14, 18, 19, 21, 24A and 24B can be simulated. CSF

Adding targets by the Add button enables messages 1 and 5 for each AIS target.

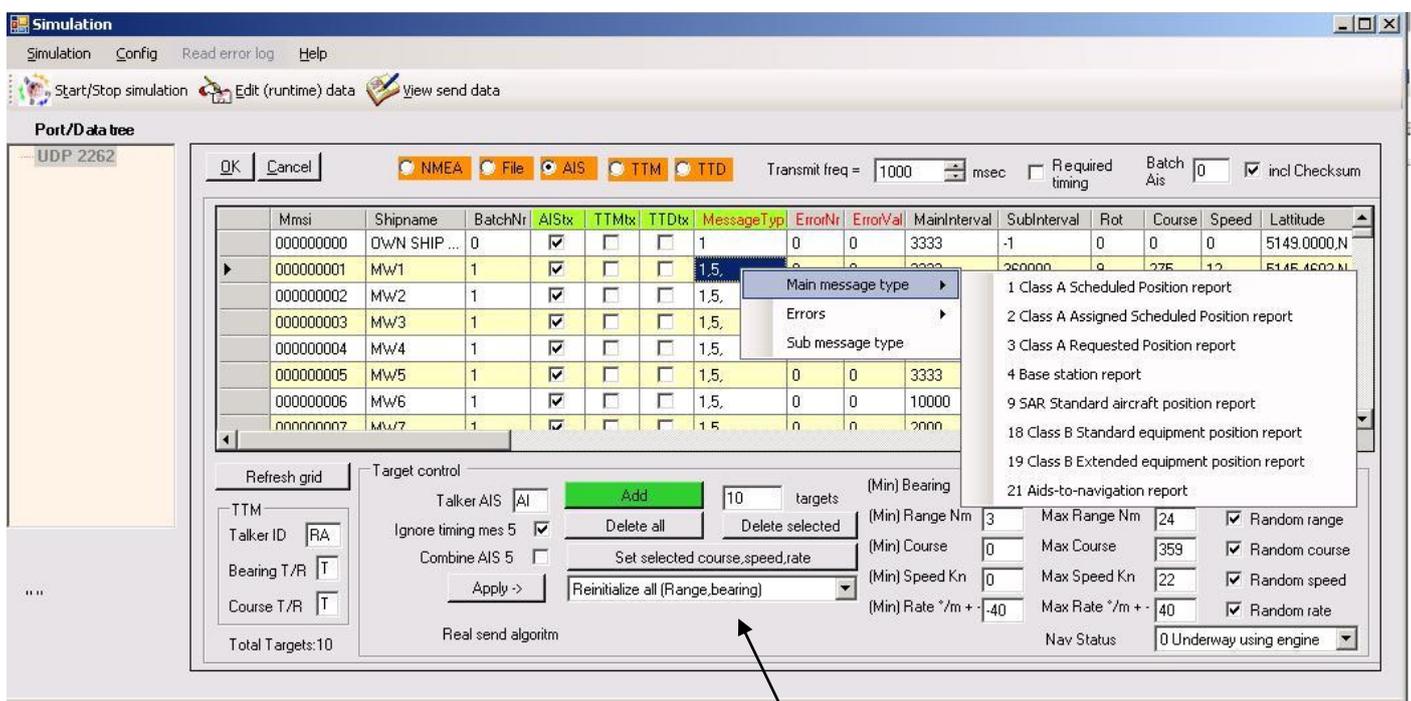
Other messages and sub message can be selected by the menu(right click in grid)

Message 1 (position report) contains navigational data like heading, speed, position etc. and is updated every transmission cycle of the message.

Ais message 1 contains about 50 characters and message 5 about 115 chars.

Note: message 5 uses 2 transmission packets. (max NMEA message length = 83 chars).

These two messages can be combined to one message.



“Reinitialize all” and “Reinitialize current batch” positions targets at their initial range and bearing from own ship. To set new initial data for targets, first delete them and add new targets. Other options in the list enables for a batch of targets to set the same value.

Message 5 contains static ships data like ship name, draught etc, and is transmitted each 6 minutes unless a value is changed or **Ignore timing Ais 5** is checked.

See [reporting interval](#) specifications and document **ITU-R M.1371-3.pdf**

During simulation, many target fields can be changed on the fly except fields with **red header text**.

Not all fields for all messages can be configured, these get default values.

A right mouse click on the grid shows a menu where Main AIS messages and errorValues can be selected. Other errors not in this list can be set in the grid's cell.

Fields with **green header background** can be clicked on the header which gives some options.

For the Aistx, TTMtx and TTDtx headers, transmission is toggled.

Left click on Messagetype header allows selecting of AIS sub messages.

Rot values between -719 and + 719 degrees/s . Negative value gives rate to port, positive to stbd.

Rot value -730 entered in the **Min rate deg/min** textbox indicates that ROT is not available.

Course values between 0 and 359 degrees. (In message1 course and true heading will have same value).

Speed between 0 and 102 knots. SAR (message 9) can have 1023 knots.

The dropdown box besides the apply button can e.g. recalculated target positions on the initial range and bearing from the **current** own ship position.

All targets can be used to simulate TTM messages, NMEA specs limits this actually to 99.

The first 10 targets can be used to simulate Tender Track data.

Transmission of a target can be suspended by unchecking the Tx field in the grid.

Mouse click on the column headers of these fields, toggles transmission of all targets.

Selection of rows is done by clicking on the space where the pencil is drawn. Use Shift and Ctrl key with left mouse click. Selected rows can be deleted etc.

All changes by menu, dropdown and header options apply to current and selected rows.

Mmsi	Shipname	BatchNr	AISTx	TTMtx	TTDtx	rTTDtx	Corr	Mes
123456789	OWN SHIP	0	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1.5,
000000001	MW1	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1.5,
000000002	MW2	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1.5,
000000003	MW3	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1.5,
000000004	MW4	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1.5,
000000005	MW5	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1.5,
000000006	MW6	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1.5,
000000007	MW7	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1.5,

Other AIS messages:

Safety addressed message(12) per default uses VDO MMSI to send message to, but this can be changed.

If a large amount of AIS messages must be send, e.g. 1500, AIS targets can be batched in one transmission packet. (maximum 24). A com port at 38400 baud cannot be used for this amount of data.

AIS required timing option

Above, all AIS targets are send sequentially, row by row with a fixed interval.

NMEA AIS specs states that depending on message type, speed, rate and navigation status, messages must be transmitted at different time intervals.

When rate > 5 degrees/minute, the program assumes that the ship is changing course.

When adding targets, the required main message and sub message intervals are filled by the program.

Be aware of the Navigation status when adding targets.

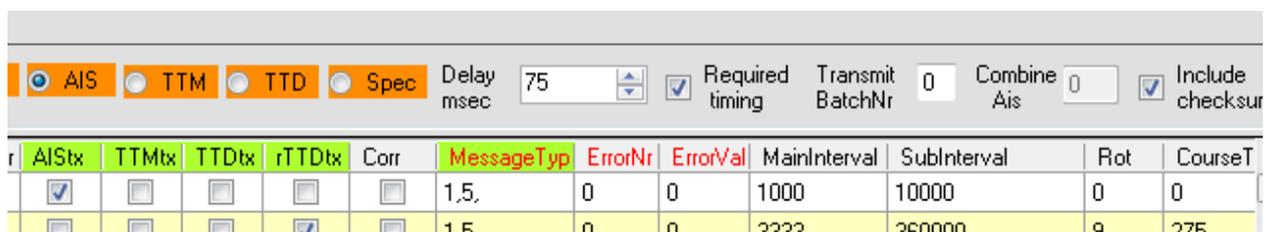
If real life AIS receivers send \pm 10-15 messages/second and 80% of the messages from the ships in port have this data: Rate=Not Available, Speed < 3 knots, Navigation Status=0 (underway using engine).

80% of the ships must send with that data, a position report (message 1) every 10 seconds, and a static report (message 5) every 360 seconds.

So to for fill the [requirements](#), and in the best case, the ais receiver will not send more than 144 different ships (message 1 and 5) with correct timing. If there are more ships, than timing will be behind or the message rate must go up. (see [AIS example](#) calculations).

This program can simulate real life but it can send data faster.

To use timed AIS targets, check the **Required timing**.



The screenshot shows a software interface for configuring AIS targets. At the top, there are radio buttons for 'AIS', 'TTM', 'TTD', and 'Spec', with 'AIS' selected. To the right, there are input fields for 'Delay msec' (set to 75), 'Required timing' (checked), 'Transmit BatchNr' (0), 'Combine Ais' (0), and 'Include checksum' (checked). Below this is a table with columns: 'r', 'AIStx', 'TTMtx', 'TTDtx', 'rTTDtx', 'Corr', 'MessageTyp', 'ErrorNr', 'ErrorVal', 'MainInterval', 'SubInterval', 'Rot', and 'CourseT'. The table contains two rows of data.

r	AIStx	TTMtx	TTDtx	rTTDtx	Corr	MessageTyp	ErrorNr	ErrorVal	MainInterval	SubInterval	Rot	CourseT
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1.5	0	0	1000	10000	0	0
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1.5	0	0	3333	360000	9	275

The **transmit frequency** value is now used to achieve a **minimum delay** between messages.

A value of 60 milliseconds gets close to the real life AIS receiver transmission intervals 15 messages/sec. Of course this depends on pc speed and time given to this application.

The MainInterval and SubInterval values are used to transmit the AIS messages..

A value of -1 in these fields will not send the main or sub message. Values can be changed.

Note: If more than one sub message is configured then these messages will be send within the same interval and in separate transmission packets.

If targets cannot be send on time, selection must be done which message goes first.

Are they being send disproportional or proportional to the time they are behind?

There are targets with reporting intervals of 2 or 10 seconds and other messages with a 360 seconds interval. All of them can be behind in time due to the amount of targets.

If they all are 10 seconds behind in time, or the message with a 2 seconds interval is 1 second behind and the one with a 360 seconds interval is 100 seconds behind, which goes first?

The program provides different send AIS target selection algorithms.



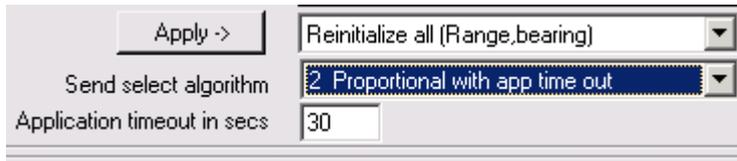
0 Proportional:

If in time behind: the largest value of **Interval divided by time behind** goes first (time behind is negative). Disadvantage is that messages with long intervals (360 seconds) are hardly sent. The short interval messages occupy the time frames.

1 Most behind in time first.

Disadvantage is that short interval messages (2-10 seconds) get too much behind.

2 Proportional with considering of the target application time out value.



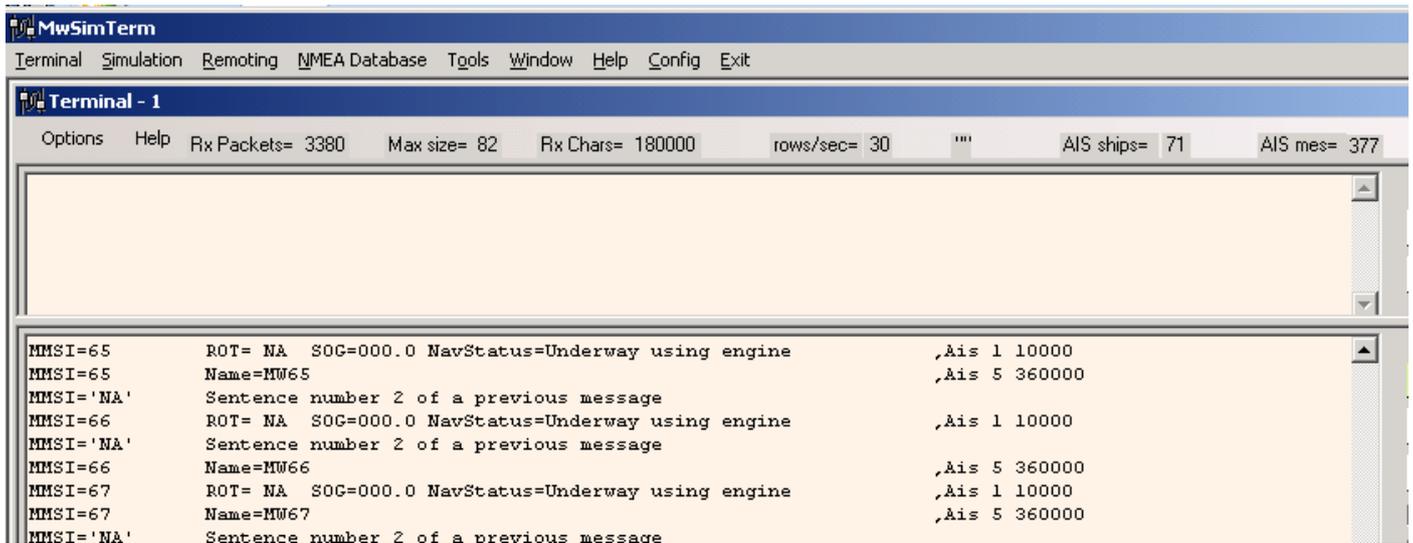
Fill in the smallest value of the target application time out value. (Fast target timeout)

Algorithm is the same as proportional but all intervals smaller than the target application timeout are set to the application timeout value. This frees the time frame for short interval messages, so more targets can be sent.

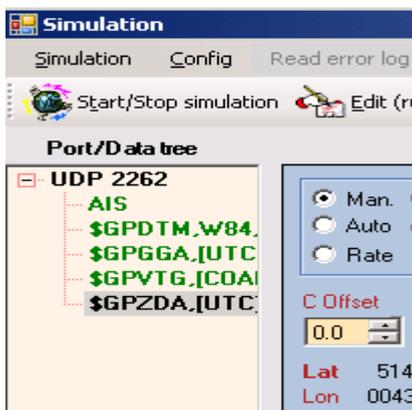
With this algorithm and a minimum delay of 10 milliseconds, 940 targets can be transmitted by UDP without causing an alarm for fast ships at 30 seconds timeout and 180 seconds timeout for slow targets.

When simulating real life, first check the message rate at the AIS receiver output and the total Ais ships. Do this for at least 6 minutes. Then achieve the same rate with the **minimum delay** setting (see [AIS example](#) calculations) and **add** the amount of targets.

The message rate and total different Ais ships can be checked under terminal, Check **Parse AIS**.



Note: if sending other NMEA data through the same AIS port, you might get serious problems with timing if message rates are high.



Only one AIS node with required timing can be used.

Sequential AIS nodes can be more than one, also in combination with the required timing AIS node.

Examples below send messages 1 and 5 for each target with app time outs of 180 for slow and 30 for fast.

100 targets with a message rate ± 12 messages/second should be able to keep the requirements at baud rate 38400.

When sending more targets, timing will get behind with this delay time.

Sending messages with a rate ± 64 messages/second, can handle ± 300 targets on time when using **proportional** algorithm.

Sending messages with a rate ± 64 messages/second, can handle ± 900 targets without alarms when using **proportional with app time out** algorithm (time out of 30 seconds).

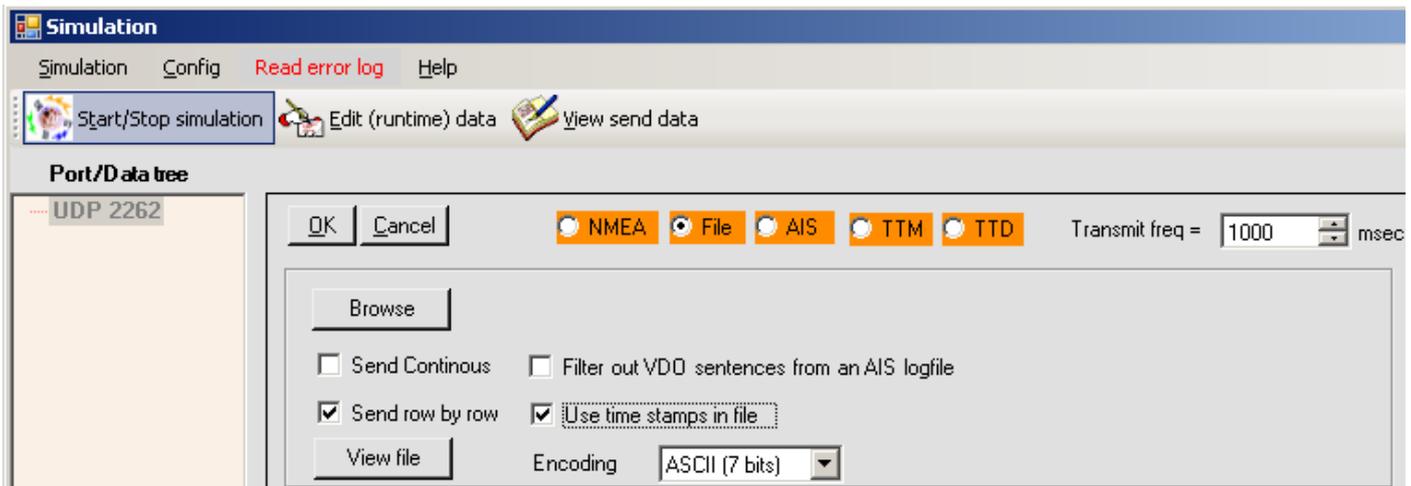
Note: Target applications often calculate the timeouts only for the position report (message 1).

There are two different TDD messages.

One is Tender track data and the other the encrypted Track Target Data.
select the option on the page.

Track Target Data sends 4 targets in one transmission cycle. Only the first 1023 targets are used.
The corr checkboxes add a correlation number to the target data message. The correlation number will be the index of the array (1-1023) (see NMEA help TTD message).

File transmission.



An ascii or binary file can be send, checksums can be added for each row in the file.

The file can be send continues or only once.

In the ...data directory an AIS logfile of the port of Rotterdam can be found to send AIS targets.

An AIS log file can contain !AIVDO sentences which can be filtered out.

These sentences contain position etc info of own ship.

[Encoding](#) of the file can be set. Note: NMEA data needs ASCII encoding. Chars 32 till 127.

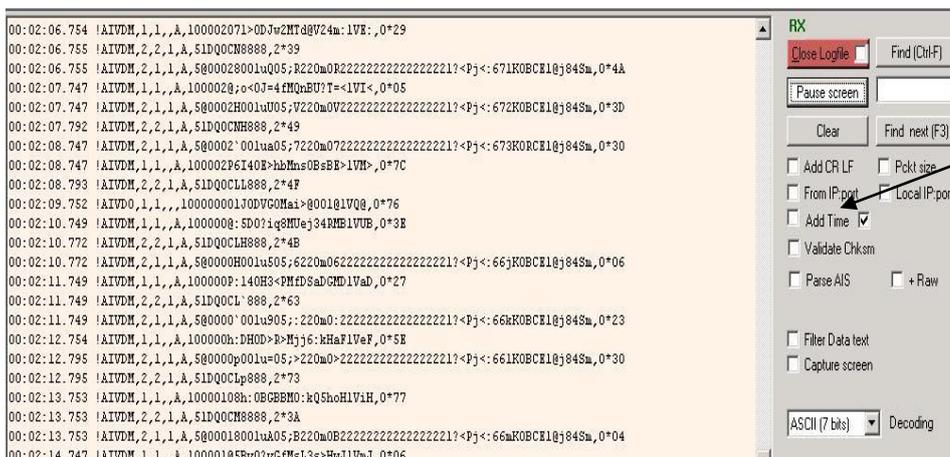
If the ascii file rows contain checksums and **“include checksum”** is checked then the original checksum is removed and a new one created.

File can be send **“row by row”** which means that every tx interval a line is send (ending with LF), otherwise the whole file is send each tx freq.

The send buffer will always be max 1024 bytes. In non (Bytes) [encoding](#), the delay between transmit packets will be 100ms if **row by row** is not checked.

A file can be send with timing which follows a timestamp in the file.

To achieve this, first record data with either time stamp **“Add Time”** under terminal, then transmit this file.



Format of a row with timestamp in the file must be: HH:mm:ss.sss <data>linefeed. Max row length=1024 e.g. 00:00:10.719 !AIVDM,1,1,,B,102=WpPP00PD;m<MdK0cjwv>R<3w,0*3C

First row of file must start with a timestamp.

Next rows without timestamps are skipped.

Transmission is stopped if a timestamp is invalid. **Continues** file send will be ignored after an error.

Last row of file is not transmitted for ease of the programming.

Encoding must be ASCII(7 bits), Send row by row must be checked.

Normally timestamps should sequentially increase every row in the log file.

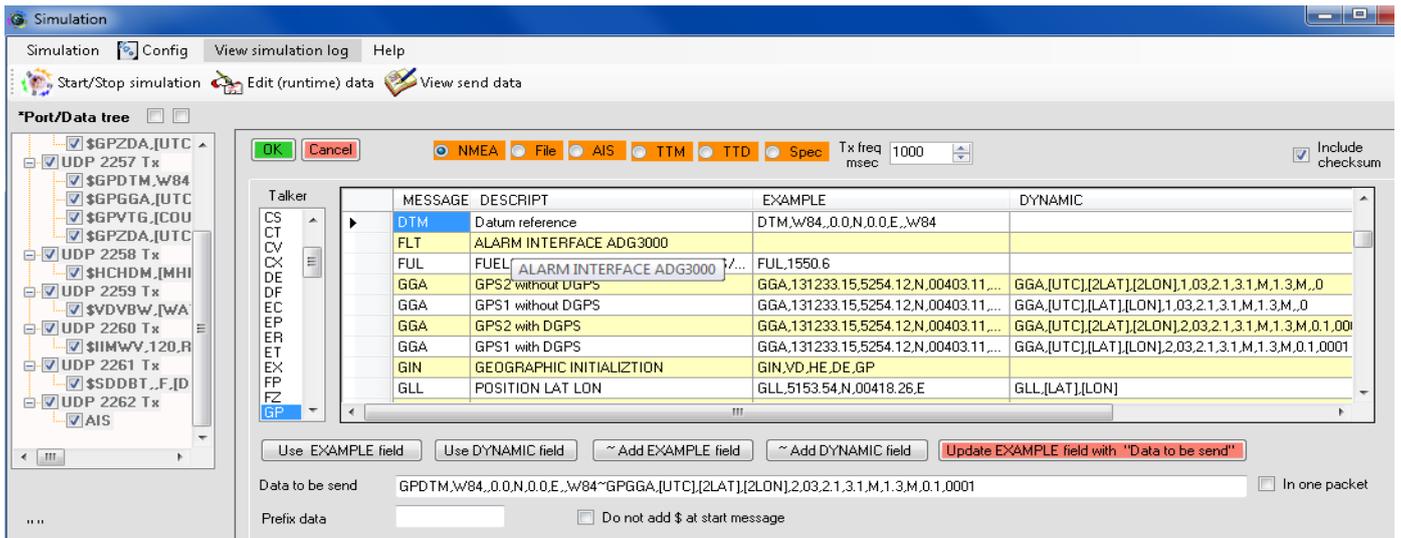
Due to asynchrone communication, it might happen that logged rows get a timestamp which is earlier than the previous row, also other processes might occupy too much time. System allows for 500 milliseconds difference, else transmission is stopped. Also if difference > 60 seconds the transmission is stopped.

When logging happens overnight (from 23:59:59:999 to 00:00:00:100) system handles this difference automatic.

A file which was logged in **Hex mode** under terminal can be send as it was received. The added LineFeed will be removed. Encoding must be Ascii and row by row must be checked.

Select encoding None(bytes) to transmit a binary file.

NMEA transmits nmea messages, select a talker, then a message. The internal NMEA database is used.



Click use example field or use dynamic field to format the data in "Data to be send". (the [dynamic](#) fields will get simulated real time data from the virtual ship)

Two messages can be combined on a node. Separated by a tilde (~).

Use for e.g. DTM and GGA message, position messages must be send immediately after DTM in some cases. Both messages can be send in a separate transmit packet or in one.

The "Data to be send" text can be changed before pressing **OK**. Any text can be transmitted.

The "Data to be send" text can be copied back to the example field and is saved in the database.

The \$ character and checksum are added automatic to data to be send by the program.

But this can be overruled by **include checksum** and **do not add \$** checkboxes .

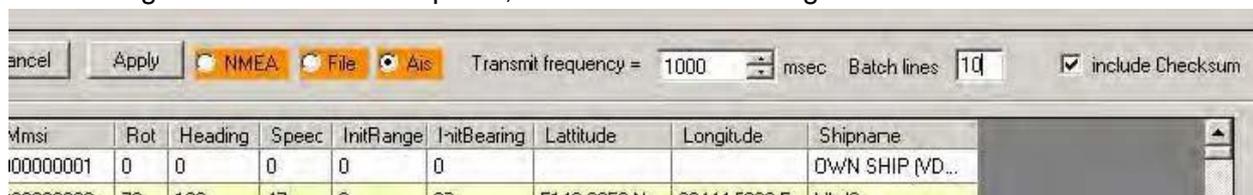
If a wrong checksum is required, uncheck include checksum and add a checksum to "Data to be send" manually.

In front of an nmea message a prefix can be used. This is a global setting, so all nmea messages will have this prefix. E.g. to simulate GGA for android through telnet the prefix "geo nmea " is required.

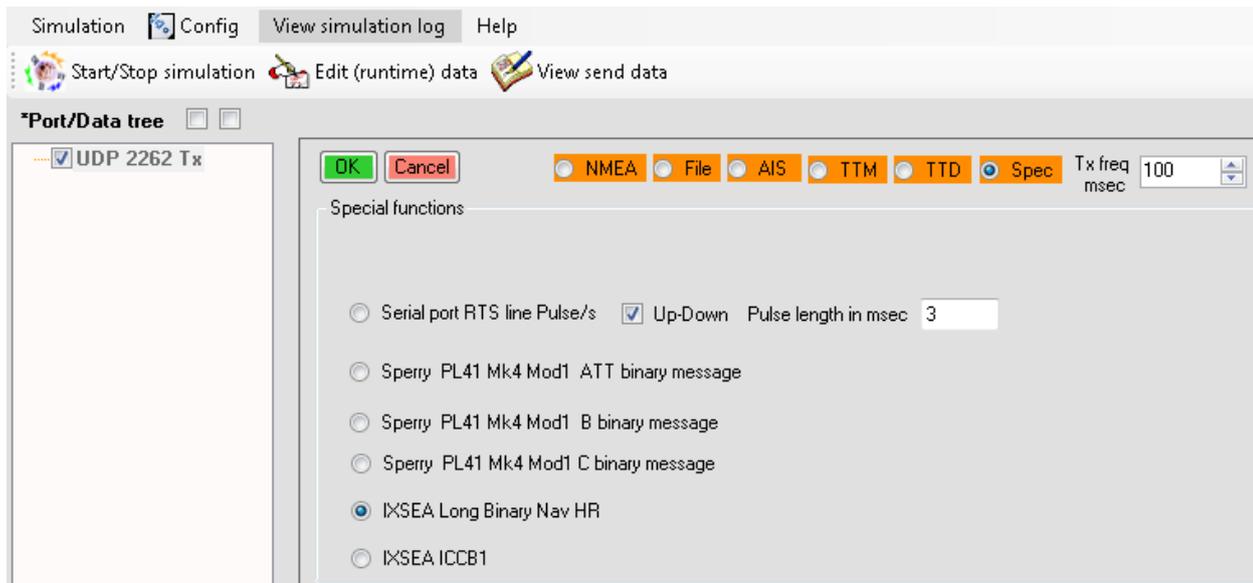
Select the time in milliseconds the data is send and if a checksum must be provided.

Timing gets inaccurate below 80 milliseconds due to MS. If transmit frequency=1 millisecond, only 64 rows/second are transmitted.

If a message rate of 200Hz is required, create 3 same messages with a rate of about 70 ms.



Spec(pecial functions



Some binary message can be selected here.

The serial port's RTS line can be used as a pulse generator.

Other options are gyro messages for sperry and IxSea gyro.

Configuration can be saved and reloaded through the simulation menu.

Current ships heading, position, speed, gps2 antenna offset and time offset are also saved.

Some preconfigured configuration files are available in the data directory.

If in a loaded configuration file, ports are assigned which are not available in the current system they are drawn in red color and data is not send.

A configuration file can be used to [automatic startup](#) a simulation from a command line.

At the TAB **Ship** several parameters of the virtual ship can be set.

This data can also be changed and applied by the **Force buttons** after simulation is started.

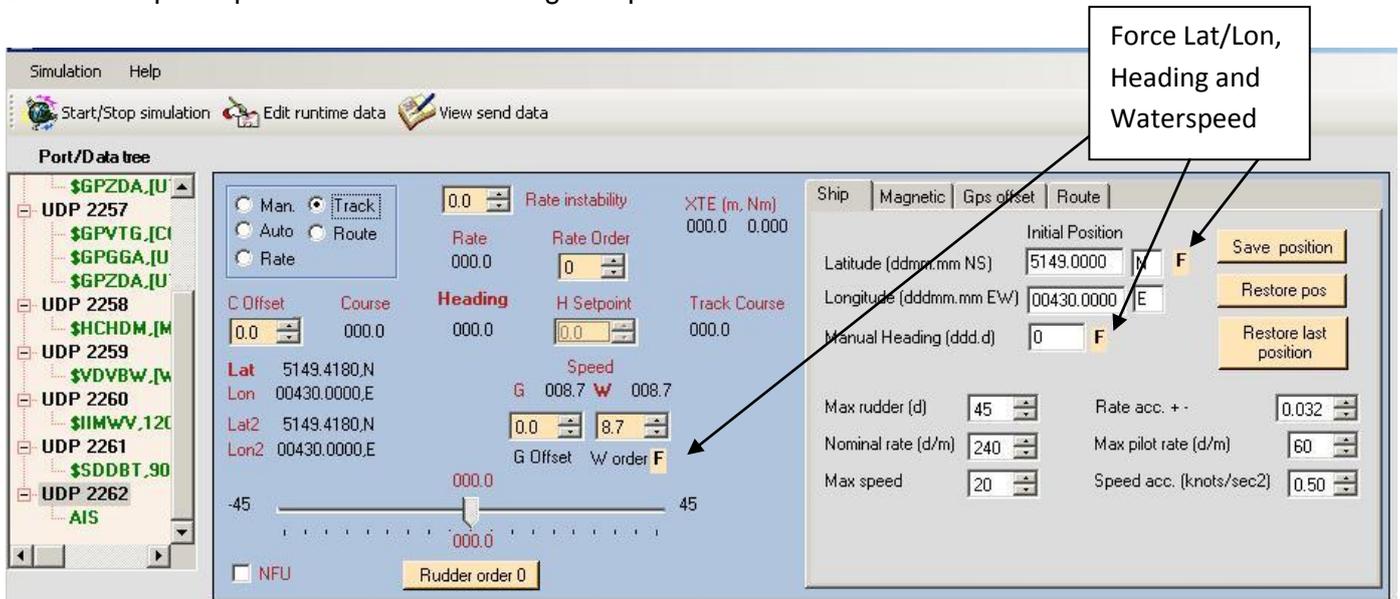
Lat Lon is entered in NMEA format. (decimals of minutes instead of seconds of degrees.)

Initial Latitude and Longitude will be auto saved and restored.

When closing the simulation window, the last runtime position is always saved which can be restored by **"Restore last position"** button.

Through the **"Save position"** and the **"Restore position"** buttons any runtime position can be saved and restored.

Once all required ports and data are configured press the **start simulation** button.



All nodes in the data tree get a [runtime color](#) indicating the status of the node.

Use the **water speed order** and the **rudder order slider** to move the virtual ship.

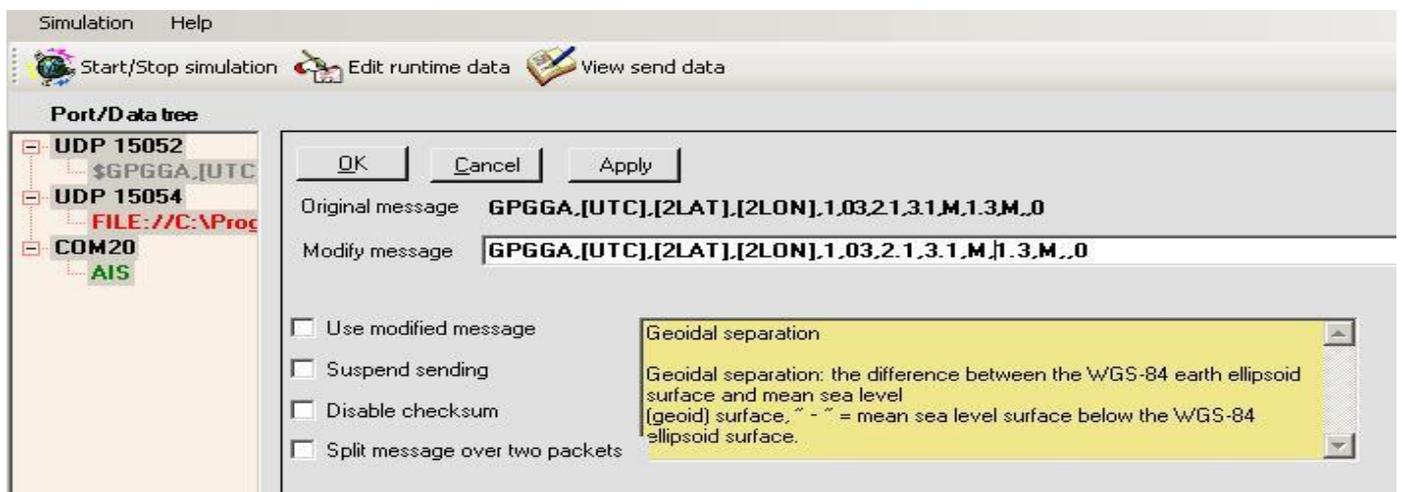
The ship will only turn when waterspeed >0, however if rate pilot is selected and waterspeed =0, then ship will turn around its axis.

The virtual ship supports all steering modes. NFU overrides the mode temporarily.

Negative water speed forces steering mode to manual.

Position is calculated according to the WGS-84 **ellipsoid** model.

During simulation the nmea **runtime data** can be changed on the fly through the menu or toolbar button

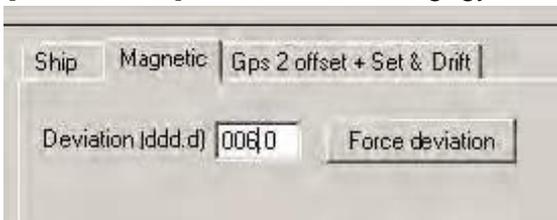


Transmission can be suspended, checksum disabled, or the message itself can be edited. The original message will be saved, and if done with the modified message just uncheck "Use modified message" to restart sending the original one.

If the cursor is moved in the Modify message textbox the memo is shown for each field which is taken from the [Message Fields Description table](#).

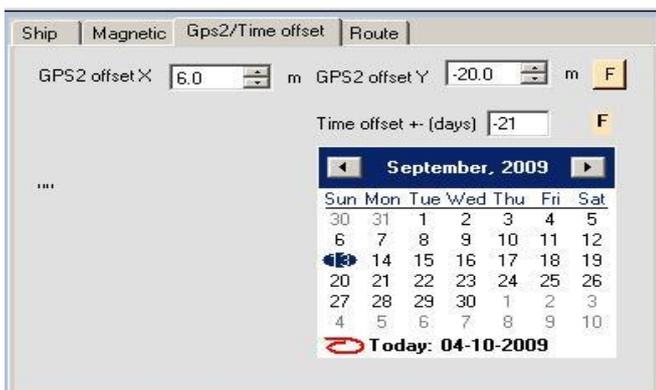
An offset can be given for Magnetic [MHEADING].

[MHEADING] can be used for e.g. gyro2



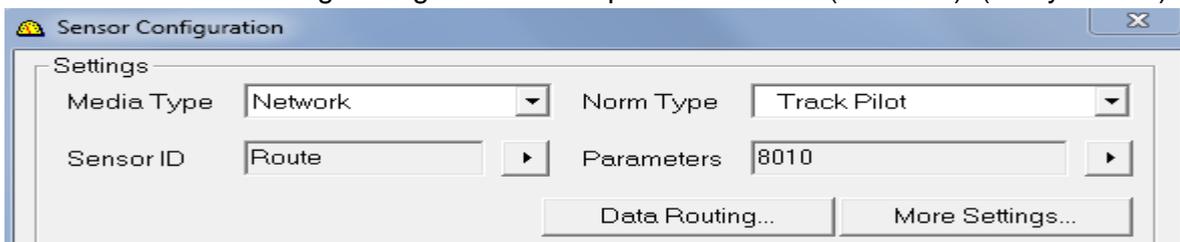
Time is taken from the PC, however an offset can be set, this might help if chart licenses are expired.

GPS2 antenna offset is related to GPS(1) position.



Previous logged route data file (Maris ecdis4000 by UDP) can be opened and started.

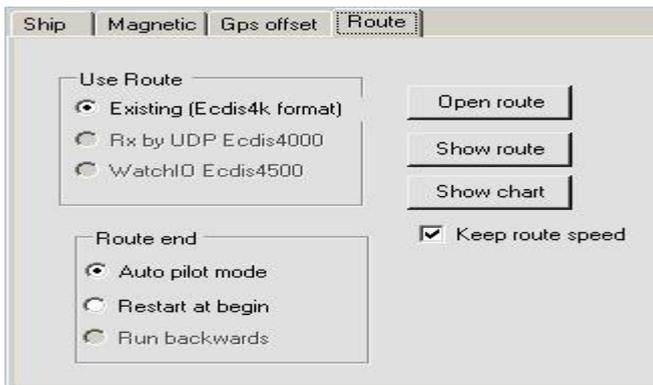
Smonitor needs following setting to enable output of track data.(the route) (every minute)



Log the WPD and RTE messages under terminal and save these to a file.

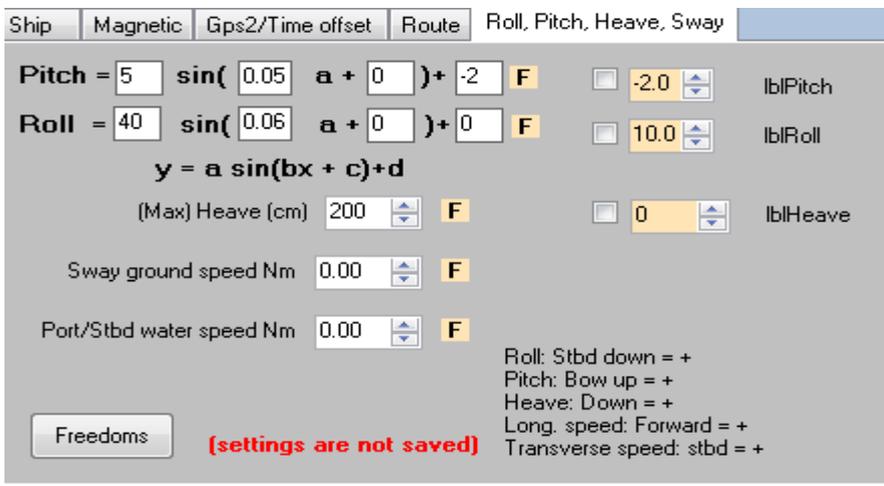
```
$ECWPD,5149.87,N,00429.02,E,WP_008,926.0,m,0,185.200,m,185.200,m,10.0,N,0*26
$ECRTE,2,1,C,clockwise,WP_001,WP_002,WP_003,WP_004,WP_005,WP_006,WP_007*21
```

Open the file and the virtual ship can be set to sail this route.



If **roll**, **pitch** etc are simulated (used in the messages) then this TAB applies Formula (sine wave) for dynamic changing roll, pitch can be changed here. Roll and Pitch are only calculated when this is required in the send messages

Also a fixed roll, pitch and heave can be set.



Error log:

During simulation errors are logged to ...\\data\\simulation.log

Menu read error log will be disabled at start of simulation.

When an error occurs during simulation or when simulation is stopped, the menu will be enabled.

Data tree colors during simulation:

Port node:

Red at an error, else black.

Data node:

Green if port can be opened, else black.

Orange if data is temporarily suspended or if bps exceeds the maximum.

Blue if NMEA message is modified.

Pink if checksum is disabled.

Baudrate versus Bits per second: Take care that the bits per second does not exceed the maximum when using comports. Only one bit of information (signaling element) is encoded in each electrical change.

The baudrate, therefore, indicates the number of bits per second that are transmitted.

For example, 4800 baud means that 4800 bits can be transmitted each second (abbreviated 4800 bps). Assuming asynchronous communication, which requires 10 bits per character (1 start bit + 8 character bits + 1 stop bit) this translates to a maximum 480 characters per second (cps).

Example: the NMEA message **\$HEHDT,109.5,T*22** send every 100ms translates to 19 chars (included the carriage return and linefeed at the end of the message) * 10 *10 =1900bps.

The program will warn you if you exceed the maximum. You can ignore the warning but this might cause buffer overflow, resulting in data not being send completely.

For AIS data, sending through a COM port, a warning might be shown that bps is too high.

Program **assumes** here that AIS message 1 and message 5 will be send every interval, and these messages contain total 165 chars. So with an interval smaller than 42 ms the bps might be too high.

Be aware that if sending a file through a comport the program does not check the maximum bps!!

Solution: Increase the baudrate or decrease the send interval or remove a message from the port.

If bps is exceeding the maximum the comport is written in **ORANGE**

AIS example:

Ais messages are normally send with a baud rate of 38400.

This translates in max 3840 chars/second. => 230400 chars/minute. => 1382400 chars/6 minutes.

Almost all ships send AIS message 1 (50 chars) and message 5 (115 chars spread over two sentences) Depending on the navigation status: 80% of the ships are required to send message 1 every 10 seconds and message 5 every 360 seconds. The other 20% equals about the same amount of chars. Some ships must report between 2 and 6 seconds while others every 180 seconds.

Message 1 is send 36 times every 6 minutes and message 5 once => 1915 chars for one ship.

At the maximum, the ais receiver can send $1382400 / 1915 = 721$ different ships with correct timing.

The message rate of the ais receiver should be around $(721 * (36 + 2)) / 360 = 76$ messages/sec.

Depending on the message rate, the total amount of ships with **correct timing** can be estimated.

721 : 76 = ships : message rate => suppose rate=15, than total ships will be $721 * 15 / 76 = 142$.

Time out alarms values of 180 seconds for slow ships and 10 seconds for fast ships should be sufficient if the ais receiver sends all messages in time.

So, if the message rate is around 15 messages/second, and the total amount of ships is 300, than for sure there will be timeout alarms.

Solution: Increase the slow and or fast timeout values of the target application.

Rule of thumb: double the slow and fast timeouts if the amount of ships is twice the message rate can handle on time.

Setting the target range shorter in the target application does not prevent the time outs, it just decreases the load on the system. And of course, there will be no alarms of targets outside the range.

Note: Target applications often calculate the timeouts only for the position report (message 1, 2 or 3).

Terminal

View incoming and send data through serial or UDP / TCP ports.

Each terminal window can have several serial ports and receiving udp ports open at the same time, but to separate ports a new terminal window can be opened. For now TCP and transmit UDP can have only one port open.

All available COM ports and IP addresses per NIC in the system are detected when window is opened. Only when sending data by UDP, the TX UDP port is automatically opened if it is closed; the other ports must be opened manually. All open ports must be closed manually.

To enable another setting for a port first close it than reopen.

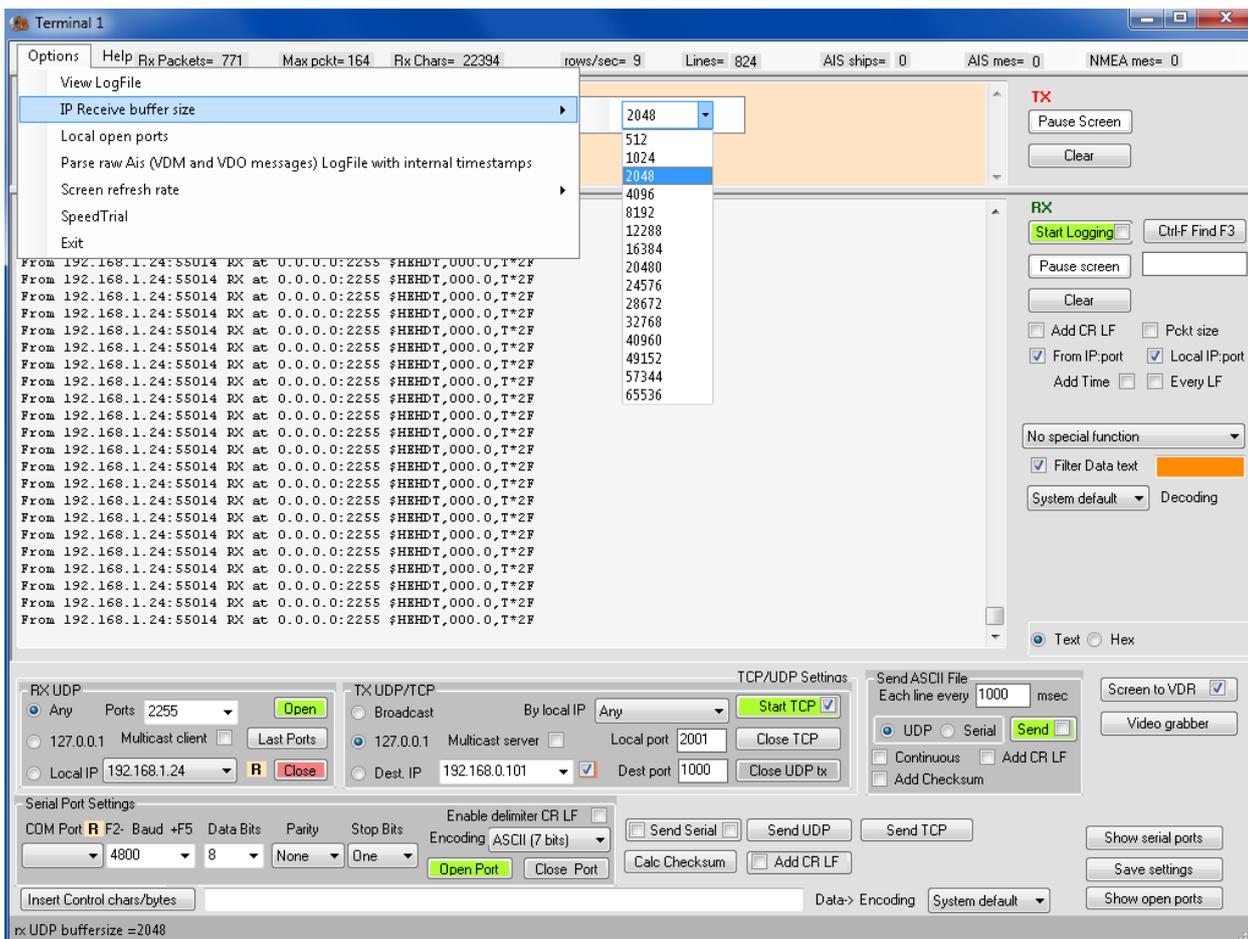
(For baudrate change by F2 or F5 program will do this auto)

When closing the terminal window all ports are closed automatically.

Data which is received through the open ports is displayed in the RX textbox.

Note: Slower systems might lock up when a lot of fast data is coming in through a port.

Real time update of the Rx textbox takes up much system resources. Then select menu options and set the screen refresh rate other than 0.



For NMEA messages, use decoding ASCII or system default and **Enable delimiter CRLF** if using a serial port.

Ascii decoding only shows chars 32-127. Unprintable chars (Ascii <32 and Ascii>127) are replaced with

spaces (Ascii 32) In **Text mode**.

If character values 0-31 and 128-255 need to be displayed or send, select encoding/decoding **None(bytes)**, all Ascii chars are written normal and Ascii NUL '\0' will be shown as <NUL> , byte 234 as <234>.

For sending a non ascii char, a char from the list under the button **Insert Control chars** can be inserted. If timing is essential for analyses, check **Add time** or the **elapsed time**. Time is written in front of the received data.

Normally every received packet gets a time stamp, however there might be more than 1 message in a packet. Check **Every LF** to get a time stamp after each linefeed.

In **Hex mode** a LineFeed can be added, after or in front of a special byte, to be able to analyze data easier.

Validate Chksm performs an NMEA checksum check only if the received line starts with "\$" or "!" and ends with CRLF. (/r/n).

Parse Ais shows the MMSI number, Ships name, Rot, Speed, Range, Navigation status, the ais message number and the [required](#) interval of the received AIS messages.

Note: The range can only be calculated after the VDO message has been received.

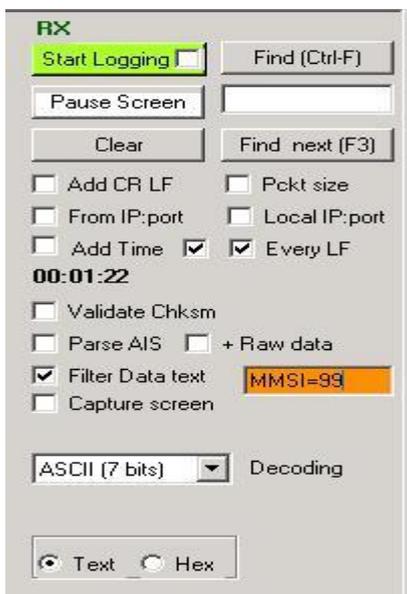
Raw AIS data routing from Maris smonitor.exe starts AIS messages with \$ instead of !. Also that program does not always send a CRLF. These messages will be handled automatic.

In the menu bar the total different Ais ships, total Ais messages and other NMEA messages totals are displayed. Raw data can be viewed the same time.

The logged file can be imported in excel, comma separated.

For analyses, log raw data with timestamps, than through menu **Options - parse AIS**, the raw data can be parsed. VDM and VDO messages are parsed.

Only necessary part of the Ais sentence is checked for validity, checksums etc are not checked.



Filter data text shows only data which contains somewhere the text in the received line.

Received data can be logged to a file.

Logging to file follows the filter, except for parse AIS, then all data will be logged.

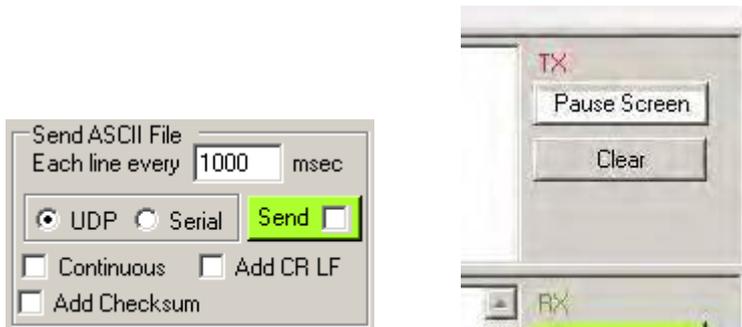
This file can be send under simulation exactly as it was received, either with timing or as a binary file. See options under file transmit.

At the bottom of the terminal window the **"Data"** textbox can be used to send some text or command to a serial or udp / tcp port.

An optional NMEA checksum can be calculated and added with a **CRLF** to the Data textbox value.



A text file can be transmitted through the terminal by a serial or UDP port.
 The optional Checksum is added in front of the CRLF.
 Data can be send to all open serial ports with the checkbox in the Send buttons.
 Send data is shown in the TX window



Under windows OS only one process can have a serial port open. If the message "Access is denied" appears when opening a serial port, than probably another process has the port open.
 However, if a comport is opened under [simulation](#), than the terminal process can open this same port in shared mode. The baudrate etc, will not be changed in shared mode.
 Note that first the simulation process must open the port (only the Primary, not a Forwarding port), and simulation must be running, than the terminal can open the port in shared mode. It does not work the opposite way.

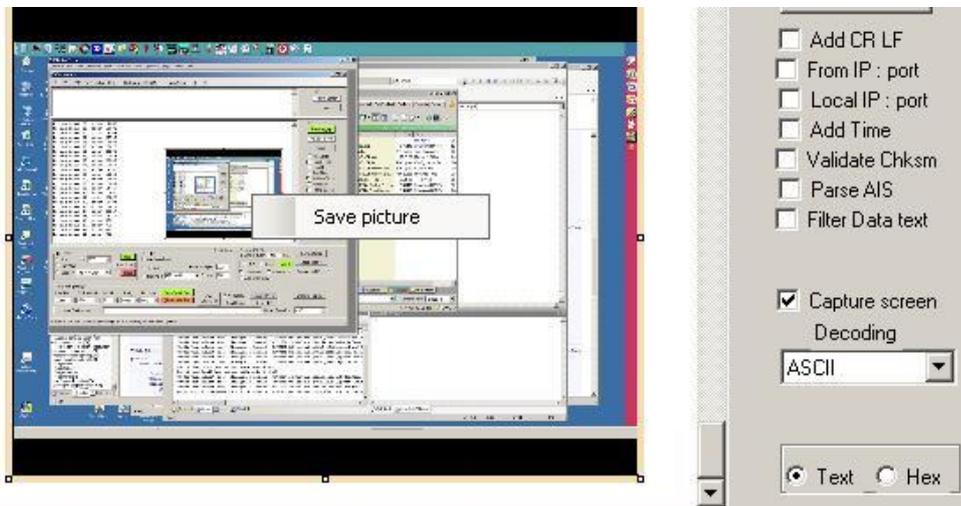
This program opens IP ports in shared mode, so more processes can open the same port, however if this terminal program opens a port it captures the data from the other process which in turn might not see the data as long as the port is open by this program.
 Opening an IP port might be blocked by another process which has the port open.

Simulate or receive the radar picture for **VDR** by UDP

To receive and view, select **capture screen** from the **special** functions dropdown box.

Note Your local IP address must be the VDR's IP address and the VDR must be disconnected from the network. Also the receive buffer size must be at least 8192 bytes.

```
1, size= 21763
2, size= 22162
3, size= 23753
4, size= 12201
5, size= 11801
6, size= 17326
7, size= 15730
8, size= 10849
9, size= 11419
0, size= 10480
1, size= 20434
2, size= 14792
3, size= 18616
4, size= 25247
5, size= 26712
5, size= 991
7, size= 991
3, size= 991
9, size= 991
```



Timing of the received picture can be logged to a file.

Right click on picture to save it in various formats:

.gif, .jpeg, .bmp, .tiff, .wmf or the default to .png if file extension is not given in the save dialog window.

Receiving by Unimacs process can be used. Click **Video grabber** button.

To send a picture to VDR, **click Screen to VDR** button. The checkbox scales the resolution to Maris format if necessary. Maris can handle max 1600/1200.

Some words on **RX UDP**:

UDP needs an IP address and port number to listen at. (Called a socket) and a receive buffer.

Select the size of the rx UDP buffer under menu options, if buffer is too small to hold the packet an error is shown.

"**Any**" listens to all available IP addresses in system. (0.0.0.0, this network)

The screenshot shows the 'TCP/UDP Settings' dialog box. It is divided into two main sections: 'RX UDP' and 'TX UDP/TCP'.
In the 'RX UDP' section, the 'Any' radio button is selected, with 'Ports' set to '2262' and an 'Open' button. Other options include '127.0.0.1' with a 'Multicast' checkbox, and 'Local IP' with a dropdown menu showing '192.168.1.184' and a 'Close' button.
In the 'TX UDP/TCP' section, the 'Broadcast' radio button is selected, with 'By local IP' set to 'Any' and a 'Start TCP' checkbox checked. Other options include '127.0.0.1' with a 'Multicast' checkbox and a 'Source port' field set to '0', and 'Remote IP' with a dropdown menu showing '10.16.148.29' and a 'Dest. port' field set to '2262'. There are 'Close TCP' and 'Close UDP tx' buttons.

"**127.0.0.1**" listens to the localhost port. This is the loopback adapter. It receives data which is sent to this localhost address by another process.

This data is internal data and not available on the network.

Or select a dedicated local IP address to listen at.

Note: one NIC can hold several IP addresses.

TX UDP:

One transmitting UDP port can be open under terminal.

Transmitting is done through a local source IP address and a local source port to a destination IP address and port.

Max packet size is 65535 bytes, the send buffer size is auto allocated.

"Broadcast" use limited broadcast to send the message over the network (255.255.255.255), through a selected local IP or **Any IP** (windows selects the most likely IP to use. **Any does not mean Every for sending**)

"Dest. IP" can be a dedicated IP as shown above, but also to all IP addresses on that subnet. (192.168.0.255) (see directed broadcast)

If the source port is left on "0" the system chooses a free UDP port to write through. If selecting a source port other than 0, be aware that other processes might be affected which uses the same port.

Safe ports to write through are in general from 3000-65536.

In the terminal RX textbox these ports are shown when checking "**From IP:port**" and "**Local IP:port**".

Broadcasting

- Limited broadcast - A packet is sent to a specific network or series of networks. A limited broadcast address includes the network or subnet fields. In a limited broadcast packet destined for a local network, the network identifier portion and host identifier portion of the destination address is either all ones (255.255.255.255) or all zeros (0.0.0.0).
- Flooded broadcast - A packet is sent to every network. (**this is blocked by all ISP routers**)
- Directed broadcast - A packet is sent to a specific destination address where only the host portion of the IP address is either all ones or all zeros (such as 192.20.255.255 or 190.20.0.0).

Broadcast (also called Limited broadcast) goes only on the local subnet and is not forwarded through a router, it is actually the broadcast address for network zero. (0.0.0.0), which is THIS network

Directed broadcast:

The broadcast address for an IPv4 host is generally obtained by performing a bitwise logical OR operation between the bit complement of the subnet mask and the host's IP address.

Example: to broadcast a packet to an entire IPv4 subnet using the private IP address space 172.16.0.0/12, which has the subnet mask 255.240.0.0, the broadcast address is: 172.16.0.0 | 0.15.255.255 = 172.31.255.255

Directed Broadcast IP Address Calculation example 2

IP=192.35.128.93 submask=255.255.255.224

Convert the computer IP address to the binary form

the binary form of 192.35.128.93 is

11000000.00100011.10000000.01011101.

Convert the subnet mask to the binary form

the binary form of 255.255.255.224 is

11111111.11111111.11111111.11100000.

Determine host bits in the computer IP address that are represented as zeros in the network mask. In our example, the last 5 bits in the network mask are zeros, hence the last 5 digits are the host bits.

Substitute all host bits in the computer IP by "1" to obtain the broadcast address in the binary form.

In our example, the broadcast address is 11000000.00100011.10000000.01011111.

Convert the binary broadcast IP address to the decimal-dot form

the binary address 11000000.00100011.10000000.01011111 translates into 192.35.128.95 broadcast IP address.

Calculate free host addresses with a given CIDR address

IP address = 192.168.10.30/30

How many host addresses can be used and which ones?

IP= 11000000 . 10101000 . 00001010 . 00011110 = 192.168.10.30

SN= 11111111 . 11111111 . 11111111 . 11111100 = 255.255.255.252

AND= 11000000 . 10101000 . 00001010 . 00011100 -> convert back

Start IP = 192 . 168 . 10 . 28

Available addresses = 4 192.168.10. x

x = 28 or 29 or 30 or 31 28=this network, 31=broadcast. **2 hosts addresses available**

Broadcast address= 11000000 . 10101000 . 00001010 . 00011111 = 192.168.30.31

See Main-Tools menu for an IP calculator.

MULTICAST

Multicast server transmits an UDP message to several interested UDP receivers.(Clients)

For both multicast (client and server) use the TX IP **Dest. IP** dropdown box to enter a multicast address.

Multicast address can only be in IP range 224.0.0.0 through 239.255.255.255

Many Multicast addresses are reserved. See <http://www.iana.org/assignments/multicast-addresses/>

TCP:

One TCP port can be open under terminal.

The TCP port can function as server or client. See checkbox tooltip.

A TCP server waits for clients to connect. More than one client can connect to this TCP server.

A client connects to a TCP server.

Use **Destination IP** and **Destination port** for the client. The client connects to the TCP server IP and local (source) port.

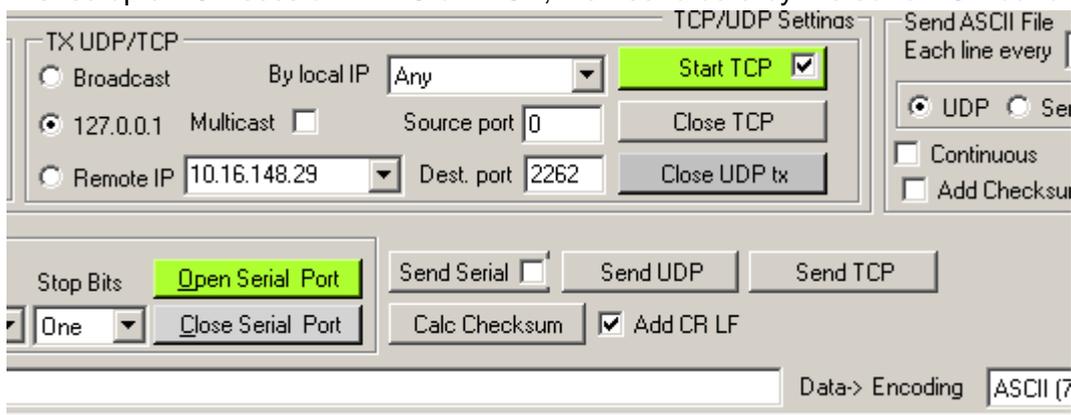
Use **By local IP** and **Local port** for a server session. Select **Any** under **By local IP** if Any IP should be able to connect to this server. The server waits on the **Local port** for a client connection request.

When the client connects to a TCP server, it sends a connect request to the servers listening port. The client local source port is an ephemeral port number and the server replies through its listening port to the client's source port. (The local source port for a TCP client cannot be assigned manually as with UDP.) The session uses two different ports.

If the client session cannot connect or loose connection to a server, the port must be manually reopened.

The server session waits again for another client to connect.

First setup a TCP session with **Start TCP**, than send data by the **send TCP** button



Note: Telnet is actually a TCP session.

Adding time to the received data.

Time stamps are taken when the complete received packet has arrived. Not when the packet started.

The time stamp is inserted in front of the data.

So the time when the first char was received of the packet is less (Take baudrate into account).

If measuring time with e.g. serial port data, the best setting on the terminal is:

Uncheck "Enable delimiter" (in serial port group),

Check "Add CRLF" (under the clear button),

Uncheck "Every LF" (behind time checkboxes)

This gives the most accurate timestamps and overview about what's happening.

Encoding/decoding

All data is send and received as a byte (8 bits).

Depending on the encoding/decoding options the data stream is differently interpreted.

When receiving NMEA messages by a serial port, every 6-8 bytes a packet is received due to the serial port chip, if **Enable delimiter CRLF** is checked, than the process will wait for the CRLF before processing the data, if a CRLF is not received than it appears that nothing is received.

Enabled delimiter CRLF will automatic decode the data with ASCII decoding.

NMEA standard uses the ASCII character set. The most significant bit of the eight-bit character (byte) shall always be transmitted as zero (D7 = 0) and the chars must be printable.

Chars 0-31 and 128-255 are invalid for NMEA. Char 127 is reserved with several others. See nmea.pdf file.

However, some equipment sends or need to be configured with other chars and they need to be interpreted.

For this the encoding / decoding option none (bytes) is included. (also for binary logging)

Equipment might send invalid characters as NMEA data.

All non printable chars in this encoding are surrounded by brackets.

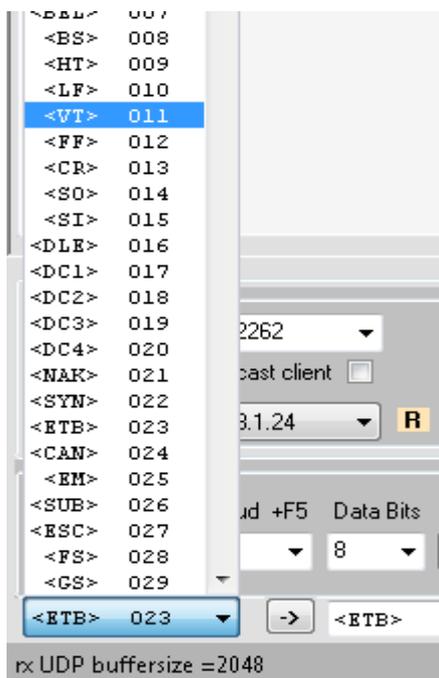
The first 32 chars are displayed by their common names,

e.g. <NUL>, <ESC> , chars above 127 by their value <245>

In none (bytes) decoding only time functions are available for analyses.

The data is then saved as binary if a log file is open; this is different from the other encodings. Also the time is saved in the log if enabled.

The button **Insert Control chars** can be used to send the unprintable chars if encoding none is selected.



Select a char and press the -> button.

So, NMEA message can be viewed in non (bytes) decoding together with any invalid char.

The other encodings might be useful in some circumstance's.

Under simulation a binary file can be transmitted with encoding option (Bytes)none.

Start Logging saves all incoming data to a file, which can be retransmitted under simulation.

To log binary data to a .bin file, select decoding none(bytes).

Unprintable chars are shown between brackets, but the binary data is logged as coming in.

Logging continues also when the screen output is paused.

Calculations

Navigational common calculations and scaling

The screenshot shows a software window titled "Calculations" with a standard Windows interface. At the top, it states "Decimal separator = . (dot)". Below this, there are three input fields labeled "Value1", "Value2", and "Value3", followed by an equals sign and a button labeled "Click to copy data to clipboard".

The main area contains several rows of buttons for different calculations:

- Unit conversions: knots to m/s, m/s to knots, rad/s to deg/m, deg/m to rad/s, degrees to radians, radians to degrees, Nm to Meters, Meters to Nm.
- Speed and Radius: Speed(knots), Rate(deg/m) to Radius(Nm); Speed(knots), Radius(Nm) to Rate(deg/m); Rate(deg/m), Radius(Nm) to Speed(knots).
- Coarse Change: Coarse1(deg Heading), Coarse2(deg Setpoint) to Coarse change(deg); Radius(Nm), Coarse change(deg) to Wheelover(m); Speed(knots), Rate(deg/min), Coarse change(deg) to Wheelover(m); Wheelover(m), Coarse change(deg) to turn radius(Nm); Leg 1(nm), Coarse change(deg), leg 2(nm) to Maximum radius(Nm).

On the right side, there is a "Google Startpoint" section with input fields for "Start lat1" (5156.0509N), "Start lon1" (00413.4780 E), "End lat2" (2924.6602.N), and "End lon2" (2 33.800W). Next to these are buttons for "calc distance gc", "calc init bearing gc", "calc xte gc", "calc distance rumb", "calc bearing rumb", and "calc xte rumb". To the right of these buttons are labels for "Distance", "Xte", and "Bearing", each with a "Click to copy" button.

At the bottom right, there is a "Scaling" section with input fields for "InMin" (4), "InMid" (11.5), "InMax" (20), and "Input" (13). There are also dropdown menus for "OutMin" (-100) and "OutMax" (100), a "<-Swap->" button, and a "Calc" button. The result of the calculation is displayed in a text box as "17.6470588235294".

Depending on the function 1, 2 or 3 input values are required.
First Enter the values, then click a button

Appendix A

From AIS document Rec. ITU-R M.1371-3

4.2.1 Reporting interval (RI)

The different information types are valid for different time periods and thus need different update intervals.

Static information: Every 6 min or, when data has been amended, on request.

Dynamic information: Dependent on speed and course alteration according to Tables 1 and 2.

Voyage related information: Every 6 min or, when data has been amended, on request.

Safety related message: As required.

TABLE 1

Class A shipborne mobile equipment reporting intervals

Ship's dynamic conditions	Nominal reporting interval
Ship at anchor or moored and not moving faster than 3 knots	3 min ⁽¹⁾
Ship at anchor or moored and moving faster than 3 knots	10 s ⁽¹⁾
Ship 0-14 knots	10 s ⁽¹⁾
Ship 0-14 knots and changing course	3 1/3 s ⁽¹⁾
Ship 14-23 knots	6 s ⁽¹⁾
Ship 14-23 knots and changing course	2 s
Ship >23 knots	2 s
Ship >23 knots and changing course	2 s

⁽¹⁾ When a mobile station determines that it is the semaphore (see § 3.1.1.4, Annex 2), the reporting interval should decrease to 2 s (see § 3.1.3.3.2, Annex 2).

NOTE 1 – These values have been chosen to minimize unnecessary loading of the radio channels while maintaining compliance within the IMO AIS performance standards.

NOTE 2 – If the autonomous mode requires a shorter reporting interval than the assigned mode, the Class A shipborne mobile AIS station should use the autonomous mode.

TABLE 2

Reporting intervals for equipment other than Class A shipborne mobile equipment

Platform's condition	Nominal reporting interval
Class B "SO" shipborne mobile equipment not moving faster than 2 knots	3 min ⁽¹⁾
Class B "SO" shipborne mobile equipment moving 2-14 knots	30 s ⁽¹⁾
Class B "SO" shipborne mobile equipment moving 14-23 knots	15 s ⁽¹⁾⁽³⁾
Class B "SO" shipborne mobile equipment moving > 23 knots	5 s ⁽¹⁾⁽³⁾
Class B "CS" shipborne mobile equipment not moving faster than 2 knots	3 min
Class B "CS" shipborne mobile equipment moving faster than 2 knots	30 s
Search and rescue aircraft (airborne mobile equipment) ⁽⁴⁾	10 s
Aids to navigation	3 min
AIS base station ⁽²⁾	10 s

⁽¹⁾ When a mobile station determines that it is the semaphore (see § 3.1.1.4, Annex 2) the reporting interval should decrease to 2 s (see § 3.1.3.3.2, Annex 2).

⁽²⁾ The base station's reporting interval should decrease to 3 1/3 s after the station detects that one or more stations are synchronizing to the base station (see § 3.1.3.3.1, Annex 2).

⁽³⁾ The nominal reporting interval for Class B "CS" is 30 s.

⁽⁴⁾ Shorter reporting intervals down to 2 s could be used in the area of search and rescue operations.