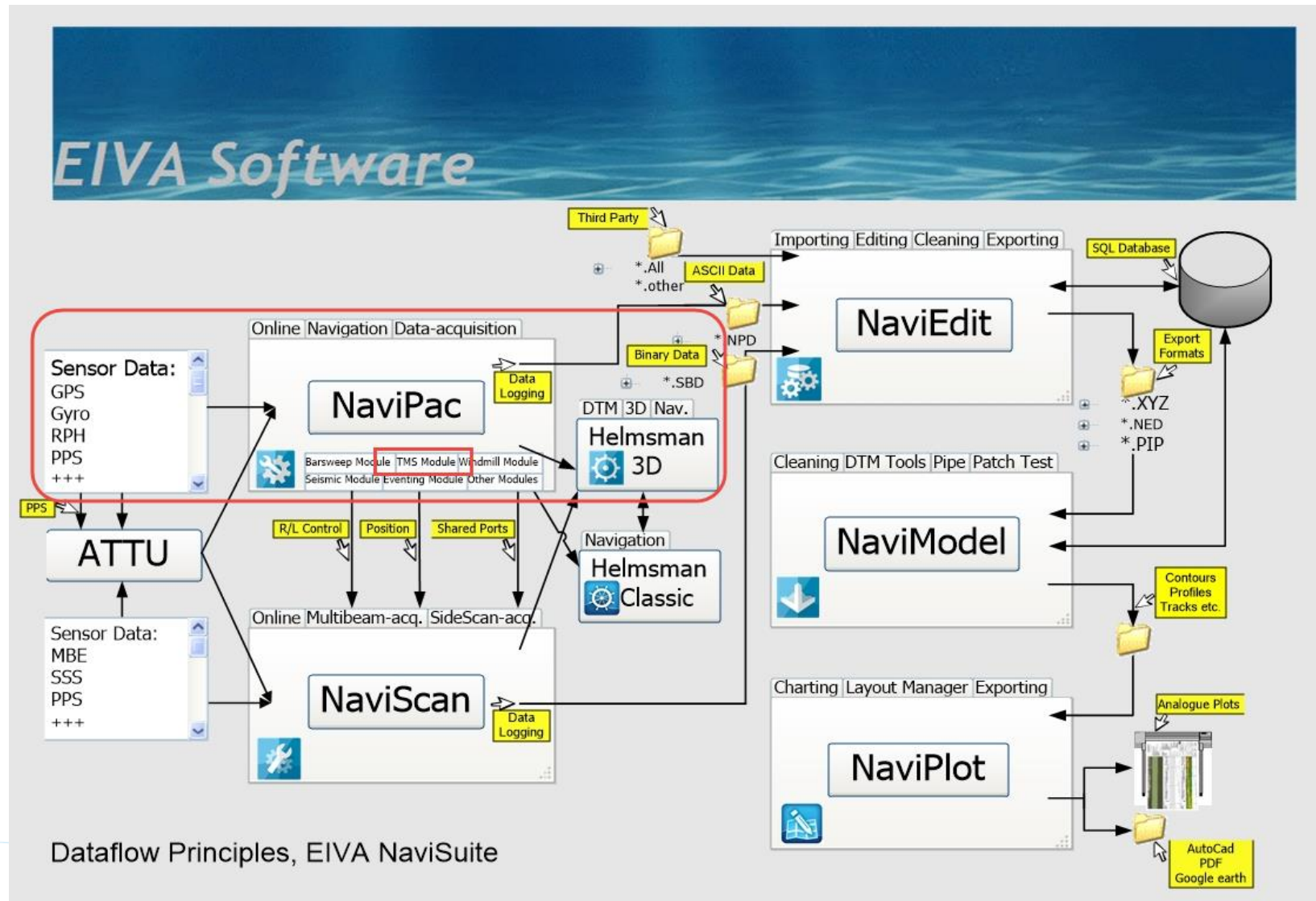




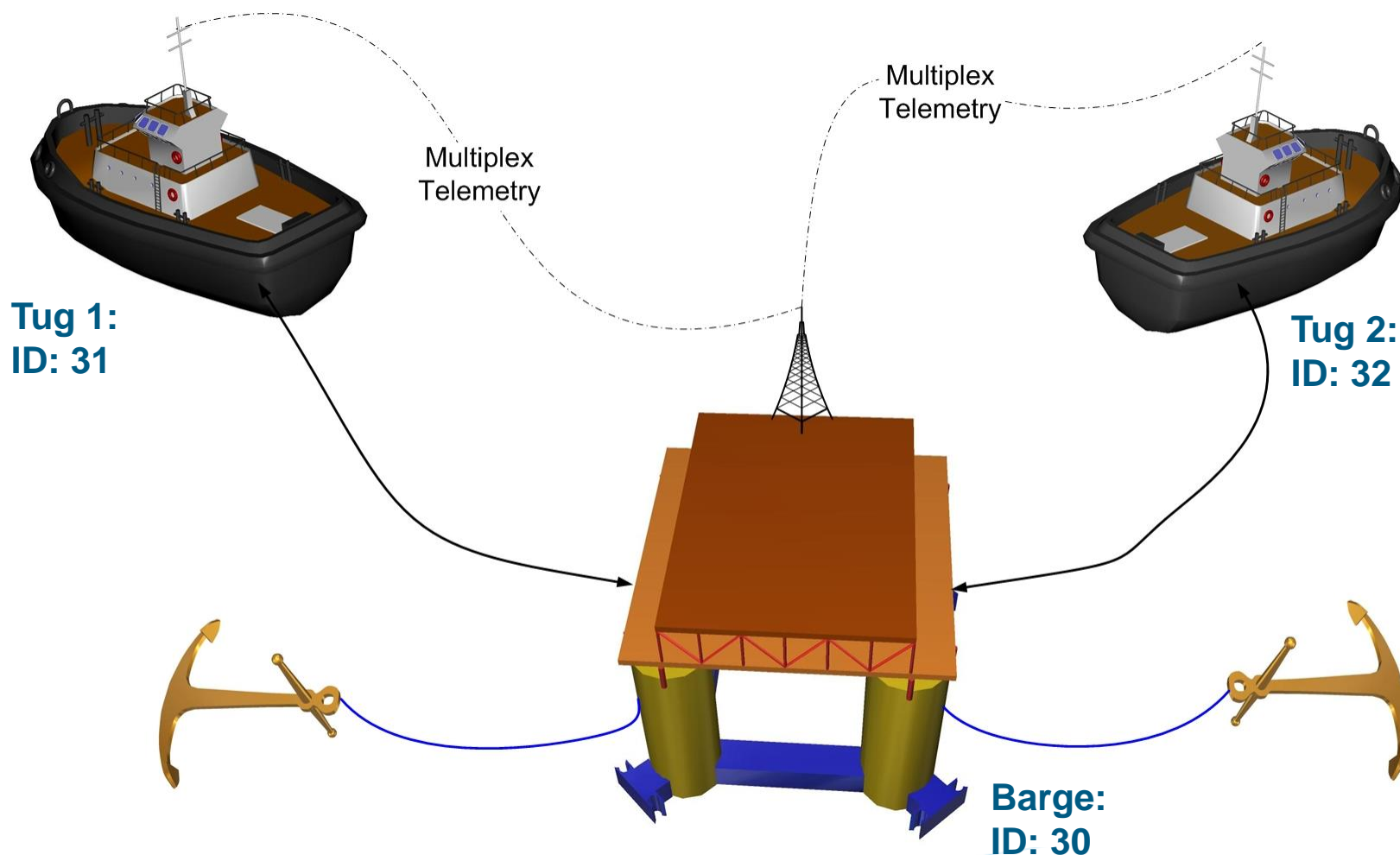
NaviPac 4 Tug Management Module

With Telemetry

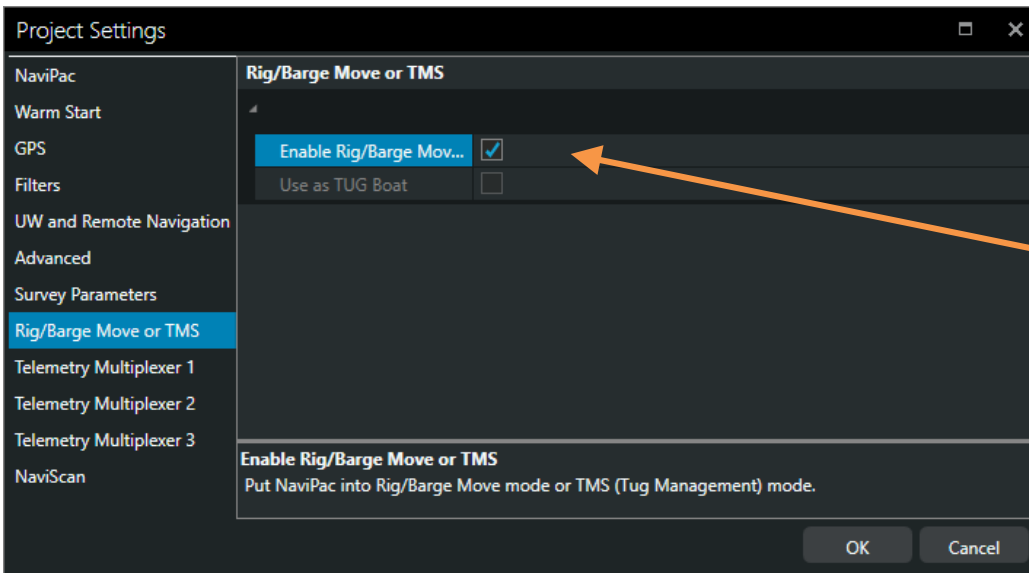
Tug Management in EIVA NaviSuite



The Situation

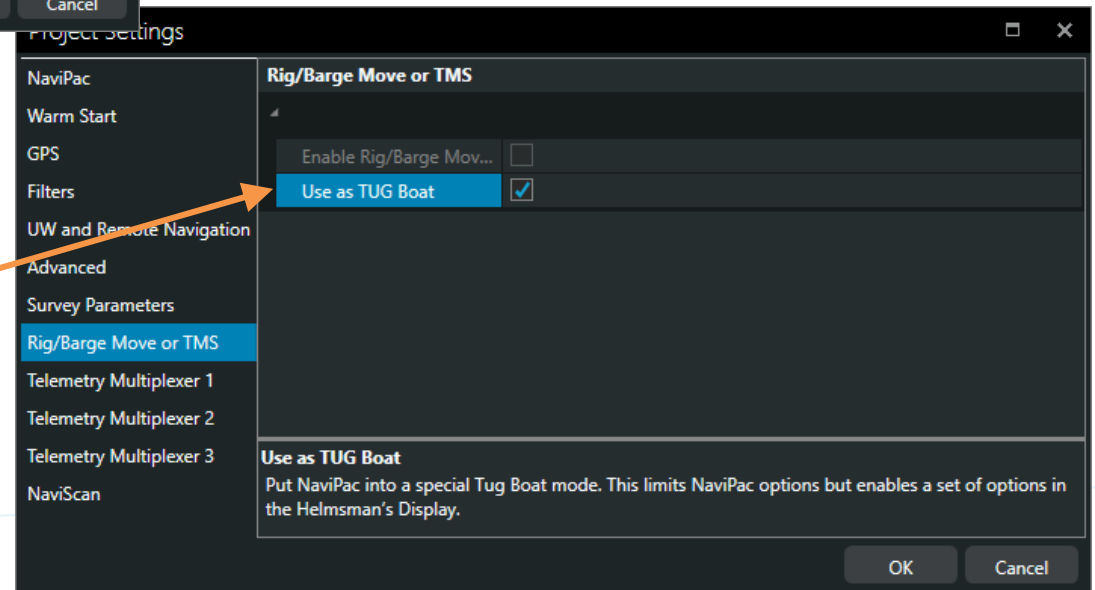


NaviPac – Defining Mode



On the Barge, Rig/Barge mode must be enabled.

Use as TUG Boat on the Tugs.



NaviPac – RIGSetup on the Barge I

RIGSetup

XY View scale (1 cm = x m) 200 Drag cursor in order to re-centre the vessel.

Load Setup... Save Setup... Reset !!!

Number of Winch points: 8

To use Auto Calculate all Anchors: Define winch points clockwise !!!!!

Winch	X	Y	Z
Winch 1	10.00	59.00	0.00
Winch 2	26.00	57.00	0.00
Winch 3	26.00	-42.00	0.00
Winch 4	5.00	-42.00	0.00
Winch 5	-20...	-42.00	0.00
Winch 6	-41...	-42.00	0.00
Winch 7	-41...	57.00	0.00
Winch 8	-25...	59.00	0.00

Rig/Barge Layout

Outline/Shape file: Select... Edit...

C:\EIVA\NaviPac\Setup\Wiking.shp

Name: Svanen

Client: Company

Close Apply

Placement ☒ Show Anchors

Well: Aarhus

Easting: 581600

Northing: 6226000

Grid Heading: 10

Anchor Positions...

Anchor Positions

Auto Calculate all Anchors...

Matched Winches and Anchors

Winch	Anchor	Easting	Northing	Range	Bearing	MLB	MLM	State
Winch 1	S1	582194.63	6226538.46	750.000	50.000	No	No	Racked
Winch 2	S2	582382.65	6225986.25	750.000	95.000	No	No	Racked
Winch 3	S3	582100.40	6225379.59	750.000	140.000	No	No	Racked
Winch 4	S4	581532.26	6225210.62	750.000	185.000	No	No	Racked
Winch 5	S5	580998.48	6225480.02	750.000	230.000	No	No	Racked
Winch 6	S6	580805.18	6226031.12	750.000	275.000	No	No	Racked
Winch 7	S7	581087.43	6226637.79	750.000	320.000	No	No	Racked
Winch 8	S8	581650.99	6226809.59	750.000	5.000	No	No	Racked

Selected Anchor

Anchor Name: S1 Anchor State: Racked

Anchor/Proposed Position

Easting: 582194.63 Northing: 6226538.46

Range/Grid Bearing from Winch Position

Range: 750.000 Bearing: 50.000

Update Anchor Restore Anchor to Original

Buoys

Mid Line Buoys

☐ Use Mid Line Markers

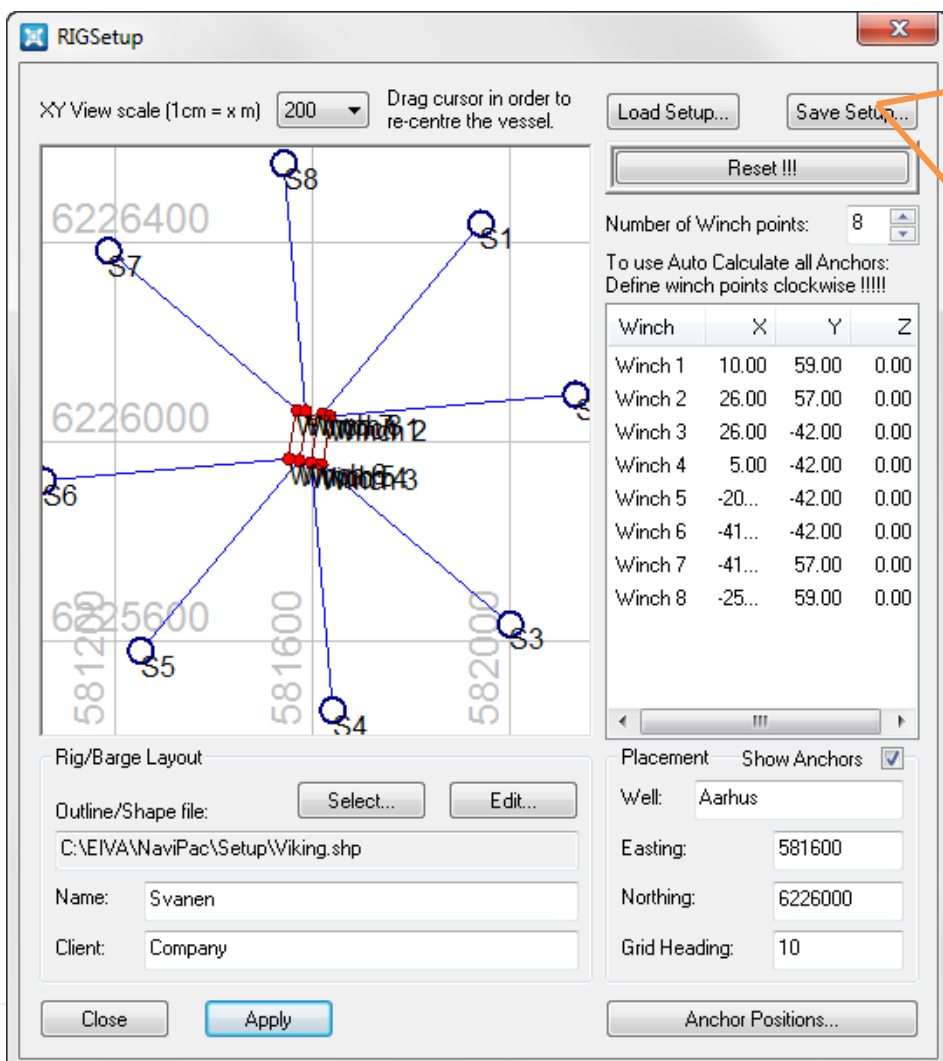
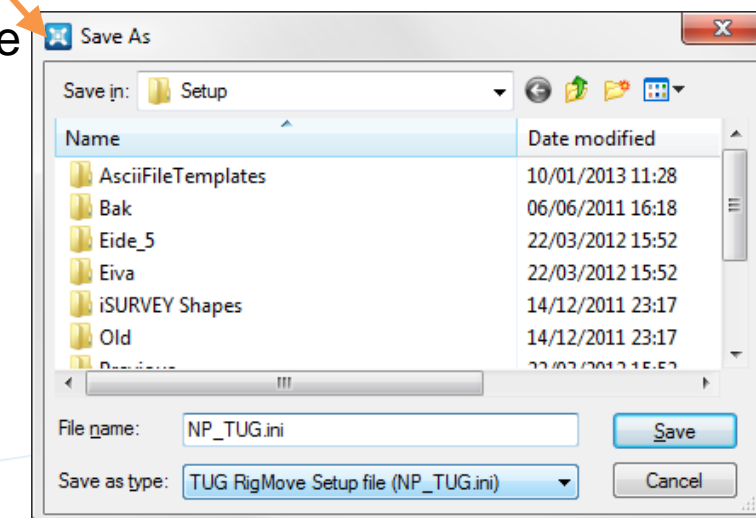
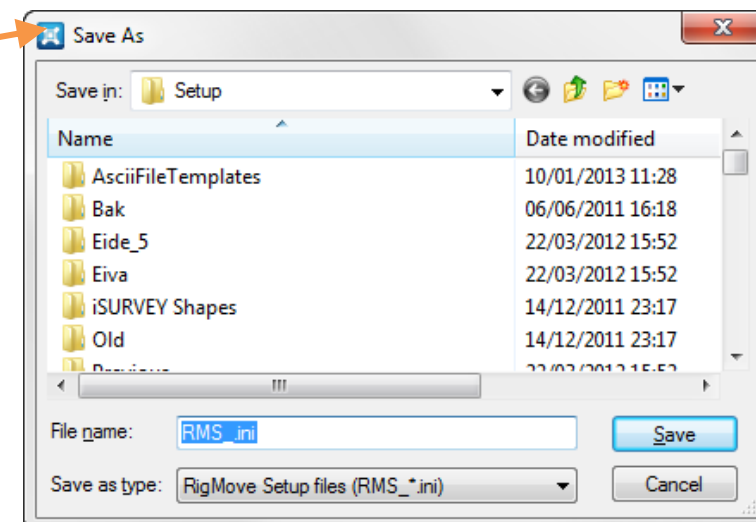
Marker Interdistance 0

Cancel OK

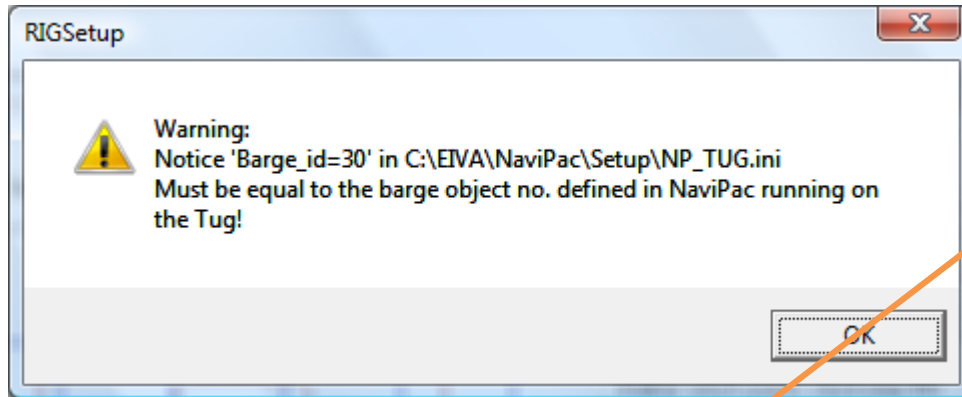
NaviPac – RIGSetup on the Barge II

1 - Save as
RigMove
Setup file.

2 - Save as
TUG Rigmove
Setup file.



NaviPac – Rigsetup for the Tugs



When saving the TUG Rigmove Setup file, the warning above is given.

The file NP_TUG.ini, which is generated from the RIGSetup tool (previous slide), must be copied onto the Setup folder in EIVAHOME of each of the Tugs (C:\EIVA\NaviPac\Setup).

```
[RigMove]
Barge_id=30
No winch points=8
WinchName01=W1
WinchOffset01=10.000, 60.000, 0.000
WinchName02=W2
WinchOffset02=27.000, 57.000, 0.000
WinchName03=W3
WinchOffset03=27.000, -42.000, 0.000
WinchName04=W4
WinchOffset04=5.000, -42.000, 0.000
WinchName05=W5
WinchOffset05=-20.000, -42.000, 0.000
WinchName06=W6
WinchOffset06=-42.000, -42.000, 0.000
WinchName07=W7
WinchOffset07=-42.000, 57.000, 0.000
WinchName08=W8
WinchOffset08=-25.000, 60.000, 0.000
```

NaviPac – Barge – Position Output

To send the position of the Barge to the Tugs, the following must be defined:

Barge

Data Output:
 Data to ext. nav. System
 Port 5000; IP addr. 127.0.0.1
 More:
 Included: Vessel
 Rate: 5
 First ID: 30

Address of multiplexer:
 127.0.0.1 (Port 5000).

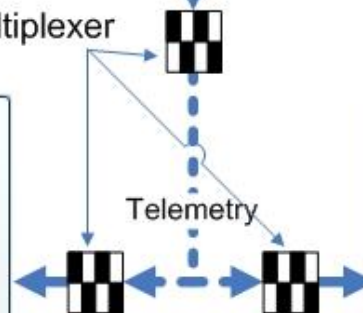
Tug 1

Dynamic Positioning:
 Remote dynamic objects 1
 Port 5010 IP adr. 127.0.0.1
 More:
 Included: Barge
 TP Number: 30

Tug 2

Dynamic Positioning:
 Remote dynamic objects 1
 Port 5010 IP adr. 127.0.0.1
 More:
 Included: Barge
 TP Number: 30

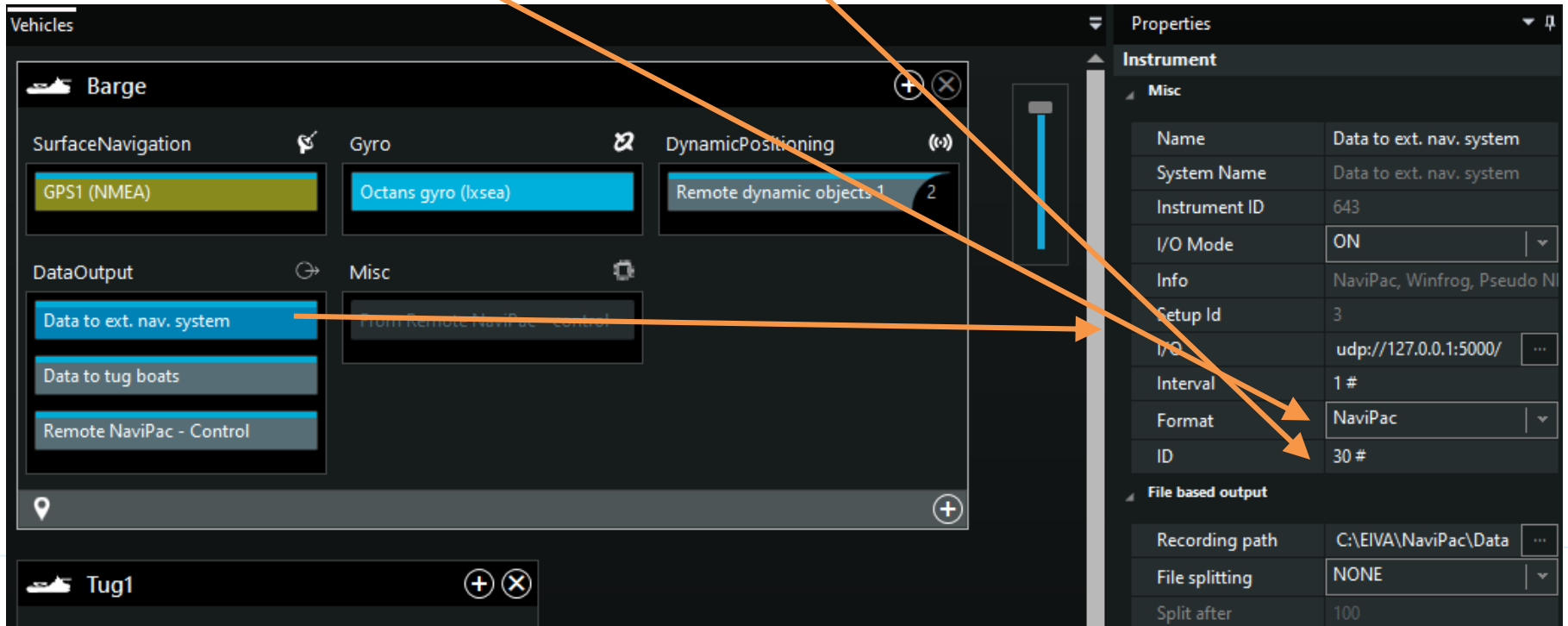
Multiplexer



NaviPac – Barge – Position Output

To send the Barge position to the Tugs, the following output must be selected:

- The IP Address should be 127.0.0.1 to send the data to the Multiplexer.
- ID of the barge position must be set to 30.
- Choose format NaviPac.



Vehicles

Barge

SurfaceNavigation Gyro DynamicPositioning

GPS1 (NMEA) Octans gyro (Ixsea) Remote dynamic objects 1 2

DataOutput Misc

Data to ext. nav. system
Data to tug boats
Remote NaviPac - Control

Properties

Instrument

Misc

Name	Data to ext. nav. system
System Name	Data to ext. nav. system
Instrument ID	643
I/O Mode	ON
Info	NaviPac, Winfrog, Pseudo NI
Setup Id	3
I/O	udp://127.0.0.1:5000/
Interval	1 #
Format	NaviPac
ID	30 #

File based output

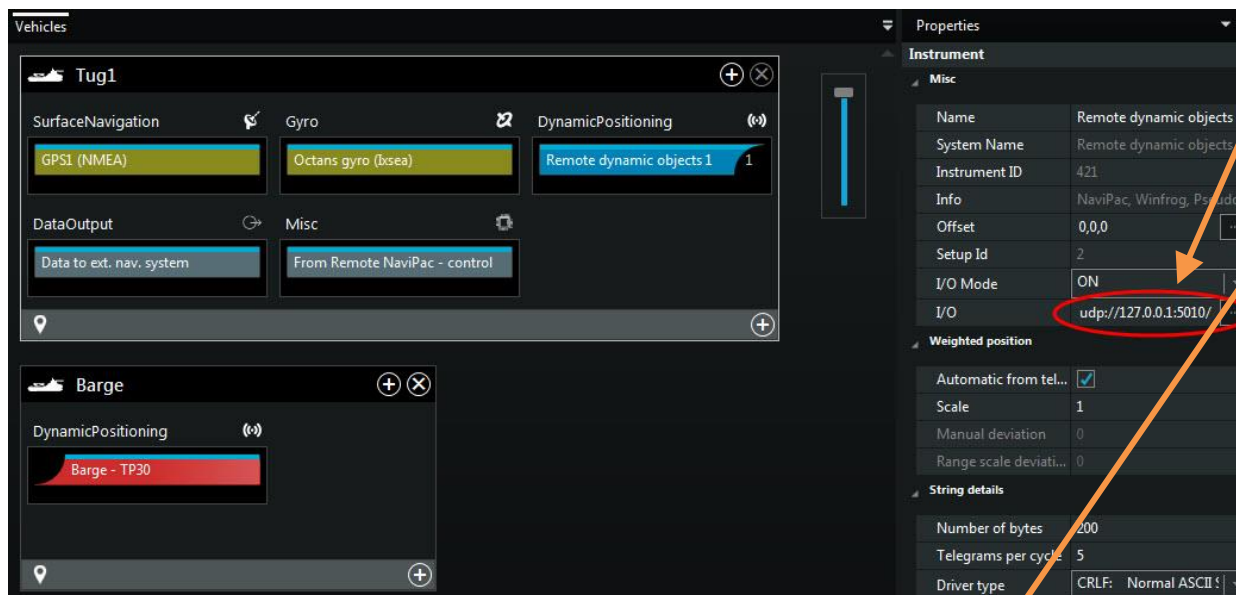
Recording path	C:\EIVA\NaviPac\Data
File splitting	NONE
Split after	100

Tug1

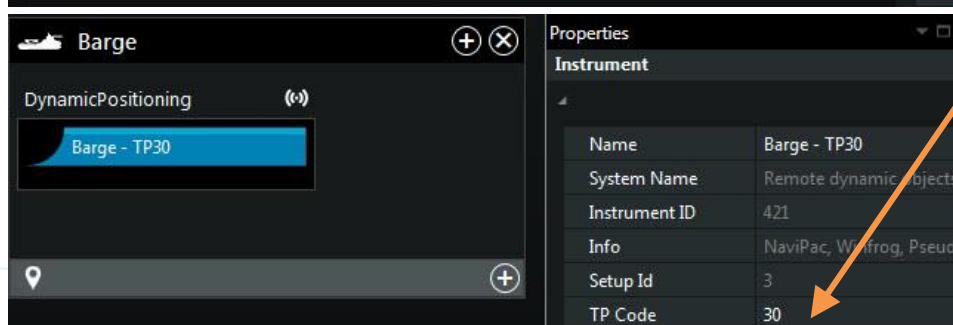
NaviPac – Tug – Receive Barge Position

To receive the barge position on the tugs, the following Dynamic positioning system must be defined:

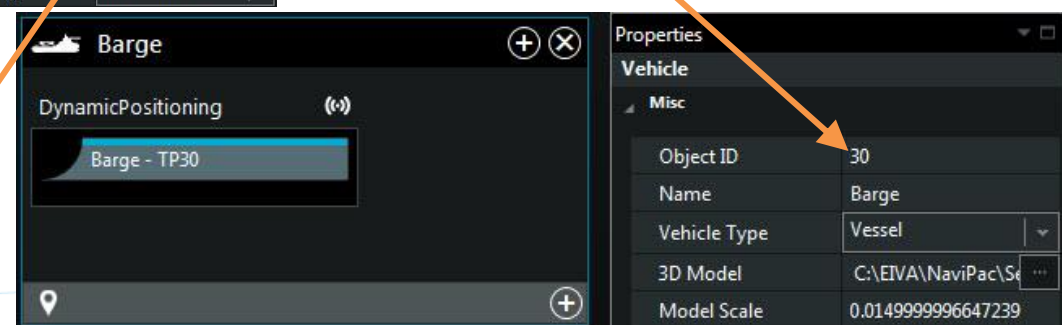
- The IP address: 127.0.0.1 is pointing at the Multiplexer program.
- The TP number of the barge is 30.
- The ID of the Barge vehicle must be 30



The screenshot shows the NaviPac interface with two vehicle windows: Tug1 and Barge. The Tug1 window shows the DynamicPositioning system set to 'Remote dynamic objects 1' with a TP Code of 30. The Barge window shows the DynamicPositioning system set to 'Remote dynamic objects 1' with a TP Code of 30. The IP address 127.0.0.1:5010 is highlighted in the Tug1 properties.

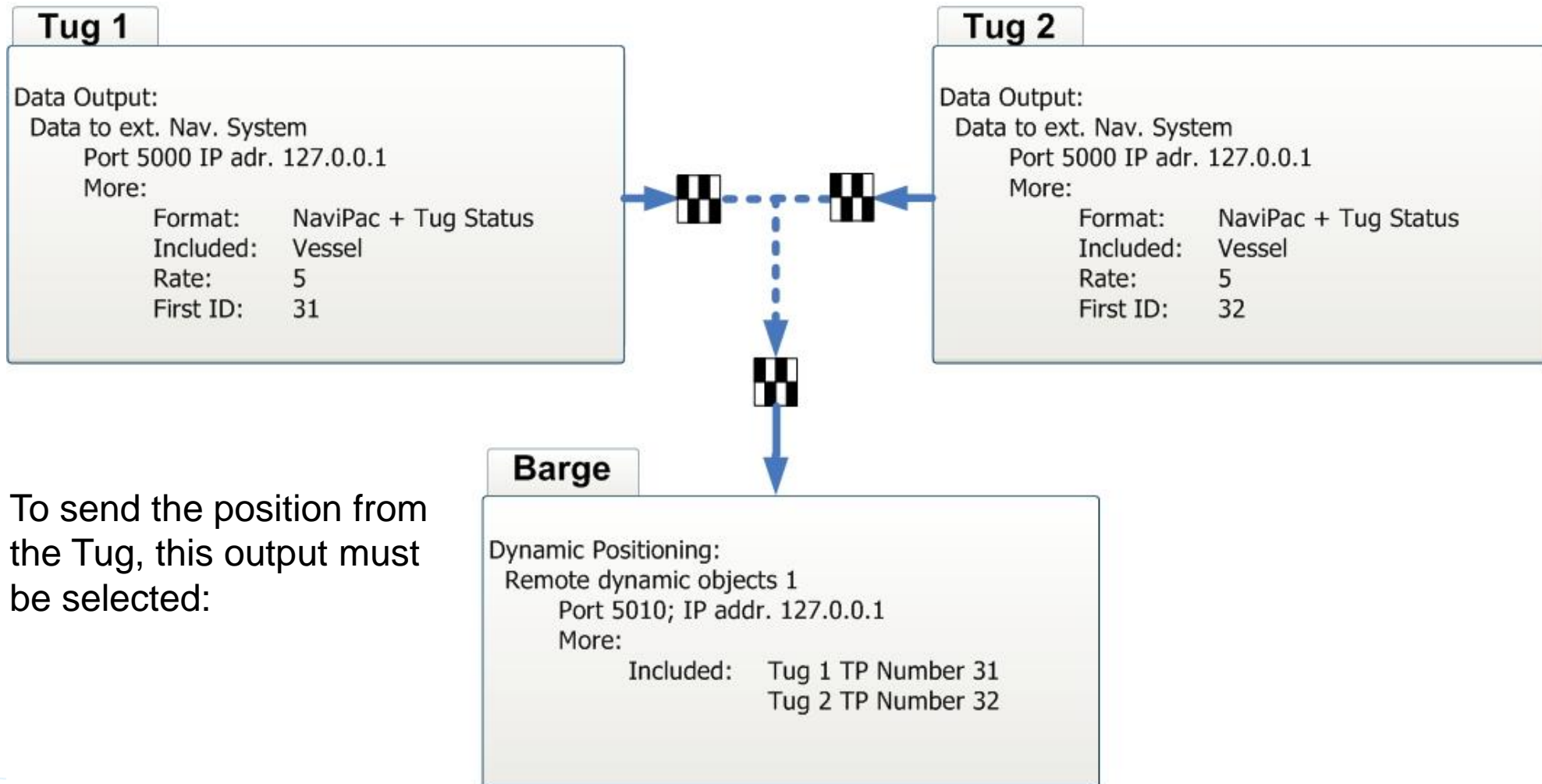


The screenshot shows the NaviPac interface with the Barge window. The DynamicPositioning system is set to 'Barge - TP30' with a TP Code of 30. The Properties window shows the Instrument details for Barge - TP30, including Name, System Name, Instrument ID, Info, Setup Id, and TP Code.



The screenshot shows the NaviPac interface with the Barge window. The DynamicPositioning system is set to 'Barge - TP30' with a TP Code of 30. The Properties window shows the Vehicle details for Barge, including Object ID, Name, Vehicle Type, 3D Model, and Model Scale.

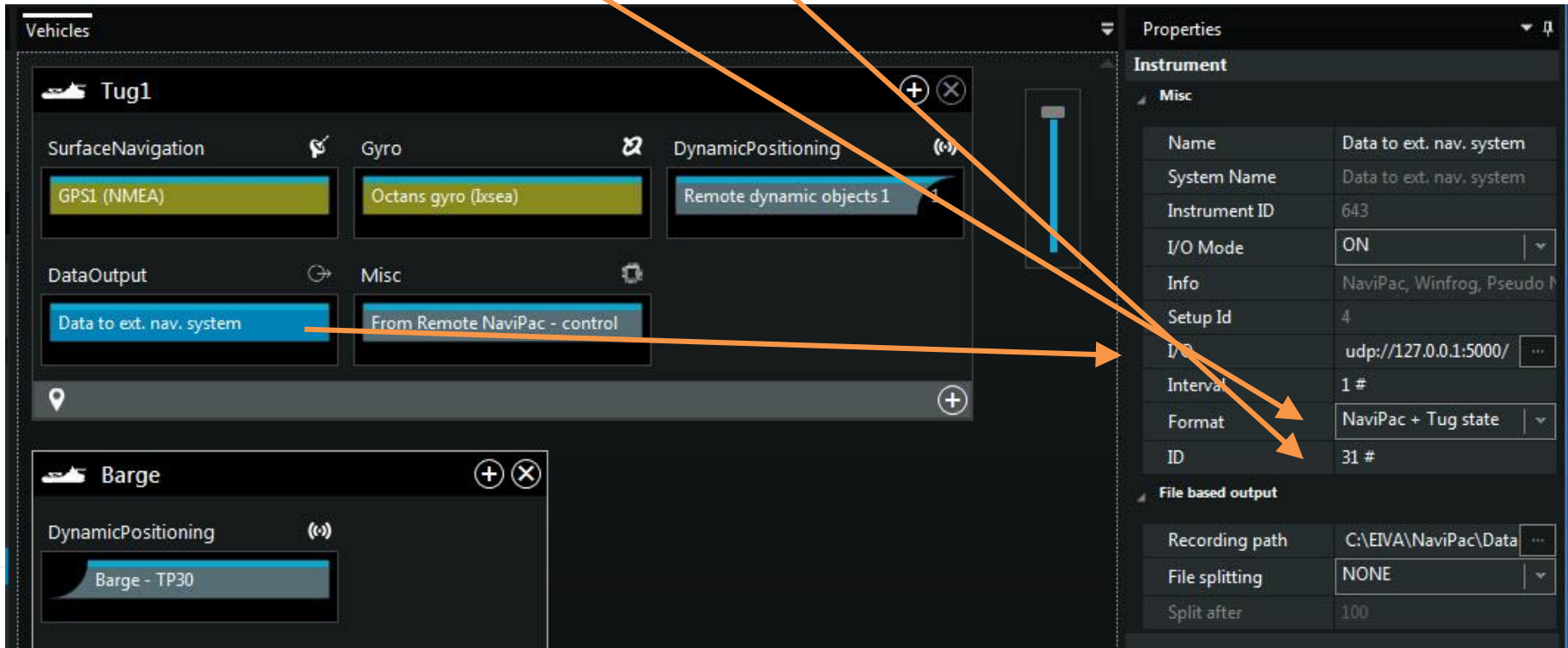
NaviPac – Tug – Position Output



NaviPac – Tug – Position Output

To send the position from the Tug 1, the following output must be defined:

- The reference point (CRP) should be the stern. This is usually the anchor handling point on a tug.
- The ID must be defined as 31 (Tug 1).
- Format is NaviPac + Tug state.



The screenshot shows the EIVA software interface with two vehicle panels: 'Tug1' and 'Barge'. The 'Tug1' panel has sections for 'SurfaceNavigation' (containing 'GPS1 (NMEA)'), 'Gyro' (containing 'Octans gyro (Ixsea)'), and 'DynamicPositioning' (containing 'Remote dynamic objects 1'). The 'DataOutput' section contains 'Data to ext. nav. system', and the 'Misc' section contains 'From Remote NaviPac - control'. The 'Barge' panel shows 'DynamicPositioning' with 'Barge - TP30'. On the right, the 'Properties' panel is open, showing the 'Instrument' tab. The 'Misc' section of the 'Instrument' tab contains the following settings:

Name	Data to ext. nav. system
System Name	Data to ext. nav. system
Instrument ID	643
I/O Mode	ON
Info	NaviPac, Winfrog, Pseudo
Setup Id	4
I/O	udp://127.0.0.1:5000/
Interval	1 #
Format	NaviPac + Tug state
ID	31 #

The 'File based output' section contains the following settings:

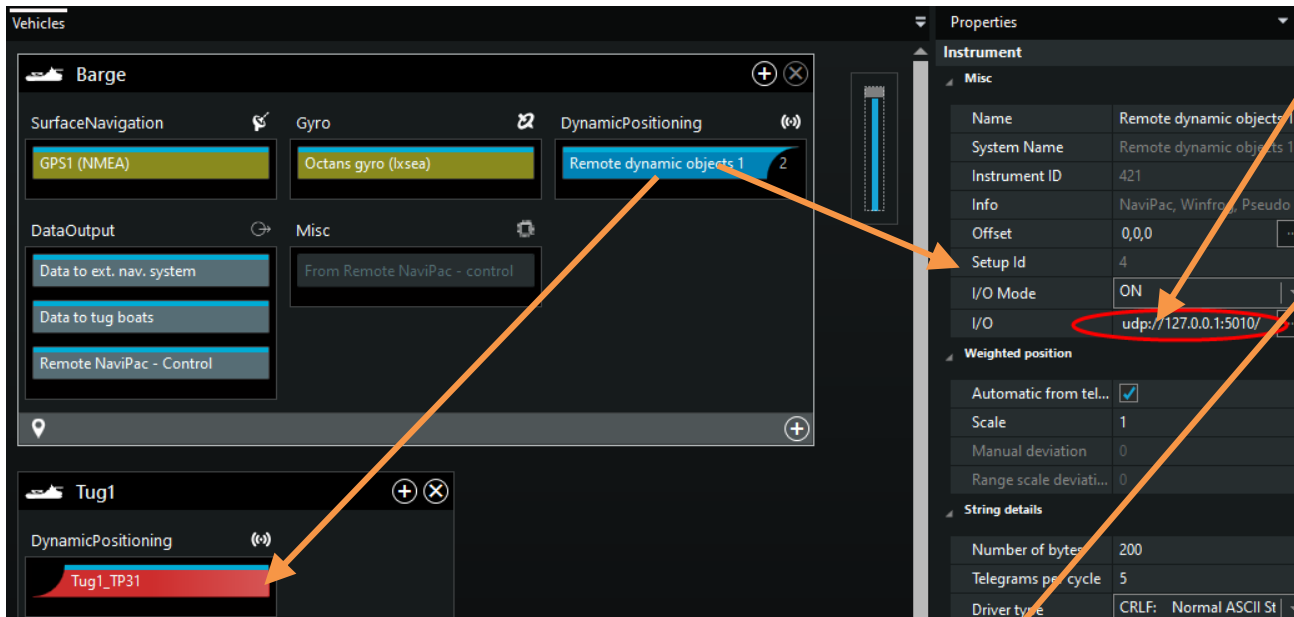
Recording path	C:\EIVA\NaviPac\Data
File splitting	NONE
Split after	100

Orange arrows indicate the configuration steps: one arrow points from 'Remote dynamic objects 1' to the 'I/O' field, another from 'Data to ext. nav. system' to the 'Info' field, and a third from 'From Remote NaviPac - control' to the 'Format' field.

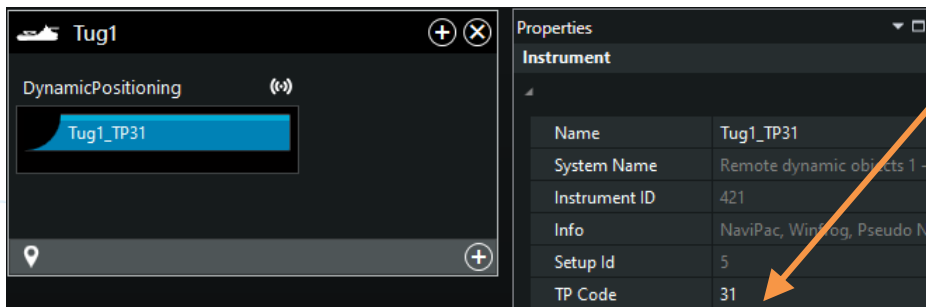
NaviPac – Barge – Receive Tug Position

To receive the tug positions on the barge, the following Dynamic positioning system must be defined:

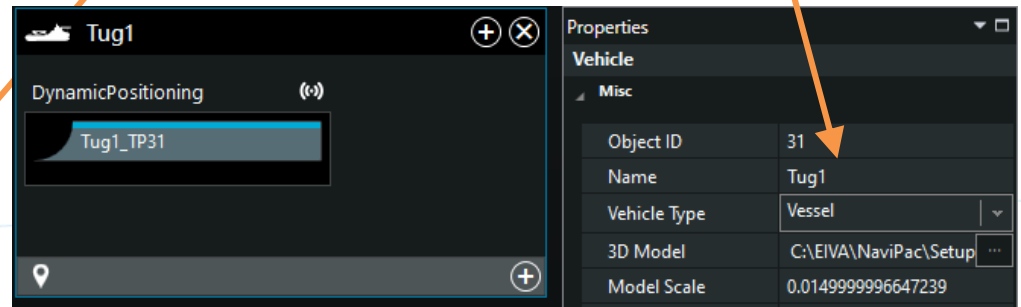
- The IP address: 127.0.0.1 is the address of the Multiplexer.
- The TP number of Tug1 is 31.
- The TP number of Tug2 is consequently 32.
- The ID of the tugs is 31 and 32, respectively



The screenshot shows the 'Vehicles' window with the 'Barge' configuration. The 'DynamicPositioning' section is active, showing 'Remote dynamic objects 1' and '2'. An arrow points from 'Remote dynamic objects 1' to the 'Properties' window.

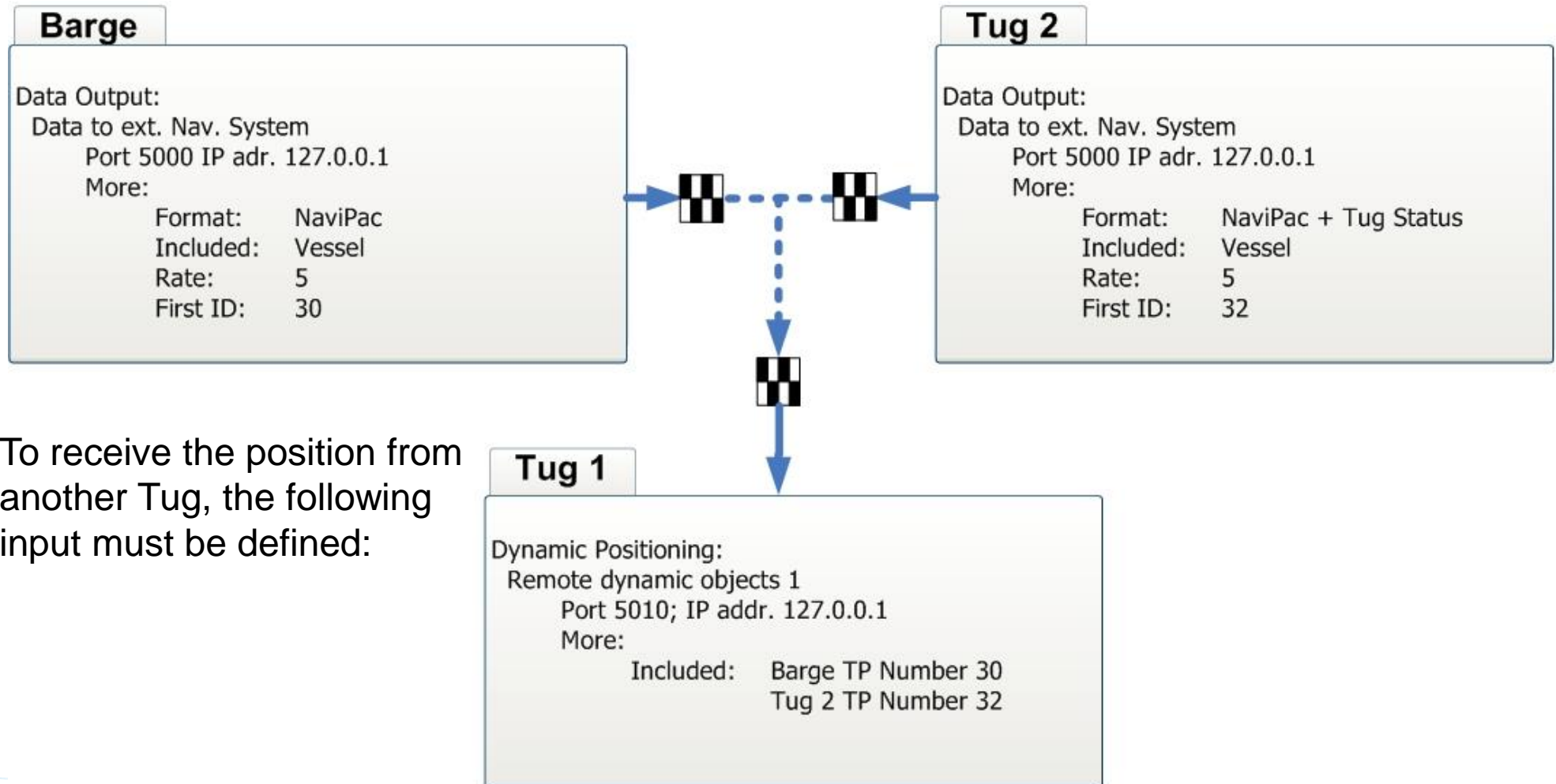


The screenshot shows the 'Vehicles' window with the 'Tug1' configuration. The 'DynamicPositioning' section is active, showing 'Tug1_TP31'. An arrow points from 'Tug1_TP31' to the 'Properties' window.



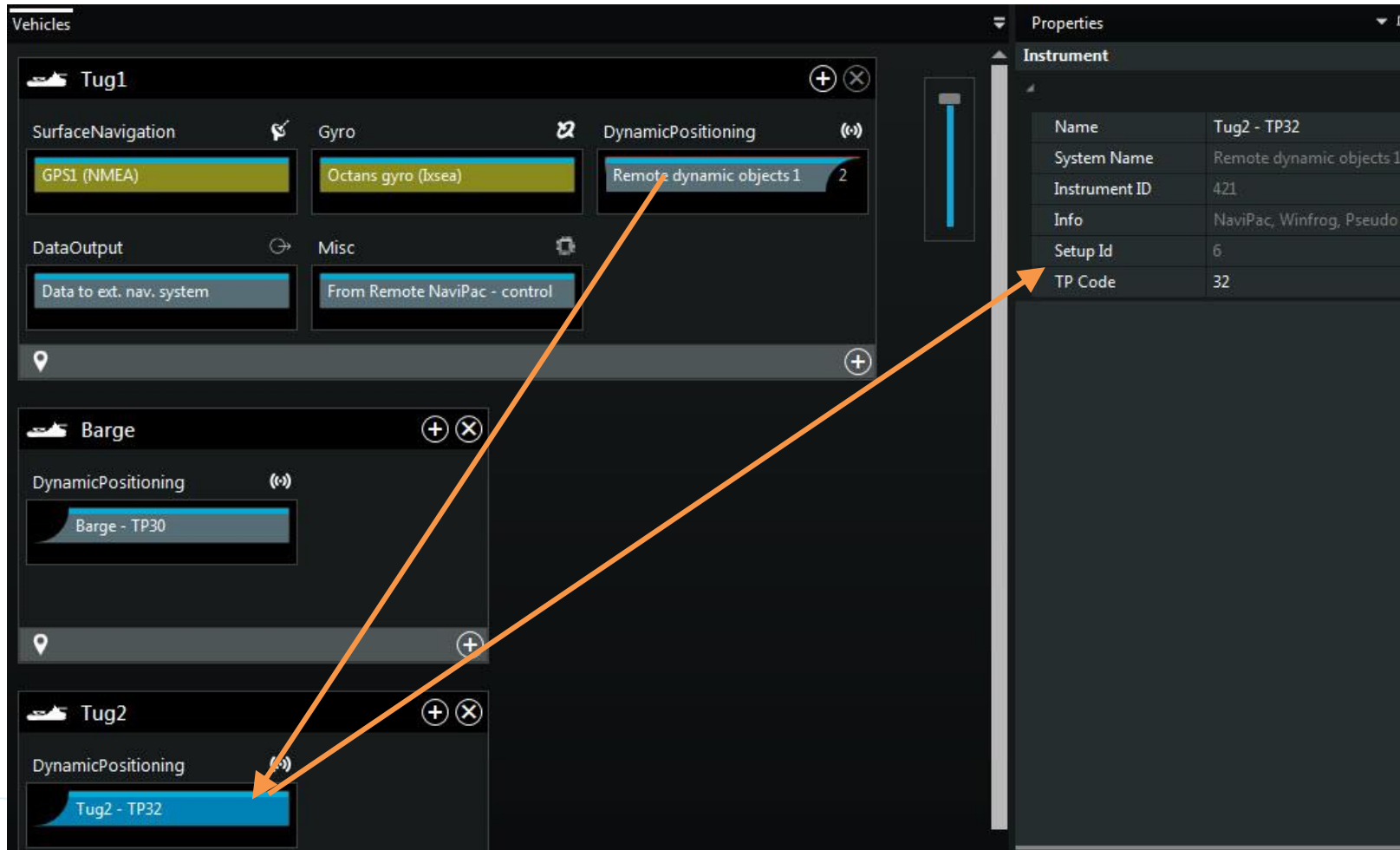
The screenshot shows the 'Vehicles' window with the 'Tug1' configuration. The 'DynamicPositioning' section is active, showing 'Tug1_TP31'. An arrow points from 'Tug1_TP31' to the 'Properties' window.

NaviPac – Tug1 – Receive Tug2 Position



NaviPac – Tug1 – Receive Tug2 Position

To receive the position from another Tug, the following input must be defined:



The screenshot displays the NaviPac software interface with three vehicle configurations: Tug1, Barge, and Tug2. The 'Vehicles' panel on the left shows the configuration for each vehicle, and the 'Properties' panel on the right shows the instrument details for Tug2 - TP32.

Tug1 Configuration:

- SurfaceNavigation: GPS1 (NMEA)
- Gyro: Octans gyro (ksea)
- DynamicPositioning: Remote dynamic objects 1 2
- DataOutput: Data to ext. nav. system
- Misc: From Remote NaviPac - control

Barge Configuration:

- DynamicPositioning: Barge - TP30

Tug2 Configuration:

- DynamicPositioning: Tug2 - TP32

Properties Panel (Instrument):

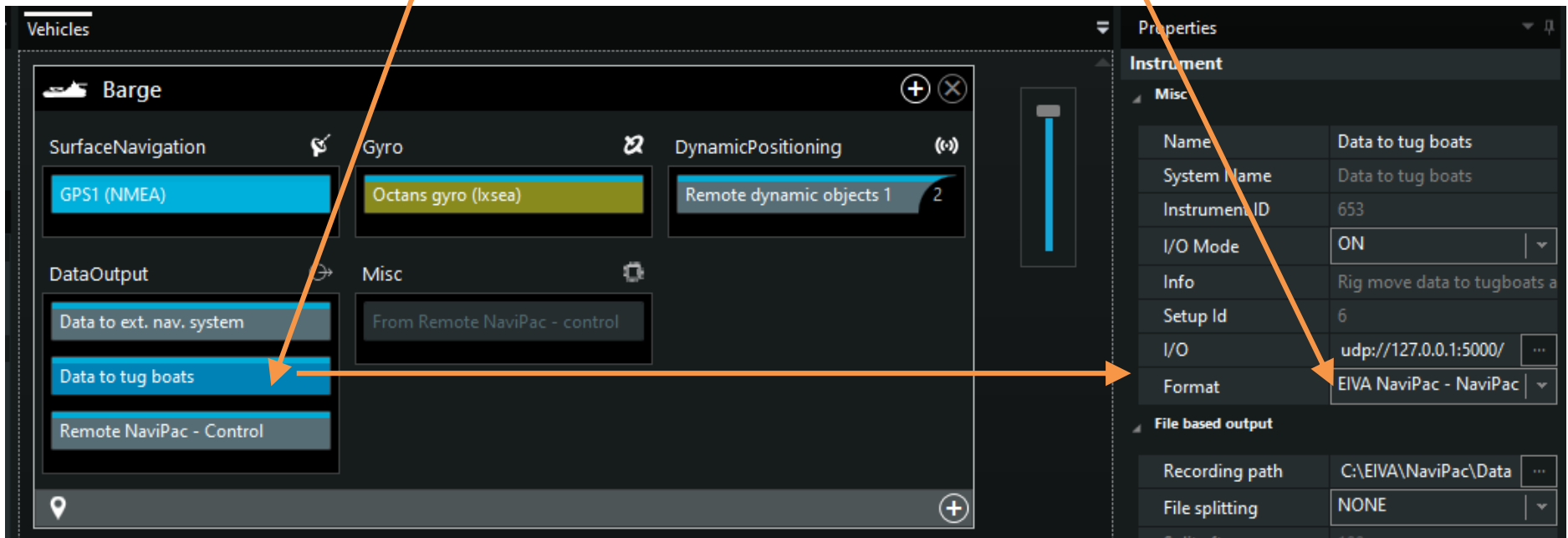
Name	Tug2 - TP32
System Name	Remote dynamic objects 1
Instrument ID	421
Info	NaviPac, Winfrog, Pseudo
Setup Id	6
TP Code	32

Two orange arrows indicate the configuration path: one from the 'Remote dynamic objects 1 2' field in Tug1's DynamicPositioning section to the 'Tug2 - TP32' field in Tug2's DynamicPositioning section, and another from the 'Remote dynamic objects 1 2' field to the 'System Name' field in the Properties panel.

NaviPac – Barge – Output Anchor Pattern

To send the Anchor pattern to the Tugs, a 'Data to tug boats' output must be defined on the Barge:

NaviPac format must be chosen.

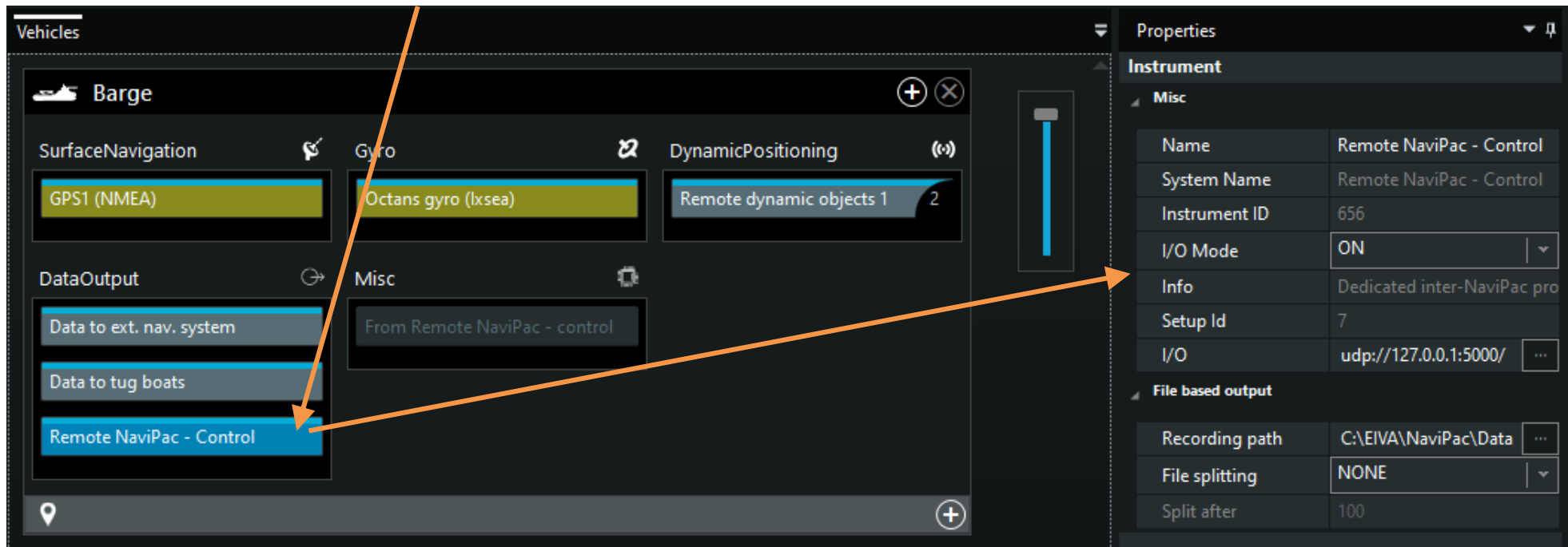


The screenshot shows the EIVA software interface for configuring a Barge vehicle. The 'Vehicles' panel on the left shows the 'Barge' configuration. The 'DataOutput' section has 'Data to tug boats' selected. The 'Properties' panel on the right shows the 'Format' set to 'EIVA NaviPac - NaviPac'.

Properties	
Instrument	
Misc	
Name	Data to tug boats
System Name	Data to tug boats
Instrument ID	653
I/O Mode	ON
Info	Rig move data to tugboats a
Setup Id	6
I/O	udp://127.0.0.1:5000/
Format	EIVA NaviPac - NaviPac
File based output	
Recording path	C:\EIVA\NaviPac\Data
File splitting	NONE

NaviPac – Barge – Send Runlines

To send Runlines to the Tugs, this output must be selected:



The screenshot displays the NaviPac software interface for configuring a Barge vehicle. The 'Vehicles' tab is active, showing the 'Barge' configuration. The 'DataOutput' section is expanded, and 'Remote NaviPac - Control' is selected. An orange arrow points from this selection to the 'Properties' panel on the right, which shows the instrument settings.

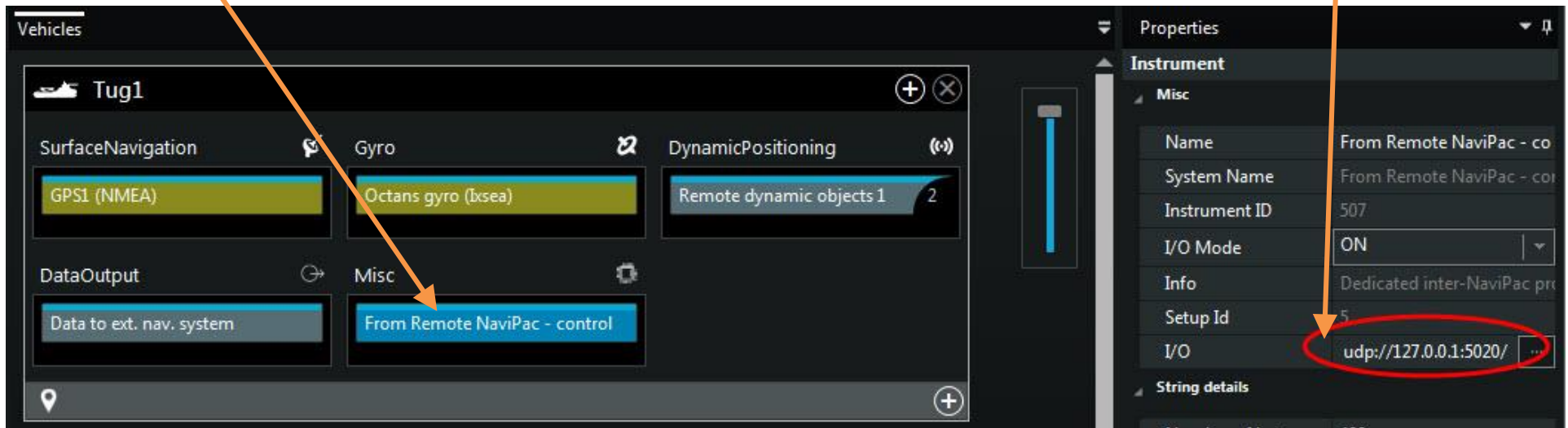
Properties Panel:

Instrument	
Misc	
Name	Remote NaviPac - Control
System Name	Remote NaviPac - Control
Instrument ID	656
I/O Mode	ON
Info	Dedicated inter-NaviPac pro
Setup Id	7
I/O	udp://127.0.0.1:5000/
File based output	
Recording path	C:\EIVA\NaviPac\Data
File splitting	NONE
Split after	100

NaviPac – Tug1 – Receive Anchor Pattern I

To receive the anchor pattern on a tug, a 'From Remote NaviPac – Control' Misc input must be defined:

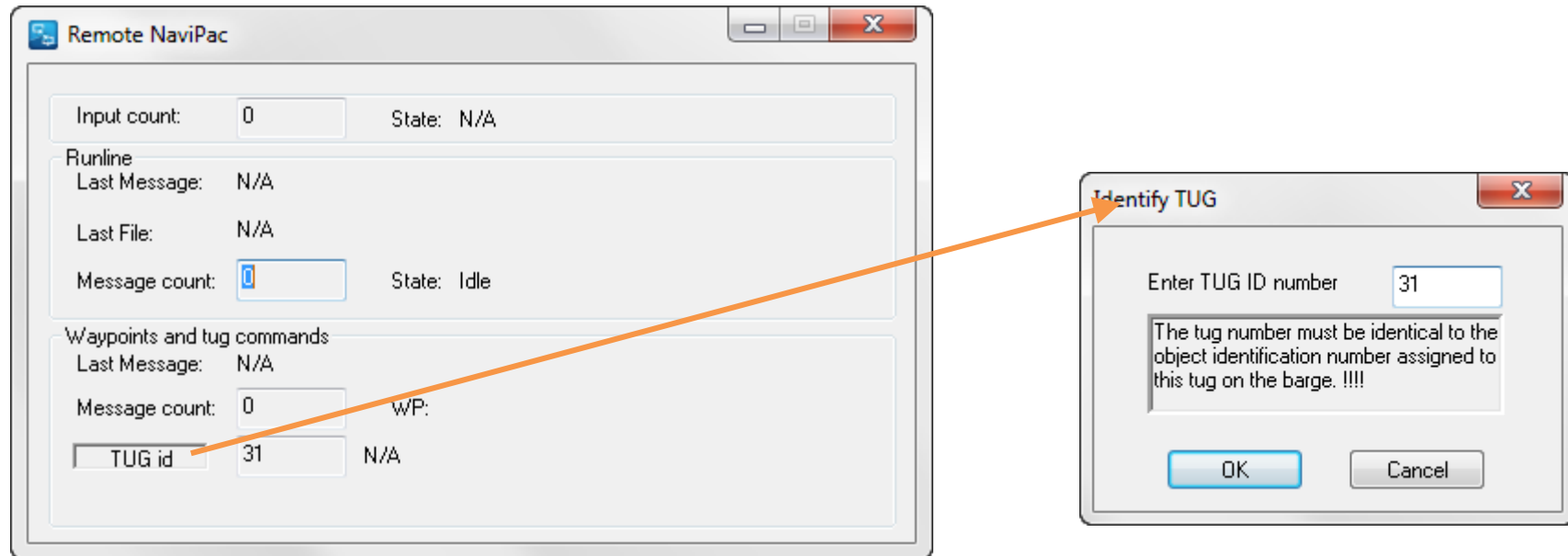
The IP address: 127.0.0.1 is the address of the multiplexer.
Port 5020 is the port, to where the multiplexer is distributing the anchor pattern and the runline data.



The screenshot displays the NaviPac software interface for configuring a vehicle named 'Tug1'. The interface is divided into several sections: 'SurfaceNavigation', 'Gyro', 'DynamicPositioning', 'DataOutput', and 'Misc'. The 'Misc' section is highlighted, showing a button labeled 'From Remote NaviPac - control'. An orange arrow points from the text 'From Remote NaviPac – Control' in the text block to this button. To the right, the 'Properties' panel is visible, showing the 'Instrument' section. The 'I/O Mode' dropdown is set to 'udp://127.0.0.1:5020/', which is circled in red. An orange arrow points from the text 'The IP address: 127.0.0.1 is the address of the multiplexer. Port 5020 is the port, to where the multiplexer is distributing the anchor pattern and the runline data.' to this dropdown.

Instrument	
Misc	
Name	From Remote NaviPac - co
System Name	From Remote NaviPac - cor
Instrument ID	507
I/O Mode	ON
Info	Dedicated inter-NaviPac pr
Setup Id	5
I/O	udp://127.0.0.1:5020/
String details	

NaviPac – Tug – Receive Anchor Pattern II



To receive the anchor pattern on the Tug, the Remote NaviPac window will be opened automatically when entering online mode. Click on the 'TUG id' text-box and the window to the right will open. Now insert the ID (31 for Tug 1 etc). NaviPac will remember this setting.

NaviPac – Messages from Tug to Barge

The operator on the tug can activate some anchor-related commands towards the barge. The activation takes place from the Helmsman's Display of the Tug:

- PICKED UP - The anchor has been picked up from barge (state becomes 'Tracking').
- DROPPED - The anchor has been dropped on the seabed (state becomes 'Laid').
- DE-ASSIGN - The assignment is rejected from the Tug
- FIX - Various events performed on the tug (will be shown on HD of the Barge).

The commands are sent on top of the existing 'Data to external navigation system' output, so no additional setup is required on the tug boat.

The data output (on the Tugs) must be selected to 'NaviPac + Tug state' or 'Expanded NaviPac'.

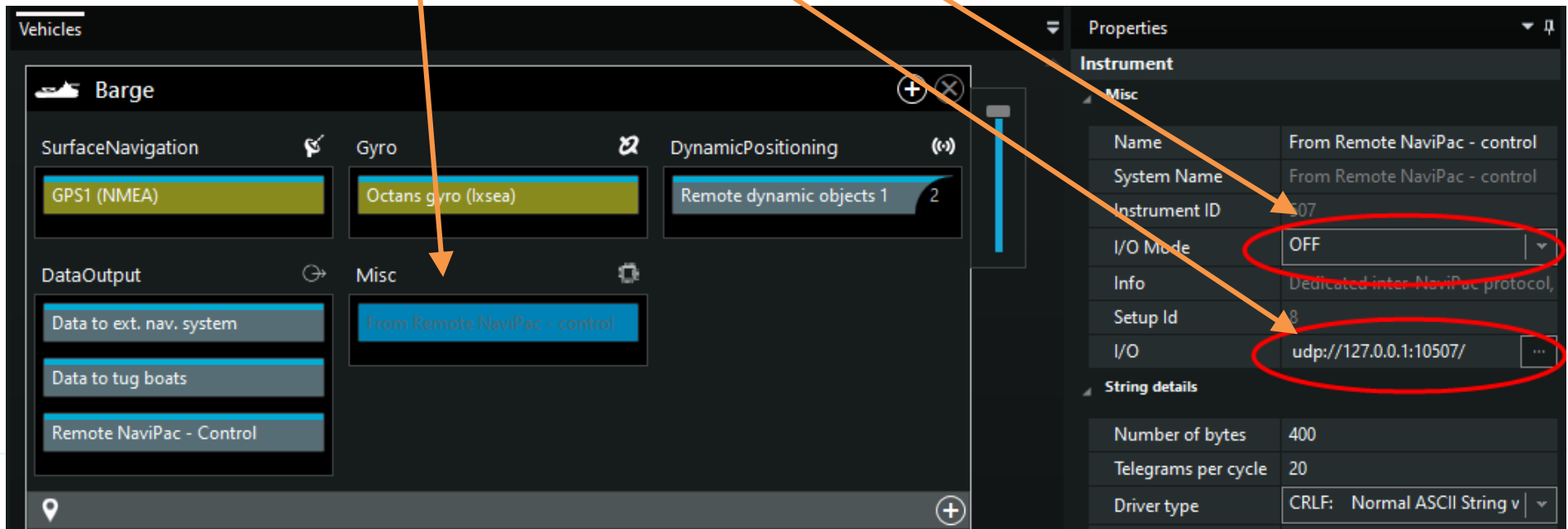


NaviPac – Barge - Messages from the Tug I

A 'Misc' input, 'From Remote NaviPac – control', must be defined in order to enable the Barge NaviPac to be capable of using the in-coming tug commands.

As the data most often is overlaid the general navigation data (from the Tug) the driver must be specified to I/O mode 'Off'.

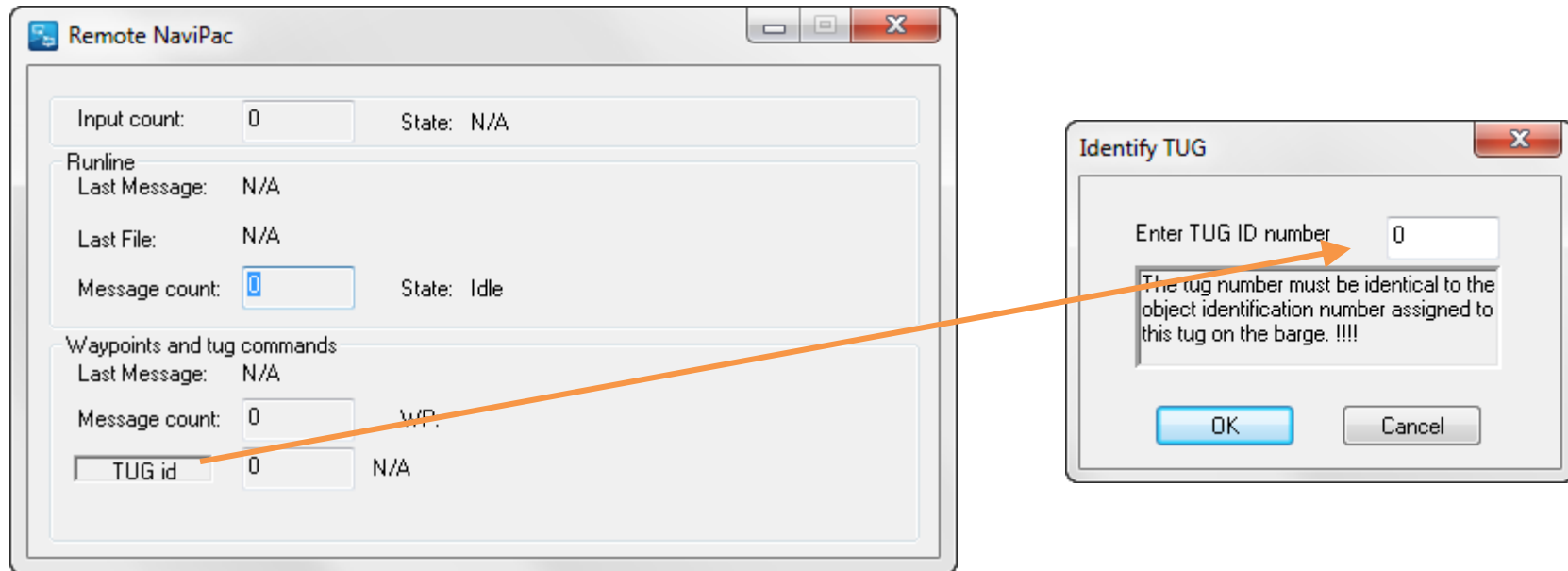
Note the port number – has to be 10507.



The screenshot displays the EIVA software interface for configuring a Barge. The 'Vehicles' panel on the left shows the 'Barge' configuration with various modules like SurfaceNavigation, Gyro, DynamicPositioning, DataOutput, and Misc. The 'Properties' panel on the right shows the 'Instrument' settings for 'Barge'. The 'Misc' section is expanded, showing 'Name', 'System Name', 'Instrument ID', 'I/O Mode', 'Info', 'Setup Id', and 'I/O'. The 'I/O Mode' is set to 'OFF' and the 'I/O' is set to 'udp://127.0.0.1:10507/'. Red circles highlight these two settings. Orange arrows point from the text above to these settings.

Instrument	
Name	From Remote NaviPac - control
System Name	From Remote NaviPac - control
Instrument ID	07
I/O Mode	OFF
Info	Dedicated inter-NaviPac protocol,
Setup Id	8
I/O	udp://127.0.0.1:10507/
String details	
Number of bytes	400
Telegrams per cycle	20
Driver type	CRLF: Normal ASCII String v

NaviPac – Messages from the Tug II



When in online mode, click on the 'TUG id' text-box and the window to the right will open. Now insert the ID (0 - telling that this is the barge). NaviPac will remember this setting. The window should never be closed, as it acts as interface between the NaviPac kernel (interpreter) and the TMS kernel (RigMon).

NaviPac – Barge – Using Multiplexer 1

Three different telemetry systems possible, each related to a radio/frequency.

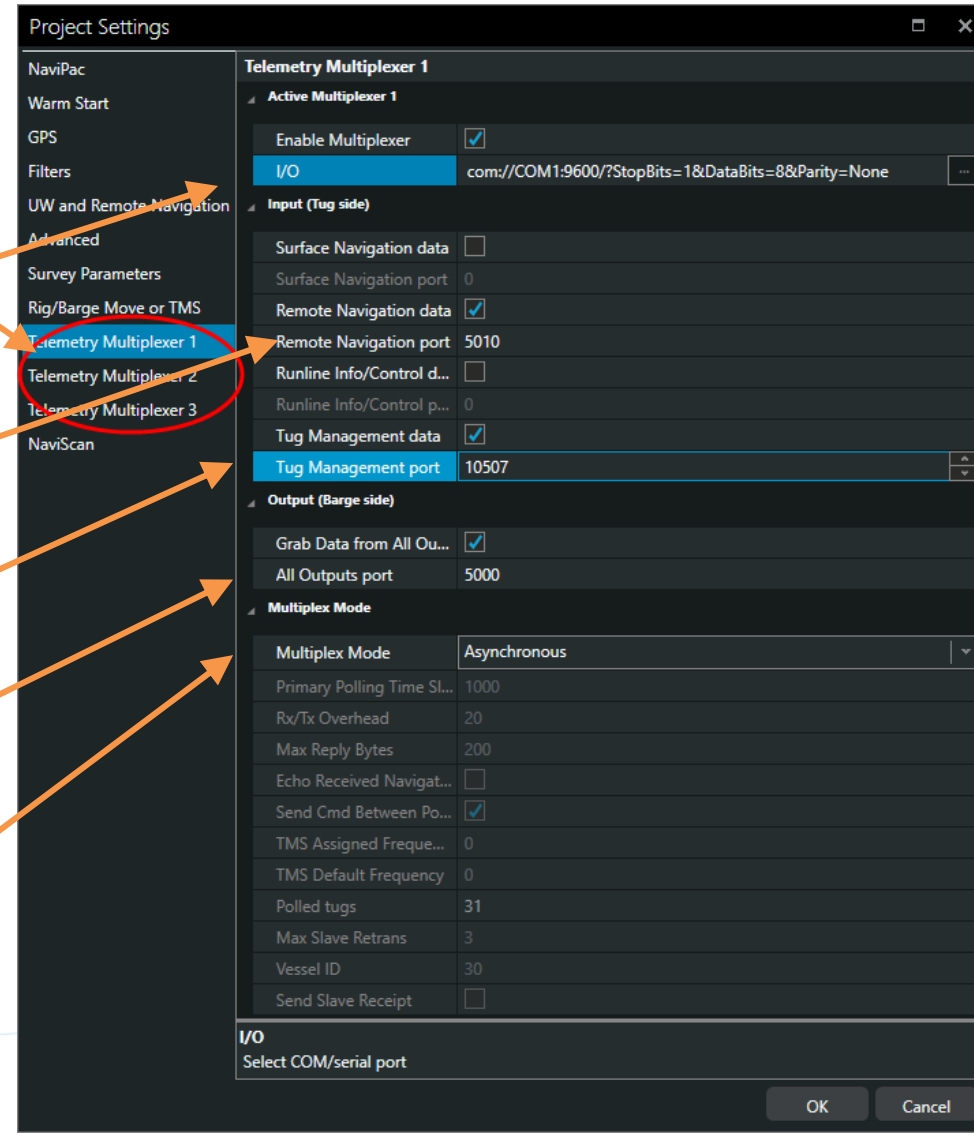
Definition of com-port and I/O settings for the radio interface from where data is read from/routed to.

Remote navigation data distributed to port 5010.

Tug Management data distributed to port 10507 (always).

Output port: all outputs to port 5000 (see next slide)

Asynchronous mode selected – otherwise Polling master on the Barge and Polling Slave on the Tugs.



Project Settings

Telemetry Multiplexer 1

Active Multiplexer 1

Enable Multiplexer ☒

I/O com://COM1:9600/?StopBits=1&DataBits=8&Parity=None

Input (Tug side)

Surface Navigation data ☐

Surface Navigation port 0

Remote Navigation data ☒

Remote Navigation port 5010

Runline Info/Control d... ☐

Runline Info/Control p... 0

Tug Management data ☒

Tug Management port 10507

Output (Barge side)

Grab Data from All Ou... ☒

All Outputs port 5000

Multiplex Mode

Multiplex Mode Asynchronous

Primary Polling Time SL... 1000

Rx/Tx Overhead 20

Max Reply Bytes 200

Echo Received Navigat... ☐

Send Cmd Between Po... ☒

TMS Assigned Freque... 0

TMS Default Frequency 0

Polled tugs 31

Max Slave Retrans 3

Vessel ID 30

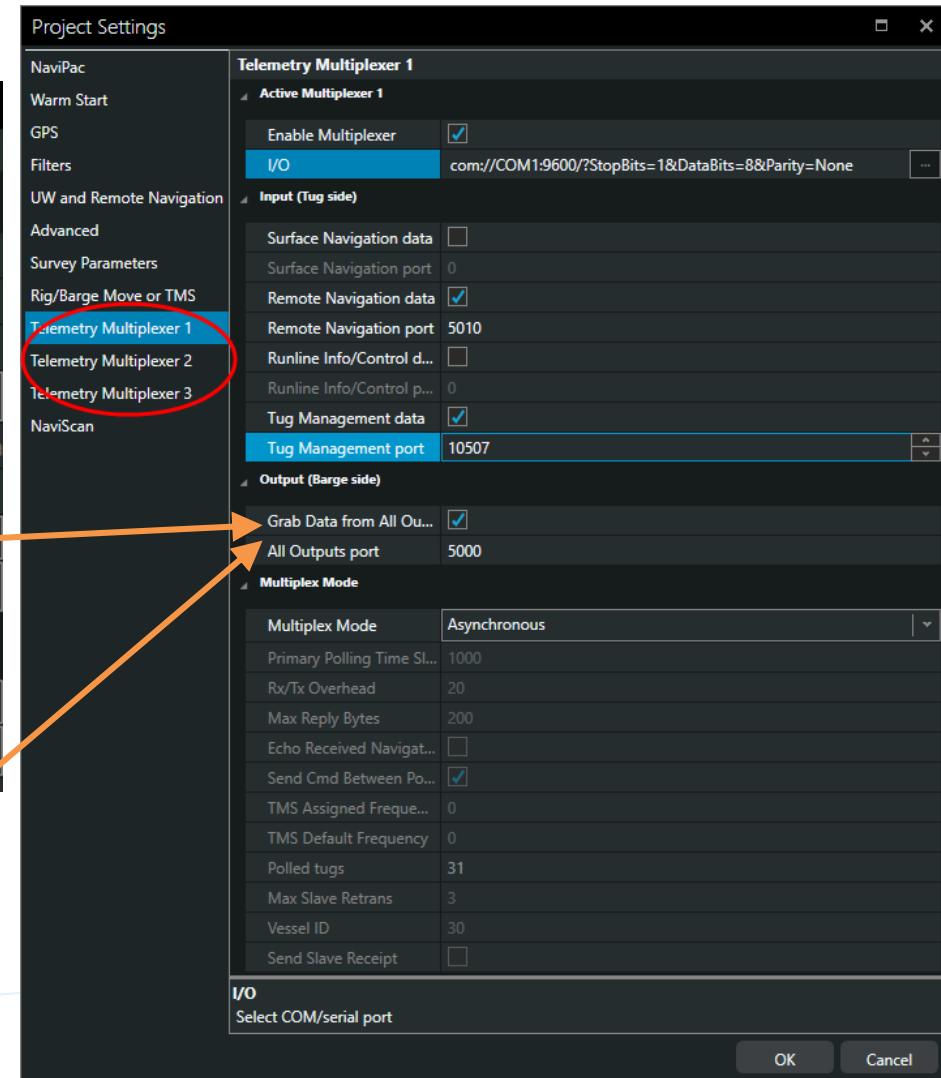
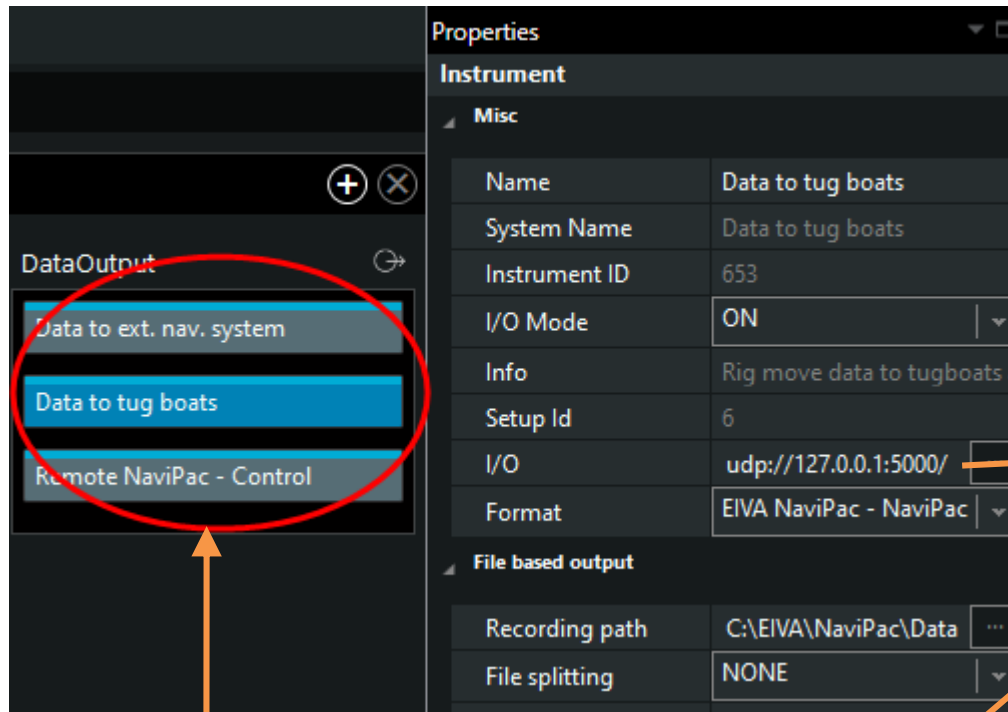
Send Slave Receipt ☐

I/O

Select COM/serial port

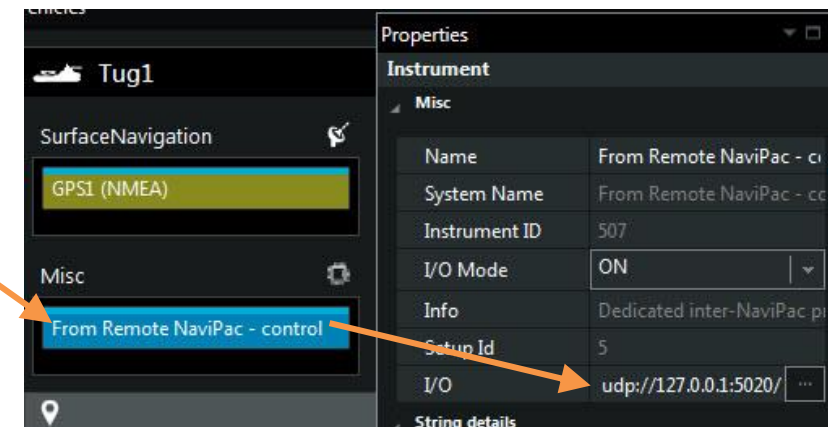
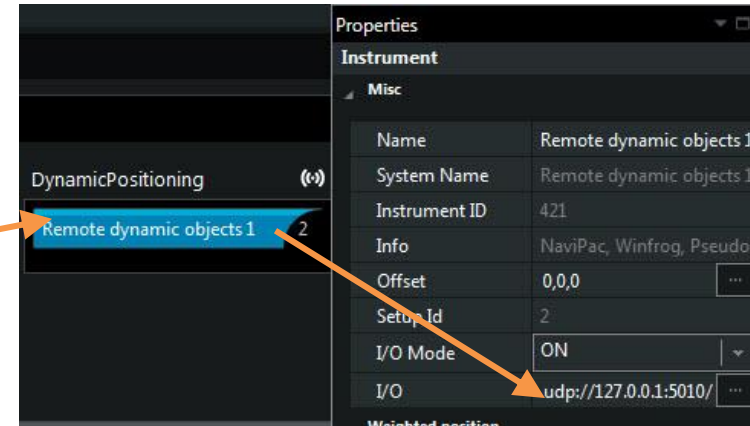
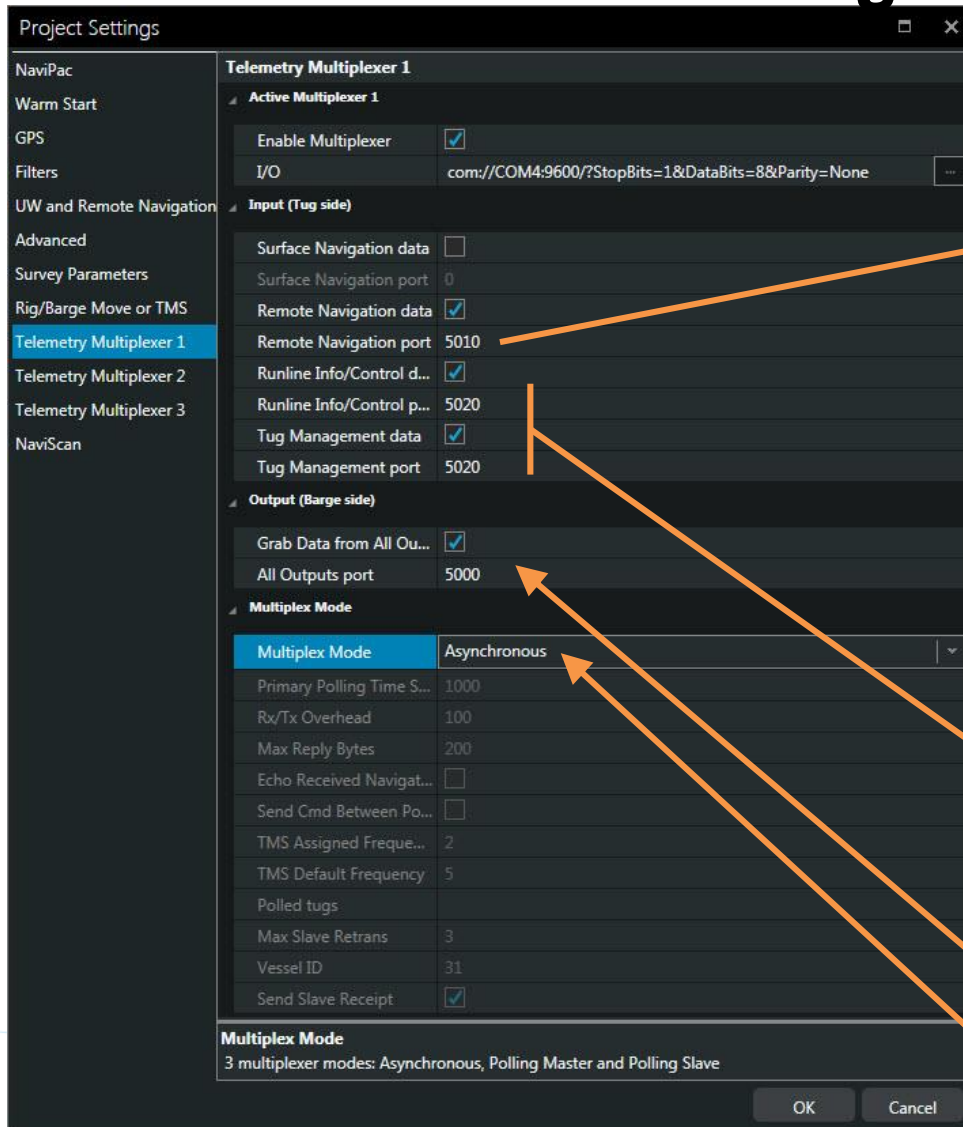
OK Cancel

NaviPac – Barge – Using Multiplexer II



All data must be output on the same address/port – ex 127.0.0.1 / 5000.

NaviPac – Tug – Using Multiplexer



All outputs to port 5000

Asynchronous mode

NaviPac – Barge – Polling Master

In polling mode, the Barge acts as a master in the communication. Tugs can only transmit within certain time-slots, when requested. Tugs are divided into polling groups with different polling frequencies.

Main polling frequency. A polling sequence starts with this interval. In TMS scenario only tracking vessels are polled with this interval. In normal scenarios all vessels are polled with this frequency.

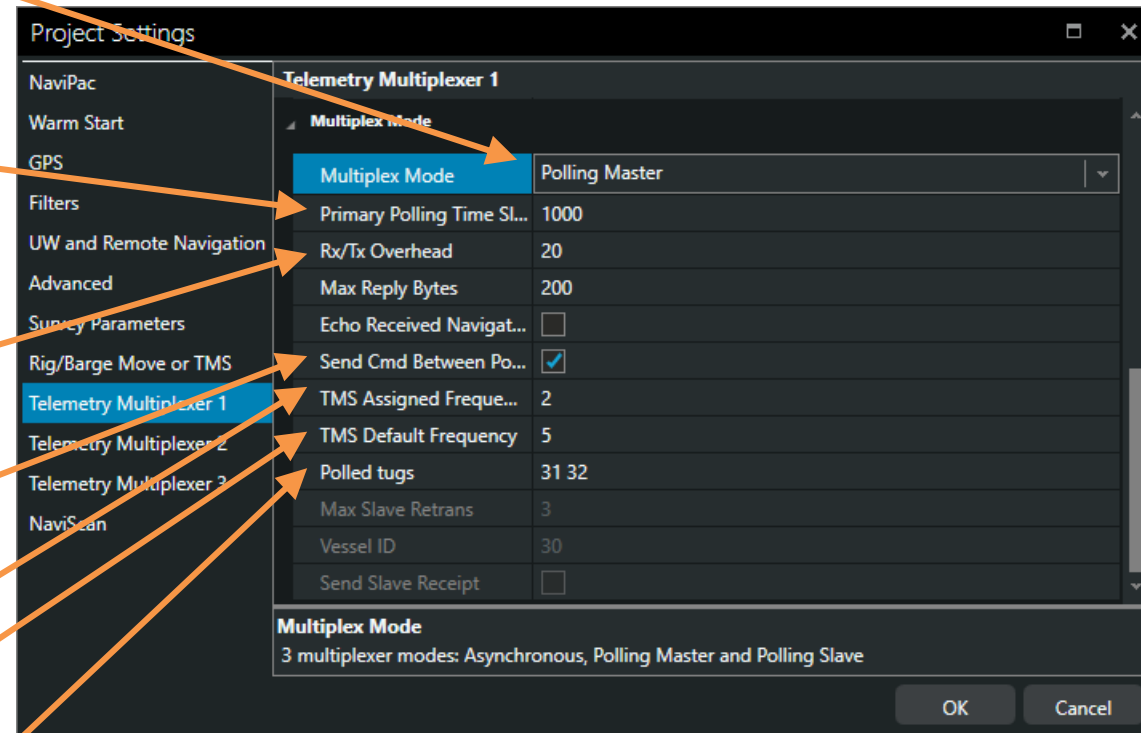
Defines the time given the modems to switch mode (Rx/Tx).

Enable 'Send Cmd..' if TMSMaster/ TMSSlave is used

Polling frequency for assigned vessels.

Polling frequency for all other vessels.

List of tugs to be polled. The list must be a space separated list of object IDs.



Project Settings	
NaviPac	Telemetry Multiplexer 1
Warm Start	Multiplex Mode
GPS	Multiplex Mode
Filters	Primary Polling Time SL...
UW and Remote Navigation	Rx/Tx Overhead
Advanced	Max Reply Bytes
Survey Parameters	Echo Received Navigat...
Rig/Barge Move or TMS	Send Cmd Between Po...
Telemetry Multiplexer 1	TMS Assigned Freque...
Telemetry Multiplexer 2	TMS Default Frequency
Telemetry Multiplexer 3	Polled tugs
NaviScan	Max Slave Retrans
	Vessel ID
	Send Slave Receipt

Multiplex Mode
3 multiplexer modes: Asynchronous, Polling Master and Polling Slave

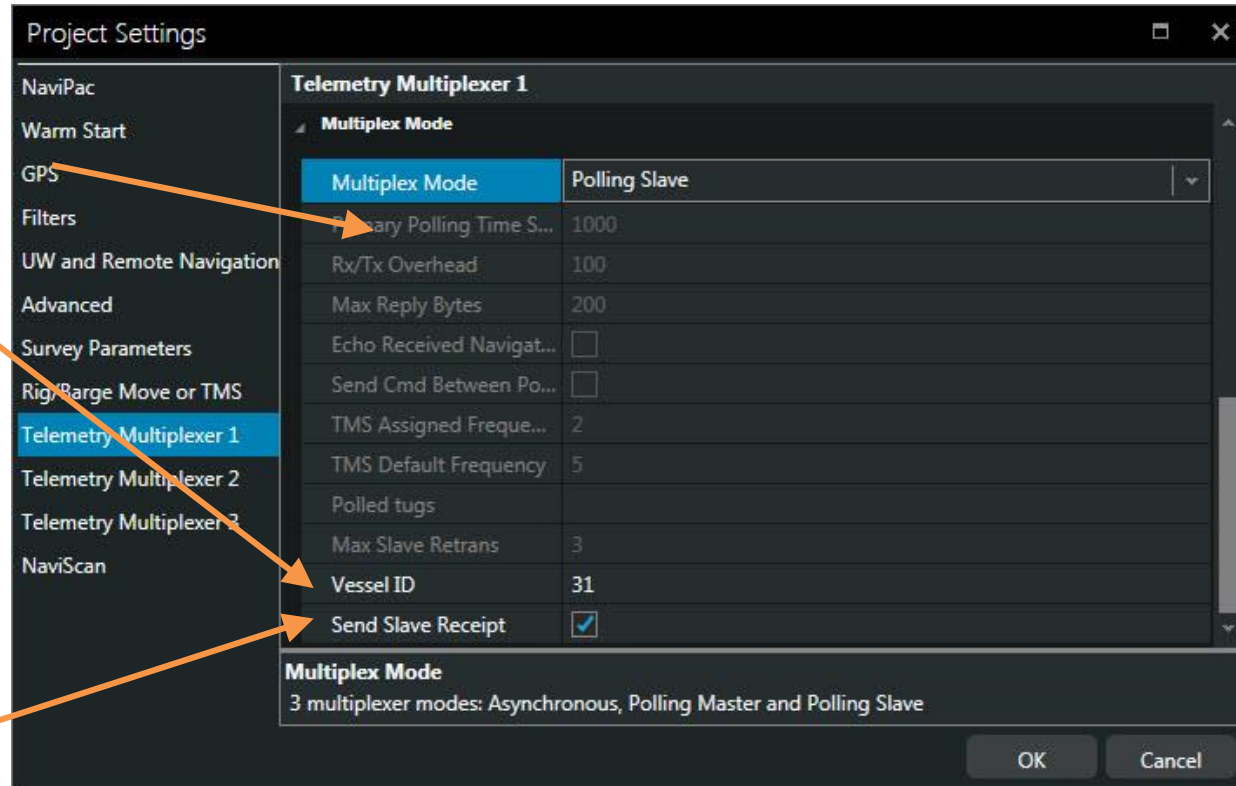
OK Cancel

NaviPac – Tugs – Polling Slave

If the Barge is set to Polling Master mode, all slaves must be set to Polling Slave mode. They are only allowed to output data to the multiplexer when requested. Slot allocation for this is handled purely by the master.

The tug ID (31 here) must be defined when in slave mode.

The slave can be configured to send an end message (acknowledge) when all buffered messages have been sent. This allows the master to close the timeslot before timeout and thereby to optimize the use of the bandwidth. This can be an alternative to defining the 'Maximum Reply Characters' on the polling master. The optimal solution would be obtained by setting this value too high and let the slave send acknowledgements.



Project Settings

NaviPac

Warm Start

GPS

Filters

UW and Remote Navigation

Advanced

Survey Parameters

Rig/Barge Move or TMS

Telemetry Multiplexer 1

Telemetry Multiplexer 2

Telemetry Multiplexer 3

NaviScan

Telemetry Multiplexer 1

Multiplex Mode

Multiplex Mode	
Polling Slave	
Asynchronous	
Polling Master	

Primary Polling Time S...

Rx/Tx Overhead

Max Reply Bytes

Echo Received Navigat...

Send Cmd Between Po...

TMS Assigned Freque...

TMS Default Frequency

Polled tugs

Max Slave Retrans

Vessel ID

Send Slave Receipt

Multiplex Mode

3 multiplexer modes: Asynchronous, Polling Master and Polling Slave

OK

Cancel

NaviPac 4 TMS - Schematic Overview

NaviPac Barge

NaviPac Project Settings:
Enable Rig/Barge Move or TMS
Configure Multiplex Telemetry (for Telemetry Solution only)

Rig Setup:
Configure Rigsetup
Save as: a) RigMove Setup
b) Tug RigMove Setup (NP_TUG.ini)

Output Barge Position:
Data Output: Data to ext. Nav. System

Receive Tug Position:
Dynamic Positioning: Remote Dynamic Object1

Receive Messages from Tugs:
Special Input: Remote NaviPac – Control
Online Mode: Define Barge ID to 0

Output Anchor Pattern:
Data Output: Data to TUG boats

Output Runlines & Waypoints:
Data Output: Remote NaviPac – Control

Send other TMS Controls:
Online Mode: TMS Master Generic View
(for Telemetry Solution only)

NaviPac Tug

NaviPac Project Settings:
Use as Tug Boat
Configure Multiplex Telemetry (for Telemetry Solution only)

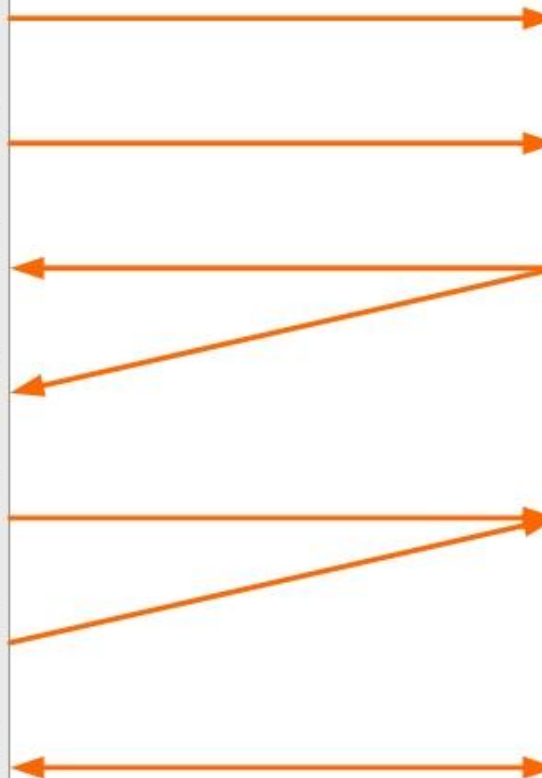
Rig Setup:
Copy Tug RigMove Setup (NP_TUG.ini) to EIVAHOME/Setup folder

Receive Barge Position:
Dynamic Positioning: Remote Dynamic Object1

Output Tug Position:
Data Output: Data to ext. Nav. System

Receive Anchor Patterns & Runlines:
Special Input: Remote NaviPac – Control
Online Mode: Define Tug ID

Receive other TMS Controls:
Online Mode: TMS Slave Generic View
(for Telemetry Solution only)





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