ATP1 and ATP2 Web-server

Operation User Guide V2.2 - Incl. ATP1 hardware installation

For: ATP Software V2_05 and web-server v1.09, and higher Sept 2022

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1. Introduction

This user guide assumes familiarity with the marine navigation systems and basic PC software tools.

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This guide covers the A+T ATP1 and ATP2 processors and common aspects of the web-server interface for setup, calibration, and diagnostics.

Throughout, “GNSS” (Global Navigation Satellite System) is used to refer to GPS, Galileo, GLONASS and other positioning systems.

Please visit: - www.AandTinstruments.com/downloads for the latest version of the manual.

2. Connectivity

The ATP1 and 2 have four core databus connections:

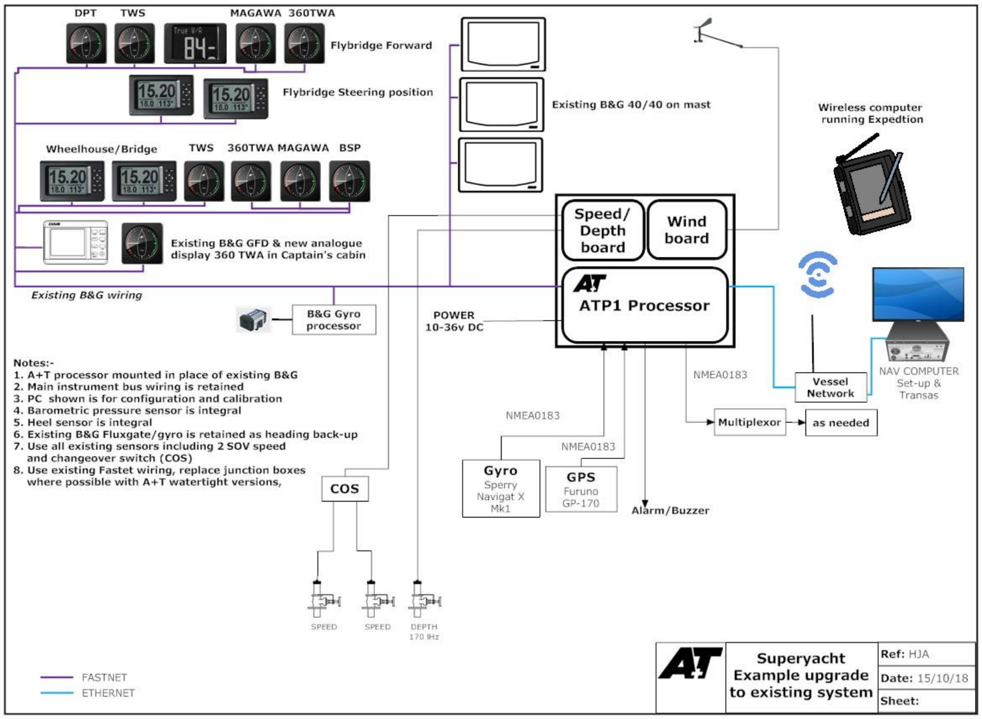
1. **Ethernet**
    a. 2 **A+T Ethernet** network ports (NET1 and NET2) carrying the A+T databus protocol for A+T sensors, interfaces and displays.
    b. Secondary **standard Ethernet** network to access the ATP web-server and for network data transfer to and from Navigation software packages such as Expedition Navigation Software.
2. **Fastnet** for B&G H2000 and H3000 displays, sensors and wiring, and A+T Fastnet based displays.
3. **CANbus (N2k compatible)** for N2k displays, systems and sensors.
4. **NMEA0183**

3. Web-server

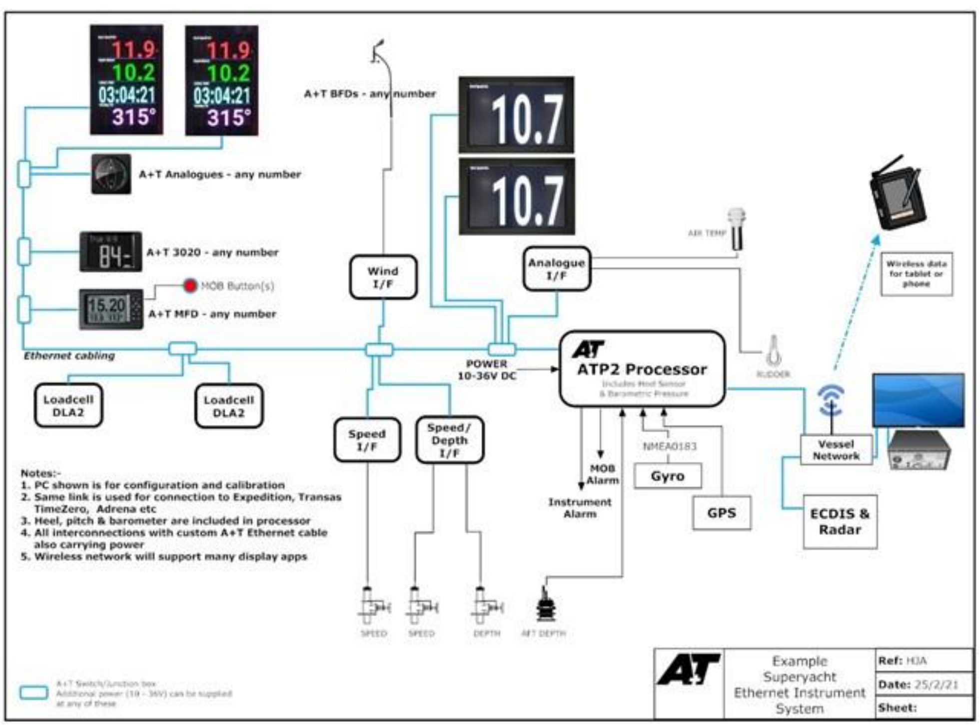
Central to the commissioning and setup, calibration, and diagnostics of A+T Processors is the built-in web-server. It may be accessed from any ethernet connected device via its web-browser. See section 5.

4. Example systems

ATP1 System



ATP2 System – See ATP2/Pilot Processor installation guide



5. Setup and connectivity

Central to the setup, calibration, and diagnostics of the ATP is the built-in web-server. It can be accessed from a connected PC, MAC, or tablet.

Calibration and other system controls from displays are restricted to a few key functions.

Getting started

Please see Appendix D for hardware installation and connection of power, sensors, and data networks.

5.1. Ethernet/Web-server

Gain access to the web-server via the ATP Ethernet port. This may be a direct connection, or via a switch/DHCP server.

Direct connections on older computers may require a cross over cable.

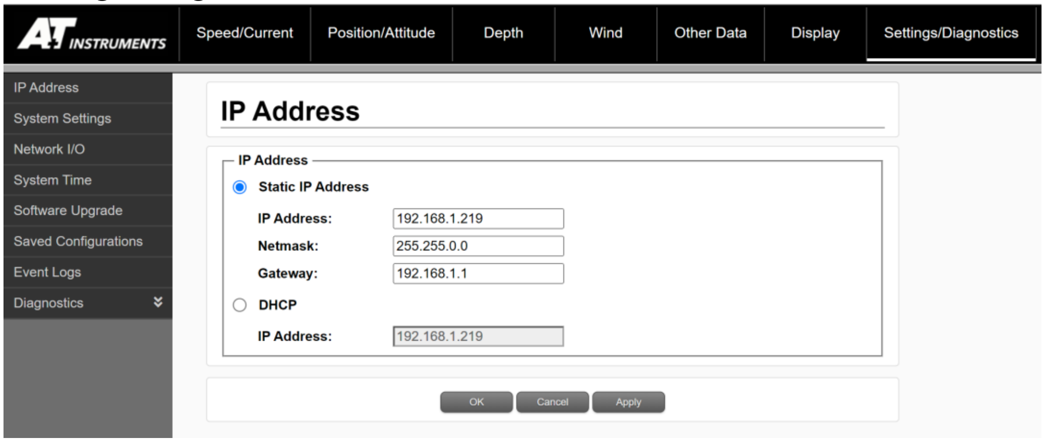
DHCP server connected ATP – please ensure the ethernet is connected to both the ATP and to the DHCP server, and the DHCP server is running before powering up the ATP.

When shipped the ATP has fixed IP address **192.168.1.219**

On first power up, the ATP waits for 5 seconds to discover if a DHCP server is providing an IP address on the connected network. If no DHCP address is received, the ATP reverts to its fixed IP address.

The ATP fixed IP address may be changed after connection to the web-server is achieved.

Settings/Diagnostics > IP Address

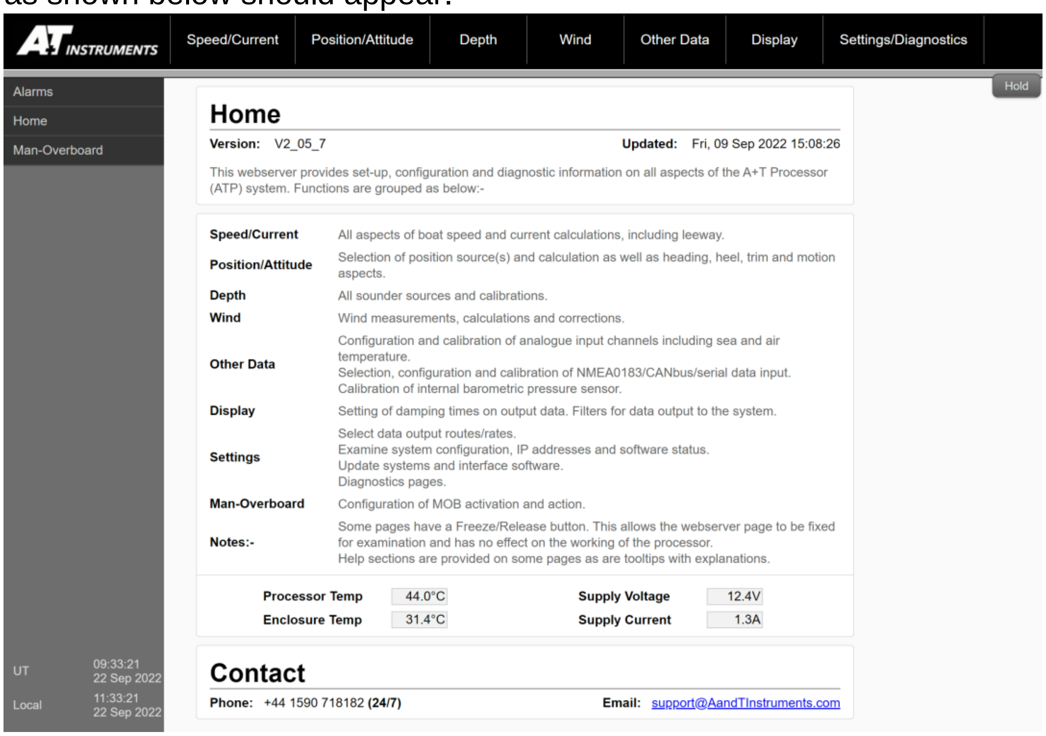


The ATP IP address is found on the small LCD display on the top left corner of the ATP cabinet.

Note: If a computer is connected directly to the ATP, then the computer ethernet adapter must be manually set to 192.168.1.xxx to communicate.

Please ensure you gain access to the A+T Web-server before proceeding

Enter the IP Address of the ATP into any browser on PC, Mac or Tablet and the page as shown below should appear.

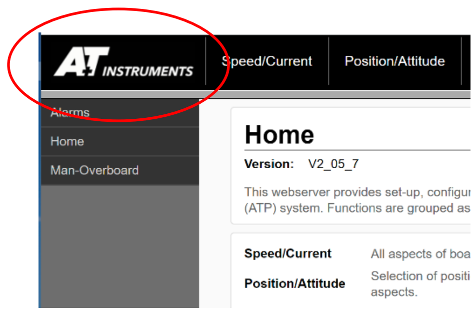


General Principles

Note that changes entered on any page are not implemented until either **OK** or **APPLY** is clicked

On all pages with real-time updating fields there is a **HOLD** button in the top right corner which holds a synchronised snapshot of any dynamic data. It can be released by clicking the button again or by changing the page displayed. Holding the web-server pages in this way has no effect on calculations or displays on the system.

The **HOME** button is the A+T logo at the top left of the screen



5.2. Wind/Speed/Depth sensor inputs

Speed, Wind and Depth sensors may input directly to the ATP (analogue/pulse input), or from CANbus or NMEA0183 sources.

Speed input is typically a raw pulse input from a pulse type paddle-wheel log.

- Up to two logs (port and starboard) may be connected.

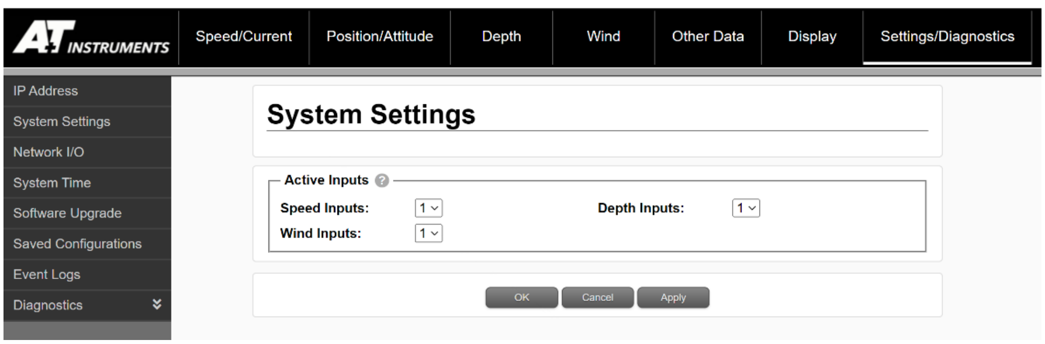
Wind input is primarily from an analogue speed and angle sensor (i.e. A+T MHU).

- Up to two Wind sensors (fore and aft) may be connected.

Depth input may be from passive or active sensors.

- Up to four Depth sensors may be connected.

The number of Speed, wind and depth inputs can be set in **Settings/Diagnostics > System Settings**:



For wiring connection, please see Appendix A.

For NMEA0183 sensors please see 5.9 and CANbus sensors 5.10

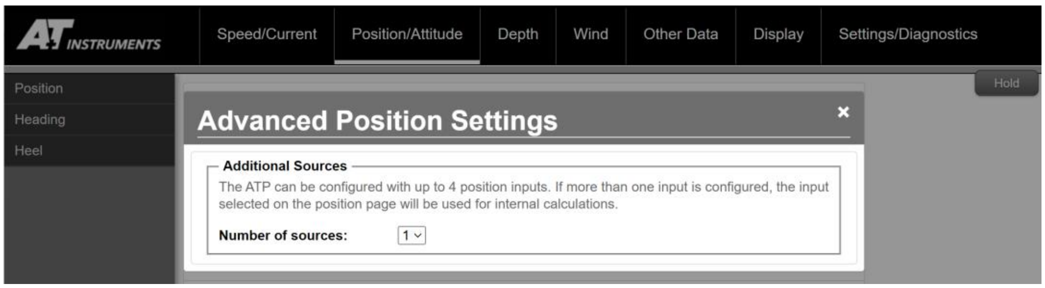
For setup and calibration see section 6.

5.3. Position inputs

GNSS sensors may input directly to the ATP from CANbus, NMEA0183, Fastnet or A+T Pilot sources.

- Up to 4 GNSS inputs may be configured
- For NMEA0183 see 5.9 and for CANbus see 5.10

The number of GNSS inputs is set at **Position/Attitude > Position > Advanced**



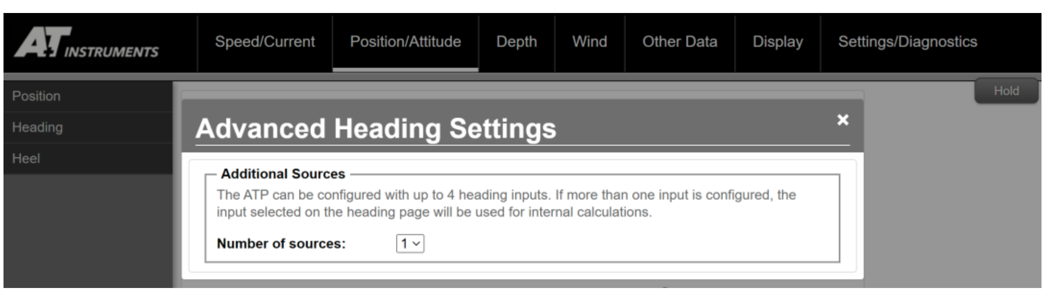
5.4. Heading sensor inputs

Heading sensors may input directly to the ATP from CANbus, NMEA0183, Fastnet or A+T Pilot sources.

- Up to 4 heading inputs may be configured
- For NMEA0183 see 5.9 and for CANbus see 5.10

The ATP Processors manage input of heading in True or Magnetic and calculate derived variables such as True Wind Direction in either. An internal World Magnetic Model is maintained to compute variation based on the position and date (NOAA WMM2022)

The number of Heading inputs is set at **Position/Attitude > Heading > Advanced**



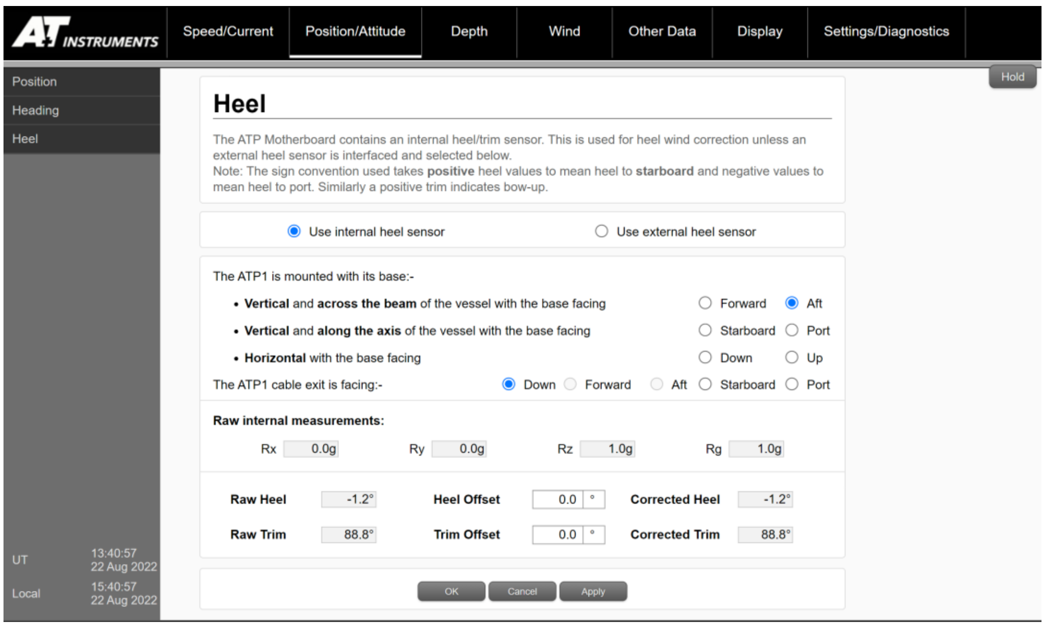
For setup and calibration see section 6.4

5.5. Heel and trim inputs

The ATP processor contains an inbuilt Heel & Trim sensor. Both can be configured at **Position/Attitude > Heel:**

External sensors may be used. For Analogue see 5.6, For NMEA0183 see 5.9 and for CANbus see 5.10

For the internal sensor to be used, the orientation of the ATP mounting must be configured.



5.6. Analogue inputs

The ATP1 has four standard analogue inputs, three with a 5V and one with a 12V excitation voltage. The ATP2 has no onboard analogue inputs.

The ATP1 and ATP2 may have analogue inputs added with the ATPANB1 Interface Box Analogue (4).

In most cases, an analogue sensor with a continuous voltage or mA sensor signal is used to measure for example Displacement, Pressure or Temperature.

Each analogue input uses a 12-bit AD converter with an input signal range of; 0 – 5 V dc, 0 - 20mA or 4-20mA.

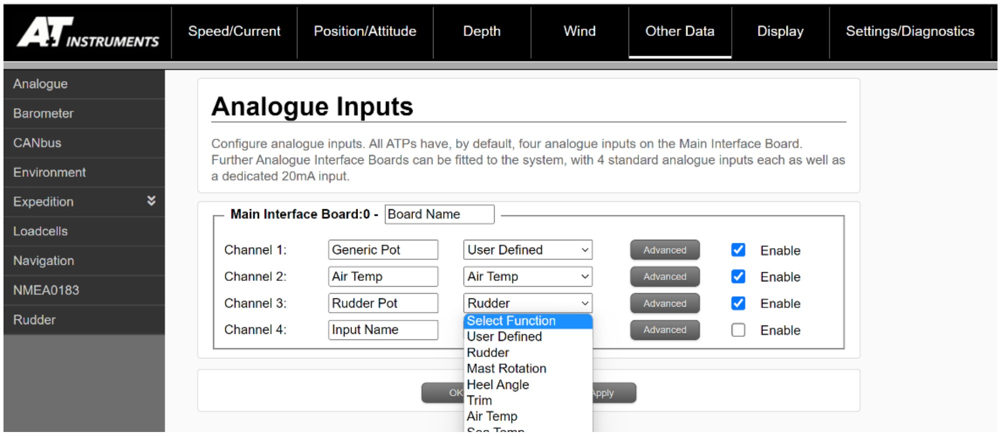
The 0-12Vdc input may have a 0-5Vdc sensor connected, however the power supply for the sensor must use the 5V from one of the 5V device supplies.

For wiring, please see Appendix A.

Analogue Sensor Setup

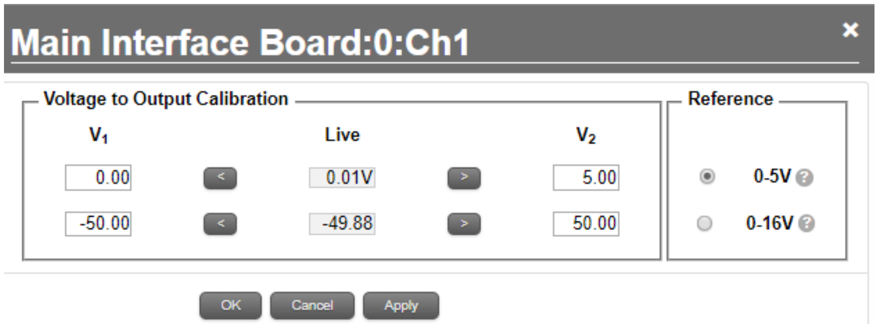
In the following example, a rotary position sensor is used to demonstrate, and the sensor is assumed to be in the 0 – 5V range.

Other Data > Analogue



1. Navigate to the **Interface Board** for which the sensor is connected to.
2. In the **Channel:** Input Name box, name your sensor (i.e., Rudder)
3. In the **Select Function** box select Rudder.
4. Tick **Enable** and click on **Apply** to save.
5. The output Channel2 is now Rudder, with a default quantity Angle and units Degrees.
6. Click on the **Advanced** box to calibrate the input.

Calibrating Analogue Sensors
The Calibration ('Advanced') page is divided into two rows and three columns.



The **top row** is voltages, the **bottom row** is values.

The **left column** shows the lower reference voltage and relative output.
The **right column** shows the upper reference voltage and relative output.
The **middle column** shows the live voltage from the sensor and the calibrated output.

The **Arrows** to the left and right are function buttons that will sample the Live voltage and populate the adjacent boxes with that voltage.

Two types of analogue output sensors are available. Calibrated and uncalibrated. Calibrated sensors such as some pressure sensors may have their Voltage and Outputs entered directly in V1 and V2 columns.

Uncalibrated sensors such as rotational or linear or load amplifier units must have two known values for the device being measured, for example -10deg and +10deg, 23mm and 180mm, zero load and cal load, or 0% and 100% etc.

To calibrate linear or rotational displacement type sensors:

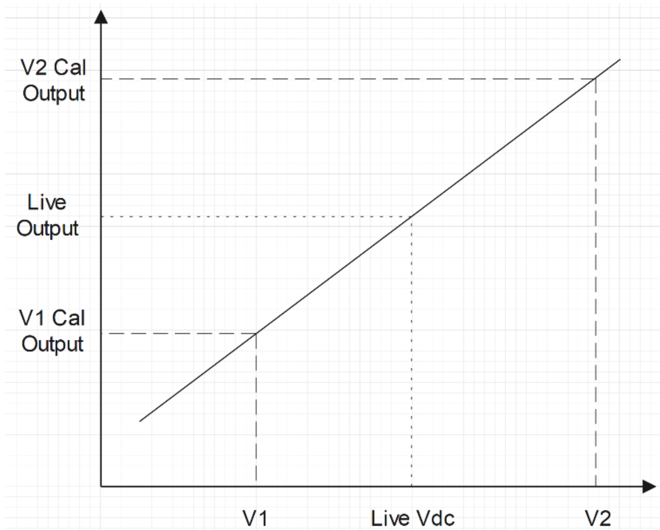
1. Ensure the device full range of motion is within the full span of the sensor.
2. Move the device approximately to the mid range of its span and note the Live Voltage.

3. Move the device to a known measurement value (i.e. -10deg).
    a. If the Live Volts is lower than the mid span centred device reading:
        i. Press the top row left arrow button to populate the V1 voltage field.
        ii. Enter the known measurement value in the lower V1 field (-10)
    b. If the Live Volts is higher than the mid span centred device reading:
        i. Press the top RIGHT arrow button to populate the V2 voltage field
        ii. Enter the known measurement value in the lower V2 field (-10)
4. Repeat 3 above for the devices second known position.
5. Press **Apply** then **OK** to exit.

To calibrate Analogue Loadcell outputs:

1. Typically, an analogue loadcell will have two calibration outputs
    a. 0 load = 0Vdc
    b. Shunt resistor calibration load
2. Check with no load on the cell the Live Voltage = 0Vdc. Some amplifiers allow 0V tuning.
    a. Set V1 to 0, or the unloaded voltage
    b. Enter 0 in the lower V1 field
3. Switch on the calibration shunt resistor
    a. Adjust the span voltage per the amplifier instructions to match the calibrated equivalent load output
    b. Set the V2 voltage
    c. Enter the calibration load in the lower V2 field.
4. **SWITCH OFF** the calibration shunt resistor
5. Press **Apply** then **OK** to Exit.

The Analgue input (Live Vdc) linearly interpolates between the V1 and V2 Cal outputs to output the Live Output, and linearly extrapolates beyond these voltages.



Reference

0-5V: Ratiometric input reference

In many pressure sensors the electrical output signal depends on the supply voltage. This is a common feature for unamplified sensors and sensors that do not have built-in regulated power supply such as potentiometers and level sensors.

0-16V: Absolute Input Reference

For sensors with built- in regulated power supply, or supplied from a source other than the ATP, where any variation of the supply will have no effect on the sensor output. NOTE: This input reference should still be chosen for 0-5V sensors with built in regulators.

5.7. Loadcells

There are four methods for input of load cell information to the ATP:

Analogue 0-5v input
Standard 0-5Vdc output amplifiers such as the A+T DLA1 or Diverse HLA are compatible. See section 5.6

Fastnet Loadcell amplifier
Data from loadcell amplifiers connected directly to the Fastnet bus such as the A+T DLA2 may input to the ATP.

To map the loadcells into the ATP:

On the web-server select **Other Data > Loadcells**. Select the dropdown arrow next to Fastnet Loadcells
For each Loadcell, select the Fastnet node (will check all nodes if set to 0)
Click on the box under Channel and select the A+T channel to write the loadcell data to (click in the box)
The **Data Value** box will display the data if it is valid and available.
Tick **Enable Input** to input the data to the ATP.

A+T Loadcell amplifier
Connected directly to the A+T ethernet bus. See the A+T DLA2 Loadcell Module for setup.

CANbus
There are several CANbus(N2k) options for example **Cyclops Marine**

Data from Cyclops Marine wireless smarttune and smartlink loadcells can be input to the ATP from the Cyclops Gateway via CANbus/n2k.

Loadcell setup: see the Cyclops instructions and App.

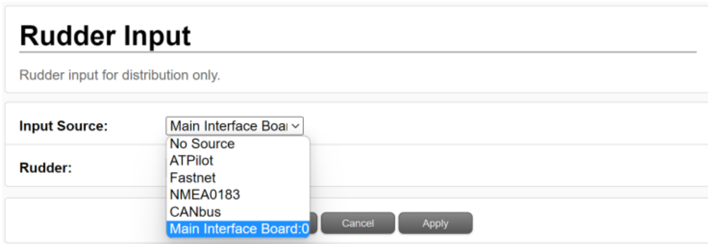
If standard Channels are selected in Cyclops settings (Backstay, Port Runner, Stbd Runner, Port V1, Stbd V1, Mainsheet, Forestay, Inner Forestay) this data will be immediately available on the ATP.

If custom channel names are used in the Cyclops setup, then the data must be mapped into ATP channels at **Display > Fastnet > Loadcells**

5.8. Rudder

A number of sources for Rudder angle may be present on the ATP. To select which rudder is to be used:

Other Data > Rudder



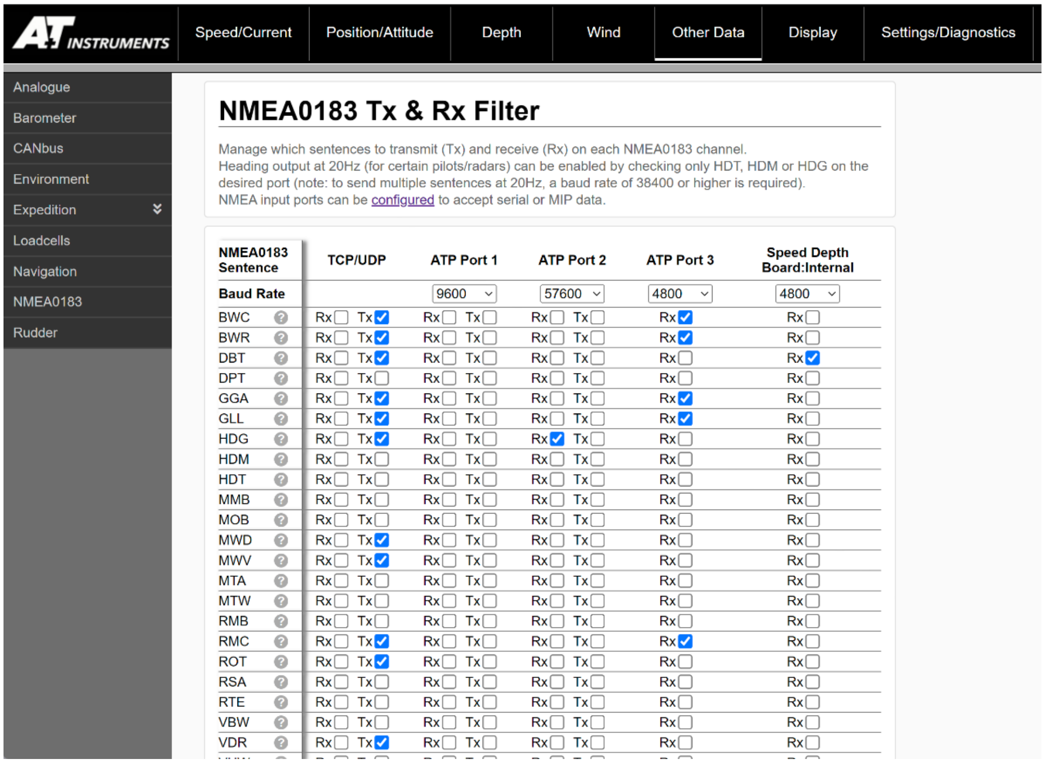
For NMEA0183, select which NMEA0183 Channel to use and got to Settings to ensure the sentence RSA is enabled.

5.9. NMEA0183

NMEA serial communication is in ASCII format with the data divided into sentences.

For wiring, see Appendix D
For NMEA0183 sentence descriptions, see Appendix G

Configuration of NMEA0183 inputs is completed on the web-server at **Other Data > NMEA0183**



The left column lists the sentences that the ATP uses.

The TCP/UDP port can receive and transmit NMEA0183 data on the Ethernet bus.

For each serial port:

Set the baud rate to match that of the NMEA0183 device
Select the sentences for the ATP to receive
Select the sentences for the ATP to transmit to the NMEA0183 device

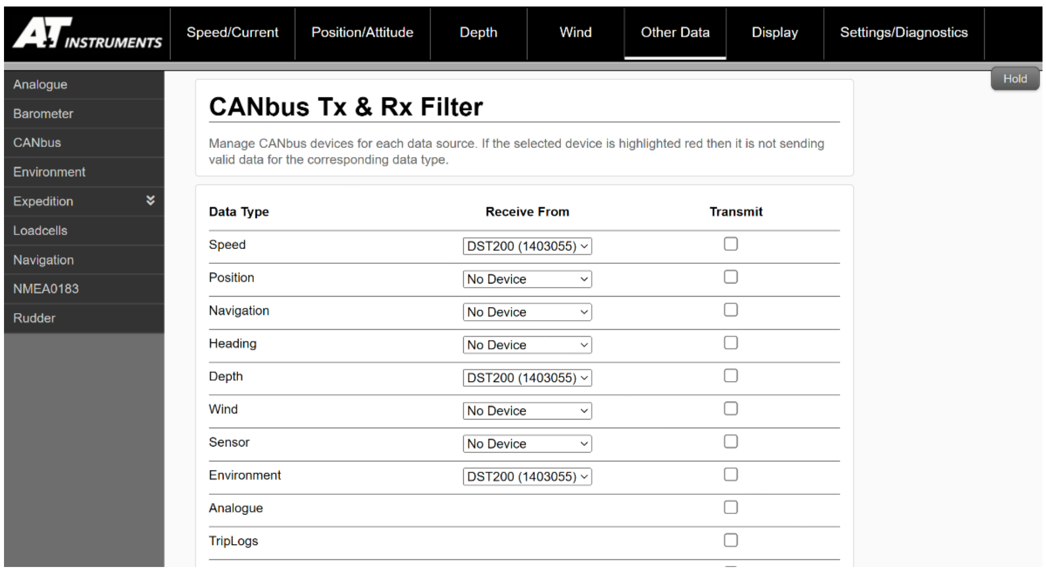
Note:
If there is more than one source of, for example, Heading, all ports with HDG may have the tick for Rx. The Heading port to be used by the ATP will be selected in **Position/Attitude > Heading**.

All available ports with live sentence data can be viewed at
Settings/Diagnostics > Diagnostics > NMEA0183

5.10. CANbus/N2k

CANbus can be used as a high-integrity data bus for networking devices and data logging. The ATP is N2k compatible and supports other devices and microcontrollers using the CANbus protocol.

Configure CANbus data on the web-server at **Other Data > CANbus**



The **Tx & Rx Filter** page is used to select the CAN data sources to **Receive From.**

By ticking the **Transmit** box, the ATP will broadcast CAN data to that device.

Any **Receive From** source that does not have valid data will be highlighted red.

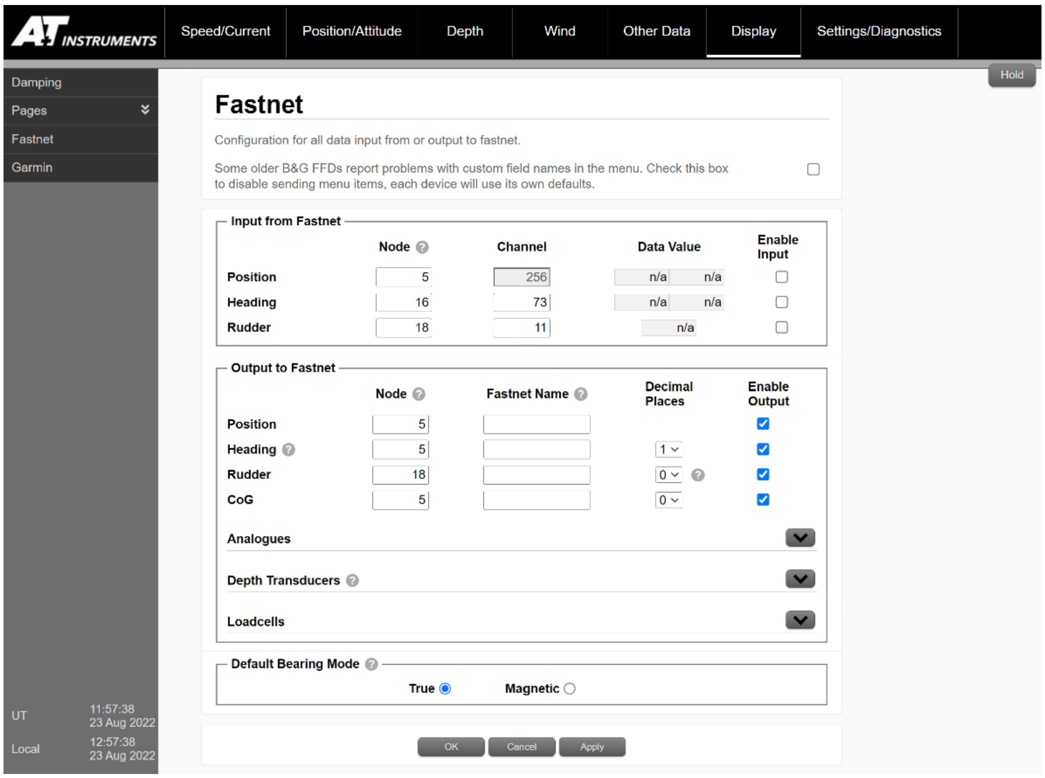
All available CAN devices information can be viewed at
Settings/Diagnostics > Diagnostics > CANbus

5.11. Fastnet

For legacy instrument systems, Fastnet databus delivers low latency channel system and information to the onboard Fastnet displays.

It also serves as an interface tool to receive sensor information from the Fastnet databus.

Access the Fastnet page at **Display > Fastnet**



This page lists the defined sensors and configuration options to send and receive data to the bus. Channel names, number of decimal places and the sensor node address is configured. The Data Value fields display received data.

Default Bearing Mode may be selected as MAGNETIC or TRUE. This only defines the mode for the displays for bearing data including Heading, Course, TWD, Current Direction, COG.

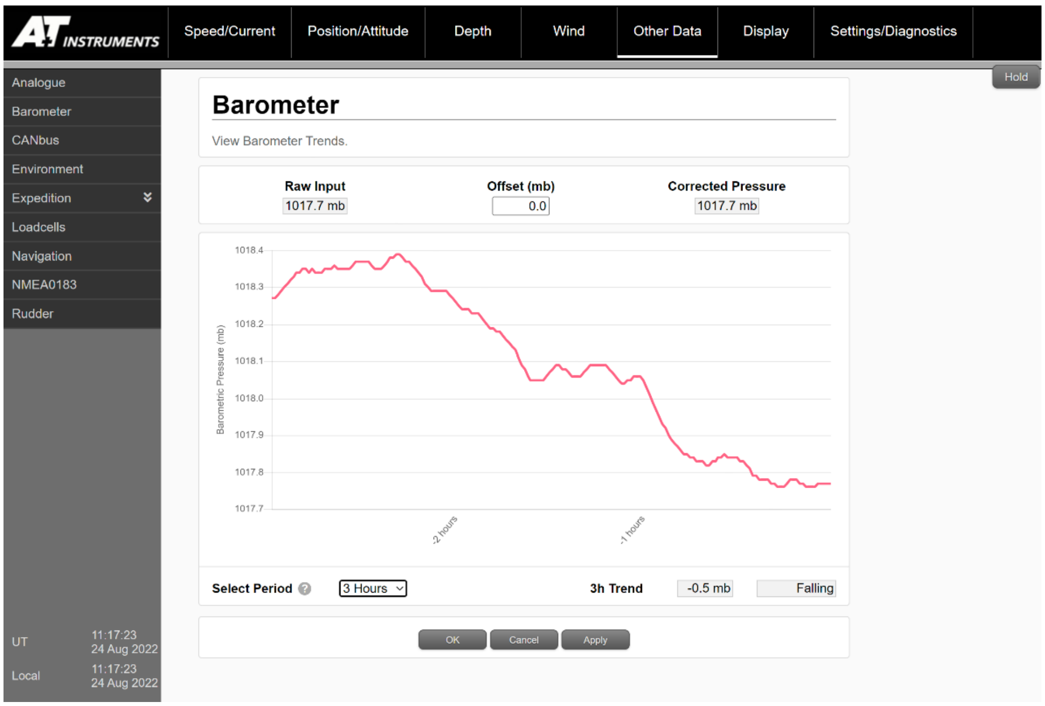
5.12. Barometer

The ATP has an inbuilt Barometric Pressure sensor. Pressure data is graphed for tracking trends in the weather.

The **Select Period** drop-down box adjusts the displayed data range period.

The **Offset (mb)** field is to calibrate the barometer to a nearby official station.

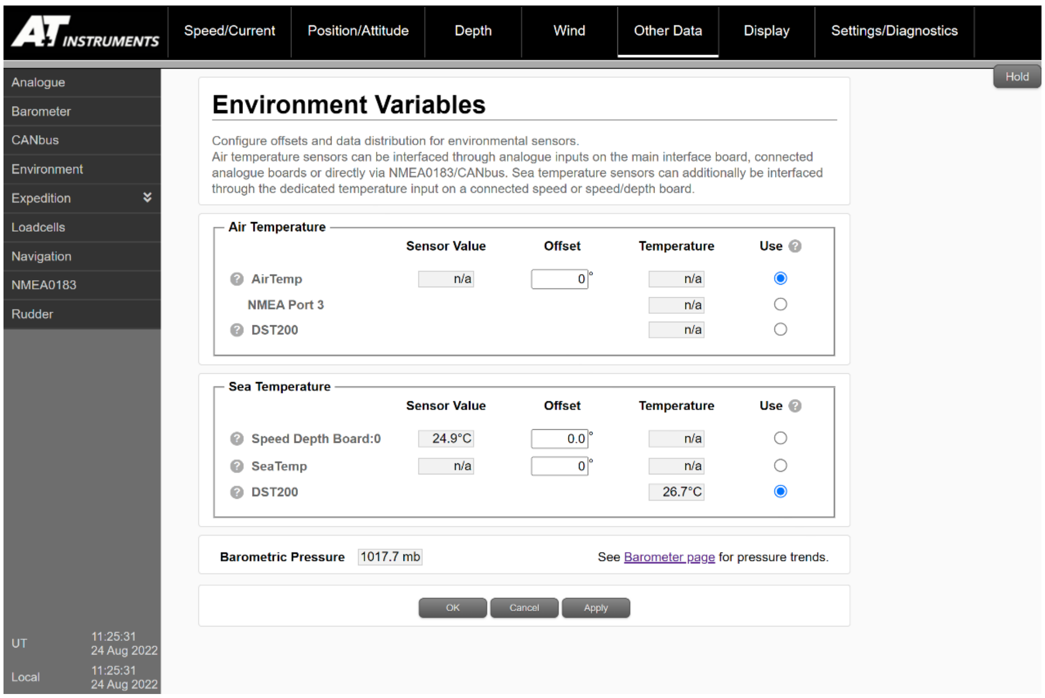
Other Data > Barometer



5.13. Air and Sea temperature

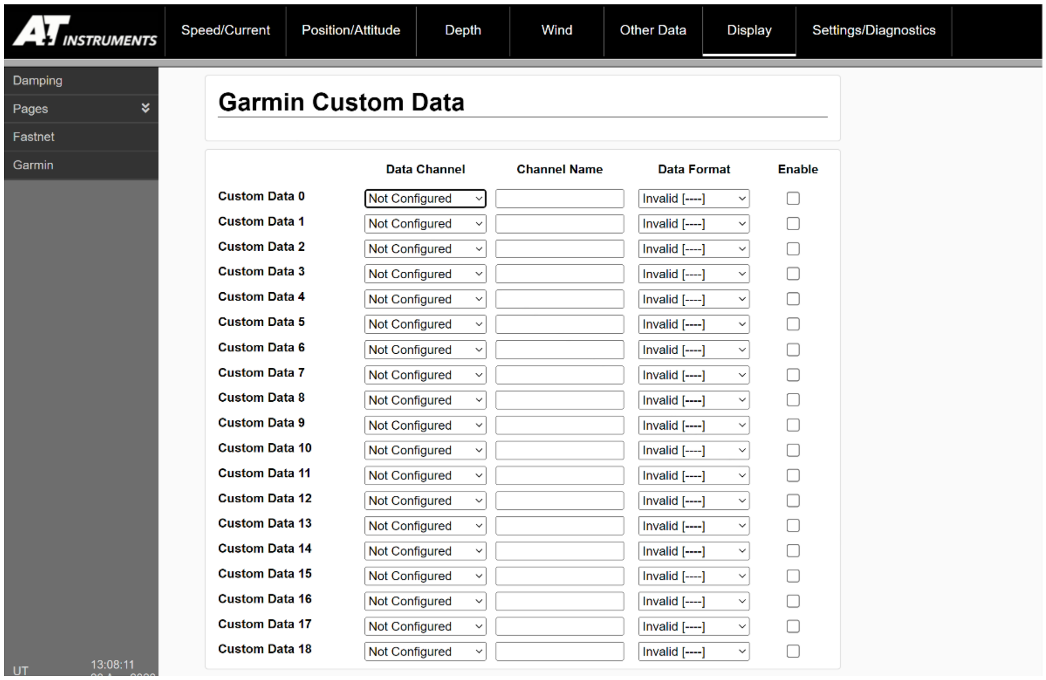
Environmental sensors may input directly to the ATP speed/depth board, or from CANbus, NMEA0183, or Analogue inputs.

Other Data > Environment



5.14. Garmin Displays

The ATP can send up to 18 channels for display on Garmin CANbus displays such as the GNX large format display.



To send custom data:

Select the ATP **Data Channel** to send
Enter a meaningful **Channel Name** to be displayed on the Garmin display
Set the **Data Format** to match that of the data being sent
Tick **Enable** to transmit the data

5.15. Man Overboard

The ATP provides a stand-alone MOB function operating as follows:

Triggering:

A+T MFD Remote Button(s)

The installation wiring for remote connection is shown in the latest MFD manual. As the remote button is providing only a contact closure, more than one may be connected to any MFD in parallel. The MOB remote function must be enabled in the MFD NMEA0183 menu.

A+T MFD Menu key

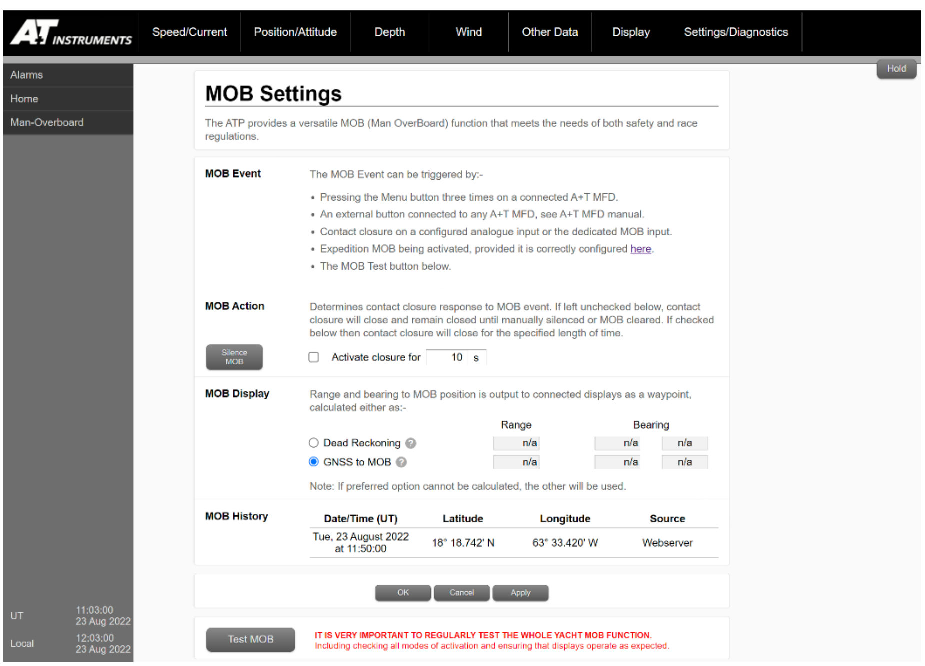
Pressing the MENU key (bottom left) three times in succession will trigger the MOB state. Note the MFD must know the ATP processor is connected under MENU/System.

Contact closure connected to the analogue input to ATP

A dedicated MOB contact closure is mounted and marked on the ATP motherboatd. Connecting this to the ATP 0v with a button triggers the MOB. **See Appendix D for wiring information**

Web-server

The MOB page is at **Home > Man-Overboard**.



Expedition
If this is triggered either manually or through the Expedition interfacing functions, then this will force the ATP into MOB mode.

Action
On activation, the following are initiated:

The **MOB** relay on the ATP is closed and remains closed until SILENCED as described below. This can be wired as required to set off alarm(s) or other devices, for example a Jon Buoy
Expedition, if networked by UDP, is forced into **MOB** mode.
MOB position, time and source are recorded and available on the web-server page.
A+T MFDs, if configured, are forced into **MOB** mode as described below.

Display
Any A+T MFD can be set to **MOB** mode. Note that B&G displays on mixed mode systems cannot be set to provide this.

On **MOB** activation, any displays set to be **MOB** displays automatically switch to show:

Range in meters of **MOB**
Bearing in degrees (T or M as defined in display settings)
Time in mm:ss since **MOB** alarm activation.

If another page is selected on an MOB display while the MOB is still active, the new page will display for 5 sec then revert to MOB data.

Note that any B&G displays on a system will be unaffected and not display MOB information.

Calculation
The MOB position will change in areas of strong current. Therefore, two methods of calculating range and bearing to the MOB are available: Dead Reckoning or GNSS.

Dead Reckoning
- The range and bearing to the MOB will be calculated using speed and course. This will substantially account for drift of the MOB due to current.
- Speed and heading/course must be well calibrated to use this method.

GNSS
- To be used in areas of little to no current

The modes may be changed after the MOB has been triggered without losing the original MOB position.

Silencing & Clearing MOB

The **MOB** alarm may be **SILENCED** at any A+T MFD (not just MOB displays) by pressing **MENU** twice then selecting **SILENCE**.

The MOB position remains set and other MOB displays remain active displaying MOB range/bearing/time.

To **CLEAR** the **MOB** status system wide, at any MFD press **MENU** twice and select **CLEAR**.

Both **SILENCE** and **CLEAR** can be set from the web-server page.

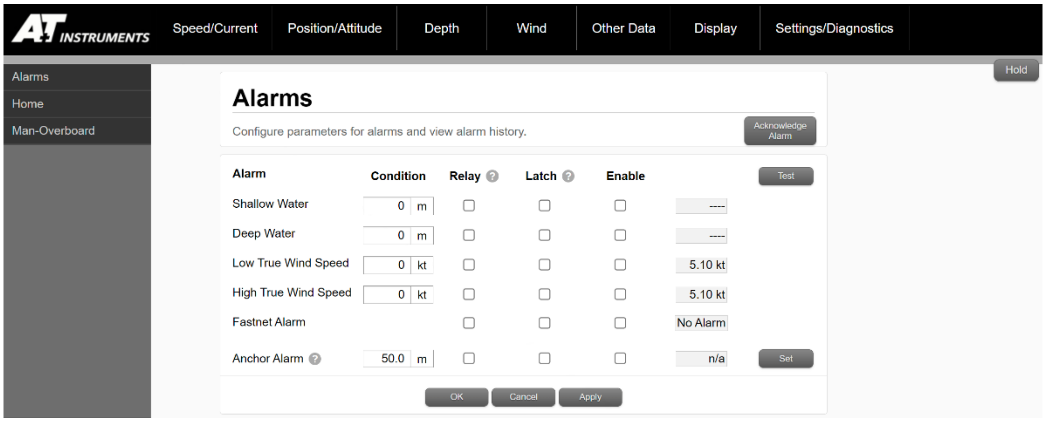
Clearing the MOB status on Expedition has no effect on the ATP MOB status.

Reactivation of MOB

No new MOB activation can be set until the active one is **cleared** as described above. A history of **MOB** events is shown on the web-server **MOB** page.

5.16. Alarms

Alarms are set up and controlled from the web-server Home page.



Alarm setup

Each Alarm has four settings:

Condition

- The threshold at which the alarm will trigger

Relay:

- If ticked, the alarm relay on the ATP will close, and remain closed until the alarm is CLEARED

Latch:

- If ticked, the alarm condition will continue until is cleared on an MFD or the Acknowledge Alarm button on the web-server is pressed
- If not ticked, the alarm will clear when the alarm condition is no longer met

Enable

- If ticked, the alarm will be triggered if the alarm condition is met

Anchor alarm

The centre of the anchor alarm circle is set when enabled or when the **Set** button is pressed.

Changing the anchor alarm radius does not reset the centre point.

5.17. Pages

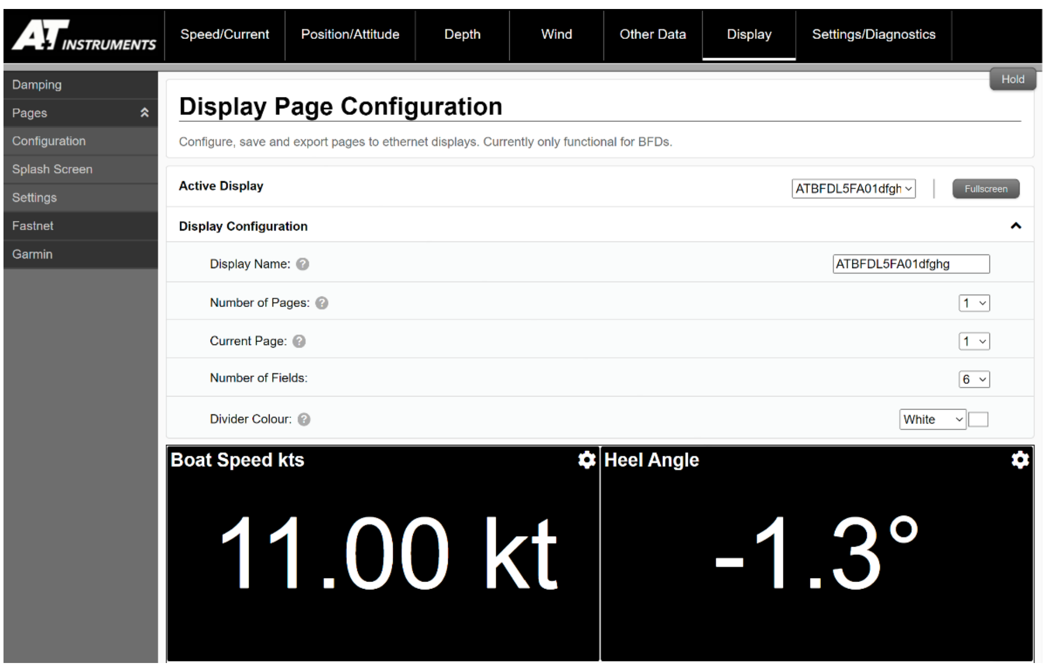
A+T Ethernet BFDs, and a web-server display can be configured at Display > Pages.

Display > Pages > Configuration
Display > Pages > Splash Screen
Display > Pages > Settings

By selecting an Active Display, it is possible to change the setup and configuration of any ethernet connected BFD or the web-server display.

From Display > Pages > Configuration, any display can be set to full screen so your computer, tablet or phone can act as an instrument display.

See the **A+T BFD** manual for further instructions.



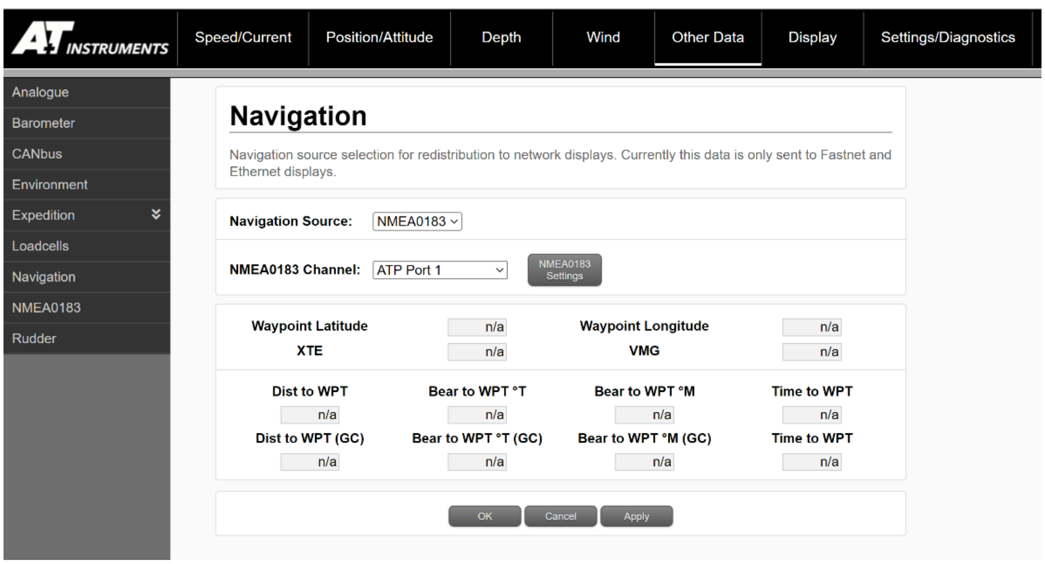
5.18. Navigation Source

External navigation systems such as Expedition Navigation Software or chart plotters may be set as the source of Navigation data.

This enables the display of Waypoint data such as Mark range and bearing, and cross track error (XTE).

Three possible sources of Navigation data are:
1. NMEA0183 from a connected chart plotter
2. CANbus – any N2k connected chart plotter
3. Expedition – UDP connected

Other Data > Navigation



NMEA0183

Configure the NMEA0183 port that the navigation data is being received. Sentences for Navigation data are:

- BWC – Waypoint information Great circle
- BWR – Waypoint information Rhum line
- XTE – Cross track error
- RMB – contains all the above information

CANbus

Set the CANbus Navigation **Receive From** to the navigation source device.

Expedition

See Appendix F. The Expedition Tx filter must contain Mark Range, Mark Bearing and Cross Track Error.

6. Configuration and Calibration

6.1. Speed Calibration

Calibration of speed inputs is available at **Speed/Current > Speed**. Two inputs are calibrated independently at **Speed/Current > Speed > Speed Input 1** (or 2 if present)

For two speed inputs, each Speed Inputs sensor source must be selected. The switching rules can be set up in **Speed/Current > Speed > Input Selection**

6.1.1 ATP Speed Depth Board

Calibration is via a single Hz value (number of pulses/s at 1kt). Increasing the Pulse Calibration (Hz) will reduce the calibrated boat speed.

Computation Estimator Time: The time factor for previous pulses received to be factored into the speed frequency calculation.

Pulse Frequency: The number of pulses per second from the paddle wheel

Base Boat Speed: speed in kt after the pulse calibration

Calibrated Boat Speed: speed in kt after the Advanced calibrations (heel and linearity) are applied.

6.1.2 NMEA0183 or CANbus

A Calibration Factor is used, default 1.0. To increase calibrated speed by, for example 10%, change the Calibration Factor by 10%. For example:

- from 1.00 to 1.10, or
- from 1.10 to 1.21

6.1.3 Advanced Corr.

Advanced calibration tables are available to calibrate out errors due to an offset installation or heel and linearity effects.

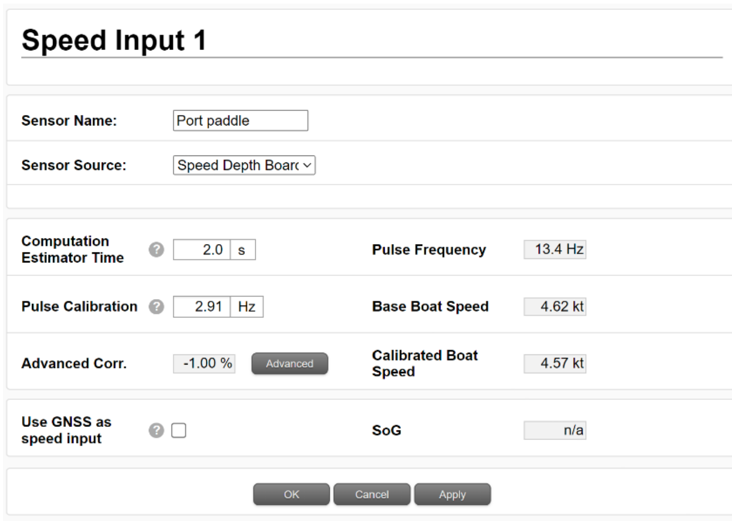
A table for correcting these errors by % is available by pressing the **Advanced** button

Advanced Calibration

Boat Speed / Heel Angle	≤5kt	10kt	15kt	20kt	≥25kt
≤-20° P	0%	0%	1.8%	0%	0%
-15° P	0%	0%	1.5%	0%	0%
-10° P	0%	0%	1.0%	0%	0%
-5° P	0.0%	0%	1.0%	0%	0%
0°	-1.0%	BASE%	1.0%	2.5%	3.0%
5° S	0.0%	0%	1.0%	0.0%	0.0%
10° S	0%	0%	1.0%	0.0%	0.0%
15° S	0%	0%	1.5%	0%	0%
≥20° S	0%	0%	1.8%	0%	0%

The % adjustments are applied to the Base Boat Speed (after initial calibration).

The % value being used can be observed on the Speed input calibration page.



Linear interpolation is used between the entered values.

Computation Estimator Time

Each received pulse is time-tagged by this value and logged. It is used to filter the speed calculation that will be used in internal calculations. This is independent to the displayed data Damping.

A lower value will improve low speed response, however may introduce noise at higher speeds.

Use GNSS SOG as speed input

In the case of failure of a speed sensor, SOG may be used as a speed input to allow the continuing calculation of data such as wind.

> This will reduce the accuracy and responsiveness of calculated data, and result in no current calulations.

Log Calibration

Rough calibration may be undertaken by comparing boat speed with SOG and adjusting Pulse Calibration or Calibration Factor accordingly.

Effects of current should be considered and using averaged data over 2-4 minutes with graphing such as with Expedition Navigation Software to improve accuracy.

Full calibration may be completed using the MOB function in the ATP.

Pressing the **MOB button** will trigger calculation of range to the MOB position based on both speed input log distance (Dead Reckoning) and from the GNSS. This is available at the web-server **home page > Man-Overboard**, and the **Test MOB** button at the bottom of the page can be used to trigger the logs, and the Hold button on the top right of the page can be used to record the respective Ranges (in meters).

In locations with no current, the difference between DR and GNSS distances is caused by errors in the speed input and a calibration value can be derived easily.

In locations with current, multiple speed runs are required. In this case, calibration runs must be completed in the direction of the current flow.

Speed calibration runs must be no less than 0.5nm (approx. 1000m) and in clear water, under engine at a constant rpm.

Methodology:

1. At a constant speed and steady heading in clear water, click the test MOB button and observe the DR and GNSS range increase in meters.
2. After a suitable distance Click the Hold button on the top right of the page and record the DR and GNSS range.
3. Repeat the process as necessary.
4. In zero current two opposing runs may be sufficient
5. In current, at least 3 runs should be completed, where the first and third runs should be averaged
6. The greater the number of runs, the more accurate the results should be.
7. To compute the new calibration value, it is necessary to establish the % error on the speed sensor.

Based on a single run, if the DR distance is 900m and the GNSS distance is 1000m then:

(GNSS - DR)/DR * 100 = [%]
(1000 - 900)/900 * 100 = 11.1%

This is the % adjustment to be applied to the calibration value.

For Pulse Calibration:
New_Hz = (1 – [%]/100) * old_hz

For Calibration Factor:
New_CF = (1 + [%]/100) * old_CF

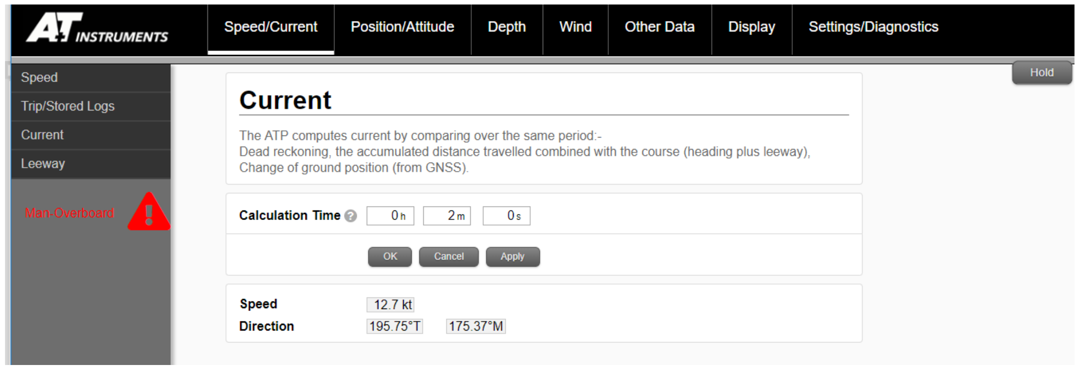
So, assuming calibration values of 3.28Hz and 0.98

New Pulse calibration = (1 – 11.1/100) * 3.28 = 2.91

New Factor = (1 + 11.1/100) * 0.98 = 1.09

6.2. Current settings

You may set the calculation time for current at **Speed/Current > Current**



Measured Current is displayed as two calculated variables processed over a specified time period.

The process compares measurements; Dead reckoning, the accumulated distance travelled combined with Course (Heading plus Leeway), and the change of ground position (from GNSS).

The time period for the calculation should be set depending on conditions. If sailing in areas with a high rate of change of current across a course (for example the Solent) a lower calc. time is required, from 20s to 1-2m to achieve the desired responsiveness. In areas with a low rate of change of currents, higher calc. times may be used for more stable and accurate current calulations.

1-2 Min	Solent
5-10 Min	Open Sea Tidal
30-60 Min	Oceanic

Current Configuration page

Two resultant variables, Current Speed (Knots), and Direction (Degrees) can be viewed in the live data boxes.

6.3. Leeway calibration

Leeway calibration can be accessed here: **Speed/Current > Leeway**

Leeway is calculated as: $\lambda = K \times Abs(Heel)/(Bs)^2$

Where

λ	Leeway in degrees, +ve is leeway to Starboard
Heel	In degrees
Bs	Boat speed in knots
K	Leeway factor.

K may be up to 30 for a superyacht, 15 for an efficient cruiser/racer and near to 10 for a very efficient race yacht (all fixed keel). Canting keels, dagger-boards and foils will change this to the point where leeway can be negative (i.e., yacht climbs to windward of its heading). A negative K may be entered to calculate leeway to windward.

At low boat speeds, this Leeway calculation may give rise to spurious estimates of leeway and derived values (including TWA.) Therefore, the ATP processor modifies the above with a weighting factor: -

Bs <2.5 kts:	W=0
2.5kts <Bs<5 kts:	W: linearly increasing from 0 to 1
Bs > 5 kts:	W=1

Thus, the above calculation for leeway is used above 5kt and to a modified extent and speeds down to 2.5 kt. Below this speed, it is not possible to model leeway based only on speed and heel (apart from anything else boats may intentionally be heeled to leeward in light airs) so adopting a zero value for leeway gives a more stable estimate for wind calculations.

6.4. Heading calibration

Position/Attitude > Heading

Third party heading sensors must be swung according to the manufacturer's instructions. Simrad or B&G CANbus/N2k Compasses may be swung from the web address "/bandg.php"

Each Heading input may have a Calibration Offset entered to correct installation errors.

Advanced Heading Calibration
Magnetometer and fluxgate compasses, even after a calibration swing, may display errors at different headings and heel angles.

A matrix is available for each heading input to correct for these errors. Click the **Compass Corrections** button for the relevant heading Input to access this table and enter corrections.

6.5. Depth calibration

Each Depth Input must have its Input Source selected and can be given a custom name.

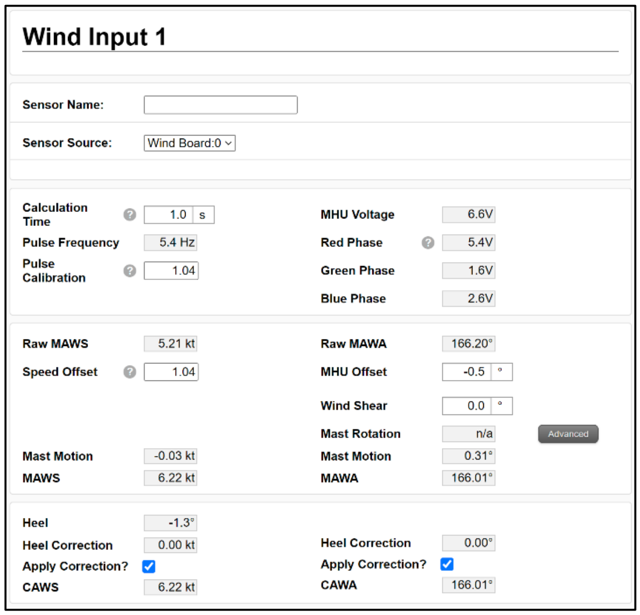
For Datum offset, add to increase Depth reading (for depth from surface) or subtract (for depth below keel/rudder).

For Port and Starboard sensors, the the switching rules can be set up in **Depth > Depth > Input Selection.**

6.6. Wind Calibration

6.6.1. Primary settings

Wind > Wind Measured



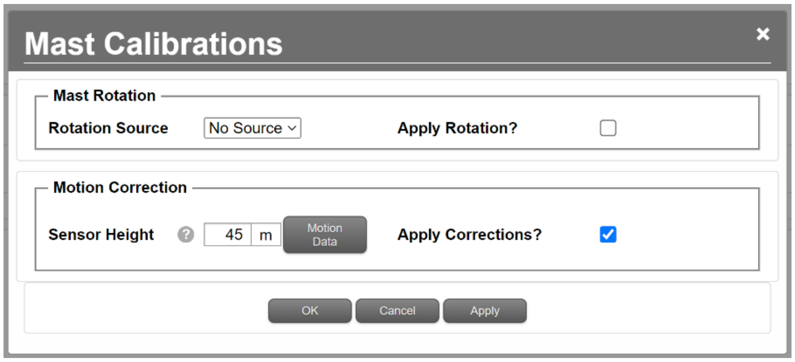
Each Wind Sensor input must have its Sensor Source selected and can have its MHU Offset calibration entered to account for installation errors.

A **Wind Shear** offset can be added to account for day-to-day changes in wind shear without affecting the base **MHU Offset** calibration.

Heel correction may be applied to correct for the geometric correction of the wind sensor when heeled.

6.6.2. Advanced settings

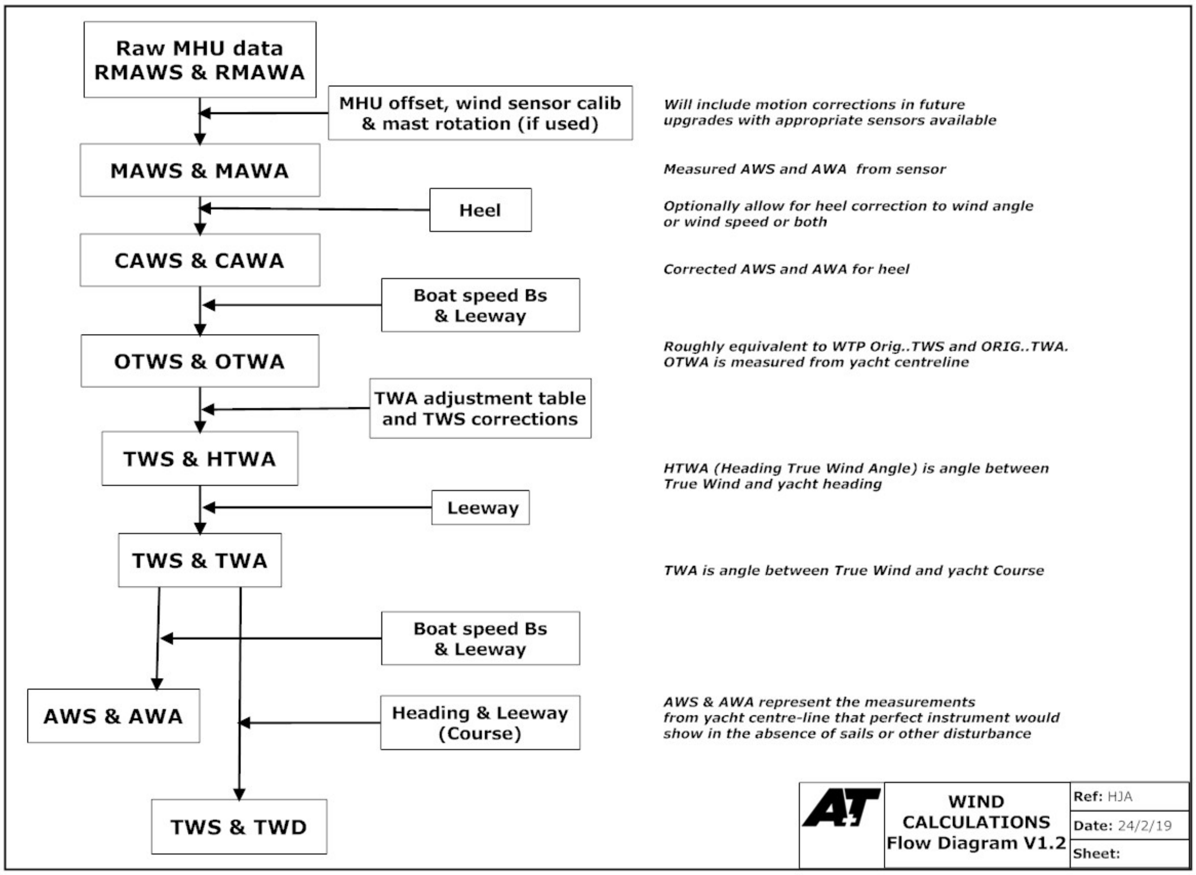
Clicking the **Advanced** button accesses further calibrations.



- Mast rotation for rotating masts to apply a rotation offset to the MHU offset
- Motion correction
  - The ATP has internal IMU's to calculate wind speeds and angles induced by the wind sensor moving through the air due to a yachts pitch and roll. These winds impact the actual wind measurement and are therefore subtracted from the raw wind measurements.
  - The rate at which the wind sensor is moving through the air mass is dependent on the distance of the wind sensor from the centre of motion of the yacht, therefore an accurate Sensor Height distance must be input in **Mast Calibrations > Sensor Height**
  - Clicking on the Motion Data button will display graphs describing the effects of the motion correction on the wind inputs.

6.6.3. Wind Calibration

This diagram defines the terms and sets out the flow diagram for calculation. Note that TWA is the angle between TWD and Course (Heading + Leeway). If the user wants to ignore Leeway, then this is achieved by setting the K value in the leeway settings to zero.



AWA and AWS are calculated from calibrated TWA and TWS.

Wind > Wind Calculations

Wind Calculations

Adjustments for wind angle and speed calculations, as target and wind speed varies.
Note that some of the intermediate values are only calculated for the currently active wind source. If you have multiple sources of wind, make sure that the source you are calibrating is currently active.

Boat Speed	4.45 kt	**CAWA**	165.57°	**OTWA**	171.30°
Leeway	-0.62°	**CAWS**	6.27 kt	**OTWS**	10.64 kt

Advanced Calibration

OTWS		**≤5kt**	**10kt**	**15kt**	**20kt**	**25kt**	**30kt**	**≥35kt**
Upwind	OTWA	60	45	42	40	40	40	40
	TWA Correction	2	3	8	9	9	9	0
Reaching	OTWA	90	90	90	90	90	90	90
	TWA Correction	-1	-4	-9	0	0	0	0
	TWS % Correction	0	0	0	0	0	0	0
Downwind	OTWA	125	138	142	152	160	160	160
	TWA Correction	8	4	0	-2	0	0	0
	TWS % Correction	-10	-15	-20	-20	-20	-15	-10

OK Cancel Apply

OTWS	10.64 kt	**TWS Correction**	-15.64%	**TWS**	8.98 kt
OTWA	171.30°	**TWA Correction**	0.00	**HTWA**	171.30°
CAWS	6.27 kt	**AWS Correction**	-26.60%	**AWS**	4.60 kt
CAWA	165.57°	**AWA Correction**	-0.87	**AWA**	164.70°
Heading	65.02°T	**Leeway**	-0.62°	**Course**	64.40°T
	64.84°M	**VMG**	-4.41 kt		64.24°M
TWS	8.98 kt	**TWA**	171.92°	**TWD**	236.32°T 236.16°M

Wind angle calibration is a process of three phases: -

Phase 1 – primary inputs

Boat speed, Heading and Leeway must be properly calibrated. These are primary inputs to the wind triangle solution and any inaccurate input data will make wind calibration difficult.

Phase 2 – MHU alignment

Any misalignment at installation must be calibrated out for each sensor.
An initial calibration may be achieved by fast motoring dead upwind in very light winds and adjusting the MHU offset to achieve AWA (or Raw MAWA) = 0. It is useful to use an average over approx. 30s to finalise this.
Adjusting MHU Offset with a +ve value will increase Stbd tack MAWA and reduce port tack MAWA, and vice versa.
To refine this calibration, check AWA (or Raw MAWA) is the same upwind tack to tack with well-mixed wind and the same trim and boat speed on each tack. Once the MHU offset is fine-tuned, TWA should also be the same tack to tack.
Once completed in good conditions, the MHU offset should NOT be adjusted unless the wind sensor or mast has been removed and re-installed. Any offset tack to tack from this point will be due to shear and can be adjusted at **Wind Shear.**

Phase 3 – TWA, TWS, TWD

Sails distort wind in the vicinity of the wind sensor, and other factors such as mast twist affect the Raw MAWA and MAWS. These measurement issues manifest themselves in the calculated TWS and TWA/TWD numbers and can be observed with tack-to-tack TWD changes and upwind to downwind TWS changes.
The correction table below allows offsets to be entered at fixed TWS bands for upwind, reaching, and downwind.

- For upwind and downwind, set the OTWA to the typical TWA that your yacht sails up/downwind. It is common to use your target TWA for the OTWA.
- Entering a value in TWA Correction upwind, reaching and downwind will add the value entered to the absolute value of TWA, i.e., a +ve number will increase TWA on both tacks.
- Entering a value in TWS % Correction will adjust the TWS by that %. i.e., -10 will result in a reduction of TWS by 10%.

As can be seen in the wind calaulations flow diagram above, AWA and AWS are calculated after the TWA and TWS calibrations are applied.

6.6.4. Methodology for calculating TWA and TWS corrections

TWA errors are observed in the 'tacking' of TWD when the yacht tacks or gybes. TWS errors are observed when a boat sailing upwind changes course to a reach or downwind.

TWA corrections

Three TWA zones are used for calibration:

Upwind sailing on a close-hauled course
Reaching sailing at TWA 90
Downwind sailing near your best VMG angle.

Conditions must be stable. If the wind is shifty and/or puffy it may be difficult to decide if a shift or change is real or a calibration error.
Monitor TWD for at least 30 seconds, and if stable, record TWD.
Tack/gybe and sail a similar angle on the opposite tack and observe TWD. It may take time (15-30 seconds) for TWD to stabilise. Once stable, record the TWD again.
If the TWD is **LIFTED** from tack to tack, your TWA is over-reading, therefore you must subtract from your TWA Correction for the specific OTWS band.
If the TWD is **HEADED** from tack to tack, your TWA is under-reading, therefore you must add to your TWA Correction for the specific OTWS band.
The correction should be half the TWD shift – for example:
Lifted by 10 deg, subtract 5 from the current TWA correction value
Headed by 7 deg, add 3.5 to the current TWA correction value

You may confirm your TWA calibration by comparing the angle you are tacking through calculated from TWA and Course.

Upwind example 1:
pTWA = 43, sTWA = 43. TWA tacking angle = 86
pCse = 168, sCse = 082. Cse tacking angle = 86

In this example, TWA is well calibrated.

Upwind example 2:
pTWA = 40 and sTWA = 50, TWA tacking angle = 90.
pCse = 168, sCse = 082. Cse tacking angle = 86

In this example, there is a TWA tacking angle error of +4. Therefore, TWA is overreading and a correction of -2 is needed. Leeway may be under-reading and contributing to this.

Reaching example:
pTWA = 88, sTWA = 91. TWA tacking angle = 181
pCse = 120, sCse = 305. Cse tacking angle = 175

TWA tacking angle error is 6. Therefore, TWA is overreading and a correction of -3 is needed.

Downwind example:
pTWA = 145, sTWA = 145. TWA gybing angle = 70
pCse = 015, sCse = 080. Cse gybing angle = 65

TWA gybing angle error is 5 and you would observe a TWD header from gybe to gybe. Therefore, TWA is under-reading and a correction of 2.5 is needed.

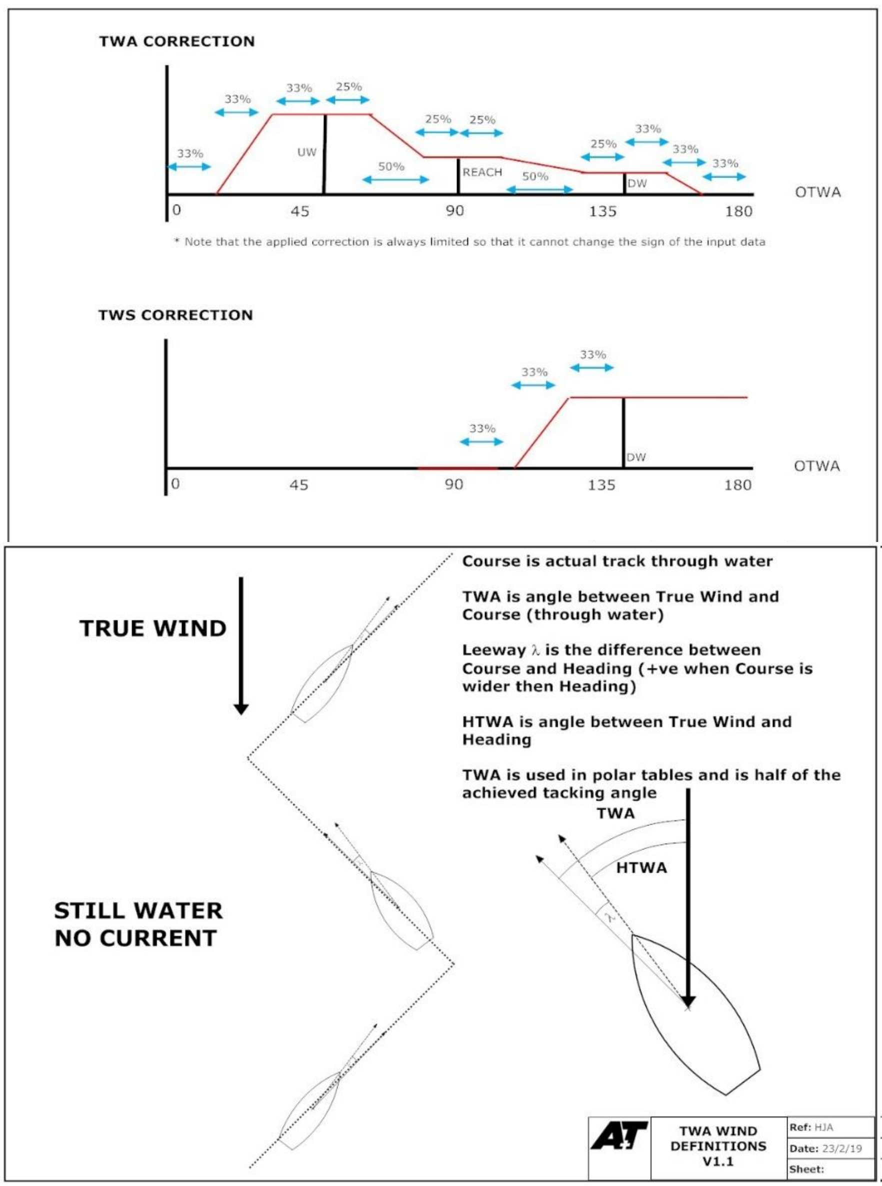
If the TWD LIFTS from tack to tack, then REDUCE the TWA correction
If the TWD HEADS from tack to tack, then INCREASE the TWA correction

TWS corrections

- Wind is accelerated over the top of the sail plan when sailing at wide angles and downwind. This effect is dramatically increased with square top mainsails and mast head spinnakers.
- The default TWS% correction is -10%.
- The error can be quantified by sailing a close-hauled course then quickly changing course to a reach, or to a downwind angle.
- It is important to change to the correct sails for each angle in this exercise.

If TWS% correction is correct, the TWA Correction required should be small.

Interpolation scheme for TWA corrections



6.7. Damping

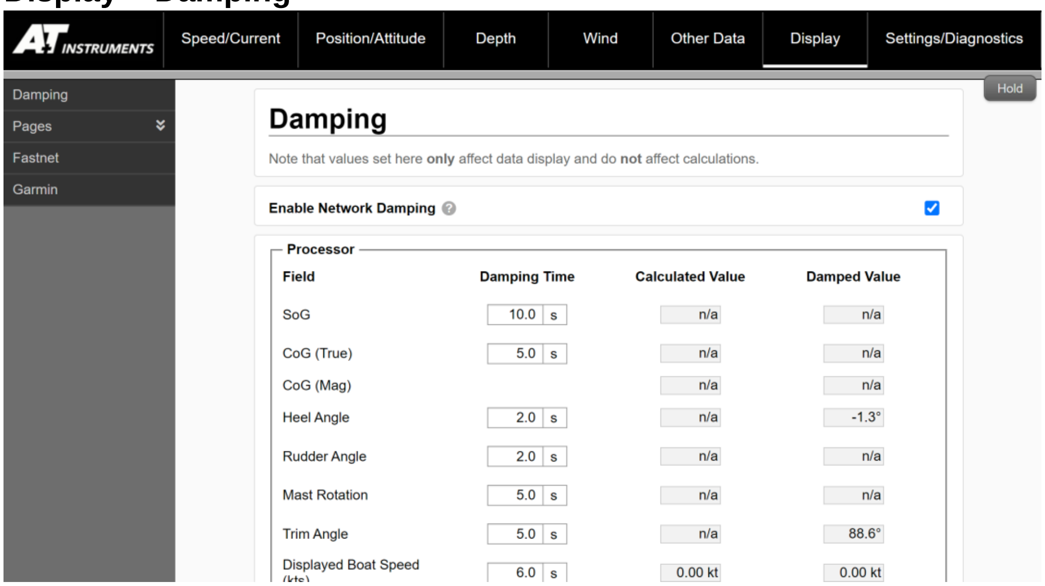
The damping of data will only apply to displayed data. It will not apply damping to data used in calculations.

The ATP uses box car damping, averaging data equally weighted over the selected period.

Damping may be applied to the channels as time constants in seconds.

The Calculated Value and the Damped Value are displayed to see the damping effect on the raw data.

Display > Damping



If **Enable Network Damping** is selected, data transmitted from ATP over NMEA0183 or Networked UDP will be the damped values.

7. Advanced Settings, Setup & Diagnostics

ATP time settings

The ATP may have UT (& date) set manually or set to synchronise from an external system such as GNSS.

Settings/Diagnostics > System Time

If synchronisation is selected:

a) Ensure that a time input is enabled (NMEA0183 ZDA or CANbus(N2k))
b) Do not enable more than one time input as sources may conflict

To ensure stable synchronisation, the ATP uses the following logic:

- No synchronisation is undertaken until **1 minute** after the later of:
  - ATP startup
  - First reception of external timing data
  - The synchronisation option is selected
- Thereafter, a full minute of valid timing data must be received.

Once this condition is met the ATP synchronise UT (including date) with the external source and make an entry into the Logs log file (see Settings/Diagnostics)

Thereafter the ATP continues to monitor the timing offset and will only re-synchronise its time when both the '1 minute' condition above is met and the ATP date has changed from the last time a synchronisation change took place.

Once initial synchronisation has taken place, no change will be made less than every 24 hours.

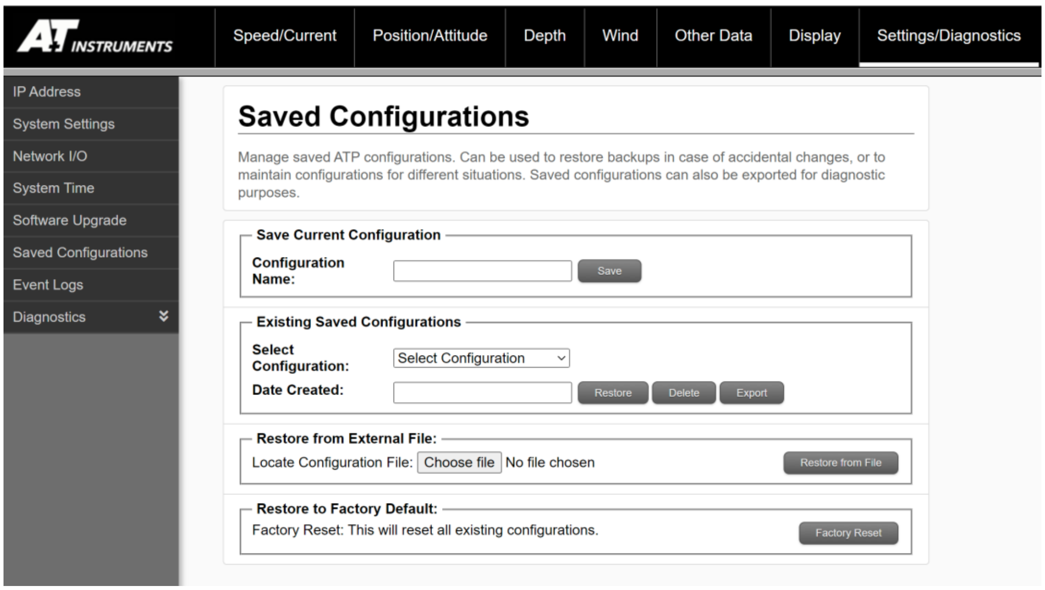
To force synchronisation, then deselect and reselect the synchronisation tick box. If, after 1 minute synchronisation does not take place, check that valid time input is available and selected.

8. Software Updating and Configuration

8.1. Saved Configurations

The ATP system setup and configuration may be saved on board the ATP or exported to a file. This will include input and output settings and calibrations.

Settings/Diagnostics > Saved Configurations



Save Current Configuration

Enter a meaningful name for the configuration and click **Save**

Existing Saved Configurations

Select a saved configuration to **Restore** to the ATP, **Delete**, or **Export** to file.

It is recommended to **Save** and **Export** settings after commissioning and from time to time in case of total loss of ATP functionality.

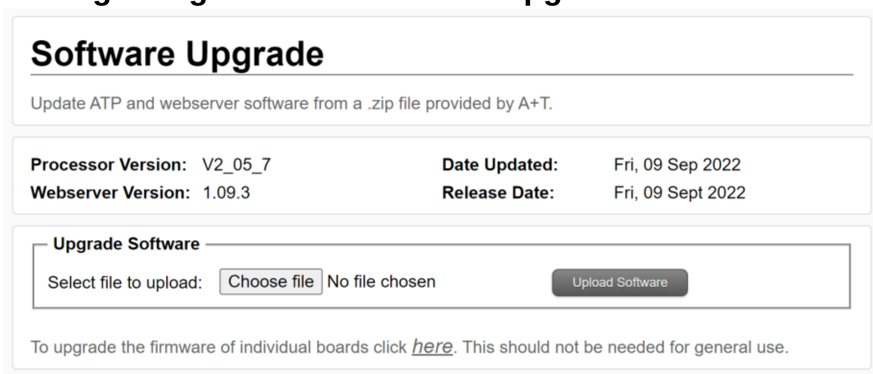
You may **Factory Reset** back to as shipped configuration. All data will be lost except for the IP settings and onboard logs.

8.2 Software Upgrade

The latest software release for the ATP is available on the A+T website under Downloads.

Configuration settings are preserved during an upgrade, but it is prudent to backup and export before upgrading.

Settings/Diagnostics > Software Upgrade



To update software:

1. Download and save the *.zip file but do not unzip it
2. Click **Choose** file and select the downloaded *.zip file.
3. Click **Update Software**

The ATP will reboot once the file is uploaded. You can verify the software version(s) in the **Software Upgrade** window.

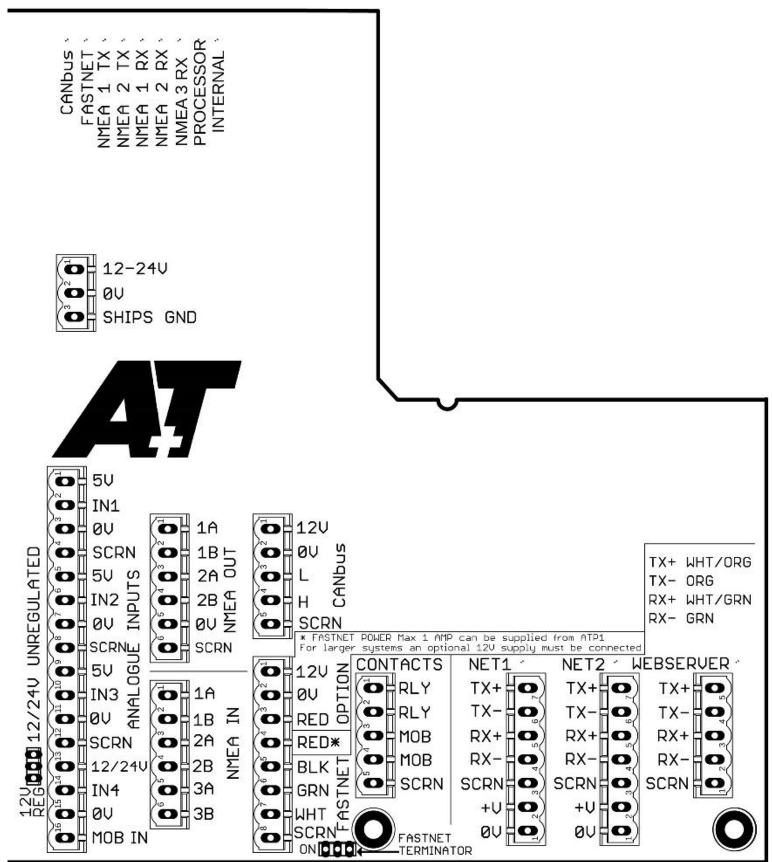
NOTE:
An advanced updating is also available. This should only be used under direct instruction from A+T.

Appendix A – ATP1 Processor Installation

The Processor may be mounted in any convenient location and orientation. It is recommended to physically mount with the cable glands either vertically down or horizontally to reduce the risk of water ingress.

Getting started

1. Provide power to the Processor 10-36 VDC
2. Gain access to the web-server port per section **7.** Below
3. Access the Processor web-server and proceed to with the installation



Power Supply

Connect either 24v or 12v power with a 5A fuse or circuit breaker protection.

The ATP Ship's Ground terminal should either be left disconnected or connected to Ship's Ground. It **should not be connected** to the power 0V.

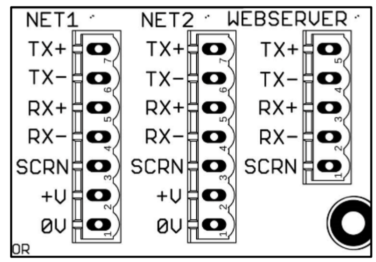
Screen connections should not be connected on NMEA0183 inputs. They should be connected on NMEA0183 outputs only.

Ethernet Connection

There are three on board Ethernet connections – NET1, NET2 and WEBSERVER

NET1 and NET2 are equivalent and can be used to reduce daisy chaining.

Terminal	Cat5e screened cable
TX+	White/Orange
TX-	Orange
RX+	White/Green
RX-	Green
SCRN	Screen
+V	White/Brown & Brown
0V	White/Blue & Blue



The +V and 0v connections use spare wires within cat5e cable. Twist together the White/Brown and Brown pair, and the White/Blue and Blue pair for connection to the +V and 0V terminals. The ATP will supply power over these pairs to power A+T ethernet switches, but not displays or other devices.

WEBSERVER is to connect directly to the ethernet port on your ships network to access the Processor Web-server.

System IP addresses as shipped:

	ATP2
Web-server	192.168.1.219
NET1/NET2	172.16.15.1

On powering up, the ATP will wait for 5 seconds to see if a DHCP server is providing an IP address on the connected network. If no DHCP address is received, then the IP address reverts to its fixed IP address. This may be changed once initial access to the web-server is achieved.

The IP address the Processor has adopted is displayed on the small LCD display on the top left of the Processor cabinet.

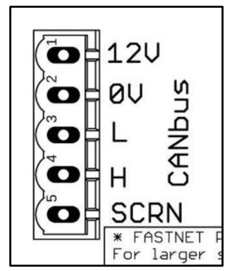
CANbus (N2k compatible) Connection

For connection of a N2k system via drop cable

The CANbus N2k power does not supply power to the Processor.

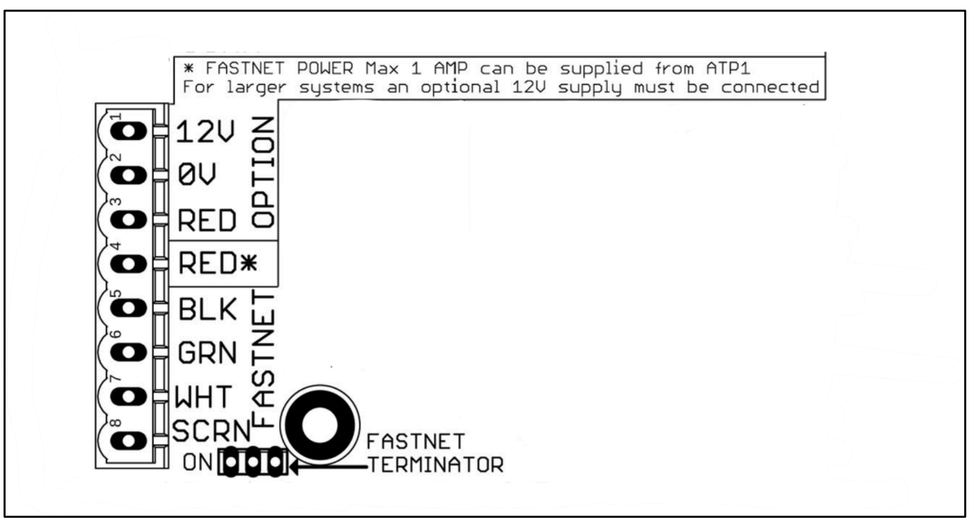
The N2k network must be supplied power independently. If it is not supplied power, it will be inactive on the Processor.

CANbus terminal	N2k
SCRN	Screen
CAN+/NET H	White
CAN-/NET L	Blue
0V	Black
12V	Red



NOTE: The 0V and 12V terminals do not supply power.

Fastnet Connection



Connect the white, green, black and screen of the Fastnet network cable as marked

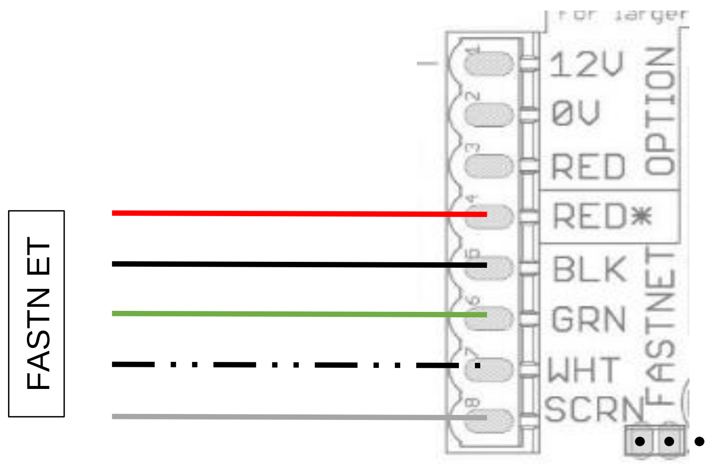
An in-built 100 Ohm resistor is mounted at the bottom of the Fastnet connector which is active when the header is in place. This should be used when the ATP is at one end of the Fastnet Network. Total terminator resistance on the Fastnet Network should be close (+/- 10%) to 50 Ohm.

For the **RED** wire connection:

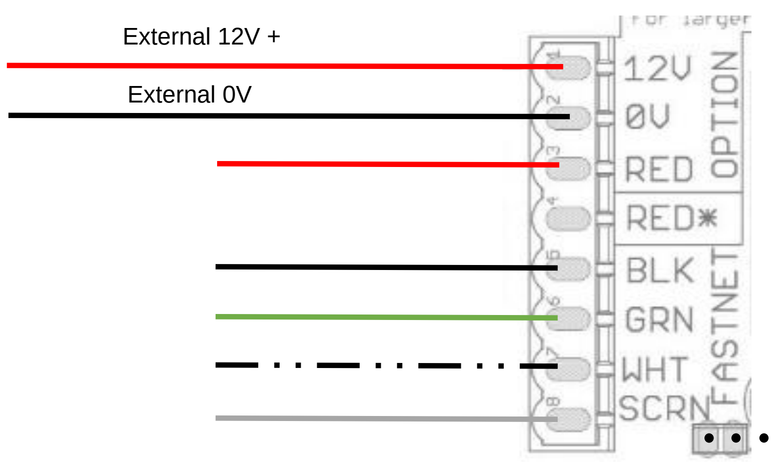
- When any B&G displays, sensors, interfaces or other 12V only units are to be connected to the Fastnet network, then this must be supplied with 12V.
- If only A+T displays and interfaces are used, then 24V may be used.

Two options for providing 12V power to Fastnet are available: -

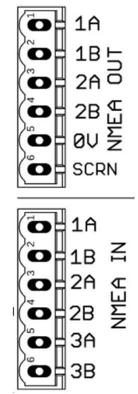
1. For a small system (up to 1 amp, typically less than 6 displays) then power may be taken from the ATP Fastnet connector marked **RED***.



2. For a larger system, the Fastnet red should be connected to the **RED** terminal immediately above this marked OPTION and a 12V external power source with a 5A fuse or circuit breaker should be connected to the connecters marked 12V and 0V OPTION.



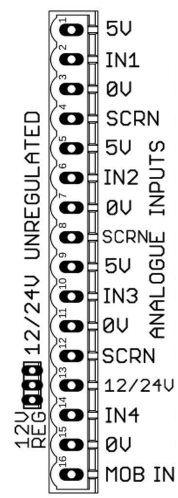
NMEA0183 in/out connections



There are 3x NMEA0183 input and 2x NMEA0183 output ports on the ATP1 and ATP2 motherboard. The ATP1 has an additional input port on the mounted Speed/Depth board.

Screen should not be connected to the input.

Analogue inputs



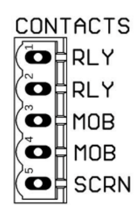
Input 1, 2 and 3 are 5Vdc regulated inputs.

Input 4 is either 12Vdc regulated, or unregulated and via the ships supply. This is selected by the header to the left of the input strip.

MOB IN

When the **MOB IN** is contacted with 0V, the ATP **MOB** function is activated.

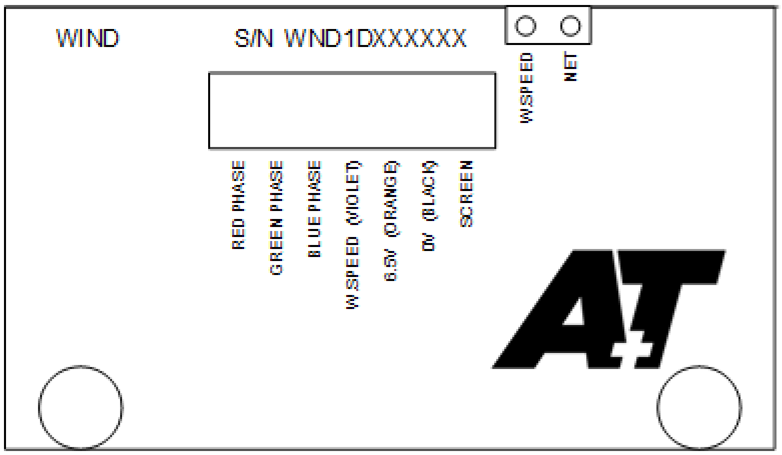
CONTACTS



The **RLY-RLY** terminal pair will move from open circuit to closed circuit in the event of an alarm (except MOB) being triggered in the ATP system

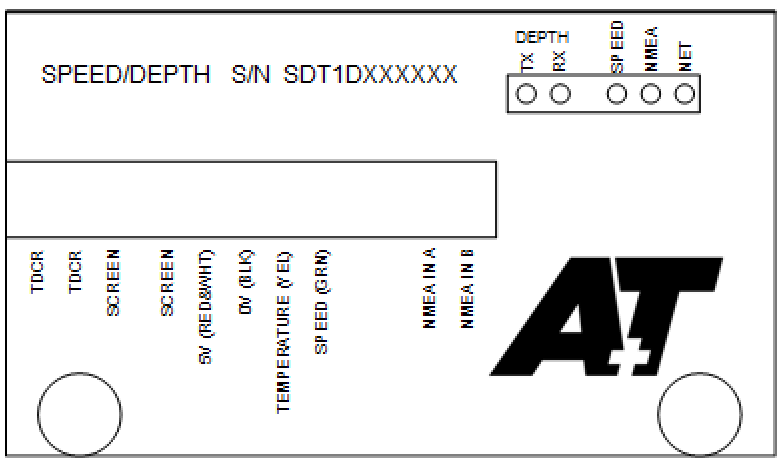
The **MOB-MOB** terminal pair will move from open circuit to closed circuit in the event of a MOB alarm

Wind Board
For analogue measured wind angle and pulse output measured wind speed.



Speed/Depth/Water Temperature Board
TDCR/TDCR/SCREEN terminals for passive depth transducers

Terminals as described for passive speed/temp transducers, and for NMEA 4 input.



Appendix B - Commissioning Checklist/Short Guide

Start up

Item	Activity	Notes
Power up	Check ATP, motherboard LEDs active small LCD display working	Boot time should not be more than 22 sec
Connect a computer with Ethernet cable	Get web-server working	Set IP address and mode
Connect Fastnet/A+T Ethernet/CANbus	Check displays showing time or barometric pressure (always output)	Check how Fastnet is powered (12v). Check network resistance. Is APT1 100 Ohm resistor fitted/needed

Boat Speed, Wind Speed, Heel & leeway

Item	Activity	Notes
Connect paddle wheel	Spin & check pulses on speed page.	Set Hz calibration to the previous value if known
Connect wind sensor	Check mast volts up and down on Wind Measurement page Check pulses coming from speed senor	
Calibrate Wind	Set up MHU offset and wind correction table as normal.	Check Leeway and heel set up first
Heel	Set up mounting orientation	
	Check output sensible	
Leeway	Set the best-known number	If a sailing vessel, else 0

NMEA 0183 Inputs, GNSS, Depth & Gyro

Item	Activity	Notes

Connect Input	Verify expected data on NMEA 0183 Diagnostics Page	
Set Filter	Web-server/Other Data/NMEA0183/Filter	Set to take in required information
GNSS	Web-server/Position. Select correct input port and verify data received.	
Gyro/Compass	Web-server/Heading. Select input port and reference True/Mag.	Verify data received and set any offset.
Depth	Web-server/ Depth. Select input port and name it if required.	Set datum offset
Outputs	Set baud rates	
	Select data to be sent on filters page	

Analogue Inputs

Item	Activity	Notes
Reference Voltage	Select header for regulated 12V or input power voltage on the 12V reference	
For each input	Select pre-defined or user	Check & calibrate
MOB	Test	

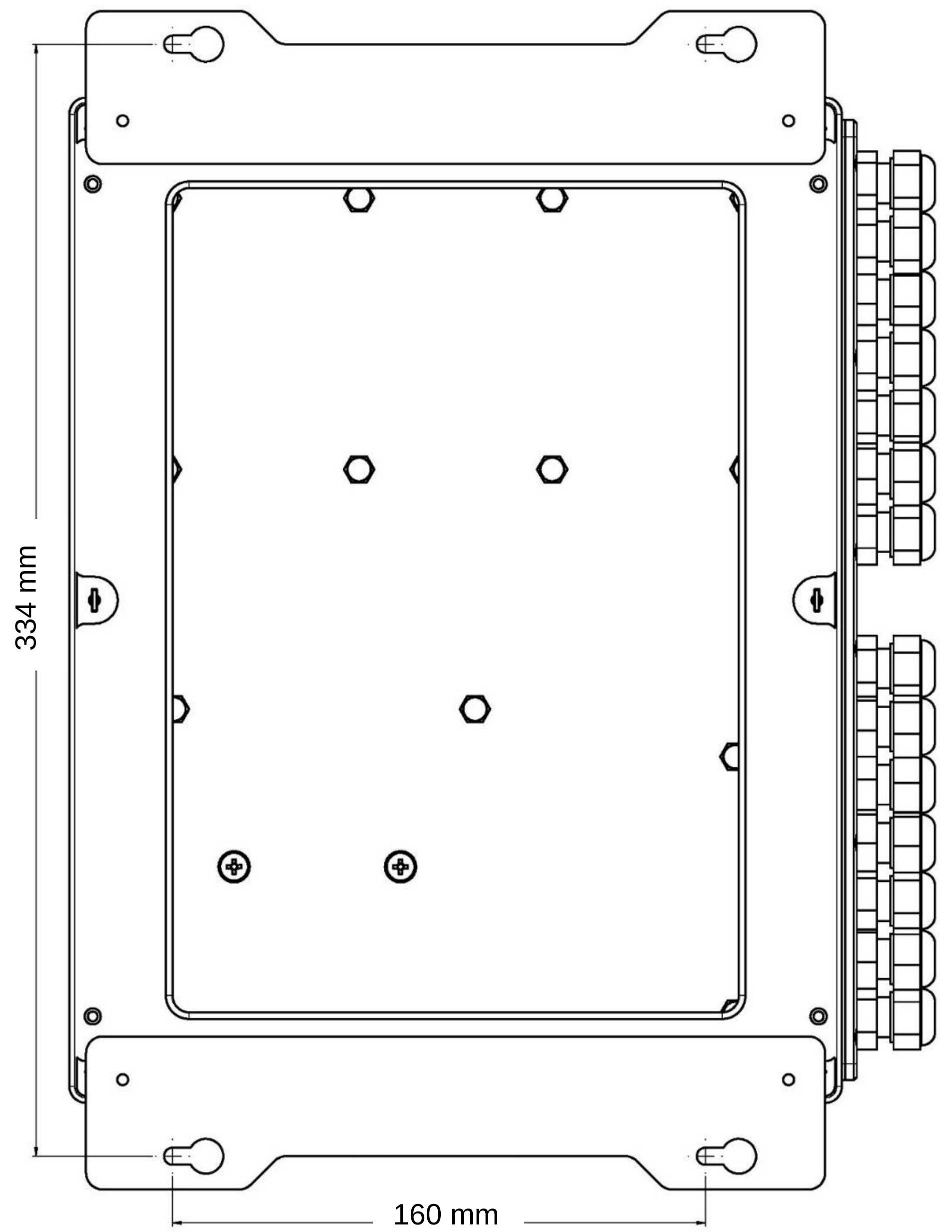
Alarms/MOB, Set from web-server Home Page

Item	Activity	Notes
Alarms	Select levels, mode and enable as required	Can close relay for connection to plc or sounder/light
MOB	Set up as required	Can close a separate relay for connection to plc or sounder/light
A+T MFDs	Set to show MOB as required Set to show connected to ATP processor under MENU/System	TEST MOB SYSTEM

CANbus (N2k compatible)

Item	Activity	Notes
inputs	Select source for data that is available on the N2k	
Outputs	Select data groups for output data from ATP	

Appendix C - ATP1 Mounting Template



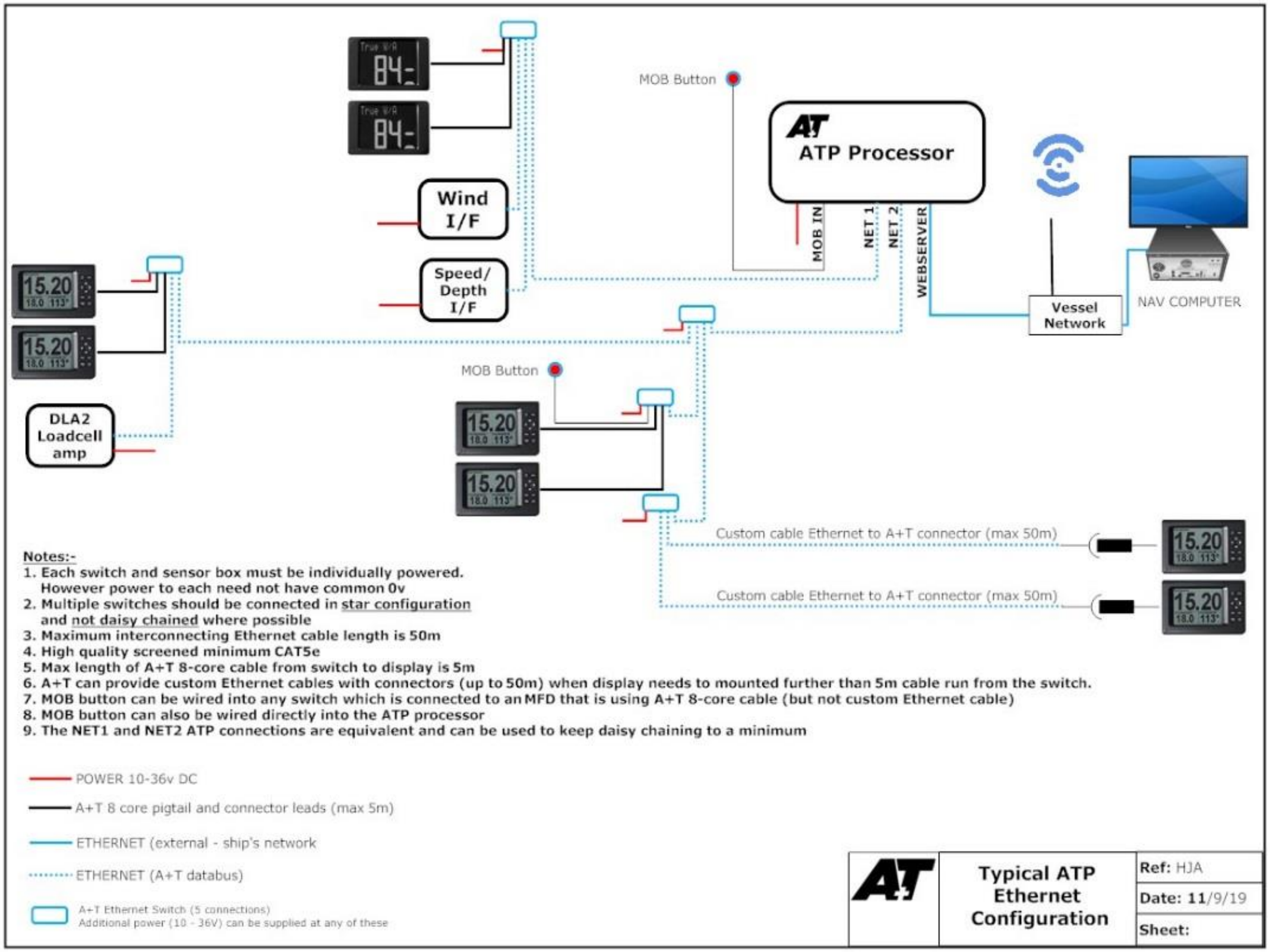
Appendix D - Ethernet System connections considerations

Ethernet Cable Specification
Cat 5e screened; RS part number 812-4801 or equivalent

Configuration
See diagram of typical configuration below

Pay particular attention to the notes regarding power input, maximum lengths of cables and switch configuration:

1. Each switch and sensor box must be individually powered. However, power to each need not have common 0v
2. Multiple switches should be connected in star configuration and not daisy chained where possible
3. Maximum interconnecting Ethernet cable length is 50m
4. Max length of A+T 8-core cable from switch to display is 5m
5. A+T can provide custom Ethernet cables with connectors (up to 50m) when display needs to mount further than 5m cable run from the switch.
6. MOB button can be wired into any switch which is connected to an MFD that is using A+T 8-core cable (but not custom Ethernet cable)
7. MOB button can also be wired directly into the ATP processor
8. The NET1 and NET2 ATP connections are equivalent and can be used to keep daisy chaining to a minimum


MOB Button
ATP Processor
MOB IN
NET 1
NET 2
WEBSERVER
Vessel Network
NAV COMPUTER
Wind I/F
Speed/ Depth I/F
DLA2 Loadcell amp
MOB Button
Custom cable Ethernet to A+T connector (max 50m)
Custom cable Ethernet to A+T connector (max 50m)
Notes:-
1. Each switch and sensor box must be individually powered. However power to each need not have common 0v
2. Multiple switches should be connected in star configuration and not daisy chained where possible
3. Maximum interconnecting Ethernet cable length is 50m
4. High quality screened minimum CAT5e
5. Max length of A+T 8-core cable from switch to display is 5m
6. A+T can provide custom Ethernet cables with connectors (up to 50m) when display needs to mounted further than 5m cable run from the switch.
7. MOB button can be wired into any switch which is connected to an MFD that is using A+T 8-core cable (but not custom Ethernet cable)
8. MOB button can also be wired directly into the ATP processor
9. The NET1 and NET2 ATP connections are equivalent and can be used to keep daisy chaining to a minimum
POWER 10-36v DC
A+T 8 core pigtail and connector leads (max 5m)
ETHERNET (external - ship's network
ETHERNET (A+T databus)
A+T Ethernet Switch (5 connections)
Additional power (10 - 36V) can be supplied at any of these
Typical ATP Ethernet Configuration
Ref: HJA
Date: 11/9/19
Sheet:

Appendix E - NMEA 0183 Sentences

BWC	Bearing and Distance to Waypoint (GC)
BWR	Bearing and Distance to Waypoint (RL)
DBT	Depth Below Transducer
DPT	Depth of Water
GGA	Global Positioning Fix Data
GLL	Geographic Position Latitude/Longitude
HDG	Heading- Deviation & Variation
HDM	Heading- Magnetic
HDT	Heading – True
MMB	Barometric Pressure
MOB	MOB Active Sentence
MWD	True Wind Direction and Speed
MWV	True / Apparent Wind Angle and Speed
MTA	Air Temperature (Legacy)
MTW	Water Temperature (Legacy)
MXS	MaxSea Proprietary MOB Sentence
RMB	Recommended Minimum Sentence B
RMC	Recommended Minimum Sentence C
ROT	Rate of Turn (Deg/min)
RSA	Rudder Sensor Angle
RTE	Route List
VDR	Current Rate and Direction
VHW	Water Speed and Heading
VLW	Distance Travelled through Water
VPW	Speed- parallel to wind (VMG)
VTG	Track made good- ground speed (COG/ SOG)
VWR	Relative Wind Speed and Angle (Legacy)
VWT	True wind speed and angle (legacy)
WPL	Waypoint List
XDR-A	Transducer Measurement
XDR-B	Transducer Measurement (Legacy B&G format)
XTE	Cross Track Error
ZDA	Time and Date

Appendix F – Expedition Navigation Software

Introduction

Once configured from the web-server, the ATP is intended to work as a stand-alone system. Higher level navigation functions are accessible via Expedition Navigation Software.

The ATP has been developed for use specifically with Expedition both to provide these functions and to provide for editing and uploading of performance information. Other navigation software packages may be used.

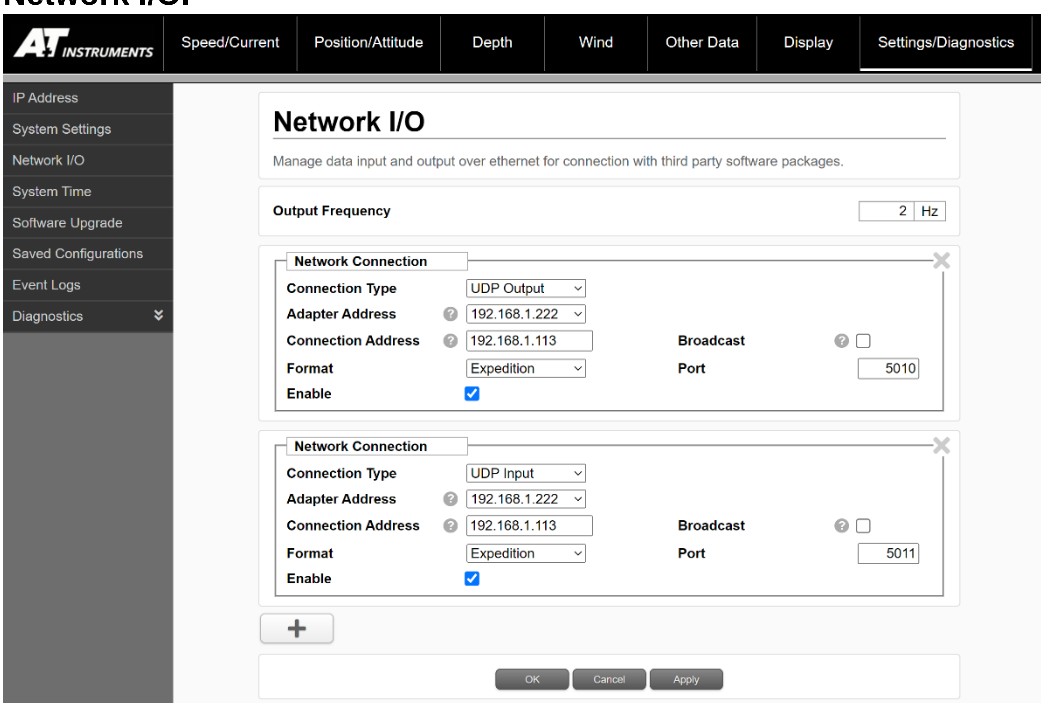
Connection

A UDP connection method provides a simple, high-speed interface between the ATP and Expedition Navigation Software. Fast, bi-directional data transmission allows easy access to channel variables, calibrations, and custom user channels. Expedition sends start timer system commands that trigger the ATP Timer.

The Connection can be direct via ethernet or wireless via a router depending on the network arrangement.

ATP Settings

To Configure the UDP connection for Expedition, go to; **Settings/Diagnostics > Network I/O.**



1. Set the **Output Frequency** to between 1 and 10Hz
2. If no free Network connections are available, Press **+** to add a connection

To send data to Expedition:

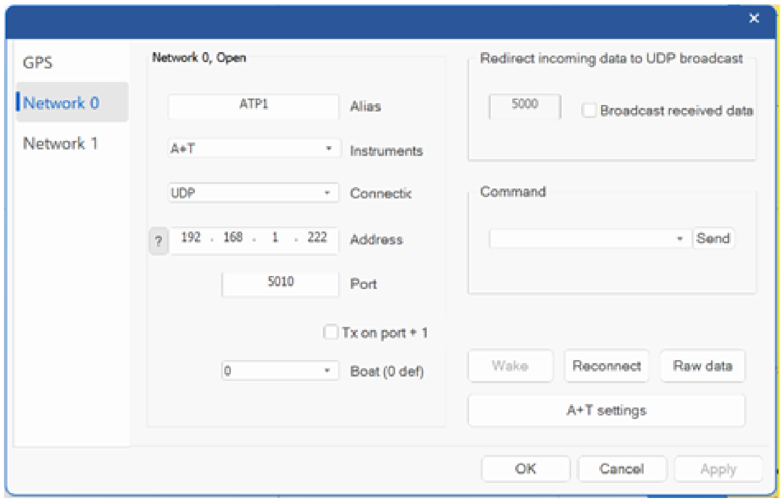
1. You may set an alias to overwrite **Network Connection.** For example, ‘Output to Exp’
2. Set **Connection Type** to UDP Output
3. Select the **Adapter Address** for the network that the computer running Expedition is connected to. Typically, this is the same network as the web-server address.
4. **Connection Address** has two options:
    a. Enter the IP address of the computer running Expedition (192.168.1.113) – this sends data directly to that computer, or
    b. Tick the **Broadcast** check box. See note on Broadcast Addresses below.
3. Set **Format** to Expedition
4. The default UDP port is 5010, however this may be changed. See below.
5. Ensure the ‘**Enable**’ checkbox is ticked.

To receive data from Expedition:

1. Press **+** to add a connection if necessary
2. You may set an alias to overwrite **Network Connection.** For example, ‘Input from Exp’
3. Set the second Connections **Connection Type** to UDP Input
4. Select the **Adapter Address** to the same as the UDP Output connection.
5. **Connection Address:** Enter the IP address of the computer running Expedition
   Note: Broadcast should, in the majority of cases, not be selected.
6. Set **Format** to Expedition
7. The default UDP port is 5010, however this may be changed. See below.
8. Ensure the ‘Enable’ checkbox is ticked.

Expedition Network settings

To configure Expedition, click on the main drop-down menu and select **Instruments** or press **ctrl+i.**



By default, there is one network port: Network 0. You may add network ports by clicking on the main drop-down menu and selecting **Instruments > Number of network connections.**

Select the Network Port you wish to use with the ATP.

1. In the **Instruments** drop down, select A+T
2. Set **Connection** to **UDP**
3. Enter the IP Address of the ATP network port
4. The default UDP port is 5010. This must match the port on the ATP Network I/O UDP Output
   a. Expedition may transmit data on a different port. If you select **Tx on port + 1**, Expedition will broadcast on the set port number + 1. This port number (+1, i.e., 5011) must be set on the ATP Network I/O UDP Input Port
5. Click **Apply**
6. If you wish to use ATP GNSS data, click **GPS** at the top of the Comm and Network port list on the left of the Instruments box, and select the Network port the ATP is connected to.

Broadcast vs. Direct Address

The broadcast address of a network is the address which all connected devices within the IP range will receive data messages.

All connected devices must use the same netmask/subnet mask: **default 255.255.255.0**. The broadcast address with this netmask is 192.168.1.255

For example, if:

1. the ATP **Adapter Address** is 192.168.1.222, the Netmask is 255.255.255.0 and Broadcast is selected, then
2. the ATP will broadcast on 192.168.1.255, and
3. any device in the IP range of 192.168.1.0 and 192.168.1.254 will be able to receive the data

Enabling this option in the ATP **UDP Output** will allow data to be received by any PC on the network in the correct IP range

It is **not recommended** enabling this option on the ATP **UDP Input**

If the ATP and PCs are configured to **DHCP**, then the IP addresses may be re-issued and break data communications. You may be able to set your DHCP to lease IP addresses to each device so that this does not occur.

If the ATP is configured to a **Static IP Address**, set Expedition to connect to this IP address directly as shown above. You may do the same for the PC(s).

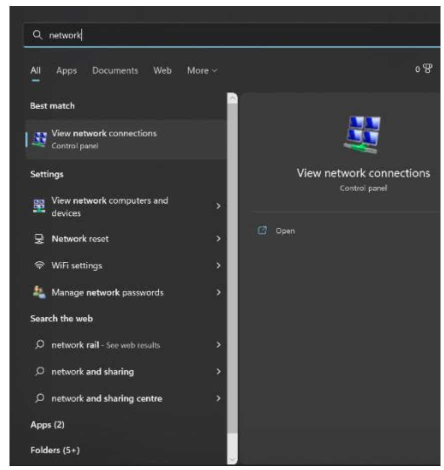
Example 1: One ATP with two PCs on the network, with fixed IP addresses.

Fix IP addresses to:

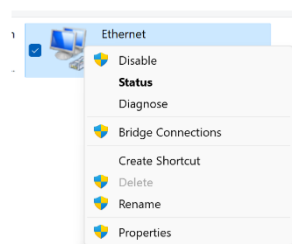
- ATP: 192.168.1.222
- PC1: 192.168.1.20 – Expedition receiving from and sending to ATP
- PC2: 192.168.1.30 – Expedition receiving from ATP only, backup system

For a Win11 PC, you may fix your IP address as follows:

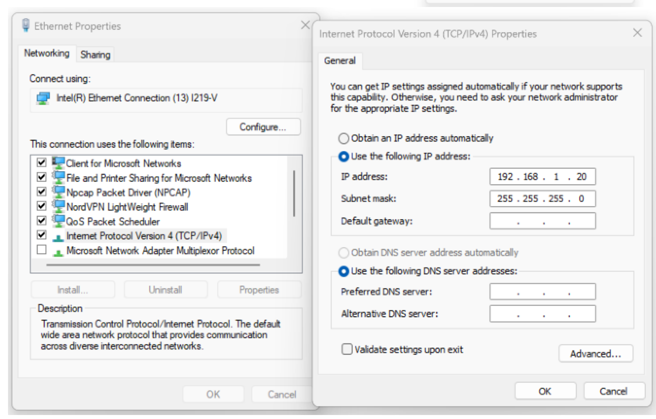
1. On your search bar enter “Network” and select **View Network Connections**



2. Right Mouse Click on the WiFi or Ethernet connection and select **Properties**



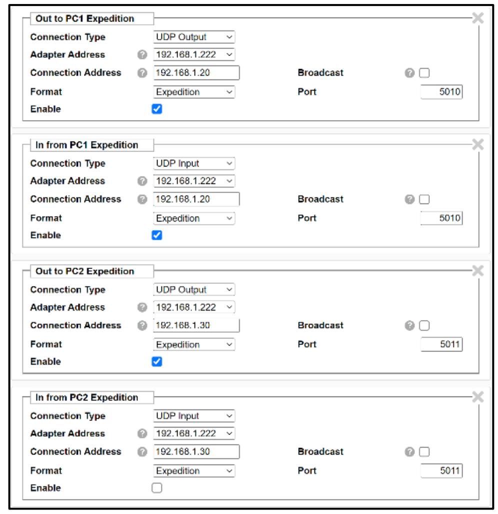
3. Highlight **Internet Protocol Version 4 (TCP/IPv4)** and press **Properties**
4. Choose **Use the following IP address:**
5. Enter the IP address for the computer and the netmask 255.255.255.0
6. Click **OK** then **OK**



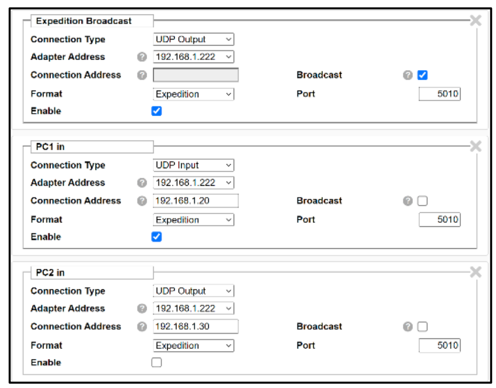
Example 1: ATP Network I/O

There are two options for configuring the ATP.

1. Each PC has a direct connection to the ATP, however PC2 UDP Input is not Enabled, but set up to easily be used if required.



2. ATP is broadcasting all Expedition data, however only PC1 can send data to the ATP.

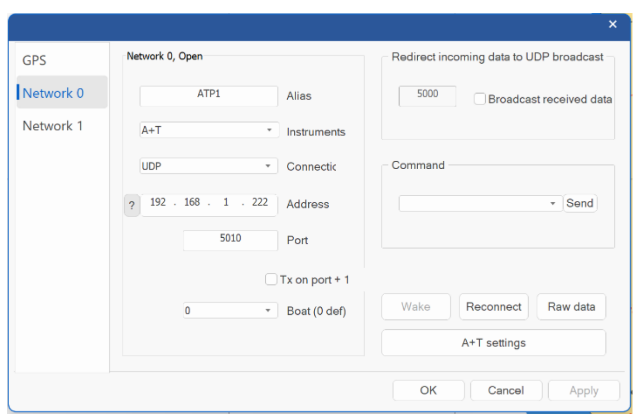


Example 1: Expedition Network Setup

Both PC1 and PC2 Expedition instruments are set to the IP address of the ATP: 192.168.1.222

Shown right is PC1 with port 5010. If the scenario in Example 1: ATP Network I/O #1 is chosen, then PC2 Expedition will need to be set to port 5011

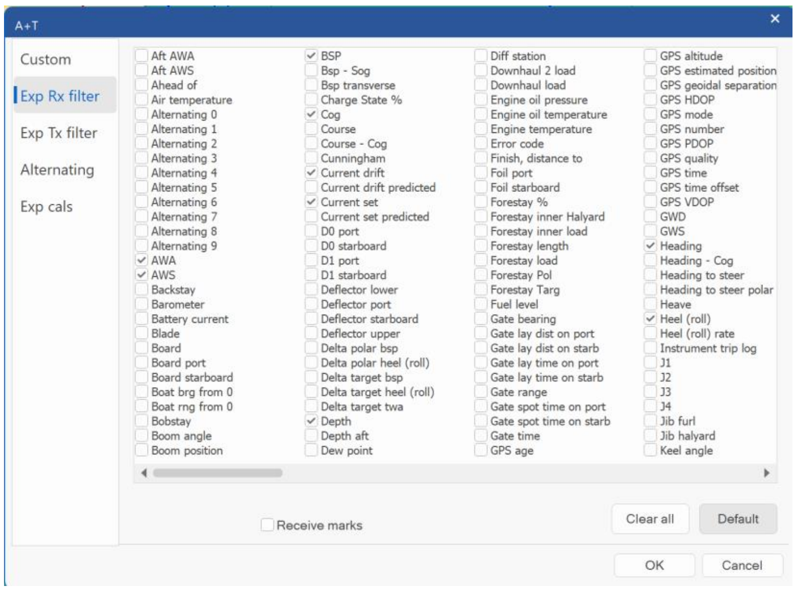
If Example 1: ATP Network I/O #2 is chosen, then PC2 Expedition port will remain 5010.



Configuring Expedition

You must select the channels you wish to receive into Expedition from ATP, and the channels you wish to send.

In the Expedition A+T Network port, Click **A+T Settings**



Custom is not used

Exp Rx filter: Select the channels to receive from the ATP. Default will select all common wind/speed/heading variables, however other sentences such as loadcells or user channels will need to be manually selected.

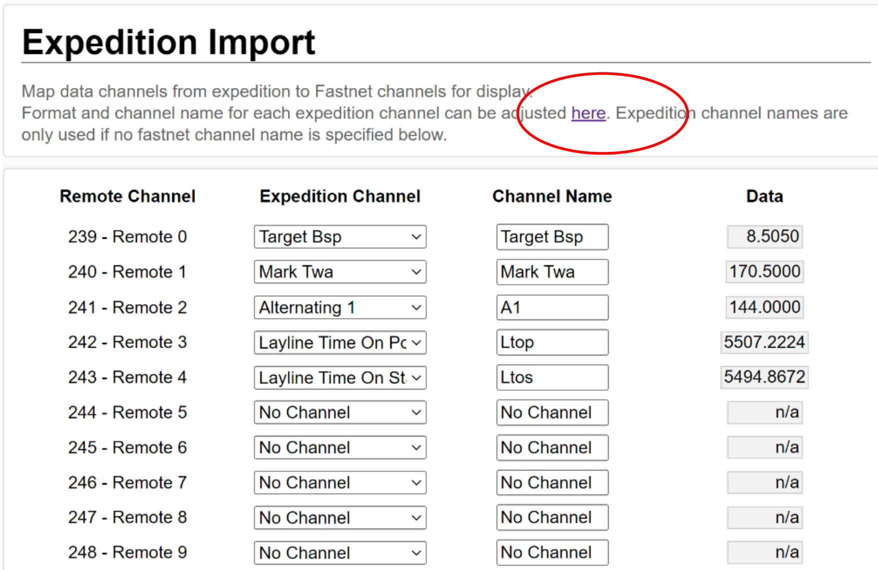
Exp Tx filter: Select the channels to transmit to the ATP. Typically, this will be target speeds and angles and other navigation information such as times to lay lines.

Alternating & Exp Cals: See Expedition manual

Expedition channels on Fastnet

10 Remote Channels are available to broadcast received Expedition data for display on connected displays (Ethernet, Fastnet or CANbus).

Other data > Expedition > Expedition Import



Expedition Import

Map data channels from expedition to Fastnet channels for display. Format and channel name for each expedition channel can be adjusted here. Expedition channel names are only used if no fastnet channel name is specified below.

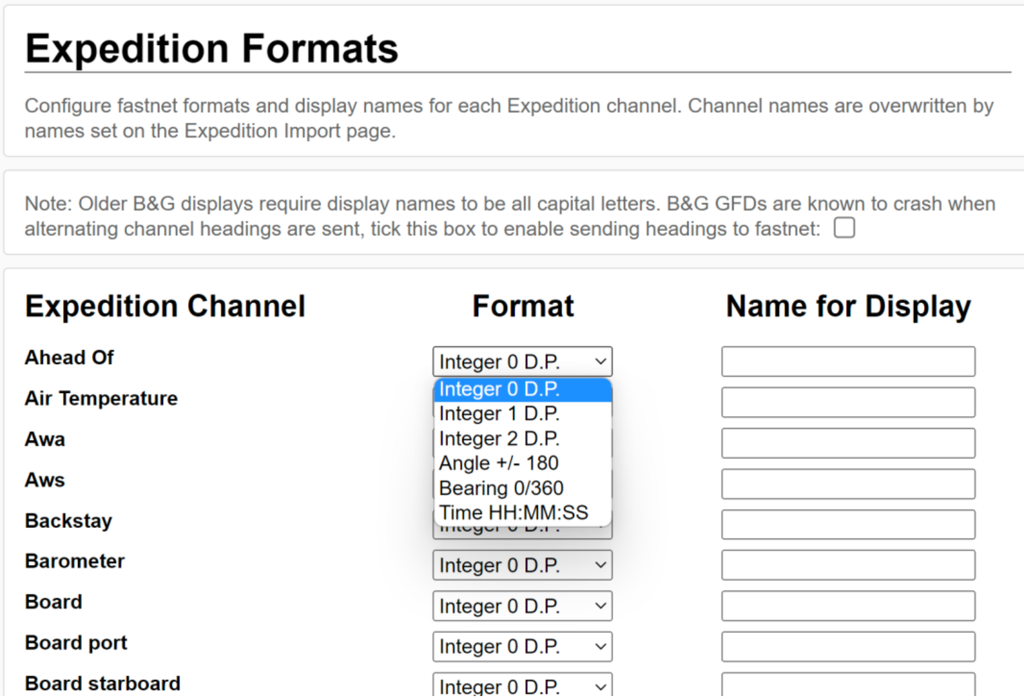
Remote Channel	Expedition Channel	Channel Name	Data
239 - Remote 0	Target Bsp	Target Bsp	8.5050
240 - Remote 1	Mark Twa	Mark Twa	170.5000
241 - Remote 2	Alternating 1	A1	144.0000
242 - Remote 3	Layline Time On Pc	Ltop	5507.2224
243 - Remote 4	Layline Time On St	Ltos	5494.8672
244 - Remote 5	No Channel	No Channel	n/a
245 - Remote 6	No Channel	No Channel	n/a
246 - Remote 7	No Channel	No Channel	n/a
247 - Remote 8	No Channel	No Channel	n/a
248 - Remote 9	No Channel	No Channel	n/a

For each **Remote Channel**, select the **Expedition Channel** variable.

The receiving of Expedition data is verified in the live data box.

For transmission to CANbus, you must select **Transmit:** User at **Other Data > CANbus**

You may change the **Channel Name** and define the data **Format** at the link in the description, circled above.

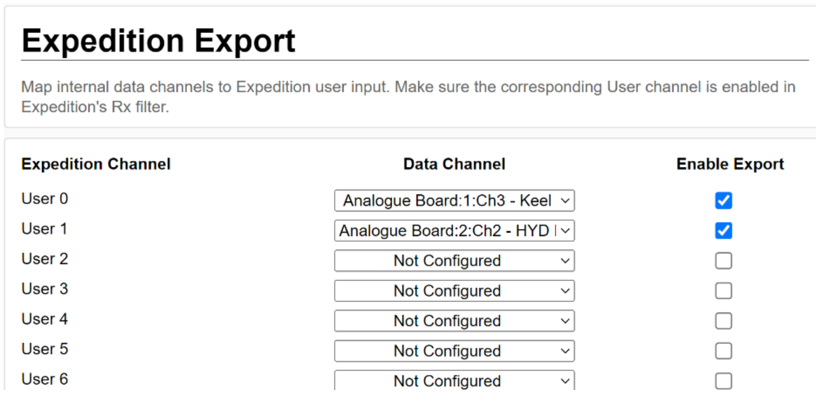


If there is any text in the **Channel Name** box, this will override any input in **Name for Display**. If **Format** is not set, it will default to integer and no decimal places.

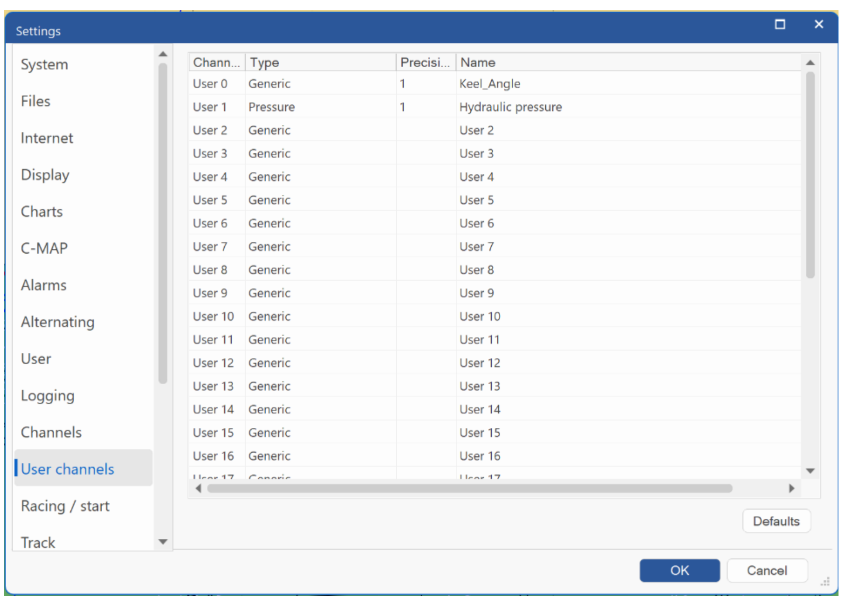
Expedition Export

There are 31 User channels in Expedition that may be used for non-standard ATP channels, for example data from a second wind sensor.

Other Data > Expedition > Expedition Export



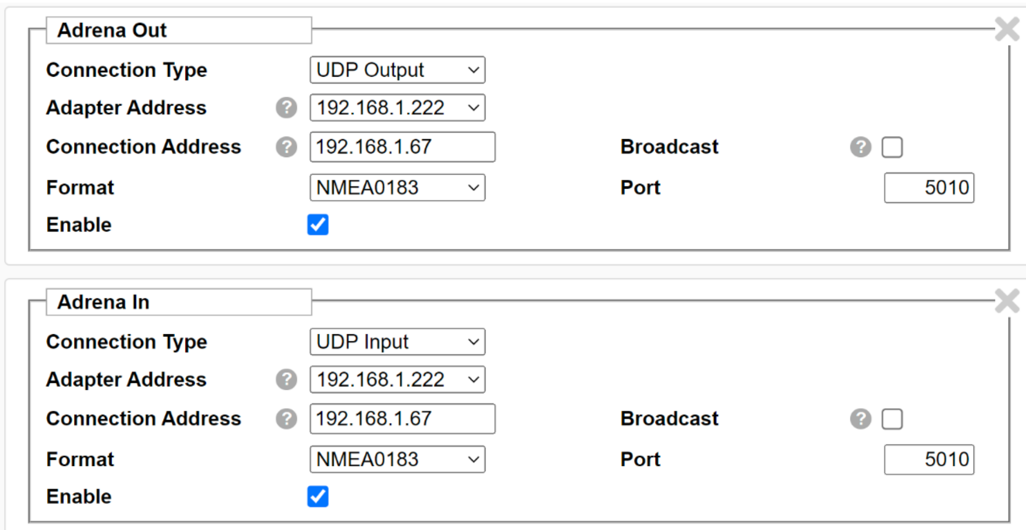
The Expedition User channels may be renamed in Expedition **Settings > User Channels**.



Appendix G – Adrena Software

Setup – ATP

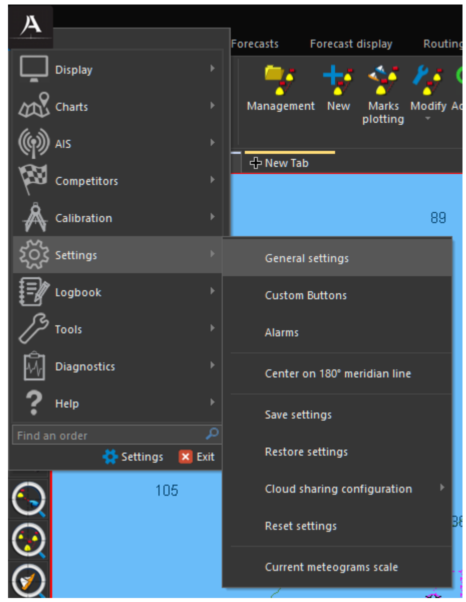
To configure the UDP connection for Adrena, go to; **Settings/Diagnostics > Network I/O.**



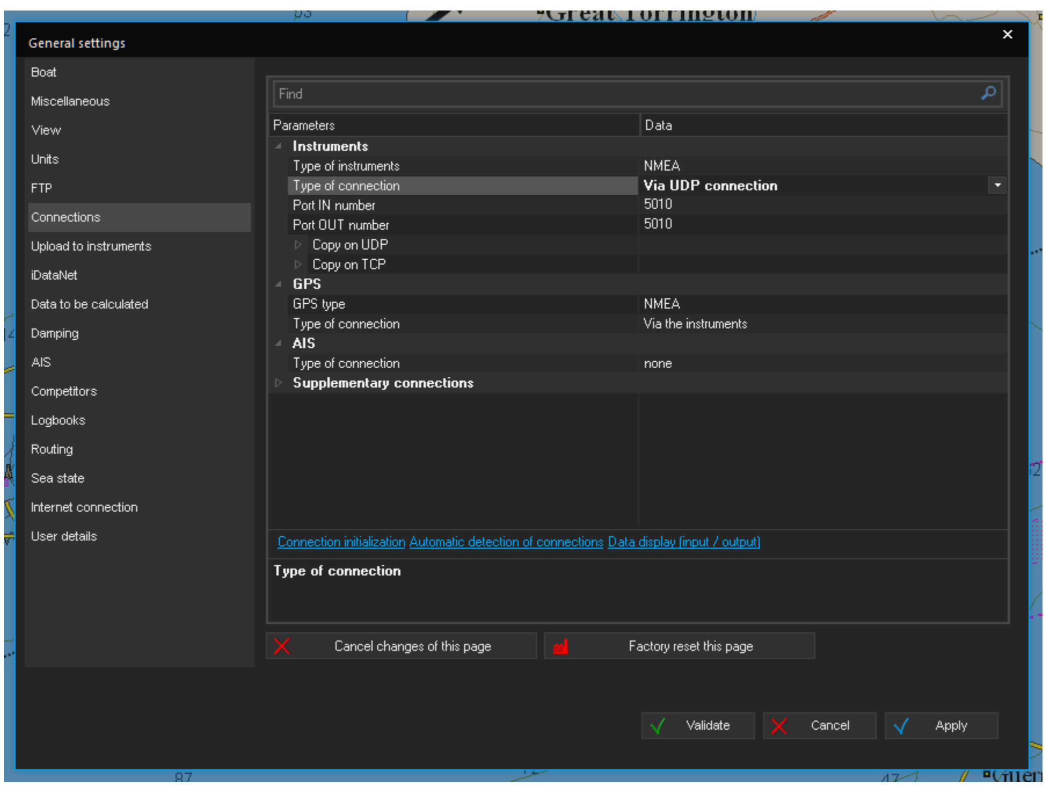
1. Set the Output Frequency to between 1 and 10Hz
2. Two Network connections are required. Press + to add a connection
3. Set Connection 1 to UDP Output and Connection 2 to UDP Input.
4. Ensure the **Enable** checkbox is ticked
5. Set the **Connection Address** to the IP Address of the PC running Adrena.
6. Set **Format** to NMEA0183
7. Enter a valid UDP Port number
8. Click **Apply** to save the configuration.

Setup – Adrena

1. To configure Adrena for use with the ATP, click on the main drop-down menu and select **Settings > General Settings**.



2. Select **Connections**.



3. Set the Type of connection to **Via UDP connection**

4. Set the Port IN number to match the port set in the UDP Output connection created on the ATP.
5. Set the Port OUT number to match the port set in the UDP Input connection created on the ATP.
6. Click **Validate**.

Adrena Import/Export

Adrena uses NMEA0183 for data transmission. NMEA0183 sentences can be enabled for Transmit and Receive under **Other Data > NMEA0183** (see Section 5.9).

The TCP/UDP filter is used for communication with Adrena.

Details of which NMEA sentences are used by Adrena can be found in section 11.1 of the Adrena manual.

Broadcast vs. Direct Address

The broadcast address of a network is the address which all connected devices within the IP range will receive data messages.

All connected devices must use the same netmask/subnet mask: **default 255.255.255.0**. The broadcast address with this netmask is 192.168.1.255

For example, if:

1. the ATP **Adapter Address** is 192.168.1.222, the Netmask is 255.255.255.0 and Broadcast is selected, then
2. the ATP will broadcast on 192.168.1.255, and
3. any device in the IP range of 192.168.1.0 and 192.168.1.254 will be able to receive the data

Enabling this option in the ATP **UDP Output** will allow data to be received by any PC on the network in the correct IP range

It is **not recommended** enabling this option on the ATP **UDP Input**

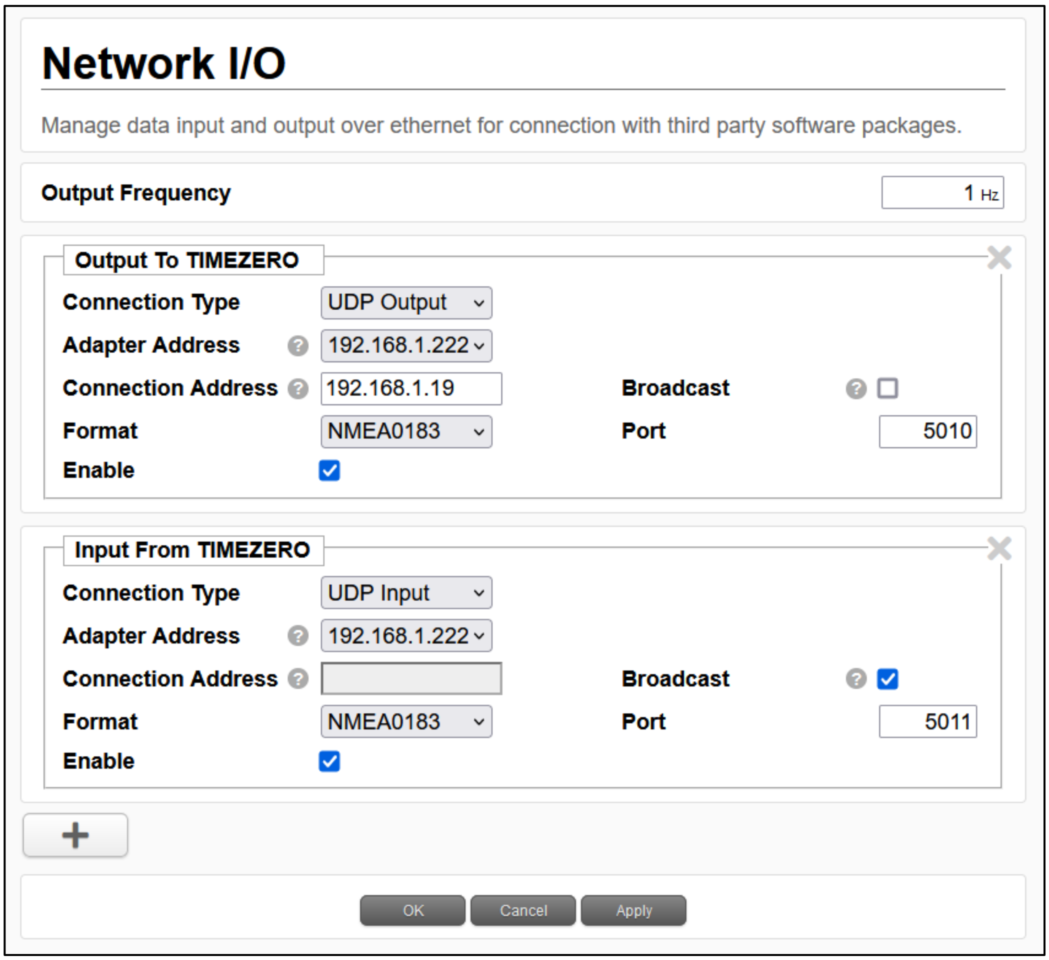
If the ATP and PCs are configured to **DHCP**, then the IP addresses may be re-issued and break data communications. You may be able to set your DHCP to lease IP addresses to each device so that this does not occur.

Appendix H – Time Zero Software

UDP Connection

UDP is the preferred connection method. Since data is transmitted at regular intervals and the occasional missed datum is acceptable, the speed of UDP is preferred over the reliability of TCP.

To configure a UDP connection for use with TIMEZERO, go to **Settings/Diagnostics > Network I/O.**



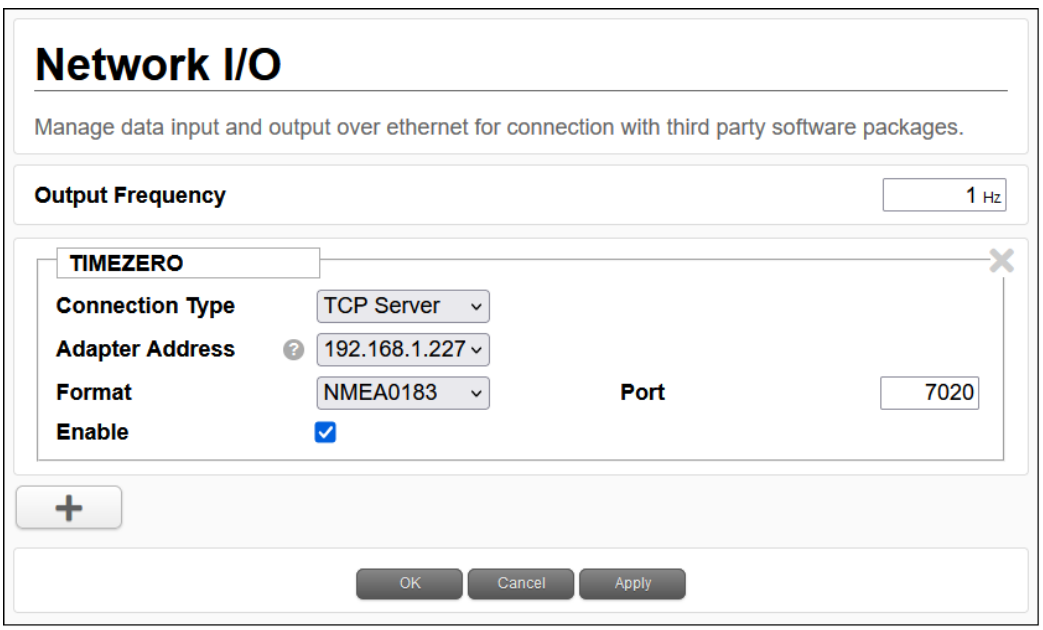
1. Set the **Output Frequency** to between 1 and 10Hz
2. If no Network connections are available, Press **+** to add a connection. You will require two connections.

1. Set Connection 1 to UDP Output and Connection 2 to UDP Input.
2. Ensure the **Enable** checkbox is ticked.
3. Set the **Connection Address** to the IP Address of the PC running TIMEZERO. (TIMEZERO lists the available IP addresses in its 'Options' dialog, under the 'Device List' tab).
4. Set **Format** to NMEA0183
5. Enter a valid UDP port number
6. Enable **Broadcast** on the UDP Input
7. Click **Apply** or **OK** to save the configuration.

TCP Connection

TCP provides more reliable transmission at the cost of extra network overhead. If high reliability is required for a specific TIMEZERO function, then consider this option.

To configure a TCP connection for use with TIMEZERO, go to **Settings/Diagnostics > Network/O.**



1. Set Connection 1 to TCP Server.
2. Ensure the 'Enable' checkbox is ticked.
3. Select NMEA0183 as the Format.
4. Enter a valid port number (any unused port between 1024 and 65536), 7020 works well for most users.
5. Click **Apply** or **OK** to save the configuration.

ATP Configuration

Before configuring TIMEZERO, set up and check the ATP configuration.

NMEA0183 data over **TCP/UDP** is sent or received according to filters set on the **Other Data > NMEA0183**

The filters for TIMEZERO use the TCP/UDP column. The filters should be set depending on user requirements, however for initial testing we recommend setting the Tx filter for **GLL, HDG** and **RMC**, and the Rx filter for **RMC.**

NMEA0183 Tx & Rx Filter

Manage which sentences to transmit (Tx) and receive (Rx) on each NMEA0183 channel.
Heading output at 20Hz (for certain pilots/radars) can be enabled by checking only HDT, HDM or HDG on the desired port (note: to send multiple sentences at 20Hz, a baud rate of 38400 or higher is required).
NMEA input ports can be configured to accept serial or MIP data.

NMEA0183 Sentence	TCP/UDP	ATP Port 1	ATP Port 2	ATP Port 3
Baud Rate		4800	4800	4800
BWC	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐
BWR	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐
DBT	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐
DPT	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐
GGA	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐
GLL	Rx ☐ Tx ☑	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐
HDG	Rx ☐ Tx ☑	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐
HDM	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐
HDT	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐
MOB	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐
MWD	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐
MWV	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐
MTA	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐
MTW	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐
MXS	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐
RMB	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐
RMC	Rx ☑ Tx ☑	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐
RSA	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐ Tx ☐	Rx ☐

Verify output from the ATP at: **Settings/Diagnostics > Diagnostics > NMEA0183**
The important rows are those with **Internal** in the **Port** column.

Message Type	Sender	Port	Message Data	System Time
GLL	NMEA0183	ATP Port 2	$ECGLL,5046.304,N,00132.954,W,133115,A,A*48	13:31:00.693
	AT Processor	Internal	$IIGLL,5046.304,N,00132.954,W,133113,A,A*48	13:31:00.556
HDG	AT Processor	Internal	$IIHDG,22.4,,,0.1,E*17	13:31:00.843
RMC	NMEA0183	ATP Port 2	$ECRMC,133115,A,5046.304,N,00132.954,W,0.0,218.5,130622,003.5,W,A*0A	13:31:00.523
	AT Processor	Internal	$IIRMC,133113.00,A,5046.304,N,00132.954,W,0.00,218.5,130622,0.1,E,A*01	13:31:00.556
VTG	NMEA0183	ATP Port 2	$ECVTG,218.5,T,222.0,M,0.0,N,0.0,K,A*3E	13:31:00.601
ZDA	NMEA0183	ATP Port 2	$ECZDA,133115,13,06,2022,,*5B	13:31:00.752

TIMEZERO configuration

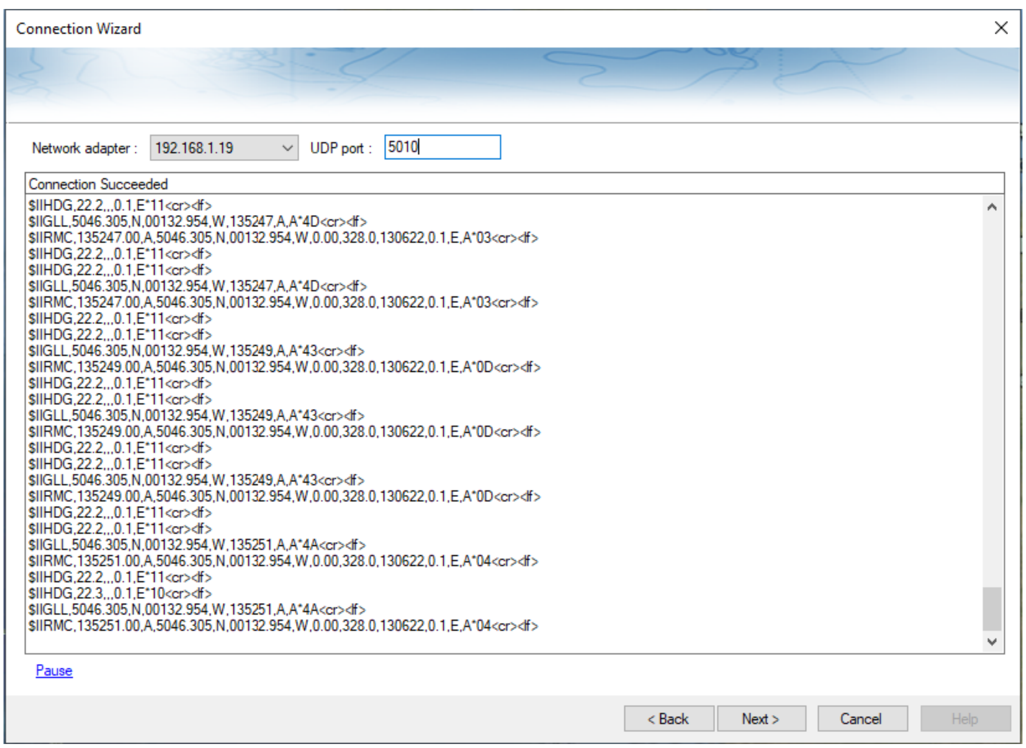
The automatic configuration wizard does not support UDP/TCP connections.

There are two steps to this configuration, output from ATP to TIMZERO and input to ATP from TIMEZERO.

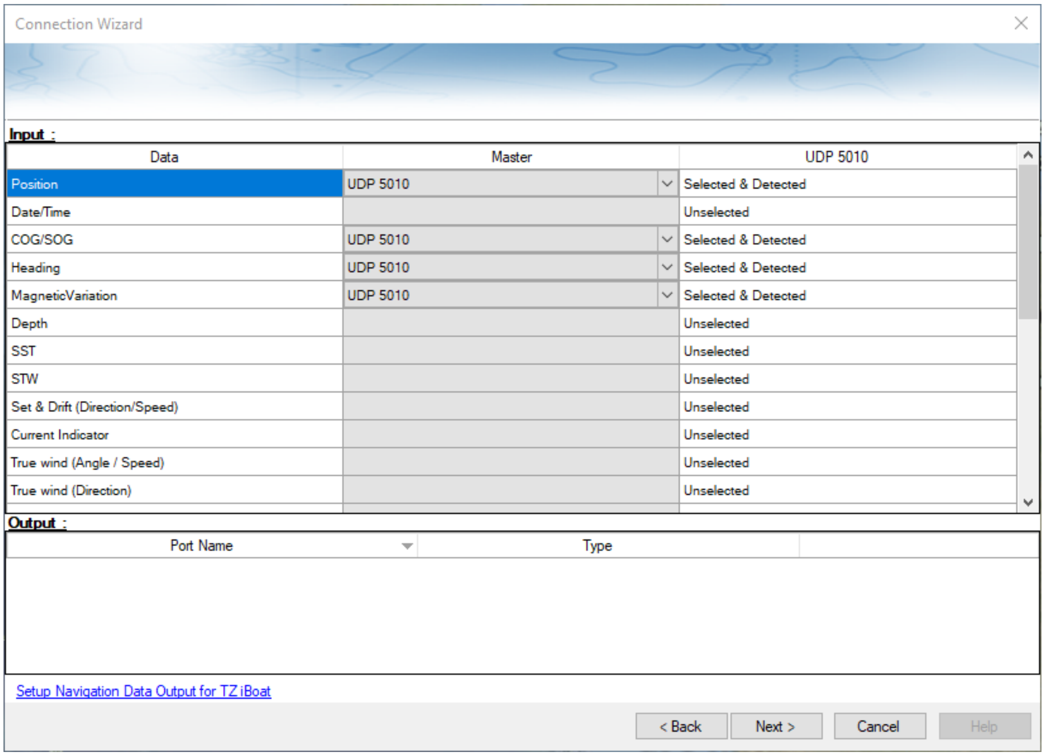
Below is the process for UDP. TCP is similar.

Output from ATP to TIMEZERO

1. Open **Connection Wizard** from the TIMEZERO menu.
2. Select **Manual port configuration** and click **Next**.
3. Select **Add/Configure UDP connection** and click **Next**.
4. Select the Network adapter which matches the ATP output.
5. Enter the UDP port of the ATP output. In the UDP example above: 5010
6. If set up in the ATP UDP/TCP NMEA0183 Tx filters you should see the NMEA0183 data stream.



7. Click **Next**

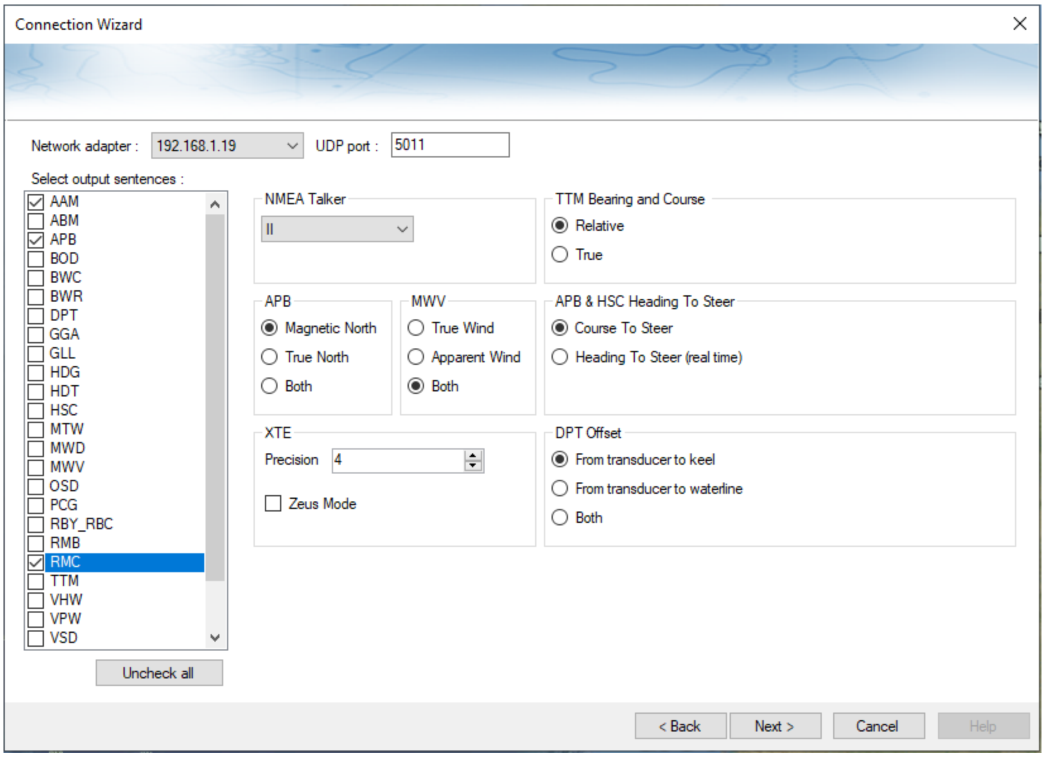


8. In the **Input** window select the data to receive from the ATP. From the UDP example above, select **Position**, **COG/SOG**, **Heading** and **Magnetic Variation**.
9. Click **Next**.
10. The next window shows a confirmation of the previous selection, listing the selected source for each datum.
11. Click **Next**.
12. You should see a confirmation window, click **Finish**.

If you have set ATP UDP/TCP NMEA0183 filters, data should appear in TIMEZERO after a few seconds.

Input to ATP from TIMEZERO

1. Open the **Connection Wizard** from the TIMEZERO menu.



2. Select **Data Output** and click **Next**.
3. Select **Add/Configure UDP connection** and click **Next**.
4. Select the Network adapter which matches the ATP Input
5. Enter the UDP port of the ATP output. In the UDP example above: 5011
6. Some NMEA0183 sentences will be enabled by default. For testing purposes, we recommend also enabling RMC.
7. See TIMEZERO manual for other configuration parameters.
8. Click **Next** and then **Finish**

To confirm connection settings, on the ATP web-server go to **Settings/Diagnostics > Diagnostics > NMEA0183.** There should be (at least) one row with 'Net' in the **Port** column, corresponding to the RMC sentence selected above.

Message Type	Sender	Port	Message Data	System Time
APB	NMEA0183	Net	$IIAPB,A,A,0.0010,L,N,V,V,253.8,M,1,253.8,M,253.8,M,A*7D	14:12:27.442
GLL	NMEA0183	ATP Port 2	$ECGLL,5046.305,N,00132.954,W,141432,A,A*4C	14:12:26.262
	AT Processor	Internal	$IIGLL,5046.305,N,00132.954,W,141432,A,A*4A	14:12:27.669
HDG	AT Processor	Internal	$IIHDG,22.8,,,0.1,E*1B	14:12:27.959
RMC	NMEA0183	ATP Port 2	$ECRMC,141434,A,5046.305,N,00132.954,W,0.0,328.0,130622,003.5,W,A*0F	14:12:27.953
	NMEA0183	Net	$IIRMC,141432.0,A,5046.3050,N,00132.9540,W,0.0,328.0,130622,0.1,E,A*04	14:12:27.668
	AT Processor	Internal	$IIRMC,141432.00,A,5046.305,N,00132.954,W,0.00,328.0,130622,0.1,E,A*04	14:12:27.669
VTG	NMEA0183	ATP Port 2	$ECVTG,328.0,T,331.5,M,0.0,N,0.0,K,A*3F	14:12:28.031
XTE	NMEA0183	Net	$IIXTE,A,A,0.0010,L,N,A*15	14:12:27.442
ZDA	NMEA0183	ATP Port 2	$ECZDA,141432,13,06,2022,,*5E	14:12:26.323

Broadcast vs. Direct Address

The broadcast address of a network is the address which all connected devices within the IP range will receive data messages.

All connected devices must use the same netmask/subnet mask: **default 255.255.255.0**. The broadcast address with this netmask is 192.168.1.255

For example, if:

1. the ATP **Adapter Address** is 192.168.1.222, the Netmask is 255.255.255.0 and Broadcast is selected, then
2. the ATP will broadcast on 192.168.1.255, and
3. any device in the IP range of 192.168.1.0 and 192.168.1.254 will be able to receive the data

Enabling this option in the ATP **UDP Output** will allow data to be received by any PC on the network in the correct IP range

It is **not recommended** enabling this option on the ATP **UDP Input**

If the ATP and PCs are configured to **DHCP**, then the IP addresses may be re-issued and break data communications. You may be able to set your DHCP to lease IP addresses to each device so that this does not occur.

TIMEZERO always outputs data to the network broadcast address. It is important that the subnet mask of the PC is the same as the ATP.

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