APPLIED ACOUSTICS
Underwater Technology

Easytrak Lite
2660 Series
Operation Manual

EZT-2660-8001/8

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Thank you for choosing Applied Acoustic Engineering as one of your subsea equipment suppliers. We hope you experience many years of reliable operational use from our products.

If you do encounter any technical issues with any of our products then contact our Technical Team via the following methods.

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Applied Acoustic Engineering Ltd has made every effort to ensure that the information contained in this manual is correct at time of print. However our policy of continual product improvement means that we cannot assume liability for any errors which may occur.

These written instructions must be followed fully for reliable and safe operation of the equipment that this manual refers to. Applied Acoustic Engineering Ltd cannot be held responsible for any issues arising from the improper use or maintenance of equipment referred to in this manual or failure of the operator to adhere to the instructions laid out in this manual. The user must be familiar with the contents of this manual before use or operation.

Table of Contents

1. INTRODUCTION TO THE 2660 EASYTRAK LITE

This manual provides the user with information on the installation, operation and maintenance of Easytrak Lite, Applied Acoustic Engineering's Ultra-Short Base Line (USBL) underwater acoustic positioning system.

USBL systems are used to position underwater items including Side Scan Sonars[1], ROVs[2], AUVs[3], and divers.

Note: This manual is suitable for Easytrak Lite GUI version 3.0 software only.

EASYTRAK OVERVIEW

With no compass input, a position will be SHIP (bow) referenced, e.g. 123m 'X' means 123m from the starboard side of the ship, whereas, with a compass, a position can be NORTH referenced; 123m 'X' means 123m from the ship in an easterly direction.

A position can either be 'relative' for example 123m 'X' and 234m 'Y' from the ship, or 'absolute' for example 412789m East, 5823456m North, if a GPS receiver and compass is enabled.

Favourite 'set-ups' can be saved and recalled at any time. The current set-up is automatically saved on program power-down allowing a quick resumption of work on the next power-up.

The display not only gives positioning data in text form, but also graphically. Beacons are individually identified and colour-coded, **GREEN** – position OK, **ORANGE** – caution, prediction being used, and **RED** – signal lost and cannot predict safely.

Either a grid or polar display can be selected; the scale of the display can be set to manual or automatic where the scale adjusts so that all targets and waypoints are visible on the screen. The display colour scheme can be changed to suit outdoors or indoors.

Because of multi-path reflections and other types of acoustic interference, the position can occasionally be corrupted; Easytrak has the facility to 'gate-out' wild values of range, heading, depression angle, velocity, and horizontal distance moved per ping. The 'out of gate' positions are replaced by predicted values. Note, a compass and pitch & roll inputs are required.

The Easytrak transducer can be fitted with an internal compass, and pitch and roll sensors. Unlike the flux gate compass (invented in the 1930's), the Easytrak transducer compass uses a three-axis magnetometer that allows for an in-situ calibration routine to counteract most localised hard magnetic anomalies.

[1] Sonar system for seabed mapping
[2] Remotely Operated Vehicle
[3] Autonomous Underwater Vehicle

The pitch and roll sensors work to ± 50°, more than sufficient for boat work. If more precision is required an external gyro and Vertical Reference Unit (VRU) outputting common NMEA[4] strings can be interfaced to Easytrak.

Please note strong magnetic anomalies can be beyond the calibration range of the internal compass. It is advisable, that a bearing check is performed prior to use.

The necessity of determining an accurate velocity of sound (VOS) through water is critical. VOS accuracy is important in two areas, (1) across the face of the transducer (used for measuring the bearing and depression angle to a target), and (2), the distance to and from the target (the range). To help overcome this source of error, the operator can enter two values of VOS into Easytrak, one for the bearing / depression angle, and a second for the range calculation. An option is available where the velocity of sound can be calculated using Medwin's formula by entering water temperature, salinity, and depth.

Depth beacons can be used to provide greater positioning accuracy, particularly appropriate at low depression angles where the slightest change can result in a significant shift in the target's vertical position.

Easytrak also includes a series of telemetry commands allowing the secure control of release beacons and alike (optional).

Easytrak Lite is ideal for small surveys. With a Global Positioning System (GPS) receiver (not supplied), the common GPS NMEA data strings $GPGLL, $GPGGA and $GPRMC can be used (optional). GPS allows the absolute positioning of sonar fish, ROVs, or seabed objects in UTM co-ordinates. With GPS, Easytrak can also be used to navigate to and from the worksite indicated by an entered waypoint. Of course should a GPS receiver not be available, Easytrak will work to a local relative grid. Once onsite the ROV or sonar fish can be fitted with a beacon, deployed, and work can begin.

Note: When using GPS, bearings are relative to GRID North; without GPS, bearings are relative to TRUE North or with the compass switched off, the vessel's Bow.

Though Easytrak is simple to use, the system provides a very powerful and flexible tool for survey use.

Note: Easytrak Lite takes about 1 minute to initialise from power up**.**

Waiting for Easytrak Lite to Initialise 008

Initialisation message

[4] NMEA The National Marine Electronics Association

2. BASIC THEORY

Easytrak is an Ultra Short Base Line (USBL) Acoustic Navigation System. Easytrak uses a single compact transducer containing multiple receiving ceramics and an interrogate ceramic.

The receiving ceramics are so arranged that each can detect an acoustic signal from a target's transmission. The acoustic signals may arrive at slightly different times due to their different signal paths. From these time differences, the bearing and depression angle[5] to the target are computed.

For a TRANSPONDER, time taken from the vessel interrogate transmission through the water to the reception of the target acoustic signal provides the range:

$$\text{Range} = \frac{\text{VOS x Traveltime}}{2} \text{ (m)}$$

The divide by 2 is because sound has to travel to and from the target i.e. twice the distance.

For a RESPONDER, time taken from the vessel electrical interrogate signal through a cable to the reception of the target acoustic signal provides the range:

$$\text{Range} = \text{VOS x Traveltime (m)}$$

Given range, bearing, and the depression angle, the relative position of the target beacon to the vessel transducer can be determined.

[5] The vertical angle between the horizon and the target.

3. System Description

Easytrak Lite consists of either four or five basic parts, the computer (optional), the deck unit, the transducer, the deck cable, and an optional USB to Quad serial convertor.

3.1 The Computer

The computer provides the user interface for the Easytrak Lite system. The computer can be either a desktop or a laptop. For the recommended specification for the computer, please see **Appendix 10**.

3.2 Easytrak Lite Command Unit

The Easytrak Lite Command Unit controls the signal acquisition and processing. The unit provides key pulses to responders and fix pulses to navigation computers or alike. The Command Unit interfaces to the computer and to any appropriate external gyro and VRU.

3.3 Transducer

The Easytrak Transducer contains receive ceramics and amplifiers that process the received signals prior to signal processing in the Easytrak Command Unit. The transducer also contains the interrogate ceramic. The transducer can be fitted with a compass, and pitch sensor, and roll sensor.

3.4 Deck Cable

The Easytrak deck cable connects the Easytrak Command Unit to the Transducer.

Various lengths of deck cable are available. Please contact Applied Acoustics or your local agent for details.

3.5 USB to Serial Convertor

It is more common these days to find computers without RS232C serial ports, so to overcome this problem, a USB to quad serial convertor can be provided. The USB to serial convertor communicates with the Easytrak Lite Command Unit on **Port 1**, the printer / NAV computer on **Port 2**, GPS on **Port 3**, and external depth on **Port 4**.

4. INSTALLATION

4.1 COMPUTER

Ensure the computer is secured to prevent falling or sliding due to vessel movement. Please read the computer user manual regarding the connection of the base unit, monitor, keyboard, and mouse.

4.2 EASYTRAK LITE COMMAND UNIT

Ensure the Command Unit is secured to prevent falling or sliding due to vessel movement.

The Command Unit requires a mains supply. The internal power supply is auto ranging (115 – 230VAC 50/60Hz) not requiring any user intervention.

Any BNC leads should be appropriately connected between the Easytrak Command Unit (front panel) and any fix boxes, responders etc.

Headphones can be plugged into the front panel of the Easytrak Command Unit to monitor received signals. The socket requires headphones with a 3.5mm stereo plug.

4.3 USB TO SERIAL CONVERTOR

Please refer to **APPENDIX 9** for installation. The USB to serial convertor connects to Easytrak Lite Command Unit on **PORT 1**, a serial printer / NAV computer on **PORT 2**, GPS on **PORT 3**, and External Depth on **PORT 4**.

4.4 TRANSDUCER

Note: Ensure that the transducer is near to vertical when powering up Easytrak, otherwise the compass may not function correctly.

4.4.1 SUSPENDED OVER THE SIDE:

This is the simplest method of deployment; however, the transducer is more prone to relative movement with respect to the vessel. Care must be taken that the transducer does not spin as the internal compass, pitch and roll sensors have a limited dynamic response. Ensure that when deployed the transducer is below the draft of the vessel by at least 1 metre and has clear horizontal visibility throughout 360°.

Note: the *suspended over the side* method cannot be used if the compass is not enabled, as the system would have no orientation reference. Also, if GPS positioning is required, the antenna must be directly over the transducer, otherwise offset errors can occur.

4.4.2 OVER THE SIDE ON A POLE:

Using the optional transducer-mounting bracket, the Easytrak transducer can be fixed over the side of a vessel with a suitable pole. The diameter of the pole will depend on the length required and the anticipated maximum speed of the ship. It is recommended that the pole be secured by cables fore and aft to prevent bending and strumming when the ship is underway.

Ensure that when deployed the transducer is at least 1 metre below the draft of the vessel and that it has clear horizontal visibility through 360°. Ensure the alignment mark on the transducer is inline (forward) with the forward/ aft line of the vessel.

Extreme care has to be taken in shallow water that the transducer does not strike the seabed, otherwise damage to the transducer and pole is likely to occur. Note that prior to a vessel going alongside, the rig has usually to be recovered.

Please see **APPENDIX 11** for the Connector End-cap Fixing Details.

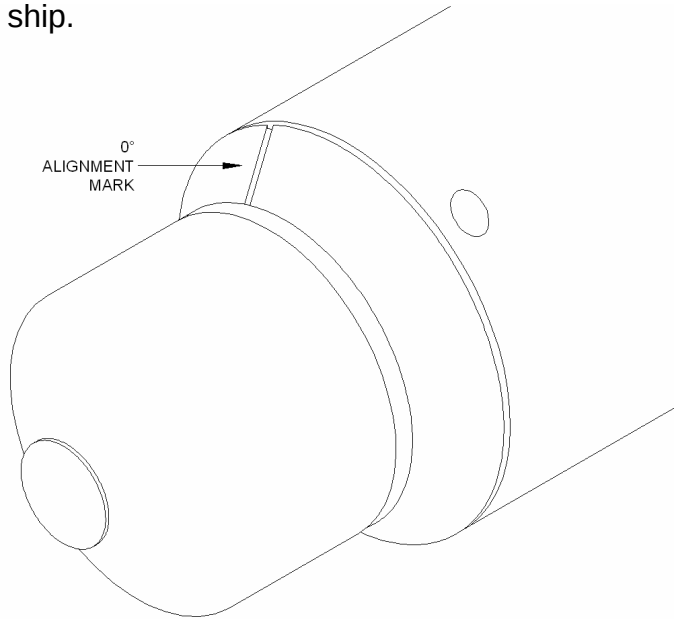
4.4.3 THROUGH A GATE VALVE:

Ensure the gate valve is of a suitable diameter to take the transducer and any mounting hardware. The transducer should be mounted on a suitable shaft; see appendix 1 for transducer dimensions.

Ensure that when deployed, the transducer's black potted end is below the draft of the vessel by at least 1 metre and that it has clear horizontal visibility through 360°.

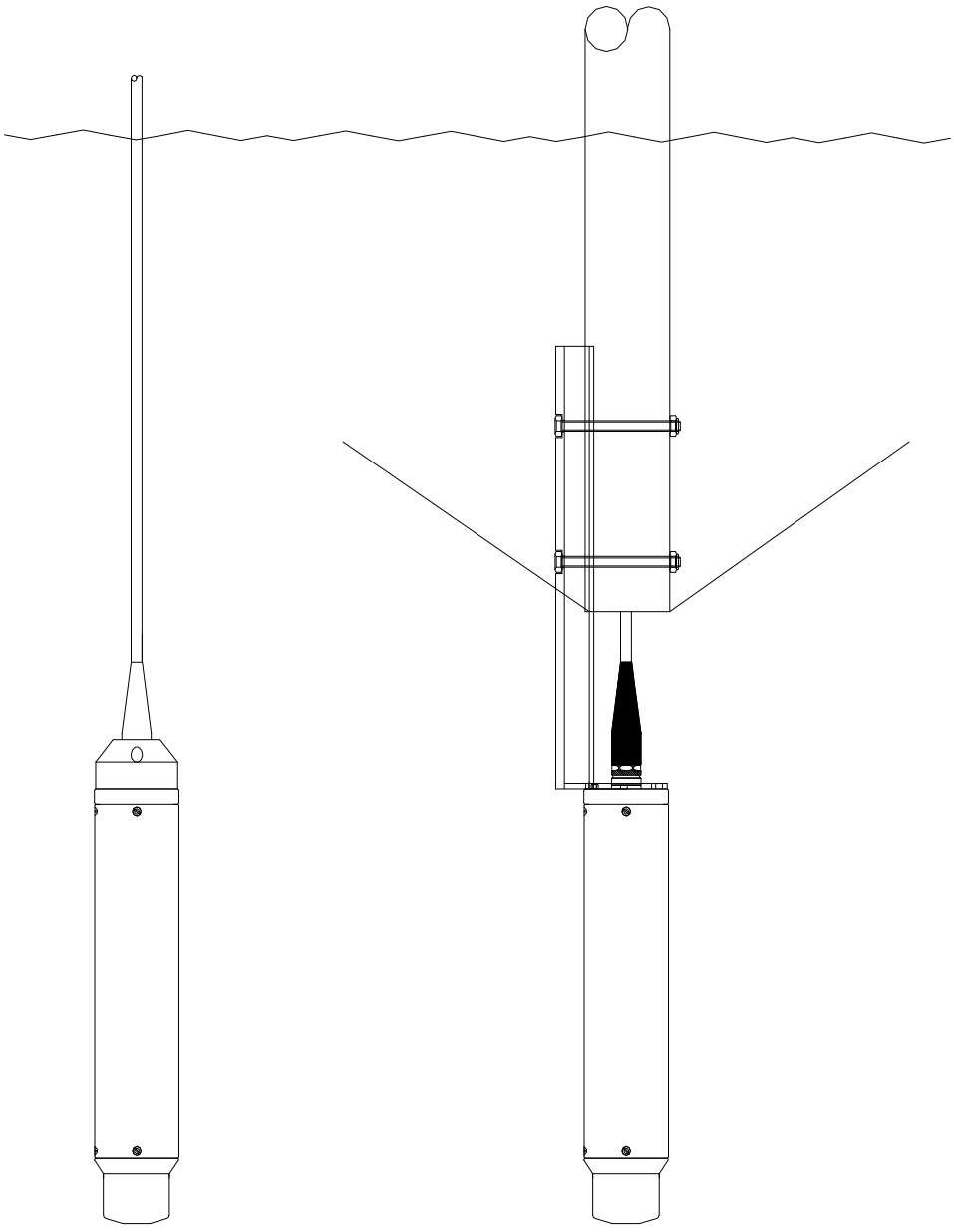
The gate valve's deployment system must be designed to ensure that the alignment mark on the transducer is pointing forward, and is inline with the forward / aft line when positioned through the gate valve.

Extreme care has to be taken in shallow water that the transducer does not strike the seabed otherwise damage to the transducer, pole, and in extreme circumstances, the ship.



Transducer alignment mark

EASYTRAK TRANSDUCER DEPLOYMENT OPTIONS DIAGRAM



4.5 Deck Cable

To prevent damage to the cable and minimise potential problems, please ensure the following points are observed:

- Ensure personnel cannot step on, or trip over, the deck cable.
- Keep the cable away from sources of electrical noise such as electrical generators, sonar sources (bang boxes etc.).
- Avoid trapping the cable in doorways, hatches and alike.
- Ensure the cable is not bent less than the minimum bend radius of **150mm**.
- Ensure the cable is not laid over sharp edges.
- When deployed over the side of a vessel, ensure that the cable is secured to any mounting pole to prevent chaffing, strumming, and excessive movement.
- Ensure the polyurethane outer jacket of the cable is not breached allowing water ingress.

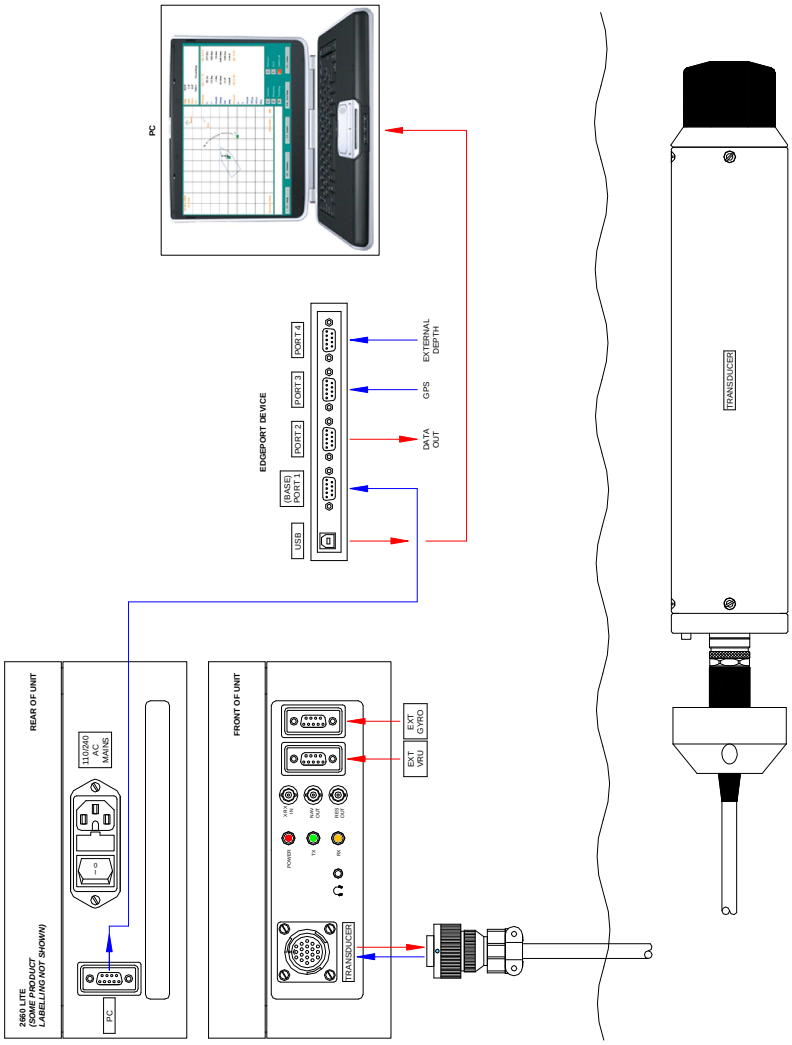
4.6 System Cabling

Connect the deck cable between the Command Unit and the Transducer.

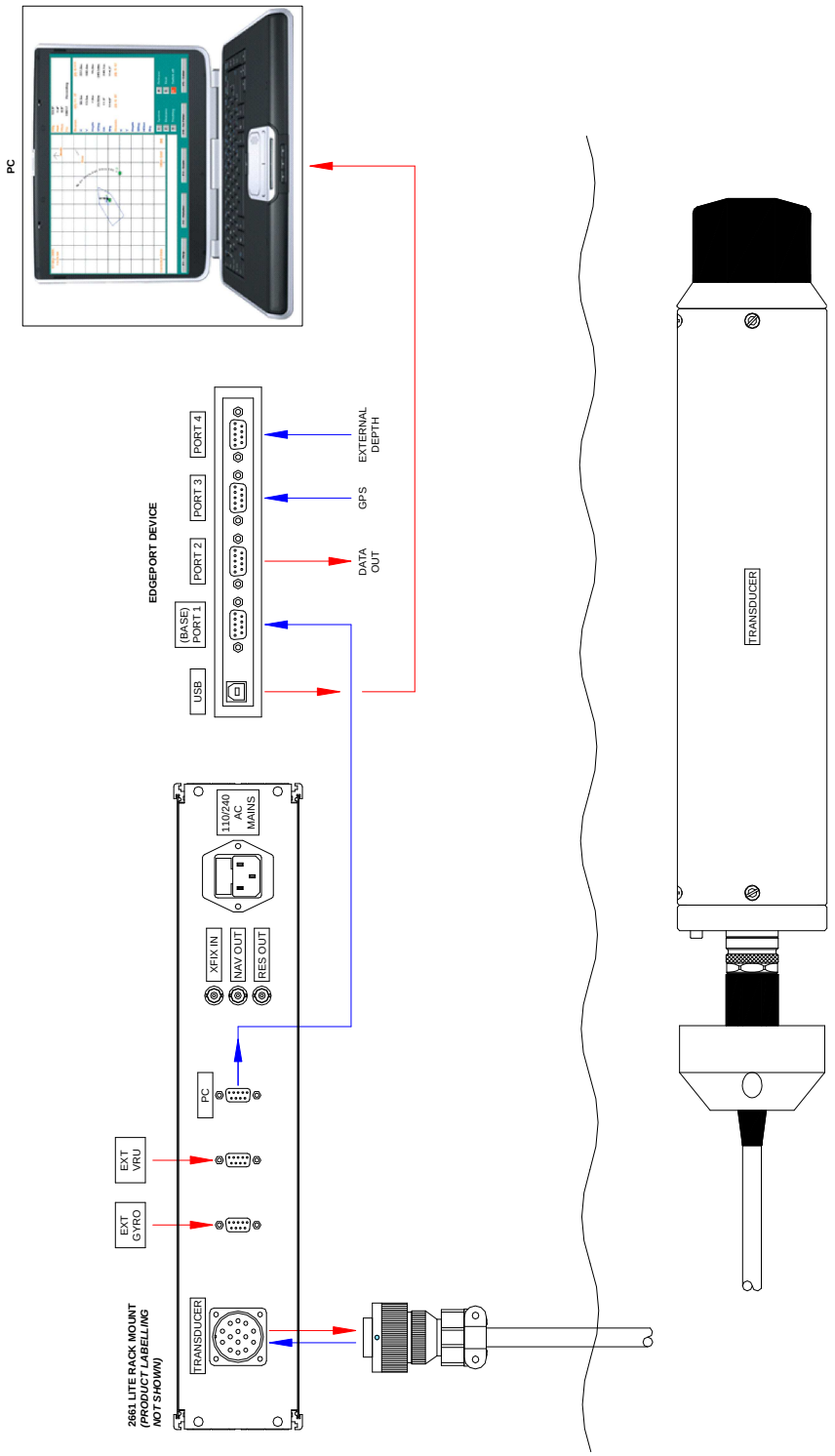
Three serial cables are provided and should be connected as follows.

- Connect the serial lead between the USB to serial interface (**Port 1**) and the Command Unit (PC).
- Connect the serial lead between the USB to serial interface (**Port 2**) and any data logging computer or serial printer (PC).
- Connect the serial lead between the USB to serial interface (**Port 3**) and any GPS receiver (PC).
- Connect the serial lead between the USB to serial interface (**Port 4**) and any External Depth source (PC).

Refer to pages 15 (2660) and 16 (2661) for system block diagrams.



2660 Lite System Diagram



2661 Lite System Diagram

4.7 Software Installation

The software installation is performed in two parts, firstly the USB drivers provided on the Edgeport or Applied Acoustic Engineering CD are to be installed, and secondly the main Easytrak Lite program. Please read the instructions in full before starting.

Note: The supplied CD has been virus scanned. Whilst Applied Acoustic Engineering has taken every reasonable precaution to minimise the risk from viruses, we cannot accept liability for any damage that might occur as a result of software viruses. AAE would advise you to carry out your own virus checks before installation.

4.7.1 USB Driver Software Installation

The Lite USB drivers for Windows XP are contained on the **Edgeport USB convertor CD;** drivers for Windows Vista and 7 are contained on the Applied Acoustic Engineering Easytrak Lite CD. Examples of driver installations are provided for Windows XP and Windows 7.

The USB driver configuration programs four serial ports to be used by the computer for communicating with the Easytrak Lite Command Unit, Serial Data Output, GPS/DGPS, and external Depth. The configuration varies between different operating systems.

4.7.1.1 Windows XP device driver set-up

Prior to connecting the USB cable between the computer and the four port USB to Serial convertor, please make a note of the current serial COM port numbers.

To observe the serial port settings select **System** from **Control Panel** on the computer. Choose the Hardware tab and click the **Device Manager** button.

Select **PORTS (COM & LPT)**, a Device Manager similar to that to the right is displayed.

It can be seen that a serial port is already assigned COM1.

1. Connect the USB cable between the convertor and the computer.

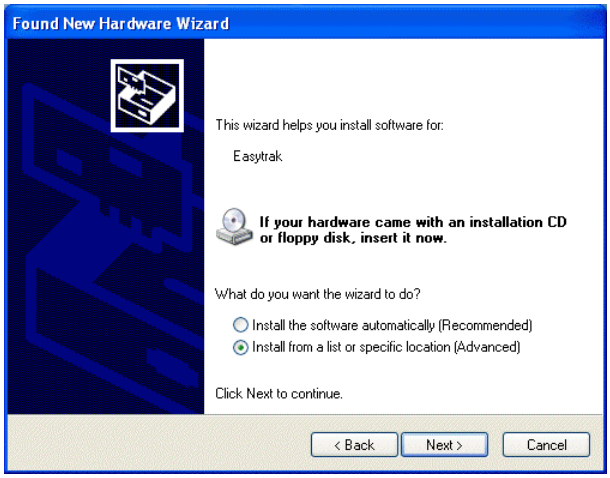
2. The message to the right (or similar) should appear.

3. After a few seconds the dialogue box to the right should appear.

4. Select the radio button NO, NOT THIS TIME.

5. Then select NEXT>

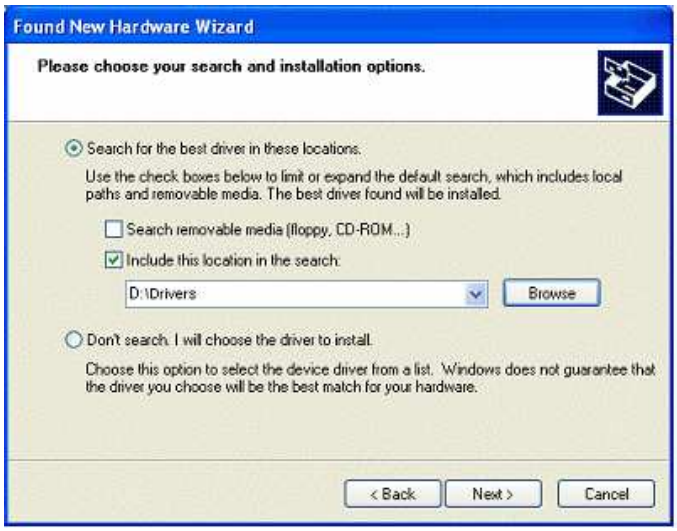
6. Next, select the radio button INSTALL FROM A SPECIFIC LOCATION (ADVANCED) radio button.



7. Then select NEXT> .

8. Select INCLUDE THIS LOCATION IN THE SEARCH checkbox.

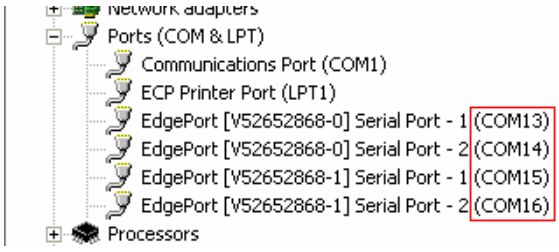
9. Next, browse the CD supplied with the Edgeport USB Convertor for the folder DRIVERS.



10. Then select NEXT> .

11. The USB drivers will now install.

12. Check the ports now assigned using Control Panel. There should be four new ports, in the example below COM13, COM14, COM15, and COM16 have been assigned from the driver installation.



13. Please make a note of the new COM ports numbers.

14. Restart the computer.

15. The driver set-up for WINDOWS XP is now complete.

4.7.1.2 WINDOWS 7 DEVICE DRIVER SET-UP

Below is a typical Windows 7 (64 bit) installation; however the responses from the computer will vary depending upon how it has been previously configured.

1. Note **ADMINISTRATOR PRIVILEGE** is required to install Easytrak in Windows 7.

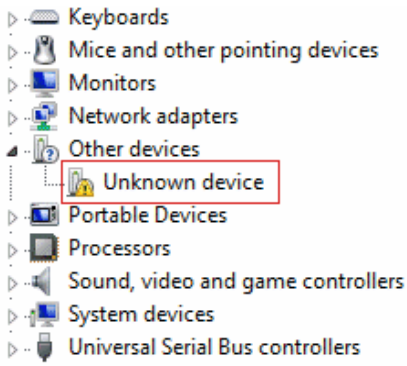
It is recommended that Windows Update is not used to find the drivers for the Edgeport USB convertor as it has been found to cause problems.

2. In Device Manager make a note of any serial port numbers, e.g. **COM1, COM2** etc.

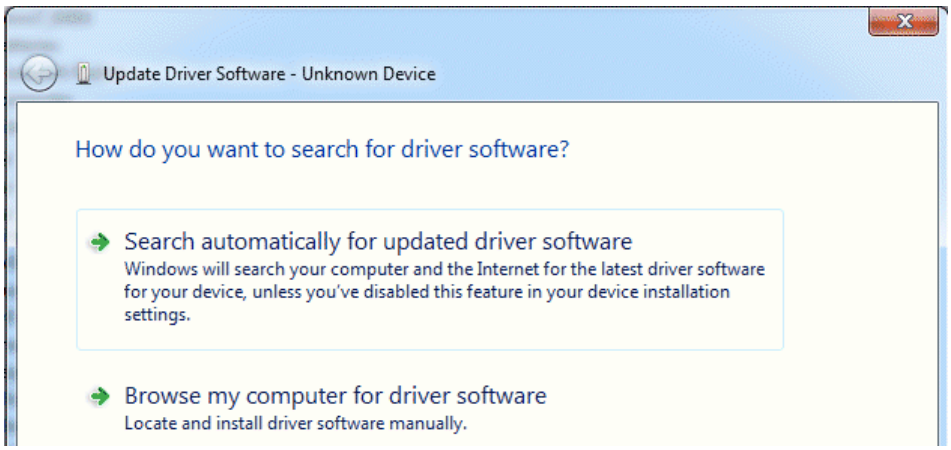
3. Insert the Applied Acoustic Engineering Easytrak Lite CD into the CD/DVD drive. (Close Down)

4. Connect the USB cable between the Edgeport USB convertor and the computer.

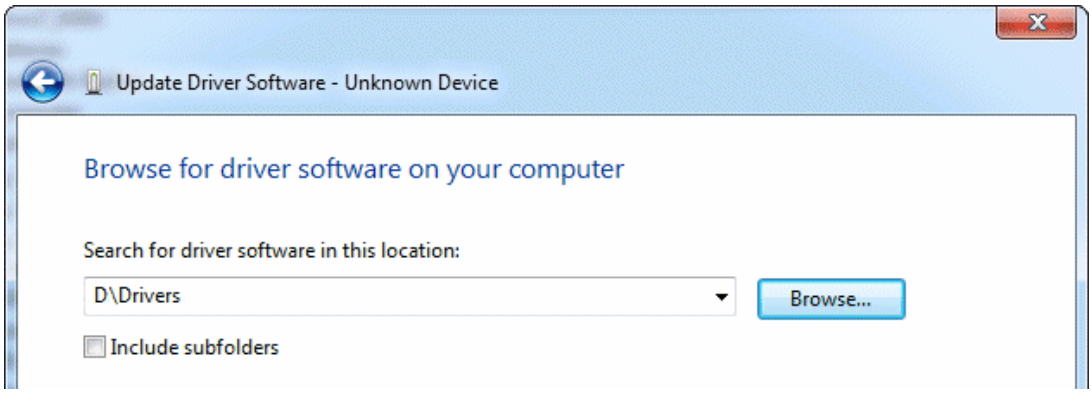
5. Using Device Manager you will see the window below (or similar). The **UNKNOWN DEVICE** is the Edgeport USB convertor.



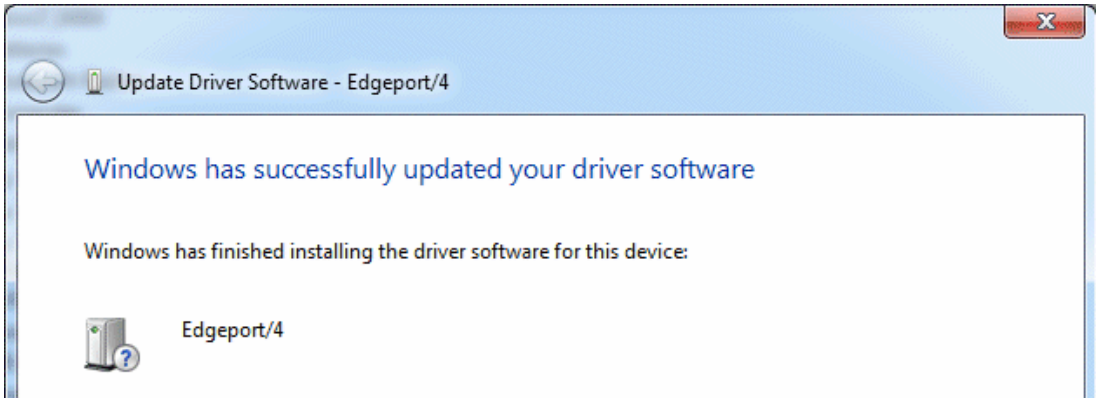
6. Right click the **UNKNOWN DEVICE** and select **UPDATE DRIVER SOFTWARE**, and then **BROWSE MY COMPUTER…**.



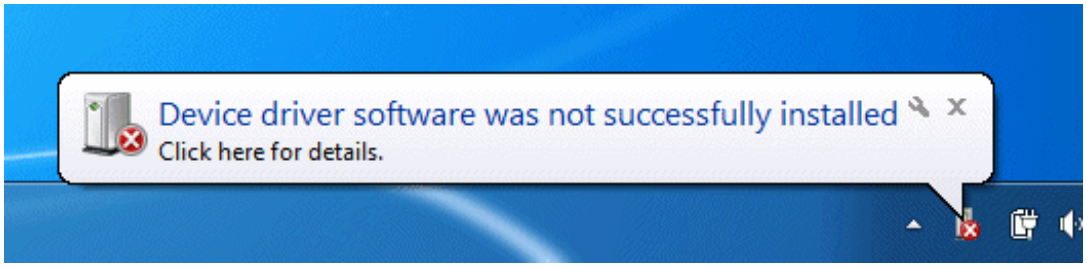
7. The following window will open up.



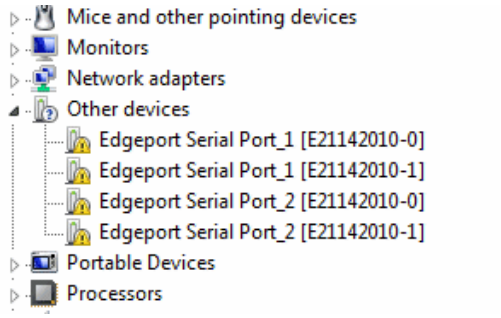
8. Select the Drivers folder on the Applied Acoustic Engineering CD then click NEXT>



9. The message above will appear, however, at this stage the drivers have not been fully installed and the following message may be displayed.



10. Observing Device Manager the following (or similar) will be seen.

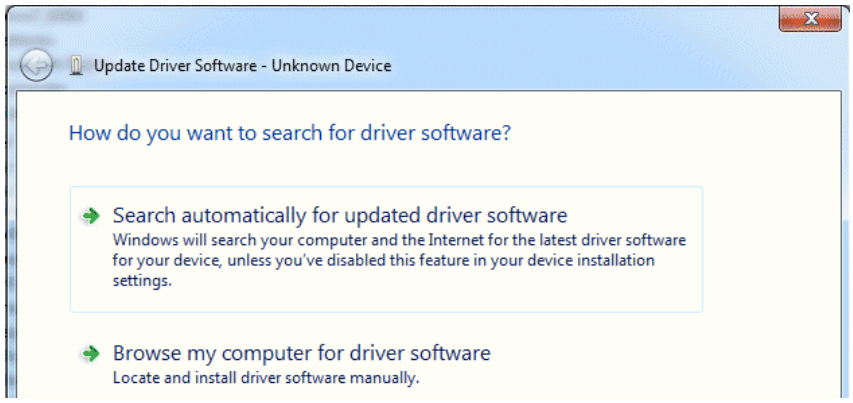


11. The four Edgeport Serial ports must be set up in the following order (not necessarily the order they appear in Device Manager):

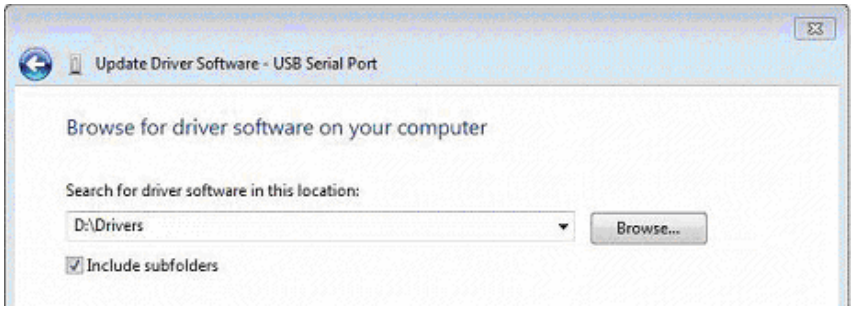
    Edgeport Serial Port_1 [Ennnnnnnn-0]
    Edgeport Serial Port_2 [Ennnnnnnn-0]
    Edgeport Serial Port_1 [Ennnnnnnn-1]
    Edgeport Serial Port_2 [Ennnnnnnn-1]

12. Right click **EDGEPORT SERIAL PORT_1 [ENNNNNNNN-0]** or similar, and then click the **UPDATE DRIVER SOFTWARE…**.

13. Again, select **BROWSE MY COMPUTER FOR DRIVER SOFTWARE.**

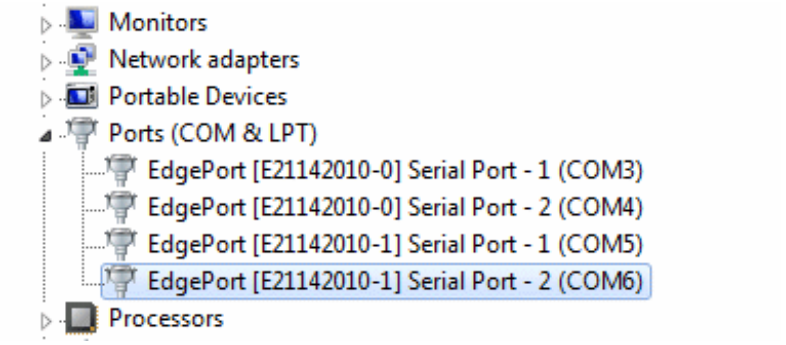


14. Select **BROWSE…**, and find the **DRIVER FOLDER** on the CD. Then click OK.



15. After the driver has installed repeat from 11/12 selecting the other three EdgePort serial ports.

16. Examine Device Manager.
17. The four ports should be set up as below, but possibly with different COM port numbers.



18. Please make a note of the new COM ports numbers, in this case COM3, COM4 COM5 and COM6.

The COM port numbers MUST be in ORDER for example COM3, 4, 5, and 6. If they are not, go to Device Manager and select Properties of the Serial port, then Port Settings, then finally Advanced… then change the COM port number. Repeat this for all ports so that they are displayed in Device Manager in order.

19. Restart the computer.
20. The driver set-up for WINDOWS 7 is now complete.

4.7.2 USER INTERFACE SOFTWARE INSTALLATION

To install the Easytrak Lite software, load the Applied Acoustics supplied CD into the computer's CD/DVD drive. The install program should run automatically, if not, open Explorer, select the appropriate CD/DVD drive and double click the file EZTLITESTART.EXE. The Splash Screen below will appear. Four options are presented, INSTALL EASYTRAK LITE, view the OPERATOR MANUAL (PDF format[6]), view the USB DRIVERS FOLDER, and CLOSE.

Installation Splash Screen

Click on the INSTALL EASYTRAK LITE button and follow the on-screen instructions to complete.

Switch on the Easytrak Lite Command unit.

Run the Easytrak Lite program from the Start Menu.

It is likely that dialogue boxes will appear saying that the current Lite COM Ports are not available. Set up with the new COM ports in Lite by selecting the dropdown menu SYSTEM / COMMUNICATIONS. In the earlier Windows 7 example, COM3 would be for the LITE PORT (PORT 1), and COM4 (Port 2) for the Serial DATA PORT, COM5 (Port 3) for GPS and COM6 (Port 4) would be for the EXTERNAL DEPTH PORT.

The Easytrak Lite Command Unit COM port is always the lower number of the new ports. Please see PARAGRAPH 8.1.3 for further details.

[6] Adobe Reader required. The program can be found at http://www.adobe.com

5. PLANNING AN OPERATION

5.1 WHAT NEEDS SETTING UP?

The EasyStart wizard in the Help dropdown menu can guide you through a basic system configuration should you wish.

Beacon selection: Ensure that if more than one beacon is to be used that each beacon is set to a different channel and that the channels chosen do not have conflicting interrogate frequencies. Check that the channels selected on Easytrak agree with the settings on the beacons. Use the Easytrak channel list in APPENDIX 2 to plan the use of suitable beacons.

How often do you require positions to be available? The slower the rate, the longer a beacon's batteries will last.

Should Easytrak be used in a confined environment, it is prudent to keep the interrogate rate as slow as possible to prevent reverberation from previous replies interfering with the current reply.

5.2 WHERE ARE THE BEACONS TO BE POSITIONED?

Find the best location for the beacon. Ensure that the beacon can be 'seen' by the Easytrak transducer i.e. it is not being obstructed. Try to avoid any acoustic reflectors that could lead to instability in bearing and range readings.

5.3 WHAT EQUIPMENT IN TERMS OF BEACONS IS REQUIRED/ AVAILABLE?

If the target has the possibility of an electrical connection to the Easytrak Command Unit, a **RESPONDER** is usually the best choice of beacon. The responder is not affected by local noise, for example, from the thrusters of a remotely operated vehicle (ROV).

TRANSPONDER are generally used where there can be no electrical connection to the Easytrak Command Unit.

PINGERS are stand-alone beacons that transmit at a regular interval, typically around once per second. Pingers are normally used as 'locators'. Pingers can be used in very high noise environments where due to local noise, the reception by the beacon of an interrogate pulse would be impossible. Knowing the depth of the pinger, the approximate position of the pinger can be determined. With no depth knowledge, only a bearing can be computed.

5.4 HOW IS THE TRANSDUCER GOING TO BE MOUNTED?

Is a gate valve available? This provides a stable mount for the transducer. It can also allow the transducer to be positioned deeper in the water, ideally below the propeller and wake. Deployment and recovery is usually straightforward. The major disadvantage is the expensive mounting hardware.

Is it possible to mount the transducer over the side of the ship on a suitable pole? The transducer is then fixed securely to the vessel in an economical manner. It can however, be difficult to have a pole deep enough to be sufficiently clear (>1m) of the ship's hull. Deployment and recovery is usually not as easy as a gate valve mount due to the weight of the transducer, and the assembly / disassembly of guide wires etc.

The simplest method is just to hang the transducer over the side of the vessel. This method is suitable for the smaller vessel. However, should the vessel move too much, the transducer can be buffeted to the extent where the internal compass and pitch & roll sensors cannot compensate for the movement.

See the transducer installation SECTION 4.4 for further information.

5.5 DO YOU REQUIRE AN ABSOLUTE OR A RELATIVE POSITION?

A relative position is a position that is relative to a local reference point, typically a position on a vessel, but can be a beacon that is on the seabed.

An absolute position is a position that conforms to a national or international geographical system; Easytrak uses Universal Transverse Mercator (UTM) referenced to the WGS84 ellipsoid. To have an absolute position of a beacon, a compass is required, either Easytrak's internal compass, or a precision external unit; also a suitable GPS receiver must be connected to Easytrak. Easytrak then uses the data from the compass and GPS receiver to derive an absolute position of the target.

5.6 WHAT LOCAL POWER IS AVAILABLE?

Should the beacon be on a sub-sea vehicle (or similar), it should be investigated whether local power is available, as it may be possible to supply power to the beacon removing the need for of battery charging. The power can be from either the vehicle's power supply or through an umbilical. Please consult the manufacturer's beacon manual for details.

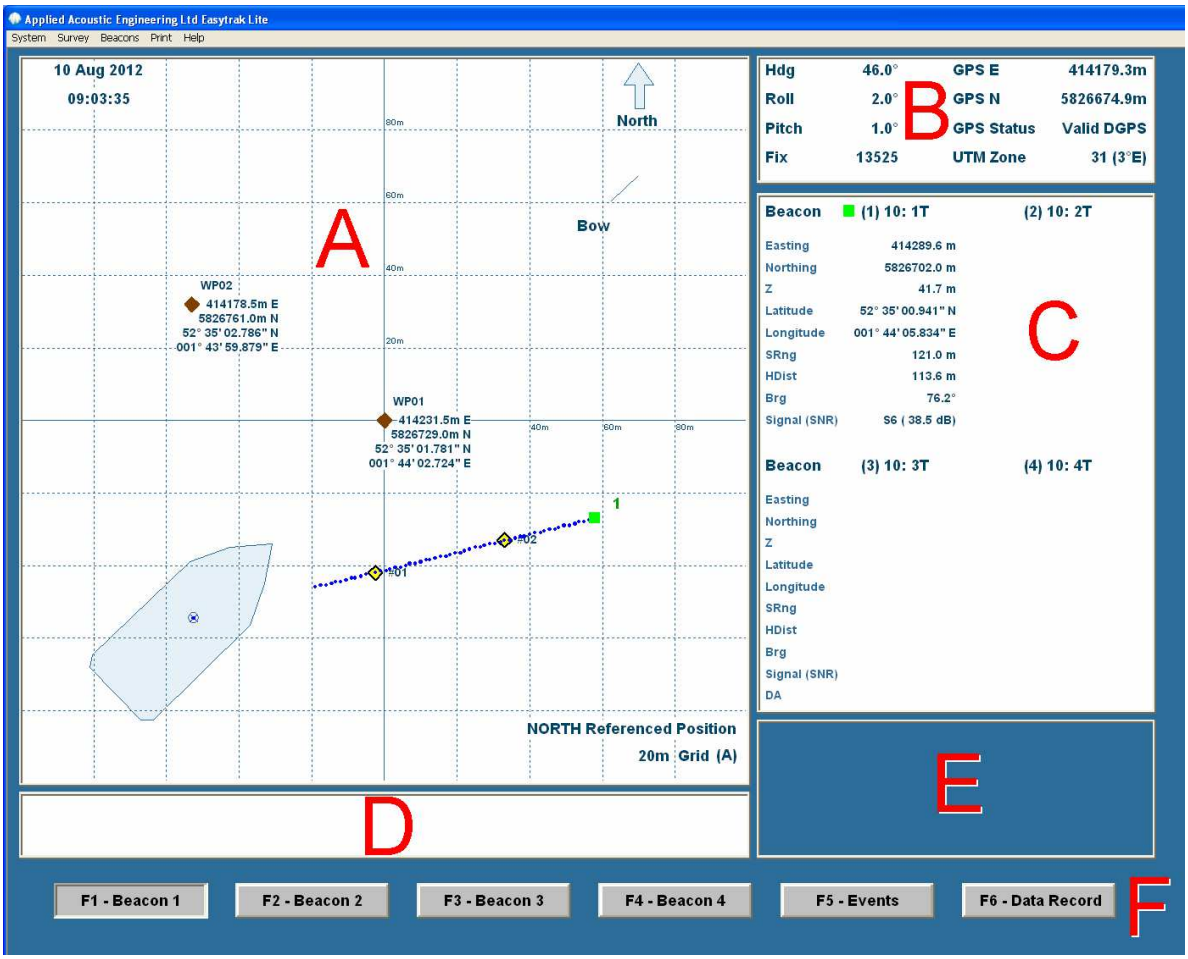
5.7 WHAT RANGE WILL YOU BE WORKING AT?

Select a beacon suitable for the range you expect to be working at; consult the manufacturer's beacon manual for specified working ranges. Easytrak has three different interrogate power levels, low, medium, and high; select the level suitable for the working range.

5.8 WHAT ACCURACY IS REQUIRED?

To improve accuracy keep ranges as short as possible; make local measurements of the velocity of sound in water; use depth beacons where appropriate, especially at low depression angles.

6. AROUND THE EASYTRAK LITE DISPLAY



6.1 PLOTTING WINDOW (A)

This is the main PLOTTING WINDOW where the ship, targets, waypoints, and events are displayed.

The SHIP is coloured light blue; the blue cross signifies the ship's position reference point.

The WAYPOINT (WP) is diamond shaped and coloured brown.

EVENTS are diamond shaped and coloured yellow.

Depending on type, beacons can be represented in three different shapes. TRANSPONDERS / RELEASES are square; RESPONDERS are circular, and PINGERS triangular. The colour of the target depends on the position quality. Please refer to the beacon section 6.3.1 for further information.

The type of data i.e. ship referenced, north referenced, gated, or smoothed used for displaying and outputting data (**PORT 2**) is displayed on the bottom right-hand side together with the grid / polar plotting scale. Alongside the scale is the symbol (A) meaning Auto-range scaling, this can be seen above. When the scale is manually set, the (A) would be replaced by a (M).

If a target goes outside the plotting area, a line is drawn from the centre of the plotting area in a direction of the target. The colour of the line depends on the quality of the last position update; please see **BEACON COLOUR-CODING SCHEME 6.3.1**.

6.2 UTILITY DATA (B)

This Window displays **UTILITY DATA** including heading, pitch & roll, the fix number, and received GPS data. When GPS data is not required and switched off, the GPS legend is not displayed.

6.3 POSITION DATA SCREEN (C)

This is the main data Window where the POSITION DATA for each beacon is displayed including X (or Eastings), Y (or Northings) and Z.

Beacon ■ (1) 10: 1T	
Easting	414289.6 m
Northing	5826702.0 m
Z	41.7 m
Latitude	52° 35' 00.941" N
Longitude	001° 44' 05.834" E
SRng	121.0 m
HDist	113.6 m
Brg	76.2°
Signal (SNR)	S6 (38.5 dB)

Beacon ■ (1) 10: 1T	
X	115.8 m
Y	28.5 m
Z	43.8 m
SRng	127.0 m
HDist	119.2 m
Brg	76.2°
Signal (SNR)	S6 (33.6 dB)

Position Data Screen

The green coloured square indicates the beacon that has been interrogated and that it is a good reply; please see **BEACON COLOUR-CODING SCHEME 6.3.1**.

(1), (2), (3), (4), indicates the beacon identification number followed by the channel number.

The channel number is in the form of **NN:NN**.

The letter following the channel number indicates the type of beacon, 'T' = transponder / Release, 'R' = responder, and 'P' = pinger.

Eastings, & **Northings, Latitude & Longitude** (or X and Y) indicate the absolute (GPS selected on) or relative co-ordinates on the horizontal plane in metres. Positions are calculated using the current system projection and ellipsoid parameters.

Z is the distance of the target below the transducer or reference point in metres.

SRng is the slant range to the target in metres.

HDist is the horizontal distance to the target in metres.

Brg is the bearing to the target in degrees.

Signal (SNR) is an indication of signal level **S0** (Minimum) to **S9** (Maximum), together with Signal to Noise Ratio in dB.

6.3.1 Beacon Colour-coding scheme

Green: Good reply and the derived position fits within all gating windows selected when in **Gated** or **Smoothed** modes.

Orange: The latest derived position falls outside one or more gating widows, or the signal is lost where the number of times the signal has been lost is less or equal to the degree of smoothing selected. Only used in **Gated** or **Smoothed** modes.

Red: Where the number of times the signal has been lost is greater than the degree of smoothing selected in gated or smoothing modes, or for each signal lost in **Ship** or **North referenced** modes, or if **GPS** is lost.

6.4 Status Message Display (D)

This Window is used for **Displaying Messages** such as interrogation status, distance and bearing etc. These messages are 'switched on' through the diagnostics menu selection or automatically by Easytrak. Due to the nature of these messages, it is possible for them to overlap.

6.5 Release Message Display (E)

This Window displays messages received back from **Release** transponders. Please see section **8.3.4 Release Menu.**

6.6 HOT KEYS F1 TO F6 (F)

Program Hot Keys

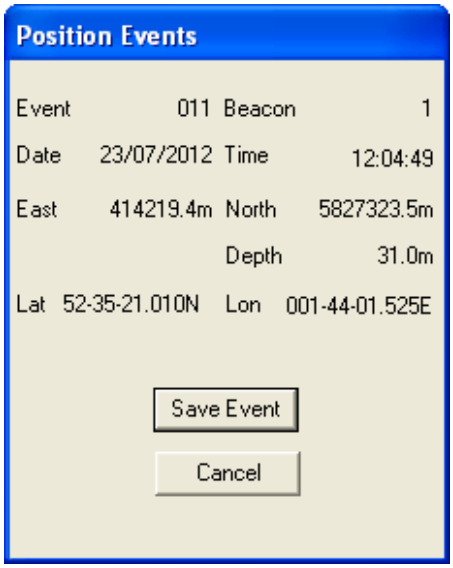
These represent the **HOT KEYS** F1 to F6 on the PC keyboard.

6.6.1 HOT KEYS F1 TO F4

A left mouse click or keyboard press of function keys **F1** to **F4** will start or stop interrogating the respective beacon. A right mouse click will display the beacon's configuration dialogue window (note there is no keyboard alternative). Please note these keys only operate when no other menu is displayed.

6.6.2 HOT KEY F5

On pressing **F5**, the following dialogue window is displayed, showing the current date, time, and position of the last interrogated beacon.



Position Events

The dialogue window has two buttons:

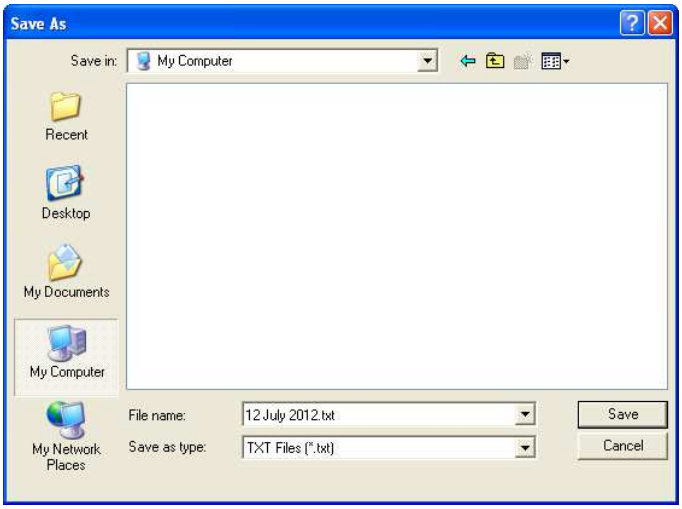
SAVE EVENT: On selecting Save Event, the event is saved and the dialogue window closes down; this is only possible if a beacon is being interrogated.

CANCEL: On selecting Cancel, the dialogue window closes down without saving the event.

6.6.3 HOT KEY F6

Function **F6** allows fix data to be saved to disc.

The ASCII format of the data saved is identical to the Applied Acoustics' AAE data output format as described in appendix 3.



Standard 'Save As' Dialogue Window

On pressing F6 a standard Windows "Save As" dialogue window is displayed allowing the user to select a file name and location. The F6 function key will then appear depressed and the text colour changes from black to red.

To stop the recording, press F6 once more. The text file generated can be read and edited by any standard text editor.

7. SPECIAL MOUSE & KEY OPERATIONS

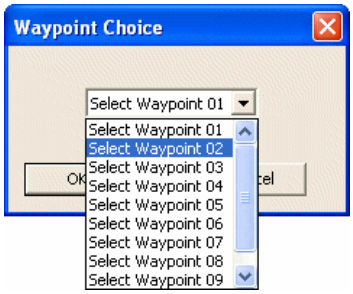
The mouse operates normally within the Windows environment, also it performs a few extra functions:-

7.1 RIGHT MOUSE BUTTON

A single RIGHT MOUSE BUTTON bring up the display menu (please see section 8.1.2).

7.2 LEFT MOUSE BUTTON

A double LEFT MOUSE BUTTON click within the plotting area will allow a WAYPOINT to be located at the mouse pointer position. Before a waypoint is displayed on the screen, an option is given to either select a waypoint number, or to cancel.



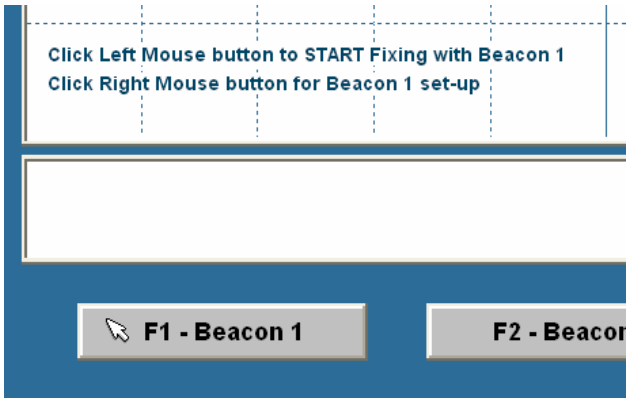
Waypoint selection Dialogue Window

7.3 MOUSE WHEEL

If the mouse has a centre wheel, the display scale can be increased or decreased by rotating the wheel.

7.4 MOUSE HOVER HELP INFORMATION

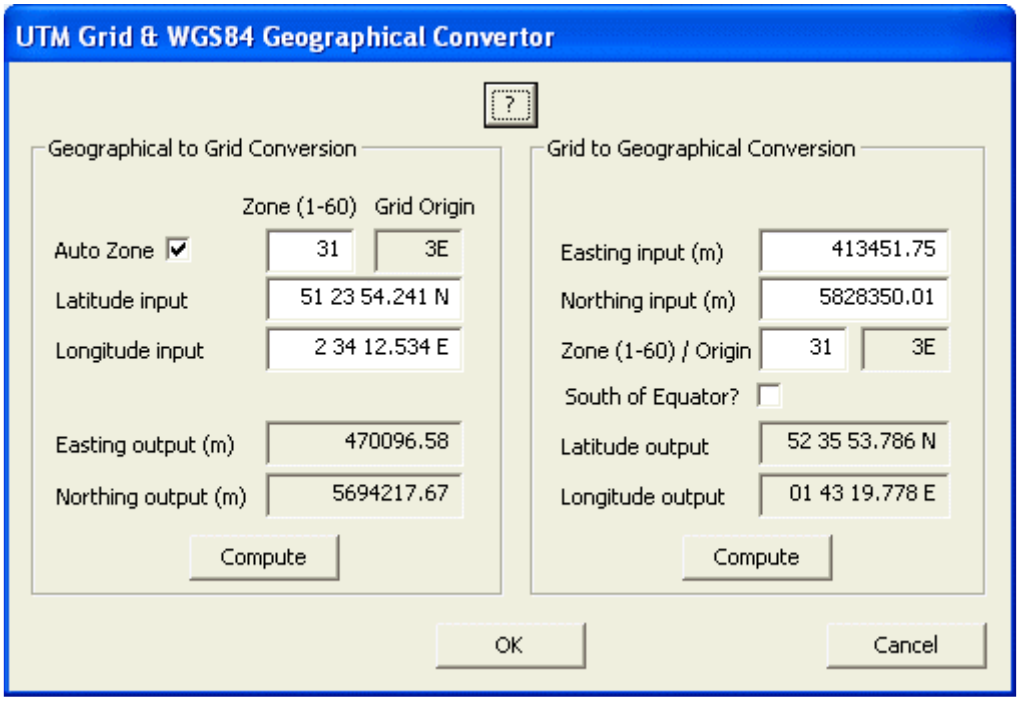
If the mouse cursor is placed over function keys F1 to F6, a simple help message is displayed in the bottom left-hand corner of the plotting window; an example is shown below.



Hover Help message for function key F1

7.5 UTM Grid & WGS84 Geographical Convertor

Pressing the Hash (#) Key the following Dialogue window will appear.



Grid & Geographical Convertor

Geographical to Grid Conversion

If the Auto Zone checkbox is checked, the zone will be computed from the inputted Latitude and Longitude; alternatively it can be entered manually (1 to 60).

Latitude and Longitude degrees, minutes and seconds are separated by a space character e.g. ddd mm ss.sss; alternatively, degrees and decimal degrees e.g.ddd.ddd or degrees, minutes and decimal minutes e.g. dd mm.mmmmmm can be entered. Follow the numerical values by North (N) or South (S), and East (E) or West (W) as appropriate.

Grid to Geographical Conversion

The Zone number is required to be entered manually. If the grid position is south of the Equator ensure the checkbox is checked.

The ? gives information regarding the conversion dialogue window.

Positions are calculated using the current system projection and ellipsoid parameters.

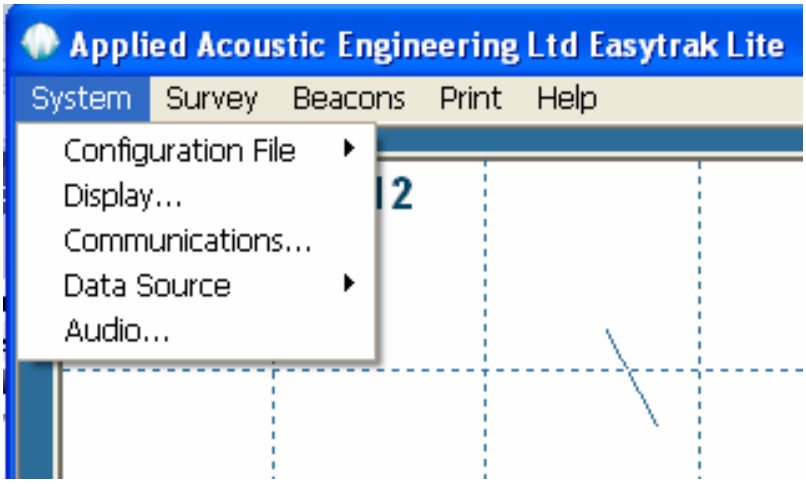
8. EASYTRAK LITE MENUS

There are five drop-down menus, SYSTEM, SURVEY, BEACONS, PRINT, and HELP.

Drop-down menu

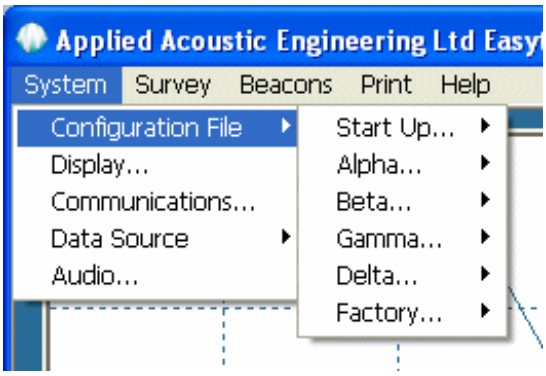
8. 1 SYSTEM

By clicking on SYSTEM of the drop-down Menu, the following options will be presented.



System Drop-Down Menu

8.1.1 CONFIGURATION FILE

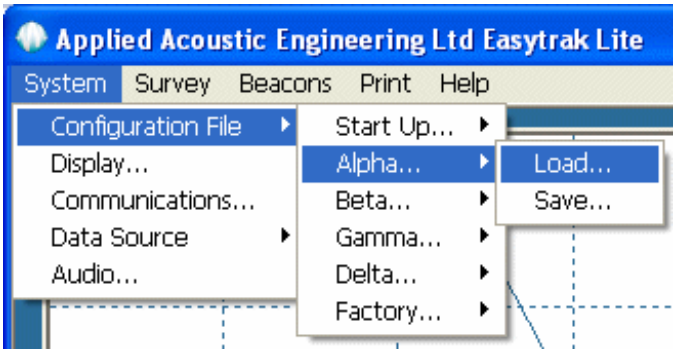


System Configuration File Set-Up

The **CONFIGURATION FILE** selection allows the choice of various system configurations, **START UP**, **ALPHA**, **BETA**, **GAMMA**, **DELTA**, and **FACTORY**.

ALPHA to DELTA are used to save and load 'user' configurations. These files will initially be identical to the factory set-up.

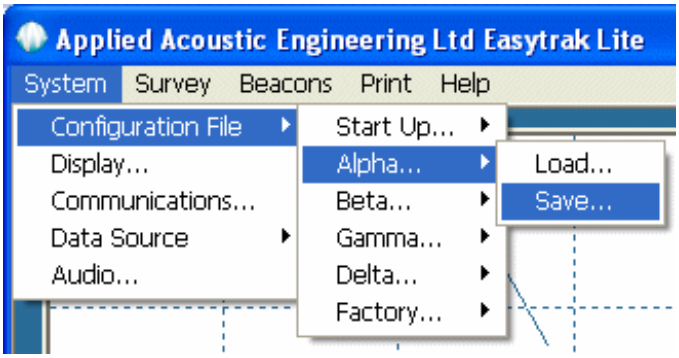
If Easytrak is being used at more than one location, a 'configuration' can be saved for each, allowing an immediate start next time you move back to a site.



Alpha Load configuration option

8.1.1.1 CONFIGURATION FILE - LOAD

System parameters and operator options such as beacon selection and display preferences are loaded and take immediate effect. The START UP file automatically loads when Easytrak is powered up. When selected, the FACTORY file loads the factory set-up system parameters; please note this includes setting the COM ports back to default. This allows the operator to return to a know set-up state.

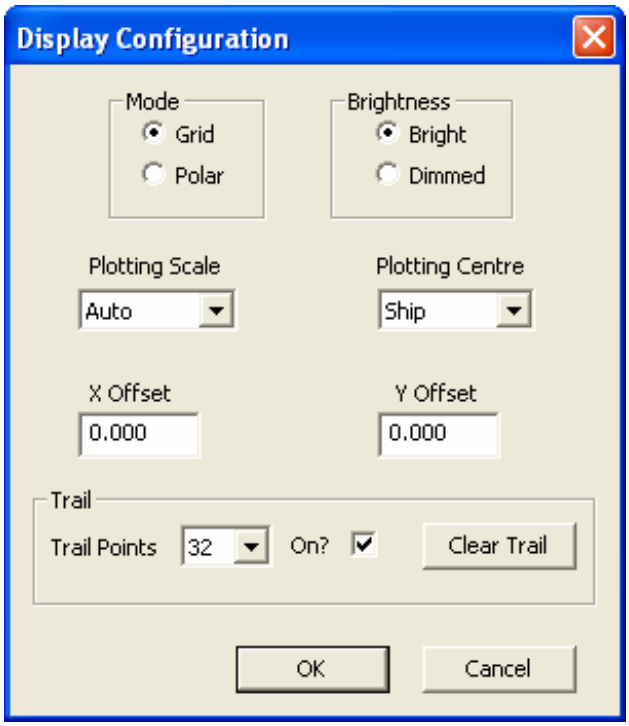


Alpha Save configuration option

8.1.1.2 CONFIGURATION FILE - SAVE

System parameters and operator options such as beacon selection and display preferences are saved. Note, as START UP is automatically saved on power down and FACTORY is set at the factory, there is no START UP or FACTORY save option.

8.1.2 DISPLAY MENU…



Display Set-up Dialogue Window

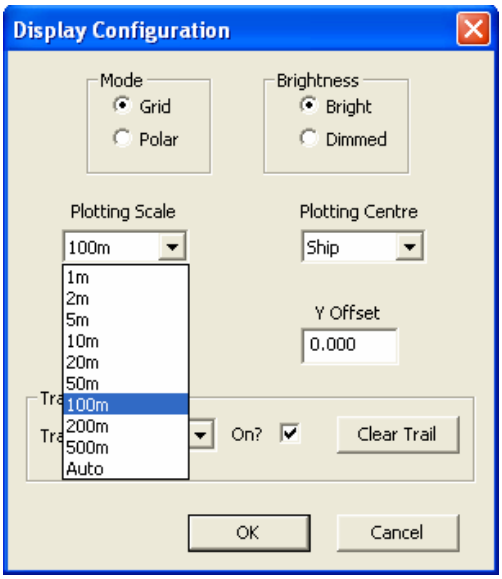
8.1.2.1 DISPLAY MODE

The **DISPLAY MODE** radio buttons determine whether the display axes are in **GRID** or **POLAR** format.

8.1.2.2 BRIGHTNESS

Switches between **BRIGHT** and **DIMMED** suited to different operating environments – **BRIGHT** for outdoors use, and **DIMMED** for indoors use.

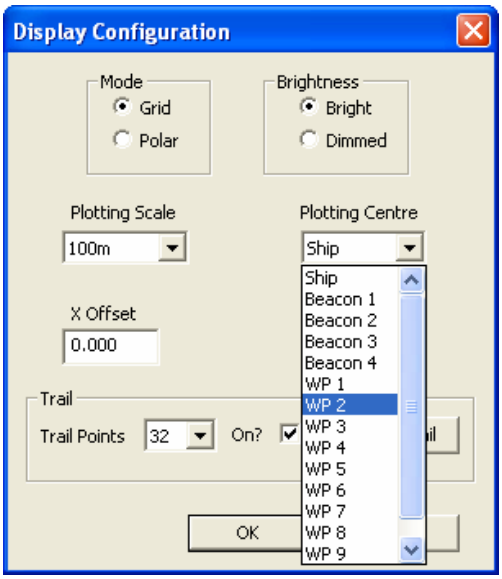
8.1.2.3 DISPLAY SCALE



Display Auto Scale option

This feature determines the **SCALED DISTANCE** between individual **RINGS** or **GRID** lines. **AUTO SCALING** adjusts the scale to ensure all targets and waypoints can be viewed on the plotting area. Scales available are:- **1M, 2M, 5M, 10M, 20M, 50M, 100M, 200M, 500M,** and **AUTO** per ring or grid line.

8.1.2.4 DISPLAY CENTRE



Display Plotting Centre option

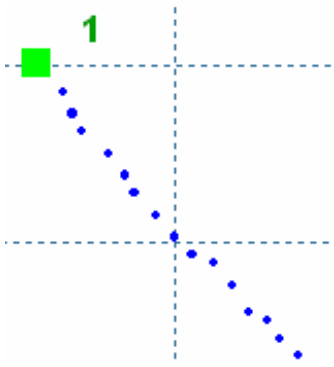
This control allows the centre of the graphical display to be referenced to either, the **SHIP**, a **BEACON, 1** to **4,** or a **WAYPOINT, 1** to **10**.

8.1.2.5 DISPLAY X/Y OFFSET

The centre of the display can be offset from the **DISPLAY CENTRE** chosen allowing the operator to zoom into a particular area of interest; X and Y are in metres.

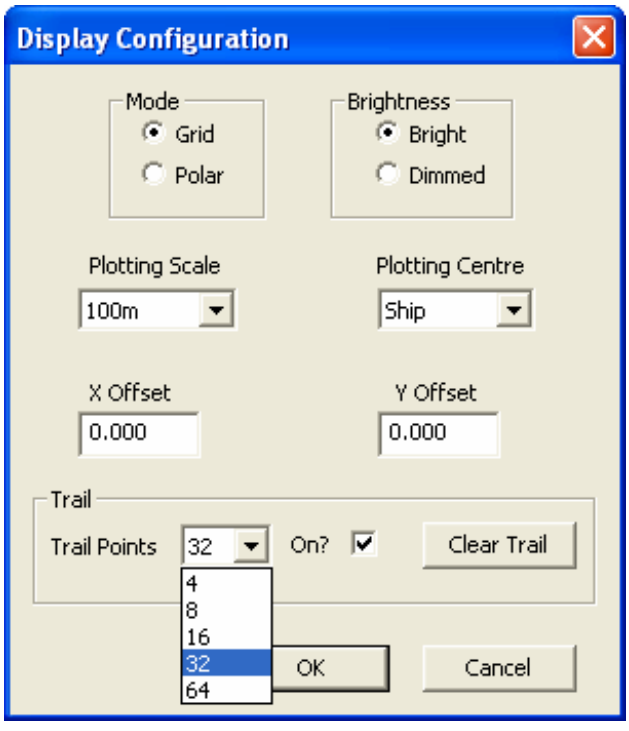
8.1.2.6 DISPLAY TARGET TRAIL ON

When selected **ON**, a snail's trail of a target's path is plotted.



Target Trail

8.1.2.7 DISPLAY TARGET TRAIL NUMBER

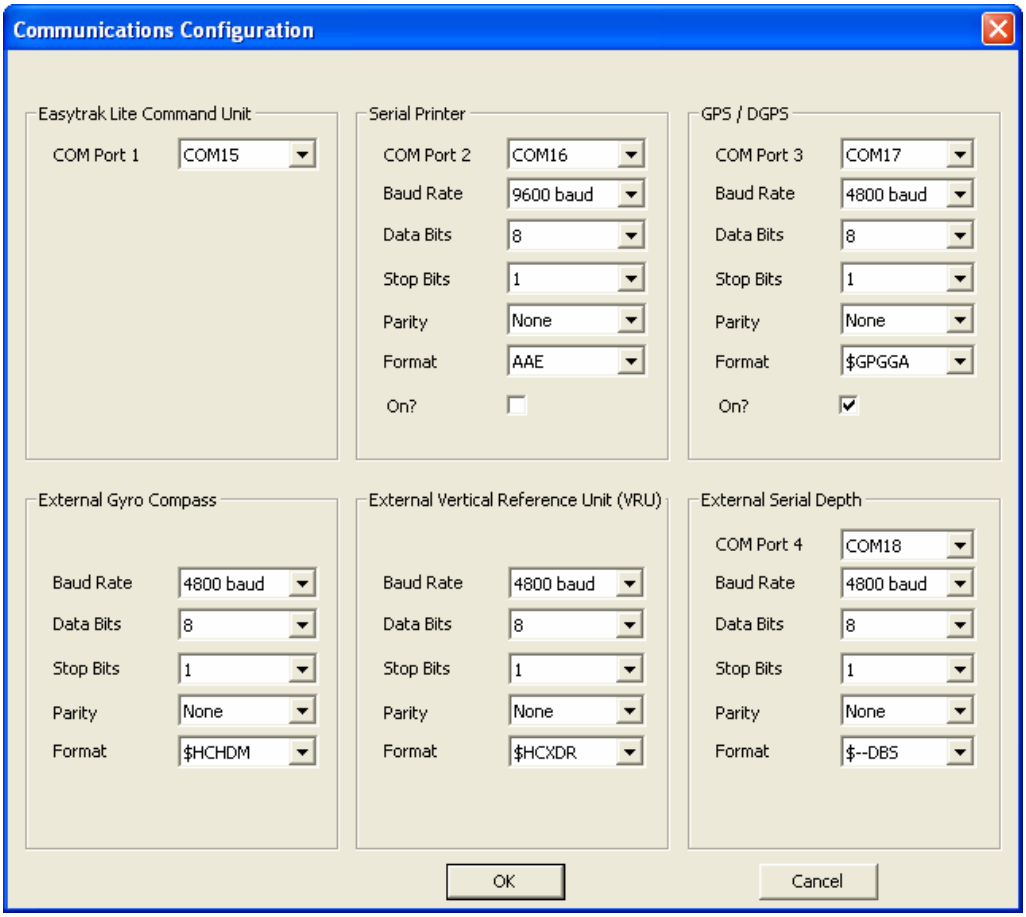


Display Trail points option

The number of (snail) trail points required 4, 8, 16, 32 or 64.

8.1.3 COMMUNICATIONS MENU…

This window allows the configuration of the serial ports used to communicate between the desktop personal computer or laptop and the Command Unit, printer, GPS.



Communications configuration Dialogue Window

It is common these days for personal computers not to have RS232C serial ports and certainly not four, which is required for Easytrak Lite. Using a USB to quad (or more) serial port convertor, the problem of lack of serial ports is resolved.

The **PORTS** used by Easytrak are selected in this dialogue window. In the above example, **COM PORT 1** is assigned **COM15** to communicate with the Easytrak Lite Command Unit, **COM PORT 2** is assigned **COM16** to communicate with the PRINTER, **COM PORT 3** is assigned **COM17** to communicate with the GPS receiver, and **COM PORT 4** is assigned **COM18** for external Depth.

Even though serial ports are commonly not available, COM1, 2, etc are frequently used internally for modems, touch pad controllers and alike; for this reason, it is advisable to use higher values to prevent clashes. To install the program software and configure the USB to four serial port convertor, please see section **4.7 SOFTWARE INSTALLATION**.

8.1.3.1 DATA OUTPUT SERIAL SET-UP

This is the RS232C communications set-up for the output of serial data from **PORT 2**, typically to a printer or navigation computer. The RS232C Serial set-up has to coincide with the set-up of the printer or navigation computer. Data is outputted after each Fix is processed and not at a pre-defined rate. Data Source i.e. Ship, North Referenced etc. is determined in the System / Data Source Menu. Please note there is no hardware or software handshaking in either direction.

SERIAL SET-UP:

Baud rate: 1200, 2400, 4800, 9600, 19200, or 38400.
Data bits: 6, 7, or 8.
Stop bits: 1, or 2.
Parity: None, Even, or Odd.

Format:

AAE:
Applied Acoustic Engineering's string.

TPII-2EC:
Simplified version of the Trackpoint 2EC string.

TP-EC W/PR:
Trackpoint string including pitch & roll.

Simrad 300P:
Simplified version of the Simrad string.

Simrad 309:
Simplified version of the Simrad string.

$PSIMSSB & PSIMSNS*
NMEA[7] format strings.

$GPRMC*
Pseudo GPS format string.

Sonar*
Requirements for the various Side Scan Sonars. The strings $GPGGA, $GPVTG, & $GPTLL are outputted. (GPS must be present and be sending $GPVTG and $GPGGA)

Please see **APPENDIX 3** for string details.

ON?:

With the checkbox checked the chosen string will be outputted after each fix.

*Note, providing GPS is available, and $GPRMC is available, the data output strings $PSIMSSB, $PSIMSNS, $GPRMC and $GPTLL use GPS UTC time and date. If GPS is not available, or GPS message $GPRMC is not available, the computer's internal date and time is used.

[7] NMEA The National Marine Electronics Association

8.1.3.2 GPS/DGPS SERIAL SET-UP

This is the RS232C communications set-up for the GPS serial input **PORT 3**. The set-up has to agree with the set-up of the GPS receiver. Please note there is no hardware or software handshaking in either direction.

SERIAL SET-UP:

Baud rate: 1200, 2400, 4800, 9600, 19200, or 38400.

Data bits: 6, 7, or 8.

Stop bits: 1, or 2.

Parity: None, Even, or Odd.

Format

Standard GPS NMEA[8] data formats.

$GPGLL

$GPGGA

$GPRMC

Please note the GPS format chosen here is used in the calculation of absolute position and for determining the status / error of the GPS position.

ON?:

With the checkbox checked the chosen string will be outputted.

8.1.3.3 EXTERNAL GYRO SERIAL SET-UP

This is the RS232C communications set-up for an external compass.

Easytrak interprets the common NMEA compass strings **$HCHDM, $HCHDT, $HCHDG,** strings from the SG Brown compass **HTDt** and **HTDS** formats, and **$HEHDT**. The PNI Corporation **TCM2.X** format can also be interpreted. The communication parameters set-up has to agree with the set-up of the compass.

Please note there is no hardware or software handshaking in either direction.

SERIAL SET-UP:

Baud rate: 1200, 2400, 4800, 9600, 19200, or 38400.

Data bits: 6, 7, or 8.

Stop bits: 1 or 2.

Parity: None, Even, or Odd.

[8] NMEA The National Marine Electronics Association

8.1.3.4 External VRU serial set-up

This is the RS232C communications set-up for a VRU.

Easytrak interprets the common NMEA pitch and roll string **$HCXDR** and TSS's **TSS1** string. The PNI Corporation **TCM2.X** format can also be interpreted. The communication parameters set-up has to agree with the set-up of the VRU.

Please note there is no hardware or software handshaking in either direction.

Serial set-up:

Baud rate: 1200, 2400, 4800, 9600, 19200, or 38400.

Data bits: 6, 7, or 8.

Stop bits: 1 or 2.

Parity: None, Even, or Odd.

8.1.3.5 External Depth serial set-up

This is the RS232C communications set-up for External Depth serial input **Port 4**. Please note there is no hardware or software handshaking in either direction.

Serial set-up:

Baud rate: 1200, 2400, 4800, 9600, 19200, or 38400.

Data bits: 6, 7, or 8.

Stop bits: 1 or 2.

Parity: None, Even, or Odd.

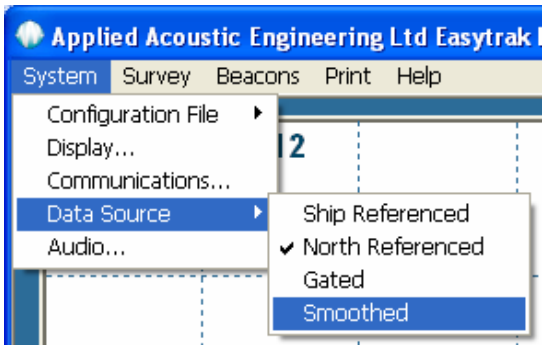
Format

Standard Depth NMEA data formats.

$-- DBS

$-- DPT

8.1.4 Data Source Menu



Data source option

This feature determines the type of data used in calculating the graphics positioning, the displayed beacon data, and the serial output data.

8.1.4.1 Ship Referenced

Positions are referenced to the bow of the SHIP. No adjustments are made due to the compass, though the position is pitch & roll corrected. Offsets are applied. The positions derived in this mode are not affected by any gating or smoothing setting.

8.1.4.2 North Referenced

Positions are referenced to the NORTH. Compass, pitch & roll, and offset values are applied to the computed position.

A Compass must be used to be north referenced, otherwise it will be ship (bow) referenced. The positions derived in this mode are not affected by any gating or smoothing setting.

8.1.4.3 Gated

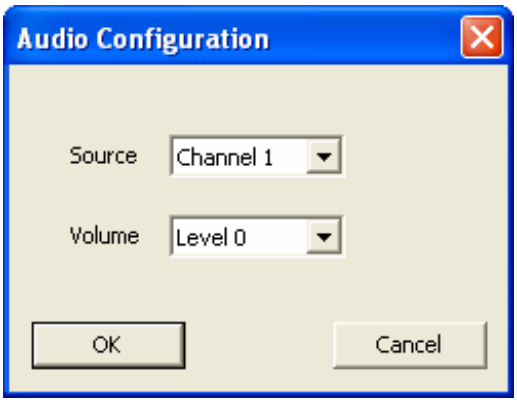
Positions are referenced to the NORTH. Basic North referenced values are used except where a value falls outside a user selected 'Gate' or a reply is lost. The lost reply or 'out of gate' position is replaced by an estimated position based on previous positions. This gate can be a maximum velocity, maximum horizontal distance moved etc.

Compass and pitch & roll inputs must be used otherwise incorrect positions will be produced.

8.1.4.4 Smoothed

Positions are referenced to the NORTH. The smoothed position is estimated from current and previous positions. The degree of smoothing is set in the 'Survey / Gate' menu. Compass and pitch & roll inputs must be used otherwise incorrect positions will be produced.

8.1.5 AUDIO MENU…



Audio Configuration Dialogue Window

8.1.5.1 AUDIO SOURCE

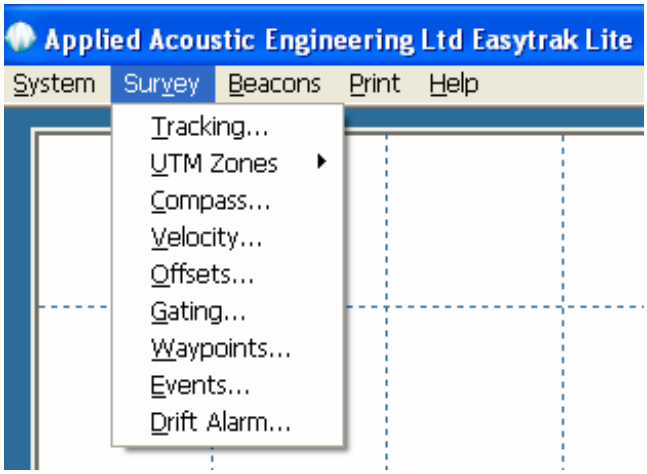
The **AUDIO SOURCE** menu allows the operator to listen to beacon replies via transducer elements 1 to 4 using the internal speaker or optional headphones. This feature is useful in that it allows the operator to listen for sources of interference.

8.1.5.2 AUDIO VOLUME

Adjusts the **AUDIO VOLUME** level from 0 (off) to 8 (maximum).

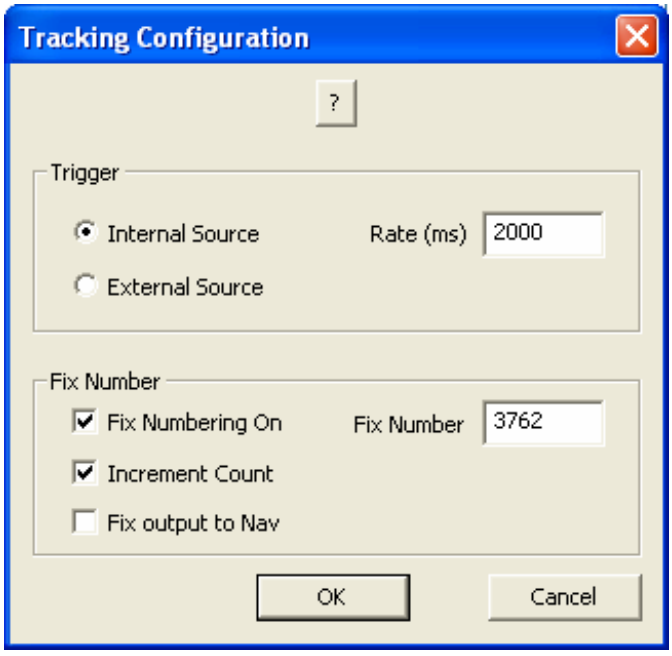
8.2 SURVEY

On selecting SURVEY the following menu is displayed:



Survey menu options

8.2.1 TRACKING…



Tracking Configuration Dialogue Window

8.2.1.1 TRIGGER SOURCE

The two **TRIGGER SOURCE** radio buttons determine whether fixes are triggered by an **INTERNAL** timer or from an **EXTERNAL** 12V pulse from a navigation computer. See Appendix 5 for details.

8.2.1.2 TRIGGER RATE

The **TRIGGER RATE (MS)** text box determines in milliseconds (ms) the rate at which targets are interrogated when the trigger source is set to 'Internal'. The minimum and maximum trigger rates are 500ms (0.5s) and 20000ms (20s) respectively. Please note, at the high trigger rates, beacon time lock out may occur.

8.2.1.3 FIX NUMBERING ON

When the **FIX NUMBERING ON** checkbox is ticked, the fix number will increment or decrement after each cycle of interrogations; if for example, beacons 1, 3 and 4 are switched on, the fix number will increment or decrement by one after beacons 1, 3 and 4 have been interrogated.

8.2.1.4 FIX NUMBERING TEXT BOX

The **FIX NUMBER** text box allows the user to manually set the fix number.

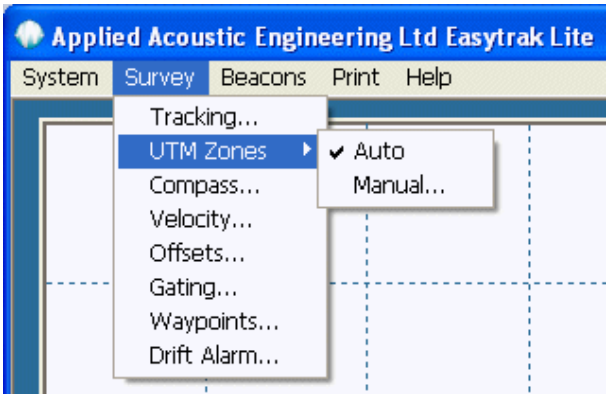
8.2.1.5 INCREMENT COUNT CHECKBOX

Checking the **INCREMENT COUNT** checkbox the fix number increments; when not checked, the fix number decrements.

8.2.1.6 FIX OUTPUT TO NAV CHECKBOX

Checking the **FIX OUTPUT TO NAV** checkbox, a 12V positive going pulse is available from the BNC connector on the front panel of the Command Unit. See Appendix 5 for details.

8.2.2 UTM ZONES



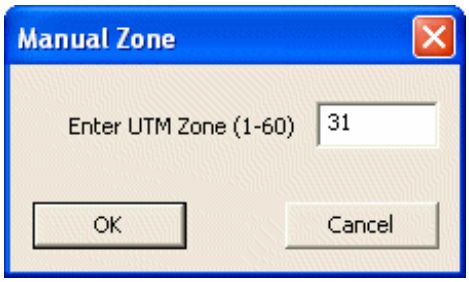
UTM Zones

8.2.2.1 UTM ZONES AUTO

If **AUTO** is selected, Easytrak Lite will automatically calculate the UTM zone which will be derived from a geographical position in valid GPS data (default),

8.2.2.2 UTM ZONES MANUAL

Should the user wish to manually enter a zone, selecting **MANUAL** will bring up the following dialogue window.



UTM Zones manual selection Dialogue Window

A user may wish to manually set a zone if the area of work is close to, or on a zone boundary.

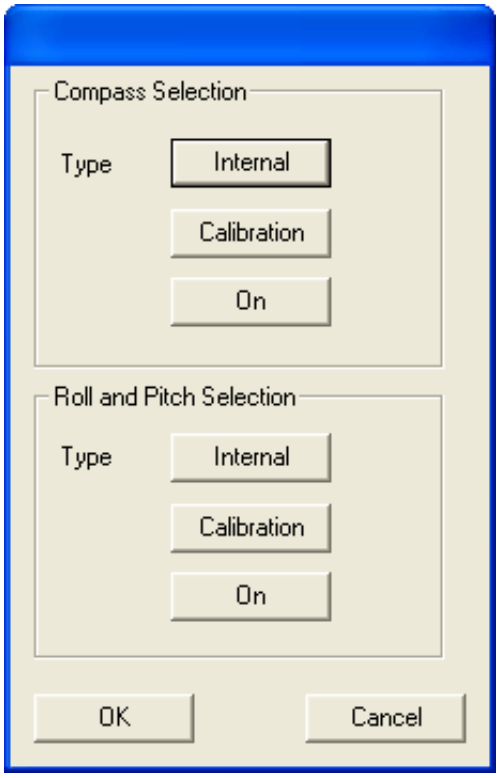
8.2.2.3 GLOBAL POSITIONING SYSTEM

Using GPS allows the absolute positioning of sub-sea targets. Note in Easytrak, all UTM calculations are based on the WGS84 ellipsoid.

Note: When using GPS, bearings are relative to GRID North; without GPS, bearings are relative to TRUE North or with the compass switched off, the vessel's Bow.

Projection and ellipsoid parameters, the current convergence value and scale factor can be viewed through the **HELP / DIAGNOSTICS** menu.

8.2.3 COMPASS…



A compass input is used to compensate for the rotation of the boat allowing grid positions to be 'NORTH' referenced. The Easytrak transducer has an in-built compass. If more precision is required, an external compass / Gyro can be used. The option of 'no compass' can also be selected.

The compass can be switched off as far as calculation and plotting is concerned; however, the compass is still displayed even when switched off providing 'Type' is not set to 'None'.

8.2.3.1 COMPASS SELECTION

INTERNAL:

This selection uses the internal compass in the transducer if installed.

EXTERNAL:

The following strings can be read, **$HCHDM**, **$HCHDT**, **$HCHDG**, the PNI Corporation **TCM2.X** string, SG Brown strings **HTDt** and **HTDS,** and **$HEHDT**. The type of string is selected in the Communications configuration menu for the compass.

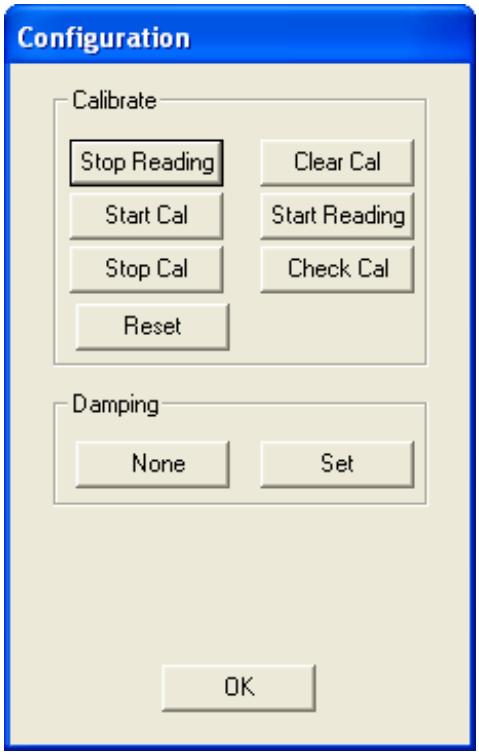
NONE:

No compass is used in the calculation of position, and no compass value will be present in output serial data strings.

Note: The Compass must be switched ON if the transducer is free hanging over the side of the vessel.

8.2.3.2 COMPASS CALIBRATION

Only available when **INTERNAL COMPASS** is selected.



Compass Set-up Dialogue Window

The transducer's internal compass can be calibrated on-site. Messages from the compass are displayed in the Message Display area of the screen.

To **CALIBRATE** the internal compass, please see Appendix 8.

Commands available are **STOP READING**, **CLEAR CAL**, **START CAL**, **START READING**, **STOP CAL**, **CHECK CAL**, and **RESET**.

8.2.3.3 COMPASS DAMPING

To reduce jitter damping can be set between **NONE** and **HIGH** depending upon the operating circumstances. Should the transducer be deployed in a static or near static situation, **HIGH** damping can be used; in a very dynamic situation, **LOW** or **NONE** can be chosen for a much quicker response.

To change the damping selection, select the damping choice – **NONE, LOW, MEDIUM,** and **HIGH**, and then select **SET**.

Compass damping is only available with transducer ARM board software version 0.006 and above. The version can be viewed in **HELP / ABOUT**.

8.2.3.4 COMPASS ON

When **ON**, the compass heading is used in calculation and is outputted in appropriate data output strings. When **OFF**, the compass heading is **NOT** used in calculation and the position is ship (bow) referenced, but the compass heading is still outputted as appropriate in data output strings.

8.2.4 VERTICAL REFERENCE UNIT (VRU)…

The Easytrak transducer has a VRU sensor to compensate for the pitch & roll movements of the vessel. If more precision is required, external VRU can be used. The option of no 'pitch and roll' can also be selected.

The VRU can be switched off as far as calculation and plotting is concerned. However, the pitch & roll values are still displayed even when switched off providing 'Type' is not set to **NONE**.

8.2.4.1 VERTICAL REFERENCE UNIT SELECTION

INTERNAL:

This selection uses the internal VRU pitch & roll sensors within the transducer if installed.

EXTERNAL:

The following strings can be read, **$HCXDR**, the PNI Corporation **TCM2.X** string, and TSS string **TSS1**. The type of string is selected in the Communications configuration menu for the VRU.

NONE:

No pitch and roll is used in the calculation of position.

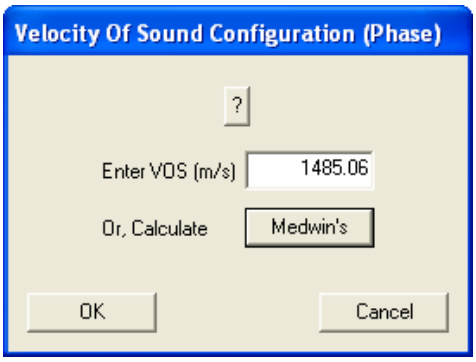
8.2.4.2 VERTICAL REFERENCE UNIT CALIBRATION

Calibrates the internal compass and pitch & roll sensors. Calibration is only available when **INTERNAL** Type is selected. This is the same routine used with the compass calibration. The Calibration routine in the 'Compass' section simultaneously calibrates the Pitch & Roll sensors, and vice versa.

8.2.4.3 VERTICAL REFERENCE UNIT ON

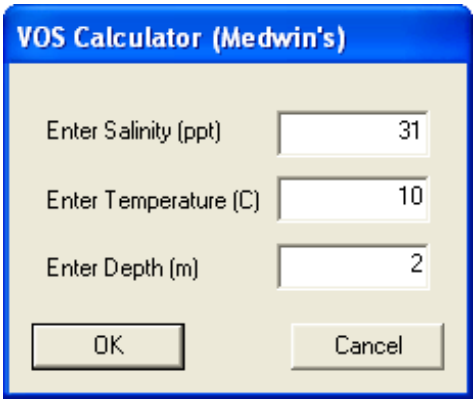
When **ON**, pitch & roll is used in calculation and is outputted in appropriate data output strings. When **OFF**, Pitch & Roll is **NOT** used in calculation, but is still contained in data output strings.

8.2.5 VELOCITY MENU…



Velocity Of Sound Set-Up Dialogue Window

This dialogue window allows the user to enter the **VELOCITY OF SOUND (VOS)** through water as used in phase measurements rather than in the calculation of range. This value is the VOS at the transducer i.e. sea level. VOS can be entered manually or calculated using Medwin's method of calculation. To use Medwin's left click the **MEDWIN'S** button and the following dialogue window will be displayed:-



Medwin's Calculator Dialogue Window

If Medwin's option is used, the VOS text box will be automatically filled with the result.

8.2.5.1 SALINITY (PPT)

Water salinity in Parts Per Thousand ***(ppt)***.

8.2.5.2 TEMPERATURE (°C)

Water temperature in Centigrade.

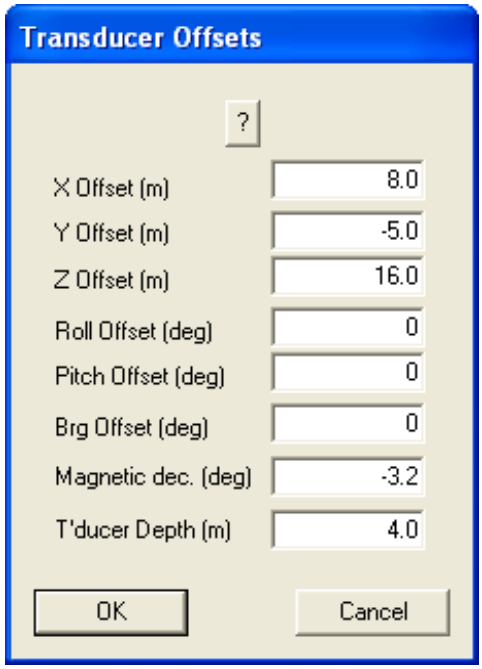
8.2.5.3 DEPTH (M)

Depth of the transducer below water level in metres.

8.2.6 OFFSETS…

By default, the position given by Easytrak is that of the transducer. In many cases however, the position needs to be referenced to another part of the vessel, for example, the navigation antenna.

The following offsets are available:- **X OFFSET** (m), **Y OFFSET** (m), **Z OFFSET** (m), **ROLL OFFSET** (degrees), **PITCH OFFSET** (degrees), **BEARING OFFSET** (degrees), **MAGNETIC (DEC)LINATION** and **TRANSDUCER DEPTH** (m) below water-line.



Transducer Offsets Dialogue Window

Note, the **BEARING OFFSET** is an acoustic bearing offset and does not affect the compass heading; **MAGNETIC DECLINATION** offset however, will affect the compass heading.

MAGNETIC DECLINATION is the angle between magnetic north and true north. Declination is considered positive when the angle measured is east of true north and negative when west.[9] Magnetic declination varies throughout the world changing slowly over time. Magnetic declination is entered into Easytrak in the following format: SDDD.DD, where 'S' is the sign + (East) or – (West), and 'D' are whole degrees and decimal degrees. The transducer internal compass and external compass strings other than **$HCHDT** are affected by the declination offset.

[9] http://www.ngdc.noaa.gov/geomag/declination.shtml

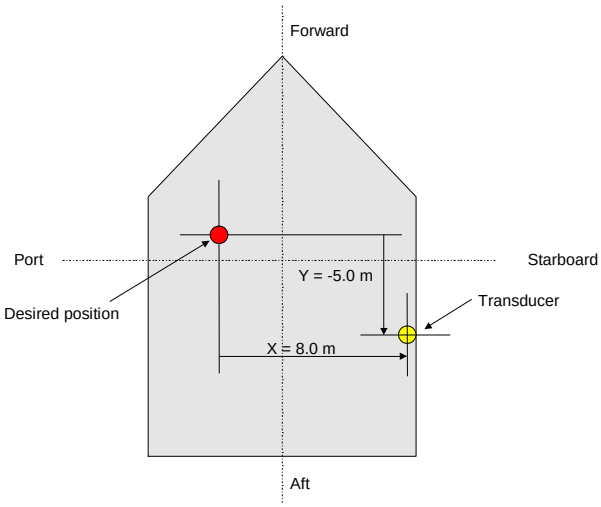
Offsets are the measured distances **from the desired position to the transducer**.

X is +ve if the transducer is starboard of the desired point, -ve if port, similarly, Y is +ve if the transducer is forward of the desired point, and –ve if aft.

The two diagrams below show examples of typical scenarios where the positions desired is the navigation antenna (typical with GPS positioning).

Fictitious offsets values have been given to demonstrate how the measurements are made, and in particular their signs.

If X, Y, and Z offsets are to be used, the transducer MUST be fixed with the alignment mark facing forward using either an over the side pole or through a gate valve.

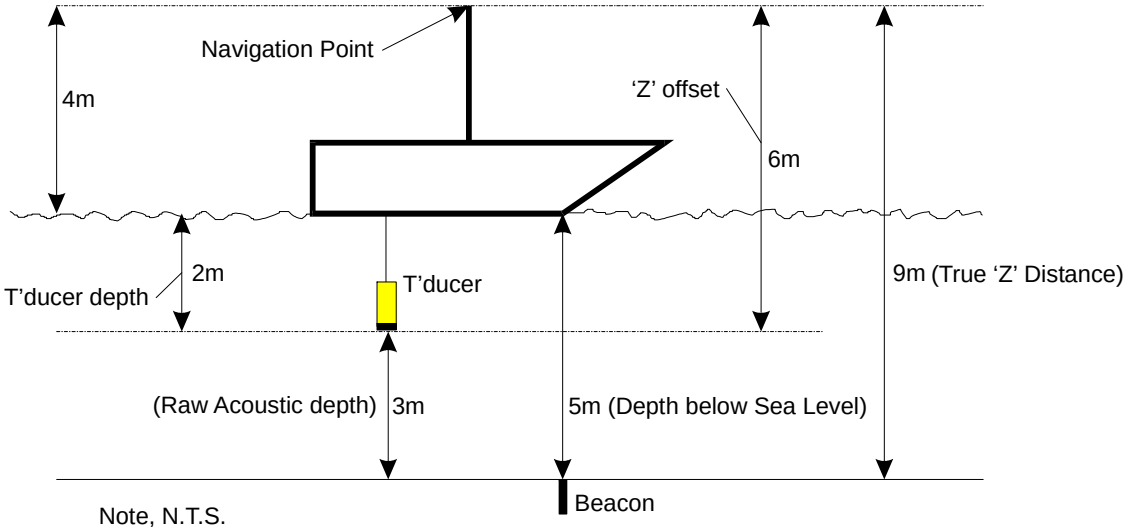


Vessel plan view

The above diagram shows the plan view of a vessel. The alignment mark on the transducer must point forward.

Overleaf shows examples as to how Easytrak handles the ‘Z’ offset and transducer depth parameters. The Z offset is +ve where the transducer is below the navigation point. Transducer depth below sea level is +ve.

‘Z’ and T’ducer offsets



The Navigation Point is the point on the vessel where all navigation measurements are referenced to; in this case, the top of the mast.

ACOUSTIC DEPTH Where Easytrak uses acoustics (using the depression angle) to calculate the depth

True ‘Z’ distance = Raw Acoustic Depth (3) + ‘Z’ Offset (6) = 3 + 6 = 9m

MANUAL DEPTH (Where the depth is entered manually, or the depth is sent serially)

True ‘Z’ distance = Manual depth to target (5) + ‘Z’ Offset (6) – T’ducer depth (2) = 5 + 6 -2 = 9m

DEPTH BEACON (Telemetry etc.)

True ‘Z’ distance = Telem. depth to target (5) + ‘Z’ Offset (6) – T’ducer depth (2) = 5 + 6 -2 = 9m

Note that if the navigation point is at sea level, then the depth of transducer – the Z offset – would be +2m in the above examples entered into the offsets menu. However, the transducer depth entry is **ONLY REQUIRED** in examples 2 and 3 above, i.e. manual depth entry or when using a depth telemetry beacon.

8.2.7 GATING MENU…

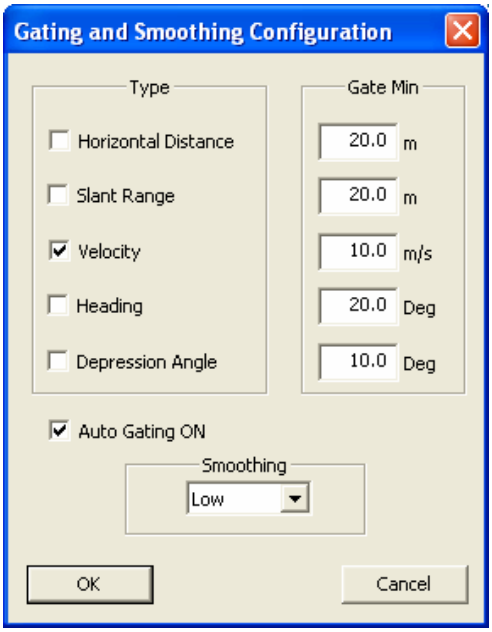
GATING can be used to remove spurious positions due to signal reflections, excessive environmental noise etc.

8.2.7.1 GATING TYPE

Parameters that can be gated include Distance (horizontal), Slant Range, Velocity, Heading, and Depression Angle.

8.2.7.2 GATING MINIMUM

Gating minimum limits the deviation a particular parameter may change between fixes. A value can be entered in a text box to define the gate size, or, in the case of automatic gating mode, the minimum size of the gate.



Gating and Smoothing Control Dialogue Window

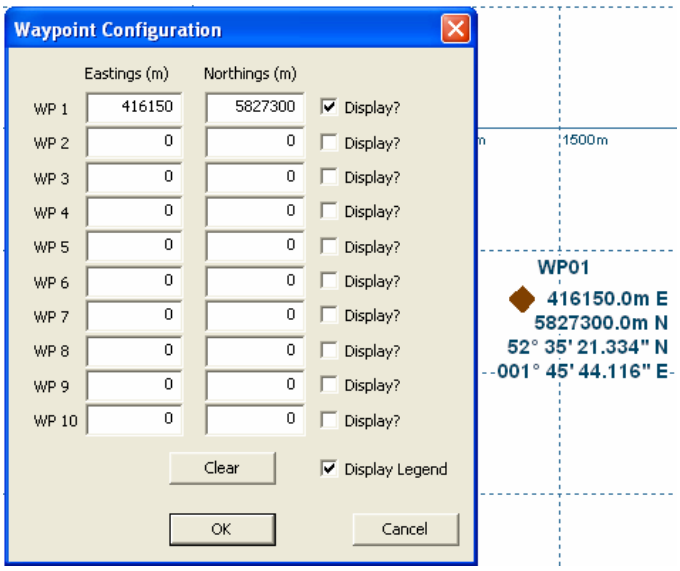
8.2.7.3 AUTO GATING ON CHECKBOX

In automatic gating mode, a gate starts very large, and then halves in size as a set of five good readings is obtained. The gate shrinks until the user defined minimum gate size is reached. Should there be five 'out of gate' readings, the gate doubles in size until stable 'in gate' readings are obtained. Automatic gating mode is recommended.

8.2.7.4 SMOOTHING TEXT BOX

This control determines the amount of smoothing of the data when THE DATA SOURCE IS IN SMOOTHED MODE. The options are LOW based on four fixes, MEDIUM based on eight fixes, HIGH based on sixteen fixes, or VERY HIGH based on 32 fixes.

8.2.8 WAYPOINT MENU…



Waypoint configuration Dialogue Window

WAYPOINTS

This allows the entry and editing of grid positions, typically in **EASTINGS** and **NORTHINGS**. Waypoints are used as references or markers, say for a shipwreck or to indicate the centre of a worksite. Waypoints are represented on-screen by a brown diamond graphic. The Easting and Northing positions (or X and Y) are entered in the appropriate text boxes and the **DISPLAY** checkbox ticked if the user requires the waypoint to be displayed on the screen. The **DISPLAY LEGEND** check box allows legend to be displayed or not. Latitude and Longitude is also displayed calculated from the Eastings and Northings using the current system projection and ellipsoid parameters.

A **DOUBLE LEFT MOUSE CLICK** will automatically bring up a window allowing a waypoint to be set-up at the position of the mouse pointer. See section **7. SPECIAL MOUSE OPERATIONS** for further information.

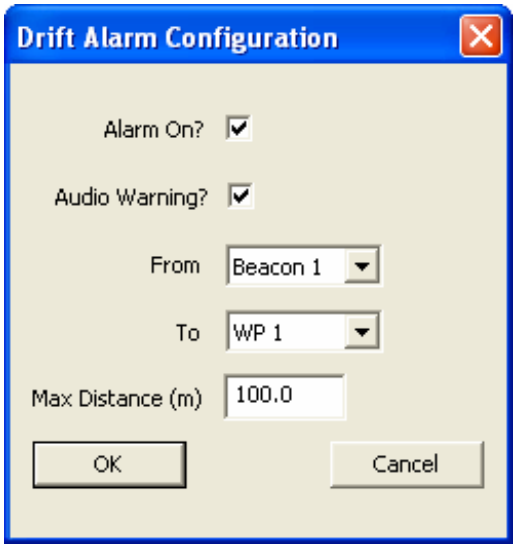
8.2.9 EVENT MENU…

The Events dialogue window allows individual events to be viewed, displayed (default), or cleared. The complete events file can also be cleared.

Events Dialogue Window

8.2.10 DRIFT ALARM…

When selected, the (slant) distance and bearing between **FROM** and **TO** is calculated. If the **SLANT RANGE DISTANCE** exceeds 'maximum distance', an alarm sounds. 'From' and 'To' can be selected from **SHIP, BEACON 1, BEACON 2, BEACON 3, BEACON 4, AND THE 10 WAYPOINTS**. The drift alarm is useful as an audible warning, for example, should the distance between a ROV and the mother ship is in danger of exceeding the ROV's umbilical length, an alarm would sound allowing preventive action to take place.



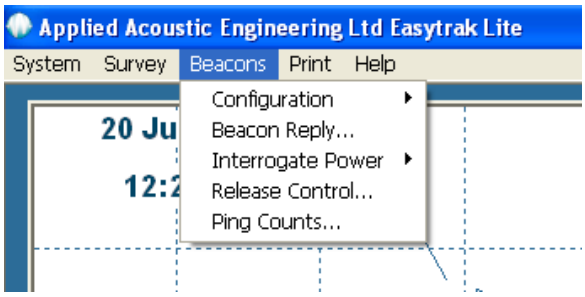
Drift Alarm Dialogue Window

Distance and bearing information

GPS can also be used to navigate to and from the worksite. Using the **DRIFT ALARM**, a slant range (SRNG) and bearing (BRG) to a waypoint containing the site's coordinates would be displayed.

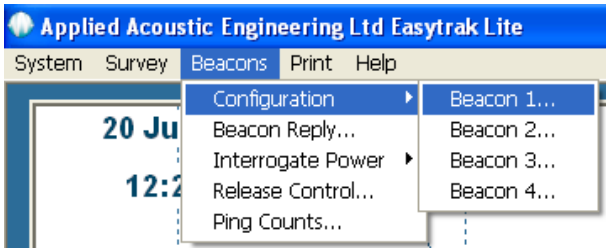
8.3 BEACONS

On selecting BEACONS the following menu is displayed:

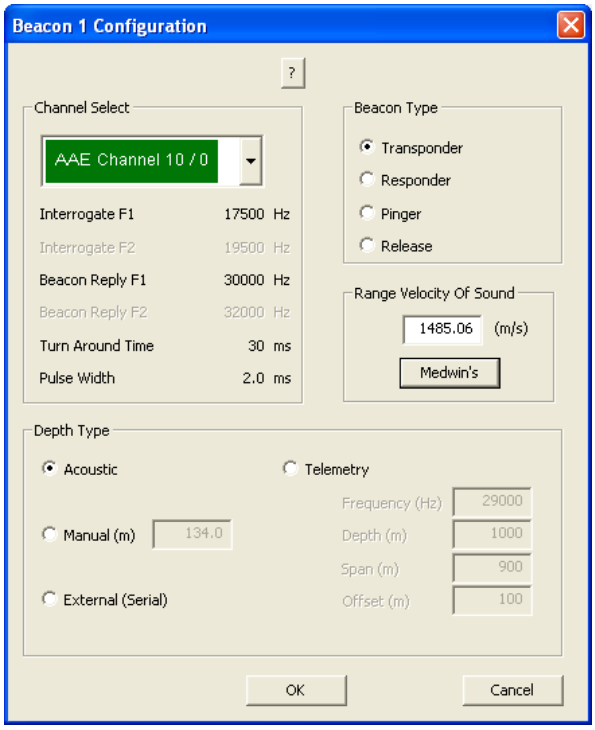


By clicking on the Configuration menu selection the option of Beacons 1 to 4 will be displayed.

8.3.1 CONFIGURATION MENU

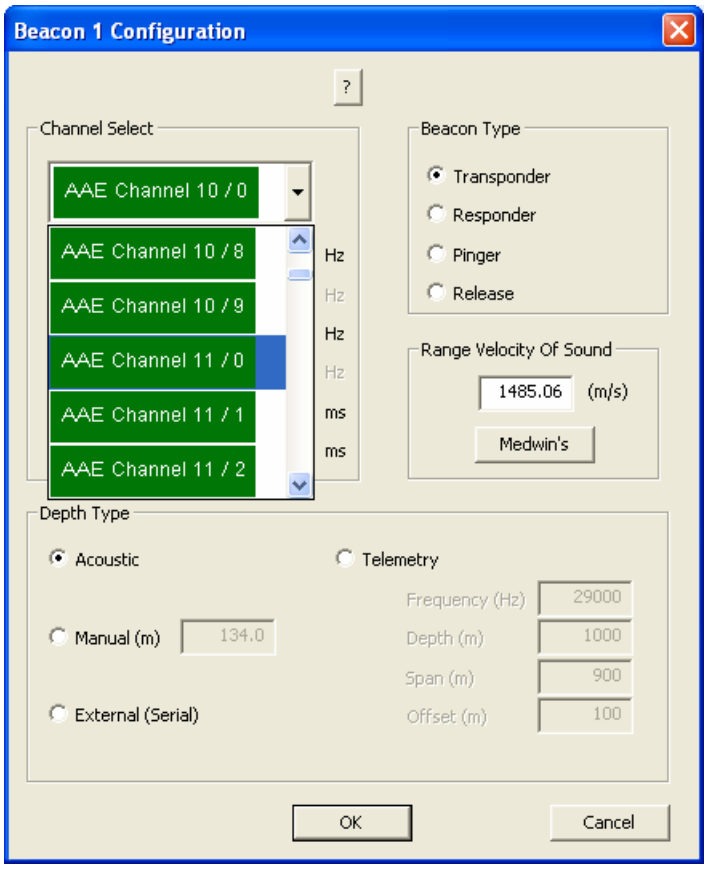


Selecting the beacon of choice will display the configuration window for that beacon.



Note the beacon configuration menu can also be brought up with a right mouse click over the respective beacon function key F1 to F4.

The [?] gives information regarding the beacon configuration dialogue window.



Beacon configuration Dialogue Window

8.3.1.1 Channel Number

On-screen Channel entry is based on the switch settings layout on an Applied Acoustic Engineering beacon. Select the channel required from the control.

Note: Ensure that the channel number set on Easytrak and the beacon agree.

8.3.1.2 Select Beacon Type

Transponder:

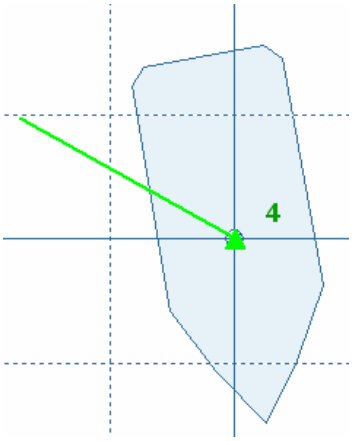
A beacon that will receive an acoustic interrogate signal at a particular frequency, and then reply (transmit) after a set time (turn around delay) on a different frequency. The frequencies are determined by the channel number set on the transponder. Ensure that the channel number set on Easytrak and the beacon are the same.

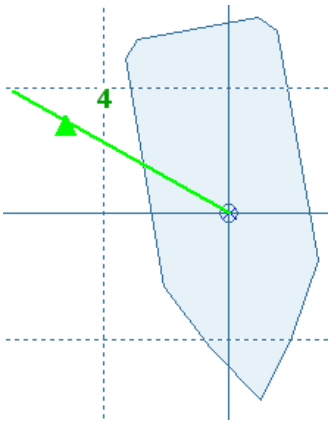
RESPONDER:

A beacon that will reply (transmit) after receiving an electrical rather than acoustic signal. Easytrak outputs a 12V positive going pulse through the BNC connector on the front panel of the Command Unit allowing connection to a responder. Please refer to the appropriate beacon manual for wiring details. The reply frequency is determined by the channel number set on the responder. Ensure that the channel number set on Easytrak and the beacon are the same.

PINGER:

A pinger is a beacon that transmits at set intervals without being interrogated. The transmit interval is typically around once per second. The pinger transmit frequency is determined by the channel number set on the beacon. Pingers generally can only give a bearing and depression angle.





The bearing for a pinger is indicated on-screen by a line from the ship.

However, if the depth of the pinger is known, and entered in the manual depth option in the beacon set-up, Easytrak can estimate the responder's position.

When using a pinger, ensure that Easytrak's interrogation interval is set to > 1.5 seconds, otherwise timeout problems may occur.

RELEASE:

A release works as a transponder and will give a position, but it also allows telemetry communications with AAE releases. Please see section **8.3.4 RELEASE MENU** for further details regarding Releases.

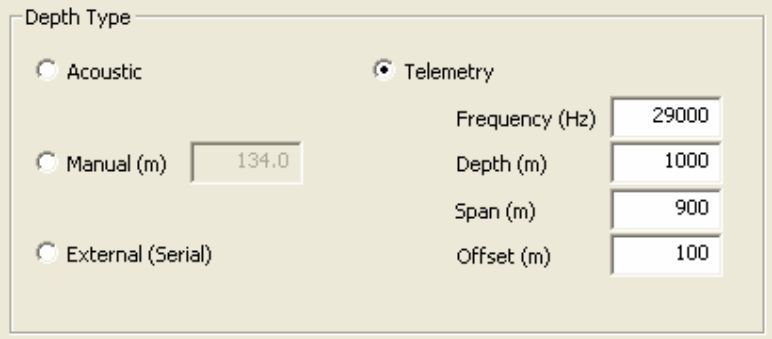
Note: Certain Trackpoint channels with the same channel number have different frequencies for Transponders and Releases.

8.3.1.3 DEPTH TYPE

ACOUSTIC:

The depth value for the target is derived from the beacon's acoustic reply.

TELEMETRY:



Telemetry depth configuration

Using telemetry gives a more accurate indication of beacon depth particularly at low depression angles. If depth telemetry is selected, this value will override that derived by acoustics or any previously entered manually.

Depth beacons rather than transmitting one pulse transmit two; the time difference between the two pulses is proportional to the depth of the beacon below sea level.

The four parameters used by manufacturers to allow the calculation of depth are **FREQUENCY**, **GAUGE DEPTH RANGE**, **OFFSET** and **SPAN** . **OFFSET** is the delay between the two pulses at zero depth; **SPAN** is the conversion factor for calculating the depth from the additional time delay.

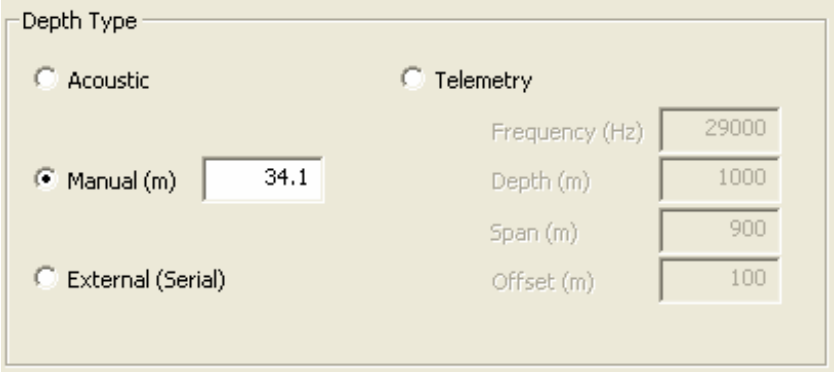
The default values of Frequency, Depth (gauge range), Span, and Offset are automatically set into text boxes according to the channel selected and mode of the channel selected, e.g. an AAE channel, or a HPR3 channel etc.

For Applied Acoustic Engineering and TPll beacons, the above values can be changed to suit different 'depth range' gauges. For HPR3 and HPR4 channels, only the frequency is displayed; HPR3 beacons by default work out at 2 metres per ms, and HPR4 1 metre per ms. The above window shows AAE channel 10/0 using a 1000m depth gauge.

The depth beacon manufacturer's user manual should be consulted to determine the frequency, depth range, span and offset used.

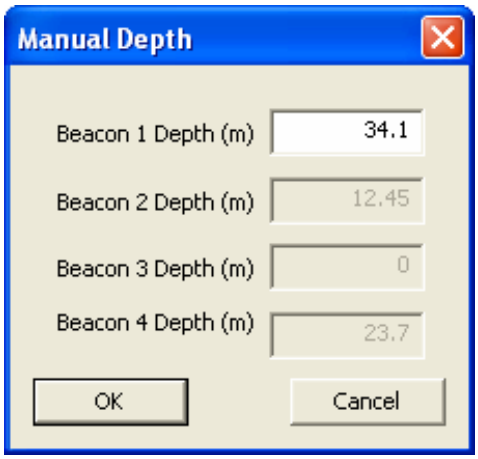
If the channel number is subsequently changed, the values will be set to the new channel's mode.

MANUAL:



Manual depth configuration

If the manual depth radio button is selected, the entered value will override the acoustic or telemetry value. This option is useful where the target is in shallow waters or the target is static and the depth is known, for example, on a wellhead or marking a wreck.



Manual depth hot key Dialogue Window

DEPTH HOTKEY

To enter manual depths quickly, a hotkey is available. By pressing the '.' (Period) key on the keyboard or keypad, the dialogue window to the left will be seen. A depth can only be entered if the depth set-up is selected to manual for that particular beacon, otherwise the text boxes will be greyed out, as with beacons 2, 3, and 4.

A manual depth of 34.1m has been entered for beacon 1 in the example above.

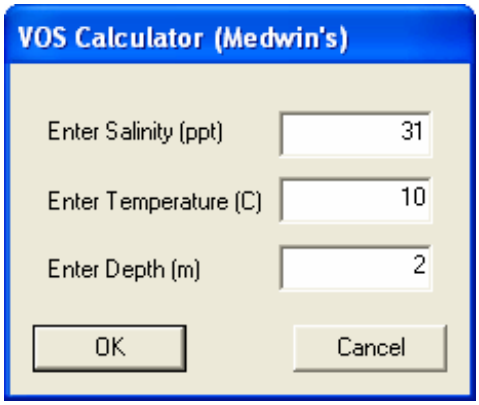
EXTERNAL:

By selecting the External radio button, depths are obtained through serial **PORT 4**. The format of the port is configured in the **SYSTEMS / COMMUNICATIONS** menu.

8.3.1.4 RANGE VELOCITY OF SOUND

This allows the user to enter the Velocity Of Sound (VOS) for transmission through the water used in the **RANGE CALCULATION** for the selected beacon.

VOS in m/s can be entered manually or computed using **MEDWIN'S METHOD** of calculation. If a VOS profile is known for the working area, an average VOS can be entered into Easytrak. To use Medwin's method, the following window is displayed:-



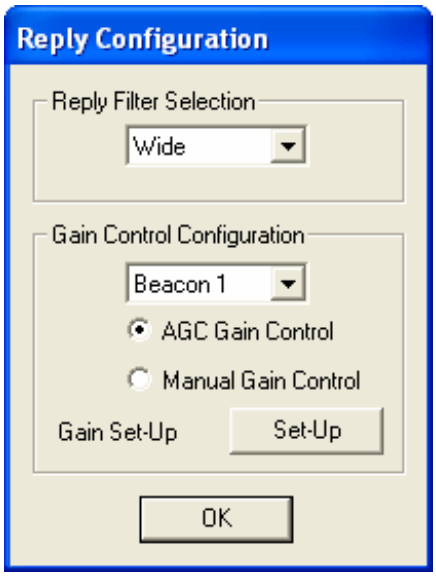
VOS calculation using Medwin's formula

SALINITY (PPT): Water salinity in Parts Per Thousand ***(ppt)***.

TEMPERATURE (C): Water temperature in degrees centigrade.

DEPTH (M): Depth of the transducer below water level in metres.

8.3.2 REPLY MENU…



Beacon Reply configuration Dialogue Window

This dialogue window controls the reception of signals from targets.

8.3.2.1 REPLY FILTER

This filter provides a band-pass filter for received signals. The filter can improve bearing stability but will not affect range. The settings are **NONE, WIDE, MEDIUM,** and **NARROW**.

8.3.2.2 GAIN CONTROL CONFIGURATION

Selects the beacon to set the **GAIN TYPE** and **SET-UP**.

8.3.2.3 GAIN TYPE

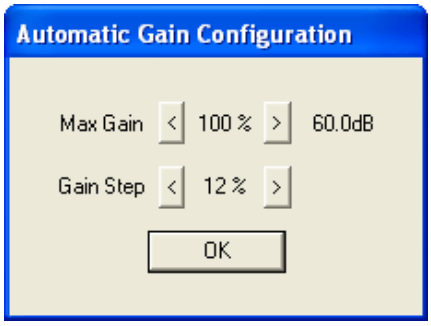
Determines the selected beacon's type of gain control, **GAIN MANUAL** or **AGC**.

8.3.2.4 GAIN SET-UP

The window displayed on selecting this button depends on the **GAIN TYPE** radio button.

AGC:

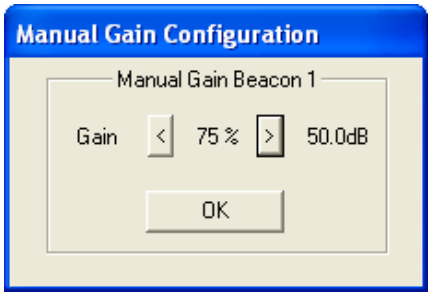
Automatic Gain Control is the recommended gain control system for all types of beacon and is suitable for most applications. AGC automatically adjusts the gain of the Easytrak receiver for optimum signal levels.



Through the **GAIN SET-UP** radio button, the maximum gain can be set, and the maximum gain step sets the maximum change in gain AGC can make in one interrogation cycle. Control is through using the left (down) and right (up) arrow buttons on the window. It is recommended that the default values shown are used.

MANUAL:

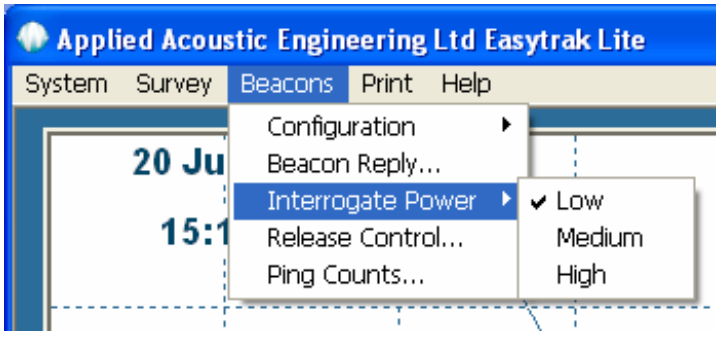
Selecting the **GAIN SET-UP** radio button, the gain can be set between 0 – 100% of full system gain.



The beacon selected is displayed on the dialogue window. The gain control is through using the left (gain down) and right (gain up) arrow buttons on the window.

If too much gain is set, a warning message will appear in the **DISPLAY MESSAGE** area.

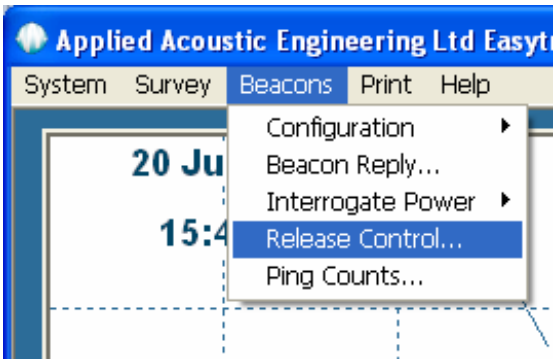
8.3.3 INTERROGATE POWER MENU



Interrogate Set-Up

INTERROGATE POWER. This selects the relative power level of Easytrak transmissions from **LOW**, **MEDIUM**, and **HIGH**.

8.3.4 RELEASE CONTROL MENU…



Release Set-Up Dialogue Window

On selecting ‘Release Control’ the following dialogue window is opened.

Release Commands Dialogue Window

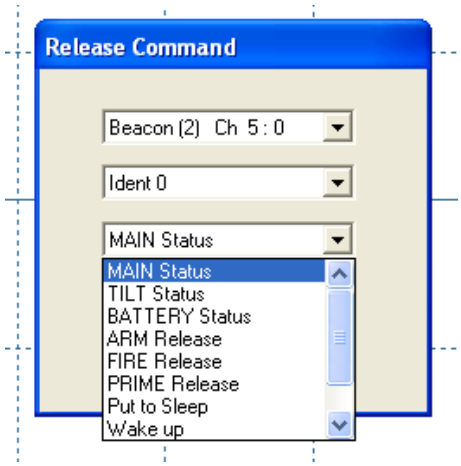
8.3.4.1 BEACON (1 TO 4)

The channel number for the particular beacon is also shown.

8.3.4.2 IDENT (0 TO 15)

AAE release beacons are internally set to a particular **IDENT**ification number.

8.3.4.3 COMMANDS



These are the commands transmitted from Easytrak to the AAE Release. Easytrak will display the response from the Release in a Window beneath the Release Command Window. Should the Release not reply or only a partial message is received, a **Timeout message** is displayed.

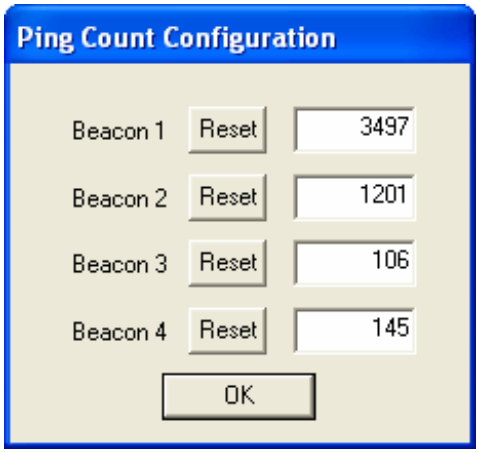
The following commands are available for the AAE release beacon:-

	COMMAND	ACTION	REPLY
0	Main Status	A request for beacon status	Shows if release is armed, if tilt is enabled, if release is faulty, and if release is asleep.
1	Tilt status	A request for tilt status.	Status of tilt sensor 1 and 2.
2	Battery status	A request for battery status	Battery status indication, if the release has jammed, if the motor is faulty, or if the shaft is broken.
3	Arm release	Arms the release	Reply same as '0'
4	Fire release	Fires the release.	Reply same as '0'
5	Prime release	Primes the release.	Reply same as '0'
6	Put to sleep	Puts the release in power saving sleep mode.	Reply same as '0'
7	Wake up	Wakes the release up from power saving mode.	Reply same as '0'
8	Anti-jam	Prevents the jamming of the release.	Reply same as '0'
9	Reset release.	Resets the electrics and mechanics of the release.	Reply same as '0'

For further information, please refer to the manual supplied with the release beacon.

8.3.5 PING COUNTS MENU…

The ping count is the number of attempted interrogations Easytrak has made to particular beacon. With history and similar operational circumstances, the count can be used to give an approximate indication to the battery life of a beacon.



Ping Count Dialogue Window

8.3.5.1 RESET: Selecting the reset button clears the count for that beacon.

8.3.5.2 PING COUNT TEXT BOX: Individual ping count.

8.4 PRINT MENU

Print Menu

This menu selection allows Waypoints, Events, and a Screen dump to be printed on a connected printer. The usual MS Windows printer dialogue window will appear allowing the selection of printer, orientation of the print etc.

8.4.1 PRINT WAYPOINTS…

```
********** Waypoint Printout Start ***********

#01  412733.6mE  5829111.0mN
#02  413660.0mE  5827292.5mN
#03       0.0mX        0.0mY
#04       0.0mX        0.0mY
#05  413587.5mE  5827315.0mN
#06       0.0mX        0.0mY
#07       0.0mX        0.0mY
#08       0.0mX        0.0mY
#09       0.0mX        0.0mY
#10       0.0mX        0.0mY

********** Waypoint Printout Finish **********
```

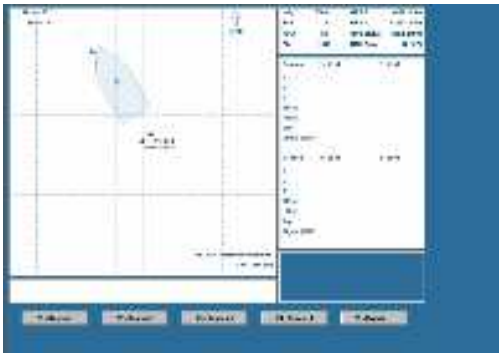
8.4.2 PRINT EVENTS…

The ‘B’ refers to the interrogated beacon; only events with the display checkbox ticked are printed e.g. event 3 was not ticked. Eastings, Northings and depth are in metres.

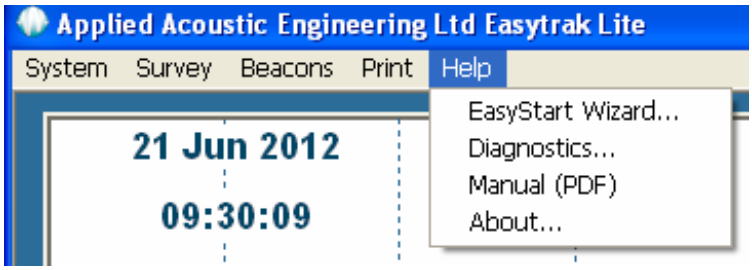
```
********** Events Printout Start ***********

No.-B-DATE-----TIME-----EASTINGS-NORTHINGS-DEPTH--LATITUDE------LONGITUDE-----
001 1 19/07/12 11:51:37 414791.9 5827470.8 0000.5 52-35-26.102N 001-44-31.807E
002 1 19/07/12 11:51:41 414791.9 5827470.8 0000.6 52-35-26.102N 001-44-31.807E
004 3 19/07/12 11:51:44 414792.2 5827471.2 0000.6 52-35-26.114N 001-44-31.819E
005 1 19/07/12 11:51:45 414792.2 5827471.5 0000.4 52-35-26.122N 001-44-31.819E
********** Events Printout Finish **********
```

8.4.3 PRINT SCREEN DUMP…



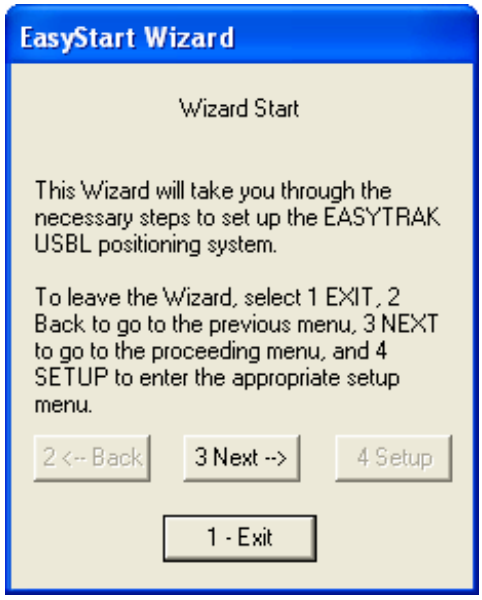
8.5 HELP MENU



Help Menu

8.5.1 EASYSTART WIZARD…

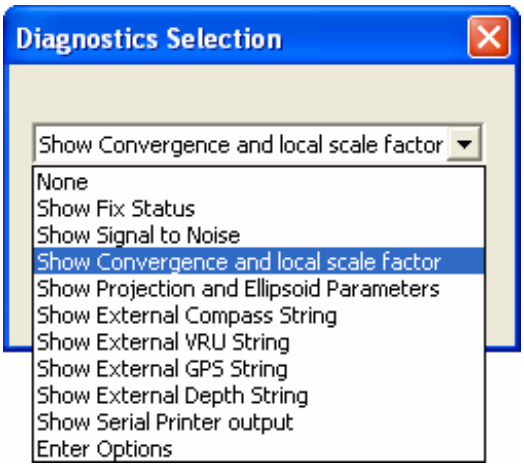
EASYSTART is a Wizard guiding the user through a basic configuration of the system.



Easytrak Wizard Dialogue Window

The **EASYSTART WIZARD** sets up **OFFSETS, VELOCITY OF SOUND, BEACON CONFIGURATION (1 TO 4), AND TRACKING**

8.5.2 DIAGNOSTIC MENU…



Diagnostics selection Dialogue Window

8.5.2.1 SHOW FIX STATUS:-

The fix status of Beacons 1, 2 3, and 4 will be displayed (if interrogating). The information given shows whether there was a timeout, Velocity gating or GPS error.

Note: If there is a GPS error, Timeout will also show an error. However, if the error is an acoustic timeout (beacon not received), only timeout will show an error.

8.5.2.2 SHOW SIGNAL TO NOISE:-

Displays the relative signal level of each receiving element. This can be useful should it be suspected that damage to the transducer may have occurred. A faulty element may show a signal level much lower than other elements with a beacon close by.

8.5.2.3 SHOW CONVERGENCE AND LOCAL SCALE FACTOR:-

Displays Convergence and the Local Scale Factor value for the ship's current position.

8.5.2.4 SHOW PROJECTION AND ELLIPSOID PARAMETERS:-

Displays False Easting (FE), Current False Northing (FN), Central Meridian Scale Factor (CN SF), Latitude Origin, Current Zone, Current Longitude Origin, Semi-major axis, and eccentricity squared (e^2) used for the current ship's current position.

8.5.2.5 Show External Compass String:-

Displays any external compass string.

8.5.2.6 Show External VRU String:-

Displays any external VRU string.

8.5.2.7 Show External GPS String:-

Displays any external GPS string.

External GPS String

8.5.2.8 Show External Depth String:-

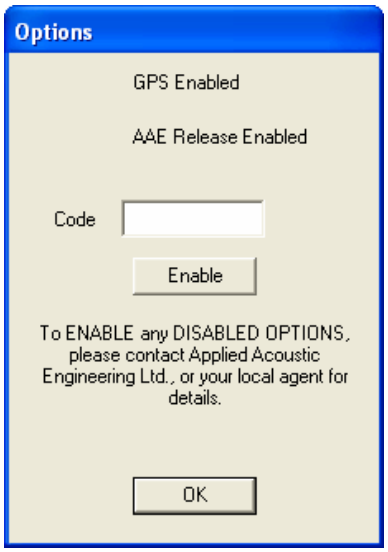
Displays any external Depth string.

8.5.2.9 Show Serial Printer Strings:-

Displays serial printer output strings. Any binary strings are represented by their hexadecimal values.

8.5.2.10 Options Menu:-

This window will show which option is enabled or disabled. To enable a disabled option please contact Applied Acoustic Engineering Ltd., or your local agent for details.



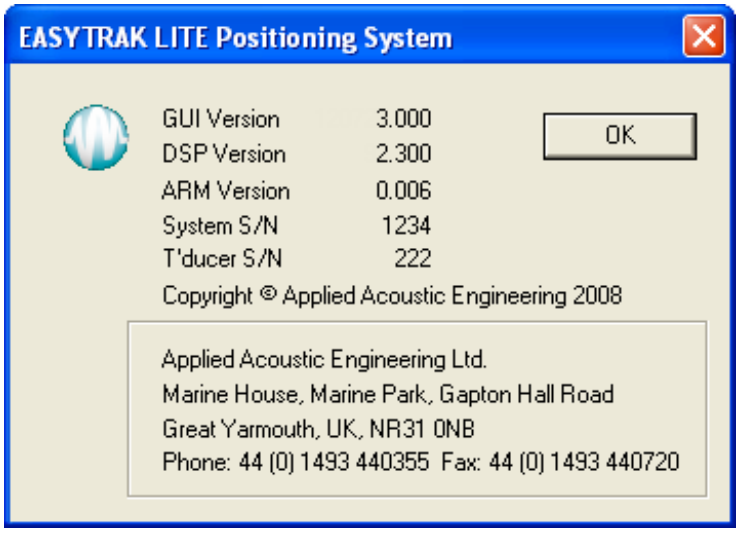
Options Menu Dialogue Window

8.5.3 MANUAL

A copy of the Operator manual is available in PDF format. Note to display the manual, Adobe Reader[10] must be installed on the computer.

8.5.4 ABOUT…

This display gives Company contact details, software versions, and serial numbers.



About Dialogue Window

[10] Adobe Reader can be downloaded from http://www.adobe.com/

9. MAINTENANCE

There are no user replaceable parts within the Easytrak Lite Command Unit. All internal fuses are thermal resettable.

9.1 CLEANING

To clean the case of the Easytrak Command Unit a lightly damped cloth should be used; solvents are not recommended.

Ensure the transducer is clean and uncontaminated prior to installation. Grease can have an adverse affect on the transducer. A lightly damped cloth should be used; solvents are not recommended.

10. PRODUCT RECYCLING / DISPOSAL

Within the EU all electronic components and batteries must be taken for separate collection at the end of their working life under EU WEEE directives. Applied Acoustics as a manufacturer within the EU will responsibly dispose of any returned end of life Applied Acoustics components / batteries through a registered WEEE scheme. In order to prevent uncontrolled waste disposal and promote re-cycling please return any end of life Applied Acoustic components postage paid by sender to our UK head office. Please contact Tech Support for a RMA number prior to shipping.

WEEE Producer Registration No. WEEE/HG1515VU.

11. TROUBLESHOOTING

Fault / Symptoms	Possible Causes	Comments
Unstable positions (General)	Transducer not deep enough in the water.	Ensure the transducer is deep enough in the water. It is recommended the transducer be below the draft of the vessel by at least 1 metre.
Unstable positions (Bearing instability but range fairly stable)	Bearing instability but range fairly stable	This may be due to multipath (reflective) interference close to the transducer or close to the target. It may be due to vessel movement especially if no form of compass/ pitch/ roll compensation is being used. Try lowering the transducer further in the water.
Unstable positions (Bearing instability and range unstable.)	Bearing instability and range unstable.	This may be due to multipath interference away from the transducer e.g. pipelines, underwater structures, and thermoclines. If the sea is flat calm, it is common for the water / air interface to give strong reflections.
Unstable positions (General)	Acoustic noise	This very much depends from where the noise originates. This noise may be audible via the internal speaker or headphones. The noise can be vessel borne such as from the propeller (try running at different revs), sonar systems (try synchronising so that the sonar's transmission does not overlap Easytrak's receive time. It is known in certain parts of the world for marine animals to generate quite loud acoustic signals.
	Electrical noise	This can be from generators, welding kits, radio communications, sonar systems etc. This noise may be audible via the internal speaker or headphones. If possible, switch off the equipment one system at a time until the offending piece of equipment can be identified.
	Channel	Does the channel selected on Easytrak agree with that selected on the beacon?
	Interrogation rate too quick	If the interrogation rate is too quick, beacon lock out may occur (minimum time set within the beacon before it can reply again). It is possible that reflections from previous signals may not have reduced sufficiently, and are picked up rather than the new signal.
	Contaminated Transducer	Ensure the transducer is clean and uncontaminated prior to installation. Grease can have an adverse affect on the transducer. A lightly damped cloth should be used. Solvents are not recommended.
No return	Beacon interrogation power	This may be due to a discharged battery, fouled transducer, or beacon fault. Try using another beacon.
	Channel	Does the channel selected on Easytrak agree with that selected on the beacon?
	Transducer interrogation power	Try increasing Easytrak's interrogate power. Check that the transducer's transducer is not damaged or fouled.

TROUBLESHOOTING CONT/…

Fault / Symptoms	Possible Causes	Comments
	Beacon reply insensitivity	This may be due to a fouled transducer, or beacon fault. Try using another beacon.
	Transducer reply insensitivity	Check that the transducer is not damaged or fouled.
	Electrical noise	See above.
No ranging or lack of range:	Acoustic noise	See overleaf.
	Thermoclines	This is due to abrupt changes of velocity of sound in the water due to variances of water temperature and / or salinity. The effect of this can be to channel the acoustic signal away from either the target or transducer.
	Obstruction	The signal may be blocked by submerged parts of the vessel, seabed objects – manmade and natural. Bubbles of air and gas produced by the vessel's propeller.
Incorrect internal compass reading	Not Calibrated	Calibrate the compass. See appendix 8.
	Magnetic anomaly	Strong magnetic anomalies can be beyond the calibration range of the internal compass. Should this be the case, it is recommended that an external gyrocompass is used. If you are using a metal pole, make sure it is not made of iron or other magnetic material!

APPENDIX 1 – SYSTEM SPECIFICATION

SYSTEM PERFORMANCE

Beacon Types	Transponders, Responders, Releases, and Pingers.
Interrogation Rate	0.5 – 30.0 seconds or external key.
Slant Range Resolution	10.0 cm.
Position Accuracy	Standard 1.4° RMS, 2.5% of slant range. High accuracy 0.6° RMS, 1.0% of slant range. Excluding effects due to incorrect VOS, ray bending, compass, roll, and pitch effects, and acceptable S/N ratio.
Heading Sensor Accuracy	When level 0.8° RMS When tilted 0.8° RMS
Tilt Sensor Accuracy	Accuracy ± 0.2° RMS Range ± 50°

ELECTRICAL

Power supply (Command Unit)

Input: 115 – 230 V~ 47-63 Hz typically 1.0 A.

Transducer

Reply bandwidth 23 to 32 kHz (for accurate tracking).
Reply beam pattern – Hemispherical.

Interrogate power:-

Low:	typically 180 re. 1µPa@1m
Medium:	typically 186 re. 1µPa@1m
High:	typically 188 re. 1µPa@1m

Interrogate bandwidth 17 to 27 kHz.
Interrogate beam pattern – Hemispherical.

Communications

All RS232C inputs must comply with EIA (Electronics Industry Association) RS232C standard.

Responder Output

+12 v pulse, 10 ms long

Sync. Input

TTL type +5 v pulse, triggers on rising edge

MECHANICAL

Dimensions

Enclosure (2660) 240 x 240 x 120 (mm).
Enclosure (2661) rack mount (2U) 482 x 88 x 345 (mm).
Transducer 330 x 100 diameter (mm).
Cable 12.5 mm diameter, yellow polyurethane sheathed, various lengths are available.

Weight

Enclosure 5 Kg approx.
Transducer 9.5 Kg in air, 7.0 Kg in water approx.

Protection

Enclosure is splash proof with IP67 rated connectors.
Transducer housing Material Transducer **AliBronze or AliSilicon**.

Transducer Cable SWL

20.0 kg (Allows transducer to be deployed from cable)

Operating Temperature -5 to 30° C.

Storage Temperature -5 to 45° C.

Miscellaneous

Channels: 4 channels displayed from 119 stored.

Specification is subject to change without notice.

APPENDIX 2 – EASYTRAK CHANNELS AVAILABLE

Applied Acoustic Engineering Channels

Switch [1] [2]	Reply f1 (Hz)	Reply f2 (Hz)	Int f1 (Hz)	Int f2 (Hz)	Depth Telemetry Reply Freq (Hz)	Transponder TAT (ms)	Responder TAT (ms)
[10] [0] Easytrak default CH1	30000	32000	17500	19500	29000	30	30
[10] [1] Easytrak default CH2	28000	30000	18500	20500	27000	30	30
[10] [2] Easytrak default CH3	26000	28000	19500	21500	25000	30	30
[10] [3] Easytrak default CH4	29000	31000	20500	22500	28000	30	30
[10] [4]	27000	29000	21500	23500	26000	30	30
[10] [5]	30000	32000	22500	24500	29000	30	30
[10] [6]	27000	29000	18000	20000	26000	30	30
[10] [7]	28000	30000	18000	21000	27000	60	30
[10] [8]	30000	32000	18000	22000	29000	60	30
[10] [9]	29000	31000	18000	23000	28000	60	30
[11] [0]	30000	32000	20000	18000	29000	60	30
[11] [1]	29000	31000	20000	21000	28000	60	30
[11] [2]	28000	30000	20000	22000	27000	60	30
[11] [3]	27000	29000	21000	18000	26000	60	30
[11] [4]	26000	28000	21000	20000	25000	60	30
[11] [5]	28000	30000	21000	22000	27000	60	30
[11] [6]	30000	32000	21000	23000	29000	60	30
[11] [7]	26000	28000	22000	18000	25000	60	30
[11] [8]	25000	0	17000	0	0	30	30
[11] [9]	25000	0	19000	0	0	30	30

Pinger Channels

Switch [1] [2]	Reply f1 (Hz)	Reply f2 (Hz)	Int f1 (Hz)	Int f2 (Hz)	Depth Telemetry Reply Freq (Hz)	Transponder TAT (ms)	Responder TAT (ms)
[4] [9] 1000ms cycle, 5ms pulse	26000	0	0	0	0	n/a	n/a
[4] [10] 995ms cycle, 5ms pulse	27000	0	0	0	0	n/a	n/a
[4] [11] 990ms cycle, 5ms pulse	28000	0	0	0	0	n/a	n/a
[5] [9] 985ms cycle, 5ms pulse	29000	0	0	0	0	n/a	n/a
[5] [10] 980ms cycle, 5ms pulse	30000	0	0	0	0	n/a	n/a

Switch [1] denotes the left-hand switch and [2] refers to the right-hand switch on an AAE beacon.

All frequencies are in Hz.

Using any frequencies above that are outside Easytrak's standard specification may incur a loss of performance and give spurious positions.

APPENDIX 2 – EASYTRAK CHANNELS AVAILABLE CONT/…

Trackpoint Channels

Switch [1] [2]	Reply f1 (Hz)	Reply f2 (Hz)	Int f1 (Hz)	Int f2 (Hz)	Depth Telemetry Reply Freq (Hz)	Transponder TAT (ms)	Responder TAT (ms)
[0] [10]	24000	0	18000	0	23000	15	15
[0] [11]	24000	0	17000	0	23000	15	15
[1] [0] TP LXT Code 1	23000	0	17000	0	22000	15	15
[1] [0] (Release)	27000	29000	23000	25250	22000	30	n/a
[1] [9]	25000	0	18000	0	24000	15	15
[1] [10]	25000	0	16000	0	24000	15	15
[1] [11]	26000	0	21500	0	25000	15	15
[2] [0] TP LXT Code 2	25000	0	19000	0	24000	15	15
[2] [0] (Release)	28000	30000	22000	24750	24000	30	n/a
[2] [9]	26000	0	18000	0	25000	15	15
[2] [10]	28500	0	17500	0	27500	15	15
[2] [11]	26500	0	18500	0	25500	15	15
[3] [0] TP LXT Code 3	27000	0	17000	0	26000	15	15
[3] [0] (Release)	27000	29000	21000	24000	26000	30	n/a
[4] [0] TP LXT Code 4	29000	0	19000	0	28000	15	15
[4] [0] (Release)	29000	31000	22000	25250	28000	30	n/a
[5] [0] TP LXT Code 5	30000	0	17000	0	29000	15	15
[5] [0] (Release)	30000	28000	21000	23000	29000	30	n/a
[6] [0]	28000	0	18000	0	27000	15	15
[6] [0] (Release)	28000	30000	22000	24250	27000	30	n/a
[6] [9]	23000	0	16000	0	22000	15	15
[6] [9] (Release)	27500	29500	20500	23750	22000	30	n/a
[6] [10]	23000	0	18000	0	22000	15	15
[6] [10] (Release)	28500	30000	21500	24750	22000	30	n/a
[6] [11]	23000	0	20500	0	22000	15	15
[6] [11] (Release)	29500	31500	22500	24750	22000	30	n/a
[7] [0]	30000	0	18000	0	29000	15	15
[7] [9]	24000	0	17000	0	23000	15	15
[7] [10]	24000	0	19000	0	23000	15	15
[7] [11]	25000	0	17000	0	24000	15	15
[8] [0]	29000	0	21000	0	28000	15	15
[8] [9]	26000	0	17000	0	25000	15	15
[8] [11]	31000	0	18000	0	30000	15	15

TPII refers to ORE Trackpoint II / II+.

Release = Release Beacon. Note with TPll, interrogate and reply frequencies are different depending on whether the beacon type is transponder or release.

APPENDIX 2 – EASYTRAK CHANNELS AVAILABLE CONT/…

Simrad HPR (Simrad 300 and 400 series – not HiPAP) Channels

Switch [1] [2]	Reply f1 (Hz)	Reply f2 (Hz)	Int f1 (Hz)	Int f2 (Hz)	Depth Telemetry Reply Freq (Hz)	Transponder TAT (ms)	Responder TAT (ms)
[0] [1]	29762	31762	20492	18492	32468	30	30
[0] [2]	30488	32488	21552	19552	29762	30	30
[0] [3]	31250	33250	22124	20124	30488	30	30
[0] [4]	31847	29847	22727	20727	31250	30	30
[0] [5]	32468	30468	23364	21364	31847	30	30
[0] [6]	27173	29173	24038	22038	29070	30	30
[0] [7]	27777	29777	24510	22510	27173	30	30
[0] [8]	28409	30409	25000	23000	27777	30	30
[0] [9]	29070	31070	26042	24042	28409	30	30
[1] [1] Sonadyne's 11 'Square'	27173	29173	21552	23552	32468	30	30
[2] [2] Sonadyne's 22 'Circle'	28409	30409	22727	24727	27173	30	30
[3] [3] Sonadyne's 33 'Delta'	29762	31762	23923	21923	28409	30	30
[4] [4] Sonadyne's 44 'X'	31250	29250	25126	23126	29762	30	30
[5] [5] Sonadyne's 55 'Y'	32468	30468	26455	24455	31250	30	30

Simrad HIPAP Channels

Switch [1] [2]	Reply f1 (Hz)	Reply f2 (Hz)	Int f1 (Hz)	Int f2 (Hz)	Depth Telemetry Reply Freq (Hz)	Transponder TAT (ms)	Responder TAT (ms)
[1] [2]	29250	31250	21000	21500	29750	60	30
[1] [3]	29750	31750	21000	22000	30250	60	30
[1] [4]	30250	32250	21000	22500	28750	60	30
[1] [5]	30750	32750	21000	23000	27250	60	30
[1] [6]	27250	29250	21000	23500	27750	60	30
[1] [7]	27750	29750	21000	24000	28250	60	30
[1] [8]	28250	30250	21000	24500	30750	60	30
[2] [1]	28500	30500	21500	21000	29000	60	30
[2] [3]	29500	31500	21500	22000	30000	60	30
[2] [4]	30000	32000	21500	22500	28500	60	30
[2] [5]	30500	32500	21500	23000	27000	60	30
[2] [6]	27000	29000	21500	23500	27500	60	30
[2] [7]	27500	29500	21500	24000	28000	60	30
[2] [8]	28000	30000	21500	24500	30500	60	30
[3] [1]	28750	30750	22000	21000	29250	60	30
[3] [2]	29250	31250	22000	21500	29750	60	30
[3] [4]	30250	32250	22000	22500	28750	60	30
[3] [5]	30750	32750	22000	23000	27250	60	30
[3] [6]	27250	29250	22000	23500	27750	60	30
[3] [7]	27750	29750	22000	24000	28250	60	30
[3] [8]	28250	30250	22000	24500	30750	60	30
[4] [1]	28500	30500	22500	21000	29000	60	30

APPENDIX 2 – EASYTRAK CHANNELS AVAILABLE CONT/…

Simrad HIPAP Channels

Switch [1] [2]	Reply f1 (Hz)	Reply f2 (Hz)	Int f1 (Hz)	Int f2 (Hz)	Depth Telemetry Reply Freq (Hz)	Transponder TAT (ms)	Responder TAT (ms)
[4] [2]	29000	31000	22500	21500	29500	60	30
[4] [3]	29500	31500	22500	22000	30000	60	30
[4] [5]	30500	32500	22500	23000	27000	60	30
[4] [6]	27000	29000	22500	23500	27500	60	30
[4] [7]	27500	29500	22500	24000	28000	60	30
[4] [8]	28000	30000	22500	24500	30500	60	30
[5] [1]	28750	30750	23000	21000	29250	60	30
[5] [2]	29250	31250	23000	21500	29750	60	30
[5] [3]	29750	31750	23000	22000	30250	60	30
[5] [4]	30250	32250	23000	22500	28750	60	30
[5] [6]	27250	29250	23000	23500	27750	60	30
[5] [7]	27750	29750	23000	24000	28250	60	30
[5] [8]	28250	30250	23000	24500	30750	60	30
[6] [1]	28500	30500	23500	21000	29000	60	30
[6] [2]	29000	31000	23500	21500	29500	60	30
[6] [3]	29500	31500	23500	22000	30000	60	30
[6] [4]	30000	32000	23500	22500	28500	60	30
[6] [5]	30500	32500	23500	23000	27000	60	30
[6] [7]	27500	29500	23500	24000	28000	60	30
[6] [8]	28000	30000	23500	24500	30500	60	30
[7] [1]	28750	30750	24000	21000	29250	60	30
[7] [2]	29250	31250	24000	21500	29750	60	30
[7] [3]	29750	31750	24000	22000	30250	60	30
[7] [4]	30250	32250	24000	22500	28750	60	30
[7] [5]	30750	32750	24000	23000	27250	60	30
[7] [6]	27250	29250	24000	23500	27750	60	30
[7] [8]	28250	30250	24000	24500	30750	60	30
[8] [1]	28500	30500	24500	21000	29000	60	30
[8] [2]	29000	31000	24500	21500	29500	60	30
[8] [3]	29500	31500	24500	22000	30000	60	30
[8] [4]	30000	32000	24500	22500	28500	60	30
[8] [5]	30500	32500	24500	23000	27000	60	30
[8] [6]	27000	29000	24500	23500	27500	60	30
[8] [7]	27500	29500	24500	24000	28000	60	30

APPENDIX 3 – DATA OUTPUT STRINGS

APPLIED ACOUSTIC ENGINEERING (AAE) DATA STRING

The AAE string has 76 characters including carriage return and line feed when not in GPS mode.

i,t,hhmmss,xxxxx.x,yyyyy.y,zzzzz.z,rrrr.r,bbb.b,dd.d,ccc.c,RRR.R,ppp.p,SSSCL

Description	String code
Beacon identification (1 to 4)	i
Data type: Ship ref (0), North ref (1), Gated (2), Smoothed (3)	t
Hour	h
Minute	m
Second	s
X (or Eastings)	x
Y (or Northings)	y
Z (Depth)	z
Slant range	r
Bearing to target	b
Depression angle	d
Compass	c
Roll	R
Pitch	p
Status (see overleaf)	S
Carriage return (CR)	C
Line Feed (LF)	L

All ranges and positions are in metres and angles are in degrees.

Note fields are comma separated. Leading 0's (except time) and empty fields are space filled. When in GPS mode, the X, Y and Z fields automatically expand to take the full GPS data value.

Example strings

"Normal" string

1,0,115906,111.1,*-222.2,**333.3,*415.7,153.4,53.3,123.5,**0.4,*-0.6,000CL**

"GPS" string

1,0,115906,111.1,500000.0,6500000.0,*415.7,153.4,53.3,123.5,**0.4,*-0.6,000CL**

Note * = space.

Status / warning codes

Any code is constructed by adding the following.

Interrogation has timed out	001
Outside range gate	002
Outside bearing gate	004
Outside depression angle gate	008
Outside horizontal distance gate	016
Outside velocity gate	032
GPS error	064
Reply signal overload	256

For example, if the status code is 048, two events have occurred, 016 (outside horizontal distance gate) + 032 (outside velocity gate) = 048.

A status code of '000' means clear of any warnings.

TRACKPOINT 2EC DATA STRING

The simplified **TRACKPOINT 2EC** string has 68 characters including carriage return and line feed.

i*hh:mm:ss*ccc*bbb.b*rrrrr.r*xxxxxx.x*yyyyyy.y*zzzzz.z*-ttttt.t*EECL

Description	String code
Beacon identification	i
Hour	h
Minute	m
Second	s
Compass	c
Bearing	b
Slant range	r
X (or Eastings)	x
Y (or Northings)	y
Z	z
Telemetry	t (always 0.0)
Error	E
Carriage return (CR)	C
Line Feed (LF)	L

Note * = space.

Note fields are space separated. Leading 0's (except time) are space filled. When in GPS mode, the X, Y and Z fields automatically expand to take the full GPS data value.

Example:-

2*23:59:59*359*359.91234.5*-10000.0*-10000.0*10000.0******0.0*00CL**

Note * = space.

Error codes

No error	Hex <20><00>
Lost signal	06

SIMRAD HPR 300P STRING

The **SIMRAD HPR 300P** string has 48 characters including carriage return and line feed.

ii*HB**SSS**ccc.c*xxxx.x*yyyy.y*zzzz.z**QQ.QCL**

Description	String code (above)
Beacon identification	i (Beacon number rather than channel number)
Transducer number	H (Always 1)
Beam	B (Always 'W')
Status	S
Compass	c (Note compass heading rather than course)
X (or Eastings)	x
Y (or Northings)	y
Z	z
Quality	Q (Always 0.0)
Carriage return (CR)	C
Line Feed (LF)	L

Note * = space.

Note fields are space separated. Leading 0's are space filled. When in GPS mode, the X, Y and Z fields automatically expand to take the full GPS data value. For figures larger than 999.9 the decimal point is removed i.e. 1001 metres.

Example:-

21**W***OK**359.9*-999.9**999.9**-1000***0.0CL**

Note * = space.

Error codes

No error	' OK'
No reply	'NRY'

TRACKPOINT STD-EC W/PR DATA STRING

The **simplified STD-EC W/PR** string has **80** characters including carriage return and line feed.

i*hh:mm:ss*ccc*bbb.b*rrrrr.r*xxxxxx.x*yyyyyy.y*zzzzz.z*-ttttt.t*EE*RRR.R*PPP.PCL

Description	String code
Beacon identification	i
Hour	h
Minute	m
Second	s
Compass	c
Bearing	b
Slant range	r
X (or Eastings)	x
Y (or Northings)	y
Z	z
Telemetry	t (always 0.0)
Error	E
Roll	R
Pitch	P
Carriage return (CR)	C
Line Feed (LF)	L

Note * = space.

Note fields are space separated. Leading 0's (except time) are space filled. When in GPS mode, the X, Y and Z fields automatically expand to take the full GPS data value.

Example:-

2*23:59:59*359*359.91234.5*-10000.0*-10000.0*10000.0******0.0*00**1.2* 2.1CL**

If the signal is lost, the following string is outputted.

2*23:59:59*359*-.-*****-.-******-.-******-.-*****-.-******-.-06***-.-***-.-CL**

Note * = space.

Error codes

No error	Hex <20><00>
Lost signal	06

SIMRAD HPR 309 DATA TELEGRAM

The **simplified HPR 309** telegram has 32 bytes including the '@' terminator.

Field Name	Size (bytes)	Byte Offset	Comment
Header	1	0	Currently set to 1
Roll	2	1	Used
Pitch	2	3	Used
Heading	2	5	Used
Transponder index	1	7	Beacon No. (1-4)
X Position	3	8	Used
Y Position	3	11	Used
Depth	3	14	Used
Position Status	1	17	Good = 0, bad = 1
Time out	1	18	Not used (0)
Transponder sequence	3	19	Not used (0)
Tracking TD angle	2	22	Not used (0)
Test	1	24	Not used (0)
Transponder type	1	25	Not used (0)
Transponder specification	1	26	Set to 1 (mobile transponder)
Transducers	1	27	Not used (0)
Transducer status	1	28	Not used (0)
Kalman filter window	1	29	Not used (0)
Checksum	1	30	Used
End of telegram	1	31	Hex 0x40 ('@')

Note the X, Y and depth values in the Simrad 309 telegram will be dependent on the data mode selected.

SIMRAD HPR 309 DATA TELEGRAM / CONT...

Header	Currently set to 1
Roll	Roll is a 12 bit, 2's complement scaled integer. Positive direction is when port side is up. Resolution is 360.0/4096 degrees. Minimum value = 800H (-2048) = -180.0°. 0 = 0°, and 7ffH = 2047 = (180° - resolution) °. The first byte in this field contains the 6 most significant bits and the next byte the six least significant bits.
Pitch	Pitch is a 12 bit, 2's complement scaled integer. Positive direction is when bow is up. Resolution is 360.0/4096 degrees. Minimum value = 800H (-2048) = -180.0°. 0 = 0°, and 7ffH = 2047 = (180° - resolution) °. The first byte in this field contains the 6 most significant bits and the next byte the six least significant bits.
Heading	Roll is a 12 bit, 2's complement scaled integer. Positive direction is clockwise. Resolution is 360.0/4096 degrees. Minimum value = 800H (-2048) = -180.0°. 0 = 0°, and 7ffH = 2047 = (180° - resolution) °. The first byte in this field contains the 6 most significant bits and the next byte the six least significant bits.
Transponder index	1 for beacon 1, 2 for beacon 2, 3 for beacon 3, and 4 for beacon 4.
X, Y and Depth position	The X, Y and Depth positions are with respect to the ship's datum point. X is positive when Starboard of the datum, Y is positive when Forward of the datum, Depth is positive when down from the datum. X, Y and Depth are 16 bit, 2's complement scaled integers. (Note the integer is sign extended to 18 bits) Resolution is 8192.0/65536 metres. Minimum value = 8000H (-4096) = -4096.0. 0 = 0 metres, and 7fffH = (4096.0 - resolution) metres. The first byte in this field contains the 6 most significant bits, the next byte the six 'middle' significant bits, and the last byte the six least significant bits.
Position status	Good fix bit 0 = 0 and bad fix bit 0 = 1
Time out	Not used, bit 0 = 0.
Transponder sequence	Not used, bit 0 = 0.
Tracking TD angle	Not used, bit 0 = 0.

SIMRAD HPR 309 DATA TELEGRAM / CONT...

Test	Not used, bit 0 = 0.
Transponder type	Not used, bit 0 = 0.
Transponder specification	Mobile transponder, bit 0 = 1.
Transducers	Not used, bit 0 = 0.
Transducer status	Not used, bit 0 = 0.
Kalman Filter window	Not used, bit 0 = 0.
Checksum	The checksum results in the exclusive 'OR'ing of all bytes of the telegram up to but not including the checksum byte.
End of telegram	The end byte of the telegram is always HEX 0x40, the character '@'.

SIMRAD $PSIMSSB DATA STRING

The simplified **SIMRAD $PSIMSSB** string is of variable length and is terminated by a carriage return and line feed.

Field	Name	Comment
$PSIMSSB	Start character and address	
,hhmmss.ss	Time	Real time of measurement
,cc	Beacon code	E.g. D50, D66
,A	Status	'A' = OK, 'V' not OK
,cc	Error code	Left empty
,a	Coordinate system	Set to 'C' for Cartesian or 'U' for UTM coordinates.
,a	Orientation	Set to 'H' for heading up, or 'N' for North referenced.
,a	SW Filter	Set to M for measured
,x.x	X coordinate	X depends on data format set.
,x.x	Y coordinate	Y depends on data format set.
,x.x	Depth	Depth depends on data format set.
,x.x	Expected accuracy	Always 0.0
,a	Additional information	Set to 'N'
,x.x	1st Additional value	Left empty
,x.x	2nd Additional value	Left empty
*HH	Checksum	Checksum
CL	Terminators	Carriage return / line feed

Example string

$PSIMSSB,161618.00,B50,A,,C,H,M,10.0,20.0,30.3,0.0,N,,*5FCL

Note, providing GPS is available, and the GPS string selected is $GPRMC, the data output string $PSIMSSB uses GPS UTC time and date. If GPS is not available, or $GPRMC is not selected, Easytrak's internal date and time is used.

SIMRAD $PSIMSNS DATA STRING

The simplified **SIMRAD $PSIMSNS** string is of variable length and is terminated by a carriage return and line feed.

Field	Name	Comment
$PSIMSNS	Start character and address	
,hhmmss.ss	Time	Real time of measurement
,cc	Beacon code	E.g. D50, D66
,xx	Transceiver number	Always 1
,xx	Transducer number	Always 1
,x.x	Roll	Roll in degrees
,x.x	Pitch	Pitch in degrees
,x.x	Heave	Always 0.0
,x.x	Heading	Between 0° and 360°
,x	Tag	Left empty
,x	Parameters	Bits (0,1) = 1 (SSBL) Bit (4) = 1 (Mobile) Bit (5) =1 (UTM Time) Other bits = 0
,x.x	Time age	Always 0.0
,x	Spare	Empty field
,axx	Master Slave	Always M121
*HH	Checksum	Checksum
CL	Terminators	Carriage return / line feed

Example string

$PSIMSNS,161618.00,B50,1,1,0.0,0.0,0.0,86.2,,1,0.00,,M121*69CL

Note, providing GPS is available, and the GPS string selected is $GPRMC, the data output string $PSIMSNS uses GPS UTC time and date. If GPS is not available, or $GPRMC is not selected, Easytrak's internal date and time is used.

PSEUDO $GPRMC DATA STRING

RMC - Recommended Minimum Navigation Information.

The **PSEUDO $GPRMC** string is terminated by a carriage return and line feed.

$GPRMC,hhmmss.sss,A,llll.llll,N,yyyyy.yy,E,k.k,c.c,DDMMYY,v.v,V*HHCL

Description	String code
Header	$GPRMC
Hour	h
Minute	m
Second	s
Status	A = OK, V = Warning
Latitude ddmm.mmmm	l
North or South (N/S)	N
Longitude dddmm.mmmm	y
East or West (E/W)	E
Speed over ground, knots	k
Course over ground, degrees true	c
Day	D
Month	M
Year	Y
Magnetic Variation, degrees	v
Magnetic Variation, east / west (E/W)	V
Check Sum	H
Carriage return (CR)	C
Line feed	L

Example String

$GPRMC,092204.999,A,5250.5589,S,00142.5084,E,0.00,89.68,210206,0.0,E*44

Note, providing GPS is available, and the GPS string selected is $GPRMC, the data output string $GPRMC uses GPS UTC time and date. If GPS is not available, or GPS $GPRMC is not selected, Easytrak's internal date and time is used.

SONAR (KLEIN 3000 SSS) DATA STRINGS

An output is provided for the **KLEIN 3000 SIDE SCAN SONAR**. This selection outputs three NMEA[11] strings one after the other - $GPGGA, $GPVTG, and $GPTLL.

The strings $GPGGA and $GPVTG provide the position and course over ground of the vessel, whereas string $GPTLL provides the position of the towfish.

Vessel Position

$GPGGA,hhmmss.ss,ddmm.mmm,N,dddmm.mmm,E,q,xx,p.p,a.b,M,c.d,M,x.x,nnnn*HHCL

Description	String code
Header	$GPGGA
UTC of position	hhmmss.ss
Latitude	ddmm.mmm
North or South (N/S)	N
Longitude	dddmm.mmm
East or West (E/W)	E
GPS Quality indicator (Varies with which D/GPS receiver is used)	q
Number of satellites in use	xx
Horizontal dilution of precision	p.p
Antenna altitude above mean-sea-level	a.b
Units of antenna altitude, metres	M
Geoidal height	c.d
Units of geoidal height, metres	M
Age of Differential GPS data (seconds since last valid RTCM transmission)	x.x
Differential reference station ID, 0000 to 1023	nnnn
Check Sum	H
Carriage return (CR)	C
Line feed	L

Note some of the fields may be left blank; this will vary depending upon the D/GPS receiver used.

[11] NMEA The National Marine Electronics Association

SONAR (KLEIN 3000 SSS) DATA STRINGS / CONT…

Vessel track made good and ground speed

$GPVTG,ttt.t,T,mmm.m,M,nnn.n,N,kkk.k,K*HHCL

Description	String code
Header	$GPVTG
True track made good (Degrees)	t
True	T
Magnetic track made good (Degrees)	m
Magnetic	M
Ground speed (Knots)	n
Knots	N
Ground speed (Km/h)	k
Knots	K
Check Sum	H
Carriage return (CR)	C
Line feed	L

Note some of the fields may be left blank; this will vary depending on the GPS receiver used.

Target position

$GPTLL,nn,mss.sss,A,llll.llll,N,yyyyy.yy,E,Easytrak,hhmmss.ss,T,*HHCL

Description	String code
Header	$GPRMC
target number (1 - 4)	nn
Latitude ddmm.mmmm	l
North or South (N/S)	N
Longitude dddmm.mmmm	y
East or West (E/W)	E
System ID string	Easytrak
Hour	h
Minute	m
Second	s
Status (T=tracking, L= Lost)	T
Check Sum	H
Carriage return (CR)	C
Line feed	L

APPENDIX 4 – FACTORY SET CONFIGURATION

This appendix contains the configuration if the **FACTORY** file is loaded from the **SYSTEM CONFIGURATION FILE** menu.

SYSTEM MENU

DISPLAY…

Display mode	Grid
Brightness	Bright
Display centre	Ship
Display X Offset	0m
Display Y Offset	0m
Grid scale	Auto
Target trail	On
Trail points	32

COMMUNICATION…

Base Unit	COM Port 1	COM15
Data output (printer)	COM Port 2	COM16
	Baud rate	9600 baud
	Data bits	8 bits
	Stop bits	1 bit
	Parity	none
	Format	AAE
	Output (on/off)	Off
GPS / DGPS	COM Port 3	COM17
	Baud rate	4800 baud
	Data bits	8 bits
	Stop bits	1 bit
	Parity	none
	Format	$GPGGA
	Input (on/off)	Off
External Gyro Compass	Baud rate	4800 baud
	Data bits	8 bits
	Stop bits	1 bit
	Parity	none
	Format	$HCHDM

APPENDIX 4 – FACTORY SET CONFIGURATION /CONT…

COMMUNICATION… /CONT…

External VRU	Baud rate	4800 baud
	Data bits	8 bits
	Stop bits	1 bit
	Parity	none
	Format	$HCXDR
External Depth	COM Port 4	COM18
	Baud rate	4800 baud
	Data bits	8 bits
	Stop bits	1 bit
	Parity	none
	Format	$--DBS

DATA SOURCE

North Referenced

AUDIO

Audio source	Channel 1
Audio volume	0 (off)

SURVEY MENU

TRACKING…

Trigger source	Internal
Trigger rate	2000 ms
Fix numbering (on/off)	On
Fix number	0
Fix number increment	On
Fix output to Nav	Off

UTM ZONES

Auto

OTHER DEFAULT PROJECTION AND ELLIPSOID INFORMATION

False Easting	500000m
False Northing	0m (Depends on subsequent GPS input)
Central Meridian Scale Factor	0.999600
Latitude Origin	0°
Longitude Origin	3° (Depends on subsequent GPS input)
Semi-major axis	6378137.0m
Eccentricity^2	0.006694379990

APPENDIX 4 – FACTORY SET CONFIGURATION /CONT…

COMPASS

Compass type	Internal
Vertical Reference Unit (VRU)	Internal

VELOCITY…

1500.0m/s (Phase velocity of sound)

OFFSETS…

X offset	0.0m
Y offset	0.0m
Z offset	0.0m
Roll offset	0.0°
Pitch offset	0.0°
Heading offset	0.0°
Magnetic Declination	0.0°
Transducer depth	0.0m

GATING…

Horizontal Distance (dist)	20.0m
Horizontal Distance (on/off)	Off
Slant Range (dist)	20.0m
Slant Range (on /off)	Off
Velocity (velocity)	10.0m/s
Velocity (on /off)	On
Heading (Bearing)	20.0°
Heading (on /off)	Off
Depression Angle (Bearing)	10.0°
Depression Angle (on /off)	Off
Auto gating (on/off)	On
Smoothing	Low

WAYPOINTS…

Eastings (all)	0.0m
Northings (all)	0.0m
Display? (all)	Off

DRIFT ALARM…

Alarm On?	Off
Audio Warning On?	On
From	Ship
To	Beacon 1
Max. Distance	100.0m

APPENDIX 4 – FACTORY SET CONFIGURATION /CONT…

BEACONS MENU

CONFIGURATION…

Beacon 1

Beacon type	Transponder
Channel number	10/0
Depth source	Acoustic
Velocity of sound (Range)	1500.0 m/s
Manual depth	0.0 m
Reply f1	30.0 kHz
Reply f2	32.0 kHz
Interrogate f1	17.5 kHz
Interrogate f2	19.5 kHz
Turn Around Time (TAT)	30.0 ms
Pulse Width	2.0 ms
Depth Telemetry Reply Frequency	29.0 kHz
Depth Telemetry Depth	1000.0 m
Depth Telemetry span	900
Depth Telemetry offset	100

Beacon 2

Beacon type	Transponder
Channel number	10/1
Depth source	Acoustic
Velocity of sound (Range)	1500.0 m/s
Manual depth	0.0 m
Reply f1	28.0 kHz
Reply f2	30.0 kHz
Interrogate f1	18.5 kHz
Interrogate f2	20.5 kHz
Turn Around Time (TAT)	30.0 ms
Pulse Width	2.0 ms
Depth Telemetry Reply Frequency	27.0 kHz
Depth Telemetry Depth	1000.0 m
Depth Telemetry span	900
Depth Telemetry offset	100

APPENDIX 4 – FACTORY SET CONFIGURATION /CONT…

BEACONS MENU… CONFIGURATION…/CONT…

Beacon 3

Beacon type	Transponder
Channel number	10/2
Depth source	Acoustic
Velocity of sound (Range)	1500.0 m/s
Manual depth	0.0 m
Reply f1	26.0 kHz
Reply f2	28.0 kHz
Interrogate f1	19.5 kHz
Interrogate f2	21.5 kHz
Turn Around Time (TAT)	30.0 ms
Pulse Width	2.0 ms
Depth Telemetry Reply Frequency	25.0 kHz
Depth Telemetry Depth	1000.0 m
Depth Telemetry span	900
Depth Telemetry offset	100

Beacon 4

Beacon type	Transponder
Channel number	10/3
Depth source	Acoustic
Velocity of sound (Range)	1500.0 m/s
Manual depth	0.0 m
Reply f1	29.0 kHz
Reply f2	31.0 kHz
Interrogate f1	20.5 kHz
Interrogate f2	22.5 kHz
Turn Around Time (TAT)	30.0 ms
Pulse Width	2.0 ms
Depth Telemetry Reply Frequency	28.0 kHz
Depth Telemetry Depth	1000.0 m
Depth Telemetry span	900
Depth Telemetry offset	100

APPENDIX 4 – FACTORY SET CONFIGURATION /CONT…

BEACONS MENU… CONFIGURATION…/CONT…

BEACON REPLY…

Reply Filter	None	
Gain Control Configuration		
Beacon 1	Type	AGC
	Max Gain	100%
	Gain Step	12%
	Manual	0dB
Beacon 2	Type	AGC
	Max Gain	100%
	Gain Step	12%
	Manual	0dB
Beacon 3	Type	AGC
	Max Gain	100%
	Gain Step	12%
	Manual	0dB
Beacon 4	Type	AGC
	Max Gain	100%
	Gain Step	12%
	Manual	0dB

INTERROGATE POWER

Low

RELEASE CONTROL…

Beacon selected	1
Ident	0
Command	MAIN Status

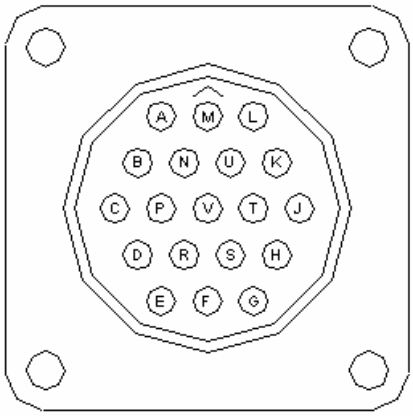
PING COUNT…

Beacon 1	0
Beacon 2	0
Beacon 3	0
Beacon 4	0

APPENDIX 5 – CONNECTOR PIN OUTS

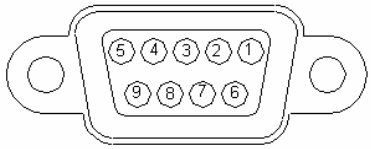
TRANSDUCER CONNECTOR

U	Ref channel+
N	PS channel+
M	PS channel-
A	Ref2 channel+
E	Transmitter +
R	Transmitter Ground
D	Transmitter Screen
H	RS232 Rx
S	RS232 Tx
L	Ref channel-
B	Ref2 channel-
P	Power +Ve
V	Power -Ve
G	RS232 Ground
K	FA Channel+
J	FA Channel+
C	Power Ground



SERIAL CONNECTORS

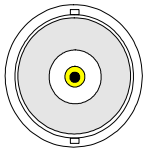
2	Receive Data (Rx)
3	Transmit Data (Tx)
5	Ground



BNC CONNECTORS

Inner	Signal +
Outer	Signal –

Note, BNC connectors are isolated.



HEADPHONES CONNECTOR

Inner	Signal
Outer	Ground

No Diagram

APPENDIX 6 – TRANSDUCER CABLE

CABLE:

Outer jacket: Polyurethane

Diameter: 13.0mm (+/- 0.4mm)

Weight (air): 23.7 kg per 100m

Weight (water): 10.4 kg per 100m

TRANSDUCER END CONNECTOR:

Type – Souriau Jupiter 'M' Series **Part number** FED F 20M T 21.14.SA.

EASYTRAK END CONNECTOR

Type – AB Heavy Duty Sealed Bayonet coupling. **Part number** (Free plug) AB06T 20A48P SN, (Cable clamp) SB 20A48 CCA.

Transducer End	Description	Easytrak End
1	Ref channel+	U
2	PS channel+	N
3	PS channel-	M
4	Ref2 channel+	A
5	Ref2 channel Screen	N/C
6	Transmitter +Ve	E
7	Transmitter Ground	R
8	Transmitter Screen	D
9	RS232 Rx	H
10	RS232 Tx	S
11	FA Channel Screen	N/C
12	Ref channel-	L
13	Ref channel Screen	N/C
14	PS Channel Screen	N/C
15	Ref2 channel-	B
16	Power +Ve	P
17	Power –Ve	V
18	RS232 Ground	G
19	FA Channel+	K
20	FA Channel+	J
21	Power Ground	C

APPENDIX 7 – MEDWIN'S FORMULA

Easytrak allows the option of either entering the velocity of sound through water manually or by using an inbuilt calculator.

Easytrak uses Medwin's formula for calculating the velocity of sound in water.

$$V = 1449.2 + 4.6 \times T - 0.055 \times T^2 + 0.00029 \times T^3 + (1.34 - 0.01 \times T) \times (S - 35.0) + 0.0158 \times D$$

Where: **V** = velocity of sound through water (m/s)

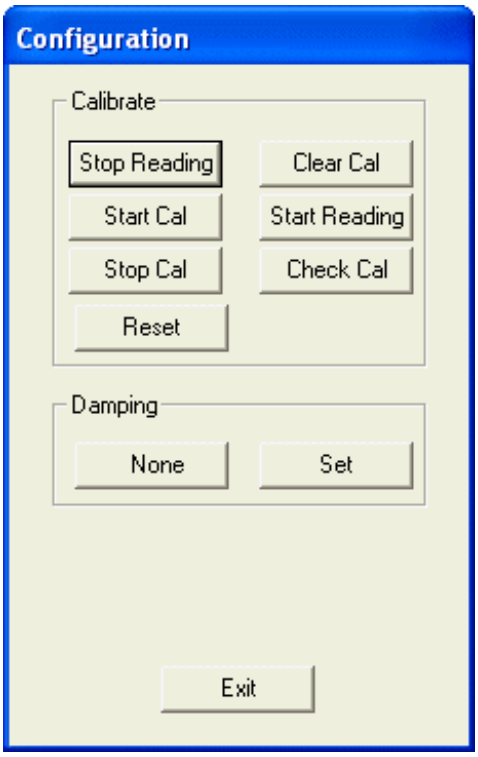
T = Temperature of the water (°C)

S = Salinity in parts per thousand (ppt)

D = depth of the water (m)

APPENDIX 8 – EASYTRAK COMPASS AND PITCH & ROLL CALIBRATION

Nearby Iron such as a ship's hull can distort the local magnetic environment resulting in a need for the Easytrak transducer internal compass to require re-calibration. The compass can be calibrated by performing the following steps.



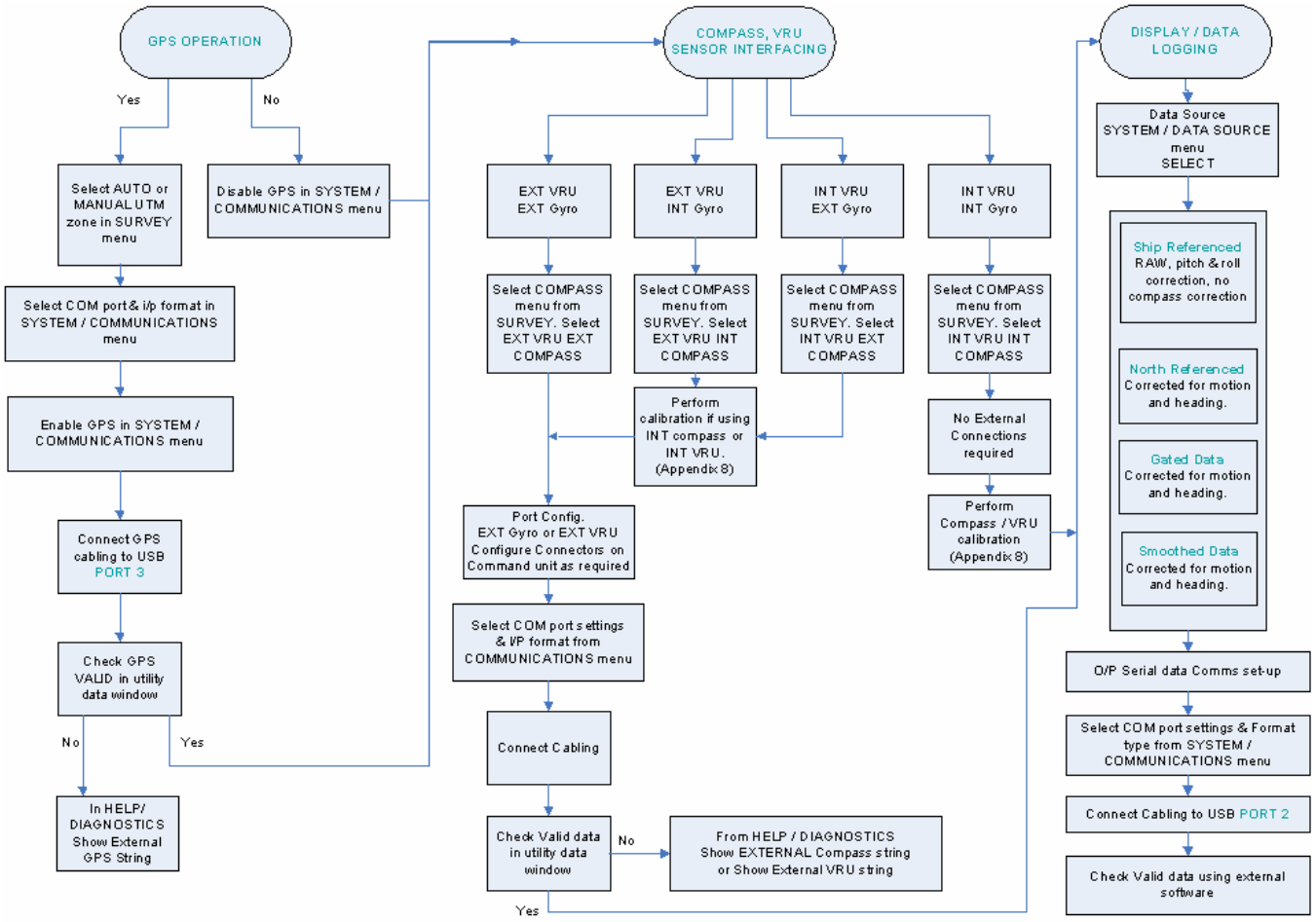
1. Ensure that both Compass selection and pitch & roll selection are set to Internal.
2. Select 'Calibration' from either compass or pitch & roll selection.
3. Halt reading by selecting **'Stop Reading'** button.
4. Clear previous calibration values, by selecting **'Clear Cal'.**
5. Start calibration by selecting **'Start Cal'.**
6. Start continuous read by selecting '**Start Reading'.**
7. Rotate the transducer at least twice through 360 degrees slowly (1 min per revolution) while changing pitch and roll as possible.
8. Halt reading by selecting **'Stop Reading'.**
9. Disable the calibration mode by selecting '**Stop Cal'**.
10. Check the quality of the calibration by selecting **'Check Cal'**, the result is presented in the form HnVnMm.mm in the bottom data area. The 'n' following H and V should be approaching 9. A low H indicates two circles were not either completed or completed too quickly; a low V indicates not sufficient tilting of the transducer during calibration. The m.mm after "M" indicates the magnitude of the local magnetic field and should be as low as possible. The value 30.0 is too high, 10 is typical. Repeat from step 3 until the calibration result is satisfactory.
11. Start continuous read by selecting **'Start Reading'**.

APPENDIX 9 – MINIMUM COMPUTER SPECIFICATION

The table below lists the recommended specification for the computer to run the Easytrak Lite program. To prevent a conflict of resources, care should be taken if attempts are made to run other programs at the same time with Easytrak.

DESCRIPTION	RECOMMENDED SPECIFICATION
PROCESSOR	>Pentium 1GHz
MEMORY	256MB
HARD DRIVE FREE SPACE	10MB
ADDITIONAL DRIVES	CD ROM / DVD ROM
DISPLAY (MINIMUM)	800 x 600 (1024 x 768 recommended)
PORTS	1 x USB (1.1, 2.0)
OPERATING SYSTEM	Windows XP (Home or Professional), Win 7 (32 and 64 bit)

APPENDIX 10 – EASYTRAK CONFIGURATION GUIDE



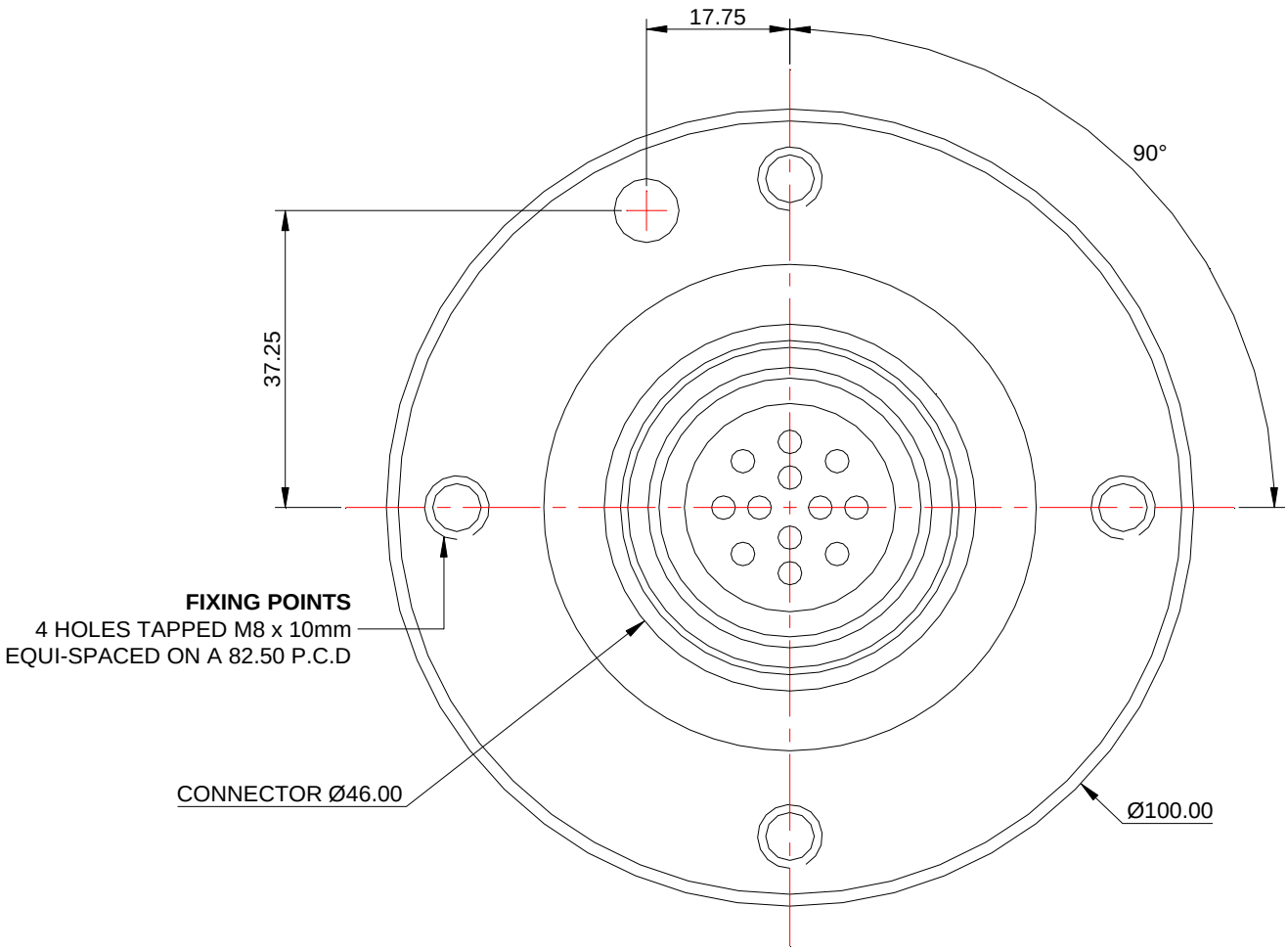
APPENDIX 10 – EASYTRAK CONFIGURATION GUIDE CONT/…

EASYTRAK CONFIGURATION EXAMPLES		
Desired Configuration	Settings Required	
GPS Referenced Internal Compass Internal Pitch / Roll Data O/P – GPRMC NMEA String	GPS ON	• Select UTM Zone either Auto or Manually from SURVEY menu. • Set COM port settings from SYSTEM / COMMUNICATIONS menu. (GPS I/P = USB **PORT 3**) • Enable GPS from SYSTEM / COMMUNICATIONS menu.
	Internal Sensors	• From SURVEY / COMPASS menu select INTERNAL for compass & VRU. • A calibration for local magnetic fields can be performed from the SURVEY / COMPASS / CALIBRATION menu – ref Appendix 8.
	Data O/P	• From SYSTEM / DISPLAY menu. Data Source must be set to North Referenced to apply heading corrections. (NB Ship ref is raw with no compass correction applied, just pitch & roll) • Data format – currently supports GPRMC NMEA string this is a pseudo GPS string. Note: In GPS mode grid co-ordinates are substituted in place of x and y co-ordinates in data string Data O/P = USB **PORT 2**
Not GPS Referenced Internal Compass Internal Pitch / Roll Data O/P – Applied Acoustics	GPS OFF	• Disable GPS from SYSTEM / COMMUNICATIONS menu.
	Internal Sensors	• From SURVEY / COMPASS menu select INTERNAL for compass & VRU. • A calibration for local magnetic fields can be performed from the SURVEY / COMPASS / CALIBRATION menu – ref Appendix 8.
	Data O/P	• From SYSTEM / DISPLAY menu. Data Source must be set to North Referenced to apply heading corrections. (NB Ship ref is raw, no compass correction applied only pitch & roll) • From SYSTEM / COMMUNICATIONS menu, set port settings and select desired string format – AAE. (Data O/P = USB **PORT 2**)

APPENDIX 10 – EASYTRAK CONFIGURATION GUIDE CONT/…

EASYTRAK CONFIGURATION EXAMPLES CONT/…	
Desired Configuration	Settings Required
Not GPS Referenced External Compass – CSI Vector (HEHDT) Internal Pitch / Roll Data O/P – Applied Acoustics	GPS OFF • Disable GPS from SYSTEM / COMMUNICATIONS menu. Sensors • From SURVEY / COMPASS menu select INTERNAL for VRU. • From SURVEY / COMPASS menu select EXTERNAL for compass. • From SYSTEM / COMMUNICATIONS menu, set Compass port settings and set format – HEHDT. Data O/P • From Display menu. Data Source set to North Referenced. • From SYSTEM / COMMUNICATIONS menu, set port settings and select desired string format – AAE. (Data O/P = USB **PORT 2**)
Not GPS Referenced External Compass – CSI Vector (HEHDT) External Pitch / Roll – TSS Data O/P – Trackpoint II	GPS OFF • Disable GPS from SURVEY menu. Sensors • From SURVEY / COMPASS menu select EXTERNAL for pitch / roll. • From SYSTEM / COMMUNICATIONS menu, set VRU port settings and set format – TSS1 from the SURVEY / COMPASS menu select EXTERNAL for compass. • From SYSTEM / COMMUNICATIONS menu, set Compass port settings and set format – HEHDT Data O/P • From SYSTEM / DISPLAY menu. Data Source set to North Referenced. • From SYSTEM / COMMUNICATIONS menu, set port settings and select desired string format – TPII (2 Options with / without pitch and roll) Data O/P = USB **PORT 2**

APPENDIX 11 – CONNECTOR END CAP MOUNTING DETAILS



CONNECTOR ENDCAP
REAR VIEW

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