Easytrak Alpha
2665 Series
Operation Manual

EZT-2665-8000/6

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Tel: +44 (0)1493 440355
Fax: +44 (0)1493 440720

Email: techsupport@appliedacoustics.com

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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 2665 EASYTRAK ALPHA

This manual provides the user with information on the installation, operation and maintenance of the 2665 Easytrak Alpha 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.

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 would be NORTH referenced; 123m 'X' means 123m from the ship East.

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.

Easytrak Alpha has been designed so that it requires the minimum of user intervention; the system can be ranging to beacons as soon as the transducer enters the water. 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.

Because of multi-path reflections and other types of acoustic interference, the position can occasionally be corrupted. In smoothing mode, Easytrak Alpha has the facility to 'gate-out' wild values of velocity. The 'out of gate' positions are replaced by predicted values. Note the compass must be enabled.

The Easytrak Alpha transducer is fitted with internal compass, pitch and roll sensors. The pitch and roll sensors work to ± 80°, more than sufficient for boat work.

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

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

Easytrak Alpha is ideal for small surveys. With the internal Global Positioning System (GPS) receiver, absolute positioning of divers, sonar fish, ROVs, or seabed objects in UTM (Universal Transverse Mercator) co-ordinates can be achieved. Easytrak Alpha can work with either the internal GPS receiver or an external receiver. With GPS, Easytrak Alpha can also be used to navigate to and from the worksite indicated by an entered waypoint. Easytrak can also work to a local grid if so required by turning the internal GPS receiver off. 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 Alpha is simple to use, the system provides a very powerful and flexible tool for survey use.

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

2. BASIC THEORY

Easytrak Alpha is an Ultra Short Base Line (USBL) Acoustic Navigation System. Alpha 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[4] 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:

$$\text{Range} = \frac{\text{VOS x Travel-time}}{2} \text{ (m)}$$

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:

$$\text{Range} = \text{VOS x Travel-time (m)}$$

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

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

3. System Description

Easytrak Alpha consists of a Command Console, power supply, GPS antenna, transducer with deck cable and the computer.

3.1 Easytrak Alpha Command Console

The Easytrak Alpha Command Console controls the signal acquisition and processing. The Command Console interfaces to the computer, navigation computer, external GPS receiver (optional), and transducer. The unit can provide a key pulse to the responder.

3.2 Transducer and Deck Cable

The Easytrak Transducer contains receive ceramics and amplifiers that process the received signals prior to signal processing in the Easytrak Alpha Command Console. The transducer also contains the interrogate ceramic. The transducer is fitted with compass, pitch, and roll sensors. The Easytrak deck cable is 'hardwired' to the Transducer and plugs into the Alpha Command Console.

3.3 GPS Antenna

The antenna plugs into the Easytrak Alpha Command Console required for the internal GPS receiver.

3.4 Power Supply

The external power supply provides power to the Command Console and the transducer.

The Easytrak deck cable connects the Easytrak Alpha Command Console to the Transducer.

Additional Items:

3.5 Computer

The computer provides the user-interface for Easytrak Alpha. The computer can be either a desktop or a laptop. For the recommended minimum specification for the computer, please see Appendix E.

3.6 Beacon/s

Types - 200, 300 Series Micro, 900 Series, or 1000 Series

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 ALPHA COMMAND CONSOLE

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

4.3 GPS ANTENNA

Locate the supplied GPS antenna in a position where it has a clear visibility of the sky in all directions.

4.4 TRANSDUCER

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: The Easytrak transducer can be fixed over the side of a ship with a suitable non-magnetic pole. Using Jubilee clips or similar, clamp the pole to the recessed part of the transducer. Ensure the transducer is aft of the pole and that the pole does not protrude beyond the face of the transducer. 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.

Please do not use the threaded holes at the top of the transducer for mounting, they are used during manufacturing.

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.

4.5 Deck Cable

Connects the Transducer to the Easytrak Command Console. 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

- With the Easytrak Alpha Command Console switched off, connect the deck cable to the Command Console.
- If the internal GPS receiver is required, connect the supplied GPS antenna cable to the Command Console.
- Connect the USB lead between the Computer and the Command Console.
- If required, connect a serial lead between the Command Console and any data logging computer or serial printer.
- If required, connect a serial lead between the Command Console and an EXTERNAL GPS receiver.
- If required, a BNC lead should be connected between the Easytrak Command Console and the responder.

4.7 Power Supply

The supplied power supply is auto-ranging (115 – 230VAC 50/60Hz) and does not require user intervention. Plug into the nearest power outlet socket. The 6.3mm connector plugs into the Easytrak Command Console.

4.8 Software Installation

The software installation is performed in two parts, firstly, the USB drivers, and secondly, the main Easytrak Alpha 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.

To install the Easytrak Alpha software, load the supplied CD into the computer's CD/DVD drive. The install program should run automatically. The dialogue box below will appear. Four options are presented, Install Easytrak Alpha, view the Operator Manual (PDF format[5]), and view the USB drivers folder and Close. At this stage select the Close button.

4.8.1 USB Driver Software Installation

The Alpha USB drivers for Windows XP through to Win 7 (32 and 64 bit) are contained on the supplied CD. Examples of driver installation are provided for Windows XP and Windows 7.

The USB configuration programs two serial ports to be used by the computer for communication with the Easytrak Alpha Command Console for control and for the Data Output serial port on the back of the Alpha unit.

The configuration will vary between operating systems.

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

4.8.1.1 WINDOWS XP DEVICE DRIVER SET-UP

Prior to connecting the USB cable between the computer and Easytrak Alpha, please make a note of the current serial port numbers.

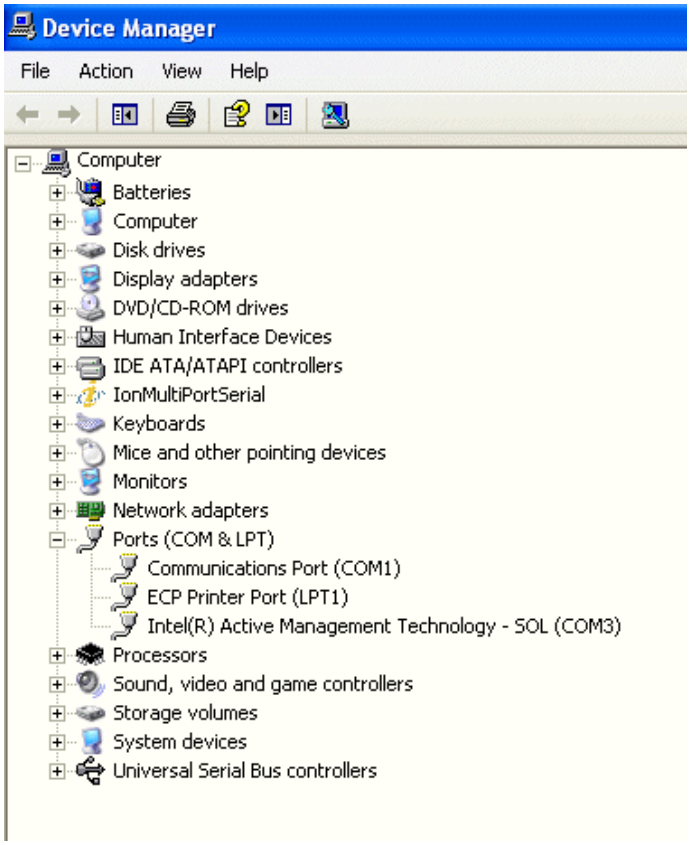
To observe the serial port settings select "System" from "Control Panel" on the computer. Choose the Hardware tab and click the "Device Manager" button.

After selecting "Ports (COM & LPT)", a Window similar to that to the right is displayed.

It can be seen to the right that the serial ports already assigned are COM1 and COM3.

1. With Easytrak Alpha switched off ensure the USB cable is fitted between Alpha and the computer.

2. Switch Alpha power on.



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

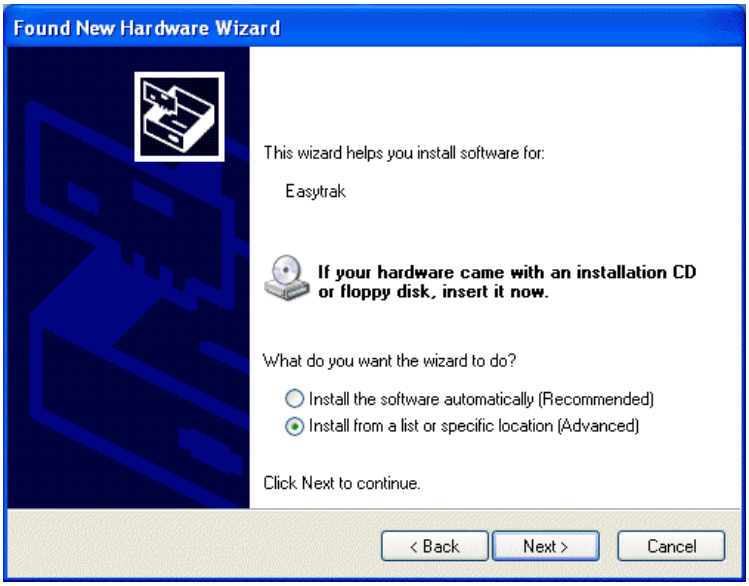
4. After a few seconds the dialogue box to the right should appear.

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

6. Then select Next>

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

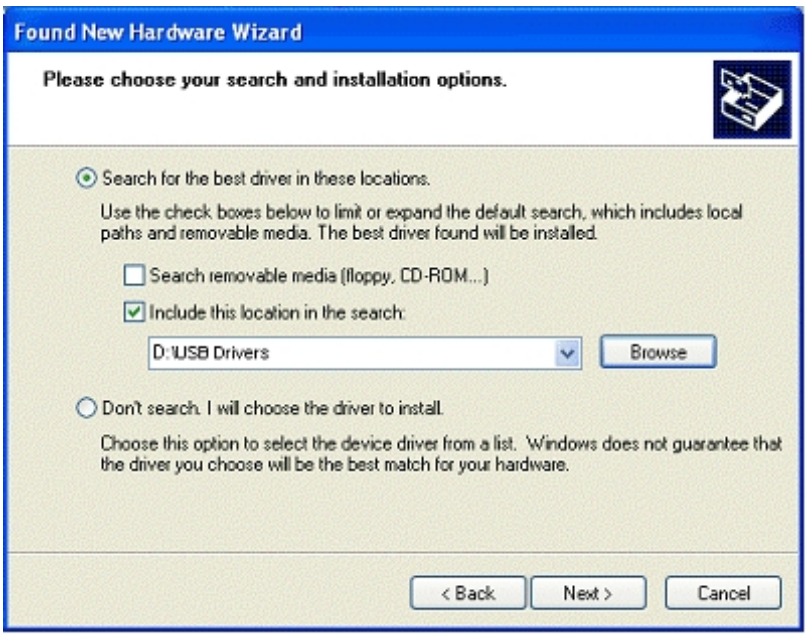
8. Then select NEXT> .



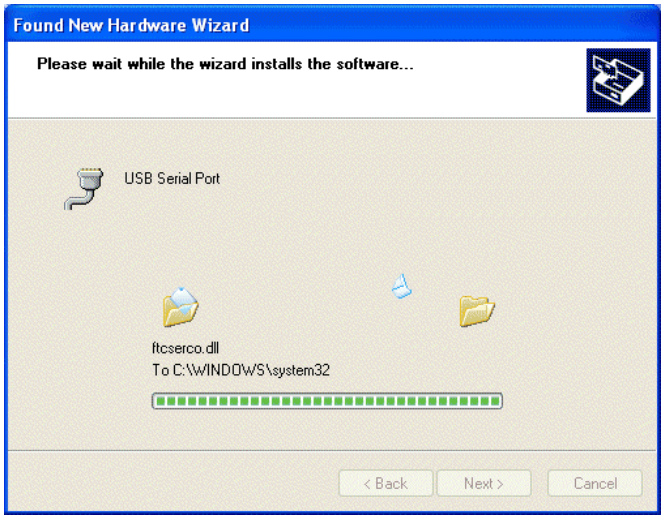
9. Select INCLUDE THIS LOCATION IN THE SEARCH checkbox.

10. Next, browse the installation CD for the folder USB DRIVERS.

11. Then select NEXT> .



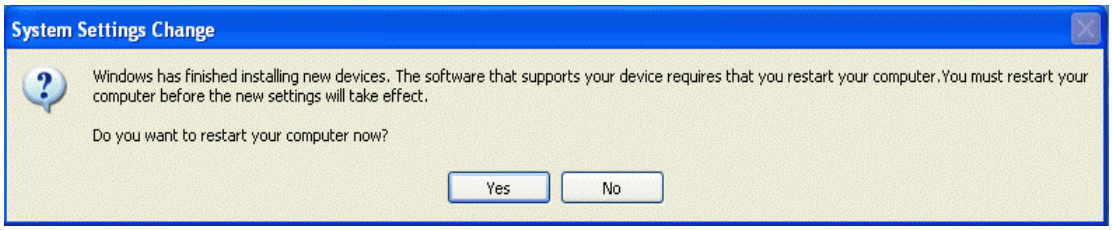
12. The USB drivers will now install.



13. A FINISH dialogue box will appear. Click the Finish button.

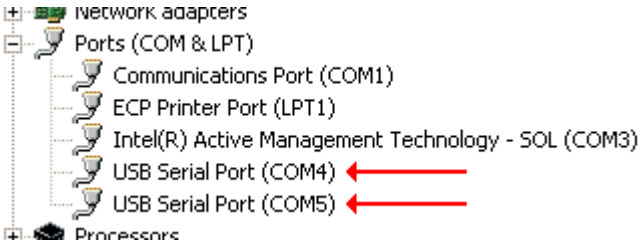
14. The installation will repeat a second time to install the second COM port. Follow the instructions from 3.

15. Once both COM ports have been installed a dialogue box may appear requesting for the computer to be restarted.



16. Remove the CD. Restart the computer in all cases.

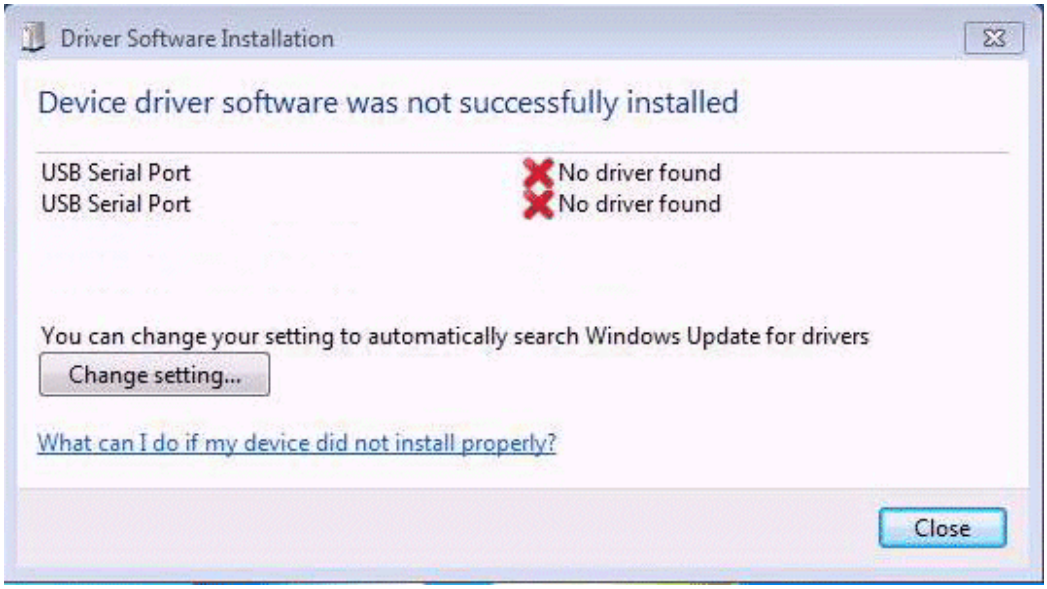
17. Once the computer has restarted, check the ports now assigned as before using Control Panel. There should be two new ports, in the example below COM4 and COM5 have been assigned from the driver installation.



18. Please make a note of the new COM ports numbers. The driver set-up for WINDOWS XP is now complete.

4.8.1.2 WINDOWS 7 DEVICE DRIVER SET-UP

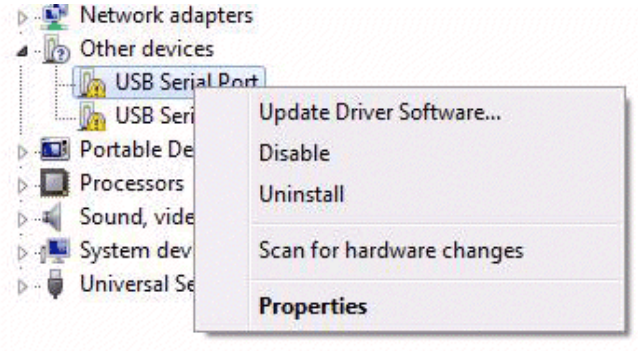
1. Note **ADMINISTRATOR PRIVILEGE** is required to install Easytrak Alpha in Windows 7.
2. In Device Manager make a note of any serial port numbers already taken by other devices, e.g. COM1, COM2 etc.
3. With Easytrak Alpha switched off ensure the USB cable is fitted between Alpha and the computer.
4. Switch Alpha power on.
5. The response of the computer will vary depending upon how it has been previously configured, in particular Windows Update. A message can be displayed saying that drivers could not be found.
6. Clicking the Further information link on the message can bring up a message box similar to that below.



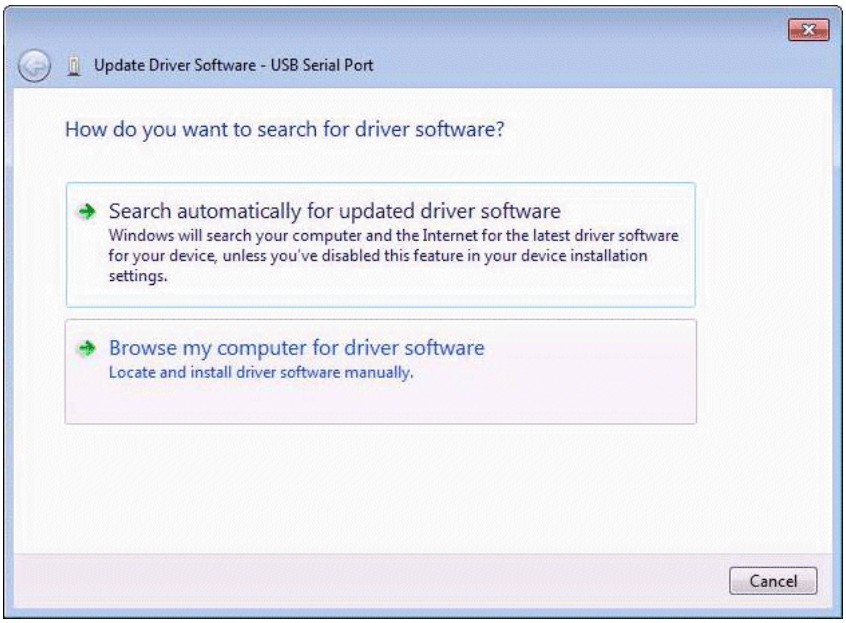
7. If the computer is connected to the **INTERNET**, drivers can normally be downloaded and installed automatically via Windows Update; select “Search for Updates”.
8. Make a note of the numbers of the two new COM ports generated e.g. COM3, COM4 etc.
9. However, if Internet access is not available proceed with the following instructions.

10. Through Device Manager you will see a window below (or similar). Sometimes, rather than **USB SERIAL PORT** being displayed **EASYTRAK 2665** may be seen.

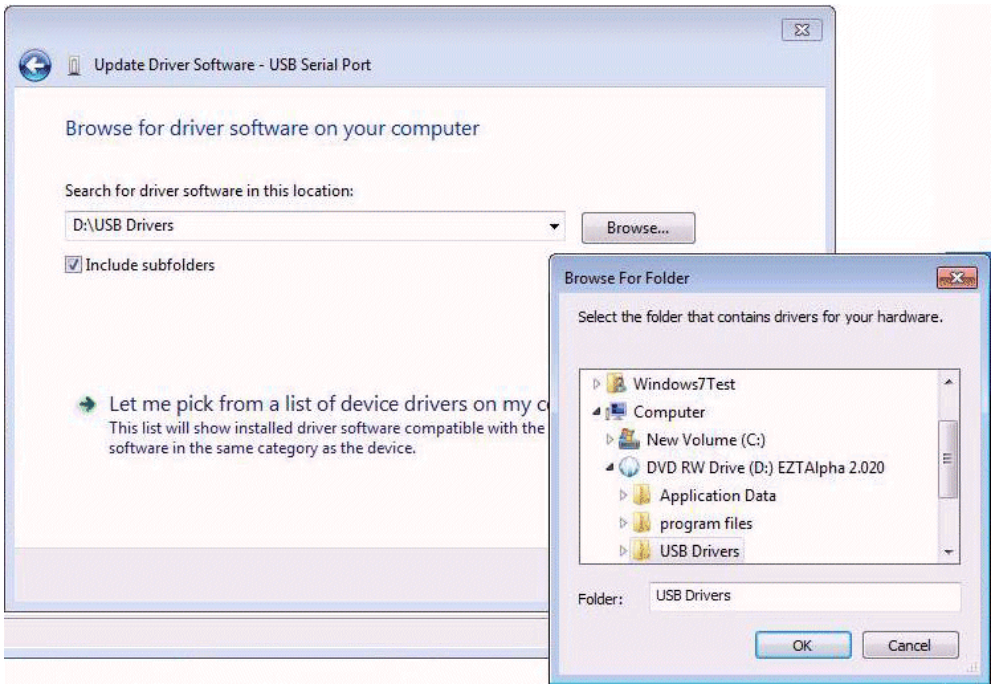
11. Right click **USB SERIAL PORT** (or **EASYTRAK 2665**) and then click the **UPDATE DRIVER SOFTWARE…** menu choice.



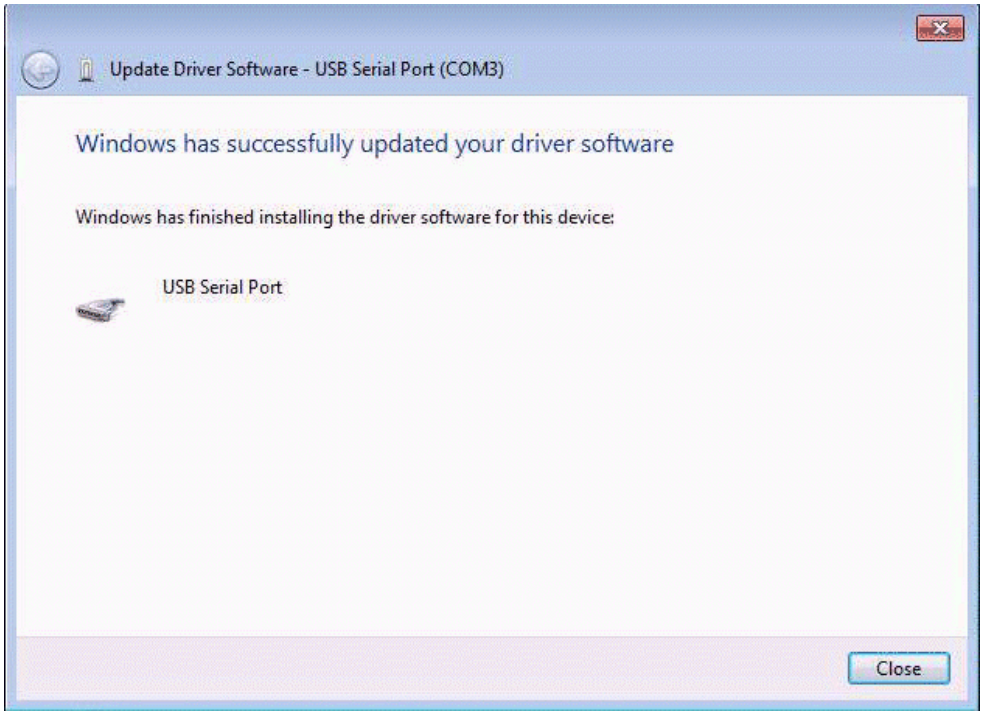
12. Next select **BROWSE MY COMPUTER FOR DRIVER SOFTWARE.**



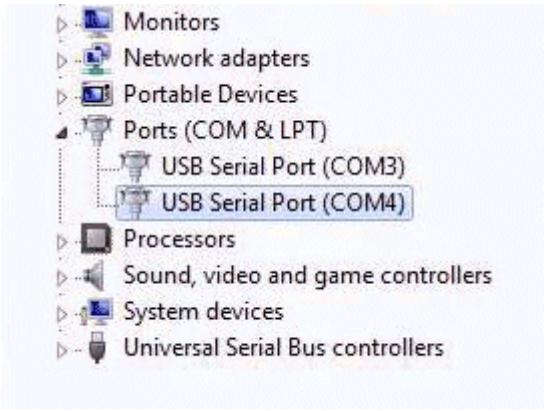
13. Select the **BROWSE…** button, select the CD/DVD drive and find **USB FOLDER**. Then click OK.



14. You should see the following message (or similar). Note the COM port number is identified in the title bar of the window.



15. Repeat from (11.) to install the second serial port. After which, by examining Device Manager, the two ports should be set up as below.



16. Please make a note of the new COM ports numbers; in this case COM3 and COM4. The driver set-up for WINDOWS 7 is now complete.

4.8.2 USER INTERFACE SOFTWARE INSTALLATION

Re-load the 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 EZTSTART.EXE. Click on the INSTALL EASYTRAK ALPHA button and follow the on-screen instructions to complete.

Run the Easytrak Alpha program from the Start Menu.

It is likely that dialogue boxes will appear saying that the current Alpha Port and Data COM Port are not available. Set up with the new COM ports in Alpha by selecting dropdown menu SET UP/COMMUNICATIONS. In the earlier Windows 7 example (instruction 15), COM3 would be for the ALPHA PORT, and COM4 would be for the DATA PORT. The Alpha COM port is always the lower number of the two new ports. Please see paragraph 8.1.7 for further details.

5. PLANNING AN OPERATION

5.1 WHAT NEEDS SETTING UP?

Check that Easytrak Alpha agrees with the settings of the beacons (Please see Appendix D).

How often are positions required? The slower the rate, the longer the beacon's batteries will last.

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

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

If the target has the possibility of an electrical connection to the Easytrak Alpha Console, the responder is usually the best choice of beacon. The position calculation is more accurate as acoustic signals only have to travel from the responder to the transducer. The responder is not affected by local noise, for example, from the thrusters of a remotely operated vehicle (ROV).

Transponders are generally used where there can be no electrical connection to the Easytrak Alpha Command Console.

5.3 WHERE ARE THE BEACONS TO BE POSITIONED?

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

5.4 WHAT LOCAL POWER IS AVAILABLE?

If the beacon is fitted on a sub-sea vehicle (or similar), it should be investigated whether local power is available. If power is available and suitable, the power can be supplied to the beacon removing the need for a battery pack and the subsequent requirement of battery charging. The power can be either from the vehicle's power supply or through an umbilical. Please read the beacon's manual for details.

5.5 HOW IS THE TRANSDUCER GOING TO BE MOUNTED?

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 long enough to be sufficiently clear of the ship's hull (>1 metre). Deployment and recovery is usually not as easy due to the weight of the pole and transducer, and the assembly / disassembly of guide wires etc.

The simplest method is to hang the transducer over the side of the vessel. This method is suitable for the smaller vessel with minimal movement. 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.

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

5.6 IS ABSOLUTE POSITIONING OR A RELATIVE POSITIONING REQUIRED?

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 Alpha uses Universal Transverse Mercator (UTM) referenced to the WGS84 ellipsoid. To have an absolute position, the compass must be enabled; also either the internal or external GPS receiver must be used with Easytrak Alpha. Easytrak Alpha then uses the data from the compass and GPS receiver to derive the absolute position of the target. To preserve accuracy, DGPS is strongly recommended over standard GPS. The GPS receiver in Easytrak Alpha is SBAS[6] enabled and automatically selects the appropriate service for the location.

5.7 WHAT RANGE IS REQUIRED?

Select a beacon suitable for the working range. Consult the beacon manufacturer's manual for specified working ranges, or contact Applied Acoustics Engineering Ltd. for advice.

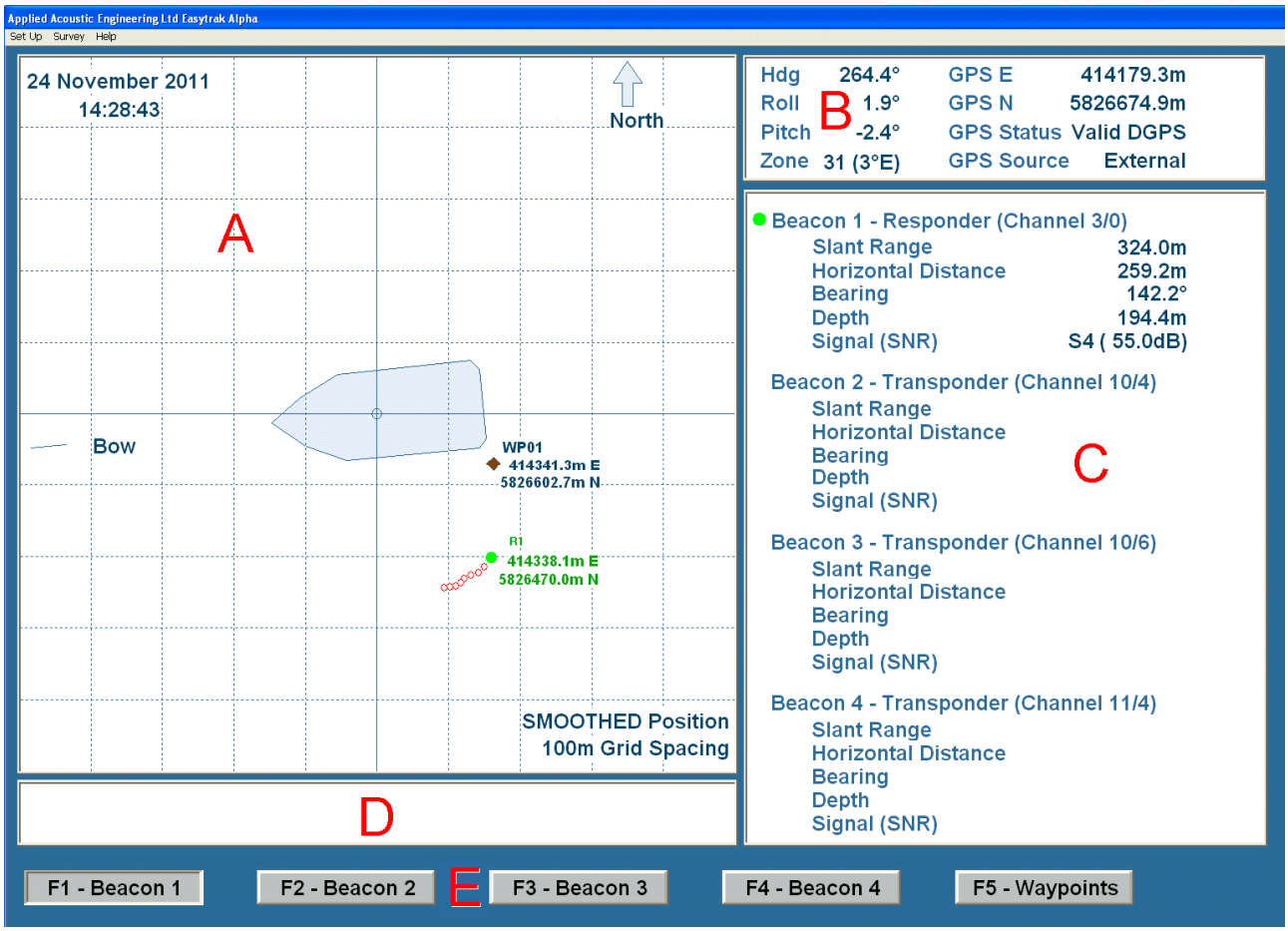
5.8 WHAT ACCURACY IS REQUIRED?

To improve accuracy keep ranges as short as possible, make local measurements of the velocity of sound in water, use manual depth at low depression angles (shallow water).

Note: It is strongly recommended that DGPS is used otherwise overall accuracy could be compromised.

[6] Satellite Based Augmentation System

6. AROUND THE EASYTRAK ALPHA DISPLAY



A This is the main PLOTTING WINDOW where the ship and targets are displayed.

The ship is coloured blue. A Waypoint (WP) is diamond shaped and coloured brown.

Depending on type, beacons can be represented in two different shapes; transponders are square and responder circular. The colour of the target depends on the position quality, green – valid, orange – caution, red - invalid. Please refer to the beacon section APPENDIX D for further information.

The type of data i.e. non-smoothed or smoothed used for displaying and outputting data is displayed on the bottom right-hand side together with the scale.

B This Window displays UTILITY DATA including heading, pitch & roll, and ship GPS data. When GPS data is not required and switched off, the GPS legend is not displayed. The colour of the GPS data fields reflect the GPS Status, Blue for valid, Orange for estimated, and Red for an invalid signal.

C This is the main data Window where POSITION DATA for each beacon is displayed including distances and bearing from the ship to the target. Signal level is displayed S0 (low) to S9 (high) together with Signal to Noise ratio (s/n). When the data has just been updated a small coloured shape is displayed to the left of the Beacon header, square for a transponder, and a circle for a responder. The colour reflects the status of the fix, green for valid, orange for predicted and red for invalid.

D This Window is used for DISPLAYING MESSAGES such as interrogation status etc. These messages are 'switched on' through menu selection or automatically by Alpha. Due to the nature of these messages, it is possible for them to overlap.

E These correspond to the HOT KEYS F1 to F5 on the PC keyboard.

7. SPECIAL MOUSE OPERATIONS

The mouse operates normally within the Windows environment, it does however, perform a few extra functions:-

- If the mouse pointer is over the plotting area and the RIGHT MOUSE BUTTON is clicked, the range and bearing from the ship to the pointer will be displayed alongside the pointer. If the right mouse button is clicked again, co-ordinates will be displayed.
- A RIGHT MOUSE BUTTON click over either of function buttons F1 to F4 will bring up a depth menu. This will allow a manual depth to be entered for the particular beacon.
- A LEFT MOUSE BUTTON double click within the plotting area will clear any trails on the screen.
- With the mouse cursor hovering over the buttons F1 to F5 simple HELP INFORMATION will be displayed in the bottom right-hand-side of the screen.

8. EASYTRAK ALPHA MENUS

There are four pull down menus, SET UP, SURVEY, PRINT, and HELP.

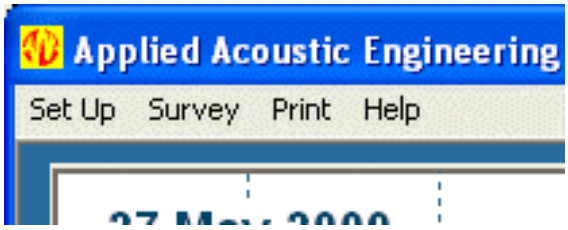


Fig 2 Pull down menus

8. 1 SET UP

On selecting SET UP the following menu is displayed:

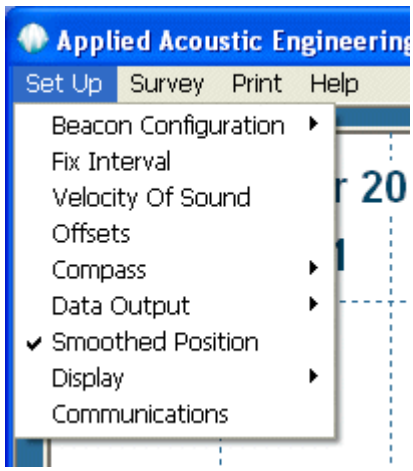


Fig 3 Set Up menu

8.1.1 BEACON CONFIGURATION

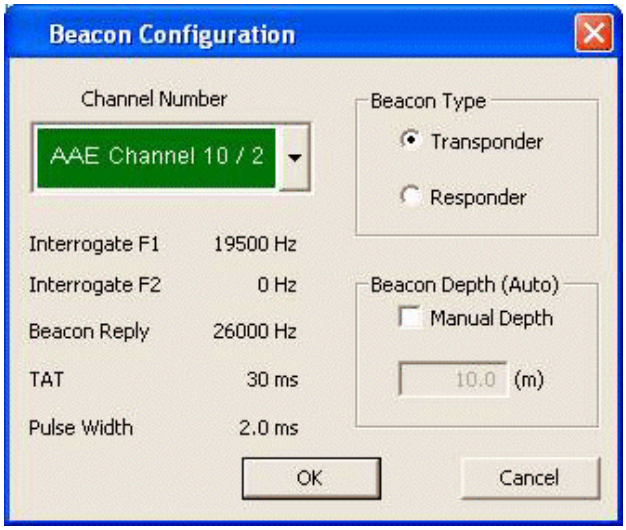


Fig 3.1.1 Beacon Configuration menu (Automatic Depth)

Selecting BEACON CONFIGURATION allows the choice of beacon channel, type, and depth method. Note due to the length of the beacon reply pulse, using the AAE or TPll channels will result in a longer beacon battery life compared to HPR3 and HPR4 channels.

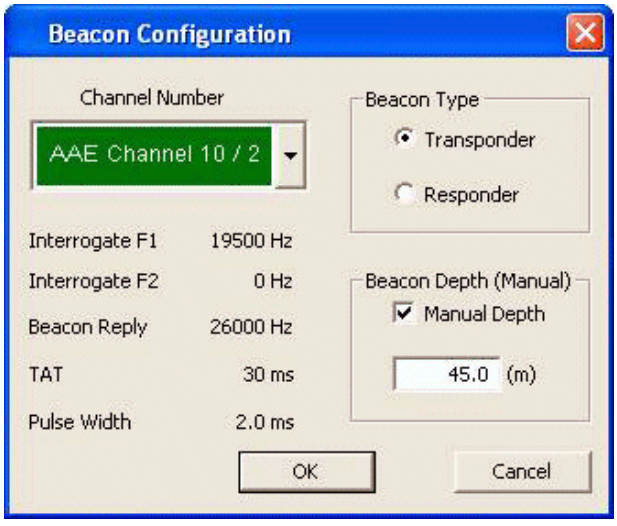


Fig 3.1.2 Beacon Configuration menu (manual Depth)

By default, depth is automatically calculated by Easytrak Alpha from the received acoustic signals. However, when the difference in water depth between the target and the transducer is small resulting in a very low vertical angle, a manual entry of depth can result in a more stable position. To enter a manual depth, tick the checkbox; the edit box will then permit a value to be entered. A right mouse click on the Function keys F1 – F4 will also bring up a dialogue box allowing the user to enter a MANUAL DEPTH or revert back to AUTO mode.

8.1.2 FIX INTERVAL

Selecting FIX INTERVAL allows a choice of 1, 2 (default), 4, or 8 second interval between fixes.

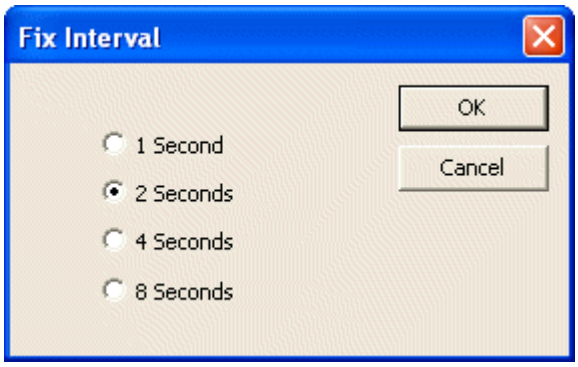


Fig 3.2 Fix Interval menu

8.1.3 VELOCITY OF SOUND (VOS)

Selecting VELOCITY OF SOUND allows a choice of 1450 m/s, 1475 m/s, 1500m/s (default), or a user entered value in the edit box.

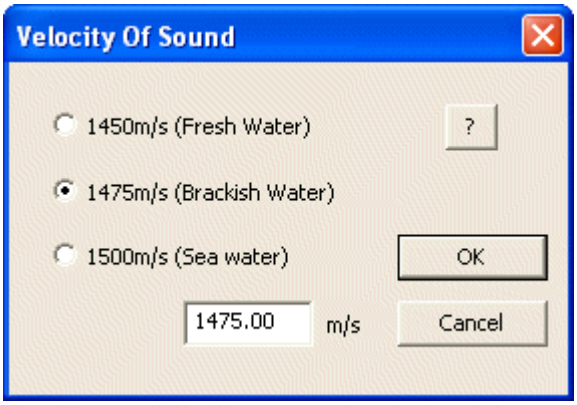


Fig 3.3 VOS menu (pre-set value)

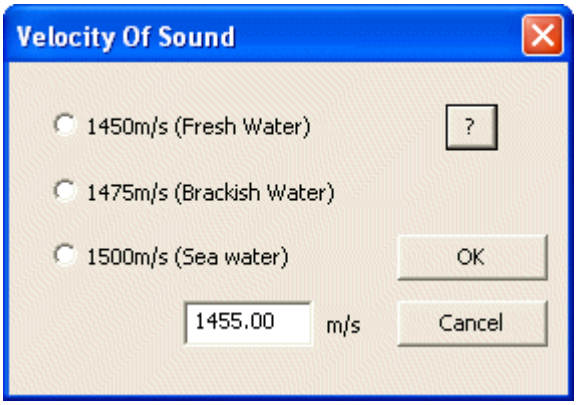


Fig 3.3.1 VOS menu (user value)

8.1.4 OFFSETS

Selecting OFFSETS allows the user to apply position offsets and Magnetic declination.

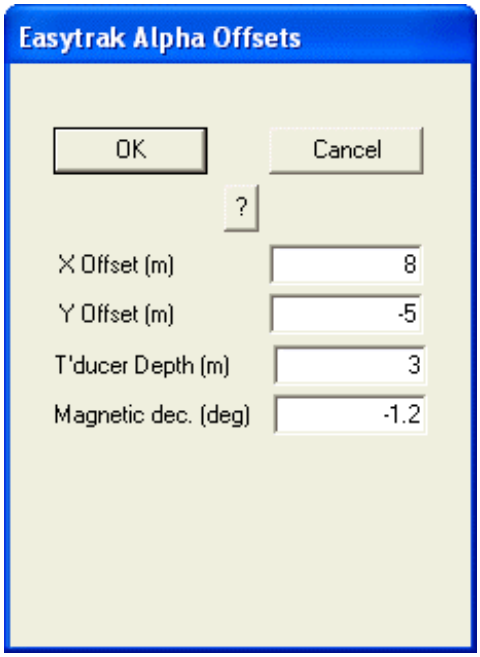


Fig 3.4 Offset menu

By default, the position given by Easytrak Alpha 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), Transducer depth (m) below water line, and Magnetic dec(lination).

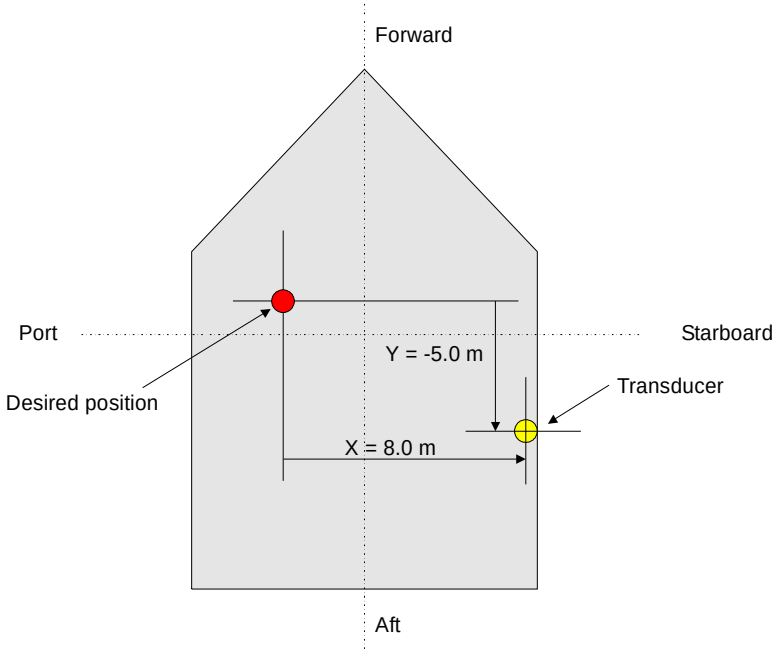
Offsets are the measured distances **from the desired position to the transducer**.

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 diagram below shows 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.

Note: If X, and Y offsets are to be used, the transducer MUST be fixed with the alignment mark facing forward using an over the side pole.



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

Magnetic declination offset 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.[7] Magnetic declination varies throughout the world changing slowly over time.

Magnetic declination is entered into Easytrak Alpha in the following format: -SDDD.DD, where 'S' is the sign + (East) or – (West), and 'D' are degrees and decimal degrees.

[7] http://www.ngdc.noaa.gov/geomagmodels/Declination.jsp

8.1.5 COMPASS

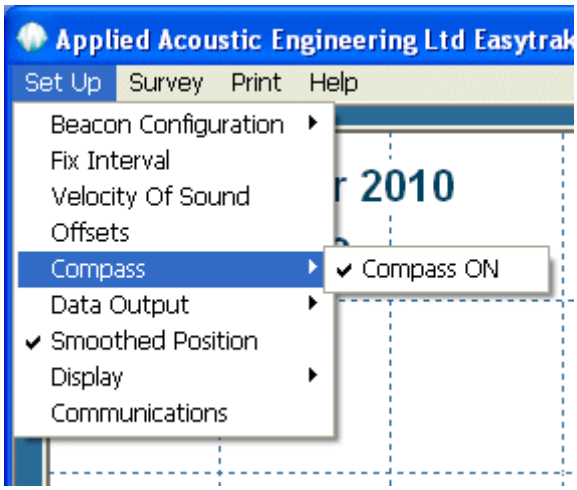


Fig 3.5 Compass menu

This selection allows the COMPASS to be switched ON or OFF. Fig 3.5 shows the compass switched on (ticked). Default is ON.

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

With the compass on, all positions will be North referenced, either a local grid, or in UTMs if GPS is available.

With the compass OFF 'X' values are relative to the Forward / Aft line, i.e. a positive value is Starboard of the Forward / Aft line, and a negative value is Port of the Forward / Aft line. 'Y' values are relative to the Port / Starboard line, i.e. a positive value is Forward of the Port / Starboard line, and a negative value is Aft of the Port / Starboard line.

8.1.6 DATA OUTPUT

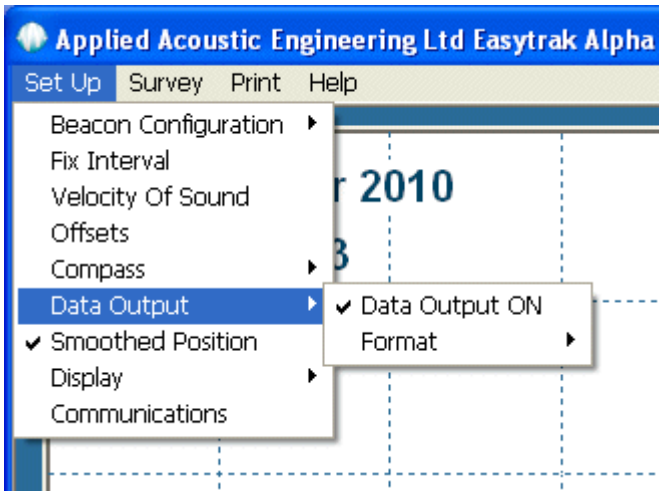


Fig 3.6 Data Output menu

Selecting DATA OUTPUT allows 'Data out' to be switched ON (ticked) or OFF (not ticked). Format produces a menu allowing the format of the output data.

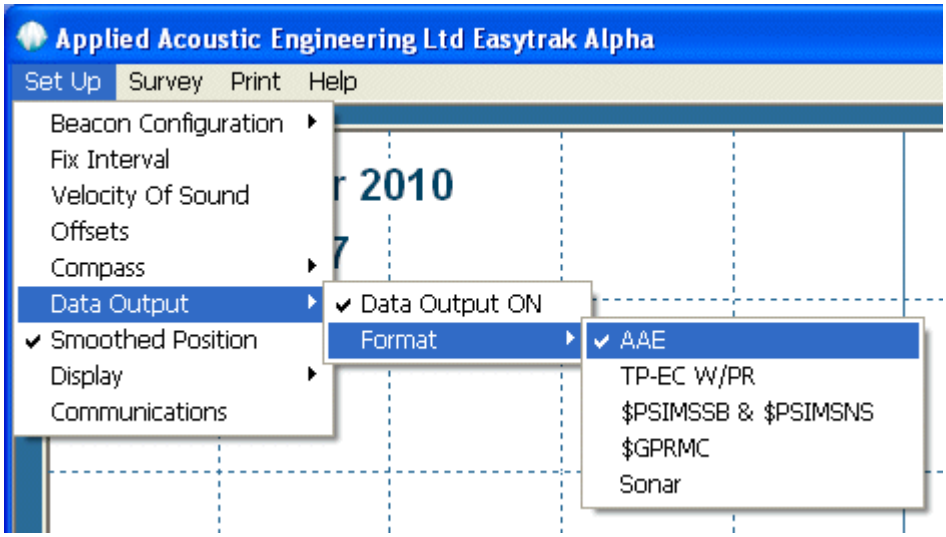


Fig 3.6.1 Data Output format menu

Please see APPENDIX B for details of each of the formats. Default is AAE format, switched OFF.

8.1.7 SMOOTHED POSITION

Selecting SMOOTHED POSITION (default) allows the current position to be smoothed, helping to eliminate noisy tracking.

When in smoothing mode, velocity gating is used to help remove occasional spurious positions. When a position is judged to be spurious or there is no reply, a predicted value based on previous good positions is used. The velocity gate is dynamic in that the size of the gate starts wide then reduces to a minimum value (10m/s) when sufficient 'good' positions are received. Should a series of 'bad' positions be received, i.e. outside the velocity gate, the gate will widen until a reliable set of valid positions is re-established.

8.1.8 DISPLAY

Selecting DISPLAY allows the display to be set to NORMAL or DIMMED for low-light conditions.

Fig 3.8 Display brightness

8.1.9 COMMUNICATIONS

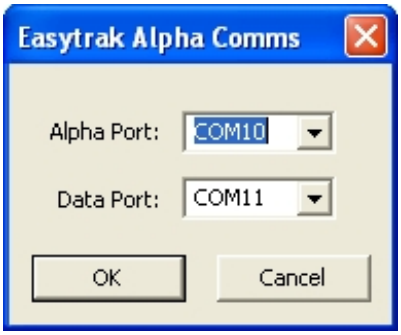


Fig 3.9 Communications

Selecting COMMUNICATIONS brings up a dialogue box to enable Easytrak Alpha to communicate with the Easytrak Alpha computer and to any navigation computer using the data output. These values must agree with those set on the Easytrak Alpha computer (PLEASE SEE 4.8.1.1 PARAGRAPH 17).

8.2 SURVEY

On selecting SURVEY the following menu is displayed:

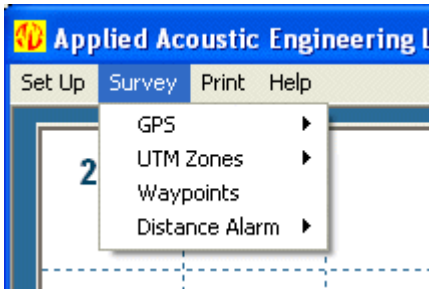


Fig 4 Survey

8.2.1 GPS

An external GPS receiver will need to output $GPGGA and $GPRMC NMEA format strings at a baud rate of 4800 once per second (preferred) or at least once per two seconds (8 data bits, 1 stop bit, and no parity).

Selecting GPS allows selection of the internal and optional external GPS receivers.

In the GPS dropdown menu there are four selections that can be made, Auto, Internal, External, and Off.

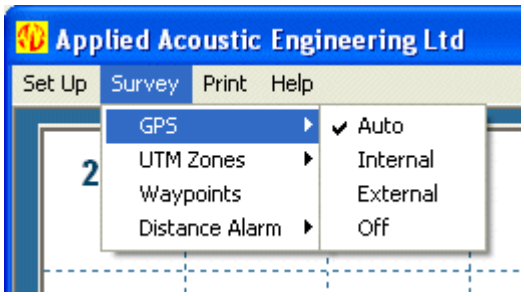


Fig 4.1 GPS

With Auto selected (default), if valid GPS data is detected, Easytrak Alpha will automatically go into 'GPS' mode presenting positions in UTM coordinates. In 'Auto' mode, External GPS always has priority over the internal GPS receiver. Once Easytrak Alpha is using the External receiver, it will not switch to internal even if the external data become invalid, as this could result in an unacceptable position jump. However, should the user wish to switch to internal, then the 'internal' option in the menu should be selected.

With INTERNAL selected, the internal GPS receiver is used irrespective of the presence of an external receiver.

With EXTERNAL selected, the External GPS receiver is used irrespective of the presence of the internal receiver.

With OFF selected, no GPS receiver is used and positions are presented in a XY format.

8.2.2 UTM ZONES

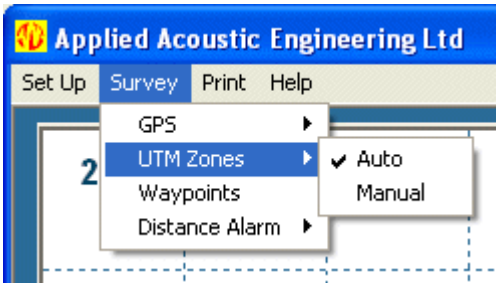


Fig 4.2 UTM Zones

In the UTM ZONES dropdown menu the user can either allow Easytrak Alpha to automatically calculate the zone derived from valid GPS data (default), or, alternatively, should the user wish to manually enter a particular zone, selecting 'manual' will bring up the following dialogue box.

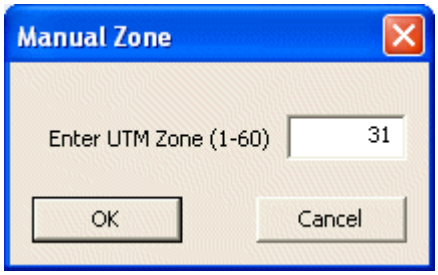


Fig 4.2.1 UTM Zones manual selection dialogue box

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

8.2.3 WAYPOINTS

Easytrak Alpha allows ten WAYPOINTS to be saved or manually entered. There are two ways for a waypoint to be entered, function key F5 automatically captures the latest beacon position, and the dropdown menu allows positions to be entered manually; in either case the dialogue box below will appear.

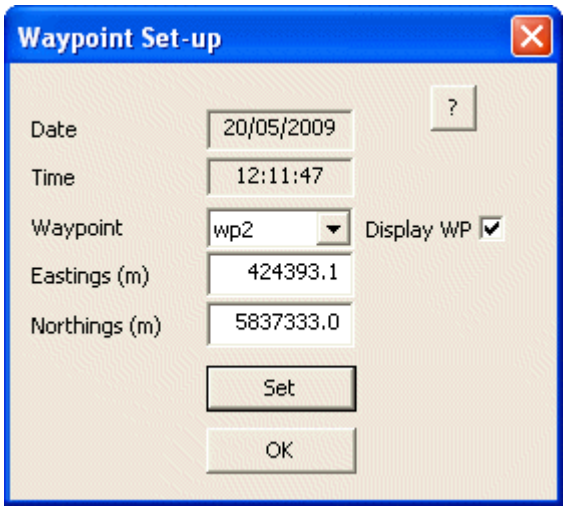


Fig 4.3 Waypoint dialogue box

The waypoint number can be selected, and by clicking on the SET button, the position data, time and date will be saved. To enable the waypoint icon to be displayed on the screen, the 'DISPLAY WP' checkbox must be selected, and the Set button clicked.

There are subtle differences between selecting the dialogue box using the dropdown menu and using the function key F5. Via the dropdown menu, the data for each waypoint can be viewed and edited (if a change is made, the time and date is updated to the current time). However, via the function key F5, though the waypoint number can be changed; only the current captured data can be viewed, i.e. historical waypoint data cannot be viewed irrespective of the waypoint number selected.

Note: Please remember, to enable any selection or alteration, the SET button must be clicked, and for a waypoint to be viewed, the 'Display WP' checkbox must be selected.

8.2.4 DISTANCE ALARM

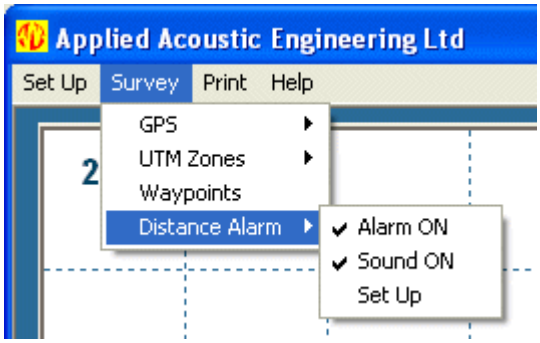


Fig 4.4 Distance Alarm

The DISTANCE ALARM monitors the distance between two selected points. Should the distance exceed the distance entered, a warning will flash on the computer screen, and if 'sound' is set on (ticked) an audio beep will sound.

The dropdown menu allows the alarm to be switched on or off (ticked), the audio beep on or off, and set up opens up a dialogue box. The default settings are with the alarm OFF and the Sound OFF.

Fig 4.41 Distance Alarm Set Up

'From' and 'To' can be selected from Ship, Beacon 1, Beacon 2, Beacon 3, Beacon 4, and Waypoints 1 to 10. The maximum distance is entered in the 'Distance' edit box. The default values are:- 'To' = Beacon 1, 'From' = Ship and Distance = 100.0m.

The distance alarm is useful as an audible warning, for example, should the distance between a ROV and the mother ship be in danger of exceeding the ROV's umbilical length.

GPS can also be used to navigate to and from a worksite. Using the distance alarm, a range and bearing to a waypoint containing the site's coordinates would be displayed.

8.3 PRINT

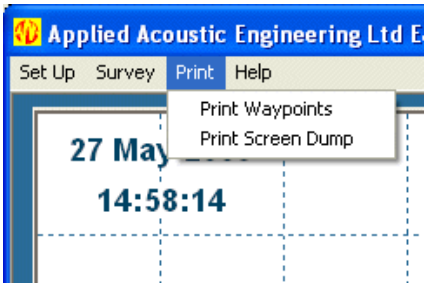


Fig 5 Print

This drop down menu allows a PRINT OUT of waypoints or a screen dump to a printer attached to the computer or on a network (9600 baud, 8 data bits, 1 stop bit, and no parity).

8.4 HELP

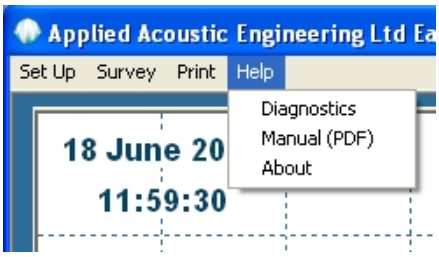


Fig 6 Help

This drop down menu presents options of DIAGNOSTICS, MANUAL and ABOUT. Note to display the manual, Adobe Reader[8] must be installed on the computer.

8.4.1 DIAGNOSTICS

The DIAGNOSTICS option allows the current fix status, signal and noise levels, convergence and beacon details to be displayed. The following dialogue box will be displayed.

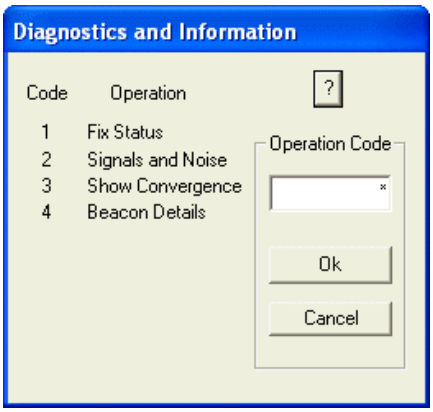


Fig 6.1 Diagnostics

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

Selecting Operation 1 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.

Operation 2 displays the relative signal level of each receiving element. This is useful should it be suspected that damage to the transducer may have occurred. A faulty element may show a level much lower than other elements with a beacon close by.

Operation 3 displays the convergence value for the current ship position.

Operation 4 displays the frequency details of Beacons 1, 2, 3 and 4.

8.4.2 ABOUT

Selecting ABOUT will give serial numbers of the Easytrak Alpha Control Unit and transducer together with software versions. Contact details for Applied Acoustics are also included.

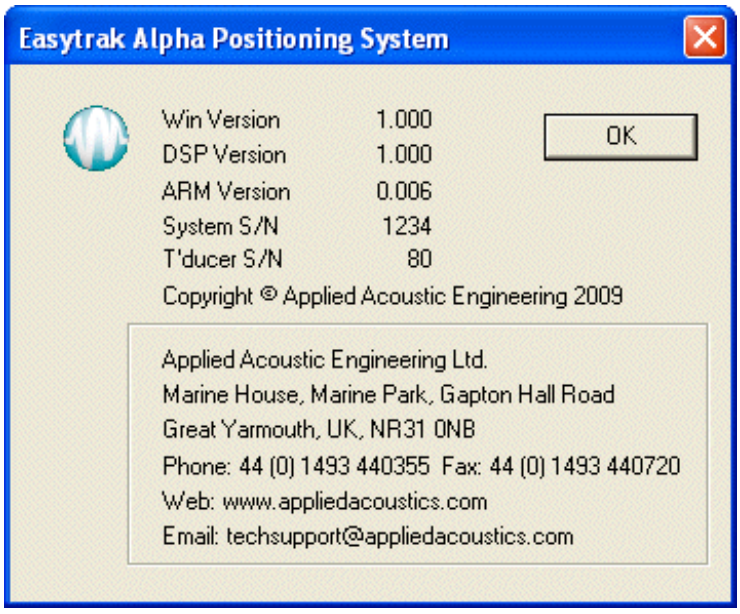


Fig 6.2 About

9. FUNCTION KEYS

Beacons can be activated or deactivated by using the FUNCTION KEYS on the computer keyboard or by a left mouse click on the F1 – F4 keys on the Easytrak Alpha display.

A right mouse click on the F1 – F4 keys brings up a dialogue box allowing the user to enter a MANUAL DEPTH.

Fig 7.1 Automatic Depth

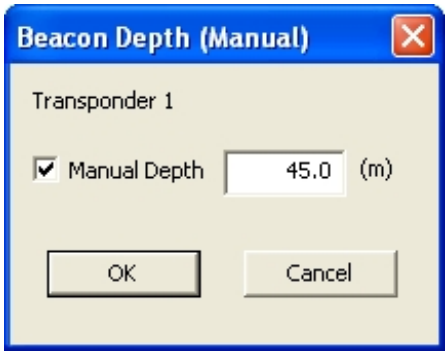


Fig 7.2 Manual Depth

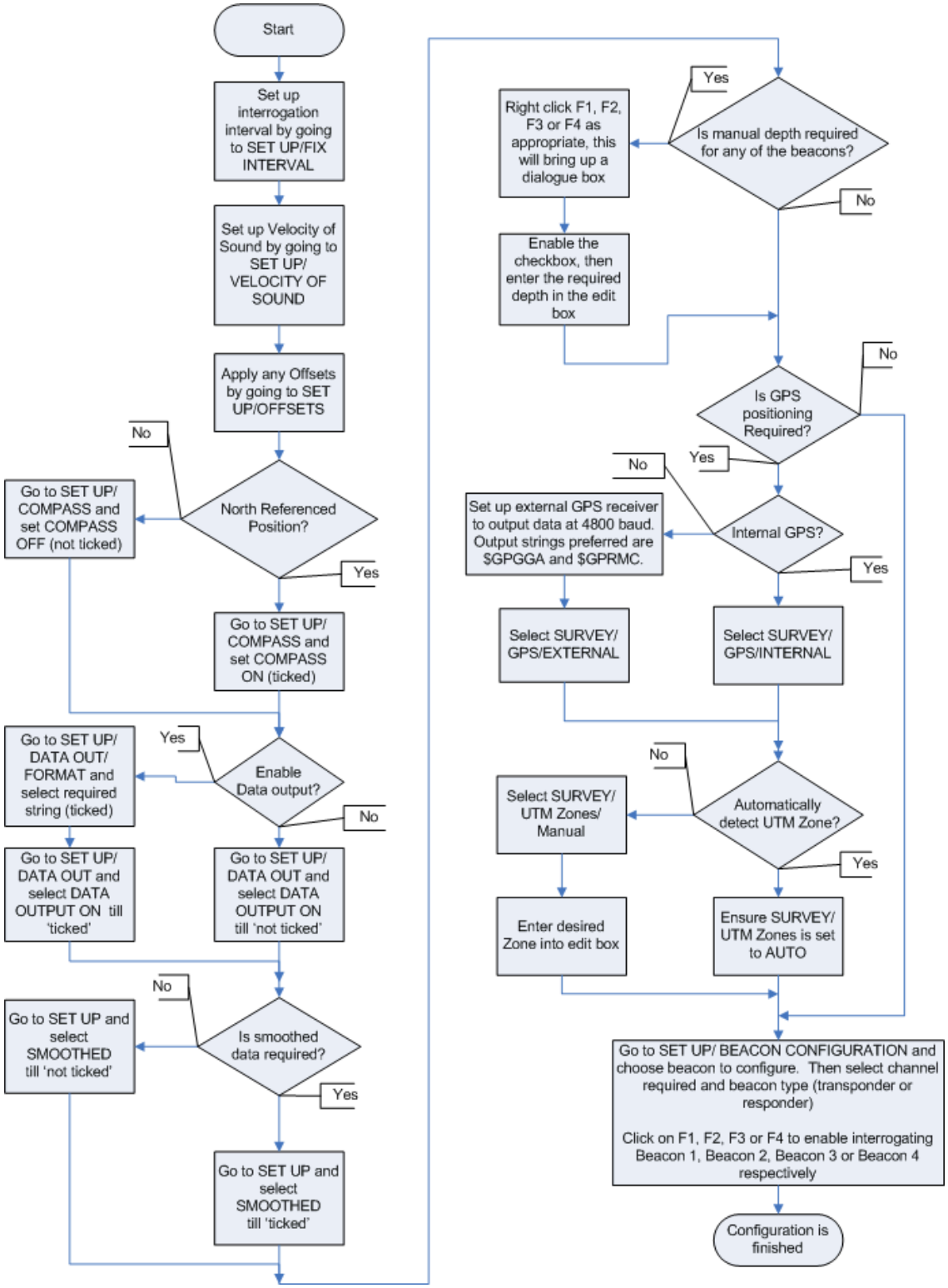
By default, depth is automatically calculated by Easytrak Alpha from the received acoustic signals. However, when the difference in water depth between the target and the transducer is small resulting in a very low vertical angle, a manual entry of depth can result in a more stable position.

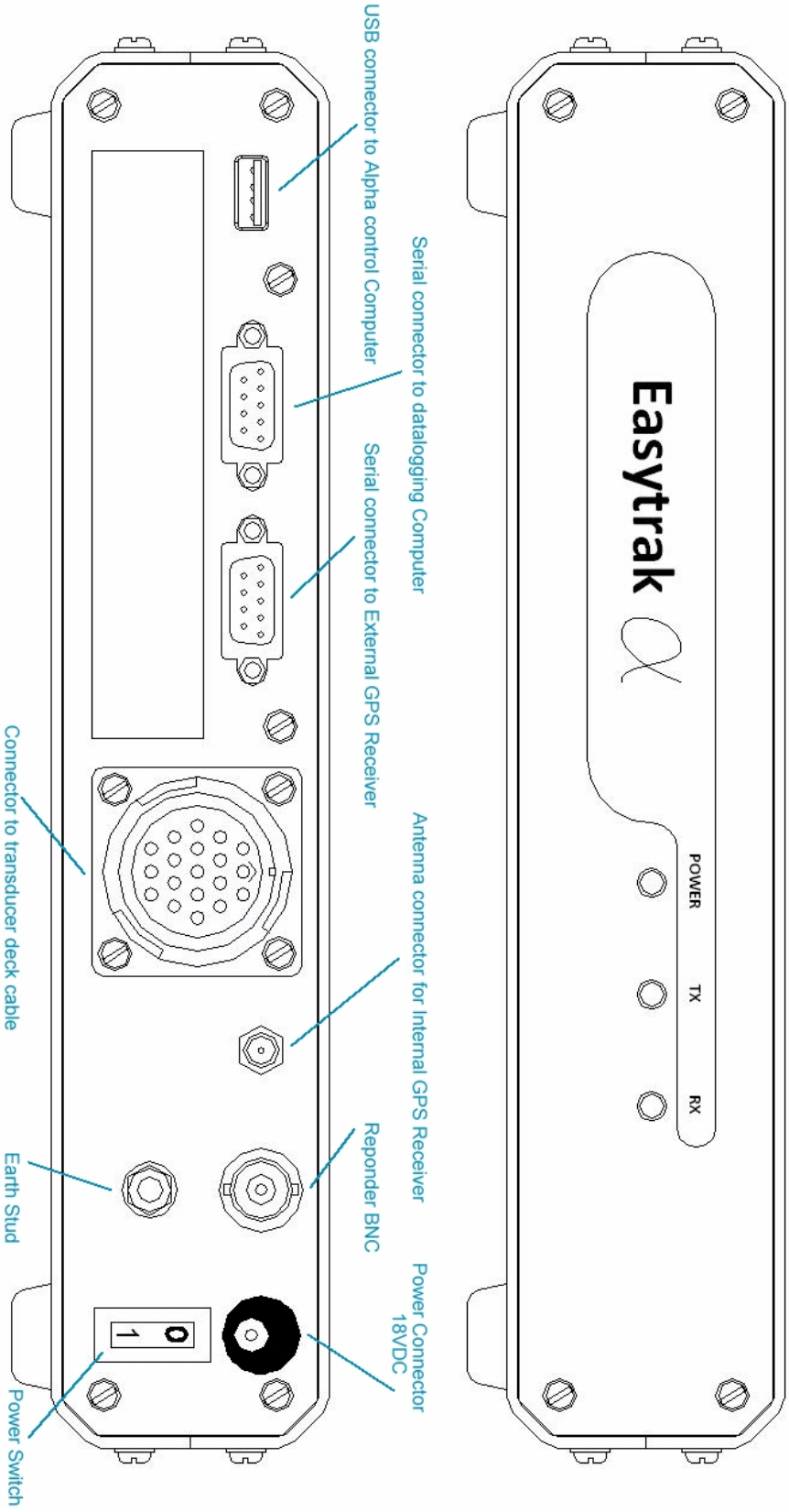
To enter a manual depth, tick the checkbox; the edit box will then permit a value to be entered.

Function key F5 brings up the WAYPOINT DIALOGUE BOX (see fig 4.3)

APPENDIX A – EASYTRAK ALPHA CONFIGURATION GUIDE

It is assumed that the Easytrak Alpha main program and USB drivers have been successfully installed and COM ports correctly set up.





FRONT AND BACK PANELS OF EASYTRAK ALPHA

EASYTRAK ALPHA CONSOLE CONFIGURATION EXAMPLES		
DESIRED CONFIGURATION	SETTINGS REQUIRED	
• Internal GPS Referenced	GPS ON	• Check from the SURVEY drop-down menu that GPS option is either AUTO (No external GPS plugged in) or Internal. • Check from the SURVEY drop-down menu that UTM Zones are set to AUTO, or set the desired Zone using MANUAL option.
• Compass ON (North referenced)	COMPASS	• Check from the SET UP drop-down menu that the COMPASS is enabled (ticked).
• Data Output – $GPRMC NMEA String	DATA OUTPUT	• From the SET UP drop-down menu, select DATA OUTPUT, then FORMAT, select $GPRMC option. To start output, ensure DATA OUTPUT ON is selected (ticked).
• Beacon 1 – Channel 10/2 type Transponder.	BEACON CONFIGURATION	• From the SET UP drop-down menu, select Beacon Configuration. Select channel 10/2 from the Combo-box and click the TRANSPONDER Radio button.
• Beacon 1 enabled	FUNCTION KEY F1	• Click F1 or press function key F1.

DESIRED CONFIGURATION	SETTINGS REQUIRED	
• Not GPS Referenced but local grid	GPS OFF	• From the SURVEY drop-down menu ensure that GPS option is OFF.
• Compass ON (North referenced)	COMPASS	• Check from the SET UP drop-down menu that the COMPASS is enabled (ticked).
• Data Output – Sonar	DATA OUTPUT	• From the SET UP drop-down menu, select DATA OUTPUT, then FORMAT, select SONAR option. To start output, ensure DATA OUTPUT ON is selected (ticked).
• Beacon 2 – Channel 10/4 type Transponder.	BEACON CONFIGURATION	• From the SET UP drop-down menu, select Beacon Configuration. Select channel 10/4 from the Combo-box and click the TRANSPONDER Radio button.

• Beacon 2 enabled	FUNCTION KEY F2	• Click F2 or press function key F2.

DESIRED CONFIGURATION	SETTINGS REQUIRED	
• Vessel Referenced X & Y	GPS OFF	• From the SURVEY drop-down menu ensure that GPS option is OFF.
• Compass OFF (Bow referenced)	COMPASS	• Check from the SET UP drop-down menu that the COMPASS is disabled (not ticked).
• Data Output – AAE	DATA OUTPUT	• From the SET UP drop-down menu, select DATA OUTPUT, then FORMAT, select AAE option. To start output, ensure DATA OUTPUT ON is selected (ticked).
• Beacon 3 – Channel 10/6 type Responder.	BEACON CONFIGURATION	• From the SET UP drop-down menu, select Beacon Configuration. Select channel 10/6 from the Combo-box and click the RESPONDER Radio button. Ensure a responder cable is connected between Alpha and the respective beacon.
• Beacon 3 enabled	FUNCTION KEY F3	• Click F3 or press function key F3.

APPENDIX B – DATA OUTPUT FORMATS

Note, the printer output configuration is set to 9600 baud, 8 data bits, 1 stop bit and no parity.

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 3)	i
Data type: Unsmoothed (1), 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

```
1,3,115906,**111.1,*-222.2,**333.3,*415.7,153.4,53.3,123.5,**0.4,*-0.6,000CL
```

"GPS" string

```
1,3,115906,500000.0,6500000.0,**333.3,*415.7,153.4,53.3,123.5,**0.4,*-0.6,000CL
```

Note * = space.

Error codes

Any error code is constructed by adding the following.

Interrogation has timed out	001
Outside velocity gate	032
GPS error	064
Reply signal overload	256

An error code of '000' means no error.

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*359.9**1234.5*-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	00
Lost signal	06

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

SONAR SSS DATA STRINGS

An output is provided for various Side Scan Sonars. This selection outputs three strings one immediately after the other - $GPGGA, $GPVTG, and $GPTLL.

The strings $GPGGA and $GPVTG provide the position and course over ground of the vessel, and 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.

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

SONAR DATA STRINGS / CONTINUED

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
Km/h	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,llll.llll,N,yyyyy.yy,E,EasytrakAlpha,hhmmss.ss,T,*HHCL

Description	String code
Header	$GPTLL
target number (1 - 3)	nn
Latitude ddmm.mmmm	l
North or South (N/S)	N
Longitude dddmm.mmmm	y
East or West (E/W)	E
System ID string	EasytrakAlpha
Hour	h
Minute	m
Second	s
Status (T=tracking, L= Lost)	T
Check Sum	H
Carriage return (CR)	C
Line feed	L

APPENDIX C – SYSTEM SPECIFICATION

SYSTEM PERFORMANCE

RANGE RESOLUTION	10cm.
POSITION ACCURACY	2.0° RMS, 3.5% of slant range. Excluding effects due to GPS error, incorrect VOS, ray bending, compass, pitch and roll effects, and acceptable S/N ratio.
HEADING SENSOR ACCURACY	<0.5° RMS
TILT SENSOR ACCURACY	Accuracy ± <1.0° RMS Range ± 80°
INTERNAL GPS / DGPS	SiRF Starlll Chip set Receiver <10m, 2D RMS <5m 2DRMS, SBAS (WAAS, EGNOS, MSAS…) corrected.

ELECTRICAL

POWER SUPPLY	Input: 115V AC – 230V AC ~ 47-63Hz typically 2A.
ALPHA COMMAND CONSOLE	Input: 12 –18V DC ⎓ up to 2A depending on input DC voltage.
RESPONDER OUTPUT	Positive 12V pulse 10ms long. BNC connector.
TRANSDUCER	MF Frequency band. Transducer beam pattern – Hemispherical. Interrogate power – Typically 186 re. 1µPa@1m
COMMUNICATIONS	All RS232C inputs should comply with EIA (Electronics Industry Association) RS232C standard.
EXTERNAL GPS / DGPS	NMEA; GLL, GGA, RMC.

MECHANICAL

DIMENSIONS	Enclosure 255 x 60 x 315 (mm). (W x H x D) (excluding cables) Transducer 370 x 100 diameter (mm). Cable 12.5 mm diameter, yellow polyurethane sheathed. Standard length is 20m.
WEIGHT	Enclosure 2.6Kg approx. Transducer 4.6Kg in air, 2.6Kg in water approx. Transducer housing Material – PVC.

MISCELLANEOUS

INTERROGATION INTERVAL	1, 2, 4 or 8 second intervals.
BEACON TYPES	Transponders and Responder (1).
CHANNELS	Please see appendix D.

ENVIRONMENT

OPERATING TEMPERATURE	-5 to 30°C.
STORAGE TEMPERATURE	-5 to 45°C.

Note: Specification is subject to change without notice

APPENDIX D – BEACON CHANNEL SPECIFICATION

AAE Channels

		Description	Interrogate F1	Interrogate F2	Reply	Misc.
10	1	EASYTRAK 200 & 900	18.500		28.000	TAT 30ms; PULSE WIDTH 2ms
10	2	EASYTRAK 200 & 900	19.500		26.000	TAT 30ms; PULSE WIDTH 2ms
10	3	EASYTRAK 200 & 900	20.500		29.000	TAT 30ms; PULSE WIDTH 2ms
10	4	EASYTRAK 200 & 900	21.500		27.000	TAT 30ms; PULSE WIDTH 2ms
10	6	EASYTRAK 900	18.000	20.000	27.000	TAT 60ms; PULSE WIDTH 2ms
11	3	EASYTRAK 900	21.000	18.000	27.000	TAT 60ms; PULSE WIDTH 2ms
11	4	EASYTRAK 900	21.000	20.000	26.000	TAT 60ms; PULSE WIDTH 2ms
11	7	EASYTRAK 900	22.000	18.000	26.000	TAT 60ms; PULSE WIDTH 2ms

TPII Channels

		Description	Interrogate F1	Interrogate F2	Reply	Misc.
1	9	TRACKPOINT	18.000		25.000	TAT 15ms; PULSE WIDTH 1.5ms
1	10	TRACKPOINT	16.000		25.000	TAT 15ms; PULSE WIDTH 1.5ms
2	10	TRACKPOINT	17.500		28.500	TAT 15ms; PULSE WIDTH 1.5ms
2	11	TRACKPOINT	18.500		26.500	TAT 15ms; PULSE WIDTH 1.5ms
3	0	TRACKPOINT	17.000		27.000	TAT 15ms; PULSE WIDTH 1.5ms
4	0	TRACKPOINT	19.000		29.000	TAT 15ms; PULSE WIDTH 1.5ms
6	0	TRACKPOINT	18.000		28.000	TAT 15ms; PULSE WIDTH 1.5ms
8	0	TRACKPOINT	21.000		29.000	TAT 15ms; PULSE WIDTH 1.5ms

HPR Channels

		Description	Interrogate F1	Interrogate F2	Reply	Misc.
0	7	HPR3	24.510		27.777	TAT 30ms; PULSE WIDTH 10ms
0	8	HPR3	25.000		28.409	TAT 30ms; PULSE WIDTH 10ms
1	6	HPR4	21.000	23.500	27.250	TAT 60ms; PULSE WIDTH 10ms
1	7	HPR4	21.000	24.000	27.750	TAT 60ms; PULSE WIDTH 10ms
2	1	HPR4	21.500	21.000	28.500	TAT 60ms; PULSE WIDTH 10ms
2	2	HPR3	22.727		28.409	TAT 30ms; PULSE WIDTH 10ms
2	6	HPR4	21.500	23.500	27.000	TAT 60ms; PULSE WIDTH 10ms
2	7	HPR4	21.500	24.000	27.500	TAT 60ms; PULSE WIDTH 10ms
3	6	HPR4	22.000	23.500	27.250	TAT 60ms; PULSE WIDTH 10ms
3	7	HPR4	22.000	24.000	27.750	TAT 60ms; PULSE WIDTH 10ms
4	1	HPR4	22.500	21.000	28.500	TAT 60ms; PULSE WIDTH 10ms
4	6	HPR4	22.500	23.500	27.000	TAT 60ms; PULSE WIDTH 10ms
4	7	HPR4	22.500	24.000	27.500	TAT 60ms; PULSE WIDTH 10ms
5	6	HPR4	23.000	23.500	27.250	TAT 60ms; PULSE WIDTH 10ms
5	7	HPR4	23.000	24.000	27.750	TAT 60ms; PULSE WIDTH 10ms

Frequencies F1, F2 and Reply are in kHz.

HPR Channels continued

6	1	HPR4	23.500	21.000	28.500	TAT 60ms; PULSE WIDTH 10ms
6	7	HPR4	23.500	24.000	27.500	TAT 60ms; PULSE WIDTH 10ms
7	6	HPR4	24.000	23.500	27.250	TAT 60ms; PULSE WIDTH 10ms
8	1	HPR4	24.500	21.000	28.500	TAT 60ms; PULSE WIDTH 10ms
8	6	HPR4	24.500	23.500	27.000	TAT 60ms; PULSE WIDTH 10ms
8	7	HPR4	24.500	24.000	27.500	TAT 60ms; PULSE WIDTH 10ms

Frequencies F1, F2 and Reply are in kHz.

Note: Specification is subject to change without notice

APPENDIX E – MINIMUM COMPUTER SPECIFICATION

The table below lists the recommended minimum specification for the computer to run the Easytrak Alpha program. Care should be taken if an attempt is made to run other programs at the same time, in case there is a conflict or overuse of resources.

DESCRIPTION	RECOMMENDED SPECIFICATION
PROCESSOR	Minimum 1.5GHz or faster
MEMORY	1GB
HARD DISK SPACE FREE	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 SP2 or Vista (Home or Professional) Windows 7

APPENDIX F – TROUBLESHOOTING

FAULT / SYMPTOM	**No Power light on the front panel of Easytrak Alpha**
POSSIBLE CAUSES	**The Power supply.** Is there power to the socket? The Power supply is not plugged into Alpha, or the Wall socket, or not switched on. **Defective power supply.** Measure the output voltage of the power supply, it should read approximately **18VDC;** if OK **faulty Alpha**.

FAULT / SYMPTOM	**"Easytrak Alpha Failed to Initialise" message is displayed**
POSSIBLE CAUSES	**Incorrect COM port has been selected.** Correct by going to Alpha dropdown menu *Set Up / Communication* and entering the correct COM port. View what ports were set up after Alpha installation. **Wiring fault.** Try replacing the USB cable.

FAULT / SYMPTOM	**No Signal return at any range**
POSSIBLE CAUSES	**Incorrect Channel.** Do the RECEIVE and TRANSMIT frequencies of the beacon agree with those of Alpha? **Beacon TX power.** This may be due to a discharged battery, fouled transducer, or beacon fault. Try with a known working beacon. **Obstruction.** The beacon's signal may be blocked by submerged parts of the vessel, seabed objects – manmade or natural. **Deck Cable.** Check that the deck cable or connectors have not been damaged. Look for cuts, splits or abrasions. Check there is no corrosion on the connector pins. **Damaged responder cable**. Check the pulse from Alpha is present at the Responder end of the cable (approx 12VDC pulse on load). **Confirmation**. Temporarily locate the transducer and a suitable beacon on-deck. Try interrogating the beacon. Is the transducer transmitting (clicking)? Is the beacon transmitting (clicking)? No, try another transducer / beacon. Is Easytrak Alpha receiving the beacon's transmission? No, move the beacon around the transducer in case the beacon is in a dead spot. If there is still no response the transducer is suspect.

FAULT / SYMPTOM	**Incorrect Range**
POSSIBLE CAUSES	**Incorrect Velocity of Sound.** Enter correct value. **Turn around delay.** Is the turn around delay set correctly in the beacon? Correct turn around delay. Alpha's turn around delay can be found in appendix D Beacon Specifications. Try another beacon in the water set to the same channel. Is another sonar system transmitting at the beacon's reply frequency?

APPENDIX F – TROUBLESHOOTING CONT/

FAULT / SYMPTOM	**Short range**
POSSIBLE CAUSE	**Attempting an excessive range for conditions.** Range is dependant on local conditions such as in-band noise from man-made and marine sources. If possible reduce noise or work at a shorter range. **Beacon reply insensitivity.** This may be due to a fouled transducer, or beacon fault. Clean beacon transducer with fresh water. Try using a known working beacon. **Transducer reply insensitivity.** Check that the transducer is not damaged or fouled. Clean the transducer with fresh water. **Obstruction.** The beacon's signal may be blocked by submerged parts of the vessel, seabed objects – man-made and natural. Bubbles of air and gas produced by the vessel's propeller. **Thermoclines.** This is due to abrupt changes of velocity of sound in water due to variances of water temperature and / or salinity. The effect of this can be to 'tunnel' or bend the acoustic signal away from either the target or the transducer. If possible try adjusting the height of the transducer in the water.

FAULT / SYMPTOM	**Bearing stable but incorrect**
POSSIBLE CAUSES	**Magnetic anomaly.** Strong magnetic anomalies can be beyond the calibration range of the internal compass. If a metal pole is being used to mount the transducer, make sure it is not made of iron or other magnetic material! If possible remove sources of local magnetic fields, or relocate the transducer, or set the transducer deeper in the water. **Dirty Transducer.** There may be grease or another substance on the transducer's surface. This can result is bearing errors due to refraction. Clean the transducer with fresh water. **Transducer damage.** The transducer may have been damaged by dropping or collision. This could result in the receive elements being displaced sufficiently to give incorrect bearings.

FAULT / SYMPTOM	**Unstable Compass**
POSSIBLE CAUSES	**Magnetic anomaly.** Strong magnetic anomalies can be beyond the calibration range of the internal compass. If possible remove sources of local magnetic fields, or relocate the transducer, or set the transducer deeper in the water. **Strumming.** Severe strumming can result in the compass giving an unstable bearing, pitch and roll. Tether transducer or pole with rope forward and aft to reduce strumming.

APPENDIX F – TROUBLESHOOTING CONT/

FAULT / SYMPTOM	**Unstable positions - bearing instability but range fairly stable**
POSSIBLE CAUSES	**Transducer depth.** Transducer may not be deep enough in the water. It is recommended the transducer be below the draft of the vessel by at least 1 metre. **Multipath interference.** This may be due to multipath interference close to the transducer or close to the target. It may be due to vessel movement especially if no form of compass compensation is being used. Adjust the height of the transducer in the water. **Movement.** If the transducer is free hanging over the side of the vessel, is the transducer being adversely affected by bow thrusters or alike? Relocate transducer. Tether transducer with rope forward and aft to reduce movement and rotation. **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. **Damaged receive element.** Select the dropdown menu Help/diagnostics (option 2) and check the relative signal levels and see if one (or more) element is very low relative to the other elements. Typically the faulty element would be < 0-5% compared to a 'good' element of '70% at a range of a few tens of metres.

FAULT / SYMPTOM	**Unstable positions - bearing instability and range unstable**
POSSIBLE CAUSES	**Transducer depth.** Transducer may not be deep enough in the water. It is recommended the transducer be below the draft of the vessel by at least 1 metre. **Interrogation rate too fast.** Beacon lock-out time may exceed interrogation rate. If the interrogation rate is too quick, it is possible that previous signal reflections may be received first. **Multipath interference.** 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. If possible try adjusting the height of the transducer in the water. **Acoustic noise.** 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 noise. Select the dropdown menu Help/diagnostics (option 2) and check the in-water noise level. **Electrical noise.** This can be conducted or radiated from generators, welding kits, radio communications, sonar systems etc. If possible, switch off equipment one system at a time until the offending piece of equipment can be identified. Select the dropdown menu Help/diagnostics (option 2) and check the in-water noise level.

APPENDIX F – TROUBLESHOOTING CONT/

FAULT / SYMPTOM	**External GPS Receiver not being seen by Easytrak Alpha**
POSSIBLE CAUSES	**Note it can sometimes take 20 - 30 minutes for a GPS receiver to initially derive a position, particularly if the receiver was previously used in a different part of the world.** **Menu configuration.** Ensure that Alpha's GPS configuration is set to AUTO or External. **No data from the GPS receiver**. Ensure the external GPS receiver is functioning correctly and outputting valid GPS data ($GPGGA and $GPRMC). **Incorrect baud rate.** Is the external GPS receiver set to 4800 baud, 8 data bits, 1 stop bit, and no parity? **Wiring error.** Confirm wiring conforms to the requirements of the pin outs in APPENDIX G. **Antenna.** Is the antenna connected to the external receiver? Is the antenna located clear of obstructions and can 'see' clearly from horizon to horizon? **Confirmation.** Confirmation of an output from the receiver can be determined by using a terminal emulation program.

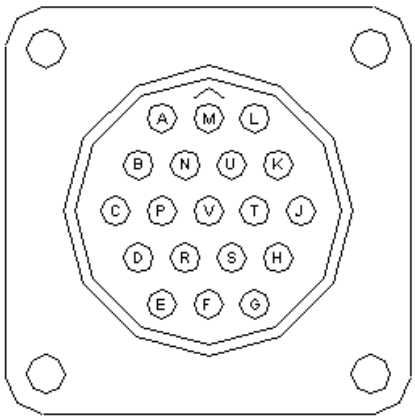
FAULT / SYMPTOM	**No valid data from the internal GPS receiver**
POSSIBLE CAUSES	**Note it can sometimes take 20 - 30 minutes for a GPS receiver to initially derive a position, particularly if the receiver was previously used in a different part of the world.** **Menu configuration.** Ensure that Alpha's GPS configuration is set to Internal or Auto if no External GPS receiver is connected. **Antenna.** Is the antenna connected to Easytrak Alpha? Is the antenna located clear of obstructions and can 'see' clearly from horizon to horizon? **Antenna damage.** Is the antenna or antenna cable visibly damaged? Replace antenna and cable.

FAULT / SYMPTOM	**No navigation data being outputted from Alpha Serial Port**
POSSIBLE CAUSES	**Menu configuration.** Ensure that Data Output is switched on (ticked) from the Set Up dropdown menu. Is the format of the output data set in Easytrak Alpha that required? **Incorrect baud rate.** Is the Navigation computer or serial printer baud rate set to receive data at 9600 baud, 8 data bits, 1 stop bit, and no parity? **Wiring error.** Confirm wiring conforms to the requirements of the pin outs in APPENDIX G. **Confirmation.** Confirmation of an output from Easytrak Alpha can be determined by using a terminal emulation program.

APPENDIX G – CONNECTOR PIN OUTS

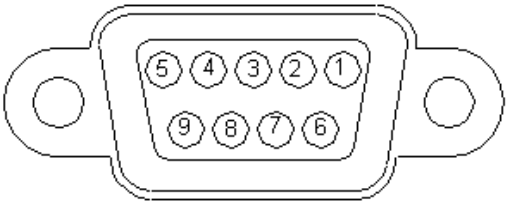
• TRANSDUCER CONNECTOR

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



• SERIAL CONNECTORS

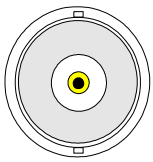
2	Receive Data (Rx)
3	Transmit Data (Tx)
5	Gnd



• BNC CONNECTOR

Inner	Signal +
Outer	Signal –

Note the BNC connector is isolated.



• POWER CONNECTOR

Inner	18VDC +
Outer	Ground

APPENDIX H - 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

EASYTRAK END CONNECTOR:

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

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

APPENDIX I - HANDLING

There are no special handling conditions with this product. For beacons, please see their specific manuals.

APPENDIX J - END OF LIFE 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.

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