



WinFrog

Integrated Navigation System

Copyright © 1993 by Fugro Pelagos, Inc.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior written permission of Fugro Pelagos, Inc.

Microsoft, Windows, Windows NT, Explorer, WordPad, NotePad, and Notebook are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

AutoCAD is a registered trademark of Autodesk, Inc.

ArcView is a registered trademark of Environmental Systems Research Institute, Inc.

Corel Draw is a registered trademark of Corel Corporation.

PageMaker is a registered trademark of Adobe Systems, Inc.

MapInfo is a registered trademark of MapInfo Corporation.

DigiBoard is a registered trademark of Digi International.

CrypKey is a registered trademark of CrypKey (Canada), Inc.

The installation program used to install WinFrog, INSTALL, is license software provided by InstallShield Software Corp., 900 National Parkway, Suite 125, Schaumburg, IL 60173-5108 (USA). INSTALL is Copyright © 1996-1997 by InstallShield Software Corp., which reserves all copyright protection worldwide. INSTALL is provided to you for the exclusive purpose of installing WinFrog. Fugro Pelagos, Inc. is exclusively responsible for the support of WinFrog, including any support during the installation phase. In no event will InstallShield Software Corp. provide any technical support for WinFrog.

WinFrog includes some components created by Blue Marble Geographics.



Printed in the United States of America

Fugro Pelagos Limited Hardware Liability Policy

Fugro Pelagos, Inc. shall not be liable for hardware problems related to systems that have not been supplied by Fugro Pelagos, Inc. Furthermore, Fugro Pelagos, Inc. shall assume no liability for and shall not warrant the compatibility or proper operation of hardware and software systems supplied by Fugro Pelagos, Inc. with other hardware not supplied by Fugro Pelagos, Inc.

Fugro Pelagos Software License Agreement

PLEASE CAREFULLY READ THE FOLLOWING TERMS AND CONDITIONS OF THIS LICENSE AGREEMENT ("AGREEMENT") BEFORE INSTALLING THE SOFTWARE. AS USED IN THIS AGREEMENT, "SOFTWARE" SHALL MEAN ANY PROGRAMS OR FILES INSTALLED FROM INSTALLATION CD(S), WHICH INCLUDES, BUT IS NOT LIMITED TO, NEW OR ORIGINAL COMPUTER PROGRAMS AND PROGRAM FILES, UPDATES, BUG FIXES, AND/OR CERTAIN DEVICE DRIVER PROGRAMS OBTAINED FROM FUGRO PELAGOS. "DOCUMENTATION" SHALL MEAN ANY USER DOCUMENTATION, INCLUDING, BUT NOT LIMITED TO, USER'S GUIDES AND MANUALS, ELECTRONIC VERSIONS OF USER'S GUIDES AND MANUALS, PRODUCT INFORMATION, AND/OR PRODUCT RELEASE NOTES. THE SOFTWARE AND ACCOMPANYING DOCUMENTATION ARE LICENSED (NOT SOLD) TO YOU BY FUGRO PELAGOS, EITHER DIRECTLY OR INDIRECTLY THROUGH AUTHORIZED RESELLERS OF FUGRO PELAGOS. YOU ASSUME RESPONSIBILITY FOR SELECTION OF THE SOFTWARE TO ACHIEVE YOUR INTENDED RESULTS AND FOR THE INSTALLATION, USE, AND RESULTS OBTAINED FROM THAT SOFTWARE.

License Grant

- A. In consideration of the License fee paid to Fugro Pelagos or to an authorized Fugro Pelagos reseller, Fugro Pelagos hereby grants you, and you accept, a nonexclusive License to use the Software on a single machine or device that executes, utilizes, or displays the Software, including, but not limited to, a server, client, or x-terminal such as a hardware device or software emulator ("Machine"), owned, leased, or otherwise controlled by you, and to use the Documentation under the terms stated in this Agreement. If a Software Security Key or other similar access code card or enabling device is provided to you by Fugro Pelagos, you agree to use same solely for accessing the Software on a single Machine. Title and ownership of the Software, Documentation, and/or Security Key remain with Fugro Pelagos or its suppliers.
- B. You, your employees, and/or agents are required to protect the confidentiality of the Software, Documentation, and/or Security Key (if a Security Key is provided). You may not distribute or otherwise make the Software or Documentation or Security Key available to any third party.
- C. You may not de-compile, reverse engineer, modify, or copy the Software or Documentation for any purpose, except you may copy the Software into machine-readable or printed form for backup purposes in the event the Software CDs are damaged or destroyed. You may combine the Software with other software. Any portion of the Software merged into or used in conjunction with other software will continue to be the property of Fugro Pelagos and subject to the terms and conditions of this Agreement.
- D. The Software and the Documentation are copyrighted by Fugro Pelagos and/or its suppliers. You agree to respect and not to remove or conceal from view any copyright, trademark, or confidentiality notices appearing on the Software and Documentation and to reproduce any such copyright, trademark, or confidentiality notices on all copies of the Software and Documentation or any portion thereof made by you as permitted hereunder and on all portions contained in or merged into other software and documentation.
- E. You may not transfer said License to another party without obtaining prior written approval from Fugro Pelagos. Such transfer shall only be valid if the other party agrees in writing to accept the terms and conditions of this Agreement. If said transfer is approved, you must, at the same time, either transfer all copies (whether in printed or machine-readable form) to the same party or destroy any copies not transferred; this includes all modifications and portions of the Software contained in or merged into other software.

YOU MAY NOT USE, COPY, MODIFY, OR TRANSFER THE SOFTWARE OR DOCUMENTATION OR SECURITY KEY, OR ANY COPY, MODIFICATION, OR MERGED PORTION, IN WHOLE OR IN PART, EXCEPT AS EXPRESSLY PROVIDED FOR IN THIS AGREEMENT.

IF YOU TRANSFER POSSESSION OF ANY COPY, MODIFICATION, OR MERGED PORTION OF THE SOFTWARE OR DOCUMENTATION OR SECURITY KEY TO ANOTHER PARTY, THE LICENSE IS AUTOMATICALLY TERMINATED.

Term

This Agreement is effective upon your opening of the software package and shall continue until terminated. You may terminate this Agreement at any time by destroying the Software, Documentation, and Security Key with all copies, modifications, and merged portions in any form. It will also terminate upon conditions set forth elsewhere in this Agreement if you fail to comply with any term or condition of this Agreement. You agree upon such termination to destroy the Software, Documentation, and Security Key together with all copies, modifications, and merged portions in any form.

Limited Warranty

During the first 90 days after receipt of the Software by you, as evidenced by a copy of your receipt, invoice or other proof of purchase (the "Warranty Period") Fugro Pelagos warrants, for your benefit alone, that the CD(s) on which the Software is furnished will be free from defects in materials and workmanship under normal use. All implied warranties, including those of merchantability and fitness for a particular purpose, shall be limited to the Warranty Period. EXCEPT AS SPECIFICALLY PROVIDED ABOVE, THE WARRANTIES PROVIDED HEREIN ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESS, IMPLIED, OR STATUTORY, INCLUDING, BUT NOT LIMITED TO, THE WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. SOME STATES DO NOT ALLOW THE EXCLUSION OF IMPLIED WARRANTIES, SO THE ABOVE EXCLUSION MAY NOT APPLY TO YOU.

FUGRO PELAGOS WILL NOT, IN ANY EVENT, BE LIABLE FOR INCIDENTAL, SPECIAL, OR CONSEQUENTIAL DAMAGES OF ANY KIND OR TYPE. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL AND CONSEQUENTIAL DAMAGES, SO THE ABOVE EXCLUSION MAY NOT APPLY TO YOU.

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS, WHICH MAY VARY FROM JURISDICTION TO JURISDICTION OR FROM STATE TO STATE.

Fugro Pelagos does not warrant that the functions contained within the Software will meet your requirements or that the operation of the Software will be uninterrupted or error free.

Limitations of Remedies

Fugro Pelagos' and/or its supplier's entire liability and your exclusive remedies under this Agreement are as follows:

A. Fugro Pelagos shall use commercially reasonable efforts to correct any defect in the Software which is reported by you, in writing to Fugro Pelagos, during the Warranty Period provided such defect can be re-created by Fugro Pelagos in an unmodified version of the Software. However, if Fugro Pelagos is unable to correct such defect within a reasonable amount of time, you may terminate this Agreement by returning the Software, Documentation, and Security Key to the place where you obtained them or to Fugro Pelagos for either replacement or, if so elected by Fugro Pelagos, refund of the amounts paid by you under this Agreement.

B. Fugro Pelagos shall replace any CD(s) not meeting Fugro Pelagos' "Limited Warranty" and which is returned to Fugro Pelagos with a copy of your receipt, invoice, or other proof of purchase or, if Fugro Pelagos is unable to deliver a replacement CD which is free from defects in materials or workmanship, you may terminate this Agreement by returning the Software, Documentation, and Security Key to the place where you obtained them or to Fugro Pelagos for either replacement or, if so elected by Fugro Pelagos, refund of amounts paid by you under this Agreement.

IN NO EVENT WILL FUGRO PELAGOS OR ITS SUPPLIERS BE LIABLE TO YOU FOR ANY DAMAGES, INCLUDING ANY LOST PROFITS, LOST SAVINGS, OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES, ARISING OUT OF THE USE OF OR INABILITY TO USE THE SOFTWARE EVEN IF FUGRO PELAGOS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, OR FOR ANY CLAIM BY ANY OTHER PARTY.

SOME JURISDICTIONS DO NOT ALLOW THE LIMITATION OR EXCLUSION OF LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

U.S. Government Restricted Rights

If the Software (including accompanying Documentation and Security Key, if any) is acquired on behalf of a unit or agency of the United States government, this provision applies. This Software: (a) was developed at private expense, and no part of it was developed with government funds; (b) is a trade secret for all purposes of the Freedom of Information Act; (c) is "commercial computer software" subject to limited utilization as provided in the contract between the vendor and the governmental entity; and (d) in all respects is proprietary data belonging solely to Fugro Pelagos, Inc. For units of the Department of Defense (DOD), this Software is supplied only with "Restricted Rights" as that term is defined in the DOD Supplement to the Federal Acquisition Regulations, 252.227-7014(a)(14) and:

Use, duplication, or disclosure by the Government is subject to restrictions as set forth in subdivision (a)(14) of the Rights in Noncommercial Computer Software and Noncommercial Computer Software Documentation clause at 252.227-7014.
Contractor: Fugro Pelagos, Inc., 3738 Ruffin Road, San Diego, CA 92123.

Governmental personnel using this Software, other than under a DOD contract or GSA schedule, are hereby on notice that use of this Software is subject to restricted rights, which are the same as or similar to those specified above.

General

You may not sub-license, assign, or transfer this License or the Software or Documentation or Security Key, except as expressly provided in this Agreement, and with written approval from Fugro Pelagos. Any attempt otherwise to sub-license, assign, or transfer any of the rights, duties, or obligations hereunder is void.

YOU ACKNOWLEDGE THAT YOU HAVE READ THIS LICENSE AGREEMENT, UNDERSTAND IT, AND AGREE TO BE BOUND BY ITS TERMS AND CONDITIONS. YOU FURTHER AGREE THAT IT IS THE COMPLETE AND EXCLUSIVE STATEMENT OF THIS AGREEMENT BETWEEN YOU AND FUGRO PELAGOS, WHICH SUPERSEDES ANY PRIOR PROPOSAL, REPRESENTATION, OR UNDERSTANDING (ORAL OR WRITTEN) BETWEEN US RELATING TO THE SOFTWARE. IN ADDITION, THIS AGREEMENT SUPERSEDES ANY PRIOR PROPOSAL, REPRESENTATION, OR UNDERSTANDING (ORAL OR WRITTEN) BETWEEN YOU AND PELAGOS CORPORATION (NOW FUGRO PELAGOS, INC.)

Table of Contents

1	Introduction
2	Configuration Overview
3	Configuring Geodetics & Units
4	Working Directories
5	Working Files
6	Vehicles
7	Peripheral (I/O) Devices
8	Operator Display Windows
9	Vehicle Data Source
10	Eventing
11	Utilities
12	Simulator
13	Positioning Using Range/Range Devices
14	GPS Calculations
15	Multi-Vehicle Positioning and Telemetry
16	Controlled Remote Tug Telemetry
17	LBL Acoustics
18	USBL Acoustics
19	Special Applications
20	LBL & USBL Calibrations
21	Basic Ribbit
Tutorial	Simulated Bathymetric Survey
Appendix A	Useful Geodetic/DGPS Reference Station Information
Appendix B	WinFrog Raw File Formats

Chapter 1: Introduction

Conventions Used in this Manual	1-1
Files	1-1
Common Reference Point (CRP)	1-2
Direction and Orientation	1-2
Abbreviations	1-2
Documentation Feedback	1-2
WinFrog Applications	1-3
WinFrog Features	1-3
Core Package	1-3
Extension Modules	1-4
WinFrog Licensing and Security	1-6
Enabling CrypKey Security in the Event of a Dongle Failure.....	1-6
To Enable an Emergency License	1-7
Installing WinFrog	1-9
To Install WinFrog from a CD	1-9
Starting WinFrog	1-9
To Launch WinFrog	1-9
Using WinFrog.....	1-11
Menu Bars	1-11
Dialog Boxes	1-11
Speed Toolbar	1-12
Lower Status Bar	1-16
Capture Screen.....	1-16
Hotkeys	1-17
Printing Features	1-17
Saving the Current System Configuration	1-21
To Save a System Configuration (.cfg) file	1-22
To Load a System Configuration (.cfg) File	1-22
WinFrog_3.ini file	1-22
Exiting WinFrog.....	1-23
To Exit WinFrog	1-23

Chapter 2: Configuration Overview

New Project Wizard	2-1
To Setup a New Project	2-1

Chapter 3: Configuring Geodetics & Units

Geodetics	3-1
To Configure the Geodetic Parameters	3-1
General Projection	3-3
Map Projections	3-4
To Configure a UTM Projection.....	3-5
To Configure a State Plan Coordinate System (SPCS) Projection	3-7
User Specific Projection Configuration.....	3-7
To Configure a Lambert Projection.....	3-8
To Configure the Local Coordinate System Projection	3-9
To Configure the Mercator (Clarke 1866 or WGS 84) Projection	3-10
To Configure an Oblique Mercator Projection	3-12
To Configure a Plant Grid Coordinate System Projection.....	3-13
To Configure the Lambert Projection for a Local Coordinate System.....	3-15
To Configure the Polar Stereographic Projection	3-15
To Configure a Station/Offset Coordinate System.....	3-16
To Configure a Transverse Mercator Projection.....	3-17
Ellipsoidal Datum Parameters	3-18
To Edit the Ellipsoidal Datum Parameters	3-18
Units.....	3-20
To Configure Units	3-20
WinFrog Line Tracking Process.....	3-23

Chapter 4: Working Directories

To Configure the Working Directories	4-1
The Working Directories Tab	4-1
To Change the Filing Directory.....	4-2

Chapter 5: Working Files

Selecting Working Files	5-2
Working Files Dialog Box	5-2
To Configure a Working File Using the Working Files Dialog Box	5-3
Creating and Selecting Less Common Working Files	5-4
To Create a .XPT, .CLS, .VEL, or .CET file	5-4
To Designate an Existing File as the Working File.....	5-5

To Create a .MKI file	5-5
Working Survey Lines (.PTS) File	5-6
To Create or Select the Working Survey Lines File	5-7
To Select a Track Route (.TRK) as the Survey Line	5-7
Editing the Contents of the Working Survey Lines File	5-7
To Edit the Working Survey Lines File	5-7
Creating a New Survey Line	5-8
To Create a New Survey Line	5-8
Overage Loop Option	5-10
To Apply an Overage Loop	5-10
Defining Curves in a Survey Line	5-12
Creating New Survey Lines Parallel to Existing Survey Lines	5-13
To Create Survey Lines Parallel to Existing Survey Lines	5-13
Creating a Grid of Survey Lines Around a Point	5-14
To Create a Grid of Survey Lines	5-14
Using the Kilometer Post Control in the Survey Line Dialog	5-16
Line Information	5-18
Event Control - SOL Event	5-18
Vessel Approach Alarm	5-18
Editing the Working Survey Lines File	5-19
To Edit the Working Survey Lines File	5-19
To Edit a Survey Line	5-19
Deleting a Survey Line	5-19
To Delete a Survey Line	5-19
Creating a Survey Line from the Working Waypts File	5-20
To Create a Survey Line from Waypoints in the Working Waypoints File	5-20
Creating a Survey Line from the Working Logs File	5-20
Tracking a Survey Line From the Working Survey Lines File	5-23
To Enable Survey Line Tracking	5-23
Working Waypoints (.WPT) File	5-23
Adding a Waypoint to the Working Waypoints (.WPT) File	5-24
To Create or Select the Working Waypoints File	5-24
Creating New Waypoints	5-24
To Create a New Waypoint from Within the Working Waypoints File	5-24
To Create a Waypoint Using the Graphics Window Shortcut	5-26
Editing the Contents of the Working Waypoints File	5-27
To Edit a Waypoint in the Working Waypoints File	5-27

Removing Waypoints from the Working Waypoints File.....	5-27
To Remove Waypoints from the Working Waypoints File.....	5-27
Tracking a Waypoint Contained in the Working Waypoints File.....	5-27
To Enable Waypoint Tracking	5-28
Working Data (.ALG) File	5-28
Creating or Selecting the Working Data (.ALG) File	5-29
To Create a New Working Data (.ALG) File	5-29
Adding a Data (.DAT) File to the Working Data (.ALG) File.....	5-30
To Add Existing Data (.DAT) Files to the Working Data (.ALG) File.....	5-30
Editing the Working Data (.ALG) File.....	5-32
To Edit Data Contained in the Working Data (.ALG) File	5-32
To Add data to the Working Data (.ALG) File	5-34
To Delete data from the Working Data (.ALG) File	5-34
Creating a Histogram of Data (.DAT) File Events	5-34
To Generate a Histogram of Offtrack Data from a Data (.DAT) File.....	5-34
Working Seismic Sources (.ASC) File.....	5-35
Creating the Working Seismic Sources (.ASC) File	5-35
To Create the Working Seismic Sources File.....	5-36
Adding Source Files to the Working Seismic Sources (.ASC) File	5-37
To Add Existing Source Files to the Working Seismic Sources File.....	5-37
To Configure WinFrog to Create Source (.SRC) Files.....	5-37
Editing the Working Seismic Sources (.ASC) File	5-38
To Edit Data Contained in the Working Seismic Sources (.ASC) File.....	5-39
To Add Data to the Working Seismic Sources (.ASC) File.....	5-40
To Delete Data from the Working Seismic Sources (.ASC) File	5-40
Creating a Histogram of the Source File Data	5-41
To Generate a Histogram of Offtrack Data in a Source (.SRC) File.....	5-41
Working Seismic Receivers (.ALL) File.....	5-41
Creating a New Working Seismic Receivers (.ALL) File.....	5-42
To Create a New Working Seismic Receivers (.ALL) File	5-42
Adding a .RCV File to the Working Seismic Receivers (.ALL) File	5-43
To Add Existing (.RCV) Files to the Working Seismic Receivers (.ALL) File	5-43
To Configure WinFrog to Create Receiver (.RCV) Files	5-44
Editing the Working Seismic Receivers (.ALL) File	5-46
Creating a Histogram of the Seismic Receivers (.ALL) File	5-49
To Generate a Histogram of Offtrack Data in a Receiver (.RCV) File	5-49

Working Logs File.....	5-49
To Create or Select the Working Logs (.LOG) File	5-49
Editing the Contents of the Working Logs File.....	5-50
To Edit the Contents of the Working Logs File	5-50
Deleting a Manual Event from the Working Logs File.....	5-51
To Remove a Manual Event.....	5-51
Working Picture (.PIC) File	5-51
To Create or Select the Working Picture File.....	5-52
Creating a Line in the Working Picture File	5-52
Creating a Circle in the Working Picture File.....	5-55
Importing Files.....	5-57
To import drawing files into WinFrog:	5-57
Editing the Working Picture File	5-58
To Edit the Working Picture File	5-58
Removing an Item from the Working Picture File.....	5-58
To Remove a Picture Point from the Working Picture File	5-58
Working Charts (.RML) File	5-59
To Load a New Working Chart (.RML/.BSB/.HDR) File	5-59
Working CRDD Database (.MDB) File	5-60
To Load a New CRDD Database (.MDB) File	5-60
To Edit the Working CRDD (.MDB) File	5-60
Working Transponders (.XPT) File	5-61
Overview of the Working Xponders Types	5-62
Working with Xponders Files (*.XPT).....	5-65
Editing the Working Xponders File	5-67
To Open the Working Xponders File.....	5-67
To Add a Transponder to the Working Xponders File.....	5-67
To Delete a Transponder from the Working Xponders File.....	5-68
To Edit a Transponder in the Working Xponders File.....	5-68
Special Case: Double Occupancy	5-69
To Configure the Fixed Transponder Networks.....	5-69
To Print the Transponder File	5-71
To View the Transponder File Summary.....	5-72
Editing Xponders.....	5-74
Editing Standard Xponders	5-75
Processing the Inclinator Data	5-87
To Print The Transponder Configuration	5-90

Editing Non-Standard Xponders	5-91
Working Control Stations (.CLS).....	5-99
Creating a Working Control Station (.CLS) File.....	5-99
To Create a New Working Control Stations File	5-99
To Add a Control Station to the Working Control Stations File.....	5-99
Editing the Working Control Stations File.....	5-101
To Edit Parameters in the Working Control Stations File	5-101
Removing a Control Station from the Working File.....	5-101
To Remove a Control Station from the Working Control Station File	5-101
Working Velocities (.VEL) File	5-101
Creating and Opening the Working Velocities File	5-102
To Create a New Velocity File.....	5-102
To Open a Velocities File	5-103
To Designate a Velocities File to be the Working Velocities File	5-103
Editing the Working Velocities File	5-103
To Open the Working Velocities File	5-103
To Add a Velocity Record to the Working Velocities File.	5-103
To Edit a Velocity Record in the Working Velocities File	5-104
To Delete a Velocity Record in the Working Velocities File.....	5-105
Printing a Working Velocities File.....	5-105
Viewing a Velocities File Graphically	5-105
Working Cable Events (.CET) File.....	5-107
Creating the Working Cable Events File	5-107
To Create a New Working Cable Events File	5-107
Editing the Working Cable Events File	5-107
To Edit the Contents of the Working Cable Events File.....	5-108
Deleting a Cable Event.....	5-110
To Remove a Cable Event	5-110
To Add a Cable Event to the Working Cable Events File.	5-110

Chapter 6: Vehicles

Adding a Vehicle	6-1
To Add a Vehicle to WinFrog.....	6-1
Configuring a Vehicle	6-2
Vehicle Presentation	6-3
To Display the Vehicle Presentation Window	6-3
Configure Vehicle Outline	6-7
To Configure a Vehicle's Outline.....	6-7

To Define a Vehicle's Dimensions	6-9
To Define a Moonpool.....	6-9
To Define a Vehicle's Outline using the Outline Entry Method	6-9
To Define a Vehicle's Outline using the Graphical Entry Method	6-11
MSEditor	6-13
Configure Vehicle-Devices	6-16
To Configure a Vehicle's Devices	6-17
Configure Tracking Offsets	6-22
To Configure Tracking Offsets	6-22
Configure Fairleads/Anchors.....	6-23
To Configure Fairleads and Anchors	6-24
Setup Vehicle Rings.....	6-25
To Setup Vehicle Rings.....	6-25
Setup Waypoint Tracking.....	6-26
To Setup Waypoint Tracking	6-26
Setup Line Tracking.....	6-29
To Configure a Vehicle to Track a Survey Line	6-29
Setup Dynamic Tracking.....	6-31
To Setup Dynamic Tracking Vehicles and Tracking Points	6-31
To View the Dynamic Tracking Information	6-35
Acoustic Calibration.....	6-37
Setup Data Events	6-37
Deleting a Vehicle	6-37
To Delete a Vehicle	6-37

Chapter 7: Peripheral (I/O) Devices

Adding a Device	7-1
To Add a Device to WinFrog	7-2
Device I/O Parameters Dialog Box	7-4
NovAtel PC Card	7-6
Editing Device Input/Output Parameters	7-7
To Edit WinFrog's Input/Output Parameters for a Device	7-8
Configuring Generic Device Parameters	7-8
To Configure Generic Device Parameters	7-9
Enabling the Timeout Warning.....	7-9
To Enable or Disable the Timeout Warning for a Device	7-9
Deleting a Device	7-10
To Delete a Device	7-10

Time Synchronization.....	7-11
Adding I/O Socket Devices.....	7-13
Configuring Socket Devices	7-13
To Configure the I/O device "WriteToSocket"	7-13
To Configure the I/O device "ReadSocket"	7-14

Chapter 8: Operator Display Windows

Maximizing Available Monitor Space.....	8-2
To Maximize Available Monitor Space.....	8-2
Virtual Screen Configuration	8-2
To Configure Virtual Screens	8-3
I/O Devices Window	8-5
To Display the I/O Devices Window.....	8-5
Graphics Window.....	8-6
To Display a Graphics Window	8-7
To Configure the Graphics Window.....	8-7
Charts	8-21
To Display a Raster Chart - Method 1	8-21
To Display a Raster Chart - Method 2	8-23
Raster Chart Viewing Tips/Hints.....	8-23
To Center the Graphics Display at the Middle of the Chart.....	8-25
ARCS Charts.....	8-26
To Display an ARCS Chart Using 2 CD-ROM Drives	8-26
To Display an ARCS Chart by Copying the Chart CD to the Hard Drive.....	8-28
To Display an ARCS Chart by Copying Update Directories to the Hard Drive	8-29
Troubleshooting Chart Problems.....	8-32
Blue Marble Map File Support.....	8-33
To Display a Blue Marble Map File	8-33
User Drawing Support	8-35
To Draw Graphic Objects When a Blue Marble Map (BMM) File is Displayed	8-35
To Draw Graphic Objects on an Existing Blue Marble Layer File (BML)	8-36
To Draw Graphic Objects on an Empty Background	8-37
To Save Graphic Objects to a Blue Marble Layer File	8-39
To Append Graphic Objects to a Blue Marble Layer (BML) File	8-40
To Edit User-Drawn Graphic Objects.....	8-40
Displaying a C-Map Vector Chart in WinFrog	8-41
To Display a C-Map Vector Chart.....	8-41
C-Map Vector Chart Feature Levels	8-43

To Bypass the Default Precision Value Associated with an Entered Scale	8-44
To Use WinFrog's Map Projection	8-44
To Indicate Illumination	8-45
Profile Window.....	8-45
To Display the Profile Window	8-45
To Configure the Profile Window	8-46
Profile Window Toolbar.....	8-53
Vehicle Text Window.....	8-55
To View the Vehicle Text Window	8-56
To Configure the Vehicle Text Window.....	8-56
To Remove a Vehicle's Data from Display in the Vehicle Text Window	8-60
Acoustics Window	8-60
To Display the Acoustics Window.....	8-60
Anchor Handling Window	8-82
To Configure a Vehicle as a Barge Vehicle	8-82
To Display and Configure the Anchor Handling Window.....	8-84
To Configure the Anchor Event Printing	8-89
Alarms Window	8-90
To Display the Alarms Window	8-90
To Configure Alarms.....	8-90
Attitude Window	8-92
To Display the Attitude Window	8-92
Auditor Window	8-94
To Display the Auditor Window	8-94
To Re-Open the Auditor Window	8-95
Bird's Eye Window	8-96
To Display the Bird's Eye Window	8-96
To Configure the Bird's Eye Window	8-97
Calculations Window	8-97
To Display a Calculations Window.....	8-98
To Configure the Calculations Window	8-98
To Perform a Position Comparison	8-100
To Configure a Position Comparison Histogram.....	8-102
To Configure the Time Series Graph	8-103
Controlled Remote Window	8-105
Distance Counter Window	8-106
To Display the Distance Counter Window	8-106

Dynamic Tracking Window	8-107
To Display the Dynamic Tracking Window.....	8-107
Helmsman Display	8-108
To View the Helmsman Display.....	8-108
To Configure the Helmsman Display	8-109
Level Bubble Window	8-110
To Display a Level Bubble Window.....	8-110
To Configure the Level Bubble Window	8-111
Numerics Display.....	8-112
To View the Numerics Display.....	8-112
To Configure the Numerics Display	8-112
To Add an Item to the Numerics Display	8-114
Smart Remote Control.....	8-115
Network Communications.....	8-115
Remote Position Data Reception	8-116
Remote Configuration	8-117
Master WinFrog Operation.....	8-118
Tracking Offsets Window.....	8-121
To Display the Tracking Offsets Window	8-122
Cable Model Windows	8-122

Chapter 9: Vehicle Data Source

To Configure a Vehicle's Data Source.....	9-2
Simulated Data Source Configuration.....	9-3
Network Data Source Configuration	9-4
To Manually Configure a Smart Remote.....	9-5
To Configure the Primary System for Network Data Output	9-7
Controlled Remote Data Configuration	9-8
Real-Time Data Source Configuration.....	9-8
Adding a Peripheral Device to a WinFrog Vehicle.....	9-8
To Add Data Generated by Peripheral Devices to a WinFrog Vehicle.....	9-9
Editing a Vehicle's Peripheral Devices.....	9-9
To Edit the Configuration of an I/O Device Once Added to a Vehicle.....	9-10
Deleting a Vehicle's Peripheral Device.....	9-10
To Remove a Device from a Vehicle's Calculations	9-10
File Data Source Configuration	9-11
To Use .raw File Data as a Position Source	9-11

Pipe Track Data Source Configuration	9-14
To Configure Touchdown Point Positioning Based on a Layback From a Reference Vehicle	9-15

Chapter 10: Eventing

Types of WinFrog Events	10-1
Automatic Events	10-1
Manual Event	10-2
Cable Events.....	10-3
Configuring Vehicles for Automatic Events	10-4
To Configure a Vehicle as Event Primary	10-4
To Configure a Vehicle as Event Secondary.....	10-5
Enabling and Activating Automatic Events.....	10-5
To Enable Automatic Event Recording	10-5
To Configure the Event Secondary Configuration Dialog Box.....	10-15
To Configure the Distance Fixing Dialog Box.....	10-17
To Activate Data Recording	10-19
To Stop Recording Data	10-20
Manual Events	10-20
To Record a Manual Event	10-21
To Edit a Manual Event After it has been Recorded.....	10-22
Cable Events.....	10-22
To Record a Cable Event	10-22
To Edit a Cable Event After it has been Recorded	10-24

Chapter 11: Utilities

Geo/Grid Conversion.....	11-3
To Convert Geographic Coordinates to Grid Coordinates	11-3
To Convert from Grid Coordinates to Geographic Coordinates	11-4
KP/Coordinate Conversion	11-4
To Convert KP Values to Geographical/Grid Coordinates	11-4
To Convert Geographical/Grid Coordinates to KP Values	11-6
Datum Transformations	11-7
To Convert Coordinates from WGS84 to the Working Datum	11-7
To Convert Working Geodetic Datum Coordinates to WGS84	11-8
Forward/Inverse Calculations	11-8
To Calculate the Range and Bearing from One Known Point to Another Known Point	11-9
To Calculate the Coordinates of a Point by Entering a Range and Bearing from a Known Coordinate	11-10

LOP/Position Calculation	11-11
To Access LOP/Position Calculation	11-11
Acoustic Utilities	11-19
Map Wizard.....	11-20
To Create a BMM map file.....	11-20
Plotter Base Map Wizard	11-25
To Add The Plotter to WinFrog.....	11-25
To Generate a New Base Map	11-25
To Register an Existing Map and Plot to it in Real Time.....	11-30
Generate DXF Map.....	11-34
To Create a .DXF Format Map	11-34
Map Parameters Dialog Box	11-36
Select Grids Dialog Box	11-37
Select Data Dialog Box	11-39
Select RAW Data Dialog Box	11-42
To Plot Raw Positional Data in the DXF Map	11-42
Generate MGD77 File	11-44
File Formats	11-44
Header Page Buttons	11-47
Time Period Data.....	11-50
Time Conversion	11-50
To Convert DOS Time to ASCII Time.....	11-50
To Convert ASCII Time to DOS Time:.....	11-51
Position Averaging.....	11-51
To Record Vehicle Positions into an .aep File	11-52
To Record an .aep File.....	11-52
To Load and View Average Position Data	11-53
To Edit and Re-Calculate Average Position Data	11-55
To Print and Save Average Position Data	11-56
Import Bathymetry	11-56
 Chapter 12: Simulator	
Simulated Devices.....	12-2
To Set the Vehicle Data Source to Simulated	12-2
To Add a Simulated Real-Time Device	12-2
To “Generically” Configure a Simulated Device.....	12-3
To Configure the Simulated GPS Device	12-3
To Configure the Simulated USBL Device	12-4

To Configure the Plow Simulator.....	12-5
To Configure the Simulated Counter	12-6
To Configure the Simulated Attitude Sensor	12-7
To Add a Simulated Real-time Device to a Vehicle.....	12-8
To Configure a Simulated Real-time Device for a Specific Vehicle	12-8
Controlling Simulated Devices	12-9
Controlling the Simulated Devices Via The Toolbar Buttons.....	12-9
To Configure the Toolbar Button Controls	12-9
Toolbar Simulator Controls	12-11
To Use the Toolbar Simulator Control Buttons	12-11
 Chapter 13: Positioning Using Range/Range Devices	
Working Control Station File	13-1
Range/Range Devices	13-2
To Add a Range/Range Peripheral I/O Device	13-2
To Add a Range/Range I/O Device to a Vehicle.....	13-2
Configuration of a Range/Range Device	13-3
To Configure the Range/Range Device	13-3
To Add a Station to the Solution.....	13-5
To Remove a Station from the Solution	13-6
Editing Range Use in the Solution.....	13-6
To Monitor Range/Range Data in the Calculations Window	13-7
 Chapter 14: GPS Calculations Extension Module	
Pseudorange Positioning.....	14-1
Differential GPS (DGPS)	14-3
RTCM Data.....	14-4
DGPS Solutions in WinFrog.....	14-4
To Configure GPS Calculations	14-5
To Add a GPS Device to WinFrog	14-5
To Generically Configure a GPS Device.....	14-6
To Add a GPS Device's Data Items to a WinFrog Vehicle's Devices List.....	14-7
To Configure a GPS Device for a Vehicle Using GPS Calcs Module	14-8
To Configure the Phase Smoothing Filter	14-13
Applying RTCM Corrections to WinFrog Pseudorange Position	
Calculations	14-14
To Add RTCM Device(s) to WinFrog.....	14-15
To Add an RTCM Device to a Vehicle's Device List	14-16

To Configure an RTCM Device in a Vehicle's Device List for use with the GPS Calcs Module	14-16
To Enable/Remove an RTCM Source in WinFrog's Pseudorange Calculations	14-18
Alarms.....	14-19
To Configure Alarms	14-21
UKOOA Statistical Testing	14-23
w-Test	14-23
F-Test	14-23
To Configure Statistical Tests	14-24
Monitoring of Statistical Tests	14-25
To Display the Results of the Statistical Testing.....	14-25
GPS Pod Positioning	14-25
To Track a GPS Pod in WinFrog.....	14-25
GPS Calculation Displays	14-27
To View Pseudorange Calculation Data	14-27
Multi-Ref Summary Page	14-29
Individual Reference Station Display Page(s)	14-30
To Display Pseudorange Calculation Results in the Calculations Dialog Box.....	14-30
To Display Pseudorange Calculation Data in the Calculations Dialog Box.....	14-33
To Display Pseudorange Calculation Statistics in the Calculations Dialog Box.....	14-36
Reference Station Integrity Monitoring (RSIM) Features.....	14-39
Reference Station Configurations	14-39
Single Reference Station Component Configuration	14-41
To Configure a GPS Receiver for DGPS Positioning.....	14-42
Use of RSIM at the Remote Station.....	14-46
To Configure a Remote Station to Use RTCM/ RSIM Data	14-48
To Turn on the Audible and Visual Alarms.	14-49

Chapter 15: Multi-Vehicle Positioning and Telemetry Extension Module

Network Functionality	15-2
Token Ring Network	15-2
Point-to-Point Network	15-3
Data Packet Types	15-4
Telemetry Setup	15-5
To Add the Telemetry Device	15-5
To Configure the Telemetry Device.....	15-6
I/O Devices Dialog Box.....	15-15

To Toggle Between Standard Telemetry and RTCM Displays	15-16
Transmitting/Receiving Positions	15-18
To Configure WinFrog to Transmit Position Information	15-18
To Configure WinFrog to Receive a Position.....	15-19
Transmitting/Receiving Targets.....	15-20
To Configure WinFrog to Transmit a Target Position	15-21
To Configure WinFrog to Receive a Target Position	15-22
Transmitting/Receiving RTCM Corrections	15-22
To Configure WinFrog to Transmit RTCM Corrections	15-22
To Configure a WinFrog Station to Receive and Apply RTCM Corrections.....	15-24
File Transfer	15-24
To Send a File via Telemetry	15-24
Receiving a File	15-28
To Change the WinFrog Telemetry Directory.....	15-28

Chapter 16: Controlled Remote Tug Telemetry

Overview	16-1
Security.....	16-4
Remote Sites.....	16-4
WinFrog with the Controlled Remote Tug Telemetry Module versus the WinFrog Remote Package.....	16-4
Remote Control with Telemetry versus TCP/IP Network	16-5
Configuring a Remote Site	16-5
To Configure a Remote Site	16-5
Remote Site Operation	16-8
Control Sites	16-9
Operation Overview	16-9
The Controlled Remote Window	16-10
To Add and Configure a Controlled Remote in the Controller's Vehicle List.....	16-11
To Connect to a Remote	16-13
To Disconnect from a Remote	16-17
To Configure the Vehicle List for the Remote	16-17
To Display the Remote Graphics at the Controller	16-19
To Send a Working File to the Remote.....	16-20
To Force an Update of the Configuration of the Vehicles on the Remote's Vehicle List	16-21
To Interrogate the Remote Vehicle Data Type List and Configuration.....	16-22
To Query the Remote Vehicle and System for Configurations	16-22

To Set the Remote's Data Transmission Rate	16-23
Monitoring and Configuring the Remote Vehicle and Graphics.....	16-24
To Configure the Remote from the Controlled Remote Window	16-24
To Interrogate the Remote from the Controlled Remote Window	16-25
Remote Control and Anchor Handling Operations	16-40
Operating Restrictions	16-40

Chapter 17: LBL Acoustics

Overview	17-1
Components	17-2
The Data	17-2
Fixed Transponder Arrays and the Working Xponder File.....	17-3
Non-Fixed Transponders and the Working Xponder File	17-4
Inverted LBL and the Working Xponder File.....	17-4
Velocity Files	17-4
Operational Modes.....	17-5
Data Items	17-6
Standard LBL Setup	17-8
To Add the LBL Device to WinFrog.....	17-8
To Configure the LBL Device	17-9
To Attach and Configure the LBL TRANSCEIVER Data Item.....	17-9
To Attach and Configure the XPONDER Data Item	17-18
To Attach and Configure the FIXED XPONDER Data Item.....	17-31
To Attach and Configure the ELEVATION Data Item	17-34
To Attach and Configure the ATTITUDE Data Item	17-36
Differential Depth Operation.....	17-37
To Implement the Differential Depth for Standard Simultaneous Positioning Operations.....	17-38
To Implement the Differential Depth for CRP Depth from Other Source Positioning Operations.....	17-38
To Implement the Differential Depth for Monitoring Depth/Attitude Operations.....	17-40
Monitoring the Standard LBL and Differential Depth Operations	17-41
To Monitor LBL Operations in the Calculation Window.....	17-41
Using the LBL Data Items Calculation Window for XPONDER and LBL TRANSCEIVER.....	17-42
Using the LBL Data Items Calculation Window for XPONDER, Depth and Attitude Only	17-47

Using the LBL Data Items Calculation Window for FIXED XPONDER	17-50
Inverted LBL Application	17-51
Overview.....	17-51
Adding the INVERTED LBL Device	17-52
Attaching Data items to the Vehicle.....	17-54
To Monitor INVERTED LBL Operations in the Calculation Window	17-65
Understanding and Using the INVERTED LBL Data Items Calculation Window.....	17-66
Editing an LBL LOP	17-75
Edit LBL Range	17-75
 Chapter 18: USBL Acoustics	
Overview	18-2
Components.....	18-2
The Data	18-2
Application.....	18-3
Attitude Data and Offsets for the Hydrophone	18-3
Attitude Data and Offsets for the Beacon	18-4
USBL Data Types.....	18-4
General USBL Setup	18-5
To Add the USBL Device to WinFrog.....	18-5
To Generically Configure a USBL Device in WinFrog	18-7
To Attach and Configure the USBL HYDROPHONE Data Type	18-7
To Attach and Configure the BEACON Data Type.....	18-13
To Attach and Configure the ATTITUDE Data Type.....	18-17
To Attach and Configure the HEADING Data Type	18-19
To Monitor the HYDROPHONE Data Type.....	18-20
To Monitor the BEACON Data Type.....	18-21
Specific USBL Setups	18-23
To Configure for Positioning the Hydrophone Vehicle	18-23
To Configure for Only Tracking the Beacon Vehicle.....	18-24
To Configure for Relative USBL Beacon Positioning for a Vehicle	18-26
To Configure for Ray Bending	18-26
 Chapter 19: Special Applications	
Doppler Speed Log.....	19-1
General Kalman Filtering	19-1

Gyro Requirements	19-2
Adding the Speed Log to WinFrog and the Vehicle	19-2
To Add the Speed Log Device	19-2
Configuring the SPEED LOG Data Type.....	19-3
Associated Configurations	19-4
Monitoring the Application of the Speed Log	19-7
To Monitor Use of the Speed Log Data Type as Attached to the Vehicle	19-7
To Monitor the Impact of the SPEED LOG Data Type	19-9
To Reset the Vehicle's Position	19-9
Calibrating the SPEED LOG Data Type	19-10
Pipe Bundle Tow Monitoring	19-14
The Pipe Bundle Traverse	19-14
Adding and Configuring the Device.....	19-15
Configuring the Pipe Bundle Vehicle	19-17
Viewing the Pipe Bundle Vehicle	19-22

Chapter 20: LBL & USBL Calibration

LBL Calibrations	20-1
LBL Transponder Array Design	20-2
LBL Transponder Deployment.....	20-3
LBL Calibration Preparation.....	20-3
LBL Calibration Data Collection.....	20-5
To Access the Acoustic Calibration Dialog	20-5
To Initiate Data Collection of Surface Range Data.....	20-16
LBL Calibration Data Editing.....	20-21
To evaluate the residuals to detect bad data	20-46
How WinFrog Bins the Data	20-47
LBL Calibration Calculations.....	20-50
To Setup the LBL Calibration Solution	20-51
To Enter Constraints for the Least Squares Adjustment.....	20-55
To Calculate the LBL Calibration Solution	20-58
Viewing the LBL Solution Statistics	20-65
Editing Calibration Station Information.....	20-68
To Edit a Calibration Base Station	20-69
To Remove a Calibration Base Station	20-71
To Edit a Working Xponder File Station	20-71
To Add a Working Xponder File Station	20-72

To Update a Calibration Base Station	20-72
To Complete the Base Station Editing	20-73
LBL Calibration Report.....	20-73
To Print an LBL Calibration Report	20-73
Recalculate LBL Data.....	20-80
Summary of the LBL Calibration Process	20-83
USBL Calibrations.....	20-84
USBL Calibration Preparation	20-85
Key Points to Review Prior to USBL Calibration	20-85
The Acoustic Calibration Dialog for Data Collection.....	20-87
To Access the Acoustic Calibration Dialog	20-87
USBL Calibration Data Collection.....	20-92
To Configure the Transducer Settings.....	20-98
To Collect USBL Calibration Data.....	20-100
To Save Calibration Data to File.....	20-101
USBL Calibration Data Editing.....	20-102
To View USBL Calibration Data for Editing.....	20-102
USBL Calibration Processing.....	20-115
To Setup for the Determination of the Beacon Position.....	20-117
To Perform the Adjustment.....	20-124
USBL Calibration Reporting.....	20-134
Recalculation of the USBL Data	20-139
Reset the USBL Calibration Data	20-140
Updating the USBL Calibration.....	20-141
To Update the USBL Calibration Data in WinFrog	20-142
Confirmation Tests	20-142
To Confirm the USBL Calibration Results.....	20-142
Summary of the USBL Calibration Process	20-143

Chapter 21: Basic Ribbit

Introduction.....	21-1
An Overview of Ribbit	21-2
Start Up.....	21-2
Status Window	21-2
Audit Trail “Notepad”	21-3
Menu Items	21-4

Data Input	21-6
Raw (.Raw) Files	21-6
Loading Raw (.Raw) Data Files.....	21-7
To Load WinFrog Raw (.raw) Files	21-7
To Manually Select .Raw Files	21-8
To Select .Raw Files by Time	21-9
Data (.Dat, .Rcv, .Src) Files	21-10
To Load .Dat, .Rcv and .Src Data Files	21-11
Manual Event (.Log) Files	21-11
To Load Manual Event (.Log) Files.....	21-11
XYZ Data.....	21-11
Loading Tide Files	21-13
ASCII Files	21-13
To Load an ASCII Tide File	21-14
World Tide (.Tab) Files	21-14
To Load a World Tide (.Tab) File	21-14
NOAA Tide Files	21-15
To Load a NOAA (.Tid) Tide File	21-15
MS Access (.Mdb) Data.....	21-16
To Load an MS Access (.Mdb) File.....	21-16
Tools.....	21-17
Data Operations	21-17
To Perform Data Operations	21-17
Merging / Deskewing.....	21-19
To Merge Data Items.....	21-19
Interpolation	21-21
To Interpolate Data	21-21
Apply Corrections	21-22
To Apply a Correction to a Data Item.....	21-22
Filtering & Thinning.....	21-24
To Thin Out a Data Item.....	21-24
To Filter a Data Item.....	21-26
To Apply a Gate Filter to a Data Item	21-26
To Apply a Mean Filter to a Data Item	21-27
To Apply a Median Filter to a Data Item.....	21-27
To Apply a Central Tendency Filter	21-28
Configure/Transform Geodetics	21-29

To Change a Data Item's Geodetics.....	21-29
Apply Offsets	21-30
To Apply a Horizontal Offset to a Positional Data Item.....	21-30
Overplot Removal.....	21-31
To Apply Overplot Removal to a Three Dimensional Data Item	21-32
Interactive Data Editor.....	21-33
To Edit a Data Item using the Interactive Data Editor	21-33
Spreadsheet Editor.....	21-35
To Edit a Data Item Using the Spreadsheet Editor	21-35
Data Output	21-36
ASCII File Output.....	21-37
To Output Data as ASCII Text	21-37
DXF File Output	21-38
To Create a DXF Chart	21-39
DXF File Output Font Options	21-46
MS Access™ .MDB File Output	21-47
To Output Data to a .MDB File.....	21-47

Tutorial: Simulated Bathymetric Survey

Procedural Steps.....	T-1
Sample Project.....	T-2
First Steps.....	T-3
Geodetics	T-3
To Configure Geodetics	T-4
Units of Measure	T-6
To Configure Units of Measure	T-6
Working Directories.....	T-8
Working Files	T-9
To Define the Working Files	T-9
I/O Devices (Peripheral Devices).....	T-11
To Add Peripheral Devices to WinFrog.....	T-11
Viewing the I/O Device Data.....	T-13
To View the I/O Devices Window.....	T-14
Configure the Vehicle.....	T-15
To Configure a Vehicle.....	T-15
Vehicle Dimensions	T-17
To Configure a Vehicle's Dimensions	T-17

Defining the Vehicle's Data Source and Devices	T-18
To Define the Vehicle's Data Source.....	T-19
Vehicle Tracking Offsets	T-23
Vehicle Text Window	T-25
To Display the Vehicle Text window	T-25
To Configure the Vehicle Text Window	T-26
Graphics Window/Display	T-27
To Display the Graphics Window	T-27
To Configure a Graphics Window	T-28
Graphics Display Zooming.....	T-29
To Zoom Out.....	T-30
To Zoom In.....	T-30
Vehicle Navigation in Simulation Mode	T-30
To Change the Position of the Vehicle.....	T-30
To Change a Vehicle's Position Using the Display Position Feature	T-31
Driving the Vehicle in Simulation Mode.....	T-31
To Configure the Simulator	T-31
To Drive the Vehicle in Simulation Mode.....	T-32
Survey Lines and Waypoints	T-32
Survey Lines	T-33
To Create New Survey Lines.....	T-34
To Create Survey Lines Parallel to an Existing Survey Line	T-36
Waypoints.....	T-37
To Create New Waypoints	T-37
Tracking a Waypoint.....	T-39
To Track a Waypoint	T-39
Collecting Data: Events.....	T-40
Automatic Eventing.....	T-40
Raw Data.....	T-41
Manual Fixing	T-42
Configuring a Vehicle for Automatic Events	T-43
To Define the Event Primary Vehicle.....	T-44
Configuring Automatic Events	T-45
To Configure Automatic Events	T-45
Eventing is Active	T-48
Tracking up the Screen	T-49
To Change the Rotation of the Graphics Display.....	T-49

Attitude	T-49
To View the Attitude Display	T-49
Starting to Record Automatic Events with Autostart	T-50
To Record Automatic Events with Autostart Activated	T-50
Stopping/Re-starting Eventing	T-51
To Stop Eventing	T-51
To Re-start Eventing	T-51
Checking the Survey Data	T-51
To Check the Recorded (.DAT) Data	T-52
To Check the Raw (.RAW) Data	T-52
Completing the Survey	T-52