4 DATABASE

Select *Execute* | *Database* from the main menu or click on the *Database* button. Select the line from the list of lines in the project. The database window will be displayed.

There is no limit to the number of database windows which can be displayed simultaneously. This facilitates the browsing and /or editing of data and enhances the analytical functionality of the program.

The database is a relational database and popup lists are provided where data is related to another table, and where the attributes are drawn from a fixed list. *Manually changing data where popup lists are provided will lead to serious errors.*

The various data tables are described below under Menu.

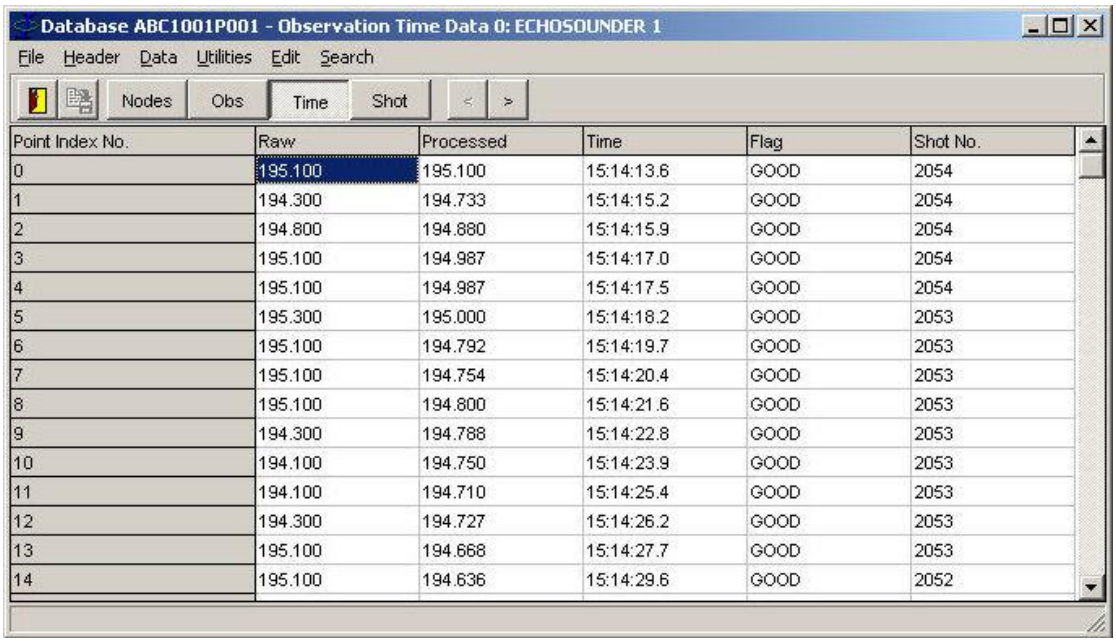


Figure 4-1

4.1 Tables and Functions

The various tables and functions are described here in the order in which they appear in the menu.

Only one table can be displayed at one time in a single instance of the database. To display more than one table simultaneously a separate instance of the Database Module must be implemented. In this case, caution must be exercised so that changes saved in one database instance are not undone by saving another.

Certain functions are available, implemented from the toolbar, according to the table displayed.

A detailed description of every database attribute is not considered necessary here as most of the attributes are self explanatory. The Node, Observation and Shot tables are covered in detail under sections 4.2 and 4.3 below.

Changes that are made are not saved until the user clicks the *Save* button, selects *File* | *Save*, or replies affirmatively to the Save Changes prompt when closing a table without having saved changes.

4.1.1 File

Select Line: Select Line from list of lines in current project. The line name then appears below the toolbar.

Print to File: Save the currently displayed table to file in comma separated value (csv) format. The file is automatically named and saved to the database folder. A popup message gives the file name.

Save: Save any changes that have been made to the current table.

Exit: Close the database window.

4.1.2 Header

General: Display the General parameters for each vessel. Geodetic ↔ Grid coordinate transformations for the start of line coordinates in the selected column are supported from the toolbar buttons Compute E/N and Compute Lat/Lon.

Grid coordinates are displayed in the units defined by the metric conversion factor.

Waypoints:	Display the line waypoints. Geodetic ↔ Grid coordinate transformations for the waypoint coordinates in the selected column are supported from the toolbar buttons Compute E/N and Compute Lat/Lon. Grid coordinates are displayed in the units defined by the metric conversion factor.
Datums:	Display the geodetic datum parameters. Datum 1 is always the survey datum.
Projection:	Display the projection parameters. The parameters shown will vary according to the type and sub-type of projection. Only those parameters for which there is a label in the left column are applicable. Grid coordinates are displayed in the units defined by the metric conversion factor.
Magnetic Variation Points:	Display the magnetic variations points. Points may be created or deleted using the Create and Delete buttons. Geodetic ↔ Grid coordinate transformations for the station coordinates in the selected column are supported from the toolbar buttons Compute E/N and Compute Lat/Lon. Grid coordinates are displayed in the units defined by the metric conversion factor.
Echosounders:	Display the echosounder definitions.
Speed of Sound Profiles:	Display the speed of sound profiles.
Speed of Sound Data:	Display the speed of sound data.
Satellite Systems:	Display the satellite system definitions.
Nodes:	This table is also invoked from the Nodes button in the toolbar.

Display the node parameters. The table includes all nodes defined in the various P2 header records, including vessels, guns, streamers, streamer compasses, depth sensors etc. The option is provided to create and delete nodes using the toolbar buttons Create and Delete.

Grid coordinates are displayed in the units defined by the metric conversion factor.

Node attributes created by SeisPos are also shown.

Observations: This table is also invoked from the Obs button in the toolbar.

Display all the observations defined in the P2 header. The option is provided to create and delete observations using the toolbar buttons Create and Delete.

Observation attributes from both the P2 and those created by SeisPos are shown.

Streamer Sections: Display the streamer section definitions. Sections may be inserted or deleted.

Receiver Groups: Display the receiver group positions as computed from the parameters given in the streamer sections.

Guns: Display individual gun attributes.

4.1.3 Data

Shot: Display the shot data from the E1000 records in the P2. The option is provided to create and delete shots using the toolbar buttons Create and Delete

Observation Time Data: Display the raw and preconditioned values, time and status flag of the observations recorded. Select the observation to display from the popup list.

This table is also invoked from the Time button in the toolbar.

Use the < and > buttons on the toolbar to scroll through the observations.

Shot Event Data: Display the preconditioned observation values de-skewed to the shot event. Select the observation to display from the popup list.

This table is also invoked from the Shot button in the toolbar.

This table will not be available until preconditioning has been carried out.

Use the < and > buttons on the toolbar to scroll through the observations.

Variable C-O: Display the variable C-O and scale/propagation speed defined in the H54 records of the P2. Select the observation to display from the popup list. If no H54 records were found for the selected observation a file error will result.

Grid Data: Display the grid convergence and point scale factor computed from the preconditioned GPS Eastings and Northings if recorded. If no GPS data has been recorded and navigation is by radionavigation then this data will be computed in the network adjustment, and subsequently available for display in this table.

4.1.4 Utilities

Save All Defaults: Saves the following header tables from the currently selected line as defaults to be optionally used for other lines in the project (see 4.2.4 Default Nodes and 4.3.4 Default Observations below):

General parameters – non-line specific parameters only

Datum parameters

Projection parameters

Magnetic variation data

Echosounder definitions

Speed of sound profiles

Speed of sound data

Satellite system parameters

Node parameters

Observation parameters

Streamer section definitions

Load All Defaults: Loads all header defaults that have been previously created for use for the currently selected line (see 4.2.4 Default Nodes and 4.3.4 Default Observations below).

Observations:

Toggle Alias Names: Toggle between the original/edited observation names and names generated by the names of the nodes associated with the observations and the observation type. This feature is useful when the observations have been inappropriately or insufficiently named in the P2 header.

Compute Nominals: Re-compute the nominal values of all observations based on observation type, speed, scale and associated node positions. Nominals are used only as an aid in the precondition module and may need to be re-computed if changes have been made to the observation and/or node parameters.

Revert to Original Configuration: Replaces the existing observation table with the original table.

Compute speed of sound: Compute speed of sound from inline acoustics. Note that if inline observations are uni-directional then Doppler effect may skew the result

Nodes:

Revert to Original Conf: Replaces the existing node table with the original table.

Apply Streamer Stretch: Allows application of a percentage stretch factor to all streamer related nodes.

Reverse Compass Names: When a line is first input the streamer compasses are named s01c01, s01c02… starting from the front of each streamer. Using this utility the compass naming convention will be reversed so that the last compass on the streamer will be number 1 e.g. s01c01.

Create 2D Nodes & Obs: Create the necessary nodes and observations for solving a typical 2D network for which insufficient observations would normally exist.

Create GPS Comparison Nodes: Create duplicate node pairs for all nodes of type SATELLITE and their reference nodes, and duplicate GPS observations. These node positions are then able to be computed independently of the main network and each other enabling true comparisons between GPS systems.

Create Sub-array Separation Nodes:	Create duplicate nodes and observations corresponding to RGPS systems on sub-arrays. The nodes may then be positioned independently of the main network and each other allowing true computation of the sub-array separations.
Q-Marine Modifications:	Makes the necessary modifications to the Node and Observation tables required to process Q-Marine datasets.
Create P-Cable Nodes:	Creates the extra nodes required to process P-Cable networks.
Extract Acoustic Data:	This utility is provided to extract reduced shot event acoustic data for use in the SPSPro FBComp module for computing acoustic pinger positions. See section 4.7.

4.1.5 Edit

Copy:	Copies the selected cells to the clipboard. **Note:** To select a full column click on the column header. To select a partial column click on the first cell, use the scroll bar to display the last required cell, then holding the <*Shift*> key down click on that cell.
Paste:	Performs the selected function on the selected cells using the contents of the clipboard as the argument.
Function:	Performs the selected function on the selected cells using the value entered at the prompt as the argument.
Correct Time Stamp:	Only available for *Observation Time Data* tables. Enables application of a correction, in seconds and decimal seconds, to all times in the table.

4.1.6 Search

4.1.6.1 Find

Specify a search string to find in the current table. Options are provided to search by column (default) or row, and to match case and/or whole cells.

On reaching the end of the table the user will be prompted to resume searching from the beginning.

4.1.6.2 Replace

An extension of the Find Dialogue to find and replace data in the current table. In the example in Figure 4-2 the speed of sound for all acoustic observations are to be changed from 1540.8 to 1541.

The number of replacements made is given.

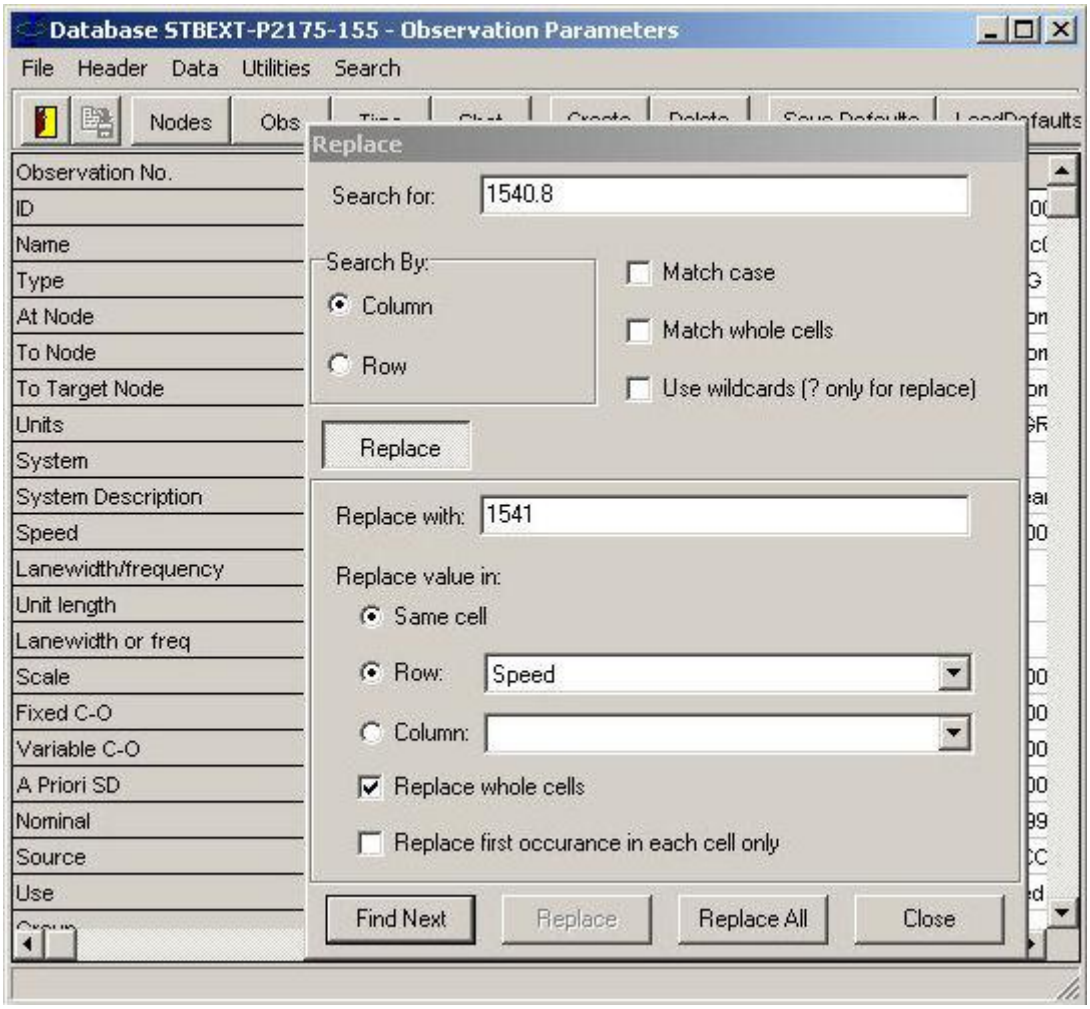


Figure 4-2

4.1.6.3 Using Wildcards

Wildcards '*' and '?' may be used for searching where '*' denotes a string of characters and '?' denotes a single character.

Wildcards can also be used to perform a masked search and replace operation. In this case the following rules apply:

1. Only '?' can be used
2. The field widths for the search, replace and grid cell must all be the same
3. The position of the '?'s in the search and replace fields must be the same

The search and replace operation will then replace only the non-'?' characters.

E.g:

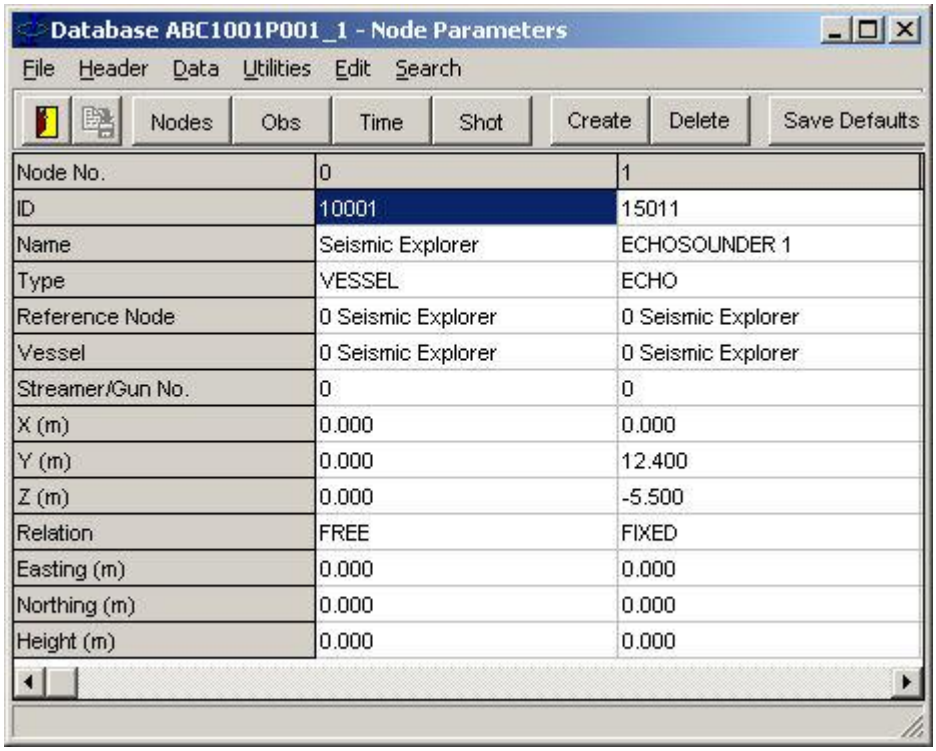
Search for: ??14????

Replace with: ??02????

will replace ‘14’ in positions 3 and 4 of each cell of width 8 characters with ‘02’

4.2 Nodes

From the Database menu select *Header* | *Nodes* or click on the *Nodes* button in the toolbar. The node table as appears in Figure 4-3 is displayed.



Node No.	0	1
ID	10001	15011
Name	Seismic Explorer	ECHOSOUNDER 1
Type	VESSEL	ECHO
Reference Node	0 Seismic Explorer	0 Seismic Explorer
Vessel	0 Seismic Explorer	0 Seismic Explorer
Streamer/Gun No.	0	0
X (m)	0.000	0.000
Y (m)	0.000	12.400
Z (m)	0.000	-5.500
Relation	FREE	FIXED
Easting (m)	0.000	0.000
Northing (m)	0.000	0.000
Height (m)	0.000	0.000

Figure 4-3

4.2.1 Node Attributes

The following attributes are displayed for each node:

Node No.: Unique number assigned by the program used for database relations. This number also appears before the node name in all node lists throughout the program for ease of searching for and identifying nodes. Cannot be edited.

ID: Unique number assigned by the software for internal use. Must not be edited.

Name: Node name, maximum 17 characters. Can be edited.

Type: Node type, selected from popup list only. Types are assigned on input by both the P2 header and the program, and can be changed although it is not advised to do so. See 4.2.2 below.

Reference Node: The name of the reference node from which offsets apply, selected from popup list only.

Vessel: The name of the vessel to which the node is ultimately referenced, selected by popup list only. Should never need to be changed.

Streamer/Gun No.: Number of the streamer/gun as defined in the P2 header. Can be edited but should not normally need to be.

X: Starboard offset from the reference node.

Y: Forward offset from the reference node.

Z: Upward offset from the reference node.

Relation: Defines the relationship between the node and its reference node, initially assigned by the program. Selected from popup list only. The following Relations are defined:

FIXED The node is rigidly fixed to the reference node and observations will be derived from the offsets in the network adjustment.

FREE The node is positioned by observations and the offsets are nominal only.

STREAMER The node is attached to a streamer at a fixed offset from the streamer reference point given by the Y value.

CONSTRAINED Reserved for future use.

Easting: The grid easting in the units defined by the projection metric conversion factor last computed in the network adjustment, or the value from the P2 header in the case of a base station.

Northing: The grid northing in the units defined by the projection metric conversion factor last computed in the network adjustment, or the value from the P2 header in the case of a base station.

Height: The height above the vessel reference point, or the value from the P2 header in the case of a base station in the units defined by the projection metric conversion factor.

4.2.2 Node Types

VESSEL Vessel reference point, from P2 header.

GUN	Centre of source, from P2 header.
STREAMER	Streamer reference point, centre of near receiver group, from P2 header.
NETWORK	Network node, e.g. acoustic transceiver, RGPS antenna, from P2 header.
COMPASS	Streamer compass, from P2 header.
BUOY	Towed buoy, from P2 header.
TAILBUOY	Positioning sensor referenced to streamer with range and bearing observations, automatically assigned.
SATELLITE	Satellite antenna, e.g. DGPS, from P2 header.
ECHO	Echosounder transducer, from P2 header.
DEPTH SENSOR	Streamer depth sensor, from P2 header.
STATION	Fixed base station, e.g. Syledis, from P2 header.
SPS SOURCE	Must be manually set to identify an acoustic pinger for output as S record to SPS file for use in receiver positioning in the SPSPro FBComp module.

4.2.3 Creating and Deleting Nodes

There may be circumstances, for example for 2D surveys, when it is necessary or desirable to create a node to which newly created, or manual, observations may be defined.

From the toolbar click on the *Create* button.

The following attributes are mandatory:
Type
Reference Node
Relation

The following attributes have no effect:
ID
Streamer/Gun No.
Easting
Northing
Height

To delete a node click on the *Delete* button. It is not possible to delete nodes which were not manually created as above. A node cannot be deleted if it is a reference for other nodes or observations. When a node is deleted the observation and node

definitions are updated when the table is saved in order to maintain correct references.

Warning: Any change in the number of nodes as a result of creating or deleting nodes will invalidate the coordinate database and the network adjustment will need to be performed again before outputting a P190 or viewing or printing the node time series plots.

4.2.4 Default Nodes

The number of nodes and their attributes are initially defined by the P2 header records, and the node file is stored in the line database. It may be desirable to define a default set of node definitions to use for all lines subsequently processed in the project. For example, node names or types have been modified, or new nodes may have been created.

4.2.4.1 Creating/Saving

To save a default node definition file, first make the necessary changes to the node attributes for the current line, and save. Then click on the *Save Defaults* button or from the menu select *Utilities* | *Save All Defaults*. The default node definition file, “default.nod” is saved to the project database folder. If one already exists which contains a different number of nodes then a warning prompt will appear and the option to cancel the action is given.

4.2.4.2 Loading

To load the default node table, first select the line for which the default table is to apply from the *File* menu. Then click on the *Load Defaults* button or from the menu select *Utilities* | *Load All Defaults*.

If any differences are detected between the existing table and the default table then the dialog as shown in Figure 4-4 appears.

For each attribute type that is different a checkbox appears in the upper panel. Checking this checkbox will cause this attribute to be replaced with the default value for **all** nodes when the *OK* button is clicked.

Details of all differences are displayed in the lower panel.

If the default table contains manually created nodes then these may be loaded only by checking the *Load Manual Nodes Only* checkbox, then clicking the *OK* button.

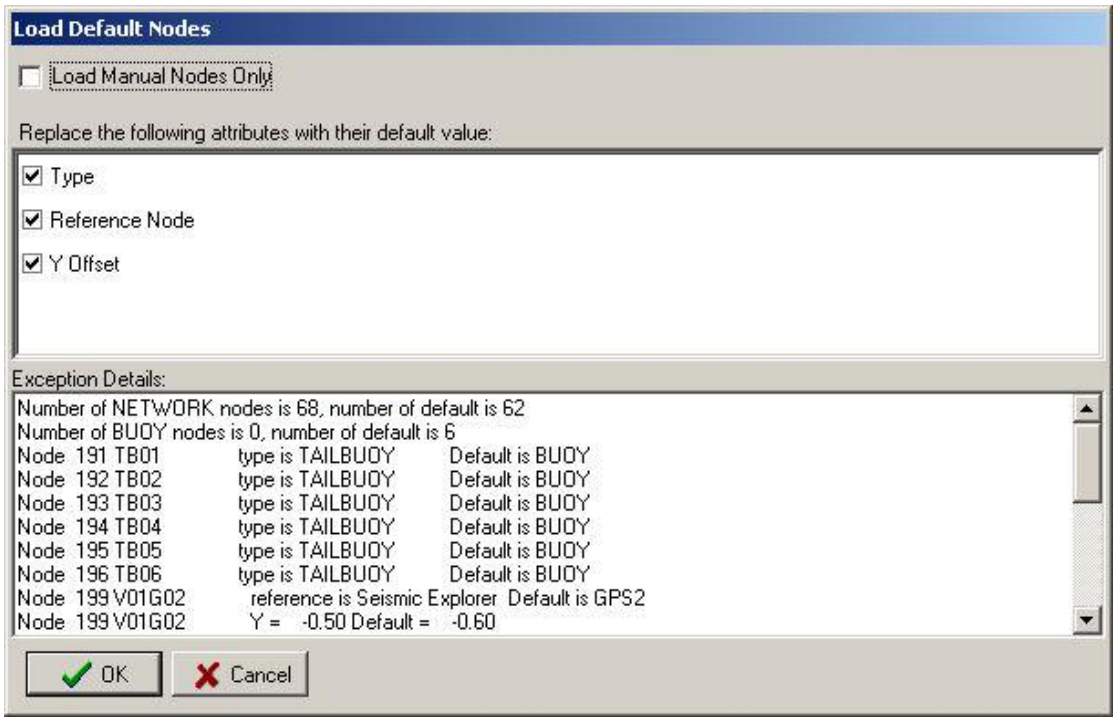


Figure 4-4

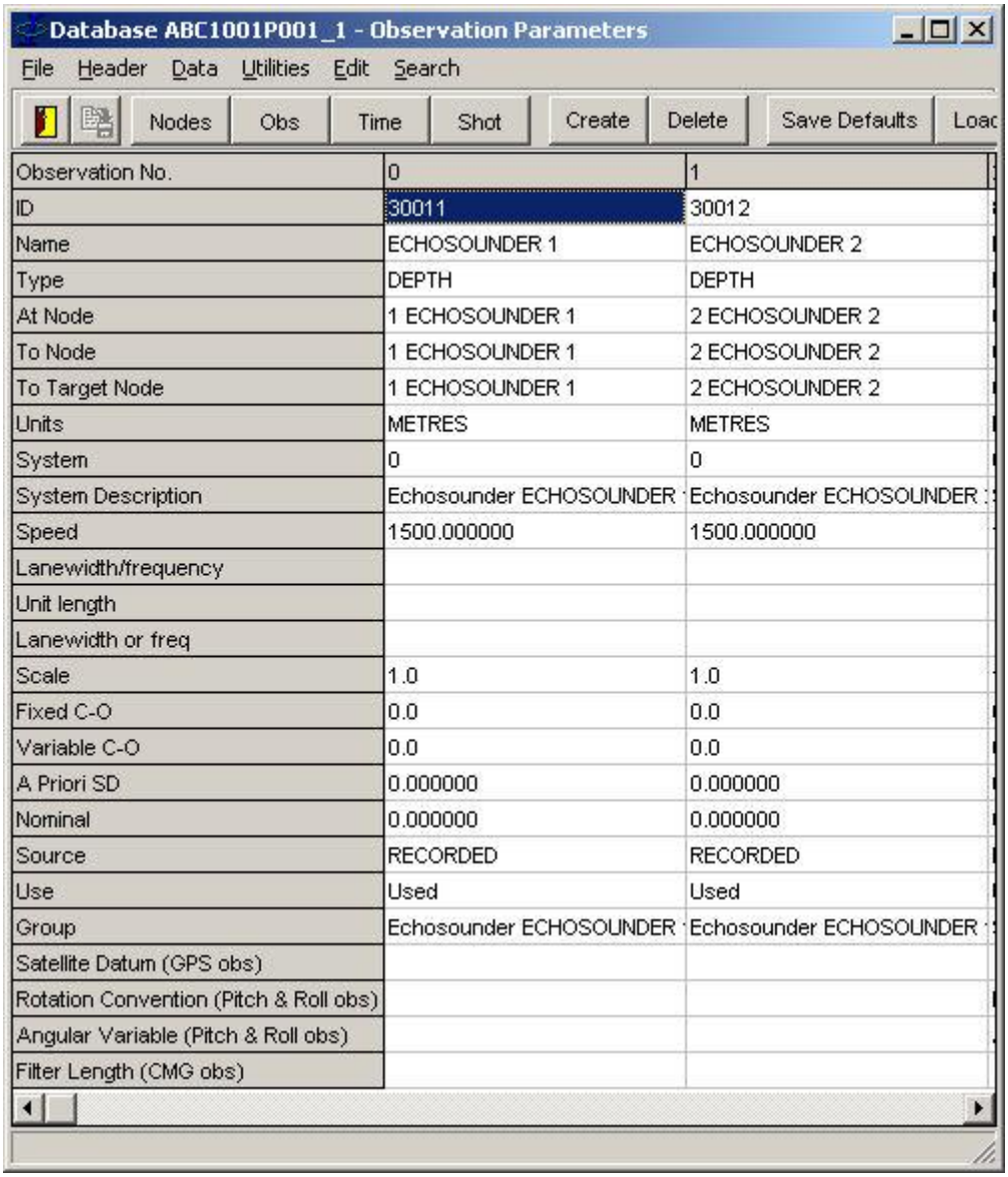
If manual default nodes exist then they will always be loaded.

When loading default nodes, the original node definition file is saved as “original.nod” in the line database.

When Automatic Processing is carried out, if a default node file exists it will be loaded immediately after the P2 file has been input. Any differences found will be written as warnings to the log, and also displayed immediately, although processing will continue.

4.3 Observations

From the Database menu select *Header* | *Observations* or click on the *Obs* button in the toolbar. The observation table as appears in Figure 4-5 displayed.



Observation No.	0	1
ID	30011	30012
Name	ECHOSOUNDER 1	ECHOSOUNDER 2
Type	DEPTH	DEPTH
At Node	1 ECHOSOUNDER 1	2 ECHOSOUNDER 2
To Node	1 ECHOSOUNDER 1	2 ECHOSOUNDER 2
To Target Node	1 ECHOSOUNDER 1	2 ECHOSOUNDER 2
Units	METRES	METRES
System	0	0
System Description	Echosounder ECHOSOUNDER	Echosounder ECHOSOUNDER
Speed	1500.000000	1500.000000
Lanewidth/frequency		
Unit length		
Lanewidth or freq		
Scale	1.0	1.0
Fixed C-O	0.0	0.0
Variable C-O	0.0	0.0
A Priori SD	0.000000	0.000000
Nominal	0.000000	0.000000
Source	RECORDED	RECORDED
Use	Used	Used
Group	Echosounder ECHOSOUNDER	Echosounder ECHOSOUNDER
Satellite Datum (GPS obs)		
Rotation Convention (Pitch & Roll obs)		
Angular Variable (Pitch & Roll obs)		
Filter Length (CMG obs)		

Figure 4-5

4.3.1 Observation Attributes

The following attributes are displayed for each observation:

Obs No.:	Unique number assigned by the program used for database relations. This number also appears before the observation name in all observations lists throughout the program for ease of searching for and identifying observations. Cannot be edited.
ID:	Unique number assigned by the software for internal use. This is also the name of the observation data file.
Name:	Observation name, maximum 17 characters. Can be edited.
Type:	Observation type, selected from popup list only. Types are assigned on input by both the P2 header and the program, and can be changed although it is not advised to do so. See 4.3.2 below.
At Node:	The node at which the observation is measured. Select from popup list only.
To Node:	The node to which the observation is measured, if applicable. Select from popup list only.
To Target Node:	Target node for angle type observations etc. Select from popup list only.
Units:	Observation measurement units corresponding to unit codes 0 to 11 in the P2 format. Select from popup list only.
System:	Measurement system number as defined in P2 header. Currently not used in the program. Can be edited.
System Description:	Measurement system description as defined in the P2 header. For user information only. Can be edited.
Speed:	Propagation speed, defined in the P2 header where applicable, otherwise defaults to 1.0. Can be edited.
Lanewidth/frequency:	The lanewidth on baseline or comparison frequency, used for hyperbolic and raw GPS observations only. Can be edited.
Unit length:	Units for the lanewidth (above). Select from poopup list only.
Lanewidth or freq:	Flag to indicate whether the value for *Lanewidth/frequency* is the lanewidth on baseline or comparison frrquency. Select from popup list only.

Scale: Scale factor (C/O) from P2 header where applicable, otherwise defaults to 1.0. Exception is for depth type observations for which this is computed during input from the calibrated and used speed of sound. Can be edited.

Fixed C-O: Fixed C-O correction defined in the P2 header where applicable, otherwise defaults to 0.0. Can be edited.

Variable C-O: Variable C-O correction defined in the P2 header where applicable, otherwise defaults to 0.0. Can be edited.

A Priori SD: Standard deviation defined in the P2 header. The units assumed by the program are the same as the observation units. Can be edited.

Nominal: Nominal value, in the units in which the observation is recorded, computed by the program based on observation type and location. Intended only as an aid to data appraisal.

Source: The source of data for the observation. Cannot be changed for recorded data but is used when creating observations. Select from popup list only.

Use: Flag to use/reject observation. Select from popup list only.

Group: Number based on observation type and system, used in precondition to apply common processing parameters to groups of similar observations. Can be edited.

Satellite Datum: Geodetic datum applicable to Easting and Northing type observations (see *Type* above). Can be edited.

Rotation Convention: For PITCH and ROLL obs only – specifies positive rotation direction.

Angular Variable: For PITCH and ROLL obs only – specifies whether angle or sine of angle is recorded.

Filter Length: For CMG obs only – average filter window in seconds when creating an observation of type COURSE MADE GOOD. This value is initially automatically calculated based on the distance of the observation's *AT* node behind the *VESSEL* node.

4.3.2 Observation Types

UNDEFINED Undefined. This indicates the presence of an error in the P2 header.

The following observation types are defined in the P2 header correspond to types 1 to 12 in the P2 format:

RANGE

HYPERBOLIC PHASE

HYPERBOLIC TIME

PSEUDORANGE COMMON BIAS

PSEUDORANGE UNIQUE BIAS

DIFFERENTIAL

COMPOSITE

ANGLE

DIRECTION

MAG BEARING

TRUE BEARING

DIFFERENTIAL TRUE BEARING

The following observation types assigned by the software during input:

EASTING	Longitude or Easting.
NORTHING	Latitude or Northing
HEIGHT	GPS height observation
X	USBL X or derived observation X
Y	USBL Y or derived observation Y
Z	USBL Z or derived observation Z
DEPTH	Water depth from echosounder

GYRO True bearing observation with “to node” as 0, stipulated in the P2 format as being the method of defining a gyro-compass aligned to the ship’s head.

DEPTH SENSOR Streamer or gun depth sensor observation

PITCH

ROLL

HEAVE

The following observation types are defined in the P2 header correspond to types 20 to 23 in the P2 format:

GPS PSEUDORANGE

GPS CODE PHASE

GPS CARRIER PHASE

GPS DOPPLER

The following observation types pertain to the P2/86 format and are not supported in this version of the software:

CIRCULAR LANE/PHASE COUNT

LBL ACOUSTIC TIME

The following observation types are available to be assigned to user defined observations recorded in the P2:

SPEED OF SOUND

The following observation types are assigned to observations input as Field Positioning Data from the E12@0 records:

FPD EASTING Longitude or Easting

FPD NORTHING Latitude or Northing

4.3.3 Creating and Deleting Observations

There may be circumstances, for example for 2D surveys, when it is necessary or desirable to create observations.

From the toolbar click on the *Create* button and follow the steps below in order:

1. Enter the observation *Name*.
2. Select the *At Node* from the popup list.
3. Select the *To Node* from the popup list.
4. Select the *Source* from the popup list. The following options are available:

NOMINAL:	The nominal value will be used for the observation data.
COURSE MADE GOOD:	The course made good of the vessel to which the observation's *At Node* belongs will be used for the observation data.
OTHER OBSERVATION:	The remainder of the list comprises all the recorded observations from which one may be chosen to be used for the observation data.

The remaining steps depend on the choice of source, and are described as follows.

Nominal:

1. The *Speed*, *Scale* and *Fixed C-O* automatically default to 1.0, 1.0 and 0.0 respectively.
2. Select the *Type* from the popup list. This would most likely be RANGE.
3. If the *Type* is ANGLE select the *To Target Node* from the popup list.
4. Select the *Units* from the popup list.
5. Enter the *A Priori SD*.
6. Enter the *Nominal*. This is the value that will be used for the observation data. In the case of RANGE type observations the nominal can be easily calculated from the node offsets shown in the network diagram (see section *6. Network Diagram*).
7. Optionally enter the *Scale* and *Fixed C-O*, although these parameters would not normally need to be changed if the nominal value is correctly calculated.

Course Made Good:

1. The Speed, Scale and *Fixed C-O* automatically default to 1.0, 1.0 and 0.0 respectively.
2. The *Type* and *Units* are automatically set to TRUE BEARING and RADIANS respectively.
3. Enter the *A Priori SD*.

A filter of type *Averaging* is automatically designated to *CMG* type observations. The filter length, in seconds, is the calculated travel time from the *At Node* t the vessel based on a speed of 4.5 knots. If filtering is not required then the filter must be set to *None*.

Other Observation:

1. The *Type*, *Units*, *Speed*, *Scale* and *Fixed C-O* are copied from the *Source* observation attributes.
2. If the *Type* is ANGLE select the *To Target Node* from the popup list.
3. Enter the *A Priori SD*.

No attributes other than those listed above for the various types of manual observations are required.

To delete an observation click anywhere in that observation's column and then click on the *Delete* button in the toolbar. It is not possible to delete a recorded observation.

Warning: creating or deleting observations will invalidate the observation QC database and network adjustment will need to be performed again before viewing or printing the network observation time series plots.

4.3.4 Default observations

The number of observations and their attributes are initially defined by the P2 header records, and the observation file is stored in the line database. It may be desirable to define a default set of observation definitions to use for all lines subsequently processed in the project. For example, observation names or standard deviations may have been modified, or new observations may have been created.

4.3.4.1 Creating/Saving

To save a default observation definition file, first make the necessary changes to the observation attributes for the current line, and save. Then click on the *Save Defaults* button or from the menu select *Utilities* | *Save All Defaults*. The default observation definition file, "default.obs" is saved to the project database folder. If one already exists which contains a different number of observations then a warning prompt will appear and the option to cancel the action is given.

4.3.4.2 Loading

To load the default observation table, first select the line for which the default table is to apply from the *File* menu. Then click on the *Load Defaults* button or from the menu select *Utilities* | *Load All Defaults*.

If any differences are detected between the existing table and the default table then the dialog as shown in Figure 4-6 appears.

For each attribute type that is different a checkbox appears in the upper panel. Checking this checkbox will cause this attribute to be replaced with the default value for **all** observations when the *OK* button is clicked.

Details of all differences are displayed in the lower panel.

If the default table contains manually created observations then these may be loaded only by checking the *Load Manual Observations Only* checkbox, then clicking the *OK* button.

Note: nominal values for MAGNETIC BEARING and TRUE BEARING type observations are not loaded.

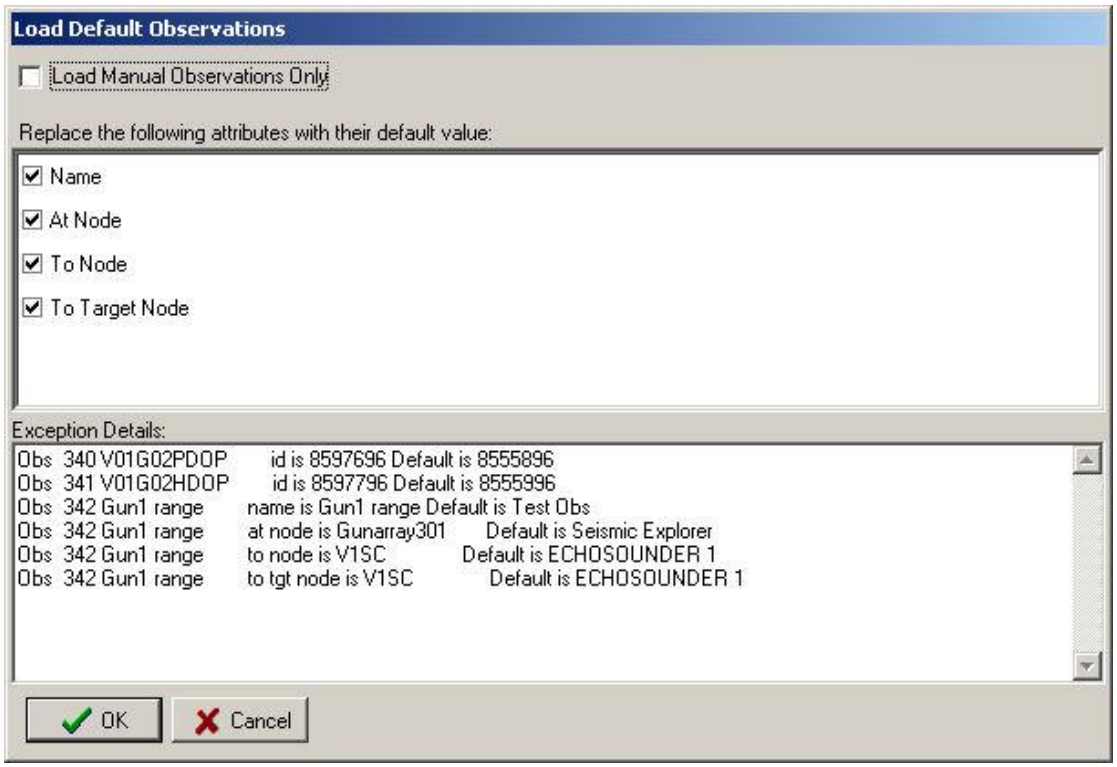


Figure 4-6

If manual default observations exist then they will always be loaded.

When loading default observations, the original observation definition file is saved as “original.obs” in the line database.

When Automatic Processing is carried out, if a default observation file exists it will be loaded immediately after the P2 file has been input. Any differences found will be written as warnings to the log, and also displayed immediately, although processing will continue.

When Automatic Processing the following observation attributes will not be loaded:

- Speed
- Fixed C-O
- Variable C-O

4.3.5 User Defined Observations

4.3.5.1 Speed of Sound

Velocimeter data may be recorded in the P2 as a user defined observation. During input the software will attempt to automatically recognise this and if successful will assign the type SPEED OF SOUND and the units METRES/SEC. This observation may then be used in the Network Adjustment for acoustic observations whose units

are MILLISECONDS in place of these observations' *Speed* attribute.

The user must specify the *At Node* attribute or SPEED OF SOUND type observations so that when more than one velocimeter is used the nearest one to the acoustic observation will be used.

4.3.5.2 Pitch and Roll

Pitch and roll data may be recorded in the P2 either in the E17 or T17 records, or as user defined observations.

User defined observations are not automatically recognised by the software. In order to make use of pitch and roll from user defined observations in the network adjustment the following should be set in the database:

Type:	Set to either PITCH or ROLL.
At Node:	Ensure that this is a node of type VESSEL on which the pitch or roll observations are made.
Units:	Select the correct units, normally DEGREES or RADIANS.
Rotation Convention	
Angular Variable	

4.3.6 OBC Receiver Positioning Datasets

When processing OBC acoustic datasets recorded by the Gator system for cable positioning the, setting the project Acquisition System to GATOR RECEIVER causes the following changes to be made:

1. Observations with units in milliseconds are considered to be two way acoustic ranges and are given the scale 0.5.
2. A node which is the AT node for acoustic observations as recognised above is considered to be a pinger node and is designated as node type SPS_SOURCE.

4.4 Shot

Select *Data* | *Shot* from the menu. The following attributes are displayed for each shot:

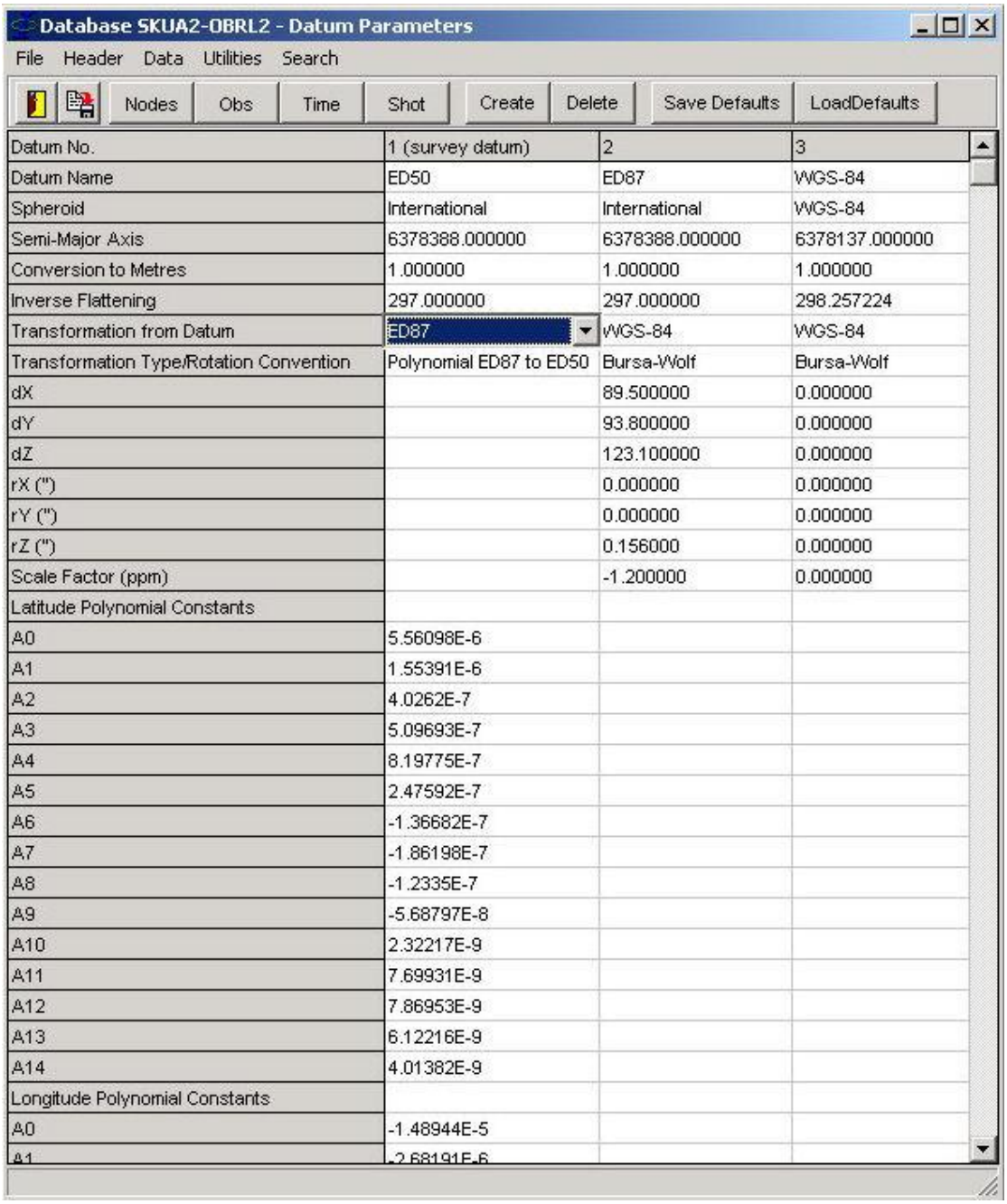
Index number (read only)
Shotpoint number
Year
Month
Day
Julian Day (read only)
Time
Delta Time - time from first shot (read only)
Source ID

Shots may be inserted and deleted by using the *Create* and *Delete* buttons.

Warning: creating or deleting shots will invalidate the observation and coordinate databases and Precondition and Network Adjustment will need to be re-run.

4.5 Datum and Projection

To view or edit the Datum table select *Header* | *Datums* from the menu.



Datum No.	1 (survey datum)	2	3
Datum Name	ED50	ED87	WGS-84
Spheroid	International	International	WGS-84
Semi-Major Axis	6378388.000000	6378388.000000	6378137.000000
Conversion to Metres	1.000000	1.000000	1.000000
Inverse Flattening	297.000000	297.000000	298.257224
Transformation from Datum	ED87	WGS-84	WGS-84
Transformation Type/Rotation Convention	Polynomial ED87 to ED50	Bursa-Wolf	Bursa-Wolf
dX		89.500000	0.000000
dY		93.800000	0.000000
dZ		123.100000	0.000000
rX (")		0.000000	0.000000
rY (")		0.000000	0.000000
rZ (")		0.156000	0.000000
Scale Factor (ppm)		-1.200000	0.000000
Latitude Polynomial Constants			
A0	5.56098E-6		
A1	1.55391E-6		
A2	4.0262E-7		
A3	5.09693E-7		
A4	8.19775E-7		
A5	2.47592E-7		
A6	-1.36682E-7		
A7	-1.86198E-7		
A8	-1.2335E-7		
A9	-5.68797E-8		
A10	2.32217E-9		
A11	7.69931E-9		
A12	7.86953E-9		
A13	6.12216E-9		
A14	4.01382E-9		
Longitude Polynomial Constants			
A0	-1.48944E-5		
A1	-2.68191E-6		

Figure 4-7

When a line is first input into the project only the datums defined in the P2 header are listed.

The defined datums along with their parameters provide the link between the satellite

datum to which the raw DGPS (or uncorrected GPS) coordinates are referenced, and the survey datum.

Note: Datum 1 is always the survey datum, and it is this datum to which the P1/90 coordinates are referenced.

The DGPS observations, whose definitions can be seen in the *Observation* table, include an attribute for *Satellite Datum*, as shown below in Figure 4-8.

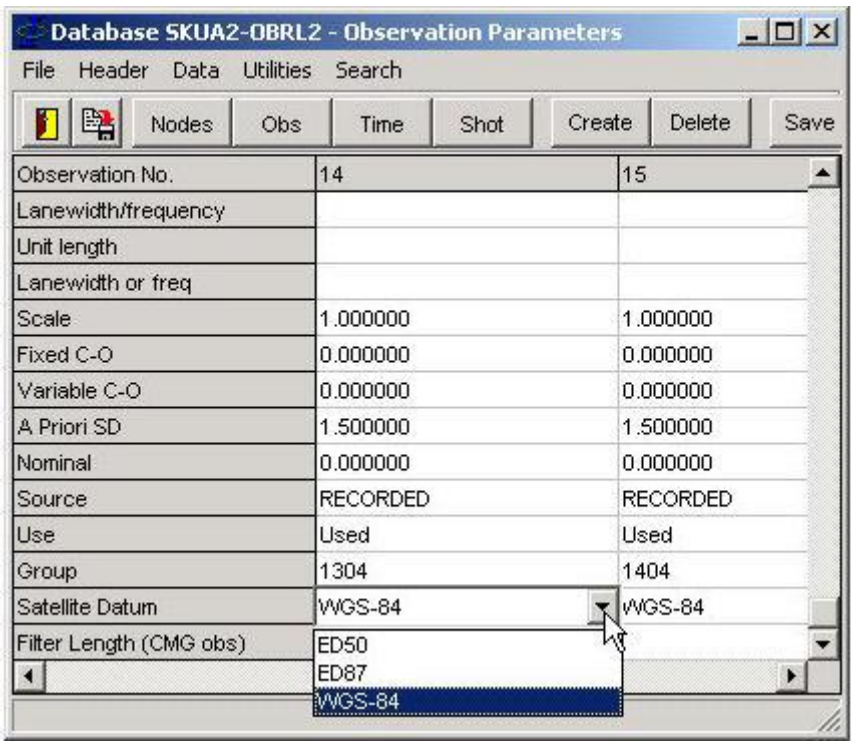


Figure 4-8

The *Satellite Datum* attribute defines which of the datums in the *Datum* table the observation coordinates are referenced to. This in turn is referenced to the S*urvey Datum*, either directly or via one or more intermediate datums. The reference is specified by the *Transformation From Datum* attribute in the *Datum Table*.

In the example shown in Fugure 4.7, the *Survey Datum*, ED50, is referenced to datum2, ED87, which is referenced to datum 3, WGS-84, which is the defined *Satellite Datum* for the DGPS observations.

4.5.1 Creating a Datum

In some circumstances it may be necessary to create a new datum. This will arise, for example, if a polynomial datum shift between ED50 and ED87 is required as the P2 format does not directly support the parameterisation of these transformation types.

To create a datum click on the *Create* button. A new datum column is *inserted to the left of the column containing the currently active cell.* Therefore, this will determine

whether or not the new datum will be the survey datum.

In setting the datum parameters ensure that the *Transformation From Datum* attribute is correctly selected from the dropdown list. In the example shown in Figure 4-7 the Survey Datum is ED50. This is referenced to datum 2, ED87 by a polynomial transformation. ED87 is referenced to datum 3, WGS-84. WGS-84 is established as being the satellite datum by the fact that the DGPS observations have it selected as their *Satellite Datum* as shown in Figure 4-8.

Ensure that the *Transformation Type/Rotation Convention* attribute is correctly selected from the dropdown list. The two standard types of Rotation Convention are supported: *Bursa-Wolf* (Position Vector) and *Coordinate Frame*. The only difference between the two is that the sign of the rotations are opposites. It is the user's responsibility to ensure that the correct convention is either defined in the P2 header, or selected from the dropdown list if creating or editing a datum.

Ensure that all the remaining parameters are correctly specified.

4.5.2 Polynomial Transformations

The polynomial co-efficients are hard-coded in the software, and the appropriate set will appear. Two options are provided: *Polynomial ED50 to ED87* and *Polynomial ED87 to ED50.*

If either of these transformations is selected, the polynomial co-efficients will be automatically displayed, and cannot be edited.

Important: the selection of the correct transformation depends on the type of datum and the *From Datum*. i.e. if the datum being created or edited is ED50, and the *From Datum* is ED87, then the transformation type should be set to *Polynomial ED87 to ED50*, as shown in Figure 4-7.

4.5.3 NADCON Transformations

NADCON transformations require the presence of the latitude and longitude difference files in the Nadcon folder located under the program folder. These files are installed during the program initial setup, but can also be downloaded form the FGPS website. NAD27 to NAD83 and NAD83 to NAD27 are supported.

4.5.4 Re-computation of coordinates

When the *Datum Table* is saved two actions automatically occur:

- Re-computation of start of line (SOL) and waypoint coordinates: the SOL and waypoint coordinates will be transformed from the old *Survey Datum* to the new *Survey Datum* (and projection).
- Re-computation of DGPS shot event data: if this data already exists (i.e. the Precondition Module has already been run at least once) then all Eastings and Northings for all DGPS observations will be re-computed on the new *Survey Datum* (and projection).

4.5.5 Projection

The survey projection parameters can be browsed or edited by selecting *Header* | *Projection* from the menu.

When this table is saved the coordinate computations described in NADCON Transformations
NADCON transformations require the presence of the latitude and longitude difference files in the Nadcon folder located under the program folder. These files are installed during the program initial setup, but can also be downloaded form the FGPS website. NAD27 to NAD83 and NAD83 to NAD27 are supported.

Re-computation of coordinates, above, take place.

4.6 2D Networks

2D operations typically do not record all the observations necessary to perform a network adjustment, but rely upon manual laybacks to position the sources and streamers. There are commonly two types of 2D networks: those without an active tailbuoy and those with an active tailbuoy.

The SeisPos Database module provides the means to automatically create the necessary extra nodes and observations. This is achieved using the menu option *Utilities* | *Create 2D Nodes & Observations*.

In the actions described below which are automatically executed, no duplicate nodes or observations are created i.e. the program first searches the node and observation tables for existing manually created nodes and observations of the required type.

Note: a maximum of 10 streamers and 10 sources is supported for this operation.

After creation, these nodes and observations appear in their respective tables in the normal way, and their attributes can be edited if desired.

After creation, the user is prompted to save the Node and Observation tables to defaults. Refer to Default Nodes and Default observations above.

4.6.1 Source and Streamer Positioning

1. If it does not already exist a node representing the stern centre of the vessel is created and named “V1SC”. The user is prompted for the distance of this point behind the Vessel Reference Point and the Y offset is given this value, forced negative. The default value that appears is the streamer offset to the towpoint on the towing body and is provided for verification. The X offset is given zero.
2. A range observation is created **from** each streamer head and source centre **to** the node V1SC. The value is calculated from the nominal offsets as defined in the P2 header. An SD of 2m is assigned.
3. A bearing observation is created **from** each streamer head and source centre **to** the node V1SC. If streamer compasses are detected then the near compass data and SD are used for the observation, otherwise the vessel’s course made good is used with an SD of 0.5°. A C-O is calculated from the nominal offsets as defined in the p2 header.

4.6.2 Streamer Tail Positioning

4.6.2.1 Without Active Tailbuoy

The last node found which is referenced to each streamer has its *Type* set to *BUOY* and its *Relation* set to *STREAMER*. This is necessary so that the network adjustment automatically creates the necessary derived observations to position the whole streamer.

4.6.2.2 With Active Tailbuoy

1. A node representing the last receiver group on each streamer is created, named "Rec1#" where # is the streamer number.
2. A range observation **from** each tailbuoy **to** its corresponding Rec1 node is created. The value is calculated from the offsets defined in the P1 header. An SD of 99m is assigned.
3. A bearing observation **from** each tailbuoy **to** its corresponding Rec1 node is created. If streamer compasses are detected then the observation uses the data and SD from the last streamer compass, otherwise the vessel's course made good is used, with an SD of 0.5° assigned.

4.7 Extracting Acoustic Data

This utility is provided to extract reduced shot event acoustic data for use in the SPSPro FBComp module for computing acoustic pinger positions.

Only data flagged as GOOD, i.e. a non-blank value in the Shot Event Data table, will be output. The extracted data has all C-Os, scale, speed and conversion to grid units applied. The list of available observations contains only observations of types RANGE (normally pinger time) and X AND Y (normally USBL).

Important: the selected observations must be for one cable (receiver line) only. The receiver line name should be entered in the appropriate field. This name must be in the same format as in the receiver SPS Preplot or drop location file.

The output file format is:

<shot line no.> <SP> <JD> <hh:mm:ss> <rcvr line no.> <rcvr id> <rcvr index> <L> <data>

The line number for both shot and receiver is the same and is extracted from the line name according to the columns specified when specifying the project parameters. See Section 2. Projects. This can be changed if need be by editing the project.

The receiver ID is taken from the last four digits of the name of the *To Node* defined for that observation.

Line numbers, shotpoints and receiver Ids are written in the SPS Revision 2.1 format F10.2.

The *L* denotes that the observation type is a slope range.

4.7.1 Offsets

Offset information for transponder nodes is written to the data file after the data has been written. The offset is calculated from the nearest receiver group of the same number as the transponder node. This information is used in the SPSPro FBComp module and it is therefore important that the transponder node offsets are correct.

4.7.2 Batch Output

To output the data for all acoustic observations for more than one line select from the menu *File* | *Select Lines*. Note that the observation and cable lists will be disabled and all observations and cables will be selected for output.