WinFrog Device Group:	**LBL ACOUSTIC**
Device Name/Model:	**ROVNAV MK4** **Type 7807 (EHF), 7808 (MF)**
Device Manufacturer:	Sonardyne International Limited Blackbushe Business Park Yateley, Hampshire GU46 6GD United Kingdom
Device Data String(s) Output to WinFrog:	PAN command responses See manual OM7145-V7
WinFrog Data String(s) Output to Device:	PAN commands See manual OM7145-V7
WinFrog Data Item(s) and their RAW record:	Transceiver (LBL TRANCEIVER) 420 Transponder (XPONDER) 421 Transponder (FIXED XPONDER) 426 Elevation (ELEVATION) 372 Attitude (ATTITUDE) 413

DEVICE DESCRIPTION:
Long base line acoustic equipment. Used to position underwater vehicles or structures and surface vehicles. Uses fixed transponders placed upon the bottom and other transponders placed on vehicles; relay or sequential only. See also chapter 5, "WORKING TRANSPONDERS (.XPT) FILE", chapter 17 "LBL ACOUSTICS" and chapter 20 "ACOUSTIC CALIBRATIONS".

There are two data items: LBL TRANCEIVER and XPONDER.

DEVICE CONFIGURATION INSTRUCTIONS

WINFROG I/O DEVICES > EDIT I/O:

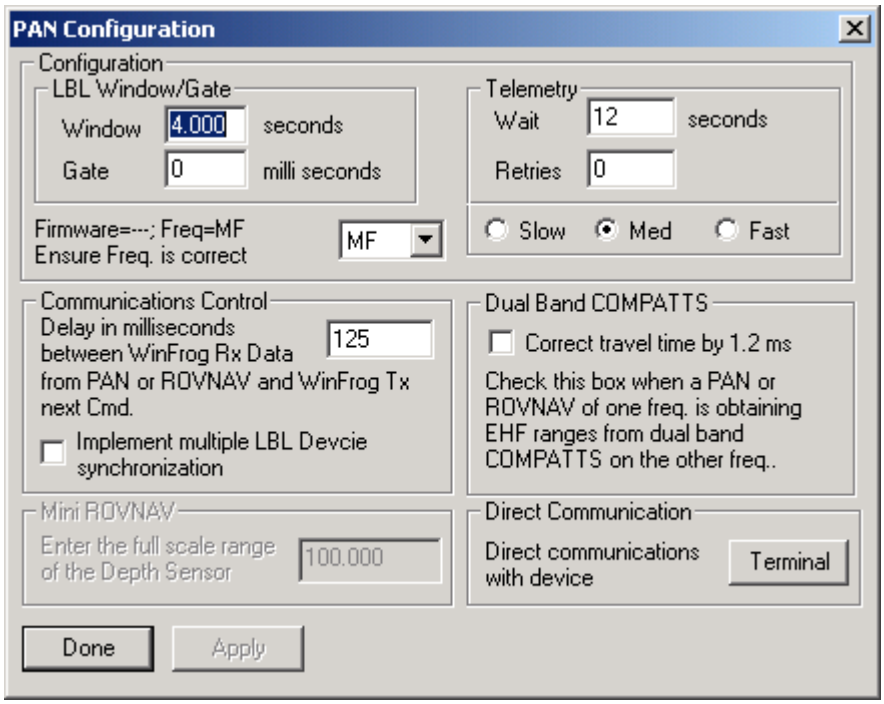
Baud Rate: 9600
Stop Bits: 2
Parity: None
Data bits: 8

WinFrog is interfaced to the RovNav unit via the Surface Control Unit (SCU). The serial interface cable comes with the system. It is a standard 9 pin serial interface cable. Power is applied to the system via a power cable connected to the SCU. **See the RovNav manual for complete details.**

WINFROG I/O DEVICES > CONFIGURE DEVICE:

This dialog provides access to a terminal for communications with the RovNav as well as options to set some RovNav parameters.

The first group, LB Window/Gate, allows you to set the long base line window and gate in the RovNav. See the PAN manual for details on the LW and RG commands. The second group, Telemetry, allows you to set the telemetry wait window in the RovNav. See the PAN manual for details on the TW command. The “retries” value indicates the maximum number of times WinFrog will attempt to obtain telemetry from a transponder. This applies to both baseline measurements and manually entered commands described below. After the initial command attempt, if “No Reply” or “?” is received, WinFrog will resend the same command up to the amount entered in this field or until it gets a reply to this command.



The Slow, Medium and Fast radio buttons set the telemetry baud rate through the water. See PAN manual for details on the BN and BF and BS commands.
When the ROVNAV device is first selected for use it automatically send the commands mentioned above to initialize the RovNav.

The RovNav firmware version and frequency of the RovNav is displayed if it has been received from the RovNav. After the initialization commands, this command is sent to the RovNav every few seconds until navigation interrogation commences or if navigation interrogation ceases.

Normally, WinFrog reads the frequency from the RovNav. However, navigation interrogation doesn’t read the frequency. The drop down list box is provided to ensure the frequency is correct, as the Dual Band COMPATT correction requires knowledge of the RovNav’s frequency.

The Communications Control value is the time difference between receipt of a telegram from the RovNav and the time that WinFrog will issue a new command. A delay is required to allow the reverberation, caused from the last acoustic energy to reach the RovNav, to attenuate around the transducer.

If more then one Sonardyne LBL device is in use, e.g. a PAN and a ROVNAV, they must be synchronized, otherwise they will interfere with each other.

Dual band COMPATTS (EHF and MF) can range on one frequency and telemeter data on the other. The problem with this is that the unit receiving the telemetry applies the total turn around time which is comprised of the turn-around-time (TAT) at the COMPATT replying to the range interrogation plus the signal detection time at both the interrogating and responding COMPATT. The latter is frequency dependent, the signal detection time for EHF is 0.6ms quicker than that for MF. For example, a Dual Band COMPATT on an ROV, configured to telemeter on MF but execute measurements using EHF, is instructed by a RovNav on MF to execute an SI command. It then ranges on the EHF band to fixed transponders. The two-way-travel-time (TWTT) for each transponder that replied is telemetered using MF back to the RovNav. The RovNav removes the COMPATT turn around time and two MF detection times for each transponder that replied. But it should remove two EHF detection times. The result in this scenario is that 1.2ms too much was removed from the observation and needs to be re-applied. If the telemetry were EHF and the ranges were MF then too little would be removed and 1.2ms would have to be subtracted. WinFrog decides whether to add or subtract this value according to the frequency above. The commands affected are SI, FS and CI. If this checkbox is selected, a1.2ms correction will be applied to all SI, FS and CI data as it comes into WinFrog and the result will be treated as the raw data. There is an option on the calibration dialog to apply this value as well, in case it was neglected when the calibration data was collected.

The terminal button provides access to a terminal window where you may enter RovNav commands. The command is sent to the RovNav when you hit the <Enter> key and any currently pending command, if any, has completed.

When clicked, the Apply button immediately accepts the settings displayed and WinFrog will begin to use them.

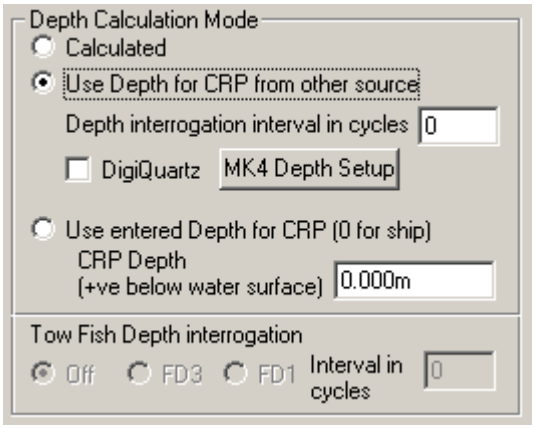
WINFROG VEHICLE > CONFIGURE VEHICLE DEVICES > DEVICE DATA ITEM > EDIT:

Data item: LBL,ROVNAV-MK4,LBL TRANCEIVER

See chapter 17 for details on setting these parameters. They are the same across all LBL TRANCEIVERS except for the following:

Depth Calculation Mode-Use depth for CRP from other source. This option can be used to enable WinFrog to use a depth from a different device such as an ROV sensor

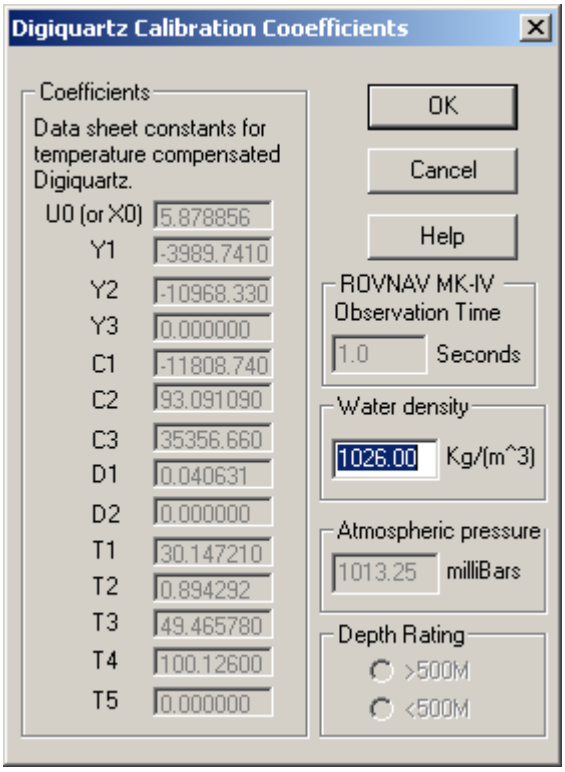
suite. It can also be used if the MK4 is to be interrogated for depth in which case, the RovNav is interrogated and the resulting depth is passed as an ELEVATION data item to the TRANSCEIVER data item as the *other source*.



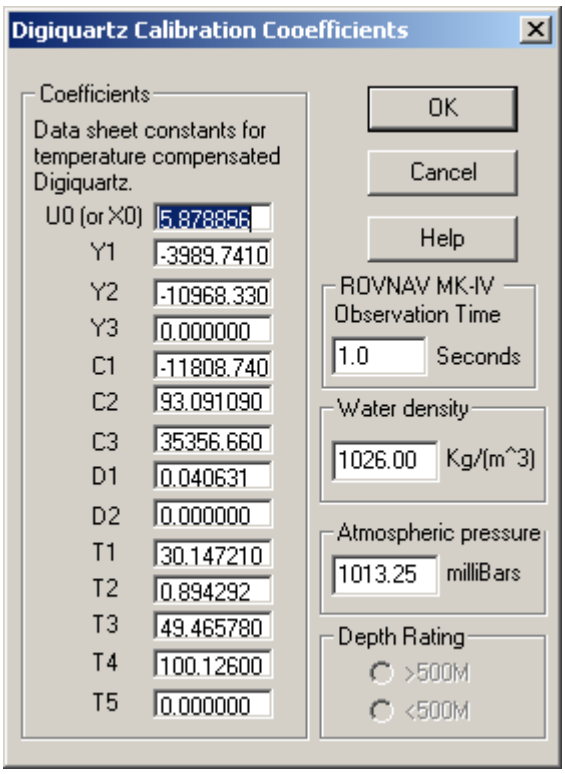
If another device is to be used as the *other source*, this option is selected and the *Depth interrogation interval in cycles* entry is left at its default of 0. The respective device's ELEVATION data item is then added to this vehicle and configured as per its documentation.

If the MK4 RovNav is to be used as the *other source*, the desired interrogation cycle is entered for the *Depth interrogation interval in cycles*. The MK4 RovNav can be equipped with a strain gauge or digiquartz depth pressure sensor. When this option is selected, the operator must correctly configure WinFrog for the respective sensor.

If a strain gauge is present, the *Digiquartz* checkbox is left unchecked and the *MK4 Depth Setup* button is clicked to access the dialog that allows the operator to enter the value for water density in kg/m^3. Note that the MK4 strain gauge returns *gauge pressure* in pounds per square inch (psig), i.e. the pressure at the sensor compensated for the atmospheric pressure (pressure at depth minus atmospheric pressure) and therefore the only value to be entered is the water density. The RovNav must be calibrated at the surface to essentially tare it for the atmospheric pressure (refer to the manufacturers documentation).



If the sensor is a digiquartz, the *Digiquartz* checkbox is checked and the the *Digiquartz Setup* button is clicked to access the dialog for the entry of the digiquartz coefficients, water density, atmospheric pressure and the observation time in seconds (1 to 9) that the RovNav is to observe the digiquartz counts over. Note that the digiquartz returns data that is processed to provide the *absolute pressure* in pounds per square inch (psia), i.e. the pressure at depth complete with the affect of the atmospheric pressure.



In both of the above cases, the resulting pressure is converted to a depth using the following formula:

$$\text{Depth} = \frac{100 \times ((68.94757 \times P) - P_a)}{d \times g}$$

where…

P	sensor pressure in psi observed from the sensor or derived from the digiquartz data
68.94757	conversion factor for psi to mb
P_a	atmospheric pressure in mb entered by the operator (in the case of a strain gauge this value is left out of the formula)
100	conversion factor for mb to N/m^2
d	water density in kg/m^3
g	gravity ($9.80665 m/s^2$)

The final step to using this option is to add the RovNav's ELEVATION data item to the vehicle. See **Data type: LBL,ROVNAV-MK4,ELEVATION** below for details for configuring this.

Transmit Code. The "transmit codes" for a Sonardyne RovNav are provided in a dropdown list. They are:

None No interrogations for this data item are transmitted. Also halts any current interrogation.

CIF Interrogate on CIF i.e. use the LB command (same as LB below).
LB Interrogate LB command. Same as using CIF above.
LI Interrogate using the immediate LB command.
II Interrogate the selected transponders individually, sequentially, using the II command.

See the PAN manual for details on these commands.

The accuracy described in chapter 17 depends upon frequency. The published accuracies for the different frequencies are:

Frequency band	Standard Deviation
LF	0.5m
MF	0.15m
HF	0.04m
EHF	0.02m

These should be considered nominal values as they do not take into account sound velocity errors and ray path bending. Unless the transducer is on an ROV (e.g. flower pot) which is operating near the same depth as the transponders, larger values should be used.

It is not necessary to attach the TRANCEIVER to the ship if positioning with it is not required. It is required for collecting surface ranges for calibration or with relay operations.

Data type: LBL,ROVNAV-MK4,XPONDER

See **chapter 17** for details on setting these parameters. They are the same across all transponders (XPONDERS).

Simultaneous Transponder
It is not necessary to attach the TRANCEIVER to the ship for simultaneous transponder operations. However it may be attached and None selected as the Transmit code. Attach the XPONDER device to the vehicle it is on. Edit the XPONDER data type as described in chapter 17 and from the dropdown list box select the simultaneous transponder. For details on the settings, see chapter 17. The accuracy described in chapter 17 depends upon frequency. The published accuracies for the different frequencies are:

Frequency band	Standard Deviation
LF	0.5m
MF	0.15m
HF	0.04m
EHF	0.02m

These should be considered nominal values as they do not take into account sound velocity errors and ray path bending. If the simultaneous transponder is working near the same depth as the fixed transponders and the sound velocity is considered accurate, these values may be correct, otherwise sound velocity and other errors should be included.

Relay Transponder
Currently WinFrog uses an observed range from the transceiver to a fixed transponder to reduce the observed relay transponder's range (which includes the ranges: vessel to relay, relay to fixed transponder and transponder to transceiver, sometimes called sing-around range). Consequently the LBL TRANCEIVER must be setup to interrogate, i.e. CIF, LB or LI must be selected. For details on the settings, see chapter 17. The accuracy described in chapter 17 depends upon frequency. The published accuracies for the different frequencies are:

Frequency band	Standard Deviation
LF	0.5m
MF	0.15m
HF	0.04m
EHF	0.02m

These should be considered nominal values, as they do not take into account sound velocity errors, ray path bending and the reduction of the sing-around range to the direct range. If the relay transponder is working near the same depth as the fixed transponders and the sound velocity is considered accurate, one should only need to account for the sing-around range reduction, otherwise sound velocity and other errors should be included.

Responder Transponder
This is not currently supported for the RovNav Mk4.

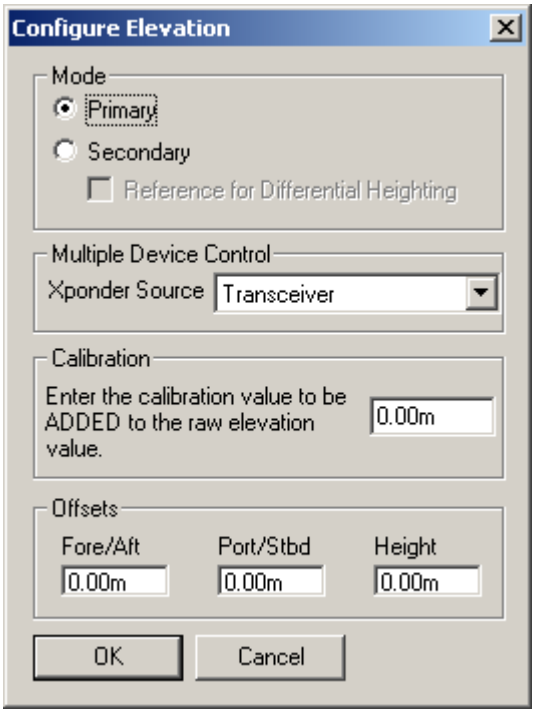
Data type: LBL,ROVNAV-MK4,FIXED XPONDER

See **chapter 17** for details on setting these parameters.

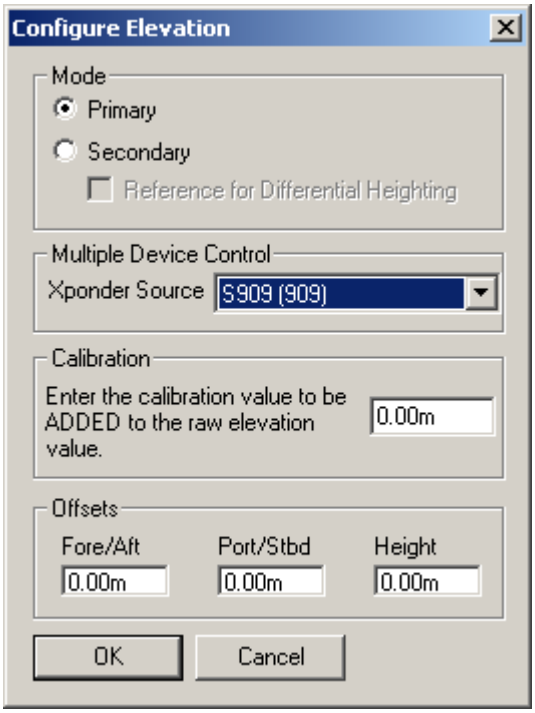
Data type: LBL,ROVNAV-MK4,ELEVATION

The configuration of the ELEVATION data item when used in association with an acoustic device depends upon its application.

When being used as the *other source* for a TRANSCEIVER data item that is configured for *Use depth for CRP from other source* (i.e. the MK4 is being interrogated for depth) this data item is set to *Primary* and the *Transceiver* item selected from the drop down ist in the *Multiple Device Control* panel.

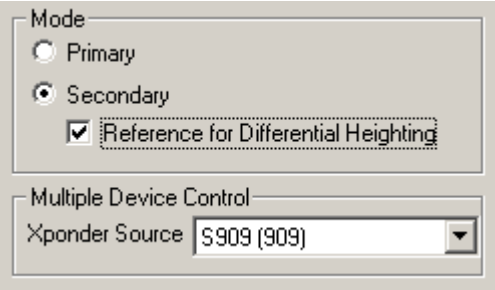


When being used with an XPONDER data item configured for *Use Depth of CRP from other Source* or *Interrogate Depth/Attitude Only*, this data item is set to *Primary* and the



transponder selected as the *Tracking Transponder* in the XPONDER configuration is selected from the drop down list in the *Multiple Device Control* panel.

If in the above, the XPONDER has been configured for *Use in differential depth mode…* this data item is set to *Secondary* and the *Reference for Differential Heighting* box is checked. The transponder selected as the *Tracking Transponder* in the XPONDER configuration is then selected from the drop down list in the *Multiple Device Control* panel.



In all above cases the following applies to the calibration and offsets.

If there is a known calibration value for the respective sensor, it is to be entered in the *Calibration* panel. Care must be taken with the sign convention. If the sensor is reading deeper than the actual depth, the entry is positive. If the sensor is reading shallower than the actual depth, the entry is negative. There are two important points to be aware of with respect to the calibration entry:

- When a transponder is selected, the depth sensor calibration value that was entered for the same transponder in the Xponder File is not automatically retrieved and used here. However, the same value and sign convention as used for that calibration value is used here even though it is stated here that the calibration is *added* and in the Xponder File dialog it is stated that the value is *subtracted*. This is because in the Xponder File dialog it is referring to a depth but in the ELEVATION data item dialog it is referring to a height.
- The calibration value is a depth term, not a pressure.

Offsets can also be entered to relate the depth (pressure) sensor of the RovNav to the CRP of the vehicle. It is important to note that the offsets apply to the sensor not the transducer. If an attitude sensor is available, the data from it will be used to reduce the offsets.

Data type: LBL,ROVNAV-MK4,ATTITUDE

See **chapter 17** for details on setting these parameters.