WinFrog Device Group:	**GYRO**
Device Name/Model:	**NAVIGAT 2100**
Device Manufacturer:	**Litton Marine Systems** 1070 Seminole Trail Charlottesville, VA 22901 Phone:804-974-2000 Fax: 804-974-2259 **C. PLATH** (division of Litton which manufactures the SR2100 Gyrocompass) Stueckenstrasse 1-3 D-22081 Hamburg, Germany Phone: ++ 49-40-299 00-0 Fax: ++ 49-40-299 00-298 Telex: 2 15 202 a plath d
Device Data String(s) Output to WinFrog:	Binary: Heading, Pitch, Roll, Velocity, Rate of turn about all three axes, Latitude, Longitude, Operating Mode, System Error, Accuracy, and Validity of data.
WinFrog Data String(s) Output to Device:	Binary: Latitude, Longitude and Speed (sent once every time the configuration window is closed)
WinFrog .raw Data Record Type(s):	Type 910 (Type 410 if data repeated 15 times) Type 410 has yet to bee observed for heading devices.

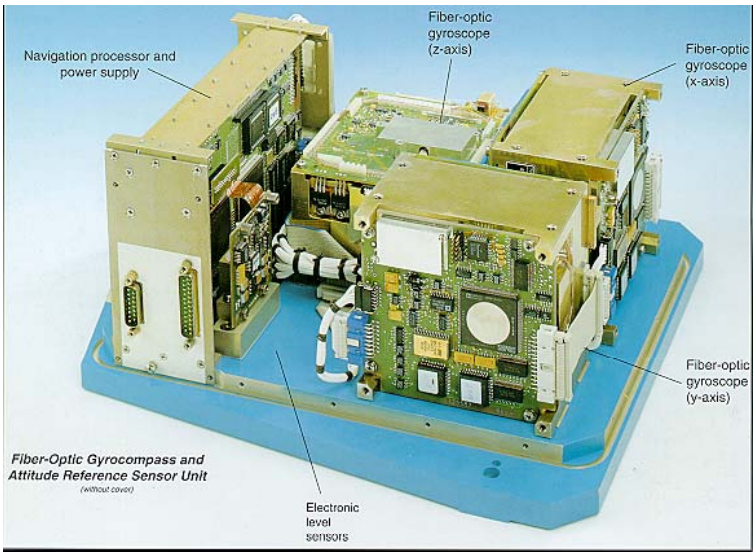
DEVICE DESCRIPTION:
The C.PLATH Fibre-Optic Gyrocompass (aka FOG) - the NAVIGAT2100 system – combines measurements of light signals sent through internal Fiber Optic lines with position and speed data to derive real time Heading and Attitude information. The NAVIGAT system is comprised of a control and display unit, an interface unit and a power supply unit. The system is the first solid-state, fully electronic gyrocompass (no rotating or other moving parts) to be manufactured.

The fundamental principle of the fiber-optic gyrocompass is the invariance of the speed of light and the so-called Sagnac effect. Here, a fiber-optic coil is used as a very sensitive rate sensor, which is capable of measuring the speed of rotation of the earth. A combination of three such fiber-optic coils (gyroscopes) and two electronic level sensors is able to determine the direction of true north. From the three rate of turn signals and the information from the electronic level sensors a complex Kalman Filter computes the direction of the rotation of the earth from which geographical north is derived.

The unit has a short settling time of 30 minutes and provides high accuracy during times of high vessel dynamics. The manufacturer claims the unit to have high reliability and no maintenance requirements during its service life. The Navigat SR2100 system is shown below.

Sensor Unit

Control and Display Unit



Sensor Unit with Cover Removed

The Navigat SR2100 System

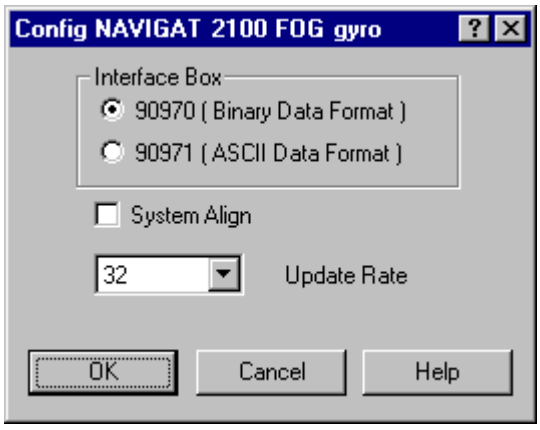
DEVICE CONFIGURATION INSTRUCTIONS (suggested):
Serial RS422 input and output are available at connector 1J2. The initialization message is transmitted with a maximum update rate of 16 Hz. The interface is fully duplex with the following settings:

Baud Rate: 19200
Data Bits: 8
Stop Bits: 1
Parity: none

WINFROG I/O DEVICES > CONFIG OPTIONS:
The NAVIGAT2100 device is added to WinFrog from the Gyro device category. Adding the NAVIGAT2100 creates Heading and Attitude data items in WinFrog.

The appropriate communication parameters must be set to match the settings configured in the gyro.

The NAVIGAT must be configured at the “generic” I/O Device window level. In the I/O Devices window, highlight the NAVIGAT 2100 device, then right-click and select Configure Device. The Configure Navigat 2100 dialog box appears, as seen below:



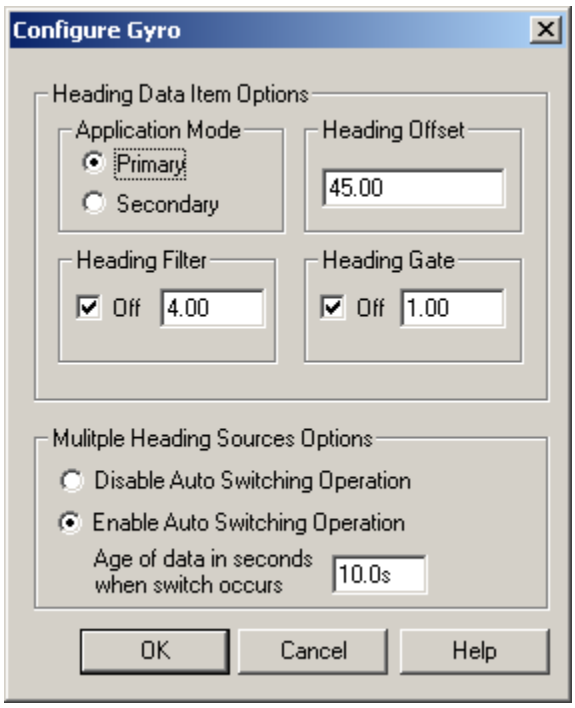
Interface Box
You must select the appropriate format to match the internal configuration of the NAVIGAT. Select either the Binary or ASCII radio button.

System Align
If this checkbox is selected, the repeater compasses will self-align when this window is exited. WinFrog sends latitude, longitude as well as speed information in two parts (X and Y components) to the NAVIGAT2100 when the Gyro is first configured. The program will also send this information every time the NAVIGAT2100 is configured at the I/O devices level, i.e. every time the System Align is checked.

Update Rate:
This sets the update rate of the NAVIGAT2100 output message in hertz. The gyro can output at rates of 1, 2, 4, 8, 16, or 32 Hz. WinFrog will send a message to the Gyro to output at 16 or 32 Hz.

WINFROG VEHICLE - DEVICES > EDIT OPTIONS:
As mentioned above, the NAVIGAT provides WinFrog with 2 Data Items: Heading and Attitude. Attitude information can be used by WinFrog to reduce GPS antenna pitch and roll to the Z datum zero reference. After adding these Data Items to a vehicle's device list, you must highlight and edit these Items (one at a time) to configure them for the application.

Configure Gyro
Editing the NAVIGAT Heading data item brings up the Configure Gyro dialog box, as seen below.



Heading Data Item Options:
Application Mode (Primary/Secondary):
Set the type of calculation to Primary or Secondary by selecting the appropriate radio button. Devices set to Primary are used to provide the vehicle heading information. Devices set to Secondary are simply monitored, and are not used in the vehicle's calculations.

Note that WinFrog supports automatic switching from a designated Primary to a Secondary in the case that data from the Primary fails (see Multiple Heading Sources Options).

Heading Offset:
A correction value (as determined from a gyro calibration) can be input in the Heading Offset box. This value is added to the heading value from the NAVIGAT to provide a corrected heading for the vehicle. Note that positive or negative values can be entered.

Heading Filter/Heading Gate:
The Heading Filter is used to "smooth" heading values used by the vehicle. The value entered in the Heading Filter indicates the number of headings that will be used to predict the next heading value. The larger the value entered, the "heavier" the filter will be – i.e. the slower the vehicle's heading will respond to changes.

The Heading Gate defines a tolerance value to limit the use of anomalies in gyro readings. If the next observed gyro value received falls outside the specified range of predicted values (i.e. plus or minus the entered value), the value will not be used.

Multiple Heading Sources Options:
WinFrog supports automatic switching from a designated Primary source to an alternate Secondary source in the event that the Primary fails. The first Secondary source to receive data after the Primary has failed becomes the alternate Primary providing the heading for the vehicle. When the designated Primary is detected as active again, the alternate Primary source reverts to Secondary and the designated Primary provides the heading data to the vehicle.

If an alternate Secondary fails and there are additional Secondary sources, it in turn is detected by the first of the remaining operational Secondary sources to receive data after the failure at which time this Secondary becomes the alternate Primary.

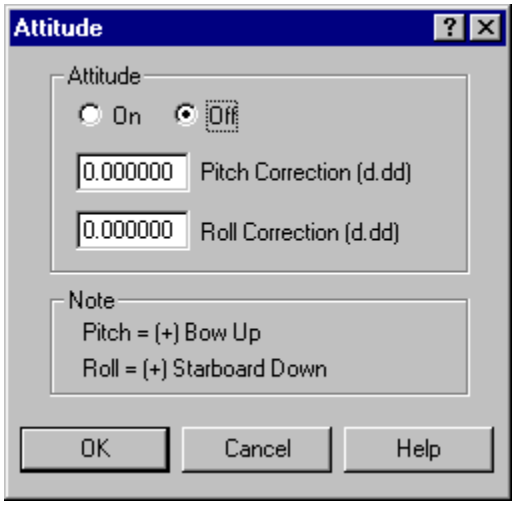
Note that this option is only available if more than 1 HEADING source is associated with the respective vehicle. Changes made to the Auto Switching options for any one of the HEADING data items are automatically assigned to the others upon exiting this dialog with OK. If the Auto Switching option is enabled and the respective HEADING source has been set to Primary, all others are automatically set to Secondary. The exception to this is when configuring a WinFrog Controlled Remote (WinFrog with a Remote module) from a Controller. In this case, changes made to one HEADING source are not automatically made to other HEADING sources. The operator must explicitly make them for each HEADING source.

This option is not available in the WinFrog Remote package.

Disable/Enable Auto Switching Operation:
Select the mode you wish to operate WinFrog.

Age of data in seconds when switch occurs:
Enter the age of data that is permitted before the source is considered to have failed.

Configure Attitude
Editing the NAVIGAT Attitude data item brings up the Attitude dialog box, as seen below.



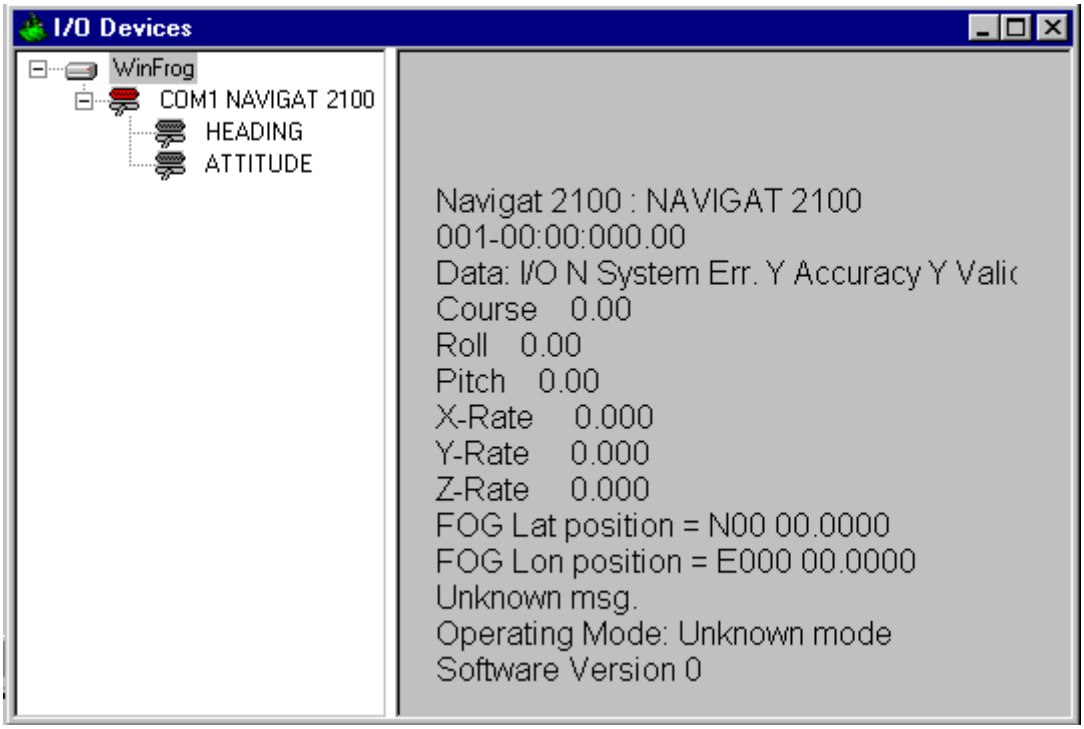
Attitude On- Off
Select the On radio button to utilize the attitude data from the NAVIGAT.

Pitch Correction
Enter a Pitch correction value as determined by calibration, in units of degrees and decimal degrees. This value is added to the pitch values received from the NAVIGAT. Sign of the entry must relate to the convention of positive values referring to stern down (i.e. bow up).

Roll Correction
Enter a roll correction value as determined by calibration, in units of degrees and decimal degrees. This value is added to the roll values received from the NAVIGAT. Sign of the entry must relate to the convention of positive values referring to starboard down (i.e. port up).

CONFIGURATION DETAILS:

Data displayed in I/O Devices Window:



Data Valid -

Course – This angle is defined as positive, from origin north via east.

Roll – This angle is positive for starboard down.

Pitch – This angle is positive for stern down.

X-Rate – This turning (rolling) rate is positive for starboard down.

Y-Rate - This turning (pitch) rate is positive for stern down.

Z-Rate - This turning (yaw) rate is positive for a positive increase in heading.

FOG Lat Position – Latitude output from FOG

FOG Lon Position – Longitude output from FOG

Life sign ack. – Software Version

Operating Mode – Three options: Gyro compass operating mode, Align operating mode, Test operating mode.

Specifications:

Voltage range:	18VDc to 36VDc. Polarity protected.
Current Consumption:	1.5A at 28VDc. Maximum Current not to exceed 2.0A.
Power Consumption:	Normally less than 42 Watts. Must be less than 56 Watts.

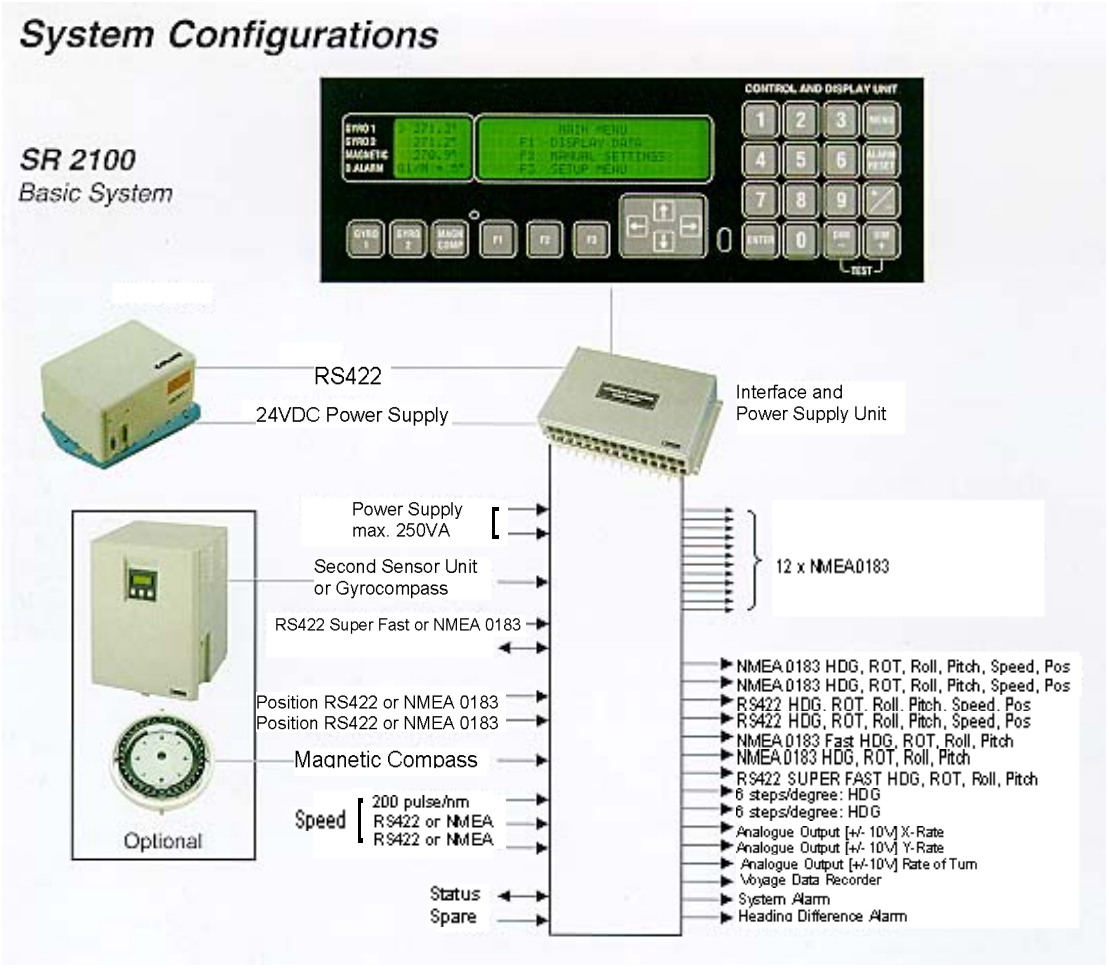
Speed References:

Forward Speed:	Positive X-speed
Starboard Speed:	Position Y-speed

(click image to view full size picture)

SR 2100 Controls and Display

1. Liquid crystal heading display with LED background illumination. Indicates in 4 lines of 9 characters the headings of GYRO 1, GYRO 2 and MAGNETIC compass, and also the preset heading Difference ALARM threshold. The difference in heading is selectable between: GYRO 1 and GYRO 2, or GYRO 1 and MAGNETIC compass, or GYRO 2 and MAGNETIC compass. The alarm threshold range is from 1º to 35º in increments of 1º.
2. Main liquid crystal display with 112 characters in 4 lines and LED background illumination. Provides the user with all necessary operational data and speed, latitude, longitude, roll and pitch angles, and rate of turn about all three axes (x,y,z).
3. Selects GYRO 1 as heading information source (selection only in a manual steering mode).
4. Selects GYRO 2 as heading information source (selection only in a manual steering mode).
5. Selects magnetic compass as heading information source (selection only in a manual steering mode).
6. Function keys. In combination wiht the main display, the function keys provide the user with a menu controlled, high-level operation dialogue.
7. The cursor keys simplify the selection of menu pages and the editing of operational data.
8. Key pad with 16 logically arranged sealed-foil keys for the input of operational data, selection of menu pages, alarm reset, test functions and illumination control.


System Configurations
SR 2100
Basic System
CONTROL AND DISPLAY UNIT
RS422
24VDC Power Supply
Interface and
Power Supply Unit
Power Supply
max. 250VA
Second Sensor Unit
or Gyrocompass
RS422 Super Fast or NMEA 0183
Position RS422 or NMEA 0183
Position RS422 or NMEA 0183
Magnetic Compass
Speed
200 pulse/nm
RS422 or NMEA
RS422 or NMEA
Optional
Status
Spare
12 x NMEA0183
NMEA 0183 HDG, ROT, Roll, Pitch, Speed, Pos
NMEA 0183 HDG, ROT, Roll, Pitch, Speed, Pos
RS422 HDG, ROT, Roll, Pitch, Speed, Pos
RS422 HDG, ROT, Roll, Pitch, Speed, Pos
NMEA 0183 Fast HDG, ROT, Roll, Pitch
NMEA 0183 HDG, ROT, Roll, Pitch
RS422 SUPER FAST HDG, ROT, Roll, Pitch
6 steps/degree: HDG
6 steps/degree: HDG
Analogue Output [+/- 10V] X-Rate
Analogue Output [+/- 10V] Y-Rate
Analogue Output [+/-10V] Rate of Turn
Voyage Data Recorder
System Alarm
Heading Difference Alarm

SR 2100 Gyrocompass Technical Data	
Accuracy: (under all conditions)	
Heading:	Less than/equal to 0.7° secant latitude
Roll/pitch angle:	Less than/equal to 1.0°
Range:	
Heading:	Less than/equal to o° to 360°
Roll & Pitch:	+/- 45°
Rates (X,Y,Z):	+/- 80°/sec.
Settling Time:	
Static conditions:	Less than/equal to 30 minutes
Sea conditions:	Less than/equal to 45 minutes
Rate of Turn:	Less than/equal to 4 minutes
Environmental Conditions: In accordance with EN 60945 (IEC 945+A1) Ambient Temperature	
Operation:	-15°C to +55°C
Storage:	-35°C to +70°C
Signal Outputs:	
NMEA heading output:	12 analogue repeaters
NMEA 0183:	2 all data
RS 422:	2 all data
NMEA 0183 FAST:	1 HDG, ROT, ROLL, PITCH
RS 422 SUPER FAST:	1 all data (bidirectional)
6 steps/degree:	2 heading
Analogue +/- 10V:	3 rate signals
Analogue 4 to 20mA:	1 rate signal
HDLC:	1 all data (bidirectional)
Signal Inputs:	
Position:	NMEA 0183/RS 422
Speed:	NMEA 0183/RS 422 200 pulse/nm (max 200kts)
Second Gyrocompass:	NMEA 0183 or RS 422
Magnetic compass heading:	NMEA 0183 or since/cosine signal
Power Requirements:	
115/230 VAC 50Hz/60Hz, and/or 24 VDC (18V - 36V). Includes automatic switchover to 24 V emergency power supply in accordance with GMDSS* Rules for INMARSAT/SES Terminals.	
Power Consumption:	
Startup and operation (DC)	45W
Each repeater compass	7W
* Global Maritime Distress and Safety System	