NORTHROP GRUMMAN

Sperry Marine

Operation, Installation and Service Manual

NAVIGAT X MK 1

Digital Gyrocompass Systems
Type 4914-CA, Stock No. 74807 and Type 4914-CC, Stock No. 74811

056343/C, 08 May 2008

Revision Record

Rev.	Date	Remarks
C	08 May 2008	Added new options (AD10 output, alarm mute relay, speed filter).
B	17 Nov 2006	Removed gyrospere installation/service instructions. These are now contained in separate documents delivered with the respective gyrosphere and container. All information regarding the master PCB refers to the new PCB, stock no. 20672.
A	18 Jan 2005	initial release.

Safety Instructions

Safety Notice Conventions

The following safety notice conventions are followed throughout this manual:

DANGER

A **Danger** notice contains an operating or maintenance procedure, practice, condition, statement, etc., which, if not strictly observed, **will result in injury or death of personnel.**

WARNING

A **Warning** notice contains an operating or maintenance procedure, practice, condition, statement, etc., which, if not strictly observed, **could result in injury or death of personnel.**

CAUTION

A **Caution** notice contains an operating or maintenance procedure, practice, condition, statement, etc., which, if not strictly observed, **could result in damage to, or destruction of equipment.**

Note

A **Note** contains an essential operating or maintenance procedure, condition or statement, which is considered important enough to be highlighted.

Special safety symbols may be used in this manual to indicate:

Risk of electrical shock.
Used in conjunction with a **Danger** or **Warning** notice.

Electrical components sensitive to electrostatic discharge.
Used in conjunction with a **Caution** notice.

General Safety Information for the Operator

WARNING	**Never rely on one heading source alone to navigate a vessel.**
⚠	**Always confirm the plausibility of the NAVIGAT X MK 1 heading and the speed and position input data against all available aids to navigation.**

WARNING	**After a power-up from cold, the NAVIGAT X MK 1 requires a settling time of three hours before reliable heading data is available.**
⚠	**Power up the system at least three hours before leaving harbour.**
	Power down the system during long docking periods only.
	Make sure that the NAVIGAT X MK 1 has settled before using its heading as the reference for heading control systems, RADAR, ECDIS, etc.
	A magnetic heading source should be made active only in case of failure of the gyrocompass(es).

WARNING	**Before using this system, operators must be appropriately trained and familiar with the operating procedures and safety instructions contained in this manual.**
⚠	**Keep system manuals in a well-known, readily available location.**

CAUTION	The supporting fluid in the gyrosphere container will start freezing at temperatures below 0 °C.
⚠	The NAVIGAT X MK 1 may no longer be operated when the ambient temperature at the gyrocompass' location falls below –10 °C while the compass is in operation or when the ambient temperature falls below 0 °C while the compass is not in operation.

CAUTION	Any service work on the gyrosphere is to be carried out by authorized service personnel only.
⚠	

CAUTION	Do not clean the compass housing with organic solvents, acetone or any other substance which could damage or discolour plastic.
⚠	Use only soapy water or a mild detergent to clean the compass housing.

General Safety Information for Service Personnel

DANGER

When the compass is energized, the gyrosphere operating voltage of 100 VAC @ 337 Hz is present on the master PCB, the gyrosphere supply lines, and across the gyrosphere contacts.
When the AC main supply is switched on, live voltages are present at the line filter and the power transformer's terminals.

CAUTION

The gyrosphere is always to be transported in its carrying box in the original transport container.
Do not throw or drop the transport container.
The transport container is to be transported in an upright position only.

Carry the carrying box containing the gyrosphere by hand only and handle it with extreme care. Remove the gyroshpere from the carrying box only if required for immediate installation.

CAUTION

After power-down of the compass system, it may take up to 45 minutes for the gyroscopes to stop rotating.
During this time, the container must be handled with extreme care.
Should the sphere touch the wall of the container, the momentum of the rotating gyroscopes will make it topple and damage the center pin.

CAUTION

The NAVIGAT X MK 1 contains electrostatic sensitive components.

Electrostatic discharge may permanently damage components.

When servicing the NAVIGAT X MK 1, take precautions to prevent electrostatic discharge. Avoid touching any of the electronic circuitry.

CAUTION

It cannot be guaranteed that parameter settings in the User and Setup menus and the entries made in the Magnetic Compass Calibration table are left intact when the software is exchanged.
Before exchanging the system software IC, record all parameter settings to be able to re-enter them manually, if required.

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Chapter 1: Introduction

1.1 Design and Main Features

The NAVIGAT X MK 1 is a microprocessor controlled marine gyrocompass system with integrated automatic North speed error correction.

As a gyrocompass, the system complies with IMO resolutions A.424(IX) and A.694(17) and with EN ISO 8728.
The HSC-version (stock no. 74811) with a specially selected gyrosphere also complies with IMO resolution A.821(19).

The rate of turn output of the NAVIGAT X MK 1 complies with IMO resolution A.526(13).

The NAVIGAT X MK 1 has been type approved by the German Federal Maritime and Hydrographic Agency (BSH), in accordance with the Marine Equipment Directive (MED) 96/98/EC, as modified by Directive 2002/75/EC.

The single unit design with a polyurethane hard foam housing allows the gyrocompass to be installed on any bridge. If required, the operating unit may be installed at a location remote from the compass or an additional remote operating unit may be used.

The unique method of supporting the gyrosphere by means of mere buoyancy ensures North stabilisation during short power failures. E.g., after a three minute loss of power, no more than two degrees of deviation may be expected. Once power has been restored, the gyrocompass will return quickly to the correct heading. The combined effects of the twin rotors and the liquid damping system virtually eliminate latitude error.

Heading is measured as a 13-bit absolute value with a digital shaft encoder. The high-speed follow-up system (follow-up speed up to 100°/s) ensures that accurate heading and rate of turn data is provided under all operating conditions.

Integrated monitoring of the supply powers, gyroscope current and the follow-up system ensure secure and trouble-free operation.

1.2 Operating Principle

The north-seeking element used in the NAVIGAT X MK 1 system is the gyrosphere, a hermetically sealed unit with a funnel-shaped recess, reaching from the outer skin down to its center.
Inside the gyrosphere, two mechanically linked gyroscopes are mounted with their spin axes horizontal in a carrying frame. The gyroscopes are allowed to turn around the vertical, but torsion bands effect a defined rest position, while a mechanical linkage ensures that the resultant spin vector of the gyros remains stationary relative to the gyrosphere. This twin gyro arrangement eliminates intercardinal roll error. Once the gyros have run up to speed, their resultant spin vector, and with it the sphere, settles in the direction of true North.

Figure 1-1:
The gyrosphere

damping trough · centering pin · S gyro · N gyro · gyro linkage · gyrosphere shell
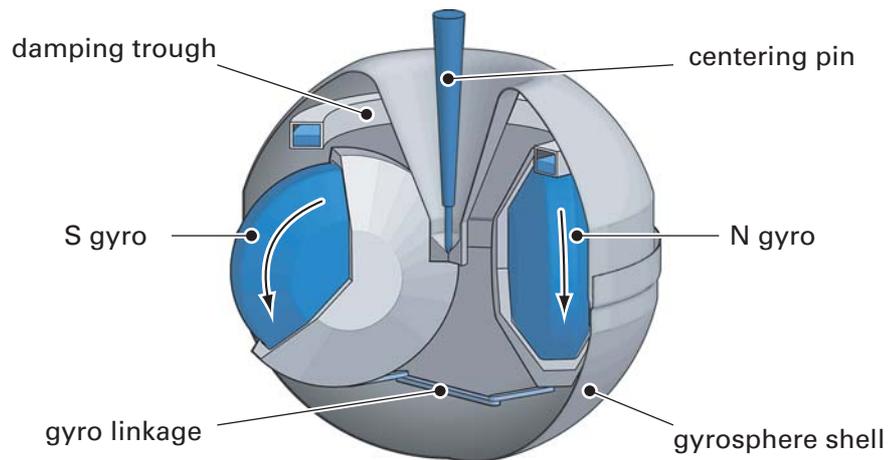
The top of the gyrosphere contains an annular damping trough, half filled with a viscous fluid. The fluid damps azimuthal oscillations of the gyroscope system. The oscillation period is tuned to the Schuler period of 84.4 minutes, so that heading errors during horizontal acceleration due to changes in speed and/or direction are prevented.

The gyrosphere floats in a supporting fluid inside the gyrosphere container. Because the buoyancy of the sphere is a little greater than its weight, a bearing cup at the bottom of the recess is pressed against the centering pin and keeps the sphere exactly centered in the container.
In order to make the gyroscope system pendulous, that is, to provide the gravity controlling moment, the gyrosphere is designed so that its centre of gravity lies slightly below the centre of bouyancy.

The gyroscopes are in fact squirrel-cage induction motors, which attain a speed of nearly 20000 rpm at a voltage of 100 VAC @ 337 Hz.
In the Mod. 10/3 container, their supply power is applied through the electrolytically conducting supporting fluid, via the top and bottom contacts. In the Mod. 10/2 and Mod. 7/2 containers, the power is applied via the centering pin and the bottom contacts.

A follow-up control circuit keeps the container aligned with the sphere at all times, thus heading can be derived from the container's orientation. While systems with the Mod. 10/3 container employ an optical pickoff to provide the follow-up control signal, systems with the Mod. 10/2 and Mod. 7/2 containers use a resistance bridge circuit, formed by the conducting paths from the contact pins in the container, through the supporting fluid and to the equator contact of the gyrosphere.

1.3 Example System Configurations

Standalone Gyrocompass/TMC System

As a standalone system, the NAVIGAT X MK 1 provides North-speed error corrected true heading as well as rate of turn data.

If a fluxgate sensor, type 4863, or an electronic magnetic compass is installed, the NAVIGAT X MK 1 applies magnetic variation and distributes magnetic heading data to external equipment (TMC function). The heading diff. alarm function permits to monitor the difference between the gyro and magnetic heading sources.
In case of failure of the gyrocompass, the magnetic heading source may be activated to provide an emergency heading reference for repeaters and other peripheral equipment.

Figure 1-2:
Standalone
Gyrocompass/TMC
system
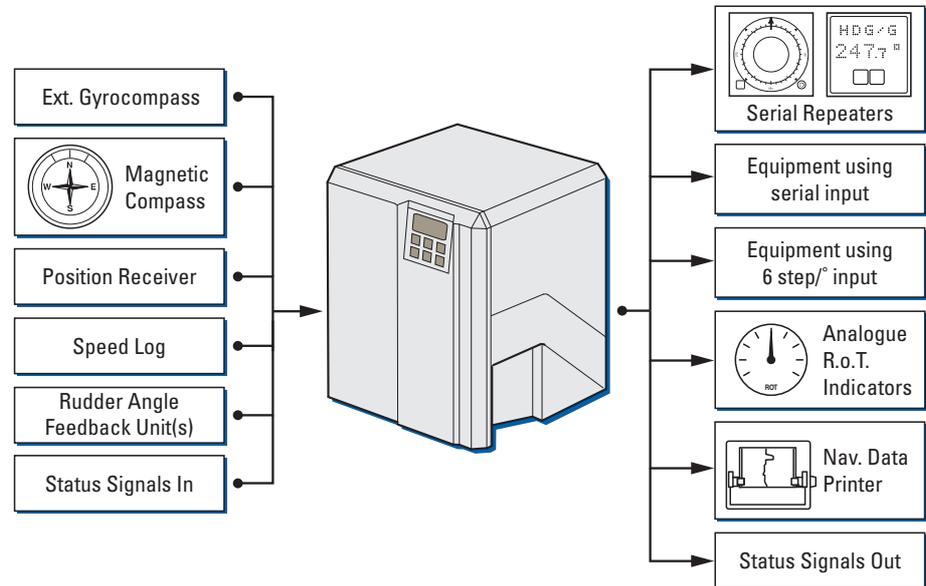
Dual NAVIGAT X MK 1 Gyrocompass/TMC System

The system shown in Figure 1-3 below is the standard configuration for a dual NAVIGAT X MK 1 gyrocompass system.

In addition to the two NAVIGAT X MK 1 compasses, this system comprises the NAVITWIN IV heading management system and the Switch-Over Unit Type 4932.

By selecting the active heading source at the NAVITWIN IV, the operator determines which compasses' data is distributed via the Switch-Over Unit to external equipment, such as heading control systems, RADAR, compass repeaters etc.

The NAVITWIN's heading diff. alarm function permits to monitor the difference between any two of the available heading sources.
The off heading alarm function permits to monitor the difference between the actual heading from the active source and the set heading order, as received from a heading control system or entered manually.

Alarms generated locally by a NAVIGAT gyrocompass are indicated and may be acknowledged at the NAVITWIN IV.
In turn, the NAVITWIN IV transmits system-wide operational settings and setup parameters to the NAVIGAT gyrocompasses.
The available heading sources, the current source selection and the hdg. diff. threshold are also indicated at both gyrocompasses.

If a magnetic heading source is installed, the NAVITWIN applies magnetic variation and distributes the data to external equipment (TMC function). In case of failure of the gyrocompasses, the magnetic heading source may be activated to provide an emergency heading reference for repeaters and other peripheral equipment.

Figure 1-3: NAVIGAT Dual Gyrocompass System
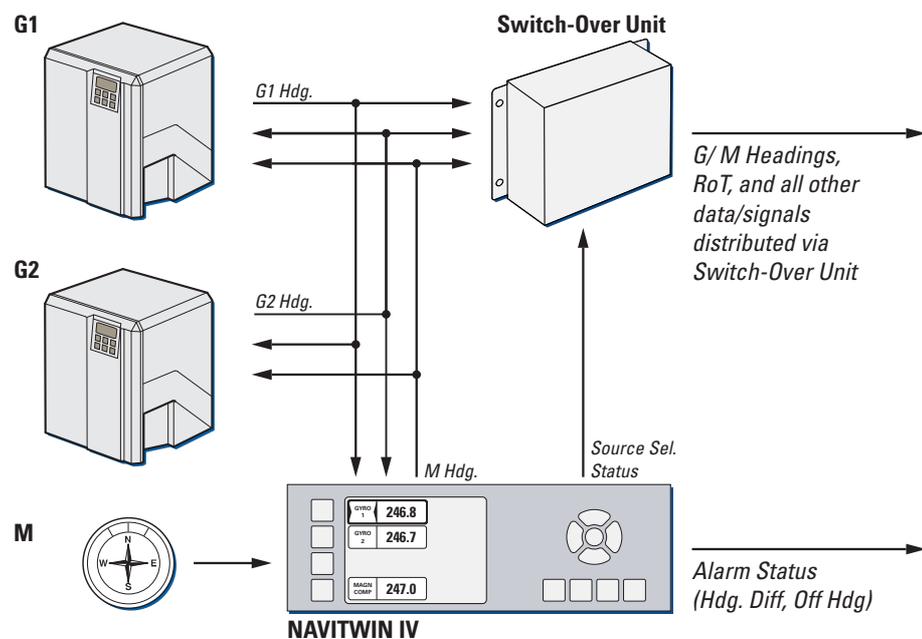
Note A system with one NAVIGAT X MK 1 and one NAVIGAT 2100 fiber-optic gyrocompass is also possible in an otherwise identical configuration.

1.4 Technical Data

Accuracies

heading: lin. mean settle point error static error dynamic error deviation after 3 min. power interruption	≤0.1° secant latitude ≤0.1° secant latitude ≤0.4° secant latitude < 2°
rate of turn	≤0.5°/minute

Operational Characteristics

mean setting time	< 3h
max. follow-up speed	100°/s
freedom of roll and pitch - with container Mod. 10 - with container Mod. 7	±40° ±90°
MTBF	40 000 h

Environmental Requirements

ambient temperature, operation	–10 to +55 °C
ambient temperature, storage (without supporting fluid)	–25 to +70 °C
environmental conditions / EMC	in accordance w. IEC 60945

Protection Grade

according to IEC 60529/DIN 40050	IP 23

Magnetic Clearance

to standard magnetic compass	0.6 m
to steering magnetic compass	0.4 m
reduced, to standard magnetic compass	0.3 m
reduced, to steering magnetic compass	0.3 m

Power Supply

supply voltage	main: 115/230 VAC, 50/60 Hz; backup: 24 VDC (18-36 V), includ- ing automatic switchover to backup supply in case of main supply failure
max. ripple content DC supply	±4 Vpp; extreme values may not exceed 36 V or fall below 18 V
power consumption: start-up operation each repeater compass	AC: 125 VA; DC: 80 W AC: 75 VA; DC: 45 W 7 W

Dimensions and Weight
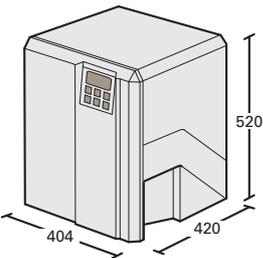
width	404 mm
height	520 mm
depth	420 mm
weight	25 kg approx.

Data Inputs

ext. gyro heading	NMEA 0183 / IEC 61162-1 or PLATH protocol or Lehmkuhl (1200, 2400, 4800 or 9600 Bd.)
magnetic heading	NMEA 0183 / IEC 61162-1 or PLATH protocol or NAVIPILOT
position	NMEA 0183 / IEC 61162-1
speed	NMEA 0183 / IEC 61162-1
compass monitor NAVITWIN	NMEA 0183 / IEC 61162-1

Signal and Status Inputs

magnetic heading, fluxgate sensor	sin., cos. and ref. voltages from Sperry Marine fluxgate sensor type 4863
speed, 200 pulse/nm	connection to P.Gnd via ext. contact, momentary
rudder angle feedback unit (2x; reads rudder angle for output to NAVIPRINT)	0 – 5 VDC return voltage from feedback potentiometer(s)
steering mode status (auto/man)	connection to P.Gnd via ext. contact, latching
ext. heading reference sel. (gyro1/gyro2)	connection to P.Gnd via ext. contact, latching
ext. heading reference sel. (gyro/mag)	connection to P.Gnd via ext. contact, latching
ext. alarm acknowledge (mute)	connection to P.Gnd via ext. contact, momentary
status input port (log status or hdg. +180° function)	connection to P.Gnd via ext. contact, latching

Data Outputs

serial repeater outputs (12x TTL)	NMEA 0183
sensor data outputs (4x RS-422; 3 available if AD10 output active)	NMEA 0183 / IEC 61162-1
FAST output (1x RS-422)	NMEA 0183 / IEC 61162-1 or PLATH protocol
SuperFAST output (2x RS-422; 1 available if AD10 output active)	NMEA 0183 / IEC 61162-1 or NMEA 0183 / IEC 61162-2 or PLATH protocol
AD10 heading data output	AD10 serial data and clock
NAVITWIN output	NMEA 0183 / IEC 61162-1 to ext. gyro / compass monitor NAVITWIN
NAVIPRINT output	serial data to nav. data printer

Signal and Status Outputs

6 step/° output (2 x)	3 phases, switched to 0V potential if active („minus switching"), common positive; internal supply 24 VDC max. 18 W (12–70 VDC phase voltage when ext. power supply is used)
rate of turn, analogue	±0.1–999.9 mV/°/min; max. 10 V, 10 mA
power failure/general alarm heading difference alarm max. ROT exceeded alarm, heading source sel. status status out to switch-over unit watch alarm acknowledge AC power status DC power status	potential-free contact closures, each rated 30 VDC/1.0 A, 100 VDC/0.3 A, 125 VAC/0.5 A

Chapter 2: Operation

2.1 Operating Conditions

The permitted ambient temperature for the operation of the gyrocompass system is -10 – +55 °C.

CAUTION	The supporting fluid in the gyrosphere container will start freezing at temperatures below 0 °C.
	The NAVIGAT X MK 1 may no longer be operated when the ambient temperature at the gyrocompass' location falls below –10 °C while the compass is in operation or when the ambient temperature falls below 0 °C while the compass is not in operation.

When the ambient temperature at the gyrocompass' location falls below -10 °C while the compass is in operation or when the ambient temperature falls below 0 °C while the compass is not in operation, the gyrosphere container must be removed from the compass housing and stored in a place where the ambient temperature will not fall below 0 °C.

If no storage place is available where the ambient temperature will not fall below 0 °C, the gyrosphere must be removed from the gyrosphere container to prevent possible damage by frozen supporting fluid.

CAUTION	The gyrosphere may be removed from the gyrosphere container by authorized service personnel only.

2.2 Display and Operating Keys

Control and Display Unit
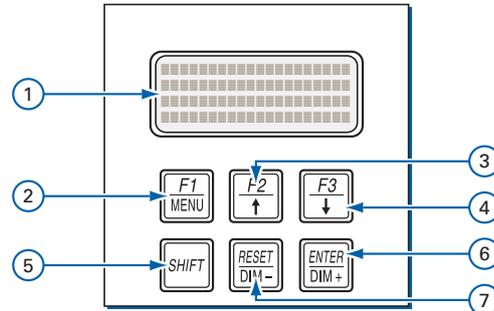
Display

① **LCD Display:** 4x20 character text display
In normal operational mode, shows the available heading sources and the heading diff. alarm threshold.
In menu mode: displays the currently active op. menu screen

Operating Keys

② **MENU / F1 key:** Calls up the main menu from normal operational mode. When pressed in menu mode, returns to next higher menu level.
When pressed simultaneously with the **SHIFT** key, the **F1** function is executed.

③ **Up (⇡) / F2 key:** In menu mode, returns from the main menu to normal operational mode. Within a sub-menu, scrolls up through available pages on same menu level.
When pressed simultaneously with the **SHIFT** key, the **F2** function is executed.

④ **Down (⇣) / F3 key:** Calls up the Main Menu from normal operational mode. Within a sub-menu, scrolls down through available pages on same menu level.
When pressed simultaneously with the **SHIFT** key, the **F3** function is executed.

⑤ **SHIFT key:** Pressed with other key to call up key's **SHIFT** function.

⑥ **DIM+ / RESET key:** Adjust the display brightness.
When pressed simultaneously with the **SHIFT** key, the **RESET** function is executed.

⑦ **DIM- / ENTER key:** Adjust the display brightness.
When pressed simultaneously with the **SHIFT** key, the **ENTER** function is executed.

2.3   External control devices

Depending on the installation, external devices may be present which remotely control certain functions of the NAVIGAT X MK 1:

- An external device may be used to select the "active" source, i.e. the heading reference to be distributed to compass repeaters, heading control system, RADAR, ECDIS etc.).

- An external selector switch may be used to reverse the heading (apply a 180° offset to the heading data), e.g. for operation in double-ended ferries.

- The audible alarm at the NAVIGAT X MK 1 the may be muted from a remote device, e.g. a central alarm panel.

2.4 Power-up Sequence

The NAVIGAT X MK 1 is not equipped with a power switch. The gyro-compass powers up as soon as supply power is applied.

Upon power up, the startup routine is executed:

```
   SPERRY   MARINE

   NAVIGAT X MK 1
```

A startup screen is shown and a system test sequence is executed.

```
>F1 GYRO 1    271.2°
 F2 GYRO 2    271.4°
 F3 MAGN.C.   270.9°
 DIFF G1/G2      5°↓
```

When the system test has been passed, the NAVIGAT X MK 1 enters normal operational mode. The display shows the heading data from the available compasses and the heading difference alarm threshold.

The currently active heading source is indicated by an arrow symbol (>) next to the source's name.

WARNING	**After a power-up from cold, the NAVIGAT X MK 1 requires a settling time of three hours before reliable heading data is available.**
⚠	**Power up the system at least three hours before leaving harbour.** **Power down the system during long docking periods only.** **Make sure that the NAVIGAT X MK 1 has settled before using its heading as the reference for heading control systems, RADAR, ECDIS, etc.**

2.5 Selecting the active heading source

The operator may select one of the available heading sources as the "active" source, i.e. the heading reference to be distributed to compass repeaters, heading control system, RADAR, ECDIS etc.).

Depending on the system configuration, the active heading source is either selected from the NAVIGAT X MK 1 control and display unit (single or dual gyrocompass systems) or from an external device such as a NAVITWIN compass monitor/heading management system, a NAVIPILOT heading control system or an external selector switch.
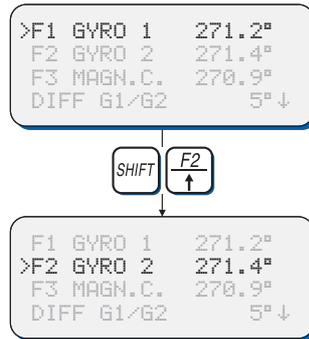
To change the active heading source from the control and display unit

Press the selector key next to the desired source's heading display.

The selected source is made active.

| Note | | If the system is configured for source selection from an external device, selection from the control and display unit is disabled.
The active heading source can be changed in a manual steering mode only.
In automatic steering modes, source selection is disabled and an error beep sounds when an attempt is made to change the active source. |

| **WARNING**
 | **Make sure that the NAVIGAT X MK 1 has settled before using its heading as the reference for heading control systems, RADAR, ECDIS, etc.**
A magnetic heading source should be made active only in case of failure of the gyrocompass(es). |

2.6 Adjusting the display brightness

The brightness of the display and keypad illumination is adjusted via the **DIM+/DIM-** keys:
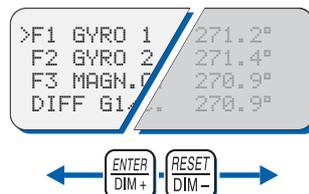
Press the **DIM+** key to increase the illumination brightness.
Press the **DIM-** key to reduce the illumination brightness.

2.7 Optional Functions

The following functions may be available if the system is equipped with the respective external controls and configured accordingly.

Muting Alarms Remotely

On alarm, actuate the mute control at a remote device (e.g. a central alarm panel). The audible alarm is muted.

Note A remotely muted alarm remains in the pending (unacknowledged) state. The alarm message is shown on the display until the alarm is acknowledged at the NAVIGAT X MK 1 or the cause of the alarm is eliminated.

Reversing the Heading Display (180° offset)

To reverse the heading display, e.g. for operation on double-ended ferries, activate the 180° offset function at the associated external control.

Note The heading display may be reversed automatically in some installations, e.g. when control is centrally transferred between fore and aft steering stands.

Resetting/Acknowledging a Central Watch Alarm

If connected to a central watch alarm facility ('dead man alarm'), the NAVIGAT X MK 1 will automatically reset the watch alarm timer whenever a key is pressed on the unit.

Should a watch alarm be given, pressing any key at the NAVIGAT X MK 1 will acknowledge the alarm and reset the watch alarm timer.

2.8 Operating Menu

The data display menu as well as the manual settings, user and service setup sub-menus are accessed through a multilevel operating menu.

Entering and Quitting the Main Menu

```
>F1 GYRO 1    271.2°
 F2 GYRO 2    271.4°
 F3 MAGN.C.   270.9°
 DIFF G1/G2     5°↓
```

```
 F1      F3          F2
MENU     ↓           ↑
```

```
    MAIN MENU       ↑
 F1 DISPLAY DATA
 F2 MANUAL SETTINGS
 F3 SETUP MENU
```
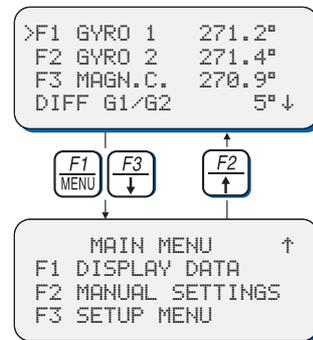
From the normal operational mode, press the **MENU** or the **Down** key to enter the menu mode.

The main menu screen opens.

From the main menu screen, press the **Up** key to return to the normal operational mode.

The NAVIGAT X MK 1 returns to normal operational mode.

Navigating the Menu

In the menu mode, the operator may navigate through the menu using the **F1**, **F2**, **F3**, **Up/Down**, **Dim+/Dim-** and **MENU** key functions.

```
    MENU X
 F1 SUBMENU Y
```

```
SHIFT   F1
       MENU
```

```
    SUBMENU Y
    OPTION A1
```
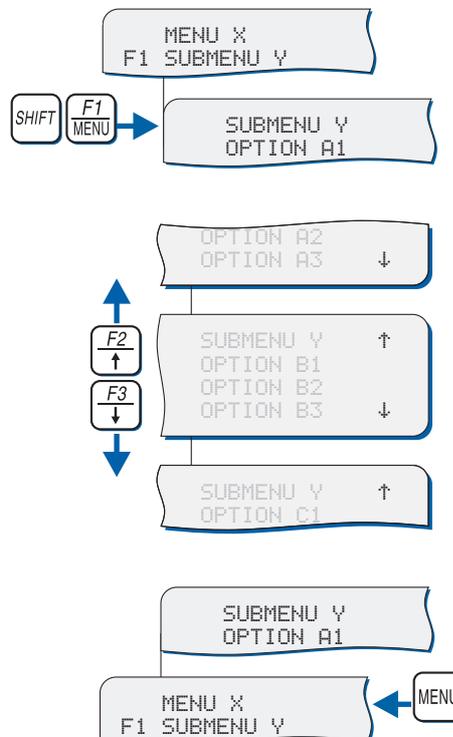
Press **Shift-F1**, **Shift-F2** or **Shift-F3** to go to the respective sub-menu.

```
    OPTION A2
    OPTION A3     ↓
```

```
 F2
 ↑
```

```
 F3
 ↓
```

```
    SUBMENU Y     ↑
    OPTION B1
    OPTION B2
    OPTION B3     ↓
```

```
    SUBMENU Y     ↑
    OPTION C1
```

Arrow symbols (↑/↓) at the right of the window indicate that further pages are available at the same menu level.

With the **Down** or **Up** key, scroll to the next or previous page respectively.

```
    SUBMENU Y
    OPTION A1
```

```
    MENU X
 F1 SUBMENU Y
```

```
MENU
```

Press the **MENU** key to return to the next higher menu level.

Selecting Parameter Settings

A number of operational and setup parameters are set by selecting the appropriate option from a list.

Flashing up/down arrow symbols to the right of a parameter setting indicate that a selection can be made from a list of options:

```
        MAN.SETTINGS
 SPEED MODE: AUTO
 POSIT MODE: AUTO
```
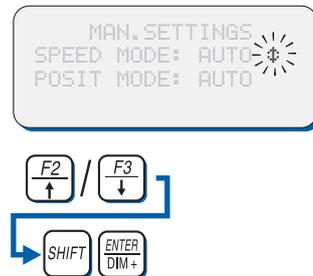
With the **Up/Down** keys, select the required option.

Press **Shift-ENTER** to confirm and store the selection.

MENU leaves the sub-menu without changes.

Editing Parameter Values

A number of operational and setup parameters are set by editing a numerical value.

A flashing box cursor indicates that a parameter's value is editable:

```
        MAN.SETTINGS
 MAN SPEED:   .3 kn
 MAN LAT: 56:78.90 N
```
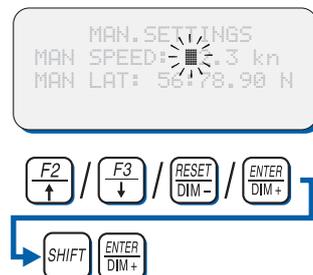
With the **Up/Down** keys, edit the character at the current cursor position.

With the **Dim+/Dim-** arrow keys, move the cursor forward/back to edit the next/previous character.

Press **Shift-ENTER** to confirm and store the new value.

MENU leaves the sub-menu without changes.

2.9 Selecting a Display Data Page

The Display Data menu allows the operator to select one out of five pages to permanently display relevant operational data, instead of the normal heading display screen.
The selected page is displayed until another page is selected or the Display Data mode is quit.

```
     MAIN MENU
 F1 DISPLAY DATA
 F2 MANUAL SETTINGS
 F3 SETUP MENU
```

SHIFT F1
       MENU

```
DISPLAY DATA GYRO 1
HEADING TRUE 271.3
 ROT    1.2  /MIN
CORR. ON       0.2
```

```
DISPLAY DATA GYRO 1
HEADING MAGN 270.9
MAGN.VAR.    2.3  E
```

F2
↑

F3
↓

```
DISPLAY DATA GYRO 1
   POSITION AUTO
   LAT  44.09.46 N
   LON 023.54.21 E
```

```
DISPLAY DATA GYRO 1
    SPEED AUTO
      12.3 kn
 CORR. 12.3 kn
```

```
DISPLAY DATA GYRO 1
  DATE 23.01.06
  TIME 12:34
```
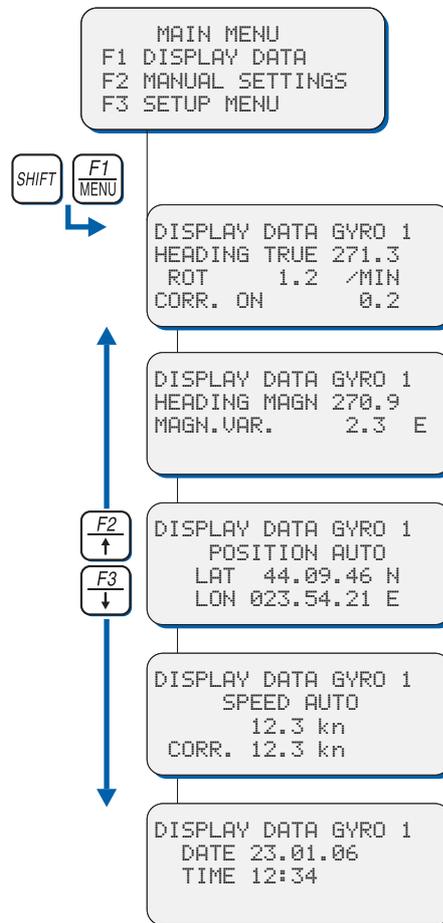
From the Main Menu, press **SHIFT - F1** to go to the Display Data sub-menu.

With the **Up/Down** keys, select the required page to display

The following data pages are available:

- True heading (own gyro heading);
  Rate of turn;
  Correction mode and value.

- Magnetic comp. heading;
  Magnetic variation.

- Position Mode;
  Latitude
  Longitude (in auto mode).

- Speed Mode;
  Actual speed value
  Speed value used for speed error correction.

- Date (DD.MM.YY);
  Time (hh.mm).

2.10 Manual Settings Menu

The Manual Settings menu provides access to settings which the opera-
tor may need to alter more or less frequently during normal operation.

Note	In case a NAVITWIN compass monitor / heading management system is installed, the manual settings must be entered at the NAVITWIN. The NAVITWIN will overwrite any manual settings entered locally at the NAVIGAT X MK 1 control and display unit.

Manual Settings – Overview

Figure 2-2:
Manual Settings


```
MAN.SETTINGS GYRO 1
F1 SPEED/LATITUDE
F2 HDG DIFF.ALARM
F3 MAG. VARIATION  ↓
```

SPEED/LATITUDE   *speed/latitude input settings*

→ **SPEED/LAT MODE**
  → **SPEED MODE**
    ○ **AUTO**
    ○ **MAN**
  → **POSIT MODE**
    ○ **AUTO**
    ○ **MAN**

→ **SPEED/LAT SET**
  → man. speed value: **0.0 – 99.9 kts.**
  → man. lat. value: **99:99.99 N – 99:99.99 S**

HDG. DIFF. ALARM   *heading difference alarm threshold*

→ **BETWEEN**
  ○ **GY1 / GY2**
  ○ **GY1 / MAG**
  ○ **GY2 / MAG**
  ○ **OFF**
→ alarm threshold: **0 – 99˚**

MAGNETIC VARIATION   *mag. variation input settings*

→ **MODE**
  ○ **AUTO**
  ○ **MAN**
→ man. variation value: **99.9˚ W – 99.9˚ E**

F3 ↓   F2 ↑

contd. on next page

Figure 2-3:
Manual Settings
(cont.d)

contd. from previous page

```
MAN.SETTINGS GYRO 1↑
F1 NORTH SP.ERR.CORR●
F2 SET. NAVIPRINT   ●
F3 SETTINGS ROT    ↓●
```

NORTH SP. ERR. CORR   *north speed error correction*

- ○**ON**
- ○**OFF**

SET. NAVIPRINT   *nav. data printer settings*

NAVIPRINT
- ○**ON**
- ○**OFF**

PAP. SPEED
- ○**60 mm**
- ○**150 mm**
- ○**600 mm**

HDG
- ○**±30˚**
- ○**±180˚**

RUDDER
- ○**±9˚**
- ○**±45˚**
- ○**±70˚**
- ○**OFF**

SETTINGS ROT   *rate of turn time constant*

TIME CONST. ROT
→ damping time constant: **0.0 – 10.0 s**

MAX. VALUE ROT
→ ROT alarm threshold: **0 – 9999 ˚/min**
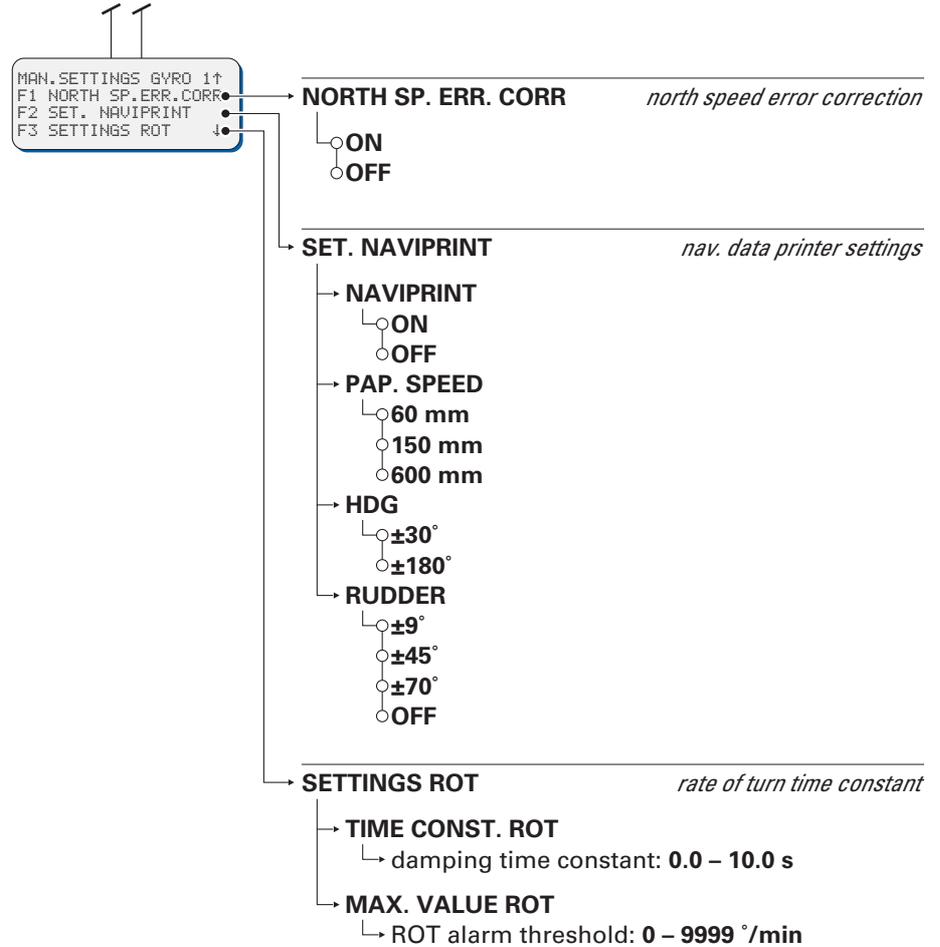
Manual Settings – Parameters

Speed/Latitude

Speed/Lat Mode
Selects the speed and position input modes.

Speed Mode
Selects the speed input mode.

Settings: **AUTO**
Speed data is read automatically from the serial data or the 200 pulse/nm input

MAN
The actual speed value is entered manually

Posit Mode
Selects the position input mode.

Settings: **AUTO**
Position data is read automatically from the serial data input

MAN
The actual position is entered manually

Speed/Lat Set
Sets the manual input values for the speed and latitude.

Values: speed: **0.0 – 99.9 kn**
latitude: **90°00.00′ N – 90°00.00′ S**

Hdg. Diff. Alarm

Sets the manual input values for the speed and latitude.

Between
Selects the heading sources to monitor.

Settings: **GY1/GY2**
               Monitor difference between gyros 1 and 2

               GY1/MAG
               Monitor difference between gyro 1 and magnetic hdg.

               GY2/MAG
               Monitor difference between gyro 2and magnetic hdg.

               OFF
               Hdg. diff monitoring is disabled

Alarm threshold
Sets the alarm threshold value.

Value: **0 – 99°**

Magnetic Variation

Sets the magnetic variation input parameters.

Mode
Selects the magnetic variation input mode.

Settings: **AUTO**
               Mag. variation data is read automatically

               MAN
               The actual mag. variation value is entered manually

Manual Value
Sets the manual input value for mag. variation.

Value: **99.9° W – 99.9° E**

North Sp. Err. Corr.

Selects the North speed error correction mode.

Settings: **ON**
               Automatic North speed error correction is enabled.

               OFF
               Automatic North speed error correction is disabled.

Set. NAVIPRINT

Sets the operating parameters for the NAVIPRINT nav. data printer.

NAVIPRINT
Turns printing on and off.

Settings: **ON**
             Activate output to printer

             OFF
             No output to printer

Pap. speed
Sets the paper feed speed.

Settings: **60 mm**
             print at 60 mm/h (1 cm = 10 min.).

             150 mm
             print at 150 mm/h (1 cm = 4 min.)

             600 mm
             print at 600 mm/h (1 cm = 1 min.)

Hdg.
Sets the scaling of the heading graph.

Settings: **±30**
             scale to show 30° to the left and to the right from the graph's
             centre (current print position shifts to centre when graph
             reaches margin)

             ±180°
             scale to show 180° to the left and to the right from the
             graph's centre (current print position shifts to the centre
             when graph reaches margin)

Rudder
Sets the scaling of the rudder angle graph.

Settings: **±9°**
             scale to show 9° to the left and to the right from the graph's
             centre. This setting provides a high-resolution recording of
             small rudder movements and is useful for monitoring e.g.
             the steering behaviour of an autopilot.

             ±45°
             scale to show ±45°. Standard setting for ±45° steering gears.

             ±70°
             scale to show ±70°. Standard setting for ±70° steering gears.

             OFF
             do not print rudder angle graph. Required setting if no rud-
             der angle feedback unit is connected to the compass.

Settings ROT

Sets the rate of turn input parameters.

Time constant ROT
Sets the damping time constant for the analogue rate of turn output.
The larger the time constant, the less short-time fluctuations will be
present in the analogue rate of turn output voltage.

Value: **0.0 – 10.0 s**

Max. value ROT
Sets the alarm threshold for the "Max. Rate of Turn exceeded" alarm.

Value: **0.0 – 6000 °/min.**

2.11 User Setup

The User Setup menu provides access to settings which the operator may need to alter occasionally.

User Setup – Overview

Figure 2-4:
User Setup

```
    USER SETUP
F1 DATE/TIME
F2 SOFTWARE VERSION
F3 MAG.C. CAL.TABLE
```

DATE/TIME   *input date/time*

    MODE
       AUTO
       MAN

    DATE
       dd.mm.yy (day.month.year)

    TIME
       hh:mm (hours:minutes)

SOFTWARE VERSION   *software version info*

    master board: ***nn.n***
    display board: ***nn.n***

MAG. C. CAL.TABLE   *magnetic compass*
                                                  calibration table

    MAG. C. CAL.TABLE
       ON
       OFF

    ENTER VALUES (F1)
       entry #: **0 – 49**
       hdg. display: **0.0 – 359.9˚**
       corr.value: **-99.9 – +99.9˚**
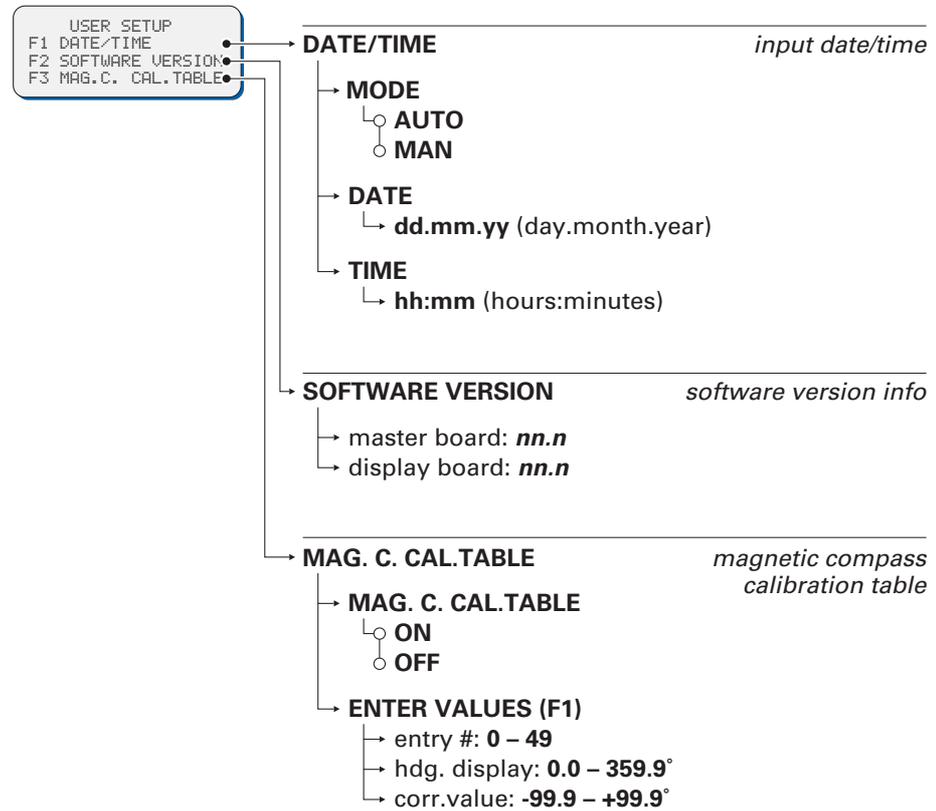
User Setup – Parameters

Date & Time

Sets the date and time input parameters.

Mode
Selects the date and time input mode.

Settings: **AUTO**
Date/time are read automatically from the serial data input

MAN
The current date and time are entered manually

Man. Date
Sets the current date manually.

Value: **DD.MM.YY** (current date in format day.month.year)

Man. Time
Sets the current time manually.

Value: **hh:mm** (current time in format hours:minutes)

Note   If manual input is used, date and time must be set after each power-up.

Software Version

Displays the master and display board software version info.

Settings: *none*
The software version sub-menu is read-only.

Mag. C. Cal. Table

Sets the parameters for the magnetic compass calibration table.

Mag. C. Cal. Table
Switches the automatic magnetic heading correction on or off.

Settings: **ON**
Automatic correction is enabled

OFF
Automatic correction is disabled

Enter Values
Enters the correction values into the magn. calibration table.

Values: *max. 50 pairs of heading and correction values*

Chapter 3: Errors and Alarms

3.1 Alarm Indication

Audible Alarm Indication

Single Beep: Invalid Action

A single short beep indicates that the operator attempted to carry out an invalid action.
This is the case, e.g. if the operator tries to change the heading reference in an automatic steering mode or to activate a heading source from which no valid data is received.

Continuous Beeping: Pending Alarm

Continuous on-off beeping indicates that a pending (unacknowledged) alarm is present.
Simultaneously, an alarm message is displayed.

Visual Alarm Indication

In case of a pending alarm, an alarm message is shown on the display which specifies the type of alarm present.

Figure 3-1:
Alarm message
(gyro failure)

```
       GYRO FAILURE

       F1 CONFIRM
```
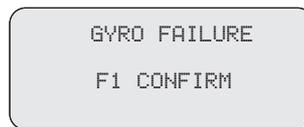
The message remains on the screen until the operator acknowledges the alarm or the cause of the alarm is no longer present.

3.2 Acknowledging Alarms/Muting the Audible Alarm

Alarm Acknowledge

To acknowledge a pending alarm at the NAVIGAT X MK 1:

```
  GYRO FAILURE

   F1 CONFIRM
```

SHIFT F1/MENU

```
    MK2 HEADING
>F1 GYRO 1    271.2°
 F2 MAGN.C.   270.9
 DIFF G1/M      5°↓
```
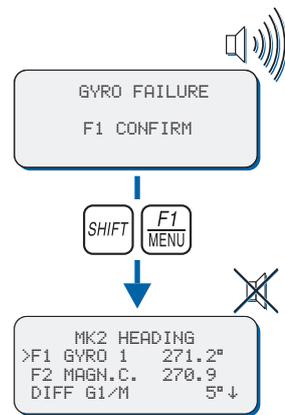
Press **Shift-F1**.

The alarm message is cleared and the audible alarm is muted.

As long as the cause of the alarm is present, the alarm remains "active". The currently active alarms may be viewed in the error list in the Service Setup 2.

Note

When an alarm has been acknowledged, the ext. alarm status output remains active until the cause of the alarm is eliminated.
When the cause of an alarm is eliminated, the alarm is acknowledged automatically and the alarm status is cleared.
The NAVIGAT X MK 1 does not keep a history of past (inactive) alarms.

Alarm Mute

To mute the audible alarm at the NAVIGAT X MK 1:

```
  GYRO FAILURE

   F1 CONFIRM
```

SHIFT RESET/DIM −

```
  GYRO FAILURE

   F1 CONFIRM
```
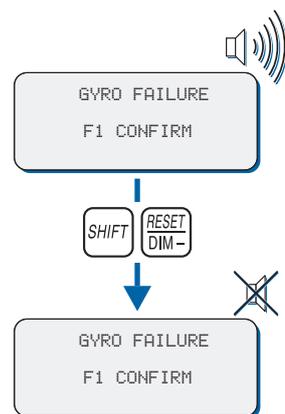
Press **Shift-Reset**.

The audible alarm indication is muted.

The visible alarm indication is not cleared and the alarm remains in the pending state until it is acknowledged by the operator.

3.3 Error messages

The following table lists the error messages which may appear on the display and in the error list when a system alarm is active.

Table 3-1:
error messages

Message on Display	Message in Error List	Cause	Corrective Action
GYRO *N* FAILURE *(N = own gyro ID)*	FAILURE GYRO *N*	The system cannot provide gyro heading. Possible causes are defects of the gyrosphere, the follow-up system or the shaft encoder, or a defect of the hard- or software on the master PCB.	If failed gyro is active hdg. source, activate another source, if available. Restart the gyrocompass system. If the error persists, call an authorized Sperry Marine service station.
GYRO *N* FAILURE *(N = ext. gyro ID)*	FAILURE GYRO *N*	Loss of data from ext. gyro heading source.	If failed gyro is active hdg. source, activate another source, if available. Check ext. gyro heading source and interface.
MAGN. COMPASS ERROR	FAILURE MAGN.	Loss of magnetic heading data from ext. source.	Check magnetic heading source and interface.
MAGN.VAR. INVALID	MAGN.VAR. INVALID	Loss of magn. variation data (if automatic input active)	Check magnetic variation source and interface.
SPEED ERROR	FAILURE SPEED	Loss of speed data from ext. source.	Check speed data source and interface.
SPEED INVALID	SPEED INVALID	Actual speed outside of valid speed range; invalid speed will not be used for North speed error correction	Check speed data source and interface. Check current speed filter parameters in Service Setup. If required, increase valid speed range and/or increase filter time constant.

Message on Display	Message in Error List	Cause	Corrective Action
POSITION ERROR	FAILURE POS.	Loss of position data from ext. source.	Check position data source and interface.
HEADING DIFF. ALARM	HEAD. DIFF ALARM	The monitored heading sources differ by more than the set alarm threshold.	Check heading sources to determine cause of the difference.
MAX ROT EXCEEDED	MAX ROT EXCEEDED	Max. Rate of Turn alarm threshold exceeded. Alarm reminds the operator not to exceed pre-set threshold during turns.	Prevent vessel from turning too fast or increase threshold if unwanted alarms are given.
FAILURE AC SUPPLY	FAILURE AC SUPPLY	Loss of power from main supply.	Check AC main power supply.
FAILURE DC SUPPLY	FAILURE DC SUPPLY	Loss of power from backup supply.	Check DC backup power supply.
RECOM-MENDED ANNUAL MAIN-TENANCE DUE! (see manual)	OPERATION TIME	Alarm given at power-up if more than 18 months have passed since last gyrosphere maintenance	Acknowledge alarm. System will power-up normally. To ensure trouble-free operation, it is highly rec-ommended to have mainte-nance carried out every 18 months.
NT COM FAULT	NT COM FAULT	Loss of input data from com-pass monitor NAVITWIN	Check NAVITWIN and interface

3.4 Service Info Menu (Service Setup 2)

The Service Setup 2 provides access to system status information which is used during installation and for troubleshooting errors.
Furthermore, an option is provided to reset the system without cycling the power (warm start).

Service Setup 2 – Access Code

To prevent inadvertent or unauthorized changes to the system configuration, all service setup menus are protected by access codes.

To access the Service Setup 2:

```
    MAIN MENU        ↑
F1 DISPLAY DATA
F2 MANUAL SETTINGS
F3 SETUP MENU
```
Call up the Main Menu

```
    SETUP MENU
F1 USER SETUP
F2 SERVICE SETUP
```
Press **Shift-F2** to select "Service Setup".

```
   SERVICE SETUP
  ENTER SETUP CODE
       000
```
When prompted for the setup code:
    Enter code "**610** "
    Press **Shift-ENTER** to confirm the code.

```
   SERVICE SETUP 2
F1 GYROSPHERE DATA
F2 OP.TIME COUNTER
F3 DATA LIST      ↓
```
The Service Setup 2 sub-menu opens.
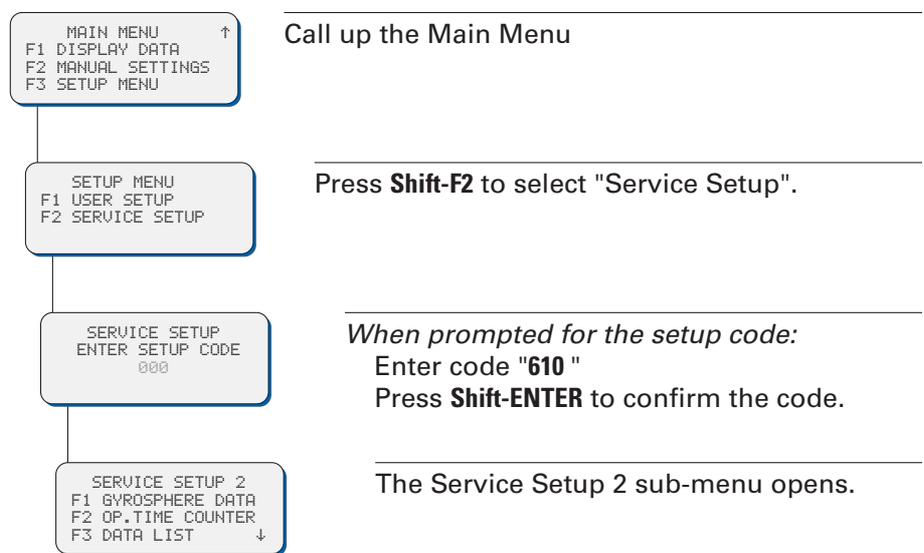
Service Setup 2 – Overview

Figure 3-2:
Service Setup 2

```
SERVICE SETUP 2
F1 GYROSPHERE DATA ●
F2 OP.TIME COUNTER ●
F3 DATA LIST      ↓●
```

GYROSPHERE DATA   *gyrosphere operational data*

→ **TEMPERATURE:** gyrosphere ambient temperature
→ **PH. BRIDGE:** phase bridge voltage
→ **GYRO CURR.:** gyrosphere current

OP. TIME COUNTER   *operation time counter*

→ operation time since last gyroshpere service (hours)

DATA LIST   *list of operational data*

not implemented in current software release

```
F3    F2
↓     ↑
```

```
SERVICE SETUP 2
F1 ERROR LIST   ●
F2 RESET MK 1   ●
```

ERROR LIST   *list of active errors*

→ error messages
→ number of errors

RESET MK 1   *system reset (warm start)*

→ initiate system reset

Service Setup 2 – Parameters

Gyrosphere Data

Displays the gyrosphere operating data.

Displays: **Temperature**
            The ambient temperature around the gyrosphere container.

            Ph. Bridge
            The follow-up circuit phase bridge voltage.

            Gyro Curr.
            The gyrosphere current.

Op. Time Counter

Displays the gyrosphere operation time counter.

Displays: Operation time in hours since last gyrosphere maintenance.
            The operation time counter is reset to zero by field service
            personnel during gyrosphere maintenance.

Data List

The Data List is not implemented in the current software version.

Error List

Displays the currently active system alarms.

Displays: **Error messages**
            The display alternates through the message texts of all
            active alarms. If no errors are present, "No Errors" is dis-
            played.

            No. of errors
            Displays the total number of active errors.

Reset MK 1

Initiates a system resets (warm start).
The warm start is equivalent to powering the system down and up
again, except that the power is not cycled.

Chapter 4: Scheduled Maintenance

4.1 Maintenance by Shipboard Personnel

For maintenance work to be carried out by shipboard personnel, no set maintenance schedule is required.

The display front plate and the compass housing should be kept clean and a regular visual inspection of cables and connectors should be carried out to detect any signs of damage or deterioration.

CAUTION

Do not clean the compass with organic solvents, acetone or any other substance which could damage or discolour plastic.
Use only water and soap or a mild detergent to clean the compass.

4.2 Gyrosphere Maintenance Specifications

The gyrosphere is the only component of the NAVIGAT X MK 1 which requires regular maintenance.

CAUTION

Scheduled maintenance or service work on the gyrosphere is to be carried out by authorized service personnel only.

18-Month Maintenance

Sperry Marine recommends to have a regular gyrosphere maintenance carried out by authorized service personnel every 18 months. During the 18-month maintenance, the gyrosphere and the inner surface of the container are cleaned and all fluids are renewed. If necessary, the centering pin is exchanged.

Note

If more than 18 months have passed since the last gyrosphere maintenance, a reminder message is displayed every time the gyrocompass is powered up.
This message indicates no malfunction but is intended to remind the operator that the recommended maintenance interval has been exceeded.
When the reminder message is acknowledged, the gyrocompass will power-up and commence normal operation. During the gyrosphere maintenance, the gyrosphere operation time counter is reset.

Five-Year Maintenance

To ensure continued trouble-free operation and to minimize the risk of failure, Sperry Marine recommends that every five years, the gyrosphere and the centring pin are exchanged by authorized service personnel.

Note   The five-year exchange interval for the gyrosphere is to be regarded as a recommendation only. Under normal conditions, the gyrosphere is able to operate flawlessly over a considerably longer period of time.

Chapter 5: Preventive Maintenance

5.1 Protecting the Gyrosphere from Low Temperatures

The permitted ambient temperature for the operation of the gyrocompass system is –10 to +55 °C.

CAUTION	The supporting fluid in the gyrosphere container will start freezing at temperatures below 0 °C.
⚠	The NAVIGAT X MK 1 may no longer be operated when the ambient temperature at the gyrocompass' location falls below –10 °C while the compass is in operation or when the ambient temperature falls below 0 °C while the compass is not in operation.

When the ambient temperature at the gyrocompass' location falls below –10 °C while the compass is in operation or when the ambient temperature falls below 0 °C while the compass is not in operation, the gyrosphere container must be removed from the compass housing and stored in a place where the ambient temperature will not fall below 0 °C.

If no such storage place is available, the gyrosphere must be removed from the gyrosphere container to prevent possible damage by frozen supporting fluid.

Removal and storage of the container as a whole (with the gyrosphere installed), as well as later re-installation of the container may be carried out by shipboard personnel.

Removal of the gyrosphere from the container and re-installation of the sphere into the container may be carried out by authorized service personnel only.

Removing the container from the compass housing

DANGER

When the compass is energized, the gyrosphere operating voltage of 100 VAC @ 337 Hz is present on the master PCB, the gyrosphere supply lines, and across the gyrosphere contacts.
Before removing the gyrosphere container, make sure the main and backup power supplies to the compass are switched off and safeguarded against accidental switching-on.

CAUTION

After power-down of the compass system, it may take up to 45 minutes for the gyroscopes to stop rotating.
During this time, the container must be handled with extreme care.
Should the sphere touch the wall of the container, the momentum of the rotating gyroscopes will make it topple and damage the center pin.

When the container is temporarily stored away with the gyrosphere installed, pack it into its original transport box or another suitable outer package and make sure that:
- the container is stored in an upright position,
- the temperature at the storage location cannot fall below 0°C,
- the container is not moved, tilted or subjected to shock.

Parts, materials and tools required

- a 5mm hex key
- a No. 2 Philips-head screwdriver

Procedure[1]

1. Unscrew the 5 mm hex-head screws of the compass housing door and take off the door from the housing

2. Disconnect the grounding strap between door and housing. Place the door aside. If the door is put next to the housing, the keypad cable may be left connected to the master PCB.
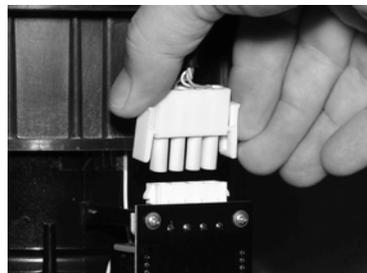
3. Unplug the gyrosphere supply and pickoff connector from its socket on the pickoff PCB.

---

1. Illustrations show the Mod. 10/3 gyrosphere container. All instructions equally apply to the Mod. 10/2 and Mod. 7/2 containers.
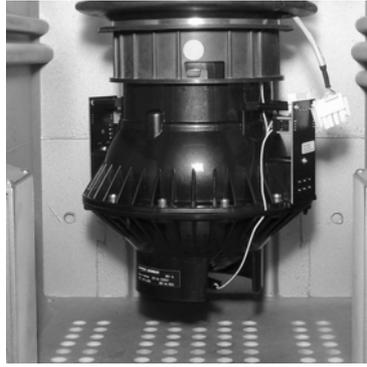
4. Turn the bellows, until the largest of the three coupling seats in the bayonet collar points towards the front of the housing.
    The seat is marked by a green dot on the collar.

5. Put both hands around the container and lift it up, so that the coupling tongues disengage from their seats in the bayonet.
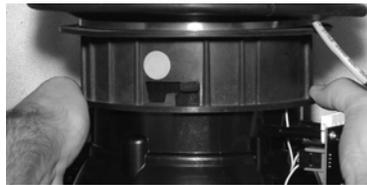
6. While supporting the container with both palms, put the thumbs on the rim of the collar, pull down on it and turn it to the left
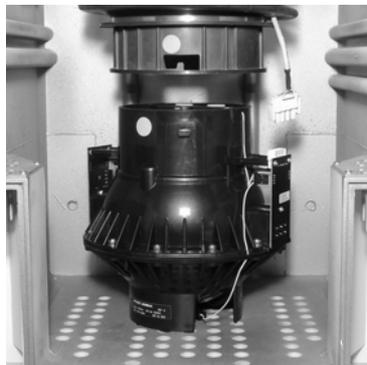
7. Gently lower the container. The coupling tongues slide down in the grooves of the bayonet and the container is released from the collar.

8. Carefully remove the container from the housing and take it to its storage location.

9. At the storage location, carefully place the container into its original transport box or another suitable outer package.

10. Clearly label the packaged container and store it safely in an upright position, making sure that it cannot be moved, tilted or subjected to shock.

11. Put the door in front of the housing and reconnect the grounding strap.

12. Fit the door back on the housing and tighten the retaining screws.

13. Take the necessary precautions to make sure that the compasses main and backup power supplies remain switched off while the container is not installed.

Re-installing the container in the compass housing

When the compass is energized, the gyrosphere operating voltage of 100 VAC @ 337 Hz is present on the master PCB, the gyrosphere supply lines and across the gyrosphere contacts.
Before installing the gyrosphere container, make sure the main and backup power supplies to the compass are switched off and safe-guarded against accidental switching-on.

Parts, materials and tools required

- a 5mm hex key
- a No. 2 Philips-head screwdriver

Procedure[1]

1. At the storage place, carefully unpack the gyrosphere container and take it to the compass' location.

2. Unscrew the 5 mm hex-head screws of the compass housing door and take off the door from the housing

3. Disconnect the grounding strap between door and housing. Place the door aside. If the door is put next to the housing, the keypad cable may be left connected to the master PCB.

4. Gently turn the bellows, until the largest of the three coupling seats in the bayonet collar points towards the front of the housing. The seat is marked by a green dot on the collar.

5. Place the gyrosphere container into the compass housing with the largest of the three coupling tongues located directly below the groove in the collar. The tongue is marked by a green dot on the container

6. Put both hands around the container and lift it into the collar, so that the coupling tongues slide into the corresponding grooves in the bayonet.

7. While supporting the container with both palms, put the thumbs on the rim of the collar, pull down on it and turn it to the right

---

1. Illustrations show the Mod. 10/3 gyrosphere container. All instructions equally apply to the Mod. 10/2 and Mod. 7/2 containers.
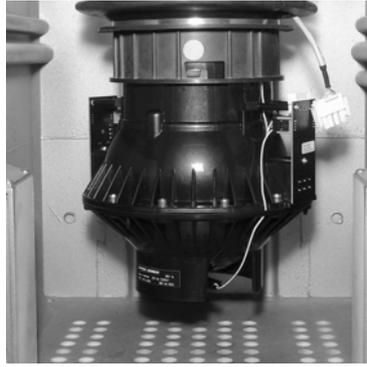
8. Gently lower the container. The coupling tongues engage into their seats in the bayonet and the container locks in place by its own weight.
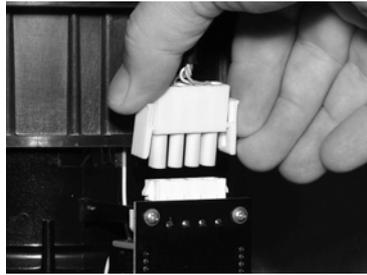
9. Plug the gyrosphere supply and pickoff connector into its socket on the gyrosphere container.

10. Check that the gyrosphere container turns freely around the vertical.

11. Put the door in front of the housing, so that the keys can be operated. If the keypad or display has been disconnected during gyrosphere installation, reconnect it.

12. The compass is now ready to be put into operation.
Leave the housing door open to observe the settling of the gyrosphere and proceed now with the power-up function test.

Power-up function test

To verify the correct operation of the re-installed gyrosphere, the settling behaviour of the compass is to be observed.

DANGER

When the compass is energized, the gyrosphere operating voltage of 100 VAC @ 337 Hz is present on the master PCB, the gyrosphere supply lines and across the gyrosphere contacts.
When operating the compass while the housing is open, do not touch the master PCB, the connecting cables to the gyrosphere container or any conductive components on the container.

Procedure

1. Power up the compass system.

```
   SPERRY  MARINE

   NAVIGAT X MK 1
```

A startup screen is shown and a system test sequence is executed.

```
>F1 GYRO 1    271.2°
 F2 GYRO 2    271.4°
 F3 MAGN.C.   270.9°
 DIFF G1/G2     5°↓
```

When the system test has been passed, the compass enters normal operational mode. The display shows the heading data from the available compasses and the heading difference alarm threshold.

In case of a first-time installation where the basic configuration has not been carried out yet, alarms will be given at this point.
Alarms caused by missing input data or an incomplete system configuration may be safely acknowledged to continue with the power-up function test.

CAUTION

Should a „GYRO FAILURE" alarm be given at power-up, the compass is not working properly.
De-energize the system and visually check the connections to the gyrosphere, the follow-up step motor and the shaft encoder.
If the failure reoccurs when the compass is powered-up again, the installation has not been carried out correctly or the gyrosphere is defective.

2. Observe the settling of the gyrosphere:

   – The gyro motors will create a spinning noise which slowly but constantly rises in pitch until the rotors reach their final speed.

   – The follow-up system will turn the container quickly around the gyrosphere until the optical pickoff "locks" onto the motion of the sphere. From then on, the container will engage in a slow oscillatory motion around the vertical, following the motion of the sphere.

   – The amplitude and speed of this motion will steadily decrease until the sphere finally settles.

3. During the settling phase, periodically call up the gyrosphere data sub-menu from the Service Setup 2 (code 610), to observe the gyrosphere current:

```
GYROSHPERE DATA
TEMPERATURE    42 °C
PH BRIDGE      10 mV
GYRO CURR     432 mA
```
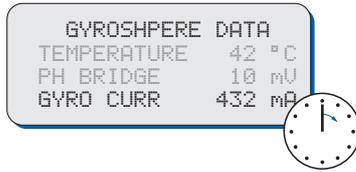
Directly after power-up, the gyrosphere current should not exceed 550 mA. The current will gradually fall while the gyrosphere settles.

```
GYROSHPERE DATA
TEMPERATURE    42 °C
PH BRIDGE      10 mV
GYRO CURR     234 mA
```
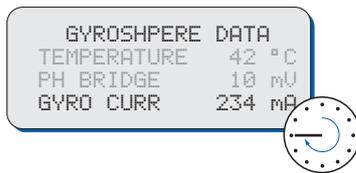
Within 45 minutes after power-up, the gyrosphere current must have dropped below 300 mA.

If 45 minutes after power-up, a gyrosphere current above 300 mA is displayed in the gyrosphere data sub-menu, the value should be confirmed by measuring directly at the 1Ω gyro current test resistor on the master PCB.

The AC-voltage in mA across the test resistor equals the gyrosphere current in mA.

CAUTION

If 45 minutes after power-up, the gyrosphere current has not dropped below 300 mA, the gyrosphere is not working properly.
If visual inspection reveals no obvious cause of malfunction, the gyrosphere is to be regarded defective and must be replaced.

4. After a settling time of at least 4 hours, verify that the compass has settled to the correct heading:

Note

To verify the compass' heading, the actual true heading of the vessel should be known with an accuracy of ±0.1°.

Chapter 6: Installation

6.1 Mechanical Installation

The NAVIGAT X MK 1 gyrocompass system comprises the compass
housing complete with installed base plate assembly and master PCB,
the gyrosphere container, the gyrosphere and the installation and
replacement parts kit.

The gyrosphere is contained in a carrying box, which is packed in a
transport container. This transport container is completely suitable for
transport by air, sea, rail and road.

CAUTION	The gyrosphere is always to be transported in its carrying box in the orig-inal transport container.
⚠	Do not throw or drop the transport container.
	The transport container is to be transported in an upright position only.

Until installation, the carrying box containing the gyrosphere is to be
stored in its original transport container. Upon installation, the carrying
box with the gyrosphere is to be removed from the transport container
and is to be carried by hand directly to the place of installation.

CAUTION	Carry the carrying box containing the gyrosphere by hand only and han-dle it with extreme care. Remove the gyroshpere from the carrying box only if required for immediate installation.
⚠	

Installing the Compass Housing

The compass housing is to be attached to a level surface, e.g. a floor or
console base by means of six M10 bolts or welding studs (to be supplied
by the shipyard). At the location of the compass, proper ventilation must
be ensured and sufficient space provided for the housing to be opened
and maintenance work to be carried out.

For the amount of space required, the attachment points and the posi-
tion of the cable inlets, refer to dimension drawing 4914-0112-02.

In the horizontal plane, the compass may be installed at any angle with
respect to the vessel's longitudinal axis.
Alignment error (i.e. the angle between the compass' and the vessel's
longitudinal axis) is corrected electronically by setting the alignment
error correction value in the Service Setup 1.

6.2 Electrical Installation

AC Supply Power Configuration

DANGER

When the AC main supply is switched on, live voltages are present at the line filter and the power transformer's terminals.
When the compass is energized (main and/or backup supply present), the gyrosphere operating voltage of 100 VAC @ 337 Hz is present on the master PCB, the gyrosphere supply lines and across the gyrosphere contacts.
When configuring the system for the vessel's AC supply voltage, make sure the compass' main and backup power supplies are switched off and safeguarded against accidental switching-on.

The NAVIGAT X MK 1 is delivered prewired for connection to 230VAC. A wire link connects transformer terminal 5 to terminal 6.

If the system is required to operate on 115 VAC, wire links must be installed to link terminal 4 to terminal 6 and terminal 5 to terminal 7. To gain access to the transformer, the master PCB and the baseplate must be temporarily removed.

Figure 6-1:
AC supply power configuration links

Wiring Up the System

DANGER

When the AC main supply is switched on, live voltages are present at the line filter and the power transformer's terminals.
When the compass is energized (main and/or backup supply present), the gyrosphere operating voltage of 100 VAC @ 337 Hz is present on the master PCB, the gyrosphere supply lines and across the gyrosphere contacts.
When wiring up the system, make sure the compass' main and backup power supplies are switched off and safeguarded against accidental switching-on.

Wire up the system according to the connection diagrams and other relevant documents provided.

If installation-specific connection diagrams have been provided for a given system, these supersede any connection information contained in standard connection diagrams.

Ship's cables are directly connected to screw-down terminals on the master PCB.

Insert the ship's cables through the inlets at the sides of the compass housing. Remove the outer cable covers, draw back the cable shields and fasten the cables with clamps or tie-wraps to the threaded studs of the inlet plates. Refer to dimension drawing 4914-0112-02.

Keep all wires running inside the housing as short as possible. Avoid to run wires from one side of the housing to the other. Route wires connecting to TB1 – TB4 through the inlets on the left hand side of the housing and wires connecting to TB5 – TB7 through the inlets on the right hand side.

6.3 Gyrosphere Installation

When the compass housing has been mounted and the system is wired up so far that supply power is available, works should continue with the installation of the gyrosphere into the gyrosphere container and the mounting of the assembled container in the compass.

Alternatively, the installer may wire up the system completely and carry out the initial system configuration before the gyrosphere is installed.

The gyrosphere installation and service instructions are contained in a separate document delivered with the gyrosphere.

CAUTION

The gyrosphere may be installed by authorized service personnel only.

6.4 Initial System Configuration

To make the system fully functional, the configuration parameters need to be set to the required values in the Service Setup 1. Additionally, the applicable standard operational settings should be entered in the Manual Settings menu.

If a magnetic heading source is connected to the NAVIGAT X MK 1, the magnetic compass calibration procedure should be carried out during a sea trial, as described under "Magnetic Compass Calibration" below6.5.

To configure the system:

1. Check that the wiring has been carried out completely. All devices connected to data or signal in- and outputs should be operative.
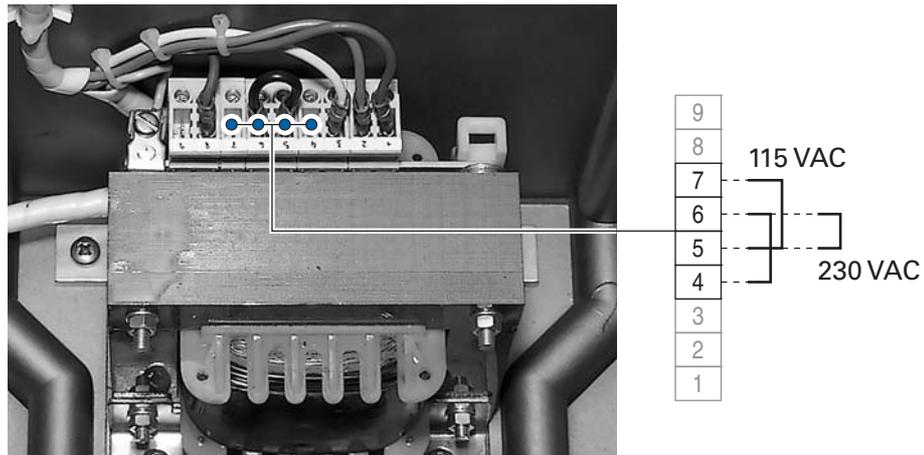
DANGER

When the compass is energized (main and/or backup supply present), the gyrosphere operating voltage of 100 VAC @ 337 Hz is present on the master PCB, the gyrosphere supply lines and across the gyrosphere contacts.
When operating the compass while the housing is open, do not touch the master PCB, the connecting cables to the gyrosphere container or any conductive components on the container.

2. Energize the system at the vessel's switch and fuse unit.
    A startup message is displayed and the initial selftest is executed.

Note

If the initial system configuration is carried out before the installation of the gyrosphere, the system will raise a „gyro failure" alarm at power-up. The alarm may be safely acknowledged at this point to continue with the initial configuration.

3. Go to the Service Setup 1.

4. Select the required system type and heading reference selection settings.

5. In dual or triple gyro systems, assign the required compass ID.

6. Select the required data formats for all devices connected to the data inputs. In G or GG type systems, disable the magnetic heading input, in G or GM type systems, disable the ext. gyro input.

7. Select the required data output formats and IEC 61162/NMEA protocol standard setting.

8. Check that the min./max. limits for the speed filter are well outside the possible range of the vessel's operating speed. In high-speed craft, the max. speed value will have to be increased.

9. If required, set the parameters for the analogue rate of turn output, the status in- and outputs and the rudder angle feedback inputs.

Note

Do not change the factory-set shaft correction angle in the Service Setup 1. The alignment error correction may be set to an approximate value at this point. The existing alignment error, however, must later be determined exactly and corrected as required.

To finalize the installation:

1. Set the operational parameters the Manual Settings menu to suitable values. Wherever possible, automatic data input should be selected in preference of manual input.

2. Enter the current date and time in the User Setup menu.

3. After configuration, function-check the system with all connected equipment in operation. Use the test mode in the Service Setup 1 to check the heading output to serial and 6 step/° repeaters and the analogue rate of turn output. The test mode is functional even if the gyrosphere is not yet installed.

4. If not yet installed, the gyrosphere must now be installed and the proper function of the compass verified.

5. To bring the gyrocompass system into working order, the existing alignment error must now be determined exactly and the error correction applied as described under "Alignment Error Correction" below6.5.

6. If required, determine the correction values for the magnetic heading and enter the magnetic compass calibration table as described under "Magnetic Compass Calibration" below6.5.

6.5 Alignment Error Correction

In order to obtain correct heading data, the existing alignment error (i.e. the angular difference between the compass orientation and the vessel's fore-and-aft axis) must be determined and the required correction applied. Alignment error is 0° if the sides of the compass housing run exactly parallel to the vessel's longitudinal axis and the back of the housing points dead ahead. The alignment error correction is carried out electronically by setting the correction value in the Service Setup 1.

vessel's fore-and-aft axis

compass orientation
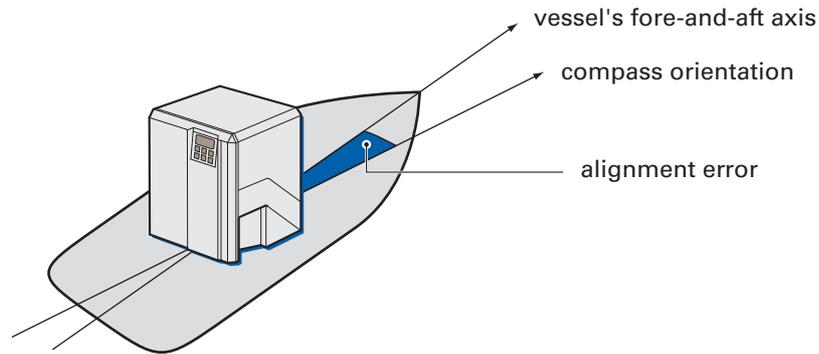
alignment error

To carry out the alignment error correction:

1. Determine the existing alignment error by comparing the compass heading with the vessel's true heading. The true heading must be known to an accuracy of at least 0.5°.

CAUTION

The compass must have been in continuous operation for at least 4 hours before the alignment error can be determined accurately.
If bearing repeaters are used to determine the true heading, these must be properly aligned to the vessel's fore-and-aft axis.

2. In the Service Setup 1, select the align error correction sub-menu.

```
   SERVICE SETUP
ALIGN ERROR CORR.
    +000.0°
```

3. Enter the required correction value. The correction value equals the alignment error with the sign reversed.

    Example:
    The vessel's true heading is 123.0°, the compass displays 123.4°, the alignment error is therefore 0.4°, thus, the required correction range is –179.9 to 180.0°.

Note

After correction of the alignment error, the compass is to display the vessel's true heading to an accuracy of at least 0.5°.

Magnetic Compass Calibration

Ideally, the magnetic heading displayed at the NAVIGAT X MK 1 would exactly match the indication of the steering magnetic compass (at a mag. variation of 0.0°).
In practice, however, deviations will occur between the steering magnetic compass heading and the heading data transmitted by a fluxgate sensor or an electronic compass, as displayed at the NAVIGAT X MK 1.

The NAVIGAT X MK 1 automatically corrects such deviations if a calibration table has been stored and calibration is activated in the User Setup.

Note

If magnetic heading is received from an already calibrated source, such as a NAVITWIN, NAVIPILOT or a self-calibrating electronic compass, calibration at the NAVIGAT X MK 1 is not required and must be disabled.

CAUTION

The magnetic heading calibration corrects deviations due to the combined effects of the magnetic environment, the particular sensor being used and the receiving circuitry on the master PCB.
Therefore, a new calibration must be carried out when:
- the steering magnetic compass is exchanged or newly adjusted,
- the magnetic heading sensor is exchanged and,
- if a fluxgate sensor is used, when the master PCB is exchanged.

It is strongly disapproved to use a true heading source, e.g. a gyrocompass, as the calibration reference.
Also, it should not be attempted to correct residual deviations of a properly adjusted magnetic compass by means of the calibration table.

Calibration Procedure

The magnetic heading calibration is a two-step procedure.

First, the existing deviations between the indication of the steering magnetic compass and the magnetic heading displayed at the NAVIGAT X MK 1 are determined. This requires that the vessel is swung very slowly through a full circle so that for each 10° of magnetic compass heading (0, 10, ..., 350°) the corresponding display value is obtained.

Then, the resultant correction values are calculated and entered in the magnetic heading calibration table at the NAVIGAT X MK 1. The calibration table stores up to 50 entries ('cal. no.s'), each of which assigns a correction value to a given magnetic heading (0, 10, ..., 350°).

CAUTION

The magnetic compass used as the calibration reference must be properly installed and adjusted.
The procedure should be carried out in calm seas only.

Determining magnetic heading correction values

1. Make sure that the magnetic variation is set to 0.0° in the Manual Settings menu.

2. Make sure that the calibration is disabled (setting 'OFF' selected in the User Setup / Magn. Cal. Tab.)

3. Select a manual steering mode.

4. Commence a continuous, very slow and steady turn. The vessel must be swung through one full circle (360°) at least.

```
>F1 GYRO 1    271.2°
 F2 GYRO 2    271.4°
 F3 MAGN.C.   270.9°
 DIFF G1/G2      5° ↓
```

Mag. Compass Heading	Mag. HDG Display (uncalibrated)	Correction Value
0	0.8	
10		

Mag. Compass Heading	Mag. Hdg. Display (uncalibrated)	Correction Value
0	0.8	
10	10.9	

mag. compass hdg.
– mag. hdg. display
= correction value

Mag. Compass Heading	Mag. Hdg. Display (uncalibrated)	Correction Value
0°	0.8°	-0.8°
10°	10.9	
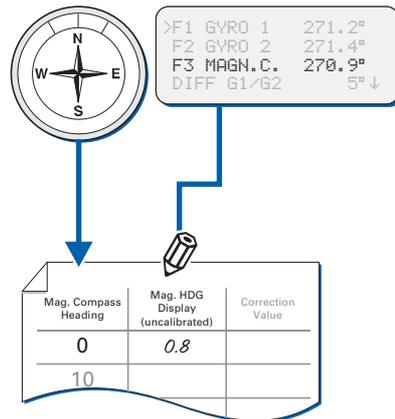
5. While the vessel is turning, compare the indication at the steering magnetic compass with the magnetic heading values shown on the NAVIGAT X MK 1 display.

At every full 10° of steering magnetic compass heading (0°, 10°, ... , 350°), note the display value.

6. Enter the observed display values in the magnetic heading calibration table (blank form included in the appendix of this manual).

7. Calculate the required correction value for each heading value.

The correction value is the offset which must be applied to a given display value in order to obtain the steering magnetic compass heading.

Example:
steering magnetic compass heading = 0°,
display value = 0,8°,
correction value = –0,8°.

Storing the magnetic heading calibration table

1. Call up the User Setup and go to the 'Magn Cal Tab' sub-menu.
    Press **Shift-F1**. ('enter values')
    The calibration table entry sub-menu is shown.

2. To enter the previously determined correction values:

```
      USER SETUP
 MAG.C.CAL.TABLE 00
 MAG.HEADING ***.*°
 CORR. VALUE ***.*°
```

Mag. Compass Heading	Mag. Hdg. Display (uncalibrated)	Correction Value
0°	0.8°	-0.8°
10°	10.9	-0.9°
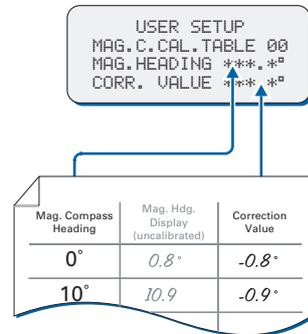
a) Using the **Up/Down** and **Dim+/Dim-** keys, enter the respective heading value.

b) Press **Shift-ENTER** to confirm the value.

c) Using the **Up/Down** and **Dim+/Dim-** keys, enter the corresponding correction value.

d) Press **Shift-ENTER** to confirm the value.

3. To enter another pair of values, press **Shift-F2**.
    The table index count in the first line is increased by 1.
    Repeat the procedure from step 2.a) above until all correction values have been entered.

4. Press **MENU** to quit the table entry sub-menu.

To scroll through the list of entries, press **Shift-F2**.or **Shift-F3** respectively from within the table entry sub-menu

To delete a pair of values, if required, go to the calibration table entry sub-menu and twice press **Shift-RESET** followed by **Shift-ENTER** to clear the heading and correction value entries.

Note	The calibration table is stored in the system's permanent memory. If the complete set of table entries is to be altered (e.g. when a new magnetic heading sensor has been fitted or the steering magnetic compass has been newly adjusted), delete the old entries from the table first.

Chapter 7: System Configuration

7.1 Configuration Menu (Service Setup 1)

The Service Setup 1 provides access to the system parameters which configure the NAVIGAT X MK 1 according to the requirements of the installation at hand.
The Service Setup 1 also provides a test mode to check the proper function of the serial and 6 step/° heading outputs and the analogue rate of turn output.

Setup Access Code

To prevent inadvertent or unauthorized changes to the system configuration, setup menus which are to be accessed by service personnel only are protected by access codes.

To access the Service Setup 1:

```
    MAIN MENU       ↑
F1 DISPLAY DATA
F2 MANUAL SETTINGS
F3 SETUP MENU
```
Call up the Main Menu

```
    SETUP MENU
F1 USER SETUP
F2 SERVICE SETUP
```
Press **Shift-F2** to select "Service Setup".

```
   SERVICE SETUP
  ENTER SETUP CODE
       000
```
When prompted for the setup code:
    Enter code "**600** "
    Press **Shift-ENTER** to confirm the code.

```
   SERVICE SETUP 1
F1 INTERFACE I/O
F2 ANALOG ROT OUTP.
F3 PROTOCOL TYPE  ↓
```
The Service Setup 1 sub-menu opens.

Service-Setup 1 – Overview

Figure 7-1:
Service Setup 1

```
SERVICE SETUP 1
F1 INTERFACE I/O
F2 ANALOG ROT OUTP.
F3 FEEDBACK SIGNAL↓
```

INTERFACE I/O   *interface configuration*

- **GYRO INPUT**
  - **PLATH**
  - **LEHMK. 1200**
  - **LEHMK. 2400**
  - **LEHMK. 4800**
  - **LEHMK. 9600**
  - **NMEA-HDT**
  - **OFF**

- **MAG.HDG.INP.**
  - **SIN/COS**
  - **NMEA-HDM**
  - **NMEA-HCHDT**
  - **NMEA-HDG**
  - **PLATH-MAGN**
  - **NAVIPILOT**
  - **COMP.MONITOR**
  - **OFF**

- **SPEED INPUT**
  - **200 Pulse/NM**
  - **NMEA**

- **POS INPUT**
  - **NMEA-GLL**
  - **NMEA-GGA**

- **SENS.D.M.OUTP.**
  - **NMEA-HCHDM**
  - **NMEA-HCHDT**
  - **NMEA-HCHDG**

- **S/FAST M.OUTP.**
  - **NMEA-HCHDM**
  - **NMEA-HCHDT**

- **MAGN. VARIATION**
  - **NMEA-HDG**
  - **NMEA-RMA**
  - **NMEA-RMC**

- **NMEA SUPERFAST**
  - **4800 BAUD**
  - **9600 BAUD**
  - **19200 BAUD**
  - **33 Hz 38400 BD**
  - **50 Hz 38400 BD**
  - **NMEA-HCHDT**
  - **PLATH**

- **TxD NMEA FAST**
  - **NMEA**
  - **HCHDT**
  - **HDT/ROT**
  - **PLATH**

Figure 7-2:
Service Setup 1
(contd.)

```
SERVICE SETUP 1
F1 INTERFACE I/O
F2 ANALOG ROT OUTP.
F3 FEEDBACK SIGNAL↓
```

ANALOG ROT OUTP.   *settings analog ROT output*

→ **sc. factor:** 0.1 – 999.9 mV/°/min
→ **zero offset:** -999 – +999 mV

FEEDBACK SIGNAL   *settings for rudder angle*
                                            feedback units

→ **No. OF RUDDERS**
  ○ **1**
  ○ **2**

→ **SET RUDDER 1**
  → **sc. factor:** 0.1 – 999.9 mV/°/min
  → **zero offset:** -999 – +999 mV

→ **SET RUDDER 2**
  → **sc. factor:** 0.1 – 999.9 mV/°/min
  → **zero offset:** -999 – +999 mV

[F3 ↓] [F2 ↑]

```
SERVICE SETUP 1 ↑
F1 SYSTEM TYPE
F2 ALIGN ERR. CORR.
F3 SHAFT.COR.ANGLE↓
```

SYSTEM TYPE   *system type / hdg. reference selection*

→ **SYSTEM**
  ○ **G**
  ○ **GM**
  ○ **GG**
  ○ **GGM**

→ **HDG. SEL**
  ○ **CDU 1**
  ○ **CDU 1+2**
  ○ **COMP.MON**
  ○ **AUTOPILOT.**
  ○ **EXT.SEL.**

ALIGN ERR. CORR.   *alignment error correction*

→ **corr. value:** -179.9 – +180 °

SHAFT COR. ANGLE   *shaft encoder correction angle*

→ **corr. value:** -179.9 – +180 °

[F3 ↓] [F2 ↑]

Figure 7-3:
Service Setup 1
(contd.)

contd. from previous page

```
SERVICE SETUP 1 ↑
F1 EXT. STATUS IN  ●
F2 NAME OF GYRO    ●
F3 TEST MODE       ↓●
```

EXT. STATUS IN   *ext. status input function*

→ **STATUS IN**
   └○ **STAT. LOG**
    ○ **STAT. HDG. +180°**

→ **ENABLE 180° OFFS.**
   └□ **GYRO1 +180°**
   └□ **GYRO2 +180°**
   └□ **MAGN +180°**

NAME OF GYRO   *Gyro ID setting*

└○ **ID-No. 1**
 ○ **ID-No. 2**
 ○ **ID-No. 3**

TEST MODE   *indicator/repeater test mode*

→ **rate of turn:** -999 – +999°/min

→ **CHANGE SETTINGS**
   → **time const.:** 0.0 – 99.9 s
   → **sc. factor:** 0.1 – 999.9 mV/°/min
   → **zero offset:** -999 – +999 mV

→ **heading value:** 0.0 – 359.9°

[F3 ↓] [F2 ↑]

```
SERVICE SETUP 1 ↑
F1 GEN.ALARM SETUP ●
F2 PROTOCOL TYPE   ●
F3 TEST MODE       ↓●
```

GEN. ALARM SETUP   *conditions for actuation*
                                                  of general alarm relay
└○ **ON ALL ALARMS**
 ○ **ON FATAL ALARMS**

PROTOCOL TYPE   *NMEA output protocol standard*

└○ **IEC 61162-1**
 ○ **NMEA 0183**

AD10 USAGE   *AD10 output protocol selection*

└○ **OFF**
 ○ **ON**

Figure 7-4:
Service Setup 1
(contd.)

```
  SERVICE SETUP 1 ↑
F1 K1 MUTE/HDG-DIFF
F2 SPEED FILTER
```

K1 MUTE/HDG-DIFF   *alarm relay K1 functionality*

   ○**HDG-DIFF**
   ○**MUTE**

SPEED FILTER   *speed filter settings for*
          error correction

   → **t. const.:** 0 – 99 s
   → **speed min.:** -99.9 – +99.9 kn
   → **speed max.:** -99.9 – +99.9 kn

Service Setup 1 – Parameters

Interface I/O

Configures the in- and output interfaces.

Gyro Input
Selects the interface protocol for the ext. Gyro input.

Settings: **PLATH**
              The input reads the PLATH binary data protocol

              LEHMK. 1200
              The input is reads the Lehmkuhl (Scandinavian Microsys-
              tems) protocol at 1200 Bd.

              LEHMK. 2400
              The input is reads the Lehmkuhl (Scandinavian Microsys-
              tems) protocol at 2400 Bd.

              LEHMK. 4800
              The input is reads the Lehmkuhl (Scandinavian Microsys-
              tems) protocol at 4800 Bd.

              LEHMK. 9600
              The input is reads the Lehmkuhl (Scandinavian Microsys-
              tems) protocol at 9600 Bd.

              NMEA-HDT
              The input reads the NMEA $--HDT sentence

              OFF
              The input is disabled

Mag Hdg. Inp.
Configures the magnetic heading input.

Settings: **SIN COS**
The input reads analogue voltages from a Sperry Marine fluxgate sensor type 4863 at the analogue fluxgate interface

NMEA-HDM
The input reads the NMEA $--HDM sentence at the NMEA magn. interface

NMEA-HCHDT
The input reads the NMEA $HCHDT sentence at the NMEA magn. interface

NMEA-HDG
The input reads the NMEA $--HDG sentence at the NMEA magn. interface

PLATH-MAGN
The input reads magnetic heading from the PLATH binary data protocol at the NMEA magn. interface

NAVIPILOT
The input reads magnetic heading from the NAVIPILOT repeater protocol at the NMEA magn. interface

COMP. MONITOR
The input reads magnetic heading (NMEA) at the Compass Monitor interface

OFF
The input is disabled

Speed Input
Configures the speed input.

Settings: **200 Pulse/NM**
Speed is computed from pulses at the 200 p./NM interface

NMEA
The input reads speed from an NMEA sentence received at the serial speed data input 1.

Pos. Input
Configures the position input.

Settings: **NMEA-GLL**
The input reads the NMEA $--GLL sentence

NMEA-GGA
The input reads the NMEA $--GGA sentence

Sens. D. M. Outp.
Selects the output sentence format for magnetic heading at the sensor data outputs

Settings: **NMEA-HCHDM**
Magnetic heading is sent using the NMEA $--HDM sentence with talker ID "HC"

NMEA-HCHDT
Magnetic heading is sent using the NMEA $--HDT sentence with talker ID "HC"

NMEA-HCHDG
Magnetic heading is sent using the NMEA $--HDG sentence with talker ID "HC"

S/FAST M. Outp.
Selects the output sentence format for magnetic heading at the FAST and SuperFAST data outputs

Settings: **NMEA-HCHDM**
Magnetic heading is sent using the NMEA $--HDM sentence with talker ID "HC"

NMEA-HCHDT
Magnetic heading is sent using the NMEA $--HDT sentence with talker ID "HC"

Magn. Variation
Selects the sentence format for automatic magnetic variation input

Settings: **NMEA-HDG**
Magnetic variation is read from the NMEA $--HDG sentence at the serial data magn. interface

NMEA-RMA
Magnetic variation is read from the NMEA $--RMA sentence at the currently active position interface

NMEA-RMC
Magnetic variation is read from the NMEA $--RMC sentence at the currently active position interface

NMEA SuperFAST

Configures the SuperFAST serial data output.

Settings: **4800 Baud**
              The output transmits all available data in NMEA format at
              4800 Bd. (standard according to IEC 61162-1)

              9600 Baud
              The output transmits all available data in NMEA format at
              9600 Bd. (non-standard)

              19200 Baud
              The output transmits all available data in NMEA format at
              19200 Bd. (non-standard)

              33 Hz 38400 Bd
              The output transmits all available data in NMEA format at
              38400 Bd. (high-speed according to IEC 61162-2)
              The update rate for the HDT sentence is 33 Hz.

              50 Hz 38400 Bd
              The output transmits all available data in NMEA format at
              38400 Bd. (high-speed according to IEC 61162-2)
              The update rate for the HDT sentence is 50 Hz.

              NMEA-HCHDT
              The output transmits magnetic heading only, using the
              NMEA $HCHDT sentence at 4800 Bd.

              PLATH
              The output transmits heading and rate of turn data, using
              the PLATH binary protocol at 9600 Bd.

TxD NMEA FAST

Configures the FAST serial data output.

Settings: **NMEA**
              The output transmits all available data in NMEA format at
              4800 Bd. (standard according to NMEA / IEC 61162-1)

              HCHDT
              The output transmits magnetic heading only, using the
              NMEA $HCHDT sentence at 4800 Bd.

              HDT/ROT
              The output transmits the active heading and rate of turn
              data only, using the NMEA $--HDT and $--ROT sentences at
              4800 Bd.

              PLATH
              The output transmits heading and rate of turn data, using
              the PLATH binary protocol at 9600 Bd.

Analog ROT Outp.

Configures the analogue rate of turn output.

Sc. Factor
Sets the scaling for the output.

Value: **0.1 – 999.9 mV/°/min.**

Zero Offset
Sets the zero-point offset for the output.

Value: **-999 – 999 mV**

Feedback Signal

Configures the rudder angle feedback inputs.

No. of Rudders
Selects between single and dual rudder systems.

Settings: **1**
              Single rudder system; rudder angle input 1 is used only

              2
              Dual rudder system; both rudder angle inputs are used; separate graphs are printed for port and stb. rudder angles

Set Rudder 1
Sets the scaling and zero-point offset for the rudder angle input 1.

Settings: scale factor: **0.1 – 999 mV/°/min.**
              zero-point offset: **-9.9 – +9.9°**

Set Rudder 2
Sets the scaling and zero-point offset for the rudder angle input 2.

Settings: scale factor: **0.1 – 999 mV/°/min.**
              zero-point offset: **-9.9 – +9.9°**

System Type

Configures the system type and the heading selector device.

System
Sets the system configuration

Settings: **G**
Single gyrocompass system: the control and display unit shows own gyro heading only; the heading source selection and heading difference alarm functions are not available.

GM
Gyro-/Magnetic compass system: the control and display unit shows own gyro and magnetic compass headings; heading source selection and heading difference monitoring functions are available for sources G and M.

GG
Dual gyrocompass system: the control and display unit shows both gyrocompass headings; heading source selection and heading difference monitoring functions are available for sources G1 and G2.

GGM
Dual gyrocompass/Magnetic compass system: the control and display unit shows both gyro and magnetic compass headings; heading source selection and heading difference monitoring functions are available for sources G1, G2 and M.

Hdg. Sel.
Selects the heading source selector device to use.

Settings: **CDU 1**
Standalone system: the active heading source is selected at the control and display unit

CDU 1+2
Dual gyrocompass system: the active heading source is selected at either one of the gyrocompasses' control and display units

Comp. Mon.
Multicompass system with Compass Monitor/Heading Management system NAVITWIN: the active heading source is selected at the NAVITWIN

Autopilot
Gyrocompass/Autopilot system: the active heading source is selected at the autopilot (NAVIPILOT V, ADII or V HSC)

Ext. Sel.
The active heading source is selected using an external selector switch

Align Err. Corr.

Sets the alignment error correction value

Settings: -179.9 – +180.0 °

Shaft Cor. Angle

Sets the shaft encoder correction value

Settings: -179.9 – +180.0 °

Ext. Status In

Configures the external status signal input port

Ext, Status In
Selects the function of the port

Settings: **Status Log**
              The port is used to monitor the "alive" status from a pulse
              speed log; if the active log is a pulse log and the input con-
              tact is open, a speed log failure alarm is given.

              Stat. Hdg. +180°
              The port is used to reverse the heading displays and data
              outputs (e.g. for use in double-ended ferries); when the
              input contact is closed, an offset of 180° is applied to the
              heading of sources for which the offset function is enabled.

Enable 180° Offs.
Enables/disables the 180° offset function for the respective heading
source.

Settings: **Gyro1 +180°** (ON/OFF)
              Gyro2 +180° (ON/OFF)
              MAGN +180° (ON/OFF)
              "On" enables, "OFF" disables offset function for respective
              heading source

Name Of Gyro

Sets the compass ID.

Settings: **1**
Standalone single gyro or main gyro in multiple gyrocompass system.

2
Backup gyro in a dual or triple gyrocompass system.

3
Backup gyro in a triple gyrocompass system.

Test Mode

Activates the output test mode

Rate of Turn
Sets the rate of turn value and turn direction for the test mode

Settings: -999 – +999 °/min

Change Settings
Accesses the analogue ROT output settings

time const.: 0.0 – 99.9 s
sc. factor: 0.1 – 999.9 mV/°/min
zero offset: -999 – +999 °/min

Note		The „Change Settings" sub-menu provides quick access to the analogue ROT output settings from the test mode. Changes made during the test mode directly affect the time constant setting in the Manual Settings menu and the scale factor and zero offset values in the Service Setup 1 / Analog ROT Outp. menu respectively.

Heading Value
Sets the target heading value for the test mode

Settings: -0.0 – +359.9 °

Gen. Alarm Setup

Selects in which cases the "General Alarm" relay is actuated.

Settings: **On all alarms**
              The relay is actuated whenever an alarm condition exists.

              On fatal alarms
              The relay is actuated only in case of fatal alarms. A fatal
              alarm exists when the gyrocompass can no longer provide
              its own heading data. Loss of external data and the heading
              difference alarm are non-fatal alarm conditions.

Protocol Type

Selects the conformance level for NMEA outputs

Settings: **IEC 61162-1**
              NMEA outputs conform strictly to IEC 61162-1. Proprietary
              output sentences start with $PPLA...

              NMEA 0183
              NMEA outputs use the older form of the proprietary nav.
              status data sentence, $PPNSD.

AD10 Usage

Enables or disables AD10 heading data output
When AD10 output is enabled, a total of one SuperFAST and three Sen-
sor Data outputs are available at TB7.
When AD10 output is disabled, a total of two SuperFAST and four Sen-
sor Data outputs are available at TB7.

Settings: **ON**
              Enables AD10 output.
              Terminals TB 7.11/7.12 provide the AD10 data signal,
              terminals TB 7.13/7.14 provide the AD10 clock signal.

              OFF
              Disables AD10 output.
              Terminals TB 7.11/7.12 provide a SuperFAST RS-422 output,
              terminals TB 7.13/7.14 provide a Sensor Data RS-422 output.

K1 Mute/Hdg-Diff

Configures the funcion of the alarm relay K1 output

Settings: **Hdg-Diff**
              Relay K1 is used to signal the heading difference alarm con-
              dition. This option must be selected in multicompass sys-
              tems which route the individual compasses' hdg-diff alarm
              relay outputs to a central alarm facility.

              Mute
              Relay K1 is used to mute an audible alarm generated by a
              central alarm facility. When this option is selected, relay K1
              is actuated whenever an alarm is acknowledged or muted
              locally at the NAVIGAT X MK 1.
              In multicompass systems which also require a heading dif-
              ference alarm output, a separate compass monitoring
              device, such as the NAVITWIN IV, must provide the heading
              difference alarm.

Speed Filter

Sets the filter parameters used for the North speed error correction.
The preset factory defaults should not normally be altered. In high-
speed craft, however, it will be necessary to increase the maximum
speed value to prevent rejection of valid high speed values.

Settings: **T. Const.**
              filter time constant: 0 – 99 s (default = 20 s)

              The filter time constant determines the level of filtering
              applied to the incoming speed before it enters the calcula-
              tion of North speed error correction.
              Occasional dropouts and glitches will be completely blocked
              for a duration of up to the time constant's value.
              At the same time, the effects of steady acceleration or decel-
              leration are smoothed out. After a change of speed, a new
              constant speed will enter the error correction routine with a
              delay of approximately five times the time constant.

              Speed Min.
              minimum speed value: -99.9 – +99.9 kn (default = -5.0 kn)

              The minimum speed value determines the lower limit of the
              valid speed range. Actual speeds below the limit will be
              rejected. Should the actual speed remain below the limit for
              more than 10 s, a "speed invalid" alarm will be given.

              Speed Max.
              maximum speed value: -99.9 – +99.9 kn (default = 30.0 kn)

              The maximum speed value determines the upper limit of
              the valid speed range. Actual speeds above the limit will be
              rejected. Should the actual speed remain above the limit for
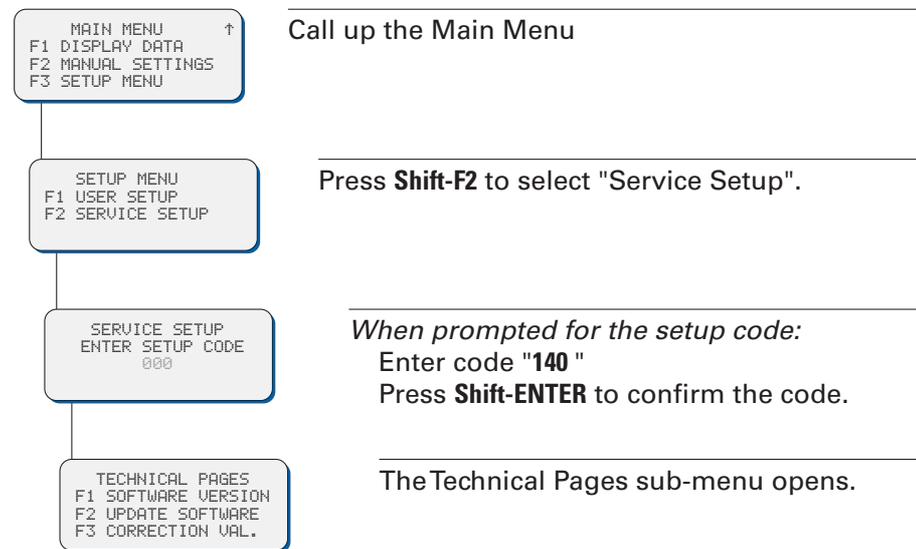   more than 10 s, a "speed invalid" alarm will be given.

7.2 Factory Settings Menu (Technical Pages)

The Technical Pages provide access to a number of factory-set parameters which need not normally be altered. However, should the system software need to be exchanged, these settings will be lost and must be re-entered manually.

Setup Access Code

To prevent inadvertent or unauthorized changes to the system configuration, setup menus which are to be accessed by service personnel only are protected by access codes.

To access the Technical Pages:

```
MAIN MENU        ↑
F1 DISPLAY DATA
F2 MANUAL SETTINGS
F3 SETUP MENU
```
Call up the Main Menu

```
SETUP MENU
F1 USER SETUP
F2 SERVICE SETUP
```
Press **Shift-F2** to select "Service Setup".

```
SERVICE SETUP
ENTER SETUP CODE
      000
```
When prompted for the setup code:
Enter code "**140** "
Press **Shift-ENTER** to confirm the code.

```
TECHNICAL PAGES
F1 SOFTWARE VERSION
F2 UPDATE SOFTWARE
F3 CORRECTION VAL.
```
The Technical Pages sub-menu opens.

Technical Pages – Overview

Figure 7-5:
Technical Pages

```
SERVICE SETUP 1 ↑
F1 GEN.ALARM SETUP
F2 NAME OF GYRO
F3 TEST MODE
```

SOFTWARE VERSION   *software version info*
  → **HARDWARE:** main PCB revision
  → **SW. VER:** software creation date
  → **MASTERBOARD:** system software version
  → **DISPLAY BOARD:** ext. display software version

UPDATE SOFTWARE   *in-circuit software update*
  → *update software via service interface*
    (factory use only, not for field service)

CORRECTION VAL.   *corr. values for temperature*
                              and gyro current
  → **corr. value temp..:** -99 – +99 ˚C
  → **gyro current gain:** 0.000 – 9.999

Technical Pages– Parameters

Software Version

Displays detailed hard- and software version information.

Settings: **Hardware**
The revision code of the master PCB.

SW Ver.
The creation date of the system software.

Masterboard
The version code of the system software.

Display Board
The version code of an external Control and Display unit, if present.
If no external unit is connected, dashes are shown.

Update Software

Initiates a software update via the service interface.

Settings: This feature is for factory use only. Field service is required to exchange the software flash-memory IC to update the system software.

Correction Val.

Sets the correction values for the on-board temperature and gyrosphere current measurement

Settings: **Corr. Val. Temp.**
Temperature correction value. Adjusts the measured value to show the actual temperature inside the compass housing. Correction range is -99.9 – +99.9 °C.

Gyro Current Gain
Gain factor for the gyrosphere current. Adjusts the measured value to show the actual current flowing through the gyrosphere.
Correction range is 0.000 – 9.999, where a setting of 1.000 equals unity gain, i.e. no correction.

Note   The correction values are set in the factory. These must not normally be altered. However, when the system software is exchanged, the values will be lost and must be re-entered manually.
The correction values are specific to the respective master PCB.

Chapter 8: Troubleshooting

8.1 Troubleshooting Instructions

The NAVIGAT X Mk 1 is a complex electronic system. In case of malfunction, it would neither be practical nor economical to carry out troubleshooting and servicing in the field down to the level of individual circuit components.

Unless instructed otherwise by Sperry Marine engineering, field service personnel should limit troubleshooting to:

*   Visual inspection of mechanical components, the master board and wiring.
*   Continuity checks of wiring connections.
*   Checks for short circuit/overload conditions or reversed polarities. These conditions are indicated by red LEDs on the master board.
*   Checking for on-board voltages and I/O signals. The presence of voltages and signals is indicated by green LEDs on the master board. Exact voltage levels must be checked with a voltmeter. The data content on serial I/O lines must be checked with the aid of suitable analyzing tools, such as PC-based protocol interpreters or terminal programs.

When components on the master board, other than socketed ICs, are assumed to cause malfunction, the complete master board assembly, stock no. 20672, is to be exchanged.

When components on the baseplate assembly are assumed to cause malfunction, the complete baseplate assembly, stock no. 22407, is to be exchanged.

DANGER

When the compass is energized (main and/or backup supply present), the gyrosphere operating voltage of 100 VAC @ 337 Hz is present on the master PCB, the gyrosphere supply lines and across the gyrosphere contacts.
When operating the compass while the housing is open, do not touch the master PCB, the connecting cables to the gyrosphere container or any conductive components on the container.

CAUTION

The NAVIGAT X MK 1 contains electrostatic sensitive components.

Electrostatic discharge may permanently damage components.
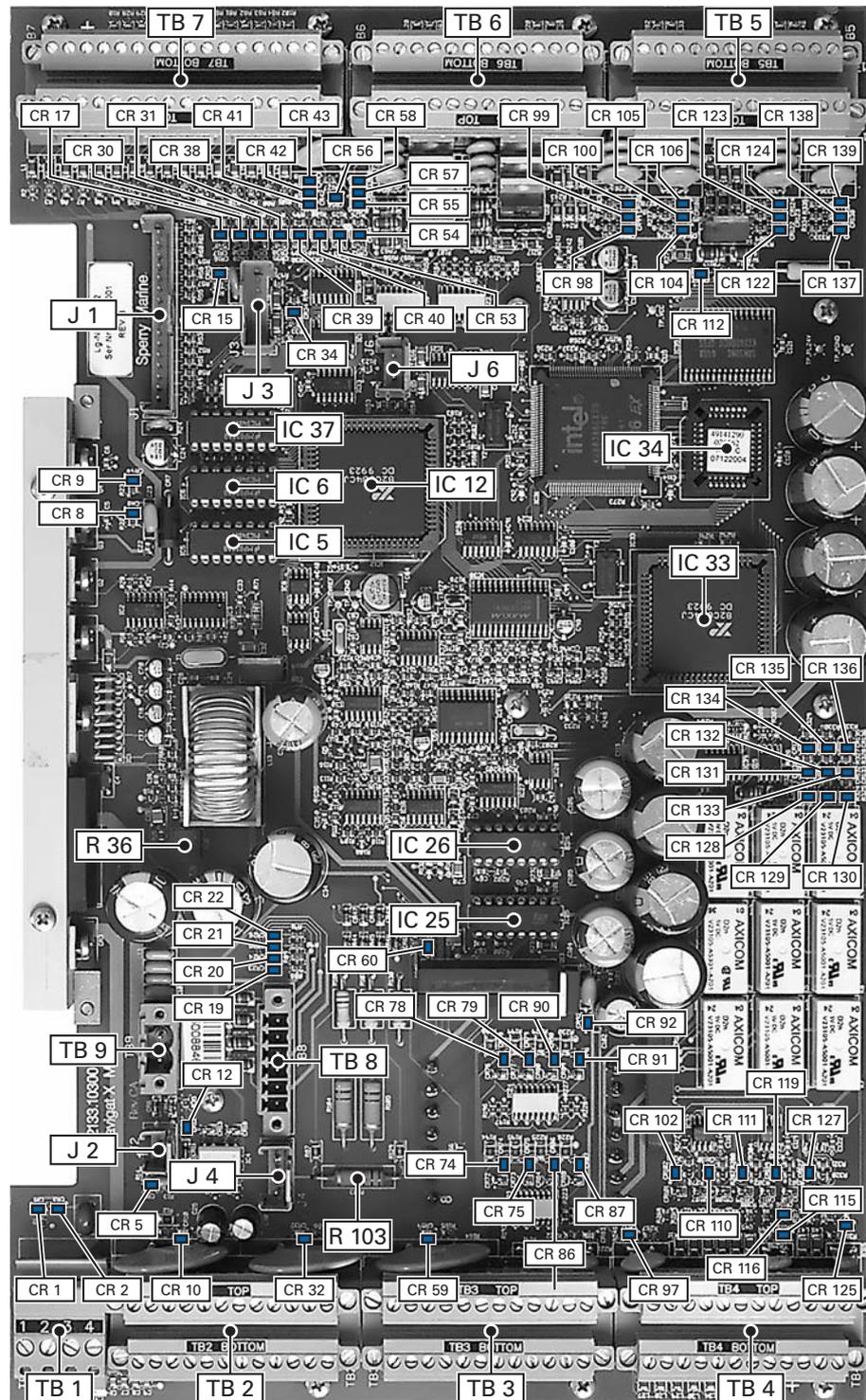
When servicing the NAVIGAT X MK 1, take precautions to prevent electrostatic discharge. Avoid touching any of the electronic circuitry.

8.2   Location of Parts on the Master PCB

Figure 8-1 below shows the locations of exchangeable components, connectors, trimpots and diagnostic LED indicators on the master PCB.

Figure 8-1:
location of parts on the
master PCB

Exchangeable Components

Part	Function	Stock No.
IC 5	quad RS-422 output driver IC; drives Sensor Data TB 7.1/7.2 and 7.3/7.4, Compass Monitor, Display units	046485-0000-000
IC 6	quad RS-422 output driver IC; drives Sensor Data TB 7.5/7.6, SuperFast TB 7.9/7.10, Fast output, nav. data printer	046485-0000-000
IC 12	UART	046537-0000-000
IC 25	follow-up motor phase 2 driver IC	045871-0000-000
IC 26	follow-up motor phase 1 driver IC	045871-0000-000
IC 33	UART	046537-0000-000
IC 34	software flash-memory IC, pre-programmed	026562-0000-000
IC 37	quad RS-422 output driver IC; drives Sensor Data TB 7.13/7.14, SuperFast TB 7.11/7.12	046485-0000-000

Connectors

TB/J	to/from
TB 1	24VDC backup supply power in / 24VDC out
TB 2	relay status outputs (watch al. ackn., G1/G2, G/M, hdg. diff., pwr. fail.), status inputs (op. unit M/R, ROT damping, Log/+180°), 200 pulse/nm speed input
TB 3	status inputs (Auto/Man, G1/G2, G/M), rudder angle feedback units fluxgate sensor Switch-Over Unit
TB 4	ext. gyro, Compass Monitor, ext. operating unit speed log NMEA position NMEA Fluxgate NMEA status input (Mute)
TB 5	serial repeaters 1–6
TB 6	serial repeaters 7–12
TB 7	sensor data outputs, Fast output, SuperFast outputs, 6 step/° outputs, nav. data printer output, analogue rate of turn output

TB/J	to/from
TB 8	follow-up step motor
TB 9	main power supply transformer
J 1	shaft encoder
J 2	cooling fan
J 3	Control and Display Unit
J 4	gyrosphere power supply and pickoff contacts
J 6	service interface RS 232 (for factory use only)

Test Resistor / Trimpots

Table 8-3:
Test resistor /
trimpots on the
master PCB

R	to / from
R 103	gyrosphere current test resistor, 1Ω; voltage across R 103 in mV equals gyrosphere current in mA; current should not exceed 500 mA at power-up and must drop below 300 mA within 45 minutes after power-up
R 36	gyrosphere voltage adjustment (factory-set, normally no adjustment required in the field) nominal gyrosphere voltage is 100 VAC @ 337 Hz.

Diagnostic LEDs

As an aid in troubleshooting, a number of diagnostic LED indicators are provided on the NAVIGAT X MK 1 PCB. These indicate the presence of supply voltages, activities on the serial data I/O lines and the current states of the status I/O ports.

Table 8-4:
Diagnostic LEDs

LED	Colour	Indication
CR 1	green	24VDC backup supply power present
CR 2	red	24VDC backup supply polarity reversed - swap lines
CR 5	red	overload 24VDC out to cooling fan - check fan
CR 8	green	+12VDC on-board supply present
CR 9	green	+5VDC (Vcc) on-board supply present
CR 10	red	overload 24VDC out TB1.3/1.4
CR 12	green	115/230 VAC main supply power present
CR 15	red	overload 12VDC out to Control and Display unit
CR 17	green	activity on Tx line, nav. data printer
CR 23	green	follow-up step motor phase 2 active
CR 24	green	
CR 25	green	follow-up step motor phase 1 active
CR 26	green	

LED	Colour	Indication
CR 30	green	activity on Tx line, Sens. Data or AD10 clock, TB 7.13/7.14
CR 31	green	activity on Tx line, SuperFast or AD10 data, TB 7.11/7.12
CR 32	red	overload 24VDC out to Switch-Over Unit, TB 3.22
CR 34	green	activity on Rx/Tx line, ext. Display Unit, TB 4.11/4.12
CR 38	green	activity on Tx line, SuperFast, TB 7.9/7.10
CR 39	green	activity on Tx line, Fast output, TB7.7/7.8
CR 40	green	activity on Tx line, Sens. Data, TB 7.5/7.6
CR 41	green	6-step/° output 2, phase 3 active
CR 42	green	6-step/° output 2, phase 2 active
CR 43	green	6-step/° output 2, phase 1 active
CR 53	green	activity on Tx line, Sens. Data, TB 7.3/7.4
CR 54	green	activity on Tx line, Sens. Data, TB 7.1/7.2
CR 55	green	6-step/° output 1, phase 3 active
CR 56	red	overload internal 24VDC 6step/° repeater supply
CR 57	green	6-step/° output 1, phase 2 active
CR 58	green	6-step/° output 1, phase 1 active
CR 59	red	overload 24VDC out to Switch-Over Unit, TB 3.23
CR 60	green	24VDC on-board supply to follow-up motor present
CR 74	green	status input closed, Alarm Mute
CR 75	green	status input closed, G1/G2
CR 78	green	status input closed, ext. status (log status or 180° offset)
CR 79	green	status input closed, 200 pulse/nm
CR 83	red	overload 12VDC out fluxgate sensor
CR 86	green	status input closed, G/M
CR 87	green	status input closed, Auto/Man
CR 90	green	status input closed, ROT damping
CR 91	green	status input closed, op. unit M/R
CR 92	green	-12VDC on-board supply present
CR 97	red	overload 24VDC out to Compass Monitor
CR 98	red	overload 24VDC out to repeater 12
CR 99	red	overload 24VDC out to repeater 9
CR 100	red	overload 24VDC out to repeater 8
CR 102	green	activity on Rx line, Compass Monitor ,TB 4.3/4.4
CR 104	red	overload 24VDC out to repeater 7

LED	Colour	Indication
CR 105	red	overload 24VDC out to repeater 10
CR 106	red	overload 24VDC out to repeater 11
CR 110	green	activity on Rx line, ext. Gyro, TB 4.1/4.2
CR 111	green	activity on Rx line, Magnetic Heading, TB 4.17/4.18
CR 112	green	activity on Tx line, Repeater outputs, TB 5 and 6
CR 115	red	overload 12VDC out to ext. CDU
CR 116	green	activity on Tx line, Compass Monitor, TB 4.7/4.8
CR 119	green	activity on Rx line, Position, TB 4.15/4.16
CR 122	red	overload 24VDC out to repeater 6
CR 123	red	overload 24VDC out to repeater 3
CR 124	red	overload 24VDC out to repeater 2
CR 125	red	overload -12VDC out, TB 4.24
CR 127	green	activity on Rx line, Speed, TB 4.13/4.14
CR 128	green	relay attracted, K1 (watch alarm acknowledge)
CR 129	green	relay attracted, K4 (max. ROT exceeded)
CR 130	green	relay attracted, K7 (heading diff. alarm)
CR 131	green	relay attracted, K2 (status G/M)
CR 132	green	relay attracted, K5 (AC power failure)
CR 133	green	relay attracted, K8 (DC power failure)
CR 134	green	relay attracted, K3 (status G1/G2)
CR 135	green	relay attracted, K6 (power failure and general alarm)
CR 136	green	relay attracted, K9 (G1/G2 to Switch-Over-Unit)
CR 137	red	overload 24VDC out to repeater 1
CR 138	red	overload 24VDC out to repeater 4
CR 139	red	overload 24VDC out to repeater 5

Chapter 9: Corrective Maintenance

The NAVIGAT X MK 1 is generally not field-serviceable on the component level. In case of malfunction, complete sub-assemblies must be exchanged and the defective sub-assemblies returned to Sperry Marine.

Singular electronic components which may be exchanged by field service personnel are the system software IC and the other socketed ICs on the NAVIGAT X MK 1 master board.

DANGER

When the compass is energized (main and/or backup supply present), the gyrosphere operating voltage of 100 VAC @ 337 Hz is present on the master PCB, the gyrosphere supply lines and across the gyrosphere contacts.
When exchanging components on the master board, make sure the compass' main and backup power supplies are switched off and safeguarded against accidental switching-on.

CAUTION

The NAVIGAT X MK 1 contains electrostatic sensitive components.

Electrostatic discharge may permanently damage components.

When servicing the NAVIGAT X MK 1, take precautions to prevent electrostatic discharge. Avoid touching any of the electronic circuitry.

9.1   Exchanging the System Software

The NAVIGAT X MK 1 system software is contained on a flash-memory chip, IC 34, on the master PCB. By exchanging the software IC, the system can be easily upgraded to a newer or downgraded to a previous software release, if required.

Note

The stock number of the pre-programmed software IC, 26562, remains identical through all software releases. The IC's revision identifier indicates which software release it has been programmed with. Unless specified otherwise upon ordering, Sperry Marine will deliver the IC pre-programmed with the latest official software release.

CAUTION

It cannot be guaranteed that parameter settings in the User and Setup menus and the entries made in the Magnetic Compass Calibration table are left intact when the software is exchanged.
Before exchanging the system software IC, record all parameter settings to be able to re-enter them manually, if required.

Exchanging the flash-memory IC

Note	The flash-memory IC is a 32-pin PLCC chip. A suitable extractor tool is required to remove the IC from its socket.

Verify that a new flash-memory IC, stock no. 26562, containing software 4914-1090-00 with the required revision identifier and release date has been obtained.

1. At the running system, take notes of the current settings in the Manual Settings, User and Service Setup menus. Check that the settings have been entered correctly into the setup tables in the appendix of this manual. If necessary, correct and amend the tables.

2. Power down the system.
    Make sure that both the main and backup supplies are switched off and safeguarded against accidental switching-on.

3. Remove the cover from the compass housing.

4. Remove the currently installed flash-memory chip (IC 34) from its socket on the master PCB.

5. Insert the new flash-memory IC into the socket.

6. Re-attach the cover to the compass housing.

7. Power up the system.

8. Re-enter all settings in the Manual Settings, User and Service Setup menus, as noted in the setup tables in the appendix of this manual.

9.2 Replacing Socketed ICs

While all socketed ICs may be easily exchanged, it will mostly be impossible for field service personnel to trace back malfunction of the system to the failure of a given IC, such as an UART or PAL.

In case of failure of an RS-422 serial data output, however, the reason is mostly a defective driver IC. The RS-422 serial data outputs use standard quadruple RS-422 line drivers (MC3487), available from Sperry Marine under stock no. 46485.

Appendix

A Setup and Configuration Tables

The following tables (blank forms) are appended to this manual:

Designation	Drawing No.
NAVIGAT X MK 1: Preferred Operational Settings	4914-0125-01
NAVIGAT X MK 1: Setup Table	4914-0125-02
NAVIGAT X MK 1: Magnetic Compass Calibration Table	4914-0125-03

Note

After installation of the NAVIGAT X MK 1, please return a filled-out copy of the Setup Table to Sperry Marine for inclusion in the ship's file. When permanent changes are made to the system configuration, please return an updated copy of the Setup Table to Sperry Marine.

B Drawings

The following drawings are appended to this manual:

Designation	Drawing No.
Dimension Drawing: Gyrocompass NAVIGAT X MK 1	4914-0112-02
Wiring Diagram: NAVIGAT X MK 1	4914-0115-01
Dimension Drawing: Operating Unit	4926-0112-01

Note

All appended drawings are revision-controlled separately at Sperry Marine. In case of doubt, verify the current revision status of the drawings with Sperry Marine. This manual's revision status does not change when the revision of an appended drawing changes.

NORTHROP GRUMMAN

Sperry Marine

NAVIGAT X MK 1
Preferred Operational Settings

Vessel:	Hull No.:
IMO No.:	Shipyard:

Service Station / Installer:	Date / Signature: /

Note 👉 Make copies of this form to note the appropriate settings in the Manual Settings and User Setups for normal operation of the equipment.
In general, automatic data input modes should be chosen in preference of manual input, wherever possible.

Manual Settings

Speed/Lat Mode	Speed Mode:		Posit Mode:	
	○ AUTO	○ MAN	○ AUTO	○ MAN

Hdg. Diff. Alarm	Between:			
	○ GY1/GY2	○ GY1/MAG	○ GY2/MAG	○ OFF
	Diff. Alarm Threshold Value:		°	

Magnetic Variation	○ AUTO	○ MAN

North Sp. Err. Corr.	○ ON	○ OFF

Settings NAVIPRINT	○ ON ○ OFF	Paper Speed ○ 60 mm/h ○ 150 mm/h ○ 600 mm/h	Heading ○ ±30° ○ ±180°	Rudder ○ ±9° ○ ±45° ○ ±70° ○ OFF

Settings ROT	Time Const. ROT:	Max. Value ROT:
	Time Constant: s	**Max. Value:** °/min.

User Setup

Date and Time Mode	○ AUTO	○ MAN

Mag. Comp. Cal. Table	○ ON	○ OFF

NORTHROP GRUMMAN

Sperry Marine

NAVIGAT X MK 1
Setup Table

Vessel:	Hull No.:	
IMO No.:	Shipyard:	
Service Station / Installer:	Date / Signature:	/

Note 👉 After installation of the NAVIGAT X MK 1, please return a filled-out copy of the Setup Table to Sperry Marine for inclusion in the ship's file. When permanent changes are made to the system configuration, please return an updated copy of the Setup Table to Sperry Marine.

Service Setup 1 (Code 600)

Interface I/O

Gyro Input	○ PLATH	○ LEHMK. 1200	○ LEHMK. 2400	○ LEHMK. 4800
	○ LEHMK. 9600	○ NMEA-HDT	○ OFF	
Mag Hdg Input	○ SIN COS	○ NMEA-HDM	○ NMEA-HCHDT	○ NMEA-HDG
	○ PLATH-MAGN	○ NAVIPILOT	○ COMP. MON.	○ OFF
Speed Input	○ 200 Pulse/NM	○ NMEA		
Pos. Input	○ NMEA GLL	○ NMEA GGA		
Sens. D. M. Outp.	○ NMEA-HCHDM	○ NMEA-HCHDT	○ NMEA-HCHDG	
S/Fast M. Outp.	○ NMEA-HCHDM	○ NMEA-HCHDT		
Magn. Variation	○ NMEA-HDG	○ NMEA-RMA	○ NMEA-RMC	
NMEA SuperFast	○ 4800 BAUD	○ 9600 BAUD	○ 19200 BAUD	○ 33 Hz 38400 BD
	○ 50 Hz 38400 BD	○ NMEA-HCHDT	○ PLATH	
TxD NMEA Fast	○ NMEA	○ HCHDT	○ HDT/ROT	○ PLATH

Analog ROT Outp.

Settings	sc. factor:	mV/°/min	zero offset:	mV

Feedback Signal

No. of Rudders	○ 1	○ 2		
Set Rudder 1	sc. factor:	mV/°/min	zero offset:	mV
Set Rudder 2	sc. factor:	mV/°/min	zero offset:	mV

System Type

System	○ G	○ GM	○ GG	○ GGM
Hdg. Sel.	○ CDU 1	○ CDU 1+2	○ COMP. MON.	○ AUTOPILOT
	○ EXT. SEL.			

Align Err. Corr.

Setting	corr. value:	°		

Shaft. Cor. Angle

Setting	corr. value:	°		

Ext. Status In

Status Log TB 3.11	○ LOG	○ HDG +180°	○ Status ROT

Name of Gyro

ID-No.	○ 1	○ 2	○ 3

Gen. Alarm Setup

Alarm relay active:	○ ON ALL ALARMS	○ ON FATAL ALARMS

Protocol Type

NMEA outp. protocol standard:	○ IEC 61162-1	○ NMEA 0183

AD10 Usage

AD10 hdg. output setting:	○ OFF	○ ON

K1 Mute / Hdg.-Diff.

K1 alarm relay functionality:	○ HDG-DIFF	○ MUTE

Speed Filter

Settings	time const.:	s		
	speed min.:	kn	speed max.:	kn

Technical Pages (Code 140)

Correction Val.

Settings	corr. val. temp:	°	gyro current gain:	°

Note 👉 Make sure to re-enter the correction values when updating the system software.
Correction values are specific to the master PCB installed. When exchanging a master PCB, read out the correction values and update this setup table to reflect the new values.
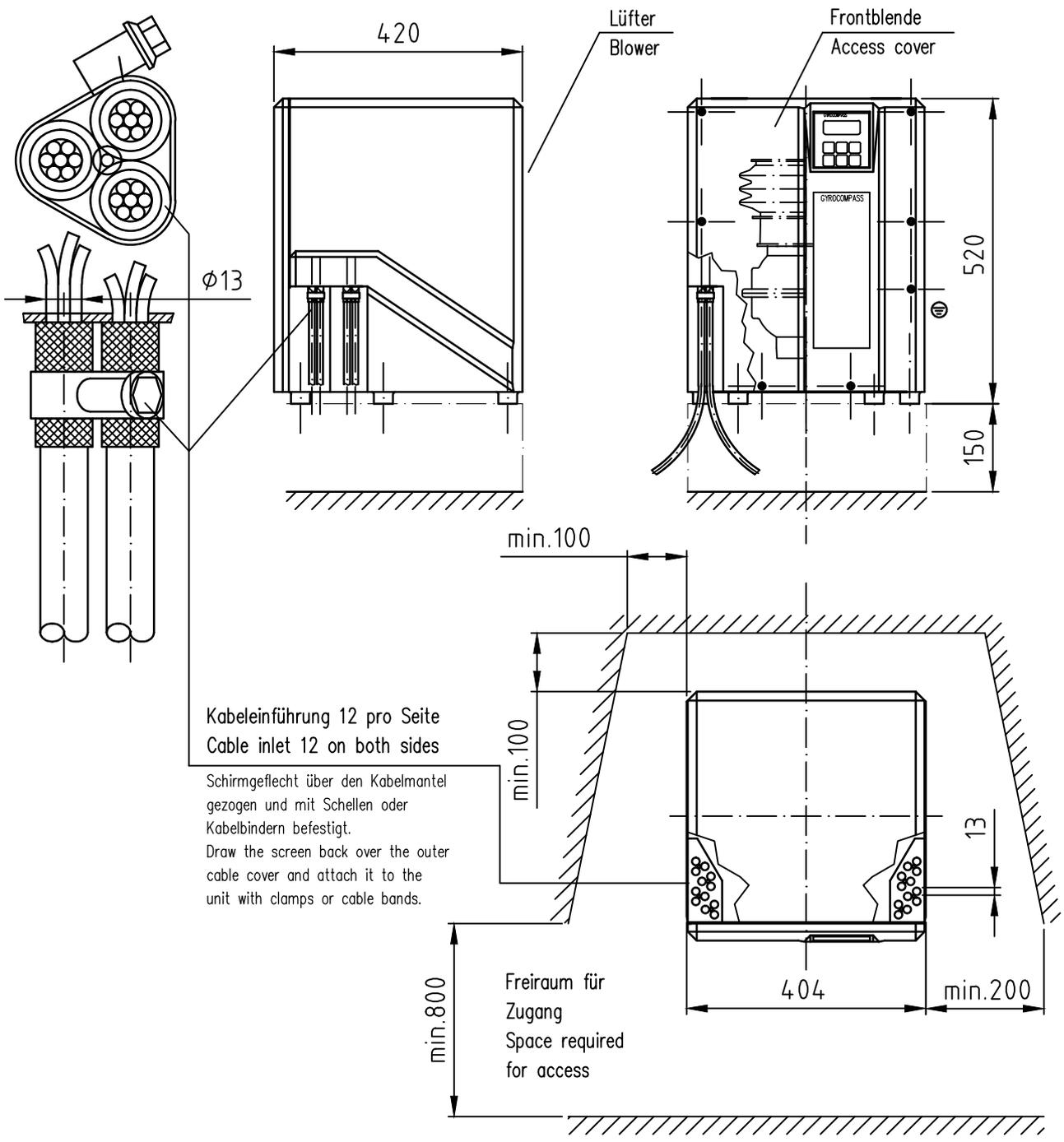
NORTHROP GRUMMAN

Sperry Marine

NAVIGAT X MK 1
Magnetic Compass Calibration Table

| Vessel: | | Hull No.: | |
| IMO No.: | | Shipyard: | |

| Service Station / Installer: | Date / Signature: |
| | / |

Magnetic Compass Hdg.	Magnetic Hdg. Display (uncalibrated)	Correction Value	Magnetic Compass Hdg.	Magnetic Hdg. Display (uncalibrated)	Correction Value
0.0			180.0		
10.0			190.0		
20.0			200.0		
30.0			210.0		
40.0			220.0		
50.0			230.0		
60.0			240.0		
70.0			250.0		
80.0			260.0		
90.0			270.0		
100.0			280.0		
110.0			290.0		
120.0			300.0		
130.0			310.0		
140.0			320.0		
150.0			330.0		
160.0			340.0		
170.0			350.0		

420

Lüfter / Blower

Frontblende / Access cover

520

150

ø13

Kabeleinführung 12 pro Seite
Cable inlet 12 on both sides

Schirmgeflecht über den Kabelmantel
gezogen und mit Schellen oder
Kabelbindern befestigt.
Draw the screen back over the outer
cable cover and attach it to the
unit with clamps or cable bands.

min.100

min.100

min.800

Freiraum für
Zugang
Space required
for access

13

404

min.200

Gewicht/Weight : 25 kg (Mod.10)
28 kg (Mod.7)
Schutzart/Protection grade : IP 23

Type	Lager Nr. Stock No.		
4914-CA	74807		
4914-CC	74811	with dynamic north speed error correction	

REV	ECO-No.	DATE	NAME
D	982928	06.09.10	Kie
C	982876	28.06.10	Kie
B	981480	10.01.05	Ho.
AA	991342	21.06.04	Kie

NORTHROP GRUMMAN
Sperry Marine
HAMBURG   GERMANY

	DATE	NAME
DRAWN	12.05.2004	Kie
CHD	see ECO	
DOS	4914-0112-021	

DRAWING No.
4914-0112-02

FIRST ANGLE PROJECTION

DIMENSIONS IN MILLIMETERS

STOCK No.   see above

DIMENSION DRAWING

Gyrocompass

NAVIGAT X MK 1

REPLACEMENT FOR:

FREE SCALE:
DIN ISO 2768 mH

SCALE

SHEET
1

SHEETS
3

205

350

27.5

225

345

Ø12 für/for M10

Frontblende
Access cover

M10*50 DIN 933

B11 DIN 9021

Bolzen und Scheiben
Werftbeistellung
Bolts and washers supplied
by the shipyard

Empfohlener Aufstellungsort:
Auf der Schiffsmittelachse sowie auf Höhe des Hauptdecks oder darunter.
Der Kompaß kann beliebig zur Schiffslängsachse installiert werden, die A-Fehlerkorrektur
erfolgt über das Bediengerät.

PREFERED LOCATION:
ON THE CENTERLINE OF THE SHIP AND ON HEIGHT OF THE MAIN DECK OR BELOW.
THE GYROCOMPASS MAY BE INSTALLED AT ANY ANGLE TO THE SHIP'S LONGITUDINAL
AXIS. ALIGNMENT ERROR WILL BE CORRECTED WITH THE CONTROL UNIT.

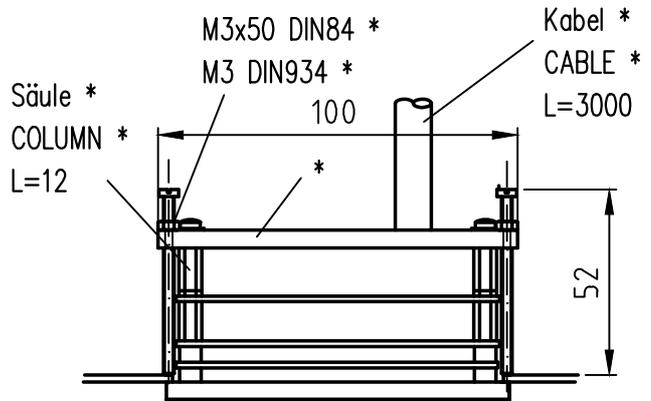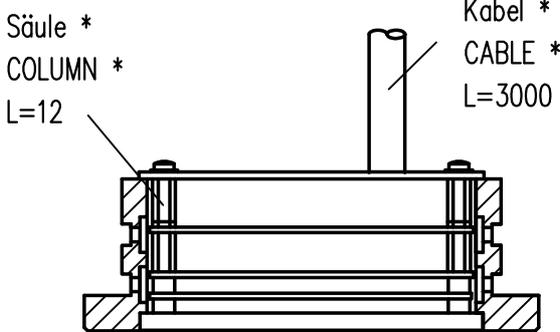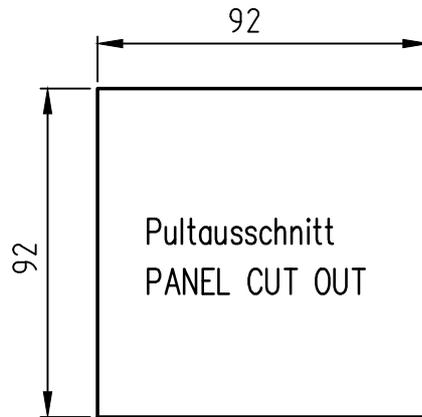| Magnetischer Schutzabstand MAGNETIC CLEARANCE	Mutterkompaß MASTER COMPASS	Tochterkompaß REPEATER COMPASS	Bediengerät CONTROL UNIT
Mindestabstand vom: MINIMUM CLEARANCE TO:			
Magnet–Regelkompaß STANDARD MAGNETIC COMPASS	0,60 m	0,70 m	0,40 m
Magnet–Steuerkompaß STEERING MAGNETIC COMPASS	0,40 m	0,45 m	0,30 m
Reduzierter Mindestabstand vom: MINIMUM CLEARANCE (REDUCED) TO: Magnet–Regelkompaß STANDARD MAGNETIC COMPASS	0,30 m	0,45 m	0,30 m
Magnet–Steuerkompaß STEERING MAGNETIC COMPASS	0,30 m	0,30 m	0,30 m

NORTHROP GRUMMAN
Sperry Marine
HAMBURG GERMANY

		DATE	NAME
DRAWN		12.05.2004	Kie
CHD		see ECO	
DOS		4914-0112-022	

DIMENSION DRAWING

Gyrocompass

NAVIGAT X MK 1

SCALE
/

DRAWING No.
4914-0112-02

FIRST ANGLE PROJECTION

DIMENSIONS IN MILLIMETERS

REV	ECO-No.	DATE	NAME
D	982928	06.09.10	Kie
C	982876	28.06.10	Kie
B	981480	10.01.05	Ho.
AA	991342	21.06.04	Kie

STOCK No. /

REPLACEMENT FOR:

FREE SCALE:
DIN ISO 2768 mH

SHEET
2
SHEETS
3

Einbauvorschlag für externe Montage des Bediengeräts:
SUGGESTED INSTALLATION FOR A REMOTELY LOCATED CONTROL AND DISPLAY UNIT:

95.7

95.7

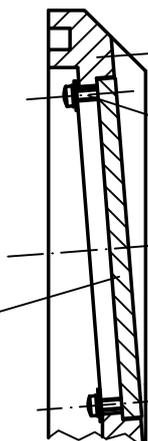GYROCOMPASS

F1 MENU   F2 ↑   F3 ↓

SHIFT   RESET DIM−   ENTER DIM+

92

92

Pultausschnitt
PANEL CUT OUT

Säule *
COLUMN *
L=12

Kabel *
CABLE *
L=3000
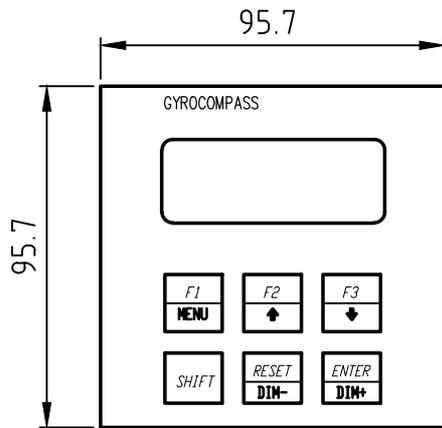
Einbau in Sperry Marine Pultrahmen
INSTALLATION IN SPERRY MARINE CONSOLE FRAME

M3x50 DIN84 *
M3 DIN934 *
100

Kabel *
CABLE *
L=3000

Säule *
COLUMN *
L=12

*

52

Pulteinbau
PANEL INSTALLATION

Einbau der Blindplatte
INSTALLATION OF
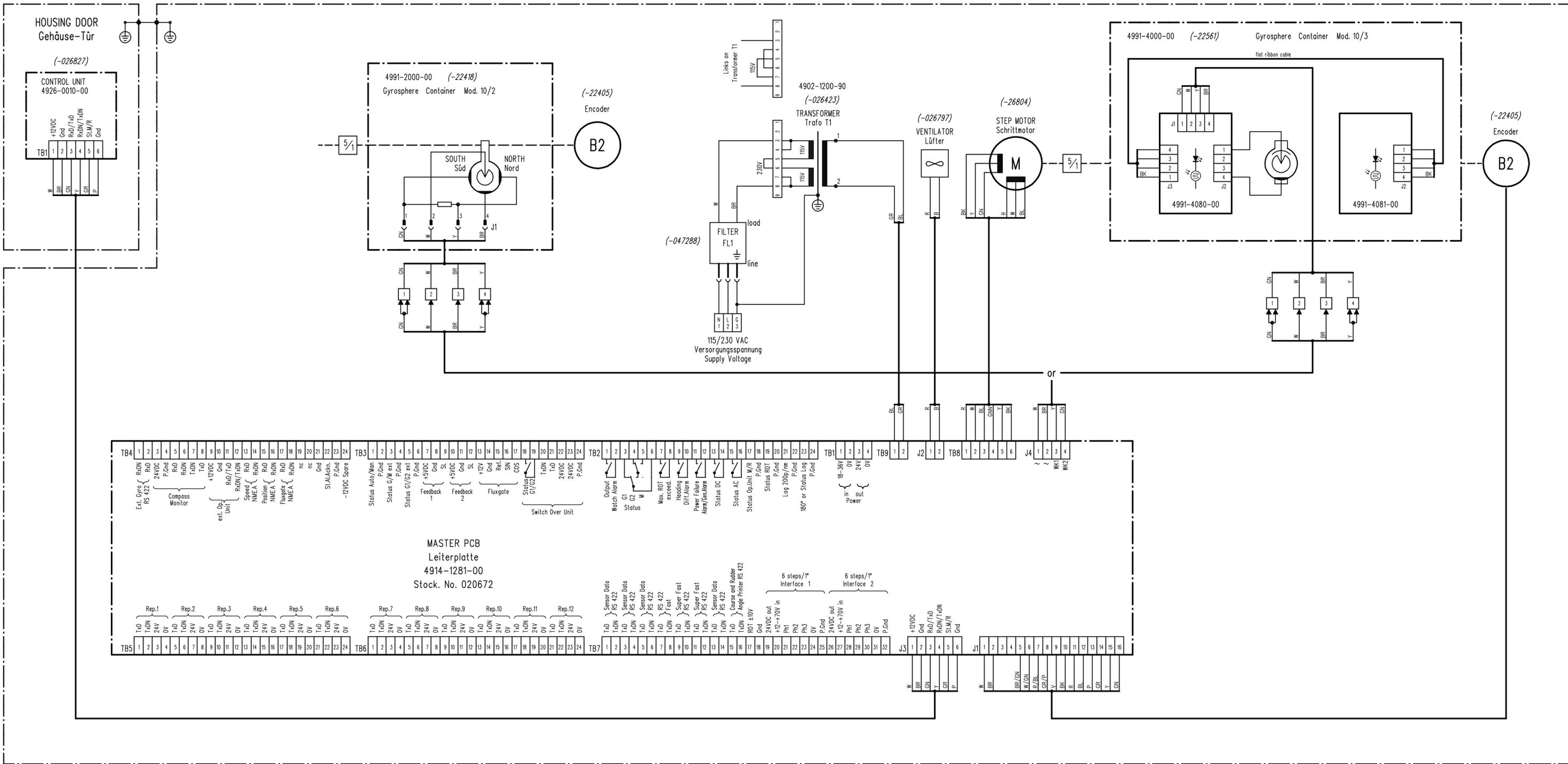A BLANK COVER

Gyrocompass

Frontblende
ACCESS COVER

M3x10 DIN7985 *
3,2 DIN6798 *
3,2 DIN9021 *

Blindplatte *
BLANK COVER *

* = Montagesatz 26890 (optional)
   INSTALLATION KIT 26890 (OPTIONAL)

				NORTHROP GRUMMAN Sperry Marine		DATE	NAME	DIMENSION DRAWING		SCALE
					DRAWN	12.05.2004	Kie	Gyrocompass		/
					CHD		see ECO			
				HAMBURG GERMANY	DOS	4914−0112−023				
D	982928	06.09.10	Kie	DRAWING No. 4914−0112−02				NAVIGAT X MK 1		SHEET 3
C	982876	28.06.10	Kie							
B	981480	10.01.05	Ho.	FIRST ANGLE PROJECTION		DIMENSIONS IN MILLIMETERS				SHEETS
AA	991342	21.06.04	Kie							
REV	ECO−No.	DATE	NAME	STOCK No. /				REPLACEMENT FOR:	FREE SCALE: DIN ISO 2768 mH	3

HOUSING DOOR
Gehäuse-Tür

(-026827)

CONTROL UNIT
4926-0010-00

TB1

+12VDC
Gnd
RxD/TxD
RxDN/TxDN
SLW/R
Gnd

4991-2000-00   (-22418)
Gyrosphere Container Mod. 10/2

(-22405)
Encoder

B2

SOUTH
Süd   NORTH
Nord

J1

5/1

Links on
Transformer T1
115V

4902-1200-90
(-026423)
TRANSFORMER
Trafo T1

230V   115V
       115V

FILTER
FL1

load

line

N L G E
1 2 3

(-047288)

115/230 VAC
Versorgungsspannung
Supply Voltage

(-026797)
VENTILATOR
Lüfter

(-26804)
STEP MOTOR
Schrittmotor

M

5/1

4991-4000-00   (-22561)   Gyrosphere Container Mod. 10/3

flat ribbon cable

4991-4080-00

4991-4081-00

(-22405)
Encoder

B2

or

MASTER PCB
Leiterplatte
4914-1281-00
Stock. No. 020672

TB4 TB3 TB2 TB1 TB9 J2 TB8 J4

Ext. Gyro RS 422
Compass Monitor
ext. Op.Unit1
Speed Log NMEA
Position NMEA
Fluxgate NMEA
Status Auto/Mem
Status G/W ext
Status G1/G2 ext
Feedback 1
Feedback 2
Fluxgate
Switch Over Unit
Output
Watch Alarm
Status
Max. ROT exceed.
Heading Diff.Alarm
Power Failure Alarm/Geräton
Status AC
Status DC
Status Op.Unit M/R
Status ROT
Log 200p/nm
180° or Status Log
18-36V 0V 24V 0V
in out
Power

TB5 TB6 TB7 J3 J1

Rep.1 Rep.2 Rep.3 Rep.4 Rep.5 Rep.6
Rep.7 Rep.8 Rep.9 Rep.10 Rep.11 Rep.12
Sensor Data RS 422
Super Fast
Coarse and Rudder
Angle Printer RS 422
ROT ±10V

6 steps/1°
Interface 1

6 steps/1°
Interface 2

+12VDC
RxD/TxD
RxDN/TxDN
SLW/R
Gnd

95,7

GYROCOMPASS

95,7

| F1 MENU | F2 ↑ | F3 ↓ |
| SHIFT | RESET DIM- | ENTER DIM+ |

92

92

Pultausschnitt
PANEL CUT OUT

M3*50 DIN84 *
M3 DIN 934 *

Kabel
CABLE
L=3000

Säule *
COLUMN *
L=12

100

*

52

Pulteinbau
PANEL MOUNTING

* = Montagesatz 26891 (optional)
MOUNTING KIT 26891 (OPTIONAL)

				NORTHROP GRUMMAN Sperry Marine		DATE	NAME	DIMENSION DRAWING	SCALE
					DRAWN	11.09.1998	Ho.	Bediengerät	/
					CHD	see ECO			
				HAMBURG GERMANY	DOS	4926-0112-01			
				DRAWING No. 4926-0112-01				CONTROL UNIT	SHEET 1
B	981428	20.10.04	Ho.	◁⊕ FIRST ANGLE PROJECTION		DIMENSIONS IN MILLIMETERS		Gyrocompass NAVIGAT X MK 1	SHEETS
AA	99934	30.09.98	Ho.	STOCK No. 74631				REPLACEMENT FOR:	FREE SCALE: DIN ISO 2768 mH	1
REV	ECO-No.	DATE	NAME						