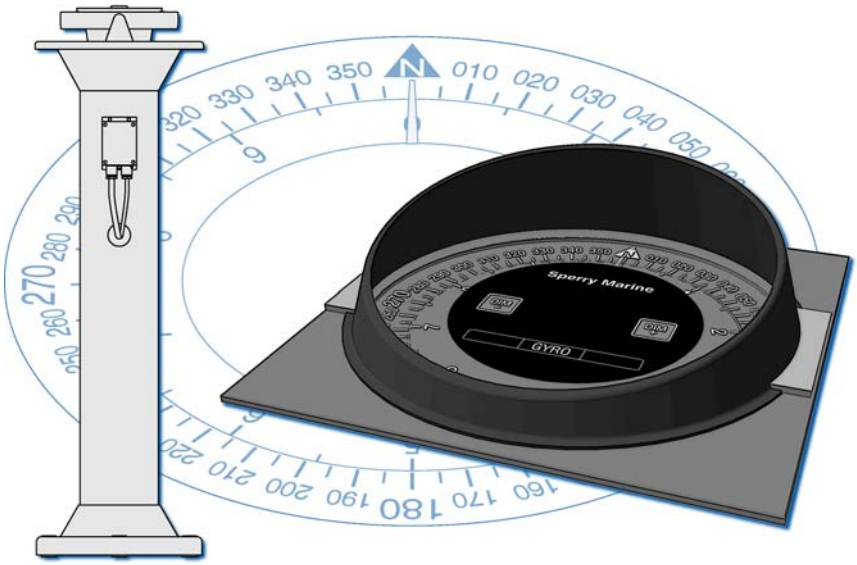
NORTHROP GRUMMAN

Sperry Marine

Operation, Installation and Service Manual



Analogue Compass Repeaters
Types 5016, 5016-AA, 5016-AB, 5016-AC

With RS-422 Serial Interface

056359-A; 19 Mar 2010

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Sperry Marine, with worldwide headquarters in Charlottesville, VA, and major engineering and support offices in Melville, NY, New Malden, England, and Hamburg, Germany, is part of the Northrop Grumman Electronic Systems sector.

Rev.	Date	Remarks
A	19 Mar 2010	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:

DANGER

Danger: Risk of electrical shock.

CAUTION

Caution: Components are sensitive to electrostatic discharge.

General Safety Information for the Operator

WARNING

Never rely on the heading indication of an analogue compass repeater alone to navigate a vessel or to perform other safety-critical operations.

The analogue repeater is an indicator only and will indicate ship's heading as long as it receives formally valid datagrams. It does not apply any filtering or plausibility checks to the incoming data.
Loss of data will result in a visual error indication but will not raise an audible alarm.

Always confirm the plausibility of the indication at the repeater against the respective source which generates the heading data.
In safety-critical operations, regularly check the data source and the repeater's indication against all available aids to navigation.

Contents

Chapter 1: Introduction

1.1 Design and Main Features

The analogue compass repeaters are remote indicators which display ship's heading using a rotating compass card assembly.

The repeaters are available in four type variants:

- Bearing Repeater, Type 5016
- Console Repeater, Type 5016-AA
- Magnetic Heading Repeater, Type 5016-AB
- Bulkhead Repeater, Type 5016-AC

Heading data is received at an RS-422 serial data input, using the NMEA 0183/IEC 61162 or the Plath binary protocol. The repeaters are able to auto-detect the input data protocol and baudrate at power-up and will self-sychronize with the input heading received.

Depending on the currently active heading source, the repeaters will indicate true heading from a gyrocompass or a transmitting heading device (THD[1]), or magnetic compass heading (raw or corrected for deviation and/or variation). The active source is shown at the repeater by a backlit indicator ("GYRO, "THD" or "MAG").
The magnetic heading repeater, type 5016-AB, is preconfigured to indicate magnetic compass heading only, regardless of which source is currently active.

All repeater variants feature a 360° and a 10° compass card, except for the magnetic heading repeater, where the 10° card is not assembled. Graduations and numbering of the cards' scales appear white on a matte black background. The cards are backlit by dimmable white LEDs. A set of dimmer pushbuttons is integrated into the repeater front plate.

The anaolgue compass repeaters have been type-approved by Germanischer Lloyd in accordance with the Maritime Equipment Directive 2002/75/EC and are listed as accessory equipment in the type approval certificates for Sperry Marine's gyrocompass systems NAVIGAT X Mk 1, NAVIGAT X MK 2, and NAVIGAT 2100.

1. In the context of this manual, "THD" refers to a transmitting heading device according to IMO MSC.116(73) or IEC 22090 parts 1-3 respectively.

1.2 Functional Description

The compass card assembly is driven through a gear train by a stepper motor. To ensure smooth and silent operation, the microprocessorized motor control uses microstepping. Photo interrupters detect when the compass cards pass their zero positions at 360° and every 10°, respectively, allowing minor step losses to be automatically corrected during operation.

Once valid heading data is received, the heading to be indicated is translated into a counter value representing the required compass cards' offset from the North (zero) position. A second counter is maintained for the cards' current offset.
The motor control constantly executes a routine to minimize the difference between these two offsets, thus making the compass cards follow-up to the heading to be indicated.

The position of the cards is held in non-volatile memory, so that it is not normally required to zero (re-synchronize) the cards upon power-up.

1.3 Repeater Type Variants

Bearing Repeater

The bearing repeater, type 5016, is gimbal-mounted in a bearing stand or in a repeater bracket attached to a bulwark.
The bowl-shaped watertight housing permits installation at exposed locations without an additional hood or cover.
For optimum protection from the elements, a protective cover is available as an optional accessory for the bearing stand.
In addition to the regular heading scales, the bearing repeater features an azimuth scale on the 360° card and a graduated verge ring for taking absolute and relative bearings with the azimuth device PV 23 (optional accessory).

Console Repeater

The console repeater, type 5016-AA, is the type variant most commonly used as steering compass repeater on the bridge.
It is suitable for direct console mounting or mounting in a console frame and may be installed horizontally, vertically or inclined.
The console repeater is normally installed at a protected location. It may be installed at an exposed location if directly mounted to the console using a watertight seal.
The repeater is equipped with a detachable sun shade.

Magnetic Heading Repeater

The magnetic heading repeater, type 5016-AB, is a console repeater preconfigured to permanently indicate magnetic compass heading only.
It posseses no 10° card. Instead, the 360° card is graduated every 1°.
The magnetic repeater is to be used only as an emergency steering repeater in case of failure of the gyrocompass(es).
To prevent its indication from being mistaken for the reference to steer by, the magnetic repeater is equipped with a detachable cover, which should be removed only in case of failure of the gyrocompass(es), when the vessel is actually steered by magnetic compass heading.

Bulkhead Repeater

The bulkhead repeater, type 5016-AC, is equipped with the same compass card assembly as the console repeater. It is suitable for mounting onto a bulkhead or other flat surface, vertically, horizontally or inclined.
An optional mounting bracket is available to install the repeater at an inclined angle relative to the mounting surface.
The watertight housing permits installation at exposed locations without an additional hood or cover.

1.4 Accessories

Bearing Repeater Stand and Brackets

The bearing repeater stand, type 4622, comprises a base, column and flared top rim in one integral part. It is made of a welded aluminium alloy and is powder-coated. The repeater gimbal ring is held in two bearing supports attached to the top rim.
When the repeater is installed in the stand, its working height is 1.45 m.
A stainless steel connection box with cable glands is attached to the stand's column.
An optional watertight cover is available to protect the stand and the repeater from the elements.

The bearing repeater bracket type 4890 is made of a welded aluminium alloy and is powder-coated. It is to be fitted to a bulwark or other vertical surface. The installation height of the bracket determines the repeaters working height.
A stainless steel connection box with cable glands is attached to the side of the bracket, where the repeater is connected to the compass system.

The adjustable bearing repeater bracket type 4905 is made of aluminium alloy and is powder-coated. It is to be fitted to a bulwark or other vertical surface. The height-adjustable bracket arms permit to vary the repeater's working height in three steps within a range of 250 mm.
A stainless steel connection box with cable glands is attached to the bracket's mounting plate.

Bulkhead Repeater Bracket

The swiveling bulkhead repeater bracket is made of powder-coated sheet metal. It permits to install the repeater at an at an inclined angle relative to the mounting surface, e.g. when it is mounted high up a bulkhead or on a ceiling. The angle is adjustable within a range of 45°.

Azimuth Device PV 23

The PV 23 (type no. 2535) is a vane-type azimuth device, to be used in conjunction with the bearing repeater, type 5016.
It is suitable for taking absolute and relative bearings of terrestial objects and of celestial bodies (stars and planets).

The near sight vane is equipped with a peep sight. It carries a mirror prism to read absolute bearings off the compass card and two coloured anti-glare filters.
The far sight vane is equipped with a wire sight and with a pivoting black mirror to pick up the reflections of objects at high elevation.
An index mark at the near side of the PV 23 is used to read relative bearings off the repeater's verge ring scale.

1.5 Technical Data

Common Features, all Repeater Types

Environmental Requirements	
ambient temperature, operation	-25 °C – +55 °C
ambient temperature, storage	-25 °C – +70 °C

Power Supply	
supply voltage	24 VDC (18-36 V)
max. ripple content	±4 Vpp; extreme values may not exceed 36 V or fall below 18 V
power consumption	6 W max.

Readout Elements	
compass cards	colour: white on black illumination: LED backlight, white
card system follow-up speed	≥ 30°/s
max. error of indication	±0.1° at rest, ±0.5° at turn ≤20°/s
lubber line	illuminated pointer, yellow

Data Input	
protocol	NMEA 0183 / IEC 61162 at 4800, 9600, 19200, or 38400 Bd., 8N1 or Plath binary, 9600 Bd., 8N1
evaluated IEC 61162 sentences	
gyrocompass heading	$--THS, $--HDT (talker ID not HC or GP)
magnetic compass heading	$HCHDT, $HCHDM, $HCHDG
heading from THD	$GPTHS, $GPHDT
nav. status (active source)	$PPLAN, $PPNSD (proprietary)
central dimming command	$--DDC or $PPLAI (proprietary)

Service I/O Port	'
USB service port	Standard USB type B receptacle for connection to a Windows host PC using a vendor-specific USB communications device class driver. The analogue compass repeater is accessed via the “SUSI” application, using a proprietary data protocol.

Bearing Repeater, Type 5016

Environmental Requirements

protection grade	IP 66 to DIN EN 60529
environmental conditions / EMC	in accordance with IEC 60945, equipment category “exposed to the weather”

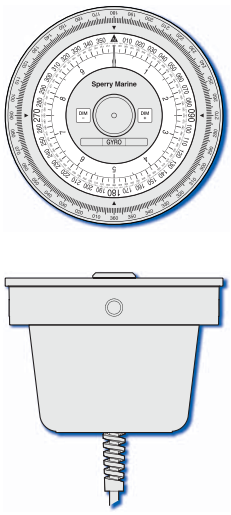
Magnetic Clearance

to standard magnetic compass	0.75 m
to steering magnetic compass	0.45 m
reduced, to standard magnetic compass	0.45 m
reduced, to steering magnetic compass	0.30 m

Readout Elements

360° card	
diameter	172 mm
scale graduations	outer: every 1°; inner: every 5°
heading scale, numbering	every 10°
azimuth scale, numbering	every 5°
10° card	
diameter	130 mm
graduation	every 0.5°
numbering	every 1°
verge ring	
diameter	225 mm
colour	white on black
graduation	every 1°
numbering	every 10°

Dimensions and Weight



diameter at top (verge ring outer dia.)	225 mm
height	165 mm
weight	5.5 kg

Console Repeater, Type 5016-AA

Environmental Requirements

protection grade front side back	 IP 66 to DIN EN 60529 IP 23 to DIN EN 60529
environmental conditions / EMC installed in console frame console-mounted, with seal	 in accordance with IEC 60945, equipment category “protected from the weather” in accordance with IEC 60945, equipment category “exposed to the weather”

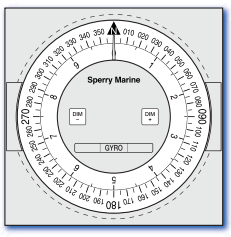
Magnetic Clearance

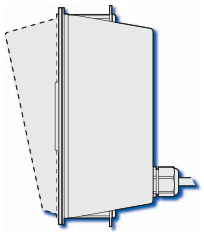
to standard magnetic compass	0.75 m
to steering magnetic compass	0.50 m
reduced, to standard magnetic compass	0.45 m
reduced, to steering magnetic compass	0.30 m

Readout Elements

360° card diameter graduation numbering	 172 mm every 5° every 10°
10° card diameter graduation numbering	 130 mm every 0.5° every 1°

Dimensions and Weight





width	192 mm
height	192 mm
installation depth below front plate	approx. 125 mm (including clearance required for cable)
projection of sun shade from front plate	52 mm
weight	1.25 kg

Magnetic Heading Repeater, Type 5016-AB

Environmental Requirements

protection grade front side back	 IP 66 to DIN EN 60529 IP 23 to DIN EN 60529
environmental conditions / EMC installed in console frame console-mounted, with seal	 in accordance with IEC 60945, equipment category “protected from the weather” in accordance with IEC 60945, equipment category “exposed to the weather”

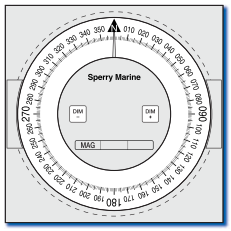
Magnetic Clearance

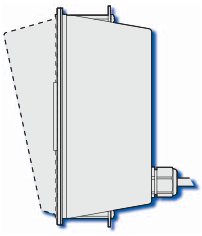
to standard magnetic compass	0.75 m
to steering magnetic compass	0.50 m
reduced, to standard magnetic compass	0.45 m
reduced, to steering magnetic compass	0.30 m

Readout Elements

360° card diameter graduation numbering	 172 mm every 1° every 10°

Dimensions and Weight





width	192 mm
height	192 mm
installation depth below front plate	approx. 125 mm (including clearance required for cable)
projection of cover from front plate	52 mm
weight	1.25 kg

Bulkhead Repeater, Type 5016-AC

Environmental Requirements

protection grade	IP 66 to DIN EN 60529
environmental conditions / EMC	in accordance with IEC 60945, equipment category “exposed to the weather”

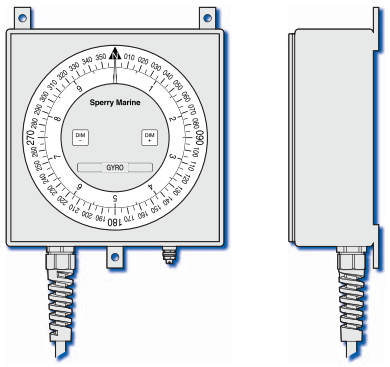
Magnetic Clearance

to standard magnetic compass	0.70 m
to steering magnetic compass	0.40 m
reduced, to standard magnetic compass	0.45 m
reduced, to steering magnetic compass	0.30 m

Readout Elements

360° card	
diameter	172 mm
graduation	every 5°
numbering	every 10°
10° card	
diameter	130 mm
graduation	every 0.5°
numbering	every 1°

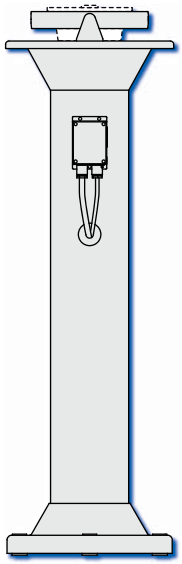
Dimensions and Weight



width	200 mm
height	240 mm
depth	83 mm
weight	2.5 kg

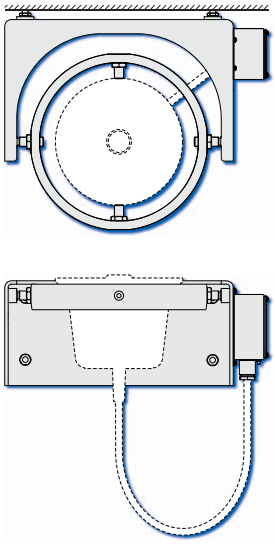
Bearing Stand, Type 4622

Dimensions and Weight

	diameter, top rim	444 mm
	height	1450 mm
	weight	10 kg

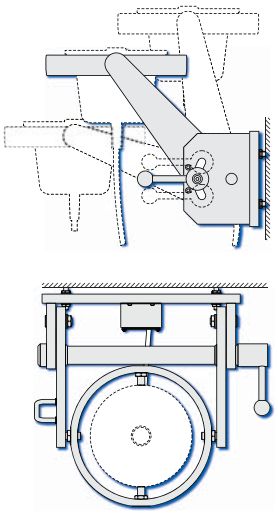
Bearing Repeater Bracket, Type 4890

Dimensions and Weight

	width	462 mm (including connection box fitted to right or left hand side)
	depth	390 mm
	height	185 mm
	weight	5.2 kg

Adjustable Bearing Repeater Bracket, Type 4905

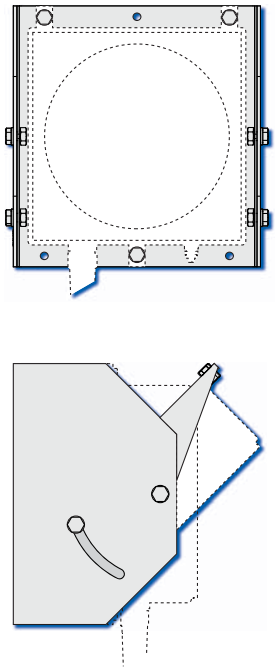
Dimensions and Weight



width	512 mm
depth lowest position highest position	 560 mm 308 mm
height lowest position highest position	 231 mm 481 mm
weight	16.5 kg

Bulkhead Repeater Bracket, Stock No. 26857

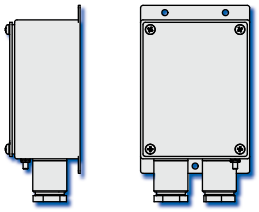
Dimensions and Weight



width	241 mm
depth	226 mm (at maximum inclination of repeater)
height	240 mm
weight	3.5 kg

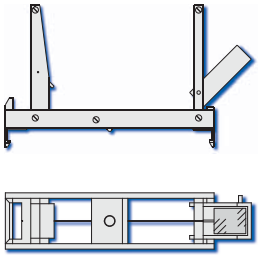
Connection Box, Type 4894-AD

Dimensions and Weight

	width	90 mm
	depth	60 mm
	height	164 mm
	weight	0.8 kg

Azimuth Device PV23, Type 2535

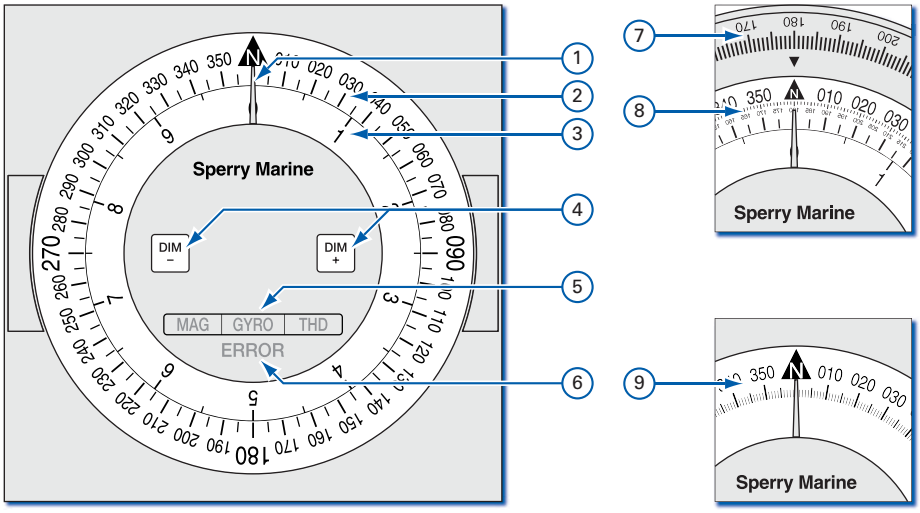
Dimensions and Weight

	width	62 mm
	depth	230 mm
	height above repeater top glass	135 mm
	weight	0.6 kg

Chapter 2: Operation

2.1 Readout Elements, Indicators and Controls

Figure 2-1: readout elements, indicators and controls



① **Lubber Line**
Indicates the "ahead" direction. Ship's heading is read off the compass card(s) at the lubber line.

②,⑨ **360° Card**
Indicates ship's heading on a 360° (1x) scale. Numbered at 10° , graduated every 5° (every 1° in magnetic repeater, type 5016-AB).

③ **10° Card**
Indicates the "fine" portion of the heading on a 10° (36x) scale. Numbered every 1°, graduated every 0.5°. Magnetic repeater, type 5016-AB possesses no 10° card.

④ **DIM- / DIM+ keys**
Adjust the illumination brightness.
Keep both keys pressed for more than 3 s, then release to initiate synchronization; keep both keys pressed for more than 10 s, then release to initiate self test.

⑤ **Source Indicators**
- **GYRO** = indicating true heading from gyrocompass,
- **MAG** = indicating magnetic compass heading (raw or corrected),
- **THD** = indicating true heading from transmitting heading device.

⑥ **Error incicator**
Indicates error conditions visually through blink codes.

⑦ **Bearing Repeater Verge Ring Scale**
Used for taking relative bearings with the azimuth device PV 23. Bearings read off at the index mark at the "near" side of PV 23.

⑧ **Bearing Repeater Azimuth Scale**
Used for taking absolute bearings with the azimuth device PV 23. Bearings read off via the mirror prism at the "near" side of PV 23.

2.2 Powering up the repeaters

The analogue compass repeaters are not equipped with power switches. The devices power up as soon as supply power is applied.

2.3 Data Protocol and Source Detection

When it is first connected to the gyrocompass system, the repeater auto-detects the communication parameters by checking for a valid protocol/baudrate combination in the following order:

- NMEA 0183 at 4800 Bd.
- NMEA 0183 at 38400 Bd.
- NMEA 0183 at 9600 Bd.
- NMEA 0183 at 19200 Bd.
- Plath binary format (9600 Bd.)

Once the repeater has recognized valid data, it stores the communication parameters and will re-activate them at subsequent power-ups to become quickly operative. Should no data be recognized using the stored communication parameters, the repeater executes the auto-detection routine again.

Note

The communication protocol and baudrate may be hard-set in the repeater configuration. This will disable auto-detection.

Within a standard Sperry Marine NAVIGAT gyrocompass system, the analogue repeater will receive the heading source selection status from the compass system.
If the NMEA 0183 protocol is used, the repeater evaluates the proprietary $PPLAN or $PPNSD sentences. If the PLATH protocol is used, the heading data itself contains a source indicator.

In systems where the NMEA 0183 protocol is used but no $PPLAN or $PPNSD sentences are received, the repeater determines the active source by searching the incoming data for valid heading sentences in the following order of priority:

- $HETHS (source = GYRO)
- any $--THS, except $GPTHS (source = GYRO)
- $HEHDT (source = GYRO)
- any $--HDT, except $GPHDT or $HCHDT (source = GYRO)
- $GPTHS (source = THD)
- $GPHDT (source = THD)
- $HCHDT (source = MAG)
- $HCHDM (source = MAG)
- $HCHDG (source = MAG)

Should the currently active source be lost, a timeout condition will occur and the repeater will search the incoming data for other valid heading sentences. Only if no valid heading sentences are received at all, the repeater will raise an error.

Note

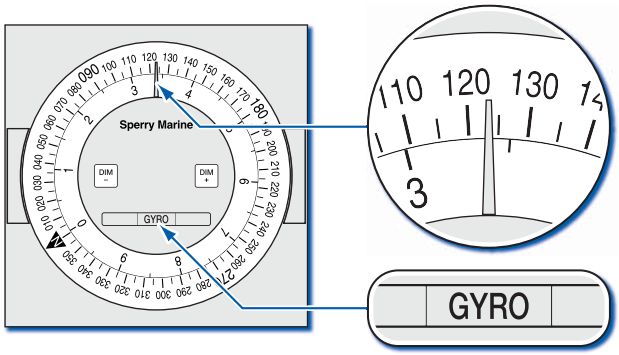
The range of recognized sentences for each source may be restricted by hard-setting the accepted sentences in the repeater configuration.

2.4 Reading off the heading and source indication

Read the vessel's heading off the 360° and 10° cards at the lubber line.

The type of heading source in use (gyrocompasss, magnetic compass or THD) is indicated through the corresponding indicator being lit.

As an example, a repeater indicating a gyrocompass heading of 123.4° is shown below.

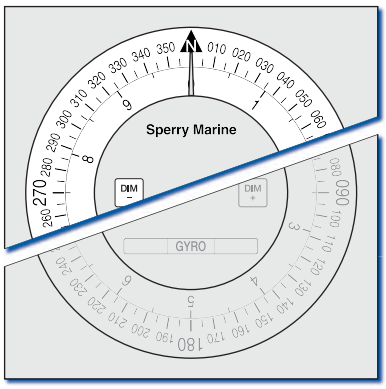


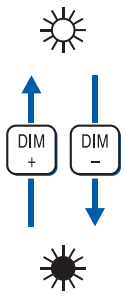
CAUTION

The heading indication at the repeater is only valid if the error indicator is off and exactly one of the source indicators is permanently lit.

2.5 Adjusting the illumination brightness

To adjust the backlight and keypad illumination brightness:





Press **DIM+** to increase the illumination brightness.

Press **DIM-** to reduce the illumination brightness.

Note

Reducing the illumination brightness also reduces the brightness of the source and error indicator LEDs.

2.6 Synchronizing the compass cards

The analogue repeaters are self-synchronizing. They do not normally require any user intervention to re-synchronize the compass card indication with the actual heading received.
However, the position offset counter may occasionally get out of sync with the actual position of the cards, e.g. due to excessive gear friction at low temperatures or when a repeater is subjected to heavy shocks during transport.

To initiate compass card synchronization:

1. Press and hold **DIM-** and **DIM+** simultaneously for more than 3 seconds, then release the keys.
2. The compass cards start turning to home in on the North (zero degree) position. When the photo interruptors detect that both cards have homed, they briefly stop and the position offset is zeroed.

The synchronization is now complete and the repeater automatically resumes normal operation.

2.7 Initiating the self test

To quickly test the proper function of the card drive and the LED indicators, a self test mode is provided.

To initiate the self test:

1. Press and hold **DIM-** and **DIM+** simultaneously for more than 10 seconds. As soon as the active source indicator goes off, release the keys.
2. The repeater first executes the synchronization routine.
3. Next, all indicators and the backlight come on at maximum brightness for 2 seconds, then go to minimum brightness for 2 seconds and back to maximum brigthness for another 2 seconds.
4. Lastly, the cards turn counterclockwise towards the South position, stop briefly and then turn clockwise through a full circle until reaching the South position again.

The self test is now complete and the repeater automatically resumes normal operation.

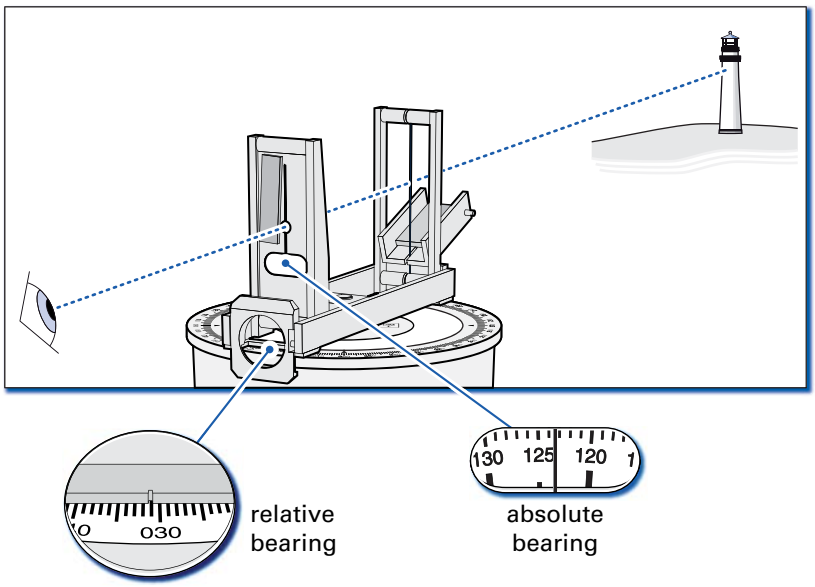
2.8 Taking bearings with the azimuth device PV 23

WARNING

Do not look directly at the sun or at its reflection in the black mirror when using the PV 23.
Permanent eye damage may result.
The PV 23 is not suited for taking the azimuth of the sun, as the anti-glare filters do not sufficiently block out direct sunlight.

1. Mount the PV 23 onto the bearing repeater:
   a) Holding the PV 23 slightly tilted to the far side, hook the far side catch under the rim of the repeater's verge ring.
   b) Let the centering pin at the underside of the PV 23 engage into the recess of the repeater faceplate.
   c) Push down on the near side of the PV 23.
   The near side catch snaps into place and the PV 23 is free to rotate around the centering pin.
2. Take bearings:
   a) Peep through the near sight while rotating the PV 23 until both sights are aligned with the observed object.

      If the object's elevation is too high for direct observation, pick up the object's reflection in the black mirror and align the sights with the reflection. If necessary, engage one or both of the coloured filters to reduce glare while observing the object.



   b) Read the object's absolute bearing off the azimuth scale through the mirror prism below the near sight.
   c) Read the object's relative bearing off the verge ring scale at the index mark on the PV 23.

Note

Observe that, being read from the near side, the azimuth and verge ring scales run from right to left,.

Chapter 3: Error Indication

When a repeater compass detects an error condition, the red “Error” indicator flashes or lights up permanently. The error indication remains active until the cause of the error is eliminated.
The repeater compasses do not possess an audible alarm indicator.

3.1 Error Blink Codes

When error is detected, the error condition at hand is indicated by the error indicator showing a corresponding blink code.

Table 3-1: repeater compass error blink codes

error condition/code	corrective action
no activity at input *or* power-up failure  *permanently on*	Check whether data is present at source’s output. Check connection between source and repeater. Check whether the repeater reacts to keypresses (dimming, synchronization). If keys are not functional, the repeater did not enter normal operational mode. Cycle power. If the error persists, send the repeater back to Sperry Marine for exchange.
heading timeout  *on / off for equal periods*	Check whether source provides valid heading data. In NAVIGAT compass systems, check that heading data originates from selected source according to $PPLAN/$PPNSD sentence. Check source’s protocol and baudrate settings. Check whether repeater configuration is hardset to different parameters than source’s output.
synchronization fault  *two short flashes followed by a pause*	Initiate synchronization of the compass cards. Cycle power. If the error persists after several attempts to synchronize, return the repeater to Sperry Marine for exchange.

In case of a heading timeout, one or all of the source indicators may flash in sync with the error indicator. This provides additional information regarding the cause of the timeout.

- If one of the source indicator flashes, no heading data is received from the currently active source. Possible causes:
  - The active source selection is read from the proprietary $PPLAN or $PPNSD sentences but no valid heading is received from the selected source.
  - The active source has marked its heading data invalid or has stopped sending data and no valid heading data is received from another source.

- If all source indicators flash simultaneously, valid datagrams are recognized at the input but the currently active source cannot be determined. Possible causes:
  - NMEA sentences are received but these do not contain any of the recognized heading sentences.
  - NMEA heading sentences are recognized but are excluded from the range of accepted sentences in the repeater's configuration.

Chapter 4: Preventive Maintenance

4.1 Maintenance by Shipboard Personnel

The analogue compass repeaters are maintenance-free. All internal moving parts, such as the stepper motor, gear train and bearings, are lifetime-lubricated. The gimbals of the bearing stand and bearing consoles are fitted with self-lubricating polymer bushings.

The repeater's front plate should be kept clean and all cables and connectors should regularly be checked visually to detect any signs of damage or deterioration.

Note

The repeater's front plate is made of clear polycarbonate.
Do not clean the front plate with organic solvents, acetone or any other substance which could damage or discolor plastic.
Use only water and soap or a mild detergent to clean the front plate.

Chapter 5: Installation

5.1 Bearing Repeater, type 5016

Installing the Bearing Stand and Repeater

Bearing repeater stands may be positioned amidships (on the fore-and-aft line) or at the port or starboard sides of the vessel.

Note

Make sure that the bearing stand is so positioned that the vessel's superstructure does not unduly obstruct the view of the horizon when bearings are taken.

The bearing stand is to be attached to the deck or a pedestal using four M 20 fasteners. Tubular spacers are provided, which are to be inserted between the mounting surface and the base of the stand.

The four attachment points are to be located on an imaginary circle of 370 mm diameter, at the 0°, 90°, 180° and 270° positions relative to the forward direction. The elongated holes in the base of the bearing stand allow to correct a misalignment of ±3.5° max.

A cable feedthrough is to be located centrally beneath the stand, so that the connection cable from the compass system runs up the inside of the stand column.

Note

The bearing repeater weights 5.5 kg. To avoid damage, the installation of the repeater in the gimbal ring should be carried out by two persons.

To install the bearing stand and repeater:

1. Check that the mounting facilities and the cable feedthrough provided by the shipyard match with the specifications given in dimension drawing 4622-0112-03.
2. Lay the connecting cable. Make sure that enough cable exits from the feedthrough to run it up the stand column and through the grommet to the connection box.
3. If the mounting surface is furnished with tapped holes, place the tubular spacers over the holes. If welded studs are provided, slide the spacers onto the studs.
4. Place the bearing stand on top of the spacers. The stand may be mounted in any of the four possible orientations. Make sure, however, that the connection box is easily accessible.
5. Loosely attach the bearing stand to the mounting surface with the fasteners provided by the shipyard. Use washers. Do not yet tighten the fasteners.
6. Remove the grommet from the cable exit in the stand column.
7. Run the connection cable up the stand column and through the exit to the outside of the stand.

8. Loosen one of the lock nuts securing the trunnions in the gimbal ring and screw back the trunnion by approximately 2 cm.
9. Hold the repeater in a convenient position close to the bearing stand. Unwind the repeater connection cable and run it through the gimbal ring, the stand column and the cable exit to the outside of the stand.
10. Lift the bearing repeater into the gimbal ring so that the lubber line points in the forward direction.
11. Locate the fixed trunnion in the bushing in the repeater.
12. Turn the loosened trunnion clockwise into the opposite bushing, so that the repeater is secured without play in the gimbal ring.
    Make sure that the repeater swings freely in the gimbal ring without jamming.
13. Check that the repeater is centered in the gimbal ring. If necessary, adjust the trunnions to center the repeater.
14. Tighten the trunnion lock nuts.
15. Align the bearing stand with the vessel's fore-and-aft line as follows:
    a) Determine the exact lateral distance between the stand's centre and the vessel's fore-and-aft line.
    b) Position a beam with a perpendicular reference mark well forward of the bearing stand, at the same lateral distance from the fore-and-aft line.
    c) Fit a PV 23 azimuth device to the bearing repeater.
    d) Take a bearing of the reference mark on the beam.
    The bearing is to be 360° exactly. If necessary, gently rotate the bearing stand until a bearing of 360° is obtained.
    e) Position a second beam well aft of the bearing stand.
    f) Take a bearing of the reference mark on the beam.
    Check that the bearing is 180° exactly. If necessary, correct any misalignment by rotating the bearing stand, then re-check the bearings of the two beams.

Note

In case the bearing stand is mounted amidships (on the fore-and-aft line), no beams need to be erected if bearings can be taken of objects on the fore-and-aft line, e.g. the centre of the foremast, flagstaff etc.

16. Tighten the fasteners on the repeater stand base.
17. Punch or cut a hole for the connection cables into the grommet, slide the grommet onto the cables and press it into the cable exit.
18. Remove the cover plate from the connection box.
19. Remove the cable jacket from the ends of the connection cables, draw back the cable screens and insert the cables into the connection box through the cable glands.
20. Firmly tighten the cable glands. Make sure to establish a solid connection between the screens and ship's ground via the glands.
21. Connect the repeater and shipside wires to the terminal blocks as per the wiring diagrams and connection drawings provided.
22. In case a custom configuration is required, configure the repeater now using the SUSI application (see chapter 6, 'Configuration").
23. Attach the cover plate to the connection box, power up the compass system and carry out a full functional test of the repeater.

Installing Bearing Repeater Bracket 4890 and Repeater

The bearing repeater bracket 4890 is typically fitted to a bulwark or other vertical surface parallel or perpendicular to the vessel's fore-and-aft line.

The shipyard is to provide the mounting surface with four M 10 bolts or welded studs, to which the bracket is then attached with nuts and washers. The mounting surface should be as exactly parallel or perpendicular to the fore-and-aft line as possible, as the mounting method permits to correct only a small amount of misalignment.

Note

Make sure that the bearing repeater bracket is so positioned that the vessel's superstructure does not unduly obstruct the view of the horizon when bearings are taken.

Note

The bearing repeater weights 5.5 kg. To avoid damage, the installation of the repeater in the gimbal ring should be carried out by two persons.

To install the bearing repeater bracket and repeater:

1. Check that the mounting facilities provided by the shipyard match with the specifications given in dimension drawing 4890-0112-03.
2. Check that easy access is provided to the connection box at the right hand side of the bracket. If necessary, unmount the box and fit it to the bracket's left hand side or directly onto the bulwark.
3. Screw a thin M 10 nut onto each of the four mounting studs. Leave a few threads exposed between the nuts and the mounting surface to allow for fine-adjustment of the nuts' positions later
4. Put a flat washer onto each nut.
5. Fasten the bearing repeater bracket to the attachment studs with four thin nuts and washers. Tighten the nuts only lightly.
6. Loosen one of the lock nuts securing the trunnions in the gimbal ring and screw back the trunnion by approximately 2 cm.
7. Hold the repeater in a convenient position close to the bracket. Unwind the repeater connection cable and run it through the gimbal ring from above.
8. Lift the bearing repeater into the gimbal ring so that the lubber line points in the forward direction.
9. Locate the fixed trunnion in the bushing in the repeater.
10. Turn the loosened trunnion clockwise into the opposite bushing, so that the repeater is secured without play in the gimbal ring. Make sure that the repeater swings freely in the gimbal ring without jamming.
11. Check that the repeater is centered in the gimbal ring. If necessary, adjust the trunnions to center the repeater.
12. Tighten the trunnion lock nuts.
13. Align the bearing repeater bracket with the vessel's fore-and-aft line as follows:
    a) Determine the exact lateral distance between the bracket's centre and the vessel's fore-and-aft line.
    b) Position a beam with a perpendicular reference mark well for-

ward of the bearing stand, at the same lateral distance from the fore-and-aft line.

c) Fit a PV 23 azimuth device to the bearing repeater.

d) Take a bearing of the reference mark on the beam.
The bearing is to be 360° exactly. If necessary, fine-adjust the positions of the flat nuts on the attachment studs until a bearing of 360° is obtained.

e) Position a second beam well aft of the bearing stand.

f) Take a bearing of the reference mark on the beam.
Check that the bearing is 180° exactly. If necessary, correct any misalignment by readjusting the flat nuts, then re-check the bearings of the two beams.

Note

In case the bearing repeater bracket is mounted amidships (on the fore-and-aft line), no beams need to be erected if bearings can be taken of objects on the fore-and-aft line instead, e.g. the centre of the foremast, flagstaff etc.

14. Thoroughly tighten the flat nuts on the attachment studs.
15. Remove the cover plate from the connection box.
16. Shorten the repeater and shipside connection cables as required.
17. Remove the cable jacket from the ends of the connection cables, draw back the cable screens and insert the cables into the connection box through the cable glands.
18. Firmly tighten the cable glands. Make sure to establish a solid connection between the screens and ship's ground via the glands.
19. Connect the repeater and shipside wires to the terminal blocks as per the wiring diagrams and connection drawings provided.
20. In case a custom configuration is required, configure the repeater now using the SUSI application (see chapter 6, 'Configuration").
21. Attach the cover plate to the connection box, power up the compass system and carry out a full functional test of the repeater.

Installing the Adjustable Bearing Repeater Bracket 4905 and Repeater

The adjustable bearing repeater bracket 4905 is typically fitted to a bulwark or other vertical surface parallel or perpendicular to the vessel's fore-and-aft line.

The shipyard is to provide the mounting surface with four M 10 bolts or welded studs, to which the bracket is then attached with nuts and spherical washers with conical seats. The mounting surface should be as exactly parallel or perpendicular to the fore-and-aft line as possible. The mounting method permits to correct a misalignment of ±3.0° max.

Note

Make sure that the bearing repeater bracket is so positioned that the vessel's superstructure does not unduly obstruct the view of the horizon when bearings are taken.

Note

The bearing repeater weights 5.5 kg. To avoid damage, the installation of the repeater in the gimbal ring should be carried out by two persons.

To install the bearing repeater bracket and repeater:

1. Check that the mounting facilities provided by the shipyard match with the specifications given in dimension drawing 4905-0112-03.
2. Screw a thin M 10 nut onto each of the four mounting studs. Leave a few threads exposed between the nuts and the mounting surface to allow for fine-adjustment of the nuts' positions later.
3. Put a spherical washers with conical seat onto each of the nuts.
4. Fasten the adjustable bearing repeater bracket to the attachment studs with four thin nuts and spherical washers with conical seats. Tighten the nuts only lightly.
5. Loosen one of the lock nuts securing the trunnions in the gimbal ring and screw back the trunnion by approximately 2 cm.
6. Hold the repeater in a convenient position close to the bracket. Unwind the repeater connection cable and run it through the gimbal ring from above.
7. Lift the bearing repeater into the gimbal ring so that the lubber line points in the forward direction.
8. Locate the fixed trunnion in the bushing in the repeater.
9. Turn the loosened trunnion clockwise into the opposite bushing, so that the repeater is secured without play in the gimbal ring. Make sure that the repeater swings freely in the gimbal ring without jamming.
10. Check that the repeater is centered in the gimbal ring. If necessary, adjust the trunnions to center the repeater.
11. Tighten the trunnion lock nuts.
12. Align the bearing repeater bracket with the vessel's fore-and-aft line as follows:
    a) Determine the exact lateral distance between the bracket's centre and the vessel's fore-and-aft line.
    b) Position a beam with a perpendicular reference mark well forward of the bearing stand, at the same lateral distance from the

fore-and-aft line.

c) Fit a PV 23 azimuth device to the bearing repeater.

d) Take a bearing of the reference mark on the beam.
The bearing is to be 360° exactly. If necessary, adjust the positions of the flat nuts on the attachment studs until a bearing of 360° is obtained.

e) Position a second beam well aft of the bearing stand.

f) Take a bearing of the reference mark on the beam.
Check that the bearing is 180° exactly. If necessary, correct any misalignment by readjusting the flat nuts, then re-check the bearings of the two beams.

Note

In case the bearing repeater bracket is mounted amidships (on the fore-and-aft line), no beams need to be erected if bearings can be taken of objects on the fore-and-aft line instead, e.g. the centre of the foremast, flagstaff etc.

13. Thoroughly tighten the flat nuts on the attachment studs.
14. Remove the cover plate from the connection box.
15. Shorten the repeater and shipside connection cables as required.
16. Remove the cable jacket from the ends of the connection cables, draw back the cable screens and insert the cables into the connection box through the cable glands.
17. Firmly tighten the cable glands. Make sure to establish a solid connection between the screens and ship's ground via the glands.
18. Connect the repeater and shipside wires to the terminal blocks as per the wiring diagrams and connection drawings provided.
19. In case a custom configuration is required, configure the repeater now using the SUSI application (see chapter 6, 'Configuration").
20. Attach the cover plate to the connection box, power up the compass system and carry out a full functional test of the repeater.

5.2 Console/Magn. Hdg. Repeater, Type 5016-AA/AB

The console repeater and the magnetic heading repeater are supplied with four attachment columns and mounting clamps for installation in a standard Sperry Marine console frame or directly into a console cutout.

In case of direct console mounting, the shipyard is to cut a square opening into the console as per dimension drawing 5016-0112-02.

To install the repeater in a console frame:

1. Loosen the four screws on the attachment columns and rotate the mounting clamps inward.
2. Connect the repeater cable to the shipside terminals as per the wiring diagrams and connection drawings provided.
3. Install a ground strap between the ground tab at the back of the repeater housing and ship's ground.
4. In case a custom configuration is required, configure the repeater now using the SUSI application (see chapter 6, 'Configuration").
5. Insert the repeater into the frame.
6. Rotate the mounting clamps outward and fasten them with the retaining screws.
7. Power up the compass system and carry out a full functional test of the repeater.

To install the repeater directly in a console cutout:

1. Remove the four screws, clamps and washers from the attachment columns. This exposes four M 4 studs on the back of the repeater's front plate.
2. Fit a clamp and washer onto each of the studs, rotate it inward and lightly fasten it with an attachment column.
3. If watertight installation is required, fit the provided rubber seal to the back of the repeater.
4. Connect the repeater cable to the shipside terminals as per the wiring diagrams and connection drawings provided.
5. Install a ground strap between the ground tab at the back of the repeater housing and ship's ground.
6. In case a custom configuration is required, configure the repeater now using the SUSI application (see chapter 6, 'Configuration").
7. Insert the repeater in the console cutout.
8. Rotate the mounting clamps outward and thoroughly fasten them with the attachment columns.
9. Power up the compass system and carry out a full functional test of the repeater.

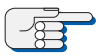
5.3 Bulkhead Repeater, Type 5016-AC

The bulkhead repeater is attached directly onto a bulkhead or is fitted to the optional swiveling mounting bracket. For this purpose, the bulkhead repeater housing possesses three attachment feet with 7 mm holes.

In case of direct bulkhead mounting, the shipyard is to provide the mounting surface with three M 6 weld studs or tapped holes, to which the repeater is attached. In case the optional swiveling bracket is used, the shipyard is to provide the mounting surface with four M 8 weld studs or tapped holes, to which the bracket is attached.

The bulkhead repeater's electrical connection is normally made via the terminal box 4894-AB. As the box contains the service USB port, it should be installed at an easily accessible location close to the repeater.

Note



Do not lengthen the cable between the repeater and the connection box. The USB service port will not work reliably if the cable is lengthened. If the connection box cannot be installed at an accessible location close to the repeater, it will be required to unmount an disassemble the repeater to gain access to the internal USB receptacle when configuring or servicing the device.
If the repeater cable is connected directly to shipside terminals, the external USB port may not be used and its four wires must be connected to blind terminals.

To install the bulkhead repeater:

1. If the repeater is to be mounted directly onto a bulkhead:
   a) Check that the mounting facilities provided by the shipyard match with the specifications given in dimension drawing 5016-0112-03
   b) Fasten the repeater to the bulkhead with suitable fasteners (shipyard supply).

   If the swiveling bracket is used:
   a) Check that the mounting facilities provided by the shipyard match with the specifications given in dimension drawing 5016-0112-04
   b) Fasten the bracket or the to the bulkhead with suitable fasteners (shipyard supply).
   c) Fasten the repeater to the bracket with the fasteners provided.
2. Install a ground strap between the ground stud at the bottom of the repeater housing and ship's ground.
3. Install the connection box at an easily accessible location close to the repeater.
4. Remove the cover plate from the box.
5. Shorten the repeater and shipside connection cables as required.
6. Remove the cable jacket from the ends of the connection cables, draw back the cable screens and insert the cables into the connection box through the cable glands.
7. Firmly tighten the cable glands. Make sure to establish a solid connection between the screens and ship's ground via the glands.

8. Connect the repeater and shipside wires to the terminal blocks as per the wiring diagrams and connection drawings provided.
9. In case a custom configuration is required, configure the repeater now using the SUSI application (see chapter 6, ‘Configuration”).
10. Attach the cover plate to the connection box, power up the compass system and carry out a full functional test of the repeater.

Chapter 6: Configuration

6.1 Using the Default Configuration

The repeater's factory default configuration will be suitable for most installations and will normally not require any customization.

By default, the repeater configuration is "all-automatic", permitting auto-detection of the input protocol and baudrate as well as the active heading source.
The automatic source detection takes place as described in chapter 2, section 2.3, "Data Protocol and Source Detection".

The magnetic heading repeater is configured by default to display magnetic heading only, regardless of which source is currently active.

6.2 Configuring the Analogue Repeater with SUSI

Note

This section is intended for authorized service personnel configuring or servicing an analogue repeater. These tasks require a PC running the Sperry Universal Service Instrument (SUSI) application. SUSI is provided to authorized service personnel only and is generally not available to end-customers.

Should it be required to configure the repeater using other settings than the factory defaults, the configuration settings must be accessed from a PC (field engineer's laptop or notebook computer) connected to the repeater's USB service port and running the Sperry Universal Service Instrument application (SUSI).

For the present section, it is assumed that you have successfully installed SUSI and the USB device driver for the analogue repeaters on your PC. Once an analogue repeater is connected to the PC, a device named "RCS - NGSM Service USB Port" (repeater compass system) must appear in the Windows Device Manager, listed as a modem device.

If you have not yet installed the SUSI and/or the device driver, refer to the SUSI Installation Guide, included in the appendix of this manual. Support for the analogue repeater is available in SUSI versions 1.024 and higher. If you are using an earlier version, obtain the current SUSI installation package from Sperry Marine and re-install the software.

The procedures described below are performed using the controls appearing in SUSI's application tab when connecting to the repeater. More advanced configuration features, accessible through SUSI's terminal and parameter tabs, are beyond the scope of this manual.

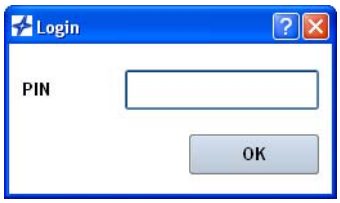
If configuring a repeater using other settings than the factory defaults, note all settings in the analogue compass repeater setup table (see Appendix). Send a copy of the filled-out table to Sperry Marine for inclusion in the ship's file.

To configure the analogue repeater:

1. If the repeater is currently powered up, switch off the power first.
2. Gain access to the repeaters USB service port receptacle:
   - In case of a console or magnetic heading repeater, remove the plastic plug from the back of the housing to access the receptacle on the repeater PCB. If necessary, unmount the repeater from the console to make sure that the port is freely accessible for plugging and unplugging the USB cable.
   - In case of a bearing or bulkhead repeater, remove the cover plate from the connection box to access the receptacle inside the box.

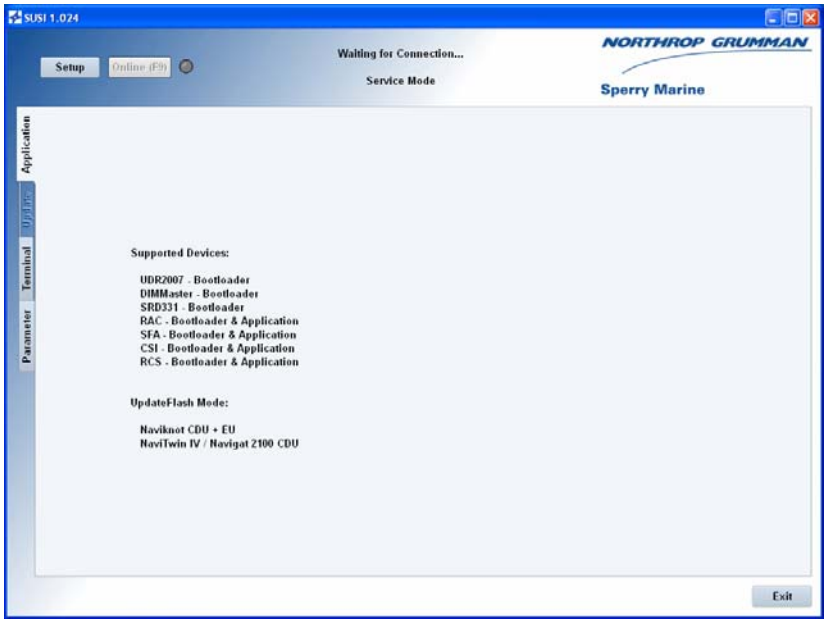
   Do not plug in the USB cable yet.
3. Power up the repeater.
4. At the PC, start up the SUSI application.

   A login dialog pops up:

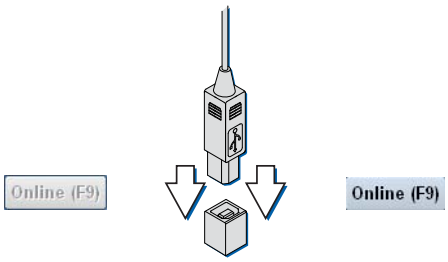


5. Enter PIN "**20097**".
   This will start up SUSI in the service mode.

   Click OK ot the enter key to continue.
6. SUSI's main window now opens, with the "Application" tab displaying a list of supported devices:



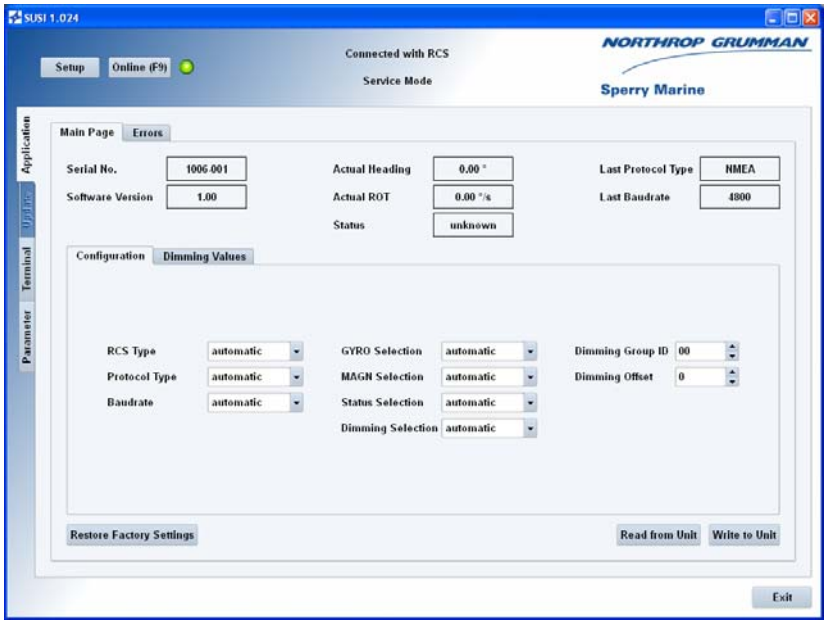
7. The “Online” button at the top left of SUSI’s main window will be greyed out, as SUSI has not yet detected a device to connect to. The status line at the top center of the window will read “Waiting for Connection...”.
8. Plug in the USB cable at the PC and at the repeater’s service port. The “Online” button should now become clickable (not greyed-out), indicating that SUSI has found a device to connect to:



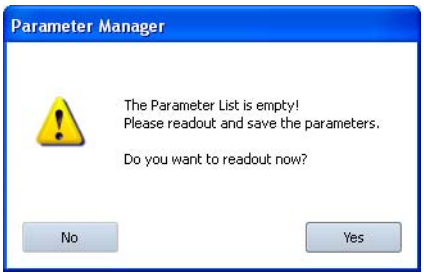
   The LED icon next to the button will remain grey, as no connection has been made yet.

9. Click Online (F9) to connect to the analogue repeater.
   The LED icon should now change to green and the status line should read “Connected with RCS”.

   Upon connection, SUSI populates the Application tab with the analogue repeater application controls and displays the application’s “Main Page”:



10. If the service PC has not previously been used to service an analogue repeater, a warning message will pop up, indicating that the parameter list for the device is empty:



Click Yes to read the current configuration from the repeater and to set the Main page parameter controls accordingly, or click No if you intend to set all parameters manually in SUSI first and write them to the repeater later.

11. If you clicked Yes in the previous step, a dialog box will pop up, asking whether the parameters should be saved as default settings for this device:

Click Yes. to save the parameters as default settings or No to cancel.

12. If you clicked Yes in the previous step, the default settings are now written to a file named “RCSdefault.xml“ in the sub-directory “Parameter Files” in SUSI’s installation directory.

Note

If a default parameter file for the analogue repeater already exists, e. g. if the PC has been used previously to service a repeater, the above warning message will not appear.
In this case, do not write back settings to the repeater before all parameters have been set as required for the repeater under service.

13. Using the Main Page controls, set the repeater configuration parameters and dimming values as required. An overview and detailed descriptions of the parameters are given below (see “Configuration Parameters” on page 6-6 and “Dimming Values” on page 6-12).

14. When all parameters are set as required, click Write to Unit to transfer the settings to the repeater.

15. To finish off the configuration, click Read from Unit in the SUSI application to read all configuration and calibration settings from the analogue repeater back into SUSI's runtime memory.
    A dialog box will pop up, asking whether these parameters should be saved as default settings for this device:

16. Click Yes to save the parameters. The saved file is named "RCSdefault.xml" and is located in the sub-directory "Parameter Files" in SUSI's installation directory.
    To be able to retrieve and restore the configuration at a later point in time, this file should be copied and saved to an appropriate location.

Note

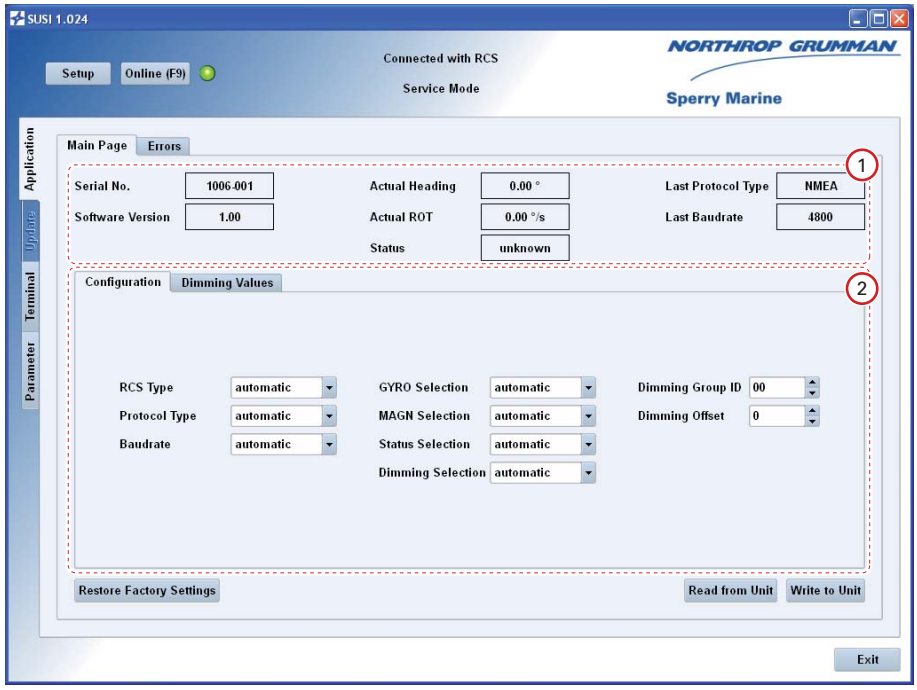
If a file "RCSdefault.xml" already exists in SUSI's "Parameter Files" sub-directory, it will be overwritten without further warning.
To be able to retrieve and restore the configuration at a later point in time, rename the file "RCSdefault.xml" and/or copy it from the "Parameter Files" sub-directory to a different location.

17. Fill out the analogue repeater setup table to retain an easily retrievable written record of the analogue repeater configuration.
18. Unplug the USB cable from the repeater and the service PC.
19. Power down the repeater and put the protective plug back on the housing or reattach the cover to the connection box, respectively.
20. The configuration of the analogue repeater is now complete.

6.3 Configuration Parameters

The analogue repeater application main page contains the settable controls to configure the repeater as required for the installation at hand.

Figure 6-1: Controls on the repeater application main page



1 Read-Only Controls:

- Repeater Serial No. and Software Version, Actual Heading, Rate of Turn and Selection Status, Last Active Protocol Type and Baudrate

2 Configuration Parameter Controls:

- **RCS Type**
  - **automatic** [1]
  - **Magnetic** [2]
  - **Gyro**
- **Protocol Type**
  - **automatic** [1]
  - **NMEA**
  - **PLATH**
- **Baudrate**
  - **automatic** [1]
  - **4800**
  - **9600**
  - **19200**
  - **38400**
- **GYRO Selection**
  - **automatic** [1]
  - **HETHS**
  - **xxTHS**
  - **HEHDT**
  - **xxHDT**
  - **GPTHS**
  - **GPHDT**
- **MAGN Selection**
  - **automatic** [1]
  - **HCHDT**
  - **HCHDM**
  - **HCHDG**
- **Status Selection**
  - **automatic** [1]
  - **PPLAN**
  - **PPNSD**
- **Dimming Selection**
  - **automatic** [1]
  - **xxDDC**
  - **PPLAI**
- **Dimming Group ID**
  - ID: **00 – 99**
  - [*default = 00*]
- **Dimming Offset**
  - offset: **-7 – +7**
  - [*default = 0*]

1 = *default setting*
2 = *default for magnetic heading repeater*

RCS Type

Sets the repeater device type.

Settings: **automatic**
Recognize heading data from gyrocompasses, THDs and magnetic compasses. This is the factory default setting.

If data is received in the NMEA 0183/IEC 6116 protocol, the repeater determines the active heading source according to the following scheme:

Check the incoming data for $PPLAN or $PPNSD sentences according to the "Status Selection" setting.

- If valid $PPLAN or $PPNSD sentences are found, check the incoming data for heading from the selected source (gyro or magnetic), according to the "GYRO Selection" and "MAGN Selection" settings.
  - If valid heading data is received from the selected source, indicate heading and source.
  - If no valid heading data is received from the selected source, raise an error.
- If no valid $PPLAN or $PPNSD sentences are found, check the incoming data for heading from any source (gyro or magnetic), according to the "GYRO Selection" and "MAGN Selection" settings.
  - If valid heading data is received from one source only, indicate the heading and source.
  - If valid heading data is received from more than one source, indicate the heading and source from the highest prioritized source:
    – Gyrocompass,
    – THD,
    – Magnetic Compass.
  - If no valid heading data is received from any source, raise an error.

Magnetic
Recognize magnetic heading data only. This is the required setting for the magnetic heading repeater, type 5016-AB. When installating a magnetic heading repeater, updating its software or exchanging its PCB , make sure that this setting is selected.

Gyro
Recognize heading data from gyrocompasses or THDs only. This setting disables automatic fallback to magnetic heading when gyro heading is lost.

Protocol Type

Selects the data protocol type.

Settings: **automatic**
Auto-detect the input protocol type, NMEA 0183/IEC 61162 or Plath binary.

NMEA
Recognize the NMEA 0183/IEC 61162 protocol only.

Plath
Recognize the Plath binary protocol only.

Baudrate

Selects the input baudrate (effective for the NMEA 0183/IEC 61162 protocol only).

Settings: **automatic**
Auto-detect the input baudrate.

4800
Receive at 4800 Bd. only.

9600
Receive at 9600 Bd. only.

19200
Receive at 19200 Bd. only.

38400
Receive at 38400 Bd. only.

Gyro Selection

Selects the accepted NMEA 0183/IEC 61162 sentences for gyrocompass and THD headings.

Settings: **automatic**
No restriction. Accept, in the following order of priority:
- $HETHS,
- $--THS with any other talker ID (except HC),
- $HEHDT,
- $--HDT with any other talker ID (except HC).

If the talker ID is "GP", the source is treated as a THD, in all other cases, the source is treated as a gyrocompass.

HETHS
Accept $HETHS only.

xxTHS
Accept $--THS with any other talker ID (except HC).

HEHDT
Accept $HEHDT only.

xxHDT
Accept $--HDT with any other talker ID (except HC).

GPTHS
Accept $GPTHS only. The source is treated as a THD.

GPHDT
Accept $GPHDT only. The source is treated as a THD.

Magnetic Selection

Selects the accepted NMEA 0183/IEC 61162 sentences for magnetic compass heading.

Settings: **automatic**
No restriction. Accept, in the following order of priority:
- $HCHDT
- $HCHDM
- $HCHDG

HCHDT
Accept $HCHDT only.

HCHDM
Accept $HCHDM only.

HCHDM
Accept $HCHDG only.

Status Selection

Selects the accepted NMEA 0183/IEC 61162 sentences for heading source selection.
This setting is only effective in Sperry NAVIGAT gyrocompass systems, which generate the respective proprietary “nav. status” sentences.

Settings: **automatic**
No restriction. Accept, in the following order of priority:
- $PPLAN
- $PPNSD

PPLAN
Accept $PPLAN only.

PPNSD
Accept $PPNSD only.

Dimming Selection

Selects the accepted NMEA 0183/IEC 61162 sentences for serial dimming of the illumination brightness.

Settings: **automatic**
No restriction. Accept, in the following order of priority:
- $PPLAI (proprietary)
- $--DDC (standard)

PPLAI
Accept the proprietary $PPLAI sentence only.

xxDDC
Accept $--DDC with any talker ID.

Dimming Group ID

Assigns the repeater to a dim group.
This setting is only effective when the proprietary $PPLAI sentence is used for serial dimming

Setting: **00 – 99**
Select an ID between “01” and “99” to assign the repeater to the respective dim group.
Selecting ID “00” lets the repeater accept any dim command received, regardless of group assignment.

Dimming Offset

Sets a local offset for the brightness level.

Setting: **-7 – +7**
Select an offset as required to match the brightness of the repeater to that of other equipment controlled through the same dim command device.

Offsets below 0 decrease, offsets above 0 increase the repeater's overall brightness by the corresponding number of brightness levels.

As the analogue repeater's illumination has eight discrete brightness levels, an offset of -7 forces the minimum level while an offset of 7 forces the maximum level at all times.

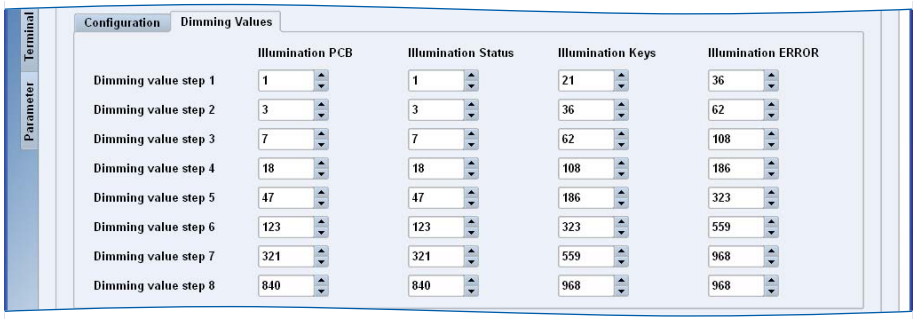
Note that adjusting the brightness with the **DIM-** and **DIM+** keys also alters the dimming offset accordingly.

6.4 Dimming Values

The illumination intensities at the repeater's eight discrete brightness levels are factory preset to provide a useful range of levels under most lighting conditions, both at day and night.
However, to permit an optimum adaption of the repeater to local lighting conditions, a configurable dimming value table is maintained in the on-board memory.

For each brightness level ("dimming step"), the table holds a set of four dimming values. These represent the illumination intensity for the card backlight ("PCB"), the source indicators ("Status"), the **DIM** keys and the error indicator.

Figure 6-2: Repeater application main page: dimming values



Adjusting Dimming Values

The analogue repeater's dimming values are preset to factory defaults which should be suitable without further adjustment in most cases.

However, in certain situations, e.g. on an open deck or under subdued lighting, a more useful range of brightness levels may be obtained if the dimming values are altered.

To alter dimming values, edit the table entries directly or use the spin controls to set them to the required values.
Each table entry may take any value between 0 (off) and 1000 (maximum brightness). Due to the nonlinear brightness perception of the human eye, it will be required to gradually increase the difference in value from step to step in order to achieve even graduation of the brightness levels.

Alterations of the dimming values are transferred to the repeater immediately. This permits to directly observe the result of changes at the currently active brightness level.

Note

Do not set the error indicator's intensity to "0" at any dimming step. This would disable the indicator at the respective step.

Serial Dimming Command Evaluation

When serial dimming is used, the analogue repeater reads the commanded brightness percentage from the $--DDC or $PPLAI sentence, respectively. At a dim offset of 0, the range of possible percentage values, is mapped to the repeater's eight brightness levels as follows:

Table 6-1: Serial dimming brightness percentage to repeater brightness level mapping

commanded percentage	repeater dimming step
00 – 11	1
12 - 24	2
25 - 36	3
37 - 49	4
50 - 61	5
62 - 74	6
75 - 86	7
87 - 99	8

If the dim offset is set to a value other than 0, via the setup or by adjusting the brightness with the **DIM** keys, the effective brightness of the repeater is altered by the corresponding number of steps up or down.

Note

The analogue repeater evaluates the brightness percentage field from the $--DDC or $PPLAI sentences only. The dimming preset and colour palette fields are ignored.

Chapter 7: Troubleshooting

The analogue compass repeaters are complex electronic devices. 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. Defective units must be sent back to Sperry Marine for repair.

Field service personnel should limit troubleshooting to the basic checks given below.

For all repeater types:

- Continuity checks of wiring connections.
- Checks for short circuit or overload conditions or reversed polarity of the external supply powers.
- Software-aided troubleshooting using Sperry Marine's SUSI application, if instructed accordingly by Sperry Marine.

For all repeaters except the bearing repeater, type 5016:

- Visual inspection of mechanical components, the PCB and wiring.
- Checks of the on-board supply voltages and I/O signals and data. The presence of voltages, signals and data is indicated by diagnostic LEDs on the PCB.
  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.

Note

Do not open the housing of a bearing repeater, type 5016.
Opening the housing in the field may lead to condensation forming on the inside surfaces, especially the top glass, at a later point in time.

CAUTION

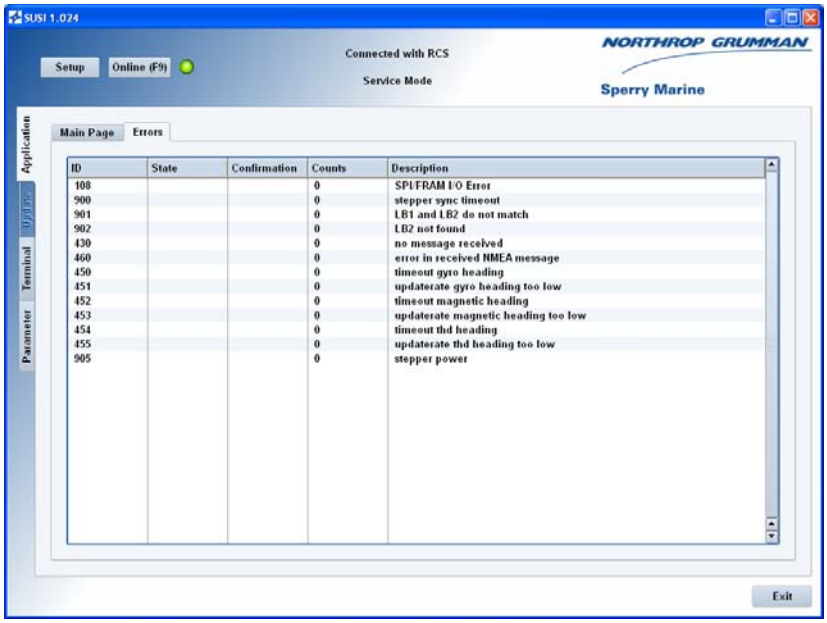
The analogue compass repeaters contain electrostatic sensitive components. Electrostatic discharge may permanently damage components. When servicing an analogue compass repeater, take precautions to prevent electrostatic discharge. Avoid touching any of the electronic circuitry.

7.1 Viewing Error Information in SUSI

Analogue Repeater Error Page

When connected to an analogue repeater, the Sperry Universal Service Instrument application (SUSI) provides an “Errors” page which displays the current activity and confirmation state of a number of possible error conditions and counts their occurrence since the last power-up:

Figure 7-1:



For errors which have not occurred since the last power-up, the state and confirmation fields will be empty and the counter will read zero.
When an error condition is detected, the state field will read “active”. If the error condition is no longer present, the state changes to “inactive”. The confirmation field will always read “not acknowledged” for errors which have occured at least once, as the analogue repeater provides no means to acknowledge an alarm.

As the Errors page is updated continuously, repeated occurrences of an error lead to a corresponding increase of the error count.

The IDs and descriptions of the error conditions shown on SUSI’s “Errors” page are given in table 7-1 below.

For more information on the SUSI application, refer to chapter 6 (“System Configuration”) and to the SUSI Installation Guide included in the appendix of this manual.

Error IDs and Descriptions

Table 7-1: analogue repeater error IDs

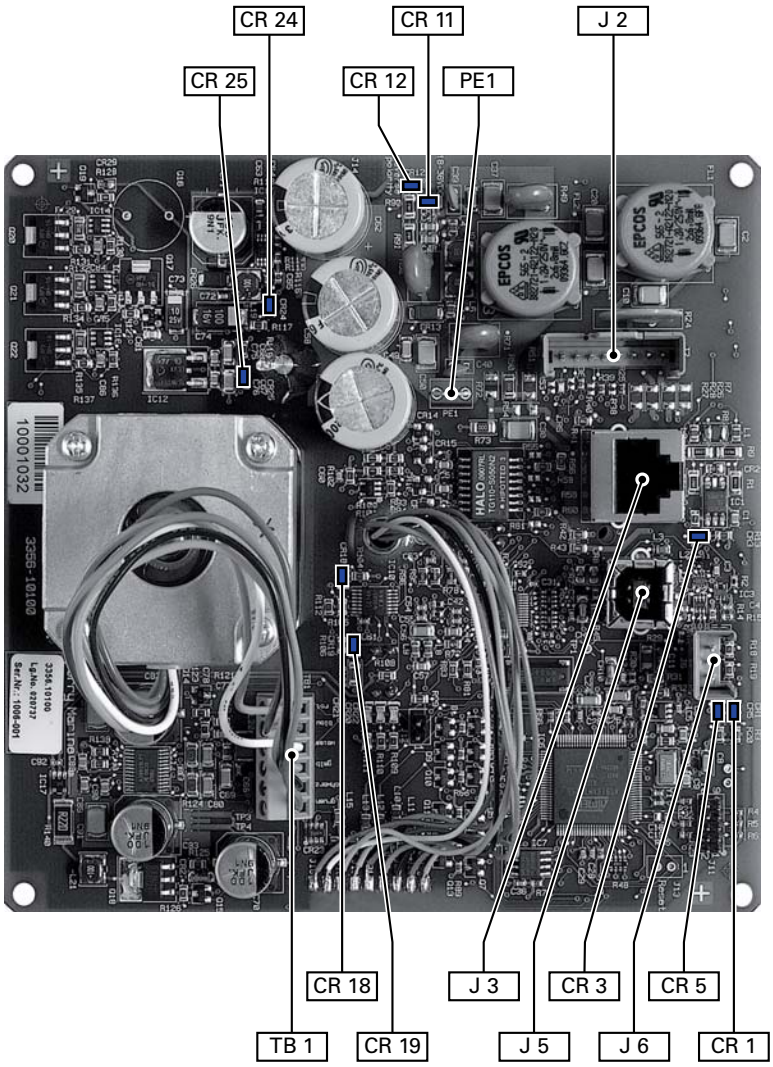
ID	description text	cause	corrective action
group 100: general errors			
108	"SPI/FRAM I/O Error"	unable to read/ write configuration settings	Cycle power. Re-enter configuration parameters via SUSI. If error persists, send return repeater to Sperry Marine for exchange.
group 400: data I/O errors			
430	"no message received"	no data at input	Check that valid data is present at the input.
450	"timeout gyro heading"	gyro heading lost or invalid while gyro is active source	Check that valid gyro heading data is present.
451	"updaterate gyro heading too low"	gyro heading update rate < 1 Hz	Check gyro messages for invalid data or checksum faults. Increase update rate at source.
452	"timeout magnetic heading"	magnetic heading lost or invalid while magnetic compass is active source	Check that valid magnetic compass heading data is present.
453	"updaterate magnetic heading too low"	gyro heading update rate < 1 Hz	Check magnetic heading messages for invalid data or checksum faults. Increase update rate at source.
454	"timeout thd heading"	THD heading lost or invalid while THD is active source	Check that valid THD heading data is present.
455	"updaterate thd heading too low"	THD heading update rate < 1 Hz	Check THD messages for invalid data or checksum faults. Increase update rate at source.
460	"error in received NMEA message"	received data out of range or not well-formed	Check whether all messages contain proper data.

ID	description text	cause	corrective action
group 900: stepper motor / synchronization errors			
900	"stepper sync time-out"	synchronization failed	Re-initiate synchronization. Cycle power. If error persists after several attempts to synchronize, return repeater to Sperry Marine for exchange.
901	"LB1 and LB2 do not match"	zero position mismatch between 10° and 360° card	
902	"LB2 not found"	unable to detect 10° card zero position	
905	"stepper power"	stepper motor phase supply voltage too low	Check actual voltage from 24 VDC supply.

7.2 Location of Parts on the Analogue Repeater PCB

Figure 7-2 below shows the locations of connectors and diagnostic LED indicators on the repeater PCB.

Figure 7-2: location of parts on the analogue repeater PCB



Terminal Boards and Connectors

Table 7-1: Terminal boards and connectors

	Function
TB 1	stepper motor connection terminal block
J 2	connector for repeater cable; connects to 24 VDC supply, Data input, ext. USB service interface
J 3	ethernet connector (for future use, currently not functional)
J 5	USB service interface connector
J 6	RS-232 service interface connector (for factory use only)
PE1	connector for repeater cable shield

Diagnostic LEDs

As an aid in troubleshooting, a number of diagnostic LED indicators are provided on the PCB. These indicate general status information, the presence of supply voltages and activity at the serial data input.

Table 7-2: Diagnostic LEDs

LED	Colour	Indication	
CR 1	green	system mode/status indication: both flashing at power-up: reading setup, initializing both flashing permanently: fatal error both off: normal operational mode CR 5 on only: device in update mode	
CR 5	green		
CR 3	green	activity at data input	
CR 11	green	24 VDC supply power present	
CR 12	red	reversed polarity 24 VDC supply power	
CR 18	green	10° card at zero position	must both be on after synchronization (cards at North position)
CR 19	green	360° card at zero position	
CR 24	green	on-board +5 VDC power present	
CR 25	green	on-board +3.3 VDC power present (Vcc)	

Chapter 8: Corrective Maintenance

The analogue compass repeaters are generally not field-serviceable on the component level.
Defective devices must be sent back to Sperry Marine for repair.

Should repeaters require to be re-configured, e.g. after installation of a new compass source, field service attendance must be requested from Sperry Marine directly or through an authorized Sperry Marine service representative.

Maintenance by field service personnel is limited to the software-based configuration and update procedures supported by the Sperry Univeral Software Instrument application (SUSI).

Note

The analogue compass repeaters are serviced and configured using the Sperry Universal Setup Instrument (SUSI).
This tool is provided to authorized service personnel only and is generally not available to end-customers.

8.1 Updating the Repeater's Firmware

Being a newer device, the analogue compass repeater supports the uploading of firmware files using SUSI. This allows to selectively update either the actual repeater application software ("MCU-Application") or the bootloader ("MCU-Bootloader").

Compared to simply overwriting ("flashing") the memory, as necessary with older devices, the file upload is a much safer updating method, as SUSI is able to validate the provided files beforehand. In case an upload should fail for any reason, the repeater will remain fully functional, continuing to run the previous firmware.

When new firmware is released for the analogue compass repeater, authorized field service personnel will be provided with the required files upon request.

Update Procedure

Note

It cannot be guaranteed that the repeater's configuration parameter settings are left intact during a firmware update.
Before updating firmware, record all parameter settings to be able to re-enter them manually, if required.

To update an analogue compass repeater's firmware:

1. If the repeater is currently powered up, switch off the power first.
2. Gain access to the repeaters USB service port receptacle:
   - In case of a console or magnetic heading repeater, remove the plastic plug from the back of the housing to access the receptacle on the repeater PCB. If necessary, unmount the repeater from the console to make sure that the port is freely accessible for plugging and unplugging the USB cable.
   - In case of a bearing or bulkhead repeater, open the repeater connection box to access the receptacle inside the box.
3. At the PC, start up the SUSI application.

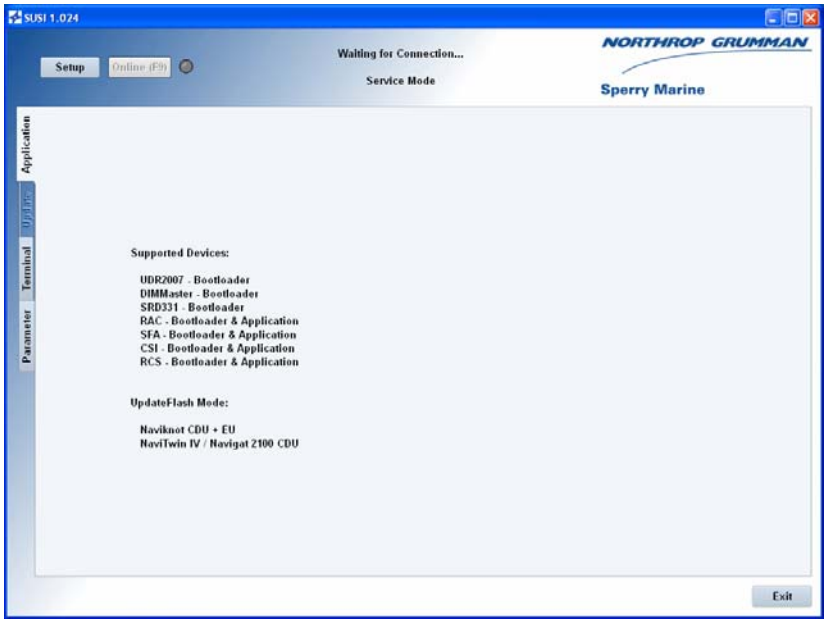
   A login dialog pops up:

4. You may either:
   - Enter the PIN "**20097**".
     This will start up SUSI in the service mode.

     Or:
   - Leave the PIN empty.
     This will start up SUSI in the "unknown login" mode.
     In this mode, you may update the repeater firmware, but will not be able to access the repeater's configuration parameters without quitting and restarting SUSI in the service mode.

   Click OK to continue.

5. SUSI's main window now opens, with the "Application" tab displaying a list of supported devices:



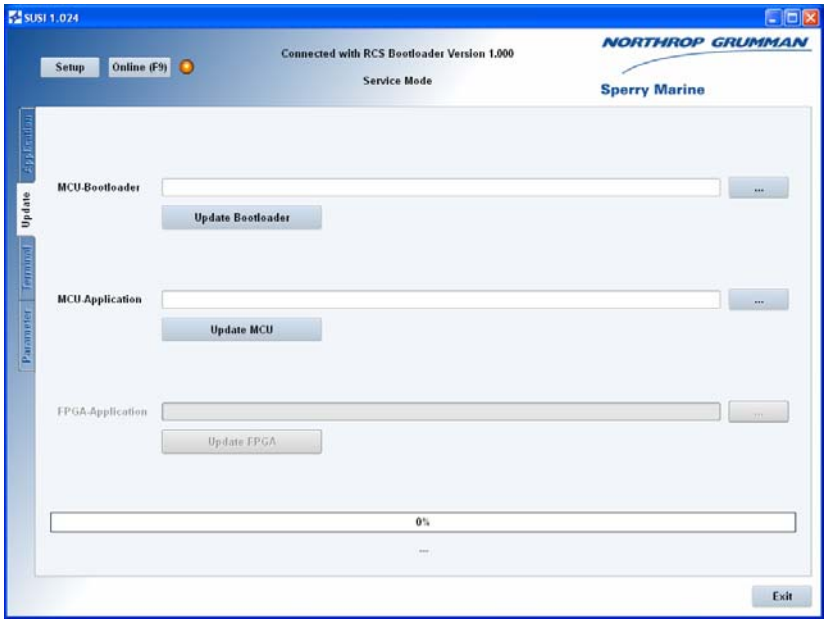
6. Plug in the USB cable at the PC and at the repeater's service port.

7. Power up the repeater.
The "Online" button should now become clickable (not greyed-out), indicating that SUSI has found a device to connect to:

The LED icon next to the button will remain grey, as no connection has been made yet.

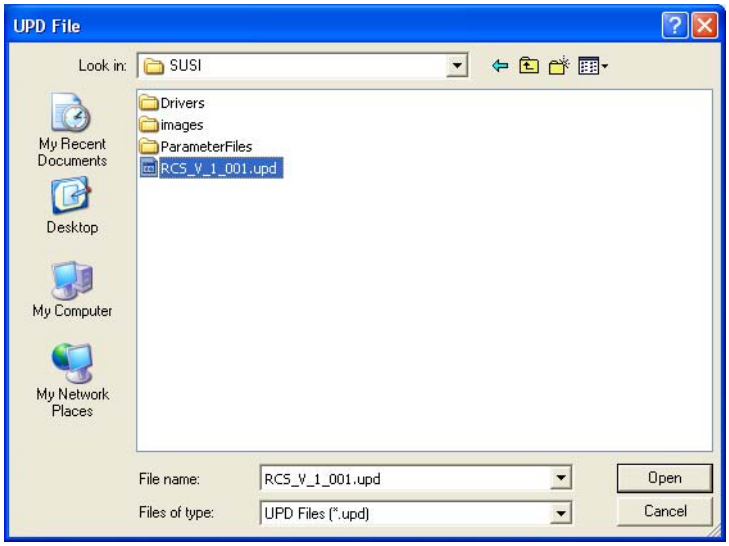
8. Click Online (F9) to connect to the repeater.
The LED icon should now change to orange and the status line should read "Connected with RCS Bootloader".

Upon connecting, SUSI opens the update tab:



The update tab provides file browsers to select firmware update files for the repeater's system software ("MCU-Application") and the bootloader ("MCU-Bootloader").
The option to update program code for an FPGA ("FPGA-Application") is greyed out, as the repeater does not contain an FPGA.

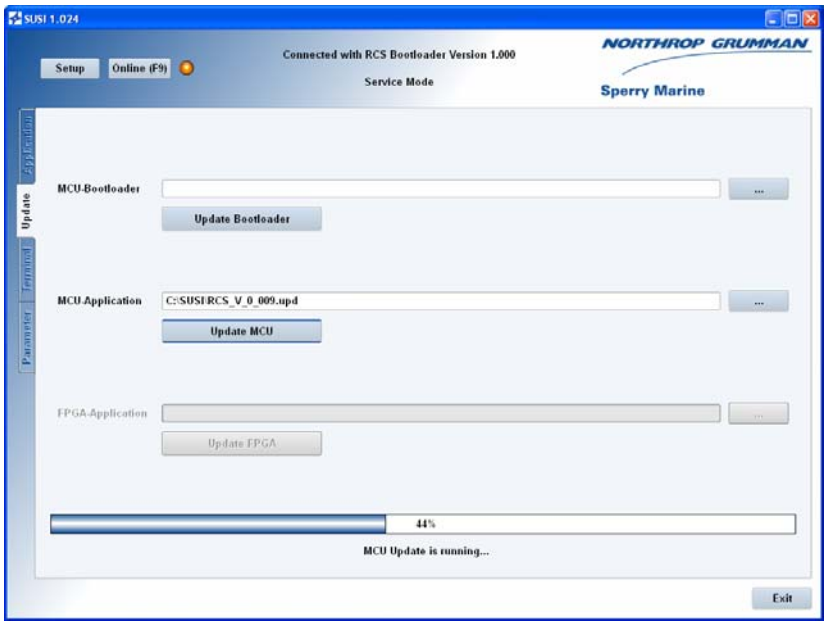
9. Depending on whether you intend to update the repeater's MCU bootloader or its MCU application, click the respective ... button to call up the file open dialog. Then, navigate to the firmware update file, select it in the dialog and click Open.



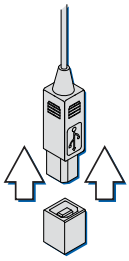
Note

The file open dialog searches for files with the extension ".upd" only. In case the update file has been given another extension for any reason, the filename, including the complete access path, must be entered manually in the respective text box of the update tab.

10. Click Update MCU or Update Bootloader respectively to initiate the actual file upload. The bargraph at the bottom of the screen indicates the progress of the update:



11. When the update is complete, the message “Update OK” will be shown below the progress bar.
Unplug the USB cable at the PC and at the repeater’s service port.



12. The repeater now reboots with the new firmware.

Appendix

A Setup and Configuration Tables

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

Designation	Drawing No.
Analogue Repeater Compass Setup Table	5016-0125-01

Note

After installation of the repeater, 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.
Bearing Repeater Compass, Dimension Drawing	5016-0112-01
Console Repeater Compass, Dimension Drawing	5016-0112-02
Bulkhead Repeater Compass , Dimension Drawing	5016-0112-03
Bulkhead Repeater Bracket , Dimension Drawing	5016-0112-04
Connection Box, Dimension Drawing	4894-0112-04
Bearing Repeater Stand, Dimension Drawing	4622-0112-03
Bearing Repeater Bracket, Dimension Drawing	4890-0112-03
Adjustable Bearing Rptr. Bracket, Dimension Drawing	4905-0112-03
Azimuth Device PV 23, Dimension Drawing	2535-0112-01
Bearing Repeater Compass, Wiring Diagram	5016-0115-11
Console Repeater Compass, Wiring Diagram	5016-0115-21
Bulkhead Repeater Compass , Wiring Diagram	5016-0115-31
Connection Box for Bearing and Bulkhead Repeater Compasses, Wiring Diagram	4894-0115-01
Gyrocompass System Repeaters Standard Connection Diagram	4932-0353-87

Note

All appended documents and 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 document or drawing changes.

C Technical Documents

Designation	Doc. No.
SUSI Installation Guide for Field Service Personnel	056358

NORTHROP GRUMMAN
Sperry Marine

Analogue Compass Repeaters
Setup Table

Vessel: _____ Hull No.: _____

IMO No.: _____ Shipyard: _____

Service Station / Installer: _____ Date / Signature: _____ / _____

Installation Reference

Repeater Type:
- ◯ 5016
- ◯ 5016-AA
- ◯ 5016-AB
- ◯ 5016-AC

Serial Number: _____

Location: _____

Software Version: _____

Configuration Settings

RCS Type
- ◯ automatic
- ◯ Magnetic
- ◯ Gyro

Protocol Type
- ◯ automatic
- ◯ NMEA
- ◯ Plath

Baudrate
- ◯ automatic
- ◯ 4800
- ◯ 9600
- ◯ 19200
- ◯ 38400

GYRO Selection
- ◯ automatic
- ◯ HETHS
- ◯ xxTHS
- ◯ HEHDT
- ◯ xxHDT
- ◯ GPTHS
- ◯ GPHDT

MAGN Selection
- ◯ automatic
- ◯ HCHDT
- ◯ HCHDM
- ◯ HCHDG

Status Selection
- ◯ automatic
- ◯ PPLAN
- ◯ PPNSD

Dimming Selection
- ◯ automatic
- ◯ xxDDC
- ◯ PPLAI

Dimming Group ID

ID: _____

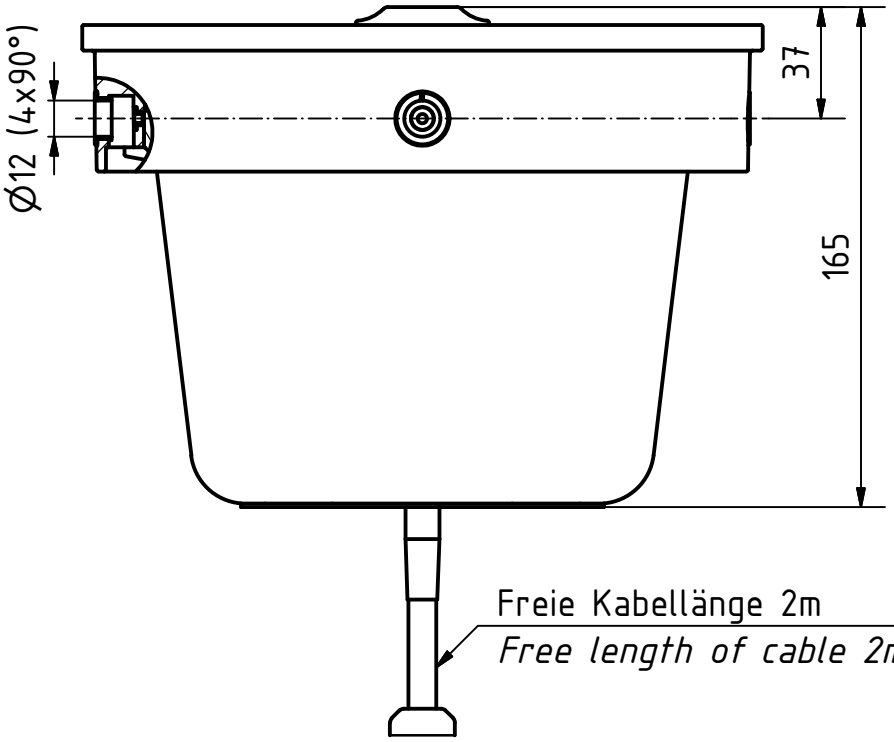
Dimming Offset

offset: _____

Dimming Values

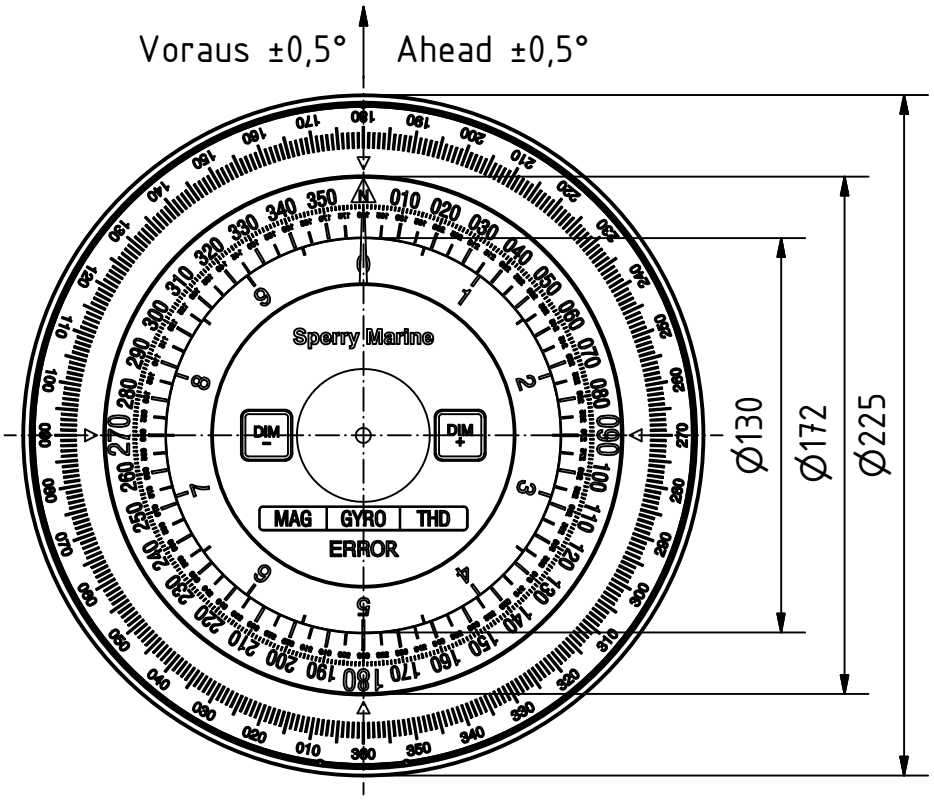
	Ilum. PCB	Ilum. Status	Ilum. Keys	Ilum. ERROR
Dimming Step 1				
Dimming Step 2				
Dimming Step 3				
Dimming Step 4				
Dimming Step 5				
Dimming Step 6				
Dimming Step 7				
Dimming Step 8				

Northrop Grumman Sperry Marine B.V.
Woltmanstr. 19, 20097 Hamburg, Germany
Tel.: +49-40-29900-0, Fax: +49-40-29900-146, E-mail: service.de@sperry.ngc.com



Magnetischer Schutzabstand
Mindestabstand vom:
Magnet-Regelkompass 0,75 m
Magnet-Steuerkompass 0,45 m
Reduz.Mindestabstand vom:
Magnet-Regelkompass 0,45 m
Magnet-Steuerkompass 0,30 m

Magnetic Safe Distance
Minimum Safe Distance to:
Standard Magnetic Compass 0,75 m
Steering Magnetic Compass 0,45 m
Minimum Safe Distance (reduced) to:
Standard Magnetic Compass 0,45 m
Steering Magnetic Compass 0,30 m



Gewicht/ *WEIGHT*: 5,5 kg
Schutzgrad/ *Protection grade*: IP66

REV	ECO-No.	DATE	NAM
A	982714	08.04.2010	Ebe
03	-	17.03.2010	Ebe
02	-	11.03.2010	Ebe
01	-	30.11.2009	Ebe

NORTHROP GRUMMAN
Sperry Marine
HAMBURG GERMANY

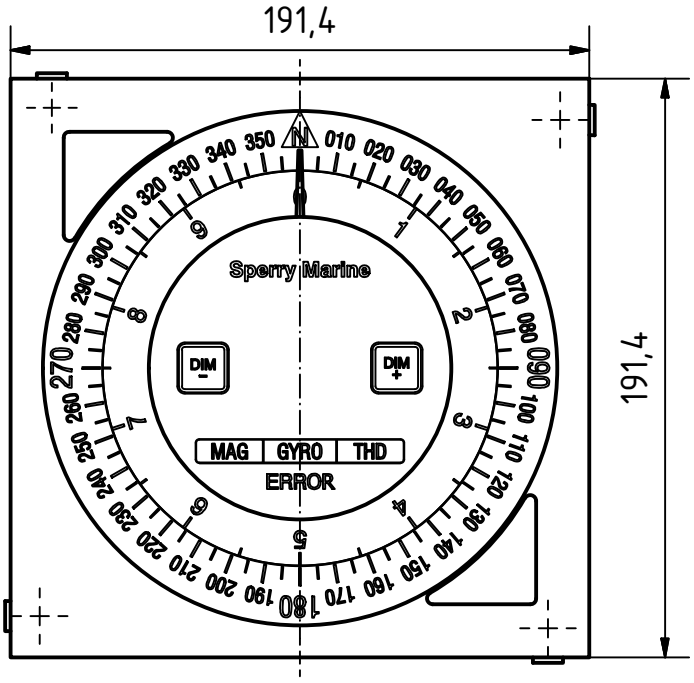
	DATE	NAME
DRAWN	24.11.2009	Ebe
CHD	see ECO	
DOS		

DRAWING No.
5016-0112-01
STOCK No. 074880-0000-000

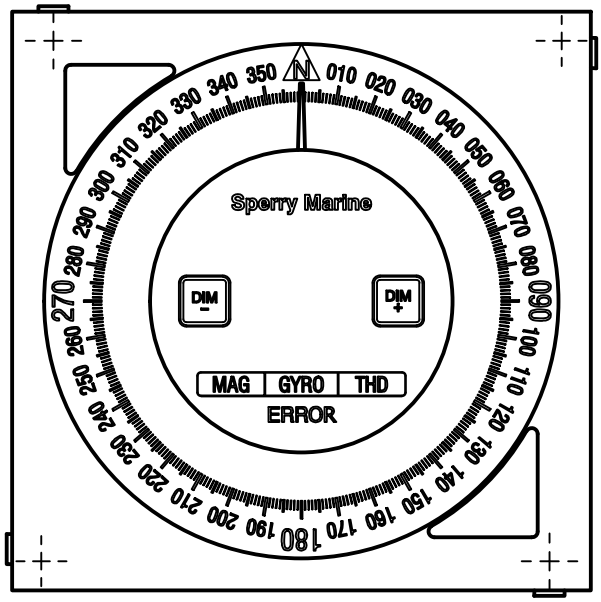
DIMENSION DRAWING
Peiltochterkompass
(RS 422)
Bearing repeater compass
(RS 422)

FIRST ANGLE PROJECTION | DIMENSIONS IN MILLIMETERS
REPLACEMENT FOR:

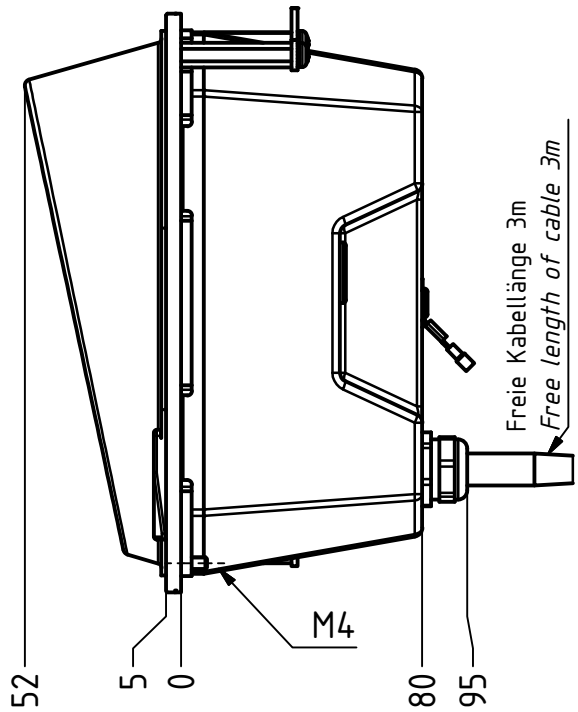
SCALE 1:2,5 A4
SHEET 1
SHEETS 1



Steuertochter mit Sonnenblende
Steering repeater with sun shield
Type 5016-AA, Sto.-No. 074881



Magnettochter mit Abdeckung
Magnetic repeater with cover
Type 5016-AB, Sto.-No. 074882



Pultausschnitt quadratisch 181,5x181,5
Square cut out for console mounting 181,5x181,5

Magnetischer Schutzabstand
Mindestabstand vom:
Magnet-Regelkompass 0,75 m
Magnet-Steuerkompass 0,50 m
Reduz.Mindestabstand vom:
Magnet-Regelkompass 0,45 m
Magnet-Steuerkompass 0,30 m

Magnetic Safe Distance
Minimum Safe Distance to:
Standard Magnetic Compass 0,75 m
Steering Magnetic Compass 0,50 m
Minimum Safe Distance (reduced) to:
Standard Magnetic Compass 0,45 m
Steering Magnetic Compass 0,30 m

Gewicht/ *WEIGHT*: 1,25 kg

Schutzgrad/ *Protection grade*:
Front: IP65
Rückseite/ *Back*: IP23

REV	ECO-No.	DATE	NAM
A	982714	08.04.2010	Ebe
03	-	17.03.2010	Ebe
02	-	11.03.2010	Ebe
01	-	30.11.2009	Ebe

NORTHROP GRUMMAN
Sperry Marine
HAMBURG GERMANY

	DATE	NAME
DRAWN	24.11.2009	Ebe
CHD	see ECO	
DOS		

DRAWING No.
5016-0112-02

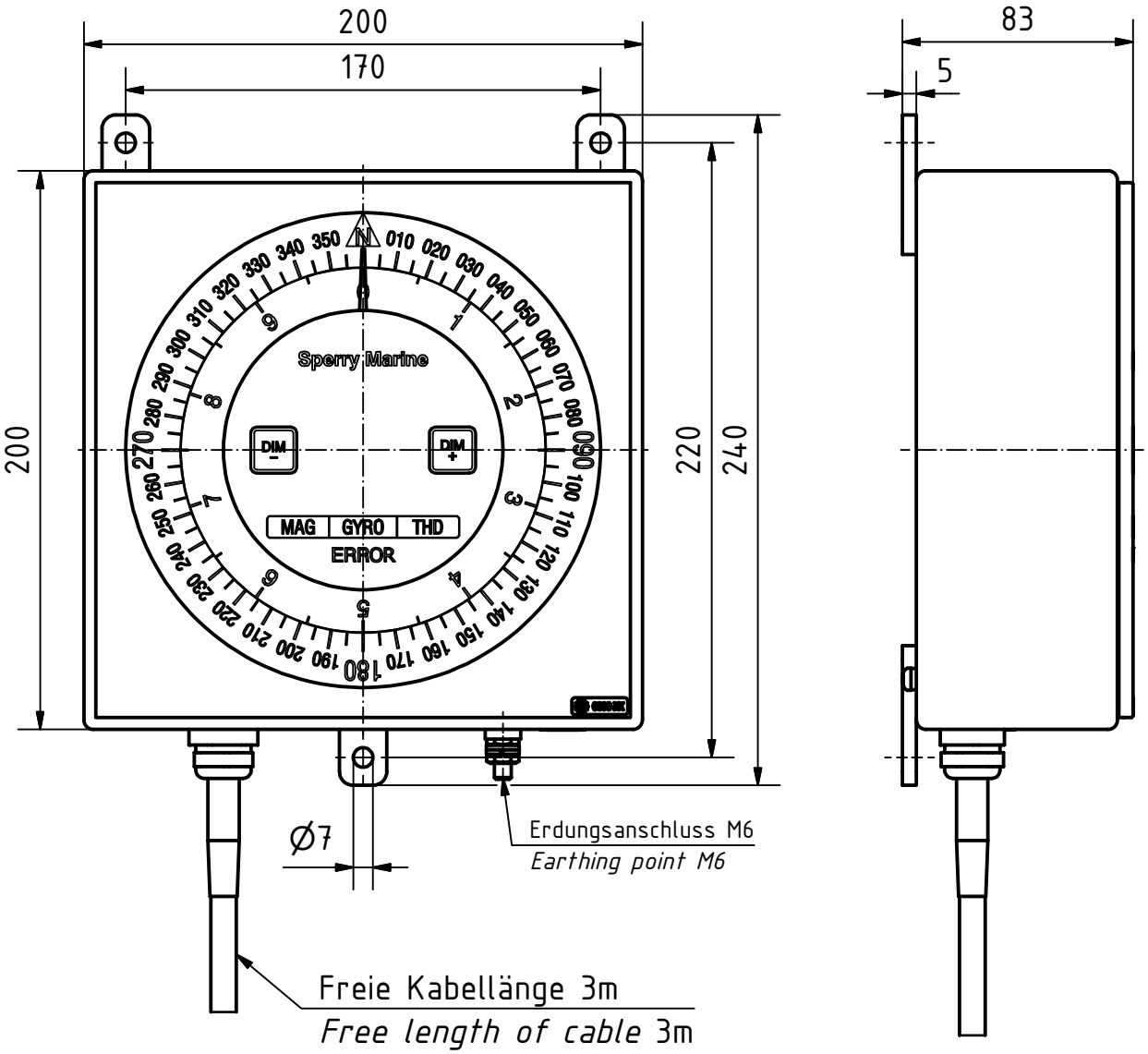
STOCK No. see above

DIMENSION DRAWING
Pulteinbautochterkompass
(RS 422)
Console Repeater Compass
(RS 422)

FIRST ANGLE PROJECTION | DIMENSIONS IN MILLIMETERS

REPLACEMENT FOR:

SCALE 1:2,5 A4
SHEET 1
SHEETS 1



Magnetischer Schutzabstand

Mindestabstand vom:

Magnet-Regelkompass	0,70 m
Magnet-Steuerkompass	0,40 m

Reduz.Mindestabstand vom:

Magnet-Regelkompass	0,45 m
Magnet-Steuerkompass	0,30 m

Magnetic Safe Distance

Minimum Safe Distance to:

Standard Magnetic Compass	0,70 m
Steering Magnetic Compass	0,40 m

Minimum Safe Distance (reduced) to:

Standard Magnetic Compass	0,45 m
Steering Magnetic Compass	0,30 m

Gewicht/ *WEIGHT*: 2,5 kg

Schutzgrad/ *Protection grade*: IP66

REV	ECO-No.	DATE	NAM
B	982912	11.08.2010	Ebe
A	982714	08.04.2010	Ebe

NORTHROP GRUMMAN
Sperry Marine
HAMBURG GERMANY

	DATE	NAME
DRAWN	25.11.2009	Ebe
CHD	see ECO	
DOS		

DRAWING No.
5016-0112-03

STOCK No. 074883-0000-000

DIMENSION DRAWING
Wandtochterkompass
(RS 422)
Bulkhead repeater compass
(RS 422)

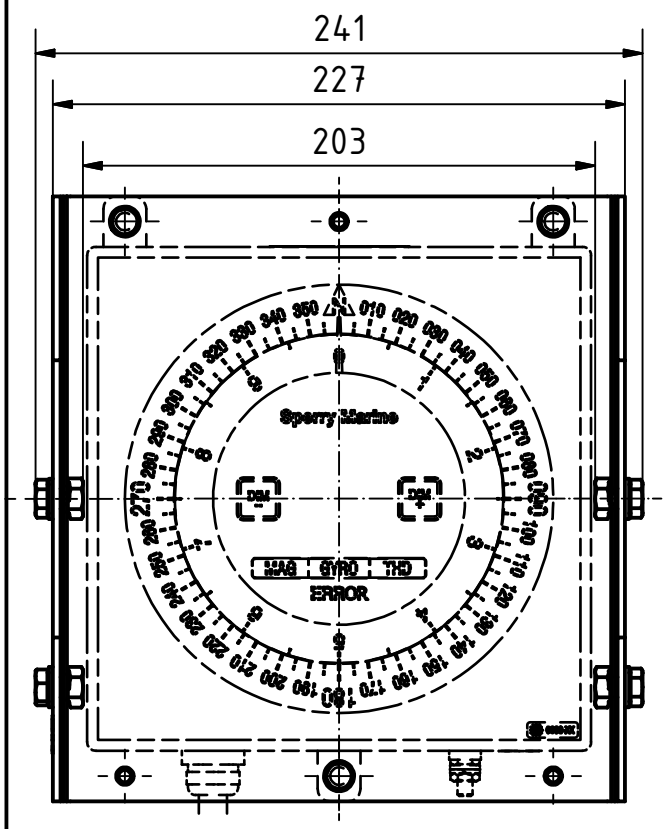
FIRST ANGLE PROJECTION | DIMENSIONS IN MILLIMETERS

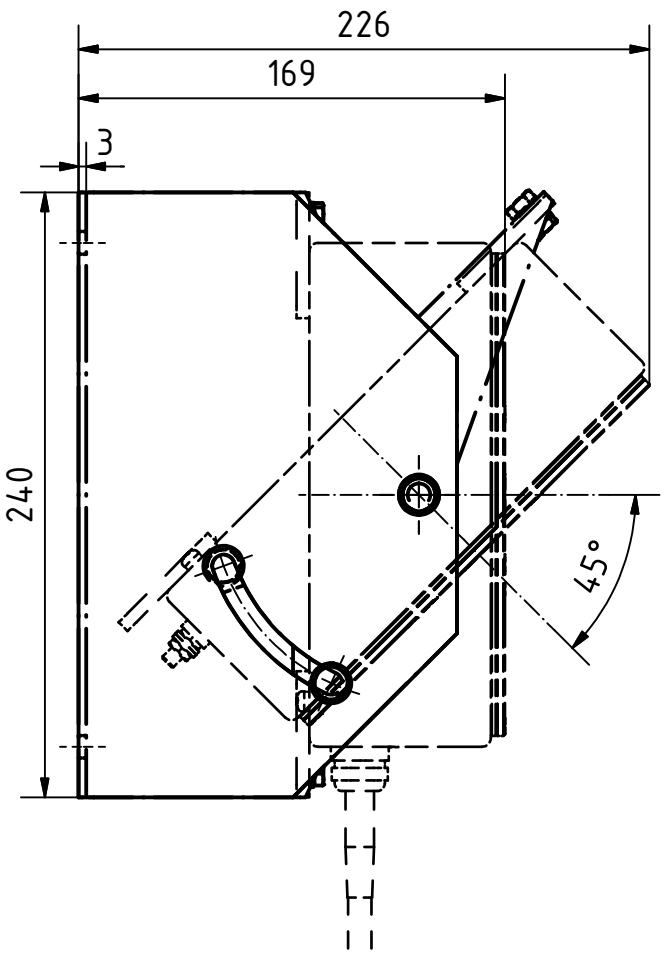
REPLACEMENT FOR:

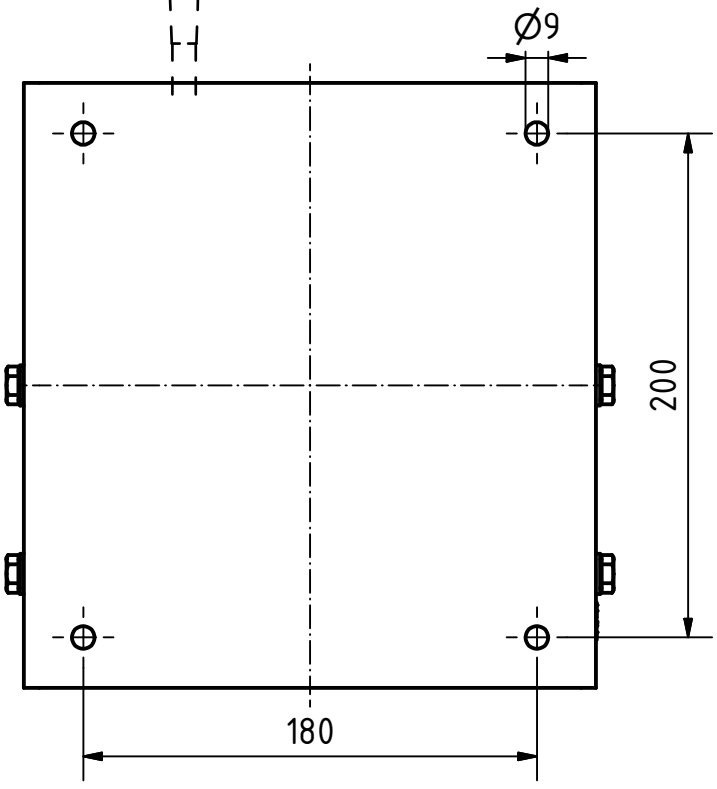
SCALE 1:2,5 A4

SHEET 1

SHEETS 1







Gewicht / *Weight*: 3,5 kg

REV	ECO-No.	DATE	NAM
A	982912	11.08.2010	Ebe
01	-	13.03.2010	Ebe

NORTHROP GRUMMAN
Sperry Marine
HAMBURG GERMANY

	DATE	NAME
DRAWN	25.11.2009	Ebe
CHD	see ECO	
DOS		

DRAWING No.
5016-0112-04

STOCK No. 026857-0000-000

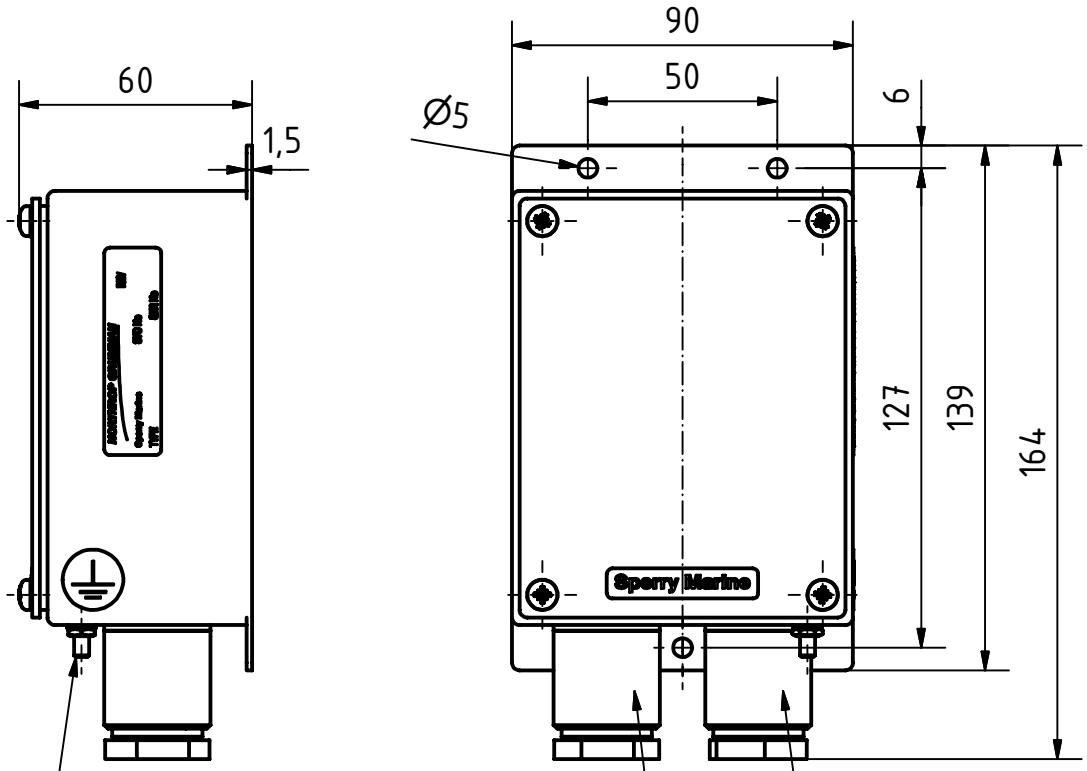
DIMENSION DRAWING
Konsole 45°schwenkbar
für Wandtochterkompass
Bracket 45° adjustable
for bulkhead repeater compass

FIRST ANGLE PROJECTION | DIMENSIONS IN MILLIMETERS

REPLACEMENT FOR:

SCALE 1:3 A4
SHEET 1
SHEETS 1

Anschlusskasten mit Servicepunkt USB-B
CONNECTION BOX WITH SERVICE PORT USB-B



Erdungsanschluss M4
EARTHING POINT M4

Kabeleinführung für geschirmtes Kabel.
(Kabel Ø 12-17 mm)
CABLE GLAND FOR SCREENED CABLE
(CABLE Ø 12-17 mm)

Kabeleinführung für Peiltochter
geschirmtes Kabel (Kabel Ø 8-10,5 mm).
CABLE GLAND FOR BEARING REPEATER
SCREENED CABLE (CABLE Ø 8-10.5 mm).

Gewicht/ *WEIGHT*: 0,8 kg

Schutzgrad/ *Protection grade*: IP65

REV	ECO-No.	DATE	NAM
A	982719	22.10.2009	Ebe

NORTHROP GRUMMAN
Sperry Marine
HAMBURG GERMANY

	DATE	NAME
DRAWN	29.05.2009	Ebe
CHD	see ECO	
DOS		

DRAWING No.
4894-0112-04

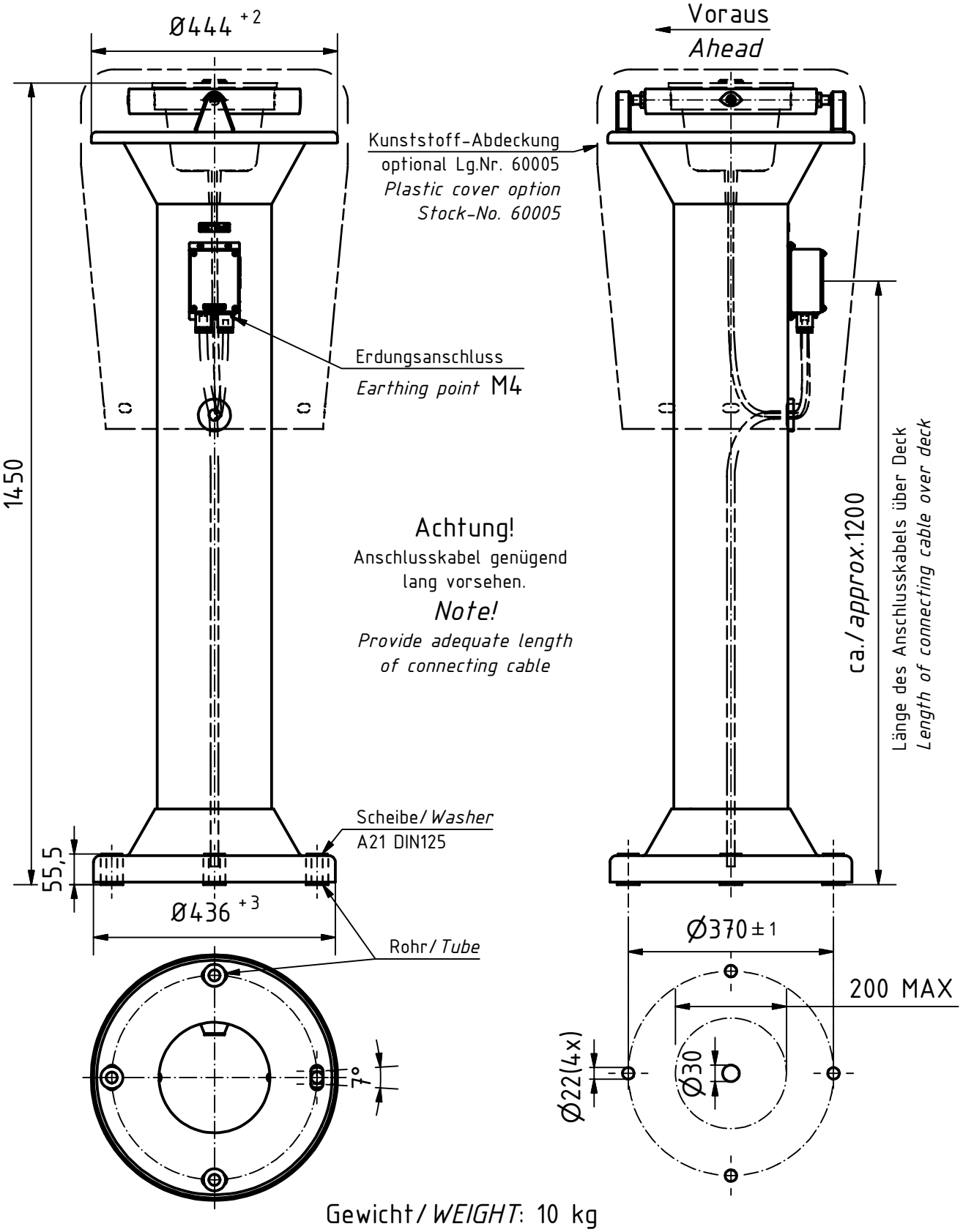
STOCK No. 074859-0000-000

DIMENSION DRAWING
Anschlusskasten
für RCS 5016
CONNECTION BOX
for RCS 5016

FIRST ANGLE PROJECTION | DIMENSIONS IN MILLIMETERS

REPLACEMENT FOR:

SCALE 1:2 A4
SHEET 1
SHEETS 1



Gewicht/*WEIGHT*: 10 kg

REV	ECO-No.	DATE	NAM
A	982719	23.10.2009	Ebe

NORTHROP GRUMMAN
Sperry Marine
HAMBURG GERMANY

	DATE	NAME
DRAWN	23.10.2009	Ebe
CHD	see ECO	
DOS		

DRAWING No.
4622-0112-03

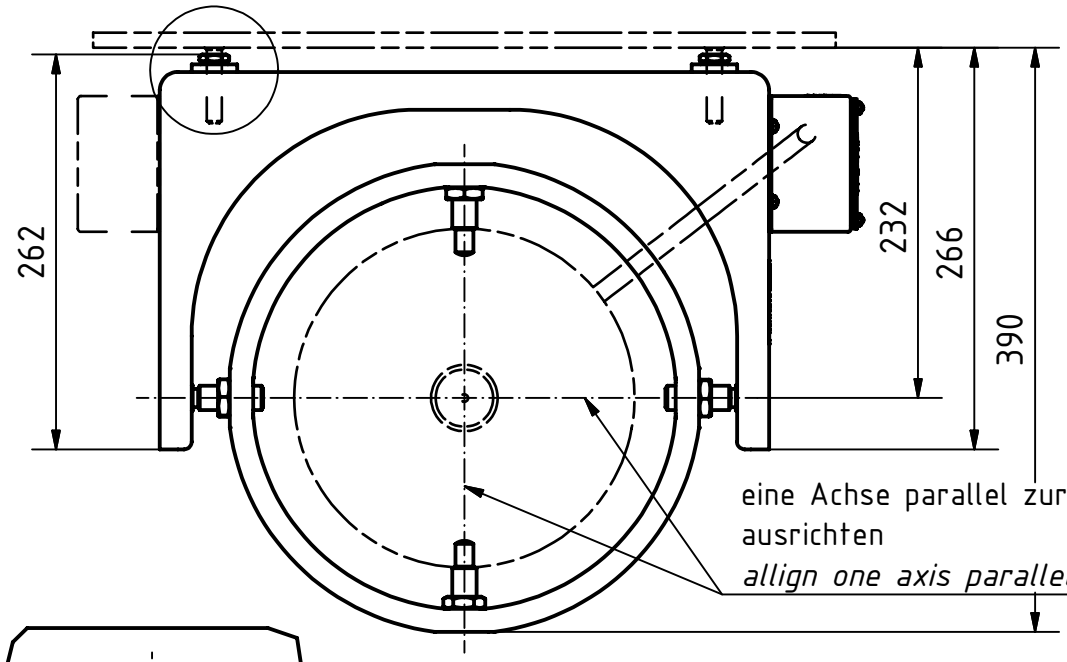
STOCK No. 074887-0000-000

DIMENSION DRAWING
Peilsäule
mit Anschlusskasten
BEARING REPEATER STAND
with terminal box

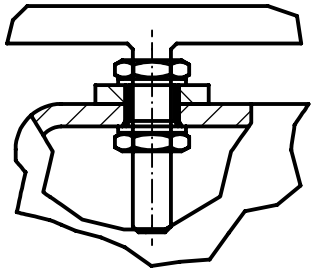
FIRST ANGLE PROJECTION | DIMENSIONS IN MILLIMETERS

REPLACEMENT FOR:

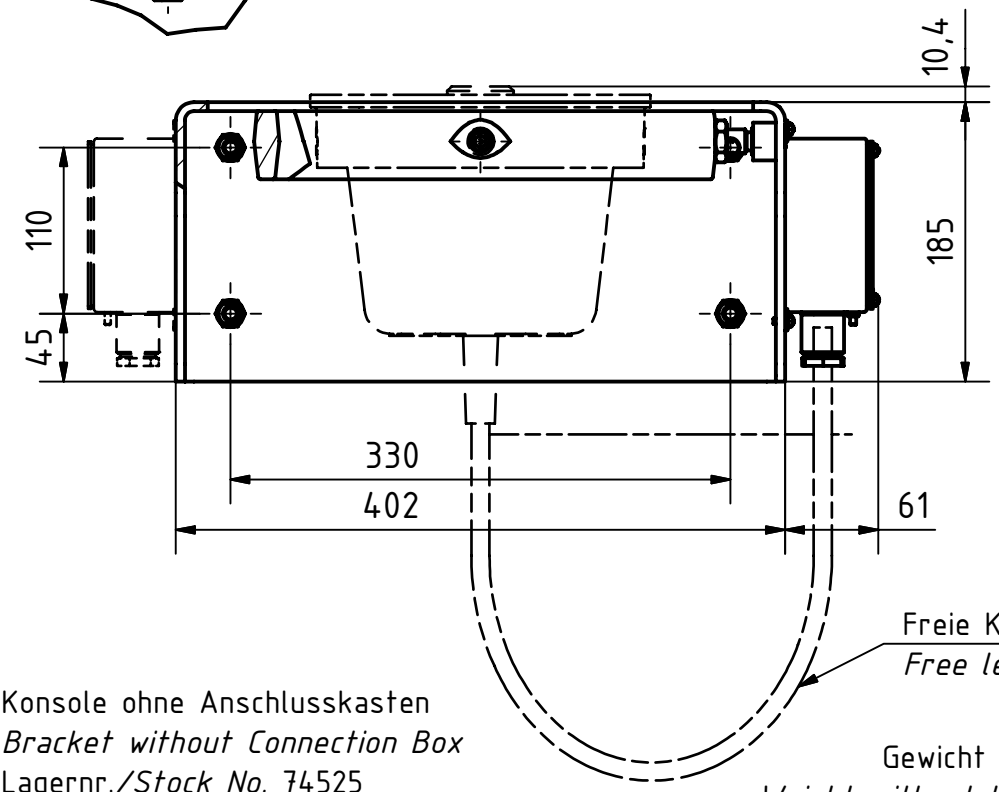
SCALE 1:10 A4
SHEET 1
SHEETS 1



eine Achse parallel zur Mittschiffslinie ausrichten
allign one axis parallel to midships line



4x Bolzen M10x50 (Werftbeistellung)
an die Bordwand gewschweißt.
4x bolts M10x50 (supplied by shipyard)
to be welded to the bulkhead.



Freie Kabellänge >1m
Free lenght of cable >1m

Konsole ohne Anschlusskasten
Bracket without Connection Box
Lagernr./*Stock No.* 74525

Gewicht ohne Peiltochter
Weight without bearing repeater 5,2 kg

REV	ECO-No.	DATE	NAM
A	982719	22.10.2009	Ebe

NORTHROP GRUMMAN
Sperry Marine
HAMBURG GERMANY

	DATE	NAME
DRAWN	14.10.2009	Ebe
CHD	see ECO	
DOS		

DRAWING No.
4890-0112-03

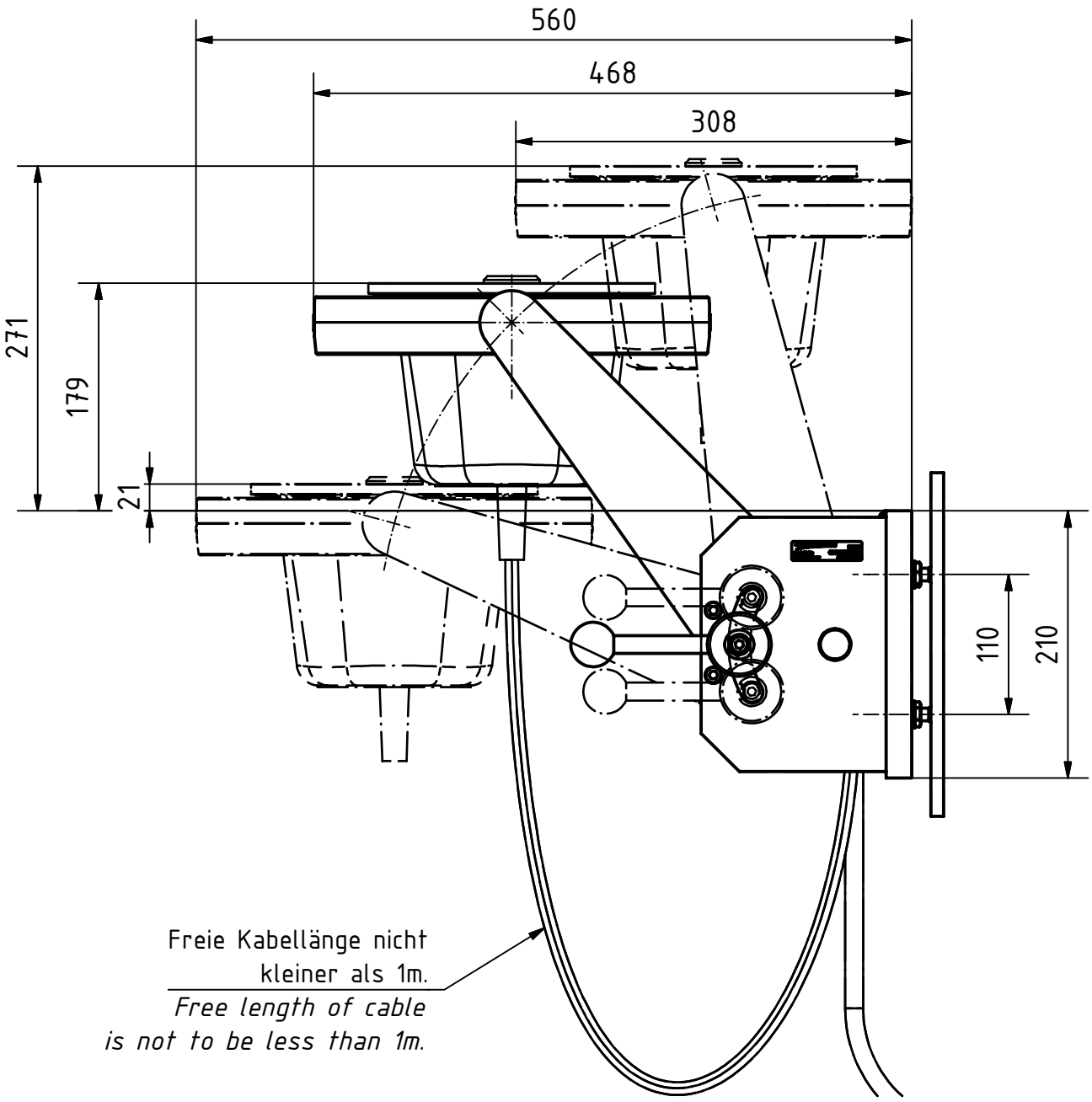
STOCK No. 074886-0000-000

DIMENSION DRAWING
Peilkonsole
mit Anschlusskasten
Bearing repeater bracket
with connection box

FIRST ANGLE PROJECTION | DIMENSIONS IN MILLIMETERS

REPLACEMENT FOR:

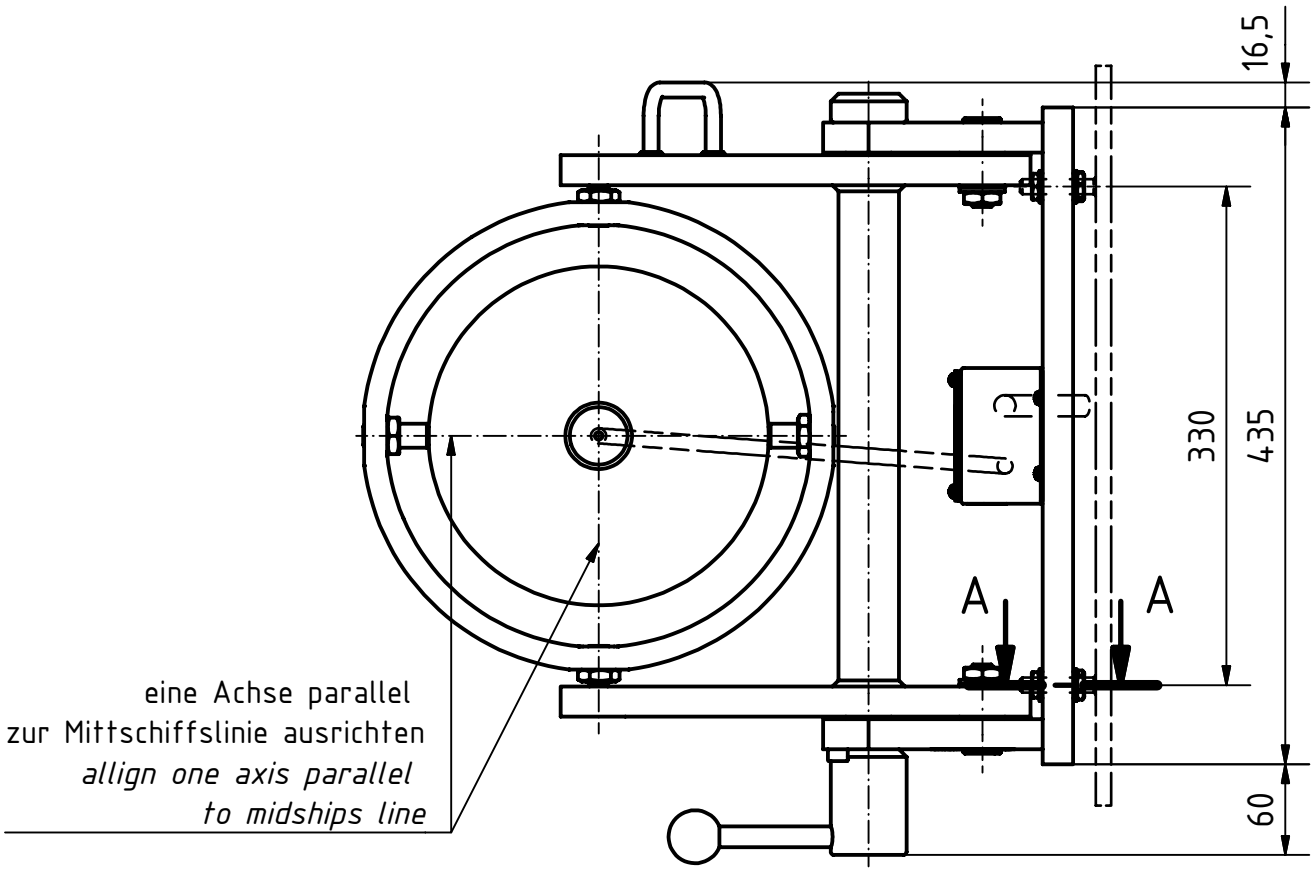
SCALE 1:5 A4
SHEET 1
SHEETS 1

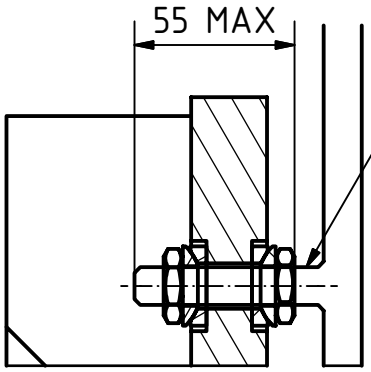


Ohne Peiltochter
Bearing Repeater not included
Gewicht/ *WEIGHT*: 16,5 kg

				NORTHROP GRUMMAN Sperry Marine		DATE	NAME	DIMENSION DRAWING Konsole höhenverst. mit Anschlusskasten Bracket adjustable with terminal box
					DRAWN	26.10.2009	Ebe	
					CHD	see ECO		
				HAMBURG GERMANY	DOS			
				DRAWING No. 4905-0112-03				
A	982719	26.10.2009	Ebe					FIRST ANGLE PROJECTION / DIMENSIONS IN MILLIMETERS
REV	ECO-No.	DATE	NAM	STOCK No. 074888-0000-000				REPLACEMENT FOR:

SCALE 1:5 A4
SHEET 1
SHEETS 2





A-A (1 : 2)

4x Bolzen M10x50 (Werftbeistellung)
an die Bordwand gewschweißt.
4x bolts M10x50 (supplied by shipyard)
to be welded to the bulkhead.

Bei überbreiten handläufen ist die
Bolzenlänge entsprechend anzupassen
oder ein Fundament vorzusehen.
Increase the length of bolts or use
additional base plate to accomodate
an extra wide hand rail.

8x Mutter, Kugelscheibe und Kegelpfanne
für A-Fehler Einstellung (±3°).
8x nut, cone washer, pan washer for correction
of alignment error (±3°).

REV	ECO-No.	DATE	NAM
A	982719	26.10.2009	Ebe

NORTHROP GRUMMAN
Sperry Marine
HAMBURG GERMANY

	DATE	NAME
DRAWN	26.10.2009	Ebe
CHD	see ECO	
DOS		

DRAWING No. 4905-0112-03

STOCK No. 074888-0000-000

DIMENSION DRAWING

Konsole höhenverst.
mit Anschlusskasten

Bracket adjustable
with terminal box

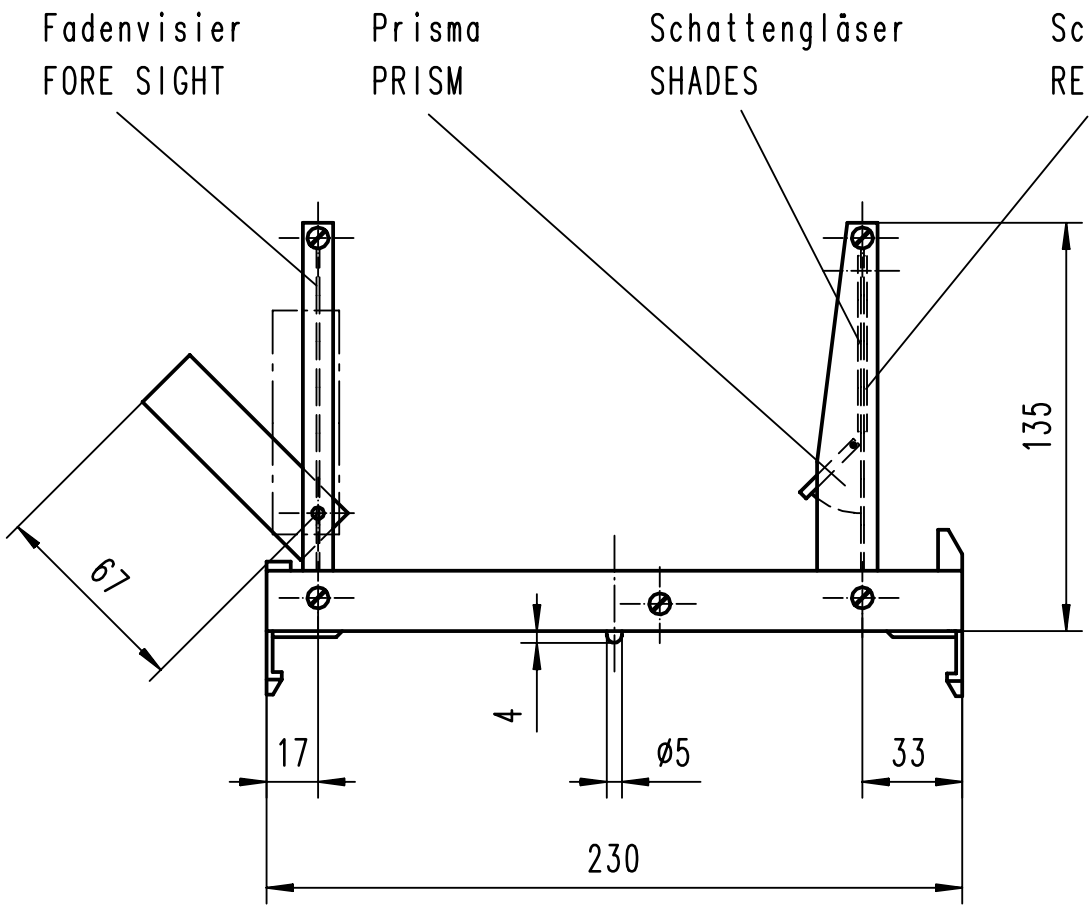
FIRST ANGLE PROJECTION | DIMENSIONS IN MILLIMETERS

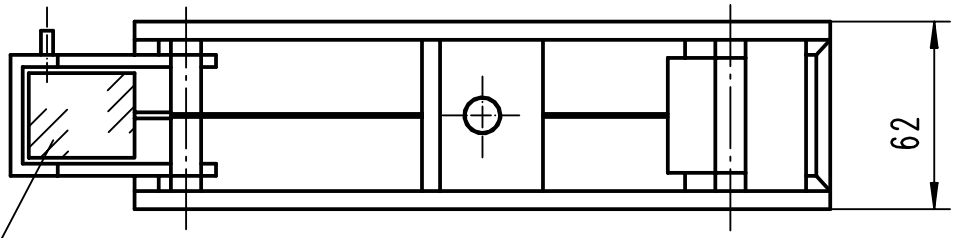
REPLACEMENT FOR:

SCALE 1:5 A4

SHEET 2

SHEETS 2





Gestirnspiegel
AZIMUTH MIRROR

Gewicht:
Weight: 0,6 kg

REV	ECO-No.	DATE	NAME
AA	98237	22.02.01	Ho.
05	46/82	21.02.83	Krü
01	-	03.05.82	Krü

NORTHROP GRUMMAN
Sperry Marine
HAMBURG GERMANY

	DATE	NAME
DRAWN	23.07.1998	Ho.
CHD	see ECO	
DOS	2535-0112-01	

DRAWING No. 2535-0112-01

FIRST ANGLE PROJECTION | DIMENSIONS IN MILLIMETERS

STOCK No. 75135

DIMENSION DRAWING
Peilvorrichtung PV23

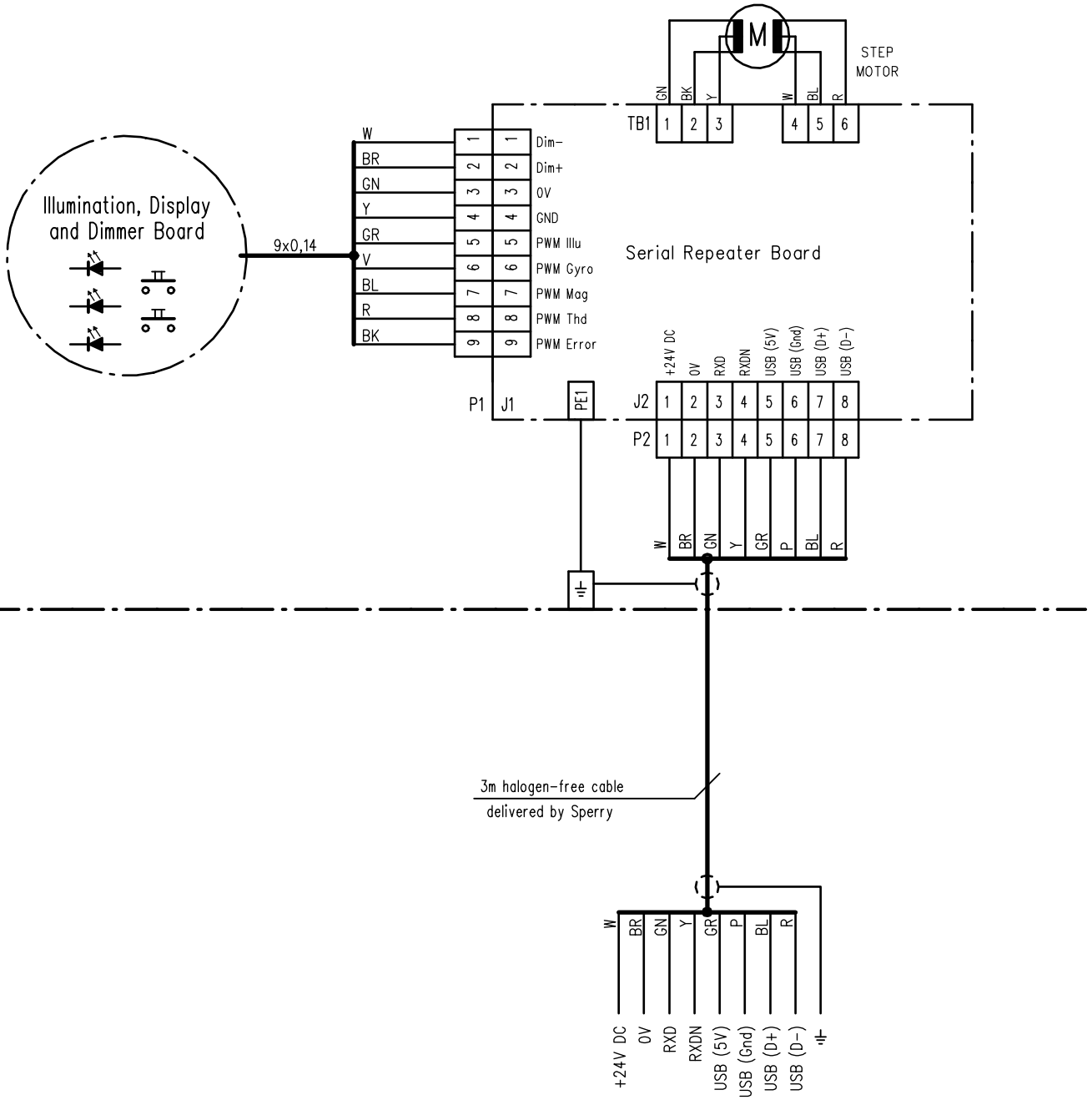
AZIMUTH DEVICE

REPLACEMENT FOR:

FREE SCALE:
DIN ISO 2768 mH

SCALE /

SHEET 1
SHEETS 1



A	981 900	14.01.10	Geisler
REV	ECO-No.	DATE	NAME

5016
74880

01150124\5016-0115-01

	Date	Name
DRAWN	14.01.2010	Geisler
DESIGN	26.11.2009	Magner
CHD ECO		

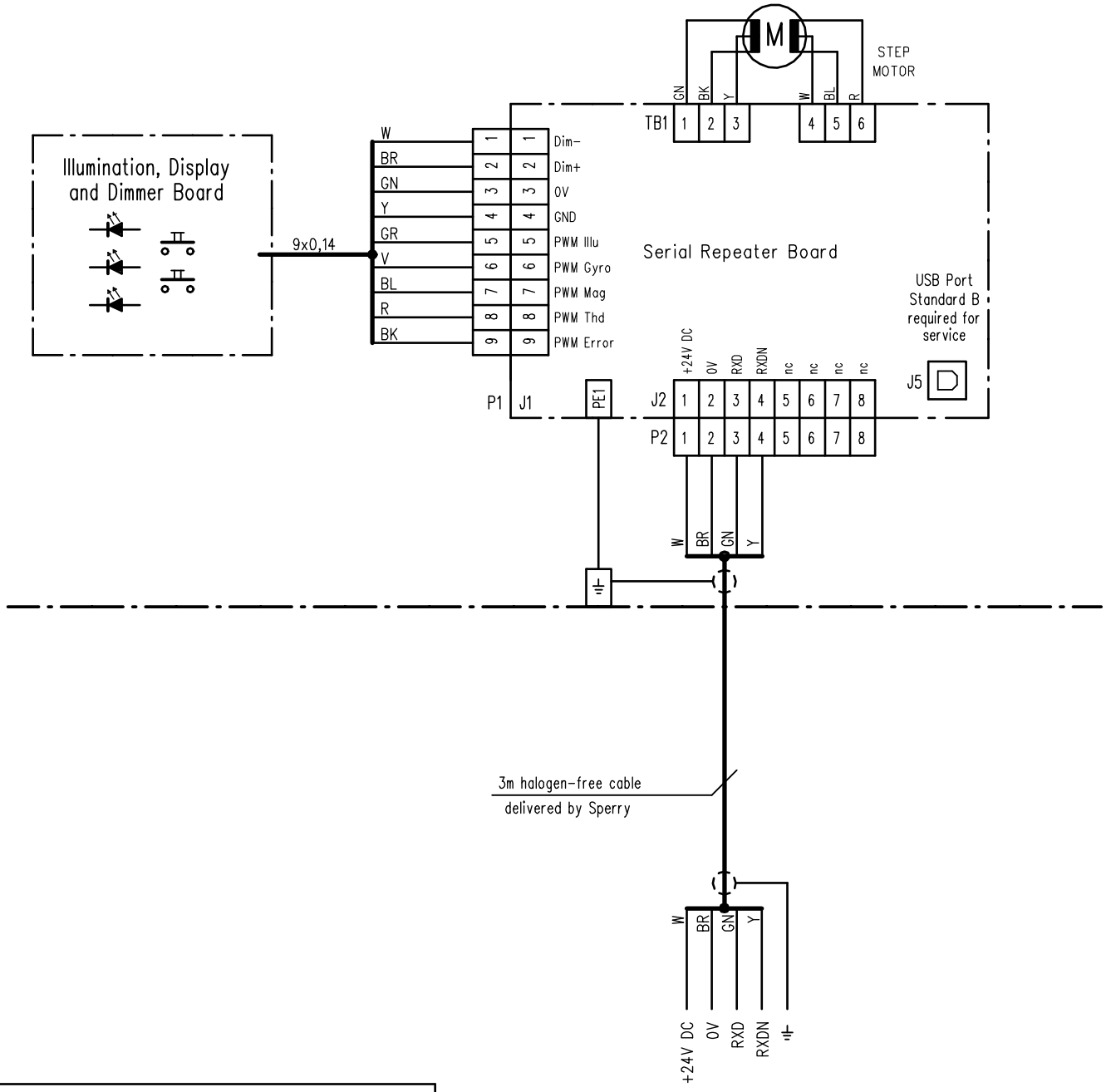
NORTHROP GRUMMAN
Sperry Marine
Hamburg Germany

TITLE Wiring Diagram

Peiltochter
BEARING REPEATER

DRAWING No. 5016-0115-01 /A

SHEET 1 SHEETS 1



5016-AA 74881	Steering Repeater
5016-AB 74882	Magnetic Repeater

REV	ECO-No.	DATE	NAME
A	981 900	14.01.10	Geisler

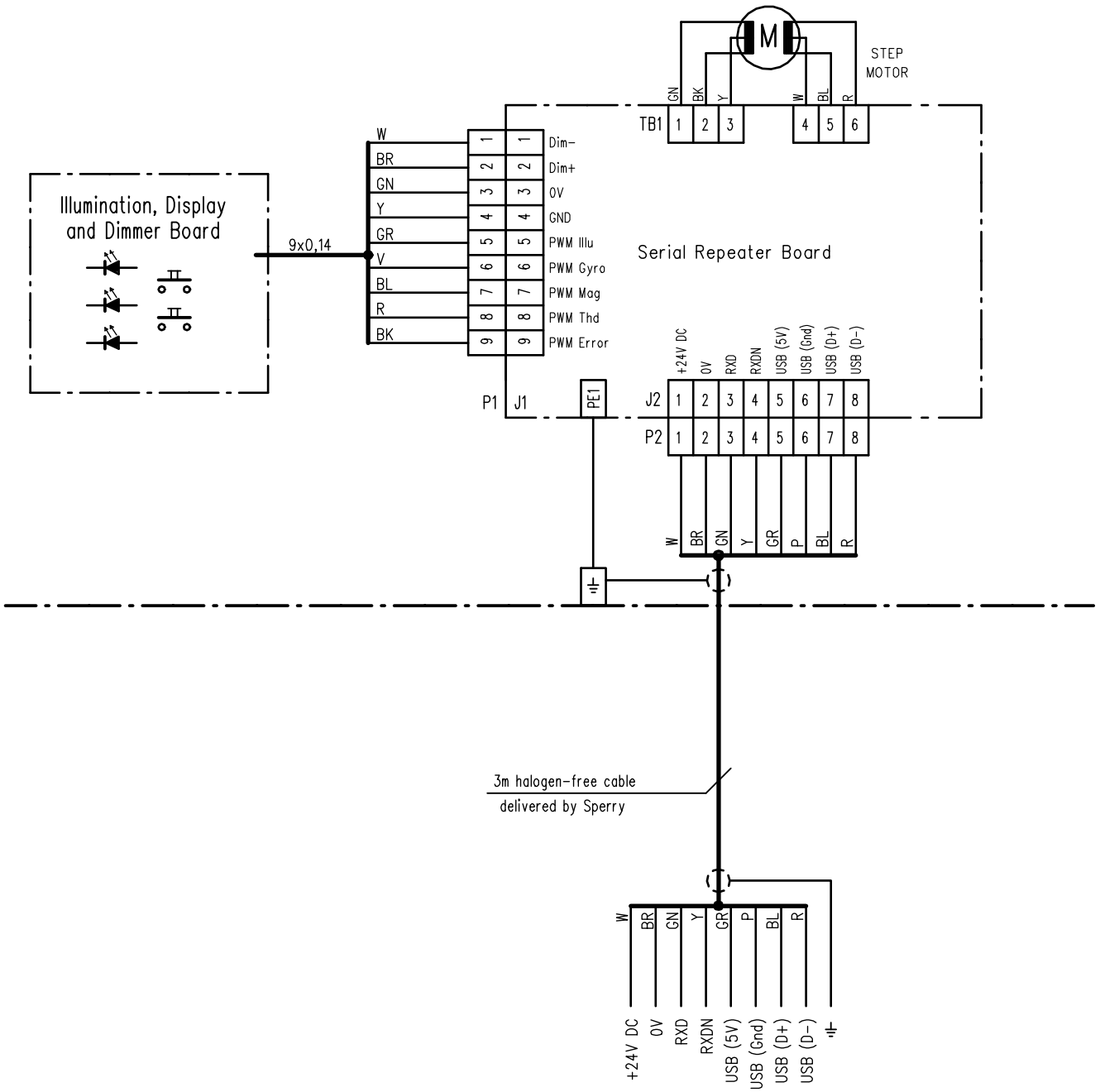
	Date	Name
DRAWN	14.01.2010	Geisler
DESIGN	26.11.2009	Magner
01150124\5016-0115-02 CHD ECO		

NORTHROP GRUMMAN
Sperry Marine
Hamburg Germany

TITLE Wiring Diagram
Steuer/Magnet Tochter
STEERING/MAGNETIC REPEATER

DRAWING No. 5016-0115-02 /A

SHEET 1 SHEETS 1

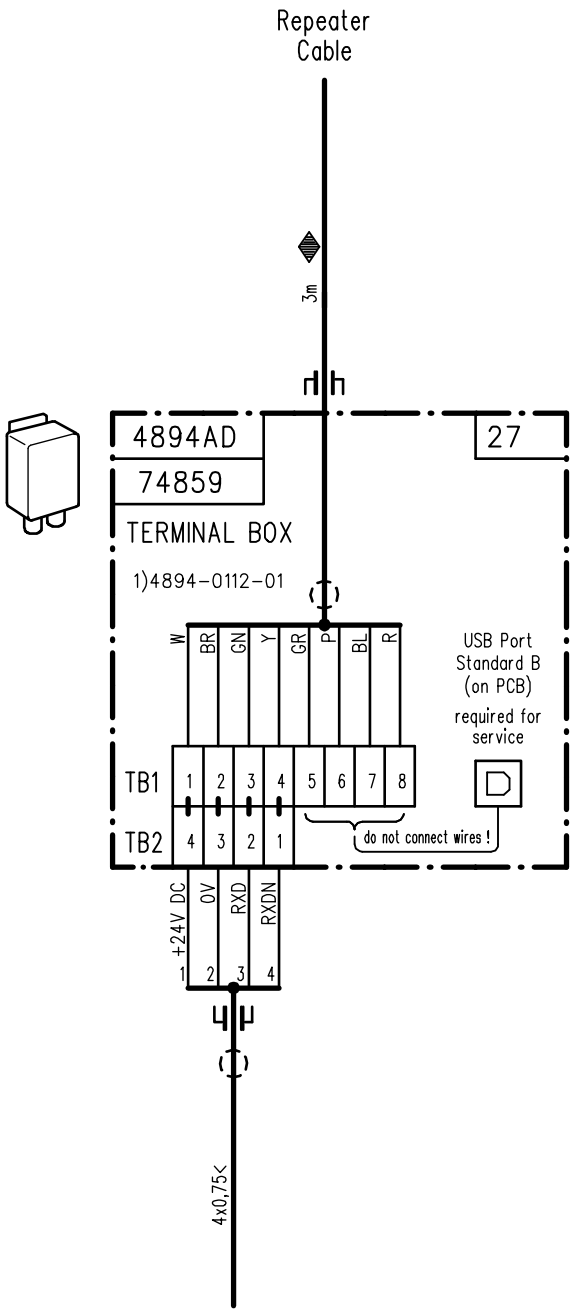


				5016-AC 74883		Date / Name
					DRAWN	14.01.2010 Geisler
					DESIGN	26.11.2009 Magner
				01150124\5016-0115-03	CHD ECO	
				NORTHROP GRUMMAN Sperry Marine Hamburg Germany		
A	981 900	14.07.10	Geisler			
REV	ECO-No.	DATE	NAME			

TITLE: Wiring Diagram
Wandtochter
BULKHEAD REPEATER

DRAWING No. 5016-0115-03 /A

SHEET 1 SHEETS 1



Caution

= Screened cables have to be grounded through cable glands.

REMARKS

1) Dimension Drawing
2) Wiring Diagram
● if required
< Screened Cable
(AA) all cables marked with letters are Sperry Marine Supply of max. 3m length

REV	ECO-No.	DATE	NAME
A	981 900	04.06.10	Geisler

4894-AD 74859		Date	Name
	DRAWN	04.06.2010	Geisler
	DESIGN	17.03.2010	Magner
01150124\4894-0115-01S01	CHD ECO		

NORTHROP GRUMMAN
Sperry Marine
Hamburg Germany

TITLE Wiring Diagram

Anschlusskasten
TERMINAL BOX

DRAWING No. 4894-0115-01 /A

SHEET 1 SHEETS 1

Port Wing

Wheelhouse

Stb. Wing

or

4894AD 27 / 74859 TERMINAL BOX 1)4894-0112-01 — USB Port Standard B (on PCB) required for service — TB1 1 2 3 4 5 6 7 8 — TB2 4 3 2 1 — do not connect wires !

5016 BEARING REPEATER 45 / 74880 1)5016-0112-01 2)5016-0115-01 STEP MOTOR — Serial Repeater Board — TB1 1 2 3 4 5 6 — J1 P1 — J2 P2 1 2 3 4 5 6 7 8 — 24V DC 0V RXD RXDN USB (5V) USB (Gnd) USB (D+) USB (D-) — BR GN Y GR P BL R

5016AA STEERING REPEATER 45 / 74881 1)5016-0112-01 2)5016-0115-01 STEP MOTOR — Serial Repeater Board — USB Port Standard B required for service — J5

4894AD 27 / 74859 TERMINAL BOX 1)4894-0112-01 — USB Port Standard B (on PCB) required for service — TB1 1 2 3 4 5 6 7 8 — TB2 4 3 2 1 — do not connect wires ! — +24V DC 0V RXD RXDN — 2 3 4

5016 BEARING REPEATER 45 / 74880 1)5016-0112-01 2)5016-0115-01 STEP MOTOR — Serial Repeater Board — TB1 1 2 3 4 5 6 — J1 P1 — J2 P2 1 2 3 4 5 6 7 8 — 24V DC 0V RXD RXDN USB (5V) USB (Gnd) USB (D+) USB (D-) — BR GN Y GR P BL R

4894AD 27 / 74859 TERMINAL BOX 1)4894-0112-01 — USB Port Standard B (on PCB) required for service — TB1 1 2 3 4 5 6 7 8 — TB2 4 3 2 1 — do not connect wires ! — +24V DC 0V RXD RXDN — 2 3 4

5016 BEARING REPEATER 45 / 74880 1)5016-0112-01 2)5016-0115-01 STEP MOTOR — Serial Repeater Board — TB1 1 2 3 4 5 6 — J1 P1 — J2 P2 1 2 3 4 5 6 7 8 — 24V DC 0V RXD RXDN USB (5V) USB (Gnd) USB (D+) USB (D-) — BR GN Y GR P BL R

Setup settings via SUSI : set all parameters to "automatic"

4896 35 / 74532 DIMMER 3,3kΩ 1)4896-0112-01 230VAC or 24VDC/LED — 2,5m

60368 77 / RATE OF TURN INDICATOR 30°/min 1)60338-0112-01 144mm — 24V — 1 2 (Z1) 3 (Z2) 4

R.O.T. connection valid for all Sperry ROT Indicators

4x0,75< — 4x□<

21 — 20 — 23 — 27 — 22

Port Stb

Permanent Magnetic Repeater only with Compass Monitor

5016AC BULKHEAD REPEATER 45 / 74883 1)5016-0112-01 2)5016-0115-01 STEP MOTOR — Serial Repeater Board — J1 P1 — J2 P2 1 2 3 4 5 6 7 8 — 24V DC 0V RXD RXDN USB (5V) USB (Gnd) USB (D+) USB (D-) — BR GN Y GR P BL R

4894AD 27 / 74859 TERMINAL BOX 1)4894-0112-01 — USB Port Standard B (on PCB) required for service — TB1 1 2 3 4 5 6 7 8 — TB2 4 3 2 1 — do not connect wires ! — +24V DC 0V RXD RXDN — 2 3 4

HDG/G 241.1° — HDG/G 241.1°

4891CA 1)4891-0112-03 45 / 74833 UNIVERSAL DIGITAL REPEATER / 4891CB 74834 1)4891-0112-04 — +24V DC 0V RXD RXDN TxD TxDN RxD2 (Centr.Dim) RxDN2 (Centr.Dim) Status IN Status OUT Status OUT Dimmer Ext. + − 0V — R BK BL P W V BR/GN W/GN GN GR V W/Y GR/P R/BL BR

2,2m

Caution = Screened cables have to be grounded through cable glands.

4894AC 27 / 74837 TERMINAL BOX 1)4894-0112-03 — TB1 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 — Unused wires have to be connected to spare terminals or insulated separately !

5016AB MAGNETIC REPEATER CONSOLE 45 / 74882 1)5016-0112-01 2)5016-0115-01 STEP MOTOR — Serial Repeater Board — USB Port Standard B required for service — J5

4891CA 1)4891-0112-03 45 / 74833 UNIVERSAL DIGITAL REPEATER / 4891CB 74834 1)4891-0112-04 — +24V DC 0V RXD RXDN TxD TxDN RxD2 (Centr.Dim) RxDN2 (Centr.Dim) Status IN Status OUT Status OUT Dimmer Ext. + − 0V — R BK BL P W V BR/GN W/GN GN GR V W/Y GR/P R/BL BR

2,2m — Unused wires have to be connected to spare terminals or insulated separately !

Dimmer Kit 1)4891-0112-03 1)4891-0112-04 / 26583 — DIM − DIM +

4805-1200 27690 TERMINAL BOARD 1)4805-0112-05 — R+D R-D RxDN — TB1 3 7 — 3m — 27689 — 4805AG 74790 NAVIPRINT NAV. DATA PRINTER 1)4805-0112-05 — 2m — 42569 ISOLATING TRANSFORMER — 2x1,5 — 230V AC Power Supply

For Rudder Angle Printer Feedback Signal required !

2x0,75<

25 — 26 — 29 — 24 — 28

Interconnections for single, dual or triple Gyro Systems with Compass Monitor and Switch Over Unit.

Caution

All Power Supplies must be separately fused !
All Housings must be grounded !
If screened cables are not grounded as shown, malfunction will occur !
Screened cables have to be grounded at both ends !

TYPE-NO / STOCK-NO / IDENT-NO

Cables marked with □: Cross Section up to 100m length: 0,75mm² over 100m length: 1,5mm²

REMARKS
1) Dimension Drawing
2) Wiring Diagram
● If required
< Screened Cable
(AA) all cables marked with letters are Sperry Marine Supply of max. 3m length

General Notes:
1. All cables shipyard supplied unless otherwise specified
2. ⋈ Components Owner- or Yard-Delivery
3. ◆ Cables delivered by Sperry Marine
4. All cables to be screened, unless otherwise specified
5. All units unless otherwise specified to be directly connected to ship's earth
6. Cable diameters acc. to classification requirements unless otherwise stated
7. All cables to include a min 1/10 of unused conductors

DESCRIPTION	REV	ECO-No.	DATE	NAME
Initial	A	981 900	31.05.10	Gelder

	Date	Name
DRAWN	31.05.2010	Gelder
DESIGN	31.05.2010	Gassig
4932\4932-0353-87501 CHD ECO	04.06.2010	Gothe

NORTHROP GRUMMAN
Sperry Marine
Hamburg Germany

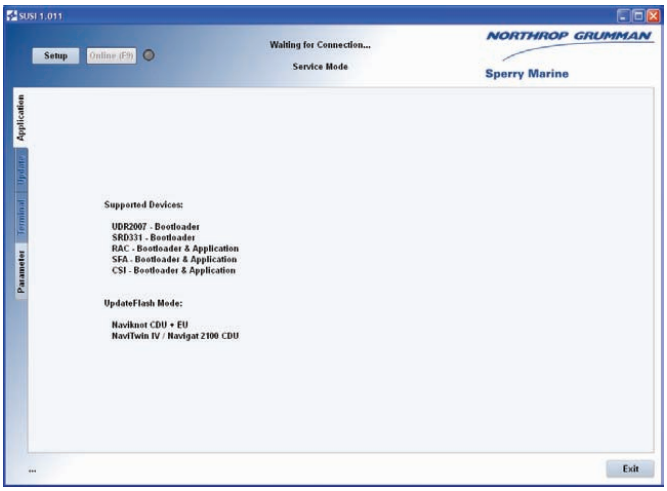
TITLE: GYROCOMPASS SYSTEM REPEATER

DRAWING No. 4932-0353-87 /A — SHEET 1 SHEETS 1

NORTHROP GRUMMAN

Sperry Marine

Installation Guide
for Field Service Personnel



SUSI

Sperry Universal Service Instrument

056358-A; 09 Jun 2009

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Sperry Marine, with worldwide headquarters in Charlottesville, VA, and major engineering and support offices in Melville, NY, New Malden, England, and Hamburg, Germany, is part of the Northrop Grumman Electronic Systems sector.

Rev.	Date	Remarks
A	09 Jun 2009	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:

DANGER

Danger: Risk of electrical shock.

CAUTION

Caution: Components are sensitive to electrostatic discharge.

General Safety Notices to Service Personnel

DANGER

Servicing a device with SUSI mostly requires that the device is operated with the housing open, as the devices' service ports are usually located inside the devices.

In some devices, connection terminals, components and tracks on the PCBs may carry hazardous voltages.

Power off any device first before opening its housing.

Make sure that the device may be safely serviced with the housing open and that its service port is accessible for plugging in and unplugging the connection cable.

CAUTION

The devices to be serviced with SUSI contain electrostatic sensitive components.

Electrostatic discharge may permanently damage components.

When servicing any device with SUSI, take precautions to prevent electrostatic discharge. Avoid touching any of the electronic circuitry.

Contents

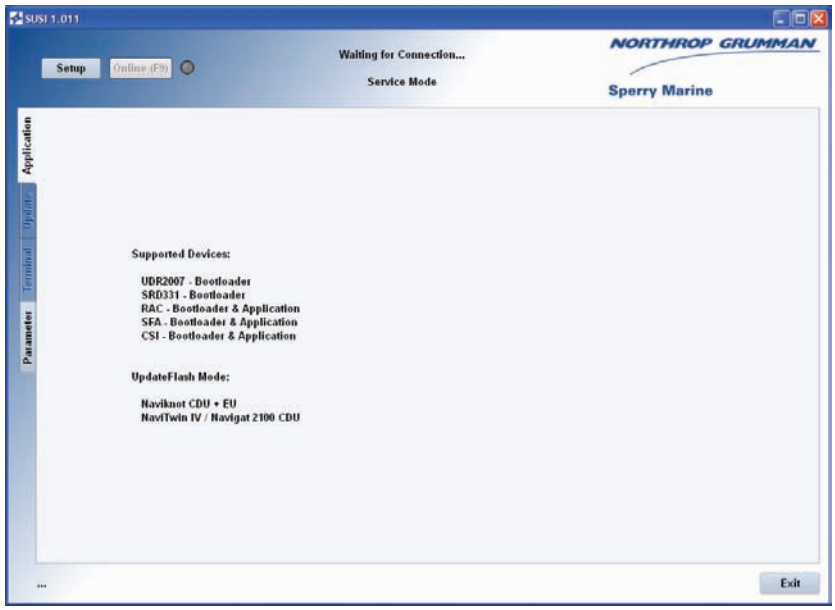
Chapter 1: Introduction

1.1 General Description

The Sperry Universal Service Instrument (SUSI) is a software application to view and modify the configuration parameters and to update the firmware of a number of Sperry Marine's microprocessor-based shipboard electronic devices.
Some newer devices do not possess user controls or configuration switches, jumpers etc. These require SUSI for their first-time configuration during commissioning and for troubleshooting or reconfiguration.

SUSI runs under the Microsoft® Windows ™ operating system and communicates with the device being serviced through a USB or an RS-232 serial connection.

Figure 1-1:
SUSI startup screen



At the time of writing of this manual, SUSI supports the configuration and/or firmware update of the following Sperry Marine products:

Device configuration and firmware update:

- Steering Failure Alarm Unit (SFA), type 5013,
- Rudder Angle Calibrator (RAC), type 5014,
- CSI.

Firmware update only:

- Universal Digital Repeater (UDR), type 4891-CA/CB,
- NAVIKNOT Preamplifier D, type 5005 (for Doppler transducer),
- NAVIKNOT Electronics Unit, types 5003 and 5004,
- NAVIKNOT 350/450/550/600 CDU, types 5001 and 5002,
- NAVIGAT 2100 CDU, type 4995,
- NAVITWIN IV, type 4994.

1.2 Scope of this Guide

This document describes the installation and basic operation of SUSI, to enable field service personnel to access the configuration parameters of a supported device and/or to update its firmware.

SUSI's functions are accessed via graphical user interface controls, grouped into four different screens, or "tabs".
Only two of these tabs are intended for field service use.

To set or alter devices' configuration parameters, SUSI offers the "application" tab, which is populated with a device-specific set of controls as soon as a connection is made to a supported device.
Detailed instructions regarding the configuration of a device through its application and descriptions of the configuration parameters are included in the respective product's manuals.

To update devices' firmware, SUSI provides the "update" tab.
Firmware updates are either carried out by uploading firmware files to the device under service (with newer devices) or by directly overwriting, or "flashing" a device's memory (with older devices). Depending on the device in question, SUSI populates the update tab with the appropriate controls.
Both update modes are described in this guide. For newer devices, the applicable update procedure is also described in the respective products' manual.

Two further tabs may be visible in SUSI when connected to newer devices, namely the "terminal" and the "parameters" tabs.
These tabs are intended mainly for factory and development use.
A detailed description is beyond the scope of this guide.
Field service personnel will not normally be required to access either of these tabs. However, when calling Sperry Marine for assistance in troubleshooting a device, field engineers may be requested to take notes of certain parameters or carry out actions through these tabs. In such cases, the assisting engineer at Sperry Marine will provide specific instructions regarding the actions to be taken.

Chapter 2: Installation

2.1 System Requirements

The computer on which SUSI is installed, must meet the following requirements:

- Operating system Microsoft® Windows XP ™ or 2000 ™[1].
- Screen resolution 1024 × 768 pixels or higher.
- A USB port (USB 1.1 or higher) is required to service:
  - Steering Failure Alarm Unit (SFA),
  - Rudder Angle Calibrator (RAC),
  - CSI,
  - Universal Digital Repeater (UDR),
  - NAVIKNOT Preamplifier D (for SRD331 speed log transducer),
  - NAVIKNOT Electronics Unit (if not using an RS-232 connection).

  To connect to an USB device, a standard USB connection cable is required, carrying type A and type B male connectors at the computer's and the device's end respectively.
- A standard RS-232 COM-port (either hardware or "virtual" COM-port) is required to service:
  - NAVIKNOT Electronics Unit (if not using a USB connection),
  - NAVIKNOT 350/450/550/600 CDU, types 5001 and 5002,
  - NAVIGAT 2100 CDU, type 4995,
  - NAVITWIN IV, type 4994.

  To connect to an RS-232 device, a special connection cable is required, carrying a female 9-pin Sub-D connector at the computer's end and a 3-pin female Stocko connector at the device's end.
  A ready confectioned cable is available from Sperry Marine under Stock No. 022939.

1. At present, SUSI does not officially support Windows Vista ™

2.2 Installing the SUSI Application

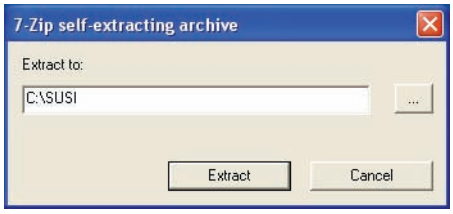
SUSI is distributed in the form of a self-extracting archive, i. e. an installer which unpacks the SUSI application and related files to a target directory on the user's computer.
The filename of the installer is "installSusi_V*n_nnn*.exe", where "*n_nnn*" denotes the SUSI's version ID.

When sent through e-mail, the installer may have been renamed or compressed (e.g zipped). In this case, rename or unpack the file to obtain an executable, i.e. a file with a ".exe" extension.

Running the SUSI Installer

1. Save the installer at a location accessible from the target computer on which to install SUSI. This location may be a local hard drive, a removable storage medium or a storage location on a network.
2. Execute "installSusi_V*n_nnn*.exe".

   The installer prompts for the target directory:

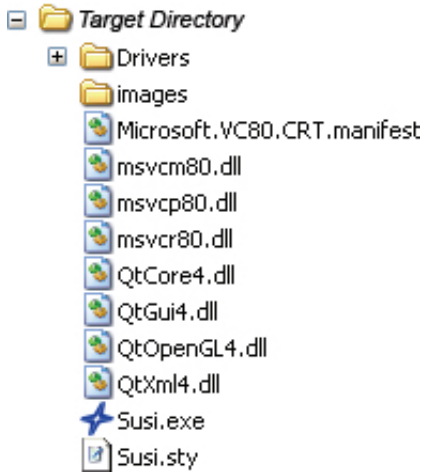


3. In case the default location shown in the dialog is not convenient, click ... to open a file browser dialog and select a different target directory:

   If required, a new directory may be created by clicking Make New Folder. Click OK to confirm the selected directory and close the file browser dialog.
   The path to the target directory is now taken over in the main installer dialog.

4. Click Extract to extract SUSI to the selected location. A progress indicator will be briefly shown. After successful extraction, the installer quits automatically.

5. Open the target directory in Windows Explorer and check that the installer has correctly extracted the SUSI as shown below:



Note 

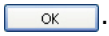
If required, create a shortcut to “Susi.exe” rather than copying or moving the file to the desktop or another location.

Checking the Installation

To check that SUSI runs properly on the target computer:

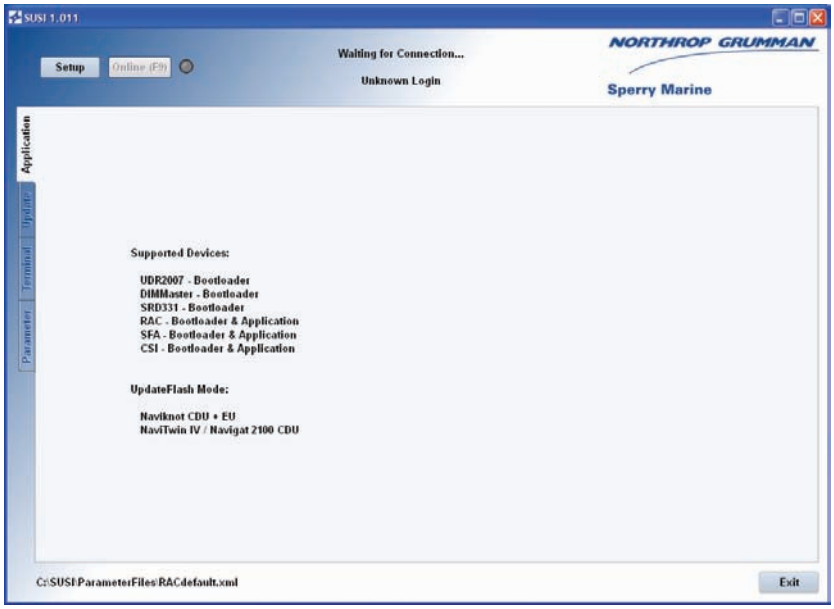
1. Double-click on Susi.exe.

   A login dialog should pop up:

   Leave the PIN empty and click 

.

2. SUSI's main window should now open, with the "Application" tab displaying a list of supported devices:



   If no warnings or error dialogs are shown, SUSI has been installed successfully.

3. Check that the device to service is included in the list of supported devices and that the version indicated in the window's title bar agrees with the latest official SUSI release (if known).

   Click Exit to quit SUSI.

2.3 Installing USB Device Drivers

Description

Servicing a device through a USB connection requires that a Windows device driver is installed on the host computer. Drivers for the supported devices are provided in SUSI's "Drivers" sub-directory.

The installation requires that the correct type of device is physically connected to a USB port at the target computer. In practice, a device driver will be mostly installed in the field, when the device in question is serviced for the first time.

At the time of writing of this manual, SUSI includes USB drivers and setup files for five different types of devices:

- The Steering Failure Alarm Unit (SFA) using Windows' "usbser.sys" driver with setup file "SFA_USB.inf";
- the Rudder Angle Calibrator (RAC) using Windows' "usbser.sys" driver with setup file "RAC_USB.inf"
- the Compass System Integrator (CSI) using Windows' "usbser.sys" driver with setup file "CSI_USB.inf"
- the UDR type 4891 CA and CB and the NAVIKNOT Preamplifier D, type 5005, using Windows' "usbser.sys" driver with setup file "SperryService1000.inf"
- the NAVIKNOT Electronics Unit, types 5003 and 5004, using drivers and setup files from FTDI.

Note  Installing a Windows device driver requires administrative rights at the target computer.

Installation Procedure

1. If the device to service is powered on, switch off the power first.

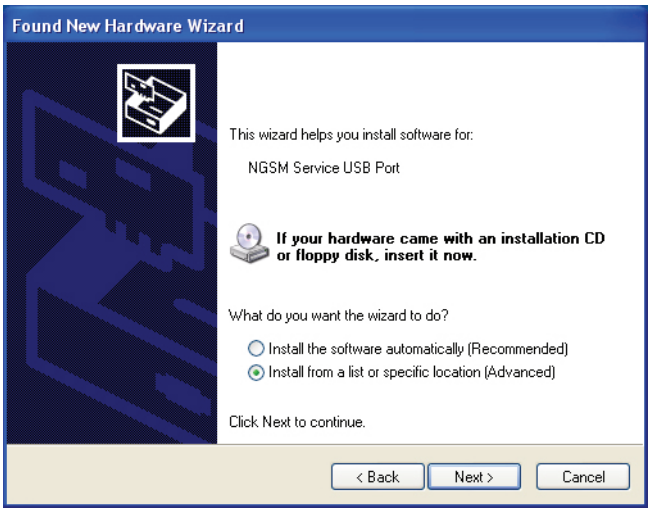
DANGER

Access to the service port of a device supported by SUSI may require that the device is operated with the housing open.
In some devices, certain connection terminals, components and tracks on the PCBs may carry hazardous voltages.
Power off any device first before opening its housing.
Make sure that the device may be safely serviced with the housing open and that the service port is accessible for plugging in and unplugging the connection cable.

2. Power up the device. Do not connect the USB cable yet.
3. When the device is operative, plug in the USB cable at the service computer and the device.
4. The “Found New Hardware” wizard is launched automatically and prompts whether to connect to the Windows Update service or not. Select not to connect to Windows Update:

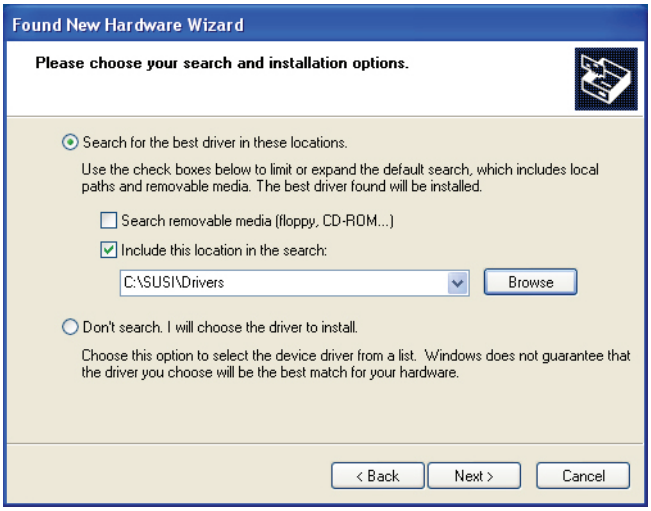
Click Next > to continue.

5. The wizard now prompts whether to install the software automatically or from a specific location.
   Select to install from a specific location.



   Click Next > to continue.

6. In the next dialog, select to search for the best driver in the given paths. Then, check the tickbox to include a named location in the search. With the Browse button, navigate to SUSI's "Drivers" subdirectory to include it in the search:

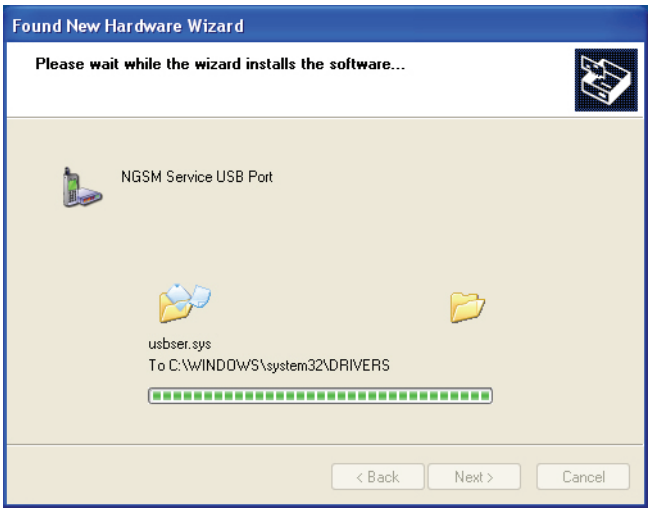


   Click Next > to continue.

7. If Windows is configured to warn when unsigned drivers are about to be installed, a dialog will be shown, stating that the device driver to install has not passed Windows Logo testing:

   This is a warning only, not a fault. As Sperry Marine does not submit its device drivers for the Windows Logo test, this warning is to be ignored by clicking Continue Anyway to continue with the installation.

8. The driver is now copied to Windows' system directory:

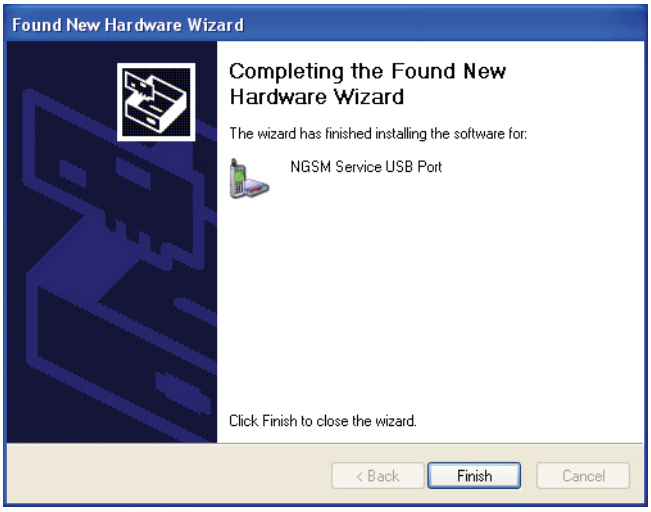


   As specific .inf files are provided with SUSI, the connected type of device is automatically recognized and will register in the Windows Device Manager accordingly.

Note

Note that newer devices register as modems, using Window's standard usbser.sys communication device class driver.
When installing the FTDI driver for the NAVIKNOT Electronics Unit, the device will register as a "virtual" COM port.

9. After completion, the wizard reports that it has finished installing the device driver:

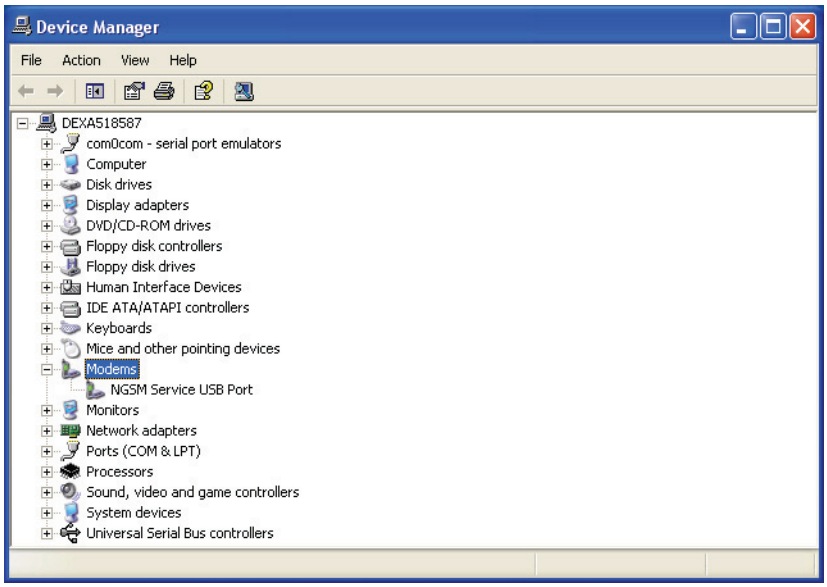


Click Finish to close the wizard.

Checking the Installation

To check whether the device driver has been installed correctly:

1. Open the Windows Device Manager and verify that a new device is listed, named in accordance with the device type.

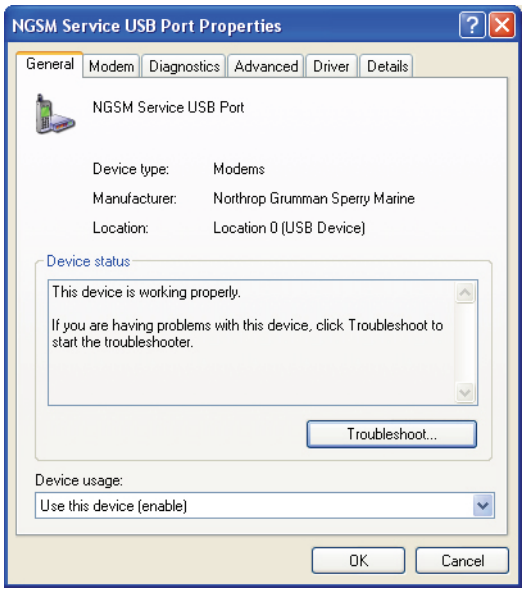


   Devices using Windows' usber.sys driver will register as modems with the following names:

   – SFA: "SFA - NGSM Service USB Port",
   – RAC: "RAC - NGSM Service USB Port",
   – CSI: "CSI - NGSM Service USB Port",
   – UDR or NAVIKNOT Preamplifier D: "NGSM Service USB Port".

   The NAVIKNOT Electronics Unit will register under the Universal Serial Bus Controllers as "USB Serial Converter".

2. Right-click on the new device. From the context menu which pops up, select "Properties" to call up the properties dialog.
   The device should be reported as working properly.

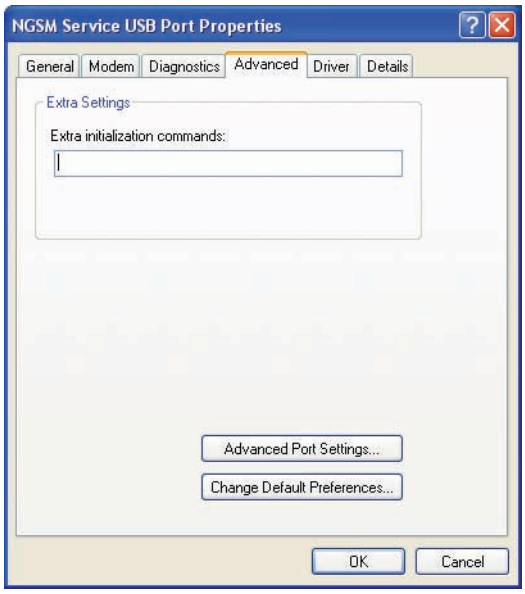


Determining the Assigned COM-Port

While the Device Manager is still open, a note should be taken of the port number which has been assigned to the newly installed device. This information might be needed, should SUSI later be unable to detect a device automatically upon connection.

In case the device has registered as a modem, using Windows' usber.sys driver, determine the port number as follows:

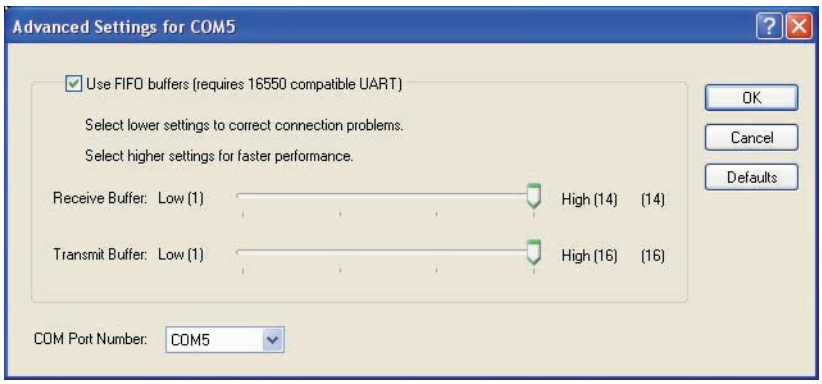
1. Right-click on the new device. From the context menu which pops up, select "Properties" to call up the properties dialog. Change to the "Advanced" tab.



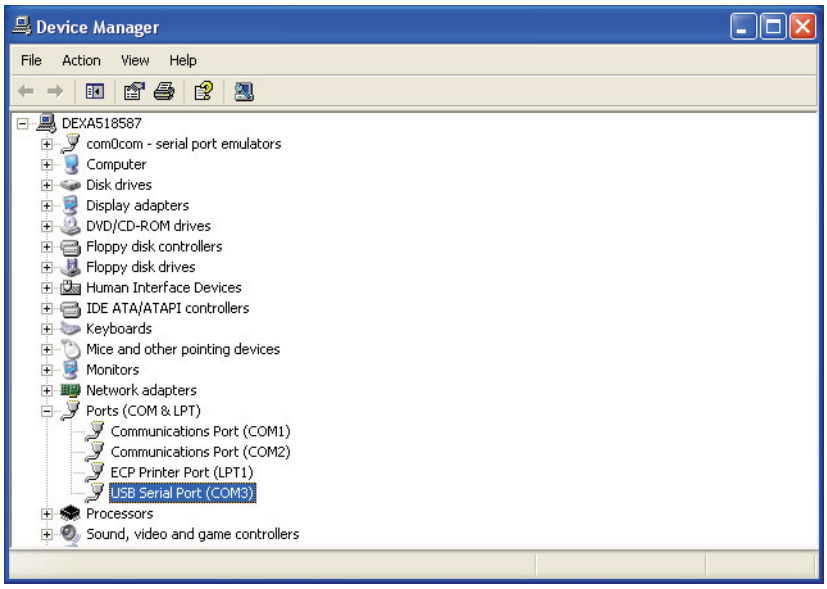
   Click 

.

2. The advanced Settings dialog appears. Take a note of the COM port number assigned to the device (COM5 in the example below):



In case of the NAVIKNOT Electronics Unit, which uses the FDTI driver, the Device Manager will list a new “USB Serial Port” and display its port number under “Ports (COM & LPT)” (COM3 in the example below):



Chapter 3: Basic Operation

3.1 Starting and Quitting SUSI

To start SUSI:

1. Double-click on Susi.exe in the installation directory or, if a shortcut has been created at another location, double-click on the shortcut.

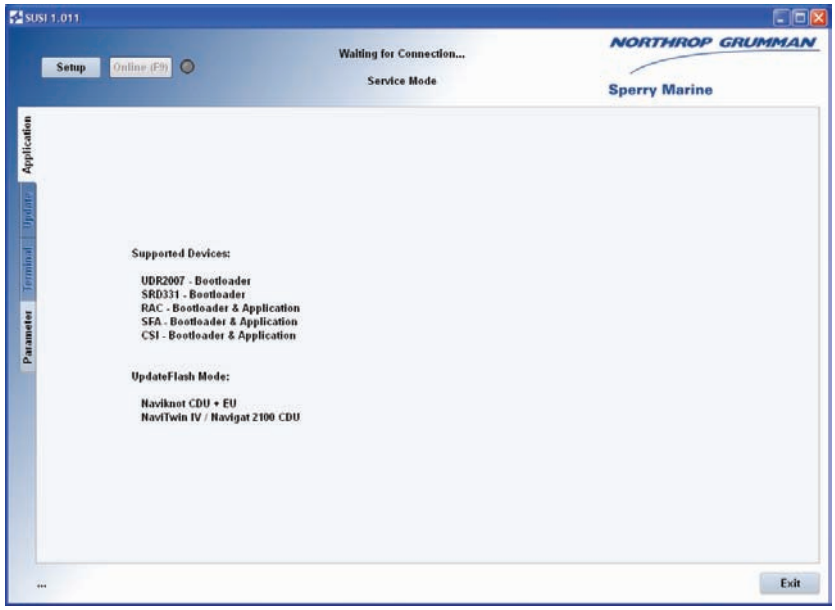
   A login dialog pops up:

2. To access a device's configuration parameters, enter "**20097**". This will start up SUSI in the service mode.

   To update a device's firmware, the PIN may be left empty. All supported devices may be updated without entering a PIN.

   Click OK to continue.

3. SUSI's main window now opens, with the "application" tab displaying a list of supported devices:



To quit SUSI:

Click Exit at the bottom right of the screen or click the close button at the right of SUSI's title bar to quit the program.

3.2 SUSI Setup

Communication Parameters

In the case of USB devices, SUSI will mostly be able to auto-detect the device under service and select the corresponding COM port automatically. Should the USB auto-detection fail, the device must be manually selected in the SUSI setup dialog.
In case of an RS-232 connection, the COM port assigned to the device under service must always be manually selected.

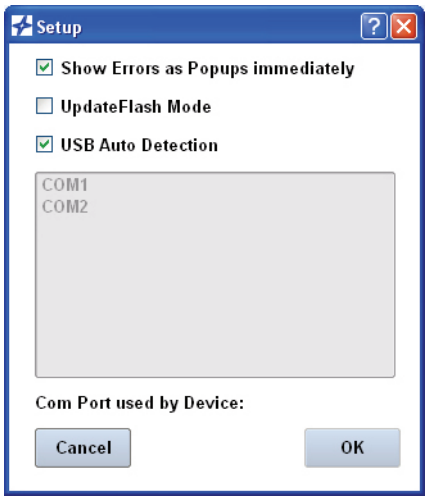
Note

To connect to a USB device, the required device driver must have been installed first (see “Installing USB Device Drivers” on page 2-5).

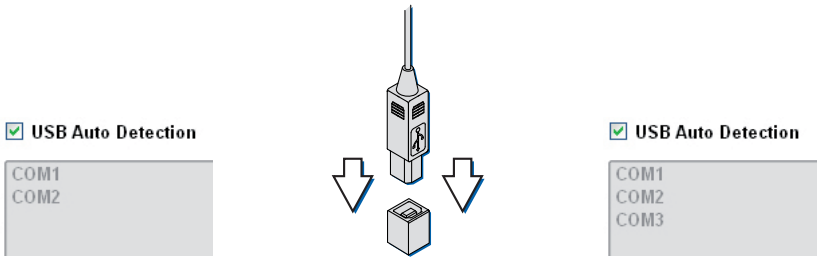
Setting up a USB Connection

1. If the device to service is not powered up already, power it up. Do not yet plug in the USB cable.

   Click the Setup button at the top left of the main window.
   SUSI’s setup dialog pops up.
   The USB Auto Detection feature should be selected by default. With Auto Detection active, the COM ports currently recognized by SUSI are listed in a greyed-out box:



2. Plug the USB cable into the device’s service port.
   A new COM port should now appear in the port list:



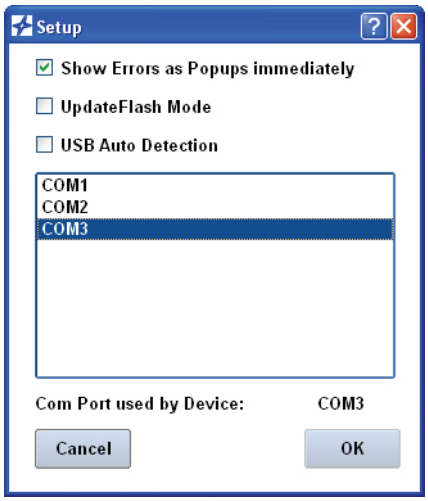
3. Click OK to close the setup dialog.

4. The “Online” button at the top of SUSI’s main screen should have become clickable (not greyed-out):

   If this is the case, skip to step 7.

   Should the button still be greyed-out, auto-detection of the USB device has failed. Continue with the next step.

5. Click the Setup button at the top left of the main window, uncheck USB Auto Detection and select the required COM port manually:



6. Click OK to close the setup dialog.

7. Click Online (F9) to connect to the device.

8. The status line and the LED symbol at the top of the screen will now indicate whether or not a connection has been made to the device under service:

   - green = connected in service mode.
     The device-specific application controls will now populate SUSI’s application tab. Access is granted to the device’s basic configuration parameters.
   - red = connected in “unknown” mode.
     The device has been recognized but no access is granted to the configuration parameters. The device-specific application will not be loaded.
   - orange = connected with device’s bootloader.
     The device was powered up with the USB cable already connected. SUSI will display the update tab. Access is granted to upload firmware to the device.
   - grey = not connected.
     The device has not been found. Check the communication parameters and the connection. Unplug the USB cable, then plug in the cable again and retry to connect.

9. If a connection has been made, SUSI is now set up as required to communicate with the device under service.

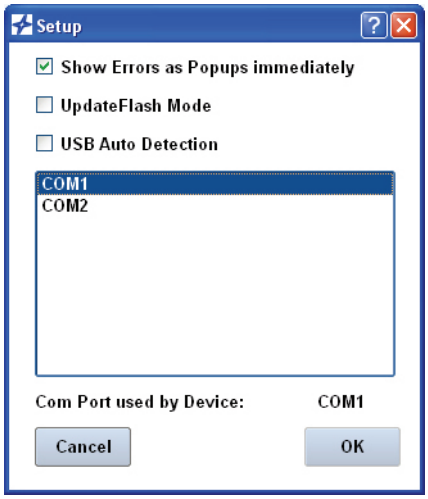
   Click Online (F9) to disconnect from the device.

Setting up an RS-232 Connection

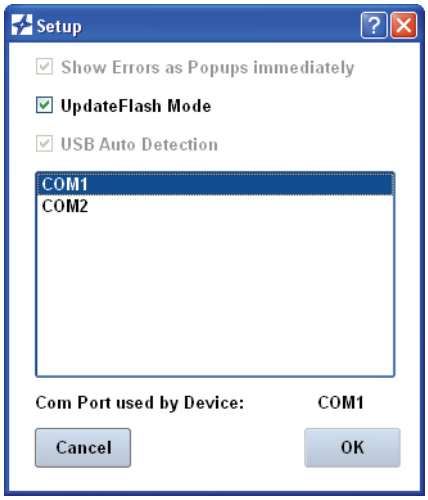
Note

Through an RS-232 connection, SUSI supports firmware updates only. SUSI is not able to verify beforehand, whether communication with the device under service is established properly.
After initiating a firmware update, observe the messages displayed, to check that the process completes successfully without error.

1. Click the Setup button at the top left of the screen.
   SUSI's setup dialog pops up.
   - If the device under service supports firmware file updates, uncheck the USB Auto Detection feature and manually select the required COM port (do not check "Update Flash Mode"):



   - If the device under service supports overwriting ("flashing") its memory, check the Update Flash Mode feature. The other option settings are disabled (greyed out) automatically in this case:



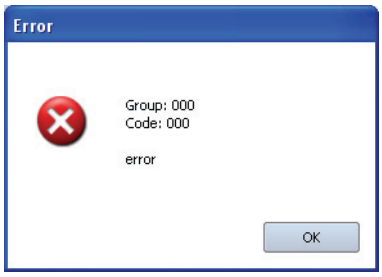
     In the Update Flash Mode, SUSI will display the update tab automatically when the setup dialog is quit.

2. Click OK to quit the setup dialog.
   SUSI is now set up as required to update the device's firmware.

Error Notification Setting

When the device under service raises an alarm, e. g. in case of a configuration error, SUSI will receive an error message.
The way in which these messages are handled may be selected in the SUSI setup dialog:

- Check the option “Show Errors as Popups Immediately” to let SUSI display a pop-up dialog for each incoming error message:



  This option lets the respective error messages pop up in the foreground. Pending messages must be acknowledged by clicking OK to let SUSI resume normal execution.

- Uncheck the option “Show Errors as Popups Immediately” to let SUSI collect incoming error messages in the background.
  Pending errors will then be indicated by an icon appearing at the bottom of the screen:

  This option prevents incoming error messages from interrupting SUSI’s normal execution. The respective messages’ pop-up dialogs may be displayed by clicking on the error icon.

Note

When the option “Show Errors as Popups Immediately” is checked and the cause of an error cannot be eliminated, SUSI may “lock up” as new error messages are generated permanently.
In such a case, power off the device under service, uncheck the option “Show Errors as Popups Immediately” and power up the device again.

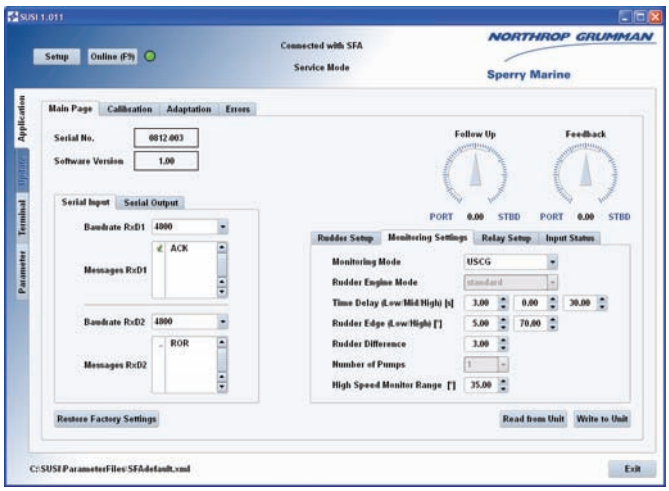
3.3 Running a Device's Application

Some of Sperry Marine's newer devices do not possess operator controls or configuration switches etc. Instead, these devices can only be configured using SUSI.
At the time of writing of this manual, SUSI supports the configuration of the Steering Failure Alarm Unit (SFA), the Rudder Angle Calibrator (RAC), and the Compass System Integrator (CSI).

For configuring and servicing these devices, SUSI provides specific user interfaces, called "applications". These contain the graphical user interface elements required to conveniently read out and alter the configuration and to display the operating state of the device under service.

As an example, the application for the Steering Failure Alarm (SFA) is shown below.

Figure 3-1: SFA Application (example)



SUSI automatically populates its application tab with the device-specific application whenever a connection is made to a supported device which has been powered up and running before the USB cable was plugged in.

Detailed instructions regarding the configuration of a the device through its SUSI application and descriptions of the configuration parameters are included in the respective product's manuals.

Note

To be granted access to a device's application, SUSI must be started in the service mode by entering a valid PIN upon login (see "Starting and Quitting SUSI" on page 3-1).

3.4 Updating a Device's Firmware

Note

Generally, it cannot be guaranteed that a device's parameter settings are left intact during a firmware update.
Before updating firmware, record all parameter settings to be able to re-enter them manually, if required.

Firmware File Upload

To update the firmware of newer devices, SUSI may be used to upload new firmware files from the service computer to the respective device's memory.

Authorized field service personnel will be provided with the required files upon request.

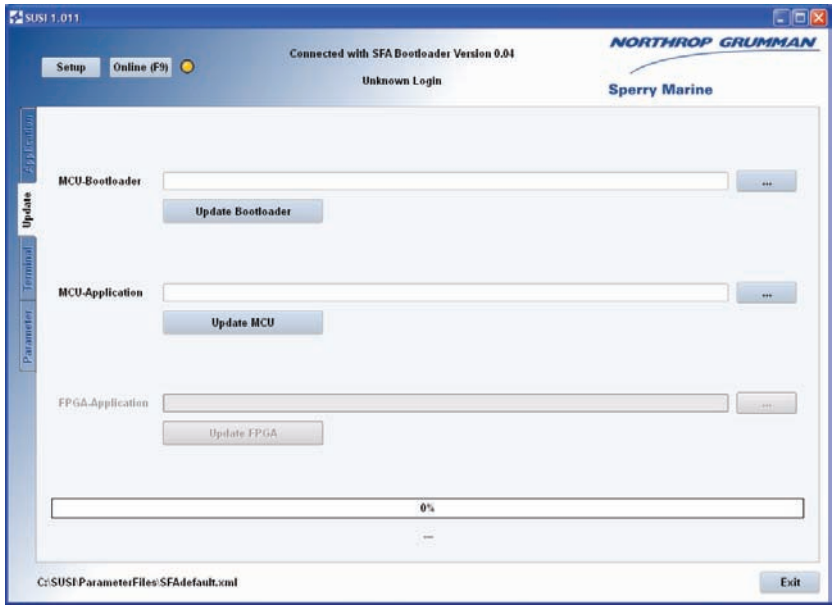
Firmware files issued by Sperry Marine will usually be named such that the filename identifies the device type and the firmware revision. The file extension used for firmware files is ".upd".

The update tab provides three file browsers to specify the file(s) to be uploaded:

- "MCU-Bootloader" selects a file to update the device's bootloader,
- "MCU-Application" selects a file to update the device's application software, i. e. the actual system software,
- "FPGA-Application" selects a file to update the program code for an FPGA. When connected to a device which does not contain an FPGA, this file browser's controls are greyed-out.

As an example, the update tab is shown below, as it is displayed when connecting to the SFA.

Figure 3-2: Update tab (example)

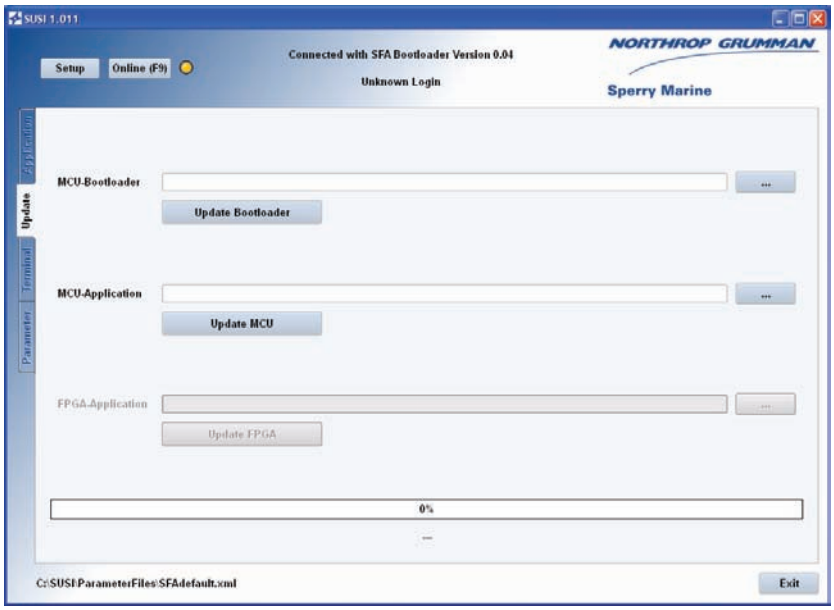


Update Procedure

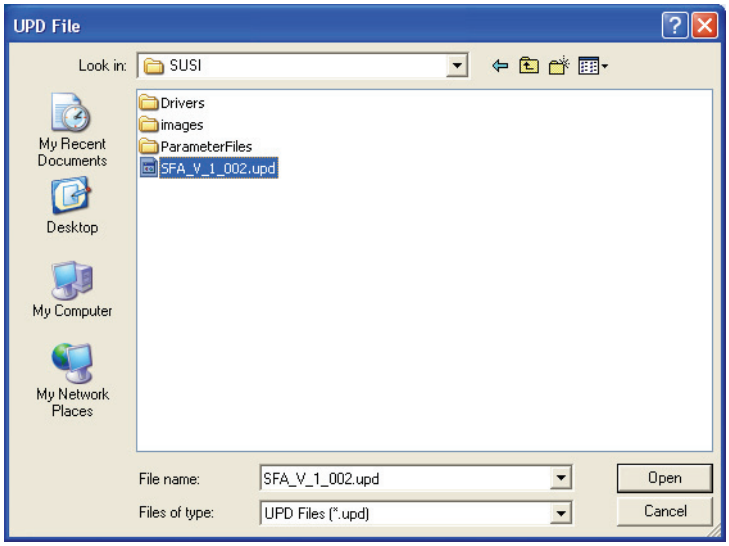
1. If the device under service is currently powered up, power it down.
2. You will have obtained a firmware update file from Sperry Marine. Save this file at a convenient location on the computer, where it is easily retrieved.
3. If SUSI is not running yet, start up the program now.
   When prompted for the login PIN, either enter the service mode PIN or leave the PIN empty.
4. Plug in the USB cable at the PC and at the device's service port.

5. Power up the device.
   The "Online" button at the top of SUSI's main screen should now become clickable (not greyed-out):

6. Click Online (F9) to connect to the device
7. The update tab should now open automatically, as shown below (connection with the SFA shown as an example).
   The LED symbol at the top of the screen should have changed its colour to orange and the status line should indicate that a connection has been made:



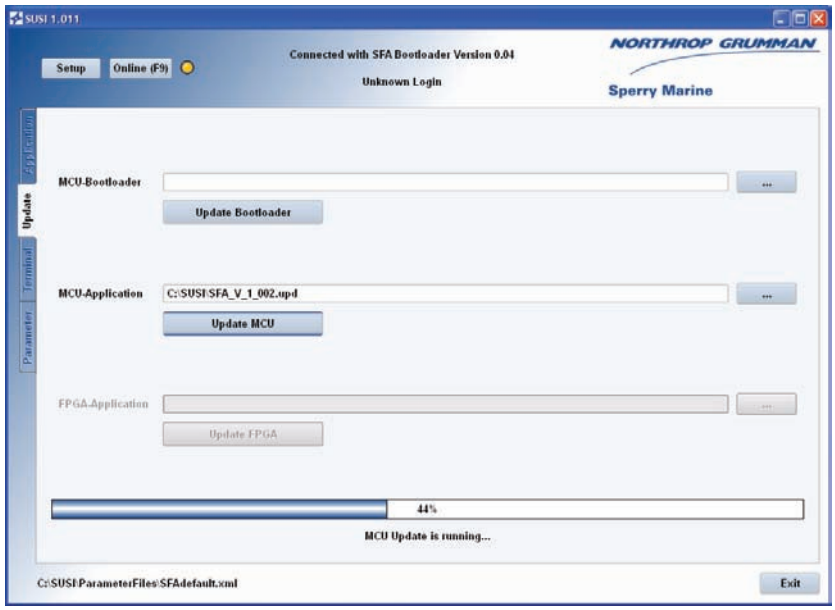
8. Depending on whether you intend to update the MCU bootloader, the MCU application or an FPGA program, click the respective ... button to call up the file open dialog. Then, navigate to the firmware update file, select it in the dialog and click Open.



Note

The file open dialog searches for files with the extension ".upd" only. In case the update file has been given another extension for any reason, the filename, including the complete access path, must be entered manually in the respective text box of the update tab.

9. Click Update MCU, Update Bootloader or Update FPGA, respectively to initiate the actual file upload. The bargraph at the bottom of the screen indicates the progress of the update:



10. When the update is complete, unplug the USB cable at the PC and at the device's service port.

11. The device now reboots with the new firmware.

UpdateFlash Mode

To update the firmware older devices, SUSI provides the “UpdateFlash” mode. In this mode, SUSI directly overwrites, or “flashes”, the respective device’s memory with the contents of a hex-file.

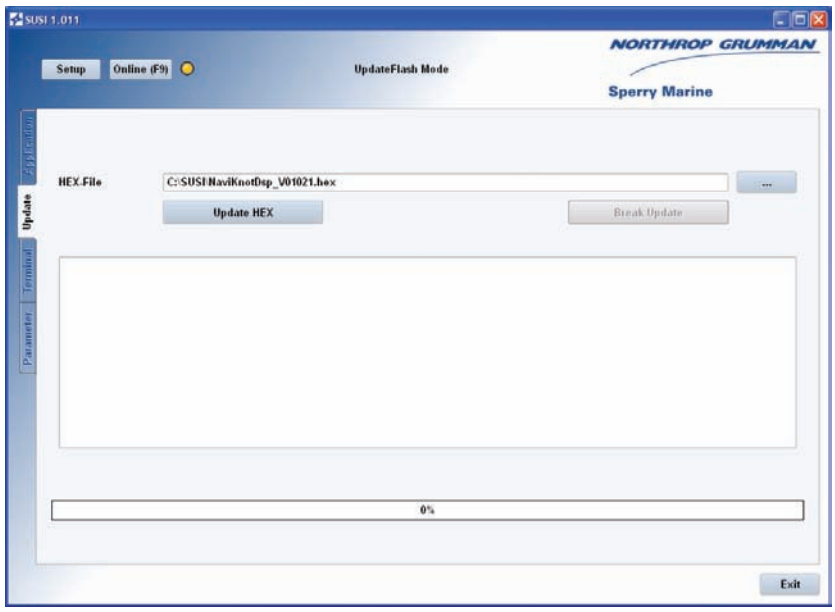
Authorized field service personnel will be provided with the required files upon request.
Important bugfix releases or software improvements from which existing clients may benefit will be announced via Sperry Marine Hamburg service bulletins to service representatives and customers.

The UpdateFlash Mode is used via an RS-232 connection only, as newer devices equipped with an USB port will use the safer and more convenient file update mode.

In the Update Flash Mode, the update tab provides a file browser to select the hex-file to write to the device’s memory.

Hex-files issued by Sperry Marine will usually be named such that the filename identifies the device type and the firmware version. The file extension used for hex files is “.hex”.

As an example, the update tab is shown below, as it is displayed when connecting to an older device.

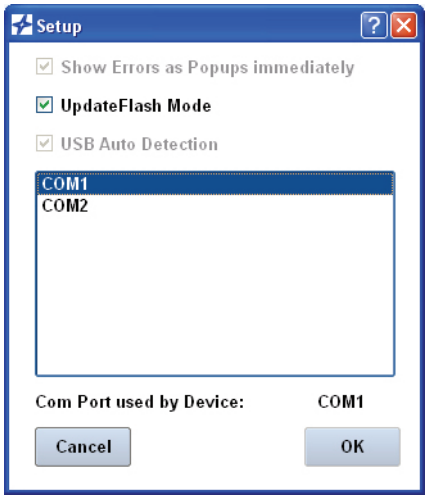


Note

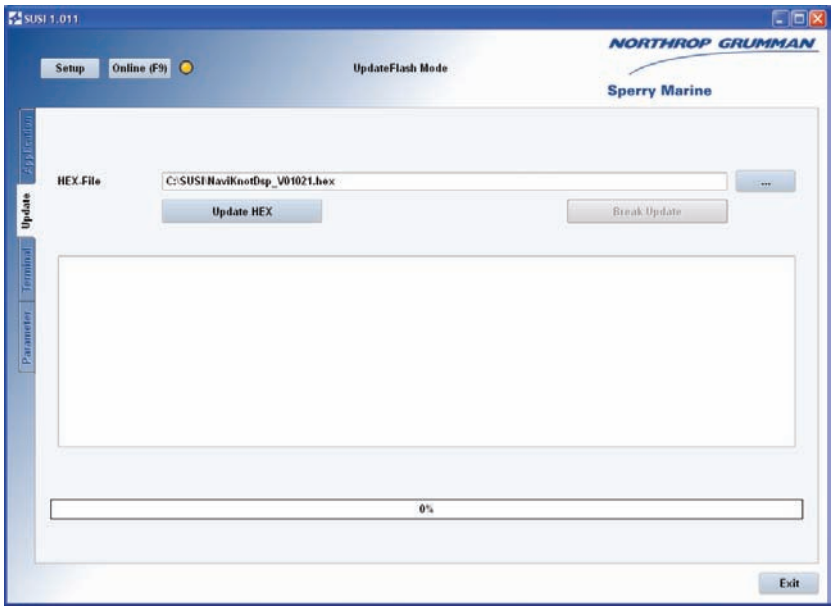
Updating a device’s firmware using the FlashUpdate mode is a risky operation, as SUSI writes directly to the device’s flash memory. Furthermore, SUSI cannot verify whether the file supplied is indeed intended for the device under service.
Once started, an update in progress may not be interrupted.
Under adverse circumstances, a failed update attempt may leave the device in an inoperable state from which it can only be recovered by replacing the flash memory chip.

Update Procedure

1. If the device under service is currently powered up, power it down.
2. You will have obtained a firmware update file from Sperry Marine. Save this file at a convenient location on the computer, where it is easily retrieved.
3. If SUSI is not running yet, start up the program now.
   When prompted for the login PIN, either enter the service mode PIN or leave the PIN empty.
4. Click the Setup button at the top left of the screen and in the setup dialog which pops up, check the “Update Flash Mode” option. Then, select the COM port to use for the RS-232 connection to the device under service:



5. Press OK to quit the setup dialog.
   The update tab opens automatically, displaying the Update Flash mode controls:



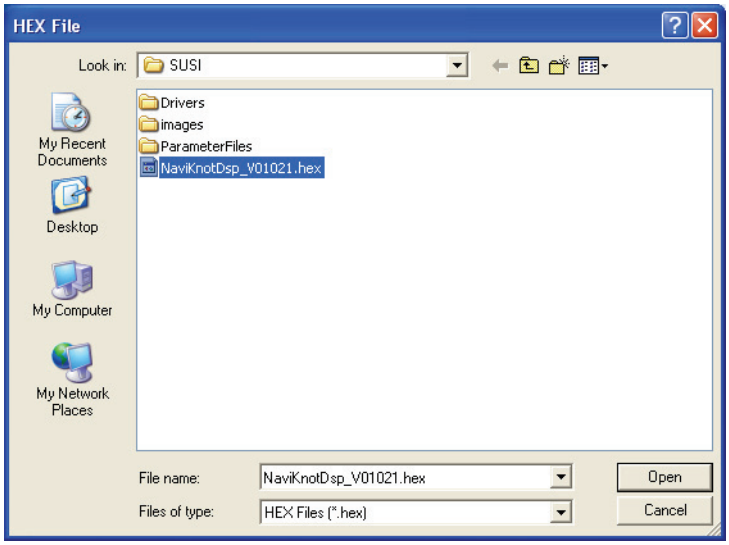
6. Plug in the RS-232 cable at the PC and at the device’s service port.

7. Click the “Online” button at the top of the screen.
   The LED symbol next to the button should now change its colour from grey to orange:

Note

In the Update Flash mode, the orange LED symbol indicates only that SUSI has acquired control of the selected COM port.
SUSI is not able to verify beforehand, whether communication with the device under service is established properly.
After initiating a firmware update, observe the messages displayed, to check that the process completes successfully without error.

8. Click ... to call up the file open dialog. Then, navigate to the firmware update file, select it in the dialog and click Open.

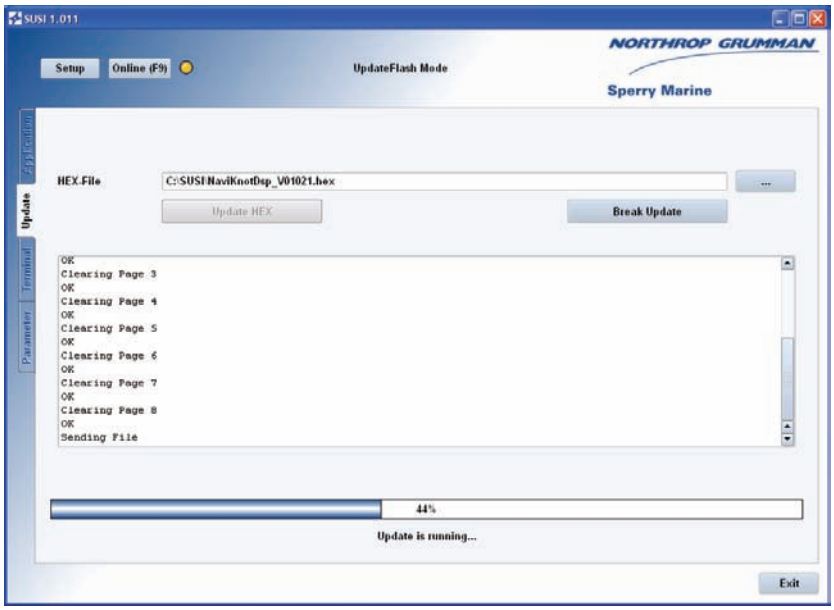


Note

The file open dialog searches for files with the extension ”.hex” only. In case the update file has been given another extension for any reason, the filename, including the complete access path, must be entered manually in the respective text box of the update tab.

9. Power up the device under service and put it into its firmware update mode. This normally requires that certain keys are kept pressed upon power-up, to prevent the device from entering normal operational mode. Refer to the respective device’s documentation for the exact procedure to follow in the case at hand.

10. In the update tab, click Update HEX to initiate the update. The bargraph at the bottom of the screen indicates the progress of the update:



11. Upon completion, a message should appear on the screen, that the software has been successfully updated.
12. The device should now reboot automatically with the new firmware.