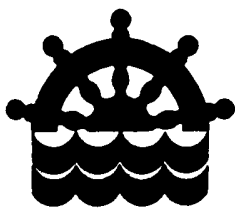


SCAN2000

Ver. 15. February 2001



Operation
and
Installation
manual



scan-steering

CONTENTS

PART I (Practical Information)

1. INTRODUCTION	3
2. MAIN UNIT	4
3. ELECTRONIC UNIT	5
4. CONTROL UNIT	7
5. INSTALLATION.....	8
5.1. Unpacking of Gyrocompass	8
5.2. Installation of Main Unit	8
5.3. Installation of Electronic Unit	9
5.4. Installation of Control Unit	9
5.5. Interconnection of Units and Power Supply	10
6. OPERATING PROCEDURE	11
6.1. Setting the latitude.....	12
6.2. Setting the Speed	12
6.3. Using the dimmer	13
7. ALARM AND REPAIR	13
8. TECHNICAL DATA.....	14
9. PLUG CONNECTIONS	17

PART II (Description)

10. DESCRIPTION INTRODUCTION.....	19
11. APPLICATION	20
12. GYROCOMPASS COMPOSITION	21
13. DESIGN AND OPERATION OF GYROCOMPASS.....	21
14. DESIGN OF GYROCOMPASS COMPONENTS.....	24

PART III (Drawings)

15. CONNECTION DRAWING	34
16. INSTALLATION DRAWINGS	35
17. CABLE DIAGRAMS (3 included cables).....	37

PART IV (Spareparts)

18. SPAREPART LIST	40
--------------------------	----

PART V (Distribution box)

19. OPTIONAL NMEA DISTRIBUTION BOX.....	41
---	----

PART VI (Connecting to existing Scan-Steering equipment)

20. CONNECTING SCAN 2000 TO EXCISTING HE 550/600 AUTOPILOT	42
--	----

1. INTRODUCTION

The present Manual contains all necessary information on installation, technical maintenance, and operation of gyrocompass SCAN 2000.

SCAN 2000 is used for indication of heading on all type of sea- and river going vessels with speed up to 90 Knots. It is based on the dynamically tuned gyroscope which provides for better accuracy and reliability of operation and simplifies the maintenance of SCAN 2000 (there is no need in flotation fluid change, extra heating or cooling, etc. which is required in nearly all other types of gyrocompasses).

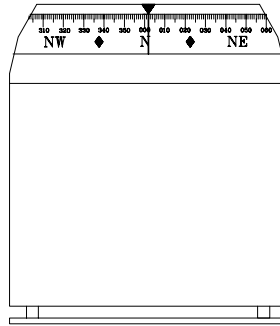
The basic model of SCAN 2000 incorporate the following units:

- Main Unit
- Electronic Unit
- Control Unit

The vessel's true heading can be read directly from the top or side of compass card of the Main Unit or from the digital display of the Control Unit. The output signals are either in international NMEA 0183 RS232/422 code or in the form of STEP voltage (6 steps/degree).

SCAN 2000 has automatic adjustment of speed and latitude when interfaced with GPS Navigator. Further speed and latitude can be adjusted manually. SCAN 2000 defines the heading against geographical meridian at the vessel speed up to 90 knots and latitude of navigation up to 75 degrees. Alignment of SCAN 2000 against meridian is made automatically.

2. MAIN UNIT



Main unit
Fig. 1.

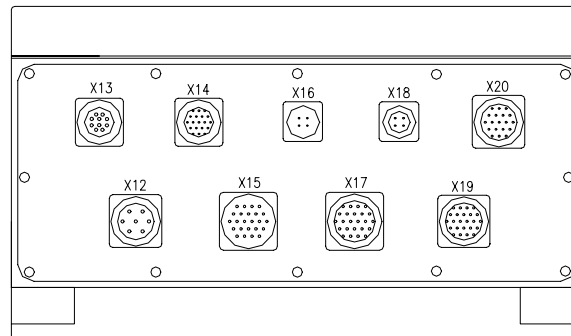
The Main Unit (Fig. 1) is a single-rotor adjusted gyrocompass based on a two-degree-of-freedom dynamically tuned gyroscope (DTG). DTG is rigidly secured to the inner gimbal of two-gimbal assembly. The outer gimbal has unlimited rotation in azimuth. The gimbal assembly is temperature stabilized. The compass card is mounted on top of the outer gimbal. The scale reads to 1 degree and is numbered from 0° to 360° every 10 degrees.

The casing of the Main Unit is comprised of a base and a transparent cover under which the compass card is located. Inside the Main Unit there is a gyro platform onto which the gyroscope and the accelerometer are secured by screws. Torques are mounted on the axes of the gimbal assembly. Two-degree-of-freedom suspension provides for the movement of the platform in horizontal and azimuth planes. Electrical signals are transmitted along the horizontal axes by flexible wires led through the hollow journals, along the vertical axes - with the help of a commentator.

There are two cable connectors for external cables in the lower part of the base, which connect the Main Unit with the Electronic Unit.

Longitudinal axis of the device is marked by two notches on the base.

3. ELECTRONIC UNIT



Electronic unit
Fig. 2.

The Electronic Unit (Fig. 2) is an analog-digital computer, which generates updating and control signals and secondary voltages necessary for the Main Unit operation. The Electronic Unit performs conversion of analog heading data into digital code.

The Electronic Unit contains 10 electronic circuit boards which are enclosed in a rectangular casing and secured by screw.

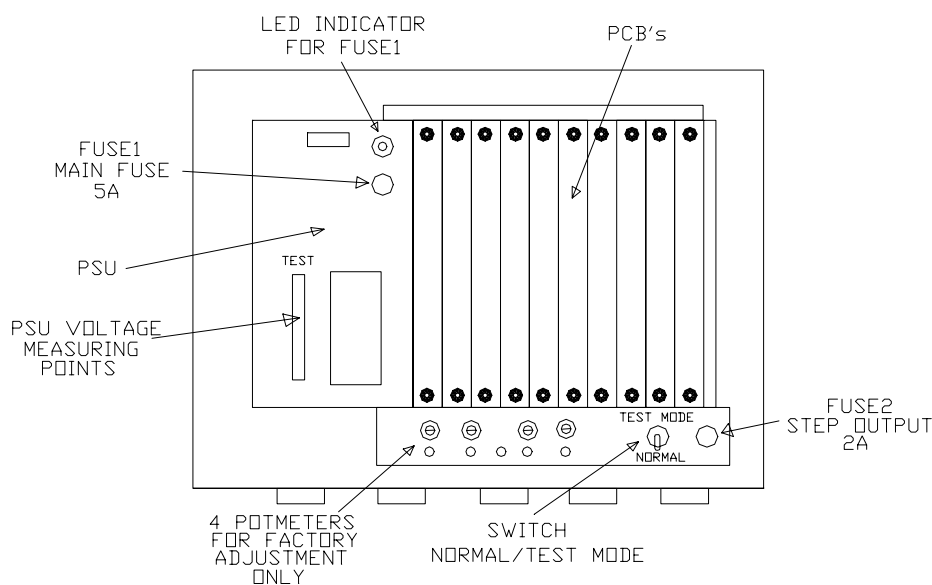
- Azimuth Channel Stabilization Amplifier Board
- Horizontal Channel Stabilization Amplifier Board
- Control Board
- Step Voltage Generation Board
- Conversion into NMEA 0183 Board
- Speed Input Board
- Heading Transformer Board
- Timer Board
- Gyro Motor Supply Board
- GPS Input Board
- Supply Unit.

In front of the Electronic Unit there is a lock that secures the top cover. Under the top cover, face sides of electronic circuit boards, two fuses, two potentiometers for gyro azimuth and horizontal drift compensation, two potentiometers for temperature component of gyro azimuth and horizontal drift compensation and mode selector are located.

On the left side of the casing there are nine electronic connectors for external cables. The Electronic Unit is connected to the Main Unit and the Control Unit. The power cable must be connected to the vessel's Mains: 24V DC, or to the optional PS 220 Power Supply.

When the cover of the Electronic Unit is opened (Fig. 2.1), there are two fuses, fuse1 is the main fuse (5A), if this fuse is faulty, a red LED near the fuse will show.

Fuse2 is the fuse for step output (2A).

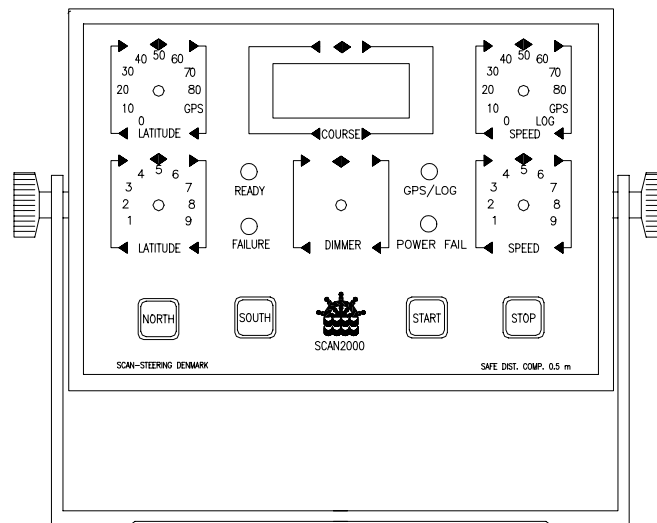


Electronic Unit

Fig. 2.1.

The switch (normal/test mode) located near fuse2, should always be in position **NORMAL**. Test mode is used only for factory adjustment.

4. CONTROL UNIT



Control unit
Fig. 3.

The Control Unit (fig. 3) performs operation control and indication of input and output data.

On the front panel of the Control Unit (fig. 3) there are:

- digital heading indication display
- indicator of readiness for operation "READY"
- general failure indicator "FAILURE"
- GPS failure indicator
- 24V Dc power failure indicators
- two buttons for "NORTH" and "SOUTH" latitude
- power on/off buttons "START" and "STOP"
- two multi-position speed control "SPEED"
- two multi position latitude control "LATITUDE"

Speed control "SPEED" has a position for an automatic input of vessel's speed from the GPS.

5. INSTALLATION

Installation and assembly of SCAN 2000 devices on the vessel can be performed after all construction, painting and decorating works are over.
Diagram of connections is given in Fig. 9 on page 34.

5.1. Unpacking of Gyrocompass

Unpacking of the equipment should be done with care
A visual inspection should be made to see that the equipment has not been damaged during shipment. All buttons and controls should be checked for freedom of movement.

5.2. Installation of Main Unit

The Main Unit is mounted on a rigid metal foundation without amortization and is secured with three 8 mm bolts through the oval holes in the casing (fig.10, p35).

It is recommended to place the Main Unit as close to the vessel's center of mass as possible so that deviations do not exceed:

- vertical axis +/- 10 m
- pitch axis +/- 5 m
- horizontal axis +/- 80 m

Absence of sudden temperature fluctuations is desirable. Sufficient free space around the Main Unit should be provided for service and maintenance operations.

The Main Unit is placed in such a way that its longitudinal axis marked by two notches on the base is parallel to the centerline of the vessel. The accuracy of positioning should not be worse than +/- 0.25°

Cable connectors of the Main Unit should face the bow of the vessel.

5.3. Installation of Electronic Unit

The Electronic Unit can be installed remotely from the Main Unit, but within two meter. It is secured with the help of a bracket or directly to the panel side with four 6 mm bolts.

During installation mind, please, that cable connectors located on the left side of the Electronic Unit must look downwards. It is important that there is easy access to the unit, for service reasons.

Also GPS NMEA input needs to be configured, either for RS422 input or RS232 input, this is done directly on the GPS PCB. Dipswitch setting is shown on PCB.

5.4. Installation of Control Unit

The Control Unit is secured to some vertical or horizontal plane on the vessel with the help of rotating bracket which ensures rotation of the casing about longitudinal axis. The bracket is secured with four 6 mm bolts.

The cable connector for the external cable is located on the bottom of the Control Unit casing.

It is recommended to install the Control Unit near the working place of the navigator to ensure convenient operation of switches and buttons.

5.5. Interconnection of Units and Power Supply

The Interconnection between the units of SCAN 2000 is made by means of cables with hermetized multiple-contact connectors. The required cables are supplied with SCAN 2000.

Before switching on SCAN 2000 please secure that all cable interconnections and earthing are correct and reliable.

Observe the polarity of the mains. Input supply voltage should be between the limits 19.0 and 29.0 Volts. Capacity of the power supply should not be less than 100 W.

6. OPERATING PROCEDURE

After all the units of SCAN 2000 have been located and secured, and the power cable has been connected:

- set SPEED control on Control Unit in "0" position
- set LATITUDE control on the Control Unit to the latitude of the vessel
- press START button on the Control Unit.
- Set hemisphere to either "NORTH" or "SOUTH" by using the pushbuttons on the front of the control unit

The value of the heading displayed on the Control Unit reflects the position of the gyroscope against the vessel's center plane at the moment of switching-on.

Alignment of SCAN 2000 against meridian is done automatically. Time of alignment depends upon the initial angular deflection of gyroscope from meridian and starting environmental conditions (temperature, initial position latitude, angle of tilt of the base) and takes up to 45 min.

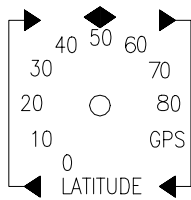
When the alignment procedure is over the green READY indicator on the front panel of the Control Unit comes on and the display will show the true heading. Maximum allowable error is $\pm 0.7^\circ$.

When operating from the GPS, set the SPEED and LATITUDE control to the "GPS" position.

To switch off the SCAN 2000 press the "STOP" button on the front panels of the Control Unit.

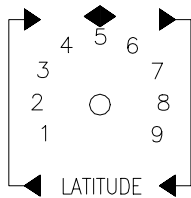
The SCAN 2000 gyrocompass is completely stopped after 5 min.

6.1. Setting the latitude

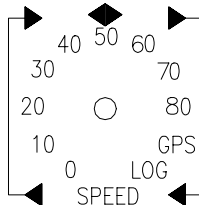


There are two buttons for setting the latitude. One button for selecting 10 step degrees and one button for selecting step degrees
 If you will use automatic LATITUDE set the LATITUDE button on "GPS"

Example: If you set the 10 step degrees on 20 and the single step on 4 you have set the latitude to 24 degrees.

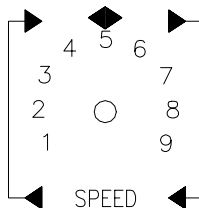


6.2. Setting the Speed

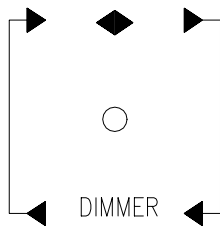


There are two buttons for setting the speed of the ship. One button for selecting 10 miles/hour and one button for selecting one mile at the time. If you will use automatic SPEED set the SPEED button on "GPS"

Example: If you set the selector for 10 miles/hour on 20 and the selector for one miles/hour on 2, the speed is set to 22 miles/hour



6.3. Using the dimmer



The dimmer button controls the light in the control box

Example: Turn the button clock ways and the light will increase and visa versa

On the Main Unit there is also located a dimmer, for regulation of illumination of the top scale. The dimmer is located on the foundation of the Main Unit. Functionality is the same as the dimmer located on the Control Unit.

7. ALARM AND REPAIR

SCAN 2000 has built-in test system for fault isolation. In case of failure fault signal is generated and the indicator "FAILURE" lights up on the front panel of the Control Unit.

When the fault is detected, press STOP button on the front panel of the Control Unit to turn off SCAN 2000. Check the voltage in the mains, make certain that the setting of latitude and speed are correct and after 2 - 5 minutes restart SCAN 2000. If the FAILURE indicator remains on the failure is permanent and you must contact an authorized Service Center.

Repair or replacement of the fault parts is performed by the authorized specialist from the Service Center, except the case when the reason of failure is the blown fuse located under the cover of the Electronic Unit.

8. TECHNICAL DATA

Time of Settling	Less than 45 min.
Tracking Speed	More than 200 deg./sec.
Accuracy at tracking speed of 6 ⁰ /sec.	0.1 ⁰
Settle Point (SP) Error	+/- 0.35 ⁰ @
Repeatability of SP Error	+/- 0.25 ⁰ @
Heading error in straight and uniform sailing	0.25 ⁰
Error Due to Rapid Change of Speed of 20 Knots	+/- 0.6 ⁰ @
Error due to rapid change at 180 ⁰	0.6 ⁰
Maximum operation speed	90 Knots
Maximum roll angle	45 ⁰
Maximum pitch angle	45 ⁰
Operation Latitude (South or North)	0 ⁰ - 75 ⁰

GPS input for auto latitude and speed	NMEA 0183 RS232/422 (4800,8,n,1) \$xxGLL,aaaa.aa,b,cccc.cc,d \$xxVTG,x.x.T,x.x,M,e.e,N,x.x,K (a = Latitude, b = N / S, c = Longitude, d = E / W, e = speed in
System Outputs	NMEA 0183 RS 422 (4800,8,n,1) \$HEHDT,xxx.x,T<CR>,<LF> 24Vdc Step (6 steps/degree) Positive Common
Error of heading data transmission the repeaters does not exceed :	0.1 deg. (NMEA output). 0.2 deg. (STEP output).
Power Input	24V DC
Power Consumption	Max. 50 W (Start-up Mode) Max. 30 W (Ready)
Operating Temperature	From - 10 to + 55 ^o C
Relative Humidity	Up to 98% at + 40 ^o C
Base Vibration Frequency with Acceleration up to 10 m/sq.s	5 - 80 Hz
Horizontal Acceleration at Vessel Swinging	Up to 1 m/sq.s

Weight:

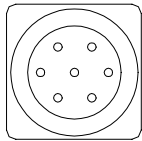
Main Unit	10 Kg
Electronic Unit	12 Kg
Control Unit	4.5 Kg

NOTE: The following optional power supply of GC is available:

- PS220 : 110 - 220 Vac 50/60 Hz power supply with automatic switch over to emergency 24Vdc supply

9. PLUG CONNECTIONS

X12

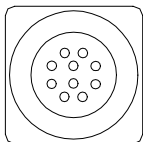


Plug X12 is the **24 Vdc** supply connection. :

Pin 1 : +24 Vdc

Pin 2 : 0 V dc.

X13



Plug X13 : **STEP** and **NMEA** Course output.

Pin 1 : step 1

Pin 2 : step 2

Pin 3 : step 3

Pin 4 : positive ref.

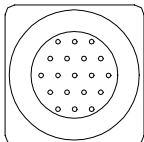
Pin 6 : NMEA 183 RS232 "HIGH"

Pin 7 : NMEA 183 RS232 "LOW"

Pin 8 : NMEA 183 RS422 "HIGH"

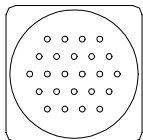
Pin 9 : NMEA 183 RS422 "LOW"

X14



Plug X14 is not used

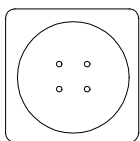
X15



Plug number X15 is interconnection between main compass and electronic unit

Cable supplied by Scan-Steering. Max 3m cable.

X16



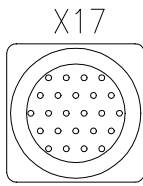
Plug X16 : **GPS** input (lat, speed).

Pin 1 : RS422 positive(HI)

Pin 2 : RS422 negative(LO)

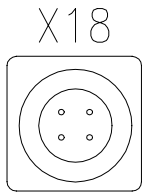
Pin 3 : RS232 Signal

Pin 4 : RS232 signal GND

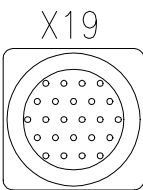


Plug number X17 is interconnection between main compass and electronic unit

Cable supplied by Scan-Steering. Max 3m cable.

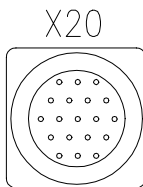


Plug number X18 is not used



Plug number X19 is interconnection between control unit and electronic unit.

Cable supplied by Scan-Steering. Max 3m cable.



Plug number X20 is not used

10. DESCRIPTION INTRODUCTION

The present Description is intended for the study of the article, its operating principle, design and application.

The following abbreviations and symbols are used in this Description:

GC	-	Gyro Compass
AA	-	Automatic Adjustment
DG	-	Directional Gyro
FSSAB	-	Follow-up Stabilization Systems Amplifier Board
GMSB	-	Gyro Motor Supply Board
VVDRB	-	Vessel s Velocity Data Reception Board
VHDFB	-	Vessel s Heading Data Forming Board in Interface NMEA 0183 RS232/422
SVFB	-	Step Voltage Forming Board
φ	-	Latitude of Vessel Location
R	-	Radius of the Earth
K	-	Vessel Heading
V	-	Vessel Velocity
K1, K2	-	Weighting Factors
$\omega_{dr.x}, \omega_{dr.z}$	-	Steady Components of Gyro Drift
Ucomp1, Ucomp2	-	Temperature Dependent Components of Gyro Drift
U	-	Angular Speed of Diurnal Earth Rotation
$\omega_{corr.z}$	-	Angular Speed of Azimuth Correction
$\omega_{corr.x}$	-	Angular Speed of Horizontal Correction
K_{rc} (K_{ro})	-	Rough Course

11. APPLICATION

The Scan 2000 Gyro Compass (GC) is designed for the indication of the heading of sea/river vessels.

GC provides:

- definition of vessel heading.
- automatic heading data transmission to analog and digital receivers.

GC is designed to operate in the following conditions:

- ambient temperature from - 10C to + 55 C
- relative humidity up to 98% at temperature of +40C
- base vibration with acceleration up to 10 m/sq.s from 5 to 80 Hz
- horizontal acceleration of vessel swinging up to 1 m/sq.s
- angular speed of vessel yawing more than 200 deg/s;
- magnetic fields (steady and variable) up to 80 A/m.

GC holds its parameters without any adjustment under the influence of the following factors:

- ambient temperature from -60 to +70 C (for the Main Unit from -50 to +70 C.
- base vibration with acceleration up to 10 m/sq.s from 5 to 80 Hz;
- long vessel tilts at angles of 45 degrees;
- angular speed of vessel yawing more than 200 deg/s;
- blows with acceleration up to 100 m/sq.s and pulse duration 10-15 ms.

12. GYROCOMPASS COMPOSITION

The basic Scan-2000 Gyrocompass incorporates the following units :

- Main unit (MU)
- Electronic Unit (EU)
- Control Unit (CU)

13. DESIGN AND OPERATION OF GYROCOMPASS

The functional diagram of gyrocompass is given in Fig.7,p32. The Scan-2000 is a single-rotor adjusted gyrocompass based on dynamically-tuned gyroscope (DTG).

DTG is mounted on the platform with the two-degrees-of-freedom suspension

DTG is rigidly secured on the inner frame of suspension so that the frame rotation axis lies along the DTG rotation axis. Inside DTG there are sensors which under misalignment of DTG rotor and casing in mutually perpendicular planes generate signals proportional to the angles of misalignment. These signals are amplified and transmitted to stabilization motors $AC\psi$ and $AC\kappa$, mounted on the axes of inner and outer frames. Motors $AC\psi$ and $AC\kappa$ drive misalignment signals to the null position and stabilize suspension frames in space.

In response to the signals from the Electronic Unit torquers AMx and AMz control gyroscope position. These torquers generate control and slaving moments along the axes of the inner frame. Torquers AMx and AMz are built-in, in the DTG.

Horizontal Indicator (HI) (accelerometer) ATN-S is mounted on the inner frame. HI generates the signal proportional to the angle of descend of gyroscope with reference to the horizontal plane.

DTG requires highly accurate system of stabilization. Thus, stabilization system's static error of the order of 1" results in steady drift with angular speed of 0.02 deg./h.

Stabilization System consists of pick-offs of DTG, control electronic circuit boards and direct drive motors.

Main features of stabilization system :

- direct drive motor.
- steady disturbing moments compensation.
- pulse-width modulation.

Control moments generated by signals of horizontal indicators and slaving moments generated by signals of Control Board in accordance with latitude and velocity are imposed directly on gyro rotor axis and bring it to the meridian and horizon. At a steady position the following voltages are applied to the torquers.

$$U_z = U \sin \varphi + \frac{V}{R} \sin K \tan \varphi + \omega dr.z + U_{comp1} + \frac{K1\beta}{\cos \varphi}$$

$$U_x = \frac{V}{R} \cos K + \omega dr.x + U_{comp2} + K2\beta$$

Correction circuit of the Control Board generates voltages proportional to the Earth rotation speed component $U \sin \varphi$, vessel velocity components

$$\frac{V}{R} \sin K \tan \varphi \quad \text{and} \quad \frac{V}{R} \cos K$$

and then they are applied to the inputs of corresponding adders. The value of horizontal indicator signal determines voltages proportional to $K1\beta$ and $K2\beta$. After amplification they are also applied to the adders which create voltages on torquers AM_x and AM_z . Sensitive element (DTG) axis is oriented against the North by $K1\beta$ signal (directing moment is created). Sensitive element axis is leveled by $K2\beta$ signal (damping moment is created).

Temperature compensation circuit generates components of gyroscope drift U_{comp1} , U_{comp2} which depend upon the ambient temperature. Temperature compensation circuit consists of temperature sensor, which is mounted on the platform next to DTG, and amplifier which has direct and inverse outputs with amplification adjustment.

Temperature compensation signals are applied to the torquers of gyroscope in accordance with its temperature characteristics. $\omega_{dr.z}$ and $\omega_{dr.x}$ are set manually with the help of potentiometers.

Motors AC_{ψ} and AC_k placed on the axes of DTG suspension bring suspension frames into position which is slaved to DTG rotor axis. Simultaneously azimuth motor AC_k turns two course detectors CKTA and CKT. CKTA is intended for signal-to-code conversion. CKT outputs correcting signals into translator.

Heading data received from CKTA are converted into 14-bit parallel code on the Heading Transformer board which is then transmitted to the former of international code NMEA version 0183 R232/422. After that it goes to the users and to the Control Unit display.

Data on latitude and vessel velocity are when set manually by using the toggle switches on the Control Unit received by Control Board in the form of analog signals: V , $\sin\phi$ and $\cos\phi$.

When using an external GPS unit for latitude and velocity, the NMEA 0183 signal from GPS goes into the GPS board, where latitude is transformed into analog signals: $\sin\phi$ and $\cos\phi$.

Vessels velocity is transformed into an 8 bit binary signal. Both signals are transmitted to the Control Board.

The mode of velocity and latitude data input (auto or manual) is set by command from Control Unit. The toggle switches is set into position GPS for automatic latitude and velocity input. In manual mode the Speed of vessel and latitude of the place is to be set.

14. DESIGN OF GYROCOMPASS COMPONENTS

The block diagram of the SCAN 2000 Gyrocompass is given in the Fig. 8, p33.

The Main Unit includes the following units:

- sensitive element, dynamically tuned gyroscope (DTG).
- accelerometer AT.
- two torquers AMx, AMz.
- course detectors CKTA, CKT.
- commutator.
- damper.

Electronic Unit is an analog-digital computer which generates correcting and control signals and secondary voltages necessary for operation of the Main Unit.

Besides, Electronic Unit performs conversion of analog heading data into digital code which is used by the different devices.

Electronic Unit includes the following articles:

- FSSAB of azimuth channel.
- FSSAB of horizontal channel.
- Control Board.
- SVFB.
- NMEA 0183 RS232/422 VHDFB.
- VVDRB.
- Heading Transformer Board.
- Timer Board.
- GMSB.
- GPS Board.
- Supply unit.

FSSAB contains the components of gyro platform stabilization systems at angles K and ψ . FSSAB provide the follow-up of gyroscope orientation in horizon and in azimuth. Pick-offs of gyro unit generate AC signals with frequency of 19.2 kHz, which are applied to the inputs of preamplifiers. They are demodulated and transmitted to equalizer which performs frequency correction of the signals received from pick-offs.

From equalizers signals are transmitted to width-pulse modulator and after modulation - to the Main Unit torquers AM at each channel of gyro platform stabilization.

Control Board is designed for the shaping of signals of control moments which are applied to gyro unit, that is for control of gyro unit movement in space.

Control signals are formed on the basis of the data received from Horizontal indicator and Control Unit.

Signal from the North Horizon Indicator β is enforced by preamplifier and through inertia member is transmitted to the adders which generate control voltage

$$\frac{K1\beta}{\cos \vartheta} \quad \text{and} \quad K2\beta$$

of torquers AMx and AMz.

Components of control signals are also applied to the inputs of the above mentioned adders.

to the adder of azimuth torquer AMx:

$U\omega_{dr.x}$ - voltage proportional to azimuth drift of gyroscope.

$\frac{V}{R} \sin Ktg\varphi$ - voltage of latitude-velocity correction.

$U \sin \varphi$ - voltage of correction of vertical component of Earth rotation speed.

U_{comp1} - voltage of correction of temperature azimuth drift.

to the adder of horizontal torquer AMz:

$U\omega_{dr.z}$ - voltage proportional to horizontal drift of gyroscope;

$\frac{V}{R} \cos K$ - voltage of velocity correction;

U_{comp2} - voltage of correction of temperature horizontal drift.

Value of the voltage proportional to the angle β may change in accordance with the operating mode: "DG", "AA" and "GC". Voltage change is controlled by Control Board and Timer Board.

Control voltages are transmitted from adders through voltage-to-current converters to the control windings of torquers of the gyro unit.

On the basis of external data K , V , $\sin\phi$ and $\cos\phi$, analog digital computer derives dependences :

$$\frac{V}{R} \sin K \tan \phi \quad , \quad \frac{\beta}{\cos} \quad \text{and} \quad \frac{V}{R} \cos K$$

The VVDRB is provided for reading and converting of vessel's velocity signals into 8-bit digital code upon data received from two types of logs, and for temperature compensation upon signals of temperature sensor.

Heading Transformer Board converts analog signals of GC course detector into 14-bit parallel code of heading K . The board generates two standard voltages for stator windings of course detector CKTA in the Main Unit.

Timer Board generates fundamental frequencies 19.2 kHz, 12.8 kHz, 480 Hz. Besides it generates commands necessary for gyrocompass start-up and operation according to the timed start-up :

"Preparation", "Adjustment", "Horizont", "AA-GC", "GC-DG", "GC" and "Failure".

Timer Board operates together with Supply Unit, GMSB and Control Board.

GC is operated from the vessel's mains (24 +/- 20%). Supply Unit generates standard voltages:

+ 5V.

+ 8V.

+/-15V.

+/-19V.

12V 480Hz single-phase ac. for stator windings of course
detector rough reading.

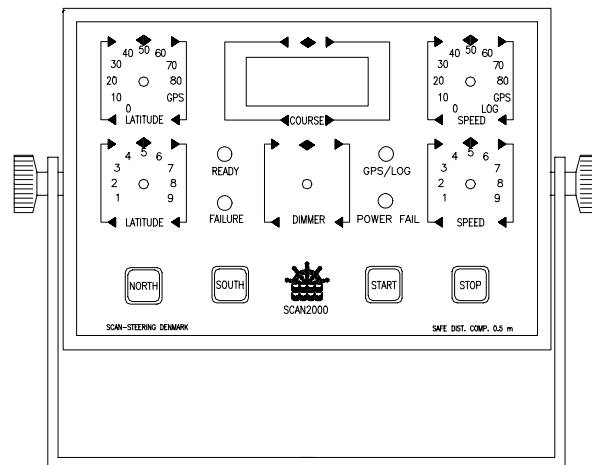
20V of single-phase ac. for GMSB

10V of single-phase ac. for GMSB

The GMSB provides power supply for gyro motor:

10V 480Hz of two-phase ac. in operating mode;

20V 480Hz of two-phase ac. in boosting mode.

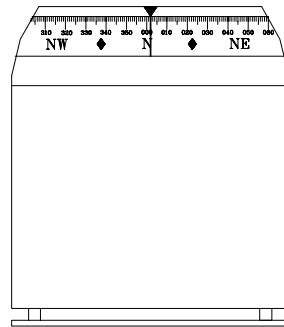


Control unit
Fig. 4.

On the front panel of the Control Unit (Fig.4) the following controls are located:

- on button.
- off button.
- North and South button for position of latitude.
- toggle switches for manual and automatic input of "V" and "φ".
- LCD heading indication display.
- green LED indicating that GC is in meridian.
- red LED indicating the failure of system.
- red LED indicating power failure.
- red LED indicating missing or faulty GPS signal.

Dimensions of Control Unit are 260x220mm.



Main unit
Fig. 5.

The Main Unit (Fig.5), which provides heading data, is enclosed in a cylindrical cast casing with dimensions 240x280mm. On the top of it there are two heading scales, one on the side and one on the top.

The casing consists of two parts: the cover and the base. The cover is secured to the base with four screws located at the angles of the base.

The device contains the gyro platform, on which the gyro unit and accelerometer AT are mounted. Two-degrees-of-freedom suspension provides the movement of the platform in horizontal and azimuth planes.

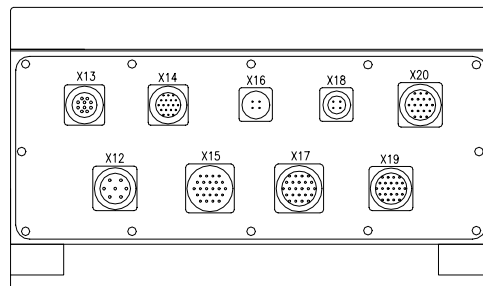
Gyro unit and accelerometer are secured to the platform with screws. They are connected electrically through connectors.

Torquers of AM type are mounted on the axes of suspension. Course detectors CKTA and CKT and heading scale are mounted along the azimuth axis. The scale reads to 1 degree. The scale is numbered from 0 to 360 degrees every 10 degrees. Electrical signals are transmitted along the horizontal axes by flexible wires led through the hollow journals, along the vertical axis - with the help of commutator.

There are two connectors of 2PMTA type for the external cable in the lower part of the base.

The Main Unit is mounted on the rigid metal foundation without amortization and secured with three bolts through the oval holes in the case base.

Longitudinal axis of the device is marked by two notches on the base. The device is aligned parallel to vessel's centreplane with the help of these notches.

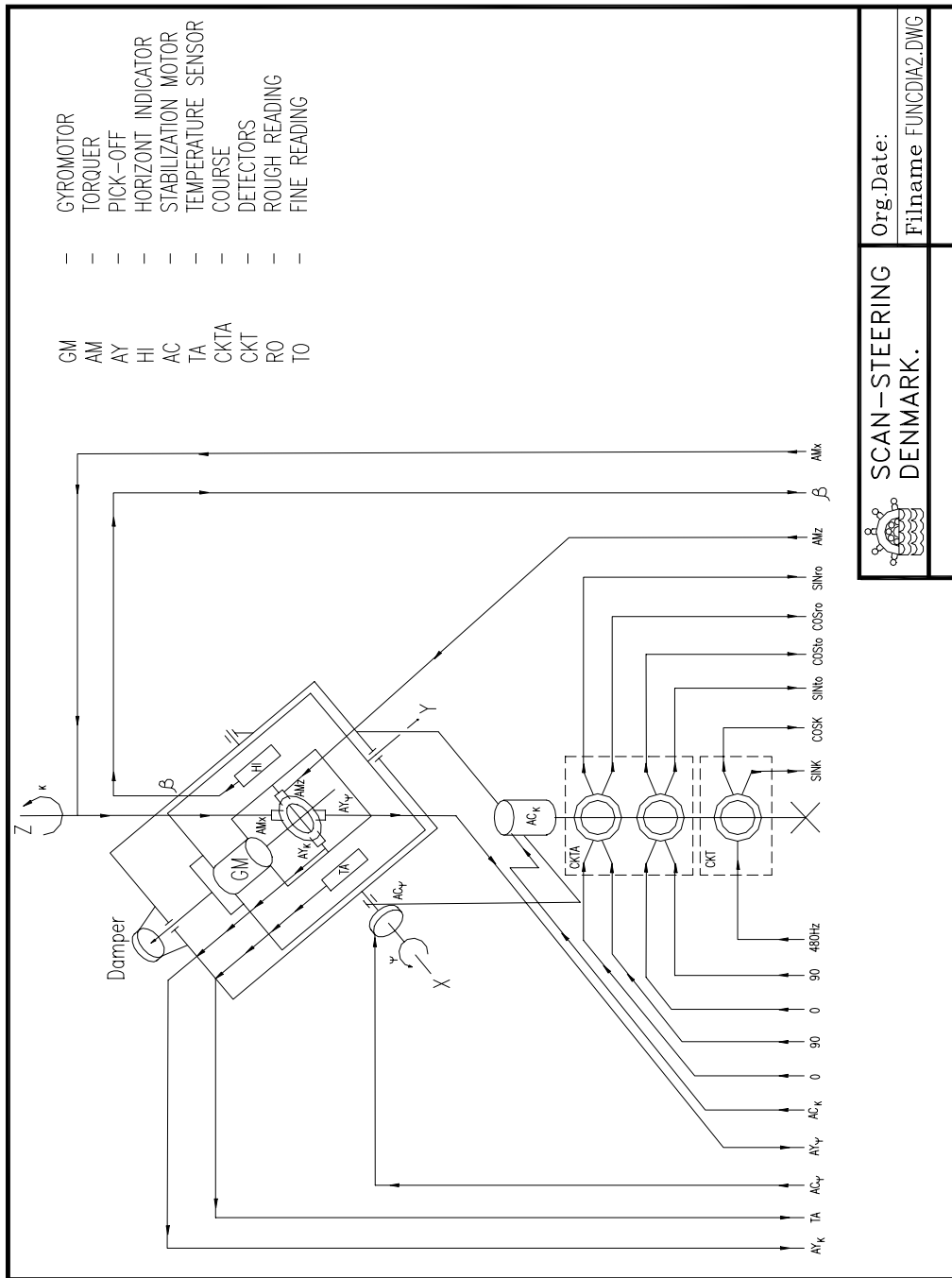


Electronic unit
Fig. 6.

Electronic Unit (Fig.6), which provides control and supply voltages to the GC , is enclosed in a rectangular casing with overall dimensions of 345x280x200mm. It contains 10 electronic circuit boards.

The device has two covers: back cover prevents the access to electrical circuitry of device, under front cover face sides of electronic circuits boards are located. Electronic circuit boards are secured to the casing by screws.

On one side of the device there are 9 electrical connectors of 2PMTA type which are intended for external cables connection. The device is secured to the deck without amortization by bolts.

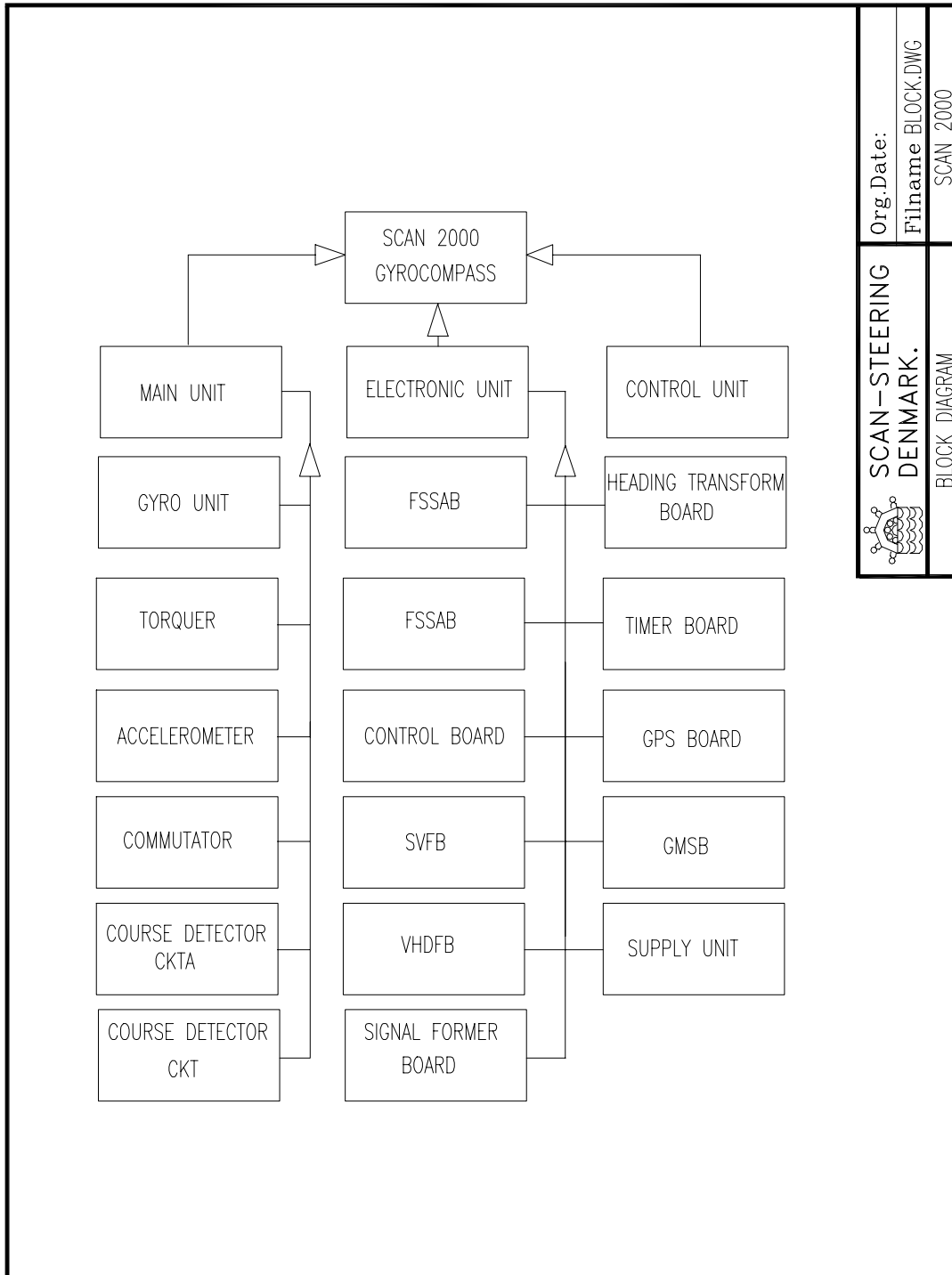


SCAN-STEERING
DENMARK.

Org. Date:
Filename: FUNCDIA2.DWG

SCAN 2000 FUNCTIONAL DIAGRAM

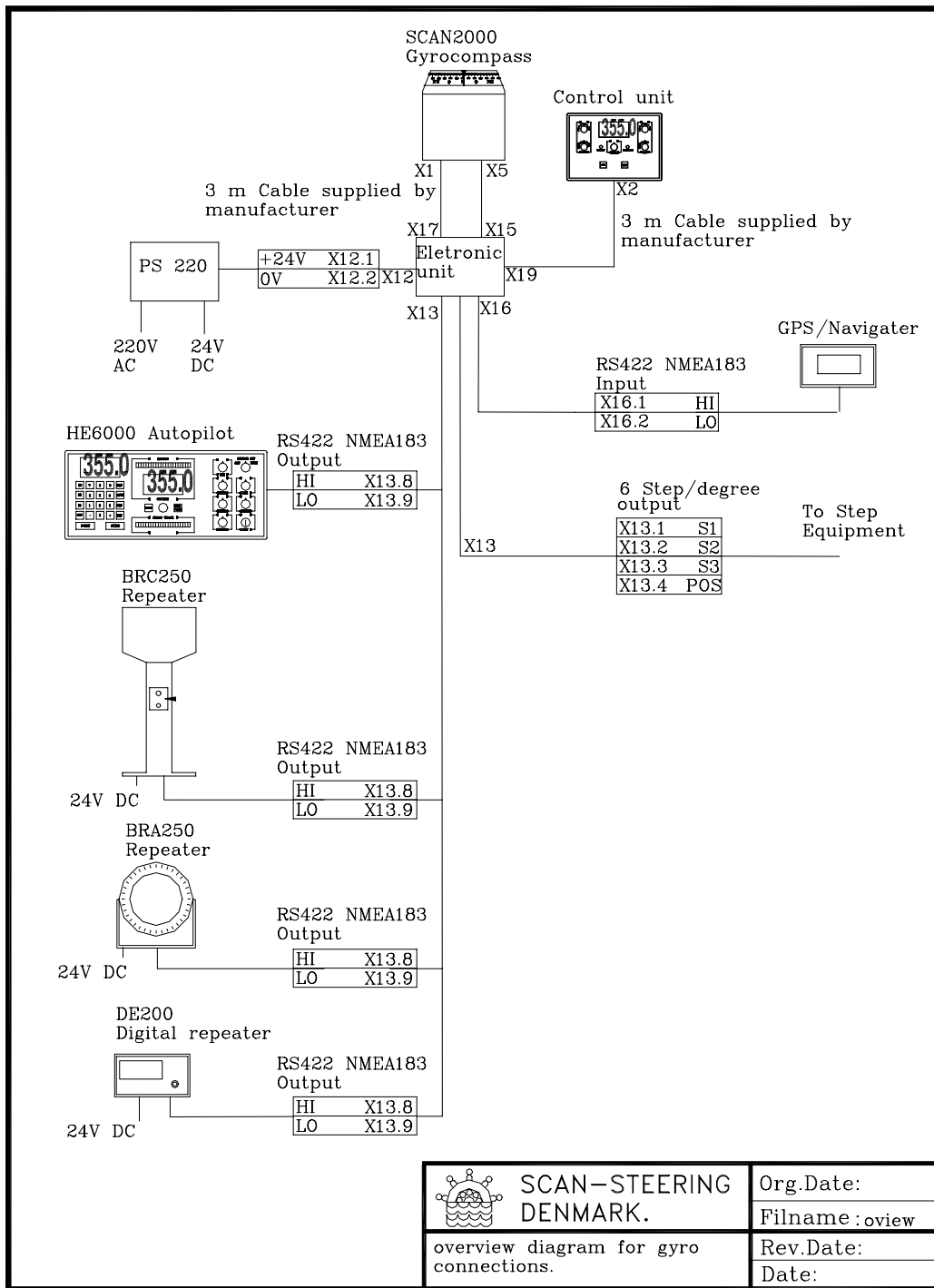
Fig. 7.



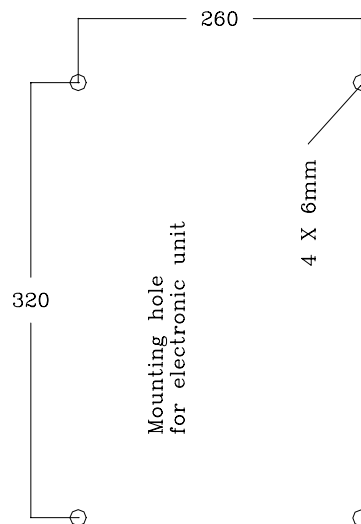
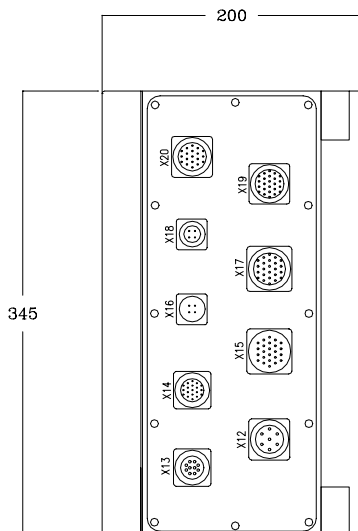
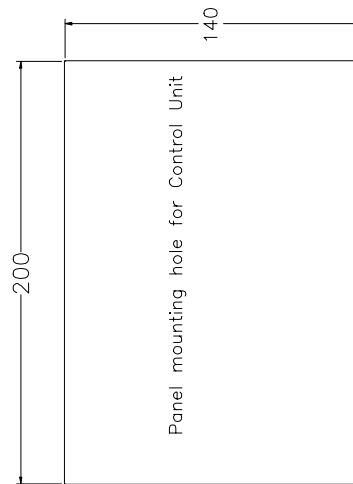
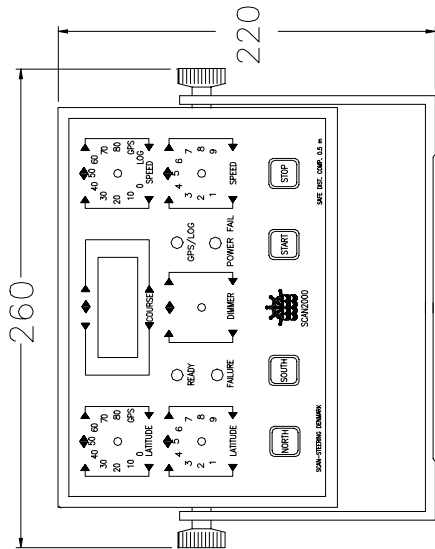
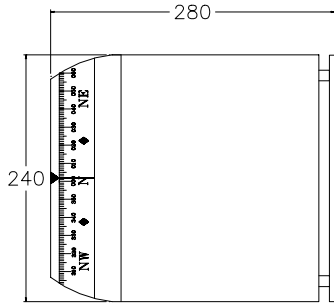
SCAN 2000 BLOCK DIAGRAM

Fig. 8.

15. CONNECTION DRAWING




Connection Diagram
Fig. 9.



17. CABLE DIAGRAMS (3 included cables)

CABLE DESCRIPTION			
Main Unit X1		Electronic Unit X17	
No	Color	Description	No
1	Red	1st. Phase Pick-off Supply	1
2	Blue	2nd. Phase Pick-off Supply	2
3	Green	1st. Phase Gyromotor Supply	3
4	Yellow	2nd. Phase Gyromotor Supply	4
5	White	Common Gyromotor Supply	5
6	Black	U excitation 0 deg. (code)	6
7	Brown	U excitation 90 deg. (code)	7
8	Violet	U excitation Common	8
9	Orange	Pick-off screen (code)	9
10	Pink	U exc. 0 deg. fine reading	10
11	Turquoise	U exc. 90 deg. fine reading	11
12	Grey	U exe. fine reading common	12
13	Red/Blue	Transformer, 1st. Phase	13
14	Green/Red	Transformer, 2nd. Phase	14
15	Yellow/Red	Common +/- 15V	15
16	White/Red	+15V	16
17	Red/Black	-15V	17
18	Red/Brown	+24V (light)	18
19	Yellow/Blue	Common +24V	19
20	White/Blue	Torquer Z (Course)	20
21	Blue/Black	Torquer Z (Course)	21
22	Orange/Blue	Torquer X	22
23	Yellow/Green	Torquer X	23
24	White/Green	Casing	24

Screened Cable, 0.35mm² Cores.

	SCAN-STEERING DENMARK.	31/10-96
	Cable X1 - X17	Filename: X1_X17
		Rev.Date:
		Date:

X1 - X17 Cable Description

CABLE DESCRIPTION

Controle Unit X2	Color	Description	Electronic Unit X19
No			No
1	Red	RS232 Signal	1
2	Blue	RS232 Signal GND	2
3	Green	+8V	3
4	Yellow	Common +8V	4
5	White	+15V	5
6	Black	Common +/- 15V	6
7	Brown	-15V	7
8	Violet	GyroCompass ON	8
9	Orange	Common ON/OFF	9
10	Pink	GyroCompass OFF	10
11	Turquoise	Ready Signal	11
12	Grey	Failure Signal	12
13	Red/Blue	Latitude Sin	13
14	Green/Red	Latitude Cos	14
15	Yellow/Red	N/S Hemisphere	15
16	White/Red	Speed (V)	16
17	Red/Black	LOG Selected	17
18	Red/Brown	+5V	18
19	Yellow/Blue	Manual Speed	19
20	White/Blue	GPS Selected	20
21	Blue/Black	Common +5V	21
22	Orange/Blue	GPS-Latitude/Log Status	22
23	Yellow/Green	GPS-Speed Status	23
24	White/Green	Common +24V	24

Screened Cable, 0.35mm² Cores.

	SCAN-STEERING DENMARK.	31/10-96
	Cable X2 - X19	Filename : X2_X19
		Rev.Date:
		Date:

X2 - X19 Cable Description

CABLE DESCRIPTION

Main Unit X5			Electronic Unit X15	
No	Color	Description	No	
1	Red	Pick-off Screen	1	
2	Blue	Pick-off Z (course)	2	
3	Green	Pick-off Z Common	3	
4	Yellow	Torquer X (course)	4	
5	White	Torquer X Common	5	
6	Black	Pick-off X	6	
7	Brown	Pick-off X Common	7	
8	Violet	Torquer Z	8	
9	Orange	Torquer Z Common	9	
10	Pink	Accelerometer	10	
11	Turquoise	Accelerometer Common	11	
12	Grey	Sin Heading Rough	12	
13	Red/Blue	Sin Heading Rough	13	
14	Green/Red	Pick-off Screen	14	
15	Yellow/Red	Cos Heading Rough	15	
16	White/Red	Cos Heading Rough	16	
17	Red/Black	Sin Heading Fine	17	
18	Red/Brown	Cos Heading Fine	18	
19	Yellow/Blue	Sin Heading of Sin/Cos Trafo	19	
20	White/Blue	Cos Heading of Sin/Cos Trafo	20	
21	Blue/Black	Common Sin/cos Heading	21	
22	Orange/Blue	Temperature Sensor	22	
23	Yellow/Green	Temperature Sensor	23	
24	White/Green	Not Used	24	

Screened Cable, 0.35mm² Cores.

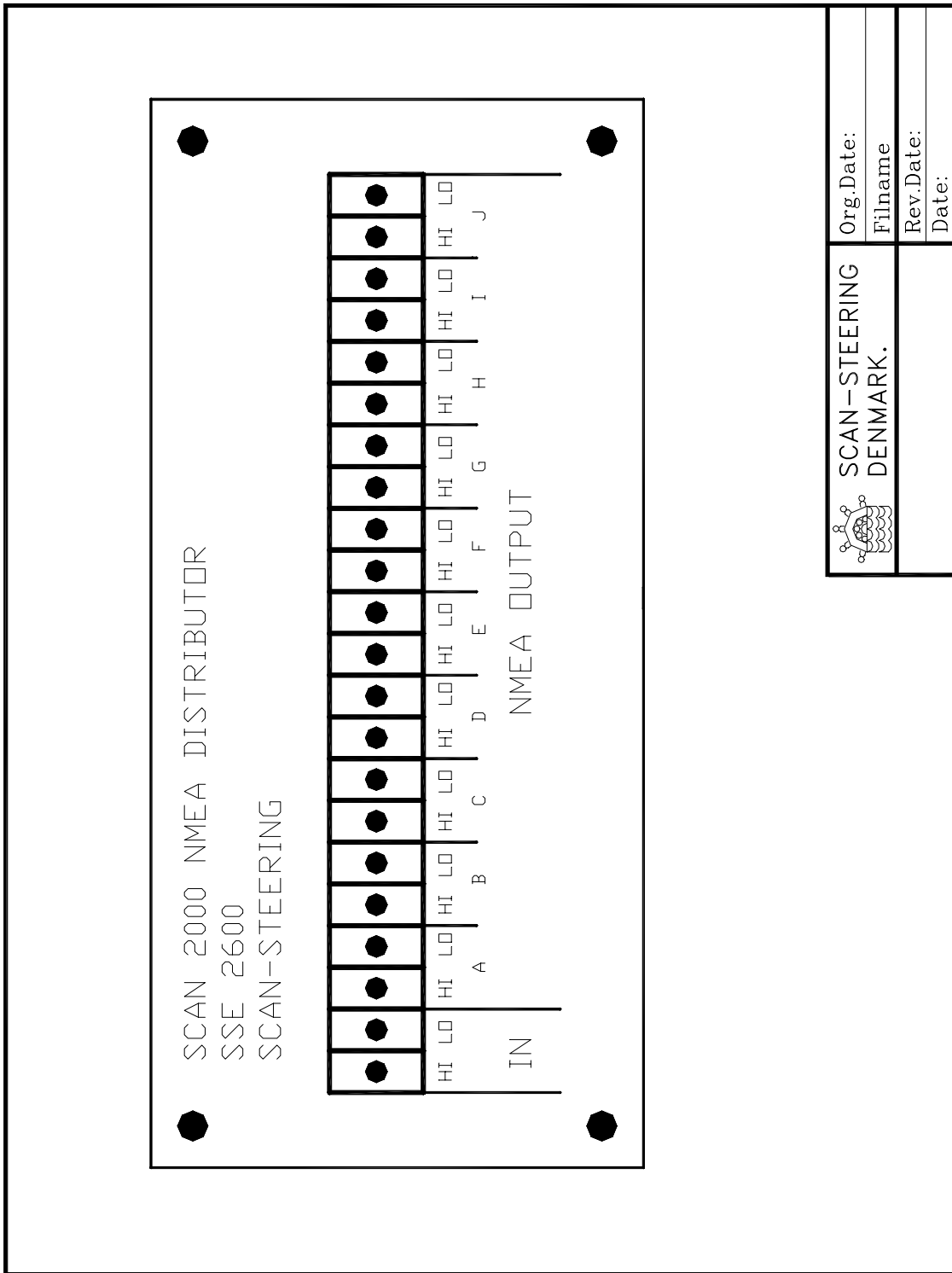
	SCAN-STEERING DENMARK.	31/10-96
	Cable X5 - X15	Filename : X5_X15
		Rev.Date:
		Date:

X5 - X15 Cable Description

18. SPAREPART LIST

ITM	Description	Part Number
1	SCAN2000 Main compass	2000-100
2	SCAN2000 Electronic unit	2000-200
3	SCAN2000 Control unit	2000-300
4	Gyroscope	2000-100-001
5	Accelerometer	2000-100-002
6	Lamps for Main compass	2000-100-003
7	Cable X1 - X15	2000-100-004
8	Cable X5 - X17	2000-100-005
9	Shock	2000-100-006
11	Power supply PCB	2000-200-001
12	Gyro Moto supply PCB	2000-200-002
13	Control PCB	2000-200-003
14	Timer PCB	2000-200-004
15	Speed input PCB	2000-200-005
16	Azimuth/Horizontal channel stabilization amplifier PCB	2000-200-006
17	Heading transformer PCB	2000-200-007
18	NMEA Code PCB	2000-200-008
19	Step voltage generation PCB	2000-200-009
20	Cable X19 - X2	2000-200-010
21	X12 Power Plug	2000-200-011
22	X13 Step / NMEA Output Plug	2000-200-012
23	X16 GPS Input Plug	2000-200-013
24	SSE2200 V1.1 PCB	2000-300-001
25	SSE2300 V1.2 PCB	2000-300-002

19. OPTIONAL NMEA DISTRIBUTION BOX



 SCAN-STEERING DENMARK.	Org.Date:
	Filename
	Rev.Date:
	Date:

20. CONNECTING SCAN 2000 TO EXCISTING HE 550/600 AUTOPILOT

When connecting the Scan 2000 Gyrocompass to the HE 550/600 autopilot, the connection must be done using the step output from the gyrocompass.

The Connections are :

Scan-2000		HE-550/600
Plug X13		
1	-	68
2	-	69
3	-	70
4	-	71

WARNING : On the ANALOG PCB of the HE 550/600 Autopilot there is a plug (P1B) Check if there is a short between pin8 and pin12, if this short exists it must be removed!. This is very important, in case the short is not removed, it could cause permanent damage to both Autopilot and Gyrocompass.

Also on the Analog PCB of the HE 550/600 there is a socket mounted with 3 resistors and 3 shorts, in a plug. This plug is for POS/NEG step reference, it must be the positive type (fig. 2.1)

On the CPU PCB inside the HE 550/600 autopilot there is a EPROM containing the program for the pilot, this EPROM must be of type **VSD1 v10**.

How to get the correct gyro course into the HE 550/600 when connected and both gyro and autopilot is started :

- Key in the course of the gyro on the pilots keypad.
- Press ENTER on the pilot.
- Now press the GYRO button and hold it for about 6 sec.

Now the gyro-course will be transmitted to the COURSE display of the pilot.