NX2

SERVICE MANUAL

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SILVA

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INTRODUCTION

This service manual will give you the basic information how to perform faultfinding and testing on the SILVA NX2 navigation system.

Silva have used a new double moulding technology and high precision assembling procedure with a new gluing robot, hereby reaching the IP68/IP66 standard for all instruments.
This means that the NX2 instruments are sealed and can not be opened.

When finding a fault in a NX2 Instrument it has to be replaced and returned to Silva according to the NX2 exchange system.

As faults and male function in the electronics of the NX2 System is very rare it is essential to start checking wiring and connections on board the boat.

Also the settings in Set up and calibration have to be checked before judging the instrument as faulty.

Faultfinding on instruments and transducers connected in a complete NX2 system, on board a vessel is well supported by signal sensors on all transducer inputs of the Server.

With our NX2 exchange system, it is possible to obtain effective service without much effort regarding time and tools.

In order to handle returns and warranty claims in a quick and safe way Silva Sweden ask you to complete a NX2 Return Form for every returned unit.

This service manual will be upgraded with complementary information when necessary and questions concerning service matters are always welcome to and answered by undersigned.

Sollentuna, 17 February 2003
SILVA Sweden AB

Kjell Sahlberg
Service Manager

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1. GENERAL INFORMATION

The Silva NX2 system is based round a central network manager, i.e. the Server, see § 2.3. All transducers are connected to the Server which transmits data on a Bus to all connected instruments.

In a limited system also the Wind Data, Compass Data and AUTOPILOT servo can be the network manager.

The communication is of bus type, which means that information is transmitted constantly and that each instrument reads the bus to collect data. The bus is RS 485. See § 2.

Silva NX2 can have a maximum of 32 communicating units, such as instruments, Autopilot etc.

The NX2 Speed instrument can also work stand-alone, in this case the Log transducer is connected direct to the instrument.
When upgrading with a Server the connection of the Log transducer should be moved to the Server.

Silva NX2 instrument series is build according to IP68/IP66 standard which means that the instruments are sealed and can not be opened.

Before starting a service procedure, check that the customer has all basic settings correct.

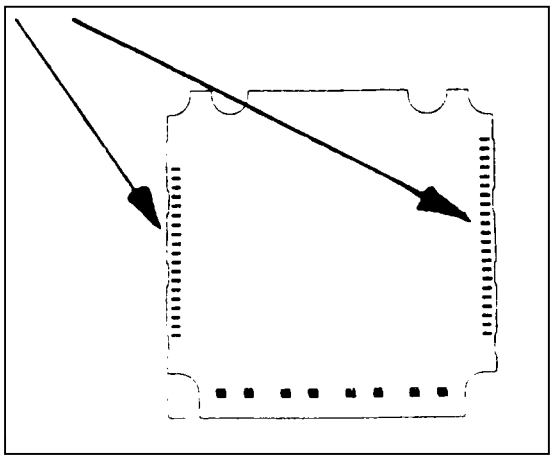
Remedy in a NX2 system with customer claim should always start with a thorough check according to the checkpoint list, see § 5.5 NX2 Faultfinding Guide.
In most instances, repair is effected by replacing the defective unit with SILVA NX2 exchange system. The Server and Wind, Compass and GPS transducers can be repaired.

The water moisture, which all marine equipment are exposed to, have been closely investigated. The following details will prevent moisture problem:

- Instrument front and window are produced as one pies in a new double moulding technology giving no possibility for water intrude of the front.
- Push buttons are made out of a new silicone material.
- The Instrument front and the back cover are integrated in a new gluing robot
- No mounting screws through the front eliminates water ingress of the instrument.
- The absence of an instrument gasket eliminates any possibility for water ingress of the front.
- A Gore-tex™ membrane, covers a venting hole in the back cover. This will give possibility for pressure balancing and air to circulate in a slow tempo, avoiding sudden changes with the risk of moisture in the instrument.

- The air volume inside the instrument is kept to a minimum.

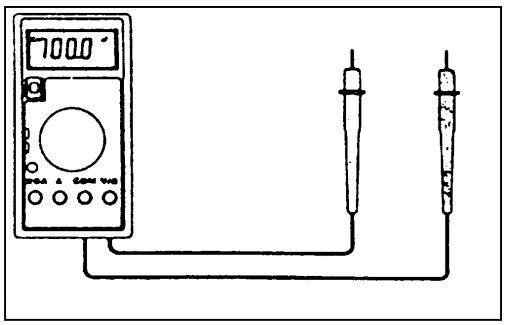
The contact points on the digital PCB are gold plated which will avoid oxide from developing with weak display segments as a result.



Fault solving - NX2 Exchange System

The NEXUS NX2 System is adapted to an Exchange system of Instruments that easily can be replaced if a fault is detected according to §5: NX2 FAULTFINDING AND TESTS ON BOARD.
The national SILVA distributor keeps stock of NX2 Instruments to give the customer a fast, safe and quick service.

Equipment for trouble shooting on board §5: NX2 FAULTFINDING AND TESTS ON BOARD and Digital multi-meter.



Repair of faulty Instruments

A faulty NX2 Instrument can only be repaired by Silva due to the high precision re-assembling procedure and the special routines in the gluing robot.

Software Version

On every SILVA Instrument the software version is shown on the display during the starting up procedure.
Moreover the software version is marked on the Type label on the back cover.

1.1 RELATED NX2 DOCUMENTS, OPERATION MANUALS AND PRODUCT TYPE NUMBERS

APPENDIX
A. NEXUS Network Specification
B. Full Duplex NEXUS specification version 1.07
C. NEXUS NMEA 0183 Input/Output, version 1.1
D. NEXUS Network Software Versions
E. NMEA Standard 0183

GB = English, D = German, F = French, S = Swedish

User Manual Art. No.	NX2 Product & Product Art. No.	Language
22172-1	Server (22120-1)	GB
22172-2	Server (22120-1)	S
22172-3	Server (22120-1)	D
22172-4	Server (22120-1)	F
22133-1	Multi Control (22117-3)	GB
22133-2	Multi Control (22117-3)	S
22133-3	Multi Control (22117-3)	D
22133-4	Multi Control (22117-3)	F
22131-1	Speed Log (22117-1)	GB
22131-2	Speed Log (22117-1)	S
22131-3	Speed Log (22117-1)	D
22131-4	Speed Log (22117-1)	F
22137-1	Autopilot Inst., Servo, RAT (22117-7)	GB
22137-2	Autopilot Inst., Servo, RAT (22117-7)	S
22137-3	Autopilot Inst., Servo, RAT (22117-7)	D
22137-4	Autopilot Inst., Servo, RAT (22117-7)	F
22134-1	Wind Data (22117-4)	GB
22134-2	Wind Data (22117-4)	S
22134-3	Wind Data (22117-4)	D
22134-4	Wind Data (22117-4)	F
22135-1	Compass Data (22117-5)	GB
22135-2	Compass Data (22117-5)	S
22135-3	Compass Data (22117-5)	D
22135-4	Compass Data (22117-5)	F
22136-1	GPS Navigator (22117-6)	GB
22136-2	GPS Navigator (22117-6)	S
22136-3	GPS Navigator (22117-6)	D
22136-4	GPS Navigator (22117-6)	F
22002-12	GPS Antenna (21970)	GB, S
22002-34	GPS Antenna (21970)	D, F
22138-1	Instrument Analogue (2217-01 to 22117-13)	GB
22138-2	Instrument Analogue (2217-01 to 22117-13)	S
22138-3	Instrument Analogue (2217-01 to 22117-13)	D
22138-4	Instrument Analogue (2217-01 to 22117-13)	F
	Remote Control Instrument (21210-903)	GB
	Remote Control Instrument (21210-903)	S
	Remote Control Instrument (21210-903)	D
	Remote Control Instrument (21210-903)	F

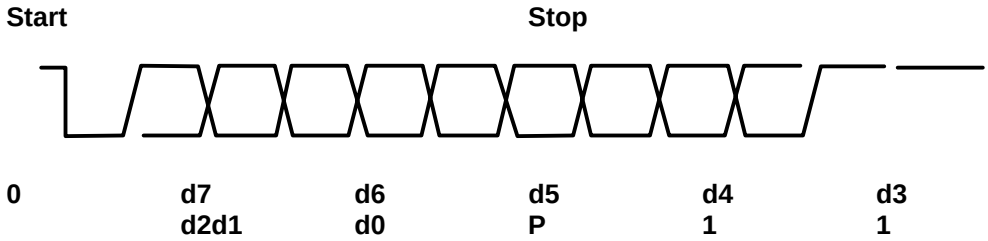
	Multi XL (22308-1)	GB
	Multi XL (22308-1)	S
	Multi XL (22308-1)	D
	Multi XL (22308-1)	F

User Manual Art. No.	Product & Product Art. No.	Language
21646-1	Multi Center (21621)	GB
21646-2	Multi Center (21621)	S
21646-3	Multi Center (21621)	D
21646-4	Multi Center (21621)	F
67701-2	Pumpset PF-0.3 / S (21341+21341-24)	GB
	Pumpset PF-0.3 / S (21341+21341-24)	S
	Pumpset PF-0.3 / S (21341+21341-24)	D
	Pumpset PF-0.3 / S (21341+21341-24)	F
67703-1	Linear Drive AN-23 (21136)	GB
	Linear Drive AN-23 (21136)	S
	Linear Drive AN-23 (21136)	D
	Linear Drive AN-23 (21136)	F
67705-1	Linear Drive SP-20 (21136-2)	GB
	Linear Drive SP-20 (21136-2)	S
	Linear Drive SP-20 (21136-2)	D
	Linear Drive SP-20 (21136-2)	F
67704-1	Integrated Drive HP-40 (69991-12)	GB
	Integrated Drive HP-40 (69991-12)	S
	Integrated Drive HP-40 (69991-12)	D
	Integrated Drive HP-40 (69991-12)	F
	Connection Box NX2/Nexus Bus (21456)	GB
67705	Connection Box Wind/Compass Data (21453)	GB
67706	MTC box (21721)	GB
21730	Server Simulator (20592-2)	GB
	Mounting instructions	
20706-1	Log / Temp transducer (20707)	GB
20706-2	Log / Temp transducer (20707)	S
20706-3	Log / Temp transducer (20707)	D
20706-4	Log / Temp transducer (20707)	F
20728-1	Wind transducer (20721)	GB
20728-2	Wind transducer (20721)	S
20728-3	Wind transducer (20721)	D
20728-4	Wind transducer (20721)	F
20867-1	Compass transducer 45° (20860)	GB, S, D, F
21751	Compass transducer 35° (21731)	GB, S, D, F
20867-1	Compass transducer 35° (21731)	GB
20867-2	Compass transducer 35° (21731)	S
20867-3	Compass transducer 35° (21731)	D
20867-4	Compass transducer 35° (21731)	F
	Other	
20917	Warranty Card	GB
20919	Representative Marine El.	

2. NX2/NEXUS NETWORK - BRIEF INTRODUCTION

For full information see Appendix A
For practical understanding see § 6 Server

The NX2/NEXUS Network is a high performance, non collision Multi talker Multi receiver databus especially designed to be used for marine and navigational applications.
The most important features are the high update rate, fast response times, very low data latency (25 ms) and very high data security even at very long distances. Another important feature is that Data transfer efficiency will not degrade even when used in large and complex systems. It utilises the RS485 standard with up to 32 senders and/or receivers to form a Local Area Network.
Data is transmitted asynchronously with 1 start-bit, 8-data-bits, 1 parity-bit, two stop-bits in 9600 baud.



2.1 PROTOCOL

All data is exchanged in PACKETS. There are two main types of PACKETS: **Data-Packets** and **New-Sender-Packets**.

The **Data-Packet** consists of a ”header byte” followed by 1, up to max. 24 bytes of data, ended with a checksum byte. The Data packets ”header byte” is identified by having the **parity bit = 1 and bit d7 = 0**. The remaining 7 bits are identifying the **type of data** that will follow (0-127). The bytes that follows the ”header byte” is the usable data. There is no length-field included, but the receiver will know by the pre-defined field length from the packet-ID (bit d6-d0 in the ”header byte”). The last byte is the checksum, equals the XOR-summation of packet-ID and all data bytes.

The **New-Sender-Packet** consists of just one byte and has no checksum. When this packet have been sent, the receiving unit switches over to transmit mode, and the ”old” sender switches over to receiver mode. The sending rights have been ”handed-over” to the **New-Sender**.

New-Sender-Packet format:

d7	d6	d5	d4	d3	d2	d1	d0	P
1	Sender ID							1

N.B. the parity bit is not used for error detection, just to identify the ”header byte” and ”next sender ID” from the data.

2.2 NX2/NEXUS USER POLICY

The NX2/NEXUS network is open for new users/applications without the need of a license or license fee.

Silva Sweden AB will support PC applications under DOS and WINDOWS™ when using the PC-Interface FD, art. no 21248. The PC-interface will convert the NX2/NEXUS half-duplex data to Full-Duplex data suitable for WINDOWS™ applications.

The PC-interface comes with software and is supplied with a 9-pole D-sub connector cable for the RS232 PC port. The PC interface will be a very useful tool to control and monitor real time data, or when editing Waypoints to/from PC-file or to/from NX2 GPS or Server.

2.3 NX2/NEXUS PRODUCT TYPE WITH POSSIBLE CATEGORIES

Product

There are basically 4 different Marine electronic product types, where some of the product types also include NMEA 0183 input & output.

- NEXUS Network-Manager
- NEXUS Network-Repeater (talk & listen)
- NEXUS Network-Repeater (listen only)
- *Standalone instruments with no NEXUS Network*

Product Type

The most advanced type is the NEXUS Network-Manager, which is needed to establish and operate a NEXUS Network. The Server will automatically be the NEXUS Network-Manager when installed, but other units may be used as a NEXUS Network-Manager. See further details in the NEXUS Network specification, appendix A.

Possible Category

Each category represents one or more core functions given from a transducer (i.e. wind- speed wind angle) or calculated by an instrument (GPS navigational data). Only one category may be activated as a category master even if multiple category instruments are available in the NEXUS Network.

Example 1: The Server may give away the Wind category to the Wind Data instrument on request from the configuration set-up. It is therefore very important to configure the Network so it corresponds to where the transducers or the ”category’s” are connected or used.

Example 2: Where two Wind Data instruments are installed, only one may be set-up to be the Wind category master, the other must be set to Repeater mode. Also, if the Server is missing, the Wind Data instrument with category Wind will become the NEXUS Network Manager. For further information, read the NEXUS Network specification, appendix A.

Product	Product Type	Possible Category/Masters
NX2 Server	**NEXUS Network-Manager *** NMEA 0183 input & output	Log & temp, Depth, Compass, Wind.
NX2 Wind Data and Compass Data instruments	**NEXUS Network-Manager** or NEXUS Network Repeater (talk & listen)	Wind and / or Log & temp Compass and / or Log & temp
NX2 GPS Antenna. New P/N 21970	NMEA 0183 output	None
Nexus GPS Antenna. Old P/N 21000	**NEXUS Network-Manager**	Position
GPS Compass XL1000/ XL300	**NEXUS Network-Manager** (limited)	Position
NX2 Autopilot Servo Unit	**NEXUS Network-Manager** (limited)	Autopilot, Compass
NX2 Multi Control, Speed Log and Autopilot instruments	NEXUS Network Repeater (talk & listen)	None
NX2 Multi XL instrument	NEXUS Network Repeater (talk & listen)	None
NX2 Multi Center	NEXUS Network Repeater (talk & listen) or NMEA 0183 input & output	Nav-Master incl. WP-bank or Nav-Repeater
NX2 Remote Control instrument	NEXUS Network Repeater (talk & listen)	None
NX2 GPS Navigator instrument	NEXUS Network Repeater (talk & listen) and NMEA 0183 input & output	Nav-Master incl. WP-bank or Nav-Repeater
All NX2 Analog instruments	Network Repeater (listen only)	None

*) Can also be named ”Master” or ”Bus-Master” in some Silva Information material.

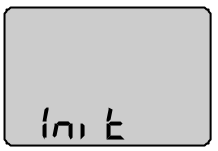
Stand alone products with no NX2/NEXUS Network!

NX2 standalone connected Speed Log instrument	
STAR Sea Data instrument	*No network possibility*
STAR Nav Repeater instrument	*NMEA 0183 input*

2.4 NETWORK START UP AND INITIALISATION

When the NX2 Network gets 12 V power on, the System will perform a Network initialisation and a system and instrument self test. The display on all digital instruments first show all segments, then the software version number and the Nexus Network ID number.

At first power on after installation you will be asked to press any KEY (PrESkey). This will give each instrument a logical ID number on the Nexus Network. This (PrESkey) can also come up when a change has been done in the system.

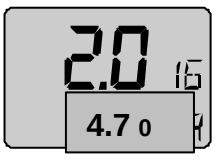


To initialise the instrument, press **SET** on all installed digital instruments, one at the time.

Note: Always wait for the text "Init OK" to be displayed, before you press SET on the next instrument!

The Server automatically gives the first unit ID number 16, then 17 and so on. The order in which you press **SET** is the same order as the instruments will be given a logical ID number on the Nexus Network.

The example shows that the instrument version number is 2.0 and the given logical ID number is 16.
The bottom line will write SILVA when the NX2 Multi Control is of version 3.7 or lower, the same as for Nexus Classic.



On NX2 Multi Control ≥4.1, Multi XL ≥1.4 and Autopilot ≥2.11 Instruments the bottom line will show the Server ver. no: e.g. 4.7 and the last smaller digit the ID number of the Network Master/Manager e.g. 0=NX2 Server.
Where 0=Server, 3=AP Servo, 8=Compass Data, 9=Wind Data,

Re-initialising the instrument
If two instruments by mistake have the same ID number, this can cause disturbance and block the information on the Nexus data bus.

To re-initialise the instrument, press **CLEAR** during the power up sequence when version and ID numbers are displayed.

The display self test is then re-started on all instruments and you will be asked to press KEY on each instrument as explained above.

Note! If you do not succeed to re-initialise, we suggest you disconnect all but one instrument with the same ID number, then repeat the above procedure.

2.41 Locking the network for unauthorised change of set up and calibration.

The Locking function gives the owner the possibility to prevent unauthorised users to enter the Set up, Calibration or to move and select sub functions for the whole NX2 System.

To lock, long (2 sec.) on “Set” to enter Set up mode.
Press “Set” and “Page” simultaneously .
Enter the code **324135** by **+** and **–** button and press Set to lock.

To unlock, press “Set” and “Page” simultaneously while “LOCKEd” is displayed when entering the Set up.
Then, enter the code **324135** by **+** and **–** button and press Set to unlock.

Note! To lock or unlock from the Wind Data or Compass Data “Set” has to be pressed after entering three digits 324 and then again after 135 as well.

Note! GPS Navigator Instrument can not be used to lock or unlock.

3. NX2/NEXUS NETWORK ERROR MESSAGE WITH CAUSE AND REMEDY

If an error message [Err #] is displayed on any instrument, an error has been detected by NX2/NEXUS Network.
The message can assist you to diagnose the cause and remedy the error.
To escape from an error message, press any push-button. If not possible to escape, reset power (turn off and on again), then make the remedy if suggested below.

Note! For errors marked with [*], most probably the unit needs a rectification. Errors marked with [¤] is only relevant for old products, GPS Antenna 21000, and GPS Compass /XL1000.

No.	Message and cause	*	Remedy
01	Activated watchdog timeout. Stack error	*	Reset power.
02	NEXUS Network data frames are missing.		Check connections and set-up.
03	No data received within approx. 10 sec.		Check connections and power voltages.
04	EEPROM read error.	*	Reset power.
05	EEPROM write error.	*	Reset power.
06	RAM memory Read-error.	*	Reset power.
07	Autolog full in GPS Compass.		Clear Autolog memory.
08	Break reset.	*	Reset power.
09	EEPROM auto initalisation, or NMEA transmit fail. (NX2/NEXUS Server only).	*	Reset power.
10	Range error, depending on wrong input e.g. 17° 70' = too many minutes.		Correct input format.
11	Remote control calibration error. Command can not be executed .		Check connections and settings.
12	No response from navigator.		Check navigator connection and settings.
13	Waypoint not defined.		Define a waypoint.
14	Impossible command when used with an external NMEA navigator.		Use only possible command.
15	Impossible command when in autopilot mode.		Use only possible commands.
16	Auto-deviation is not possible. NMEA Compass selected?		Check for extreme magnetic field, upside down mounting of transducer or wrong transducer type setting. NMEA Compass?
17	Auto-deviation check failed.		1¼ turn not completed or extreme magnetic disturbance.
18	Auto-deviation. Function denied.		Function denied since compass is busy with the auto-deviation routine.
19	Auto-deviation failure.		Error larger than 1.5°. The boat probably hit a wave during the turn.
20	GPS to CPU communication error.	*¤	Reset power.
21	GPS aqusitition failure (time out).	¤	Maximum allowed time for searching satellites. E.g. when try to navigate indoors. Check GPS antenna location.
22	CPU to GPS communication error.	*¤	Reset power.

No.	Message and cause	*	Remedy
23	DGPS (RTCM) data ignored.	¤	Change the DGPS (RTCM) setting.
24	GPS bad fix, no fix position (time expired at one-fix).	¤	Check GPS antenna location.
25	No autopilot response. Object is not connected.		Check wiring connections and fuse.
26	The unit is not allowed to power up because there is too high input voltage.	*	Check input voltage.
27	Extended object server busy or error.		Set one GPS Navigator instrument to master.
28	Route command error. The waypoint bank memory is full.		Clear waypoint bank for new space.
29	DGPS mode is interrupted.	¤	Check the DGPS receiver.
30-41	Reserved for NEXUS Autopilot Servo Unit.		See NEXUS Autopilot manual.
42	Bad transducer input / bad measurement.	*	Reset power.

	Reserved for NEXUS Autopilot Servo Unit.		
30	General autopilot failure	*	Reset power.
31	Autopilot compass input failure in autopilot standalone connection.		Check compass connection at autopilot Servo Unit.
32	Autopilot compass input failure in autopilot NEXUS Network connection.		Check compass at NEXUS Server or at the Compass Data instrument
33	Received wind data input failure.		Check wind wire connection.
34	Autopilot calibration failure.		Check for air in the system and make APC routine again in calm water at crousing speed.
35	Navigation data not available in autopilot stand alone connection.		Check NMEA input connections and settings in the navigator.
36	Navigation data not available in autopilot NEXUS Network connection.		Check connections and navigator settings.
37	Autopilot Network re-initialisation.		Check connections, wire dimensions and Battery charge and quality.
38	Autopilot Rudder transmitter failure	*	Check Rudder transmitter, connection and wireing.
41	Failure to initialise EEPROM.	*	Reset power.

4 NX2 REPLACEMENT SYSTEM OF DEFECT TRANSDUCER AND INSTRUMENT

The Silva NX2 System is designed and adapted to a replacement system of Transducer and Instruments, giving the customer fast and accurate service.

The NX2 replacement system handled by Authorised Service Agents, mean that the Service Agent stocks NX2 Transducer and Instruments for immediate replacement.

4.1 REPAIR BY FAULTFINDING AND REPLACEMENT OF DEFECT TRANSDUCER OR INSTRUMENT

If faultfinding according to §5 leads to the conclusion that any unit is defect it should be replaced in accordance to SILVA NX2 replacement system if the unit is under warranty. Wind, Compass and GPS transducers can be repaired.

If the unit is outside the warranty period the customer should be offered a restored instrument.

4.2 RETURN OF FAULTY NX2 UNITS TO AGENT/SILVA

The SILVA NX2 exchange system is a replacement system handled by Authorised Service Agents, mean that the Service Agent stocks NX2 Transducer and Instruments for immediate replacement, giving the customer fast and accurate service.

When returning NX2 Instruments to a Service Agent or Silva Sweden each unit should be followed by a NX2 Return Form, filled in as complete as possible to secure high quality on all NX2 products.

NX2 instruments followed by a complete Return Form will also pass the Silva administration fast with quick handling and return shipment without any delay.

5 NX2 FAULTFINDING AND TESTS ON BOARD

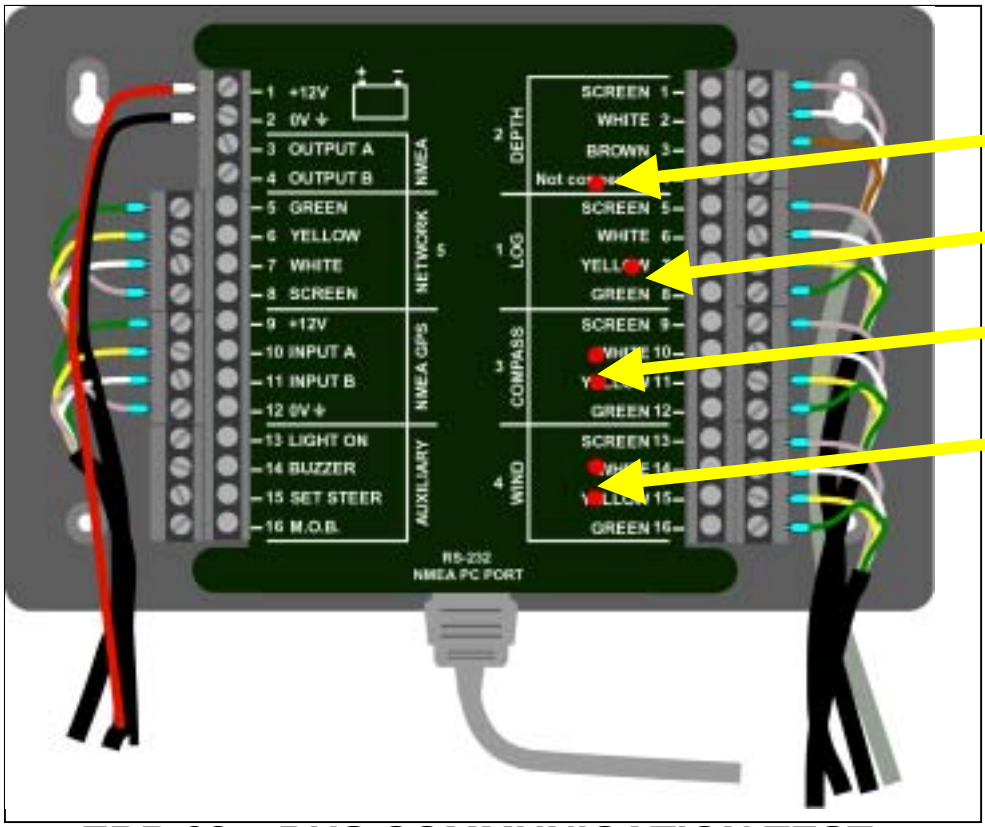
The Silva NX2 System can easily be tested on board a vessel. Always start by confirming that the “Maintenance and fault finding” in the Operation Manuals has been checked by the customer. Also be convinced that all system and calibration settings are not causing the problems.

5.1 BLANC DISPLAY - POWER TEST

Check connection terminal at the back of the Instrument: Green(+) to Screen(-) you should have 12 Volt (10-16 V), if not: **check wires, fuse and battery**. If the Instrument do not run the starting up procedure in spit of 12V OK power, it has to be replaced and sent to Silva for further tests.

5.2 NO OR WRONG VALUE ON NX2 INSTRUMENTS

Al transducer inputs on the NX2 Server are equipped with signal sensors indicating incoming signals by blinking LED’s.
Log transducer will shift the LED on log input from on to off and vice versa for every half turn on the impeller.
Depth LED will blink on every received Echo.
Compass LED’s will blink on each channel receiving signal, with constant frequency.
Wind LED’s will blink on each channel receiving signal, with a frequency related to the actual wind speed.
If lack of signal indication on LED’s, **check wires, connections and transducer**.



5.3 ERR 03 – BUS COMMUNICATION TEST

If the instrument shows Err 03 it means brake in the communication (time out is 10 sec.).
Test 1: Check connection and signal at the 4-pole jack plug the back of the Instrument: Between Yellow and White you should have ~4,3 Volt AC (varying). If ~4,3V OK do test 2. If only ~1,8 V AC, check Yellow to Screen and White to Screen, the one with 0 V is interrupted.
Check connections, wires, lose ends, mix white-yellow etc.
If no fault on the installation is found remove Yellow and White wires connected to term. 6 and 7 on the Server, do Test 1 on the Server output terminal 6 and 7.
If not ~4,3 Volt AC (varying) there is a fault in the Server.
If the Instrument does not start in spit of correct signal level, do test 2.
Test 2: If possible, check the same 4-pole jack plug with another working Digital NX2/Nexus instrument to see if there is a correct Bus-signal from the plug. If this Instrument works well there is **fault in the first instrument**, and it has to be replaced and sent to Silva for further tests**.**

5.4 ERR 02 – BUS COMMUNICATION TEST

If the instrument show Err 02 it means that there is ”some” signal on the Bus but it is in-correct, disturbed or of wrong type, (e.g. NMEA). **Check connections, Set-up and that white-yellow wires isn’t mixed.**

5.5 NO OR WRONG VALUE ON ANALOGUE INSTRUMENT

If an Analogue instrument connected to a working NX2 bus do not show relevant value: **Check Set-up, calibration, connections, wires, lose ends and that white-yellow wires isn’t mixed.**
If customer have claim on other function, please check to confirm.

5.6 NX2 FAULTFINDING GUIDE

Multi Center can be used to find reason to system faults, see 5.8

Function	Display	Cause	Action	Set-up/ Remedy
Start	Blank Display	No Power	Check back of Instrument Green+12V, Screen 0 V. See §5.1	Wires, Fuse, Battery
	Err 03	No Bus signal	Check back of Instrument Yellow-White 4.3 V AC. See §5.3	If no signal to Instrument check wires, connections, Bus-signal out fr. Server
	Err 03	No Bus signal	Check back of Instrument Yellow-White 4.3 V AC. See §5.3	If signal to instrument, Fault is in Instrument. Replace
	Err 02	Fault or disturbance in Bus signal	Check system and that Yellow-White wire isn’t reversed. See § 5.4	Correct wires. Remove spurious signal source
LCD segments missing	LCD segments missing		Check if all segments are present during Start up.	Fault in Instrument Replace
Speed/Depth/Wind/ Compass	Wrong or No Speed/Depth/ Wind or Compass	No signal from transducer?	Check signal indicators on server. see §5.2	If No signal check wires connections and transducer
Speed/Depth/Wind/ Compass	Wrong or No Speed/Depth/ Wind or Compass	Check settings per below check list.	Correct settings!	Correct settings!
Analogue Instrument value	Wrong or No value on Analogue Instru	Connections, wires, calibration, Set-up	Check accordingly, see § 5.5	If fault in Instrument Replace
Instrument Light	Not all turn ON.	Same ID-No on two Instruments	Make a Re-Initialisation so that every Instrument get its own ID-No.	
BTW	no values	No waypoint selected	Select way point	
Calibration	Not available/ Can’t be changed	Same ID-No on two Instruments	Make a Re-Initialisation so that every Instrument get its own ID-No.	
Function	**Display**	**Cause**	**Action**	**Set-up**
Compass	no heading [- - -]	Wrong setting of COG: COG set to ON but no navigator connected	Set COG to OFF	C94
Compass	no values [- - -]	Nexus compass transducer	Set C75 to OFF	C75

		and C75 set to ON		
Compass	no values [- - -]	NMEA compass transducer and C75 set to OFF	Set C75 to ON	C75
Compass	wrong COG-values	Incorrect setting of damping	Correct setting of damping	C72
Compass	wrong values	Incorrect setting of magnetic variation	Correct setting of magnetic variation	C33
Compass	wrong values	Auto deviation not performed	Run the Auto deviation	C34
Compass	wrong values	Auto deviation not successful	Check Auto deviation Run the Auto deviation	C34, C35
Compass	wrong values	Incorrect setting of compass transducer misalignment	Correct setting of compass transducer misalignment	C37
Compass	wrong values	Wrong selection of magnetic/true	Correct setting	C40
Compass	wrong values	Wrong mounting of the transducer	Check that transducer is not mounted upside down. Mount correct	
Compass	wrong values	Magnetic disturbance	Check that there are no ferrurinous items close to the transducer.	
Compass	wrong values	Incorrect setting of damping	Correct setting of damping	Sub-function NAV-page
Compass	no values [- - -] Compass Data	C71 incorrect set to [ON] (Compass Data)	Correct setting to [OFF]	C71 in Compass Data
Compass	Compass func-tion not available in Multi Control	Incorrect setting of Page Auto C31	Set C31 to PAGE ATO or PAGE ON	C31
Depth	wrong values	Wrong units	Correct setting of units	C21
Depth	wrong values	Incorrect calibration of the depth transducer position	Correct calibration of the depth transducer position	C22
Depth	no values [- - -]	Deep water outside the range of the transducer		
Depth	no values [- - -]	Deep water and soft bottom		
Depth	no values [- - -]	The boat is heeling heavily		
Depth	no values [- - -]	In propeller stream, where air bubbles are created		
Depth	wrong values	In propeller stream, where air bubbles are created		
Depth	no values [- - -]	Poor connection or reversed connectors at the amplifier box	Check connections	
Depth	no values [- - -]	Internal mount: poor signal penetration due to thick hull	Use through hull fitting	
Depth	no values [- - -]	Internal mount: air between transducer and hull	re-install the transducer	
Depth	wrong values	Going over shallow water, with uneven and high bottom vegetation		
Depth	wrong values	Heavy layers of salt or noticeable ranges of water temperature		
Depth	wrong values	Heavily agitated water containing particles of sand or some other contamination		
Depth	wrong values at anchor in harbour	Disturbances from other depth transducers		
Depth	wrong values (in harbour/at anchor)	Disturbances from chains or mooring equipment		
DTW	no values	No waypoint selected	Select waypoint	
MEM setting	Not possible. Err 02	Same ID-No on two Instruments	Make a Re-Initialisation so that every Instrument get its own ID-No.	
Multi Center	Loading Waypoint Please be patient	Same ID-No on two Instruments	Make a Re-Initialisation so that every Instrument get its own ID-No.	
	Display Blanc or Black	Contrast to low or to high	Contrast can be adjusted during start up. Push cursor button up or down.	
Multi Center		Err 03	Check connections i.e. on connector back of MCe	
Multi Center	Can not pass Warning text page		Check wires on MCe – wires with open ends have to be isolated.	
Multi Center	Course line poins only North.	Seting of Course Line not correct	Set Course Line to COG for GPS and HDC for Compass transducer.	
Function	**Display**	**Cause**	**Action**	**Set-up**
NMEA out	no values on NMEA-unit	Incorrect selection of NMEA out sentences	Select desired NMEA sentences	C77 to C93
NMEA out	wrong / no values	Poor NMEA-out connection	Check connections	
NMEA out	no values on NMEA-unit	No NMEA output	Check NMEA output, see §5.7	If no NMEA output replace Server
NMEA in	wrong / no values	Poor NMEA-in connection	Check connections	

NMEA in	No values	Wrong NMEA sentences transmitted	Check set-up in the transmitting unit	
Position	no values	Incorrect selection of position source	Correct selection of position source	Config Nexus / NMEA position in GPS Navigator
Position	wrong values	Incorrect setting of minutes/seconds, C38	Correct setting of C38	C38
Push button	No sound	Wrong setting of C71=OFF	Set to C71= ON	C71/Set C71 = ON
Push button	No sound		If correct setting of C71 Fault in Instrument	Fault in Instrument Replace
REM Remote Control	Two Instruments react on comands	Same ID-No on two Instruments	Make a Re-Initialisation so that every Instrument get its own ID-No.	
Speed	no speed [- - -]	Wrong setting of SOG, set to ON but no navigator connected	Set SOG to OFF	C95/ Set C95 = OFF (SOG)
Speed	Speed value is 0.00	Impeller is not rotating?	take up the transducer and turn the impeller. Log diode should blink and speed value on instrument.	Blinking diod indicate OK Log transducer.
Speed	no speed [0.00]	Impeller is not rotating	Clean the impeller	
Speed	no speed [0.00]	Impeller is not rotating, due to remaining antifouling inside the through hull fitting	Clean the through-hull fitting	
Speed	wrong values	Wrong units	Correct setting of units	C11
Speed	wrong values	Incorrect calibration value	Correct calibration	C12
Speed	wrong values	Incorrect setting of damping	Correct setting of damping	C13
Speed	wrong SOG-values	Incorrect setting of damping	Correct setting of damping	C72
Temperature	No Temp. (- - -)	Connections, wires, lose end	Correct connect. Check. White to ground	~1,8 V White to ground
Temperature	Wrong Temp. value	Incorrect calibration value	Correct calibration	C23, C24
Wind	no values [- - -]	Nexus wind transducer but C76 set to ON	Set C76 to OFF	C76
Wind	no values [- - -]	NMEA wind transducer and C76 set to OFF	Set C76 to ON	C76
Wind	wrong speed values	Wrong units	Correct setting of units	C53
Wind	wrong wind angle	Wrong selection of wind angle	Correct selection of wind angle	C52
Wind	wrong wind angle	Incorrect setting of mast top unit misalignment	Correct setting of mast top unit misalignment	C55
Wind	wrong wind angle	Incorrect setting of wind calibration values	Correct setting of wind calibration values	C56 to C63
Wind	wrong values	Poor cable connection	Check connections wind transducer / cable through deck connectors	
Wind	wrong values	Incorrect setting of damping	Correct setting of damping	C65
Wind	no values [- - -] Wind Data	C71 incorrect set to [ON] (Wind Data)	Correct setting to [OFF]	C71 Wind Data
Wind	Wind function not available in Multi Control	Incorrect setting of Page Auto C51	Set C51 to PAGE ATO or PAGE ON	C51

5.7 SERVER NMEA COMMUNICATION TEST

Connect the Server D-Sub to the PC via a PC-cable.

Chose Hyperterminal - Set up - Settings - Config.

- 4800 bps
- 8 bits
- No parity
- 1 Stop bit
- No XON/XOFF

The Server should send NMEA- sentences continuously. The following, C77 to C92 per below, is transmitted in default setting (see also User Manual 3.11.1)

0		(—)	No out signal
1		(APB)	Autopilot B
2		(BOD)	Bearing original destination
3		(BWC)	Bearing and distance to waypoint
4		(BWR)	Bearing and distance, dead reckoning
5	(C77)	(DBT)	Depth measured from the transducers position
6		(DPT)	Depth
7	(C78)	(GLL)	Geographic position
8		(GSA)	DOP and active satellites
9	(C79)	(GSV)	Satellites in view
10	(C80)	(HDM)	Magnetic heading
11	(C81,89)	(HDT)	True heading
12		(MTW)	Water temperature
13	(C82)	(MWD)	Wind direction and speed
14		(MWV)	Apparent wind speed and angle
15		(RMB)	Minimum navigation data
16		(RMC)	Minimum specific GPS- and TRANSIT-data
17			
18	(C83)	(VDR)	Set and drift
19	(C84)	(VHW)	Speed and course through the water
20		(VLW)	Distance travelled through the water
21	(C85)	(VPW)	Speed relative to the wind
22	(C86)	(VTG)	Distance made good and distance over ground.
23	(C87)	(VWR)	Apparent wind speed and wind direction
24	(C88)	(VWT)	True wind speed and direction
25	(C90)	(WCV)	Waypoint closure velocity
26			
27	(C91)	(XTE)	Cross track error
28	(C92)	(ZDA)	Time and date
29		(ZTG) & (UTC)	Time to destination or waypoint.

If no NMEA is sent the test failed and the Server has to be returned to Silva for further tests

5.8 Using Multi Center to find reason for NX2 Network faults.

Connect a Multi Center to the NX2 BUS: Set Display to “Network”

All units and instruments on the NX2 Network will be shown. The categories and software versions for each unit is also displayed. Multi Center can only have category N. Following categories exist:

[L] = Log and water temperature.
[D] = Depth
[C] = Compass
[W] = Wind transducer.
[P] = Position
[E] = Engine data (RPM, oil temp etc.)
[A] = Autopilot
[B] = Battery
[R] = Roll and Pitch
[N] = Navigation master with active waypoint bank.

Note: All Nexus Speed and Depth instruments will be displayed as MULTI in the list since they share instrument Id.

Press ENTER for Network utilities.
This information is for trouble shooting and fault-finding. Select Network information and press ENTER and a list of the network is displayed.
This information may be acquired from a Nexus engineer when experience any NX2 Network problems.

5.9 RETURN OF FAULTY NX2 UNITS TO AGENT/SILVA

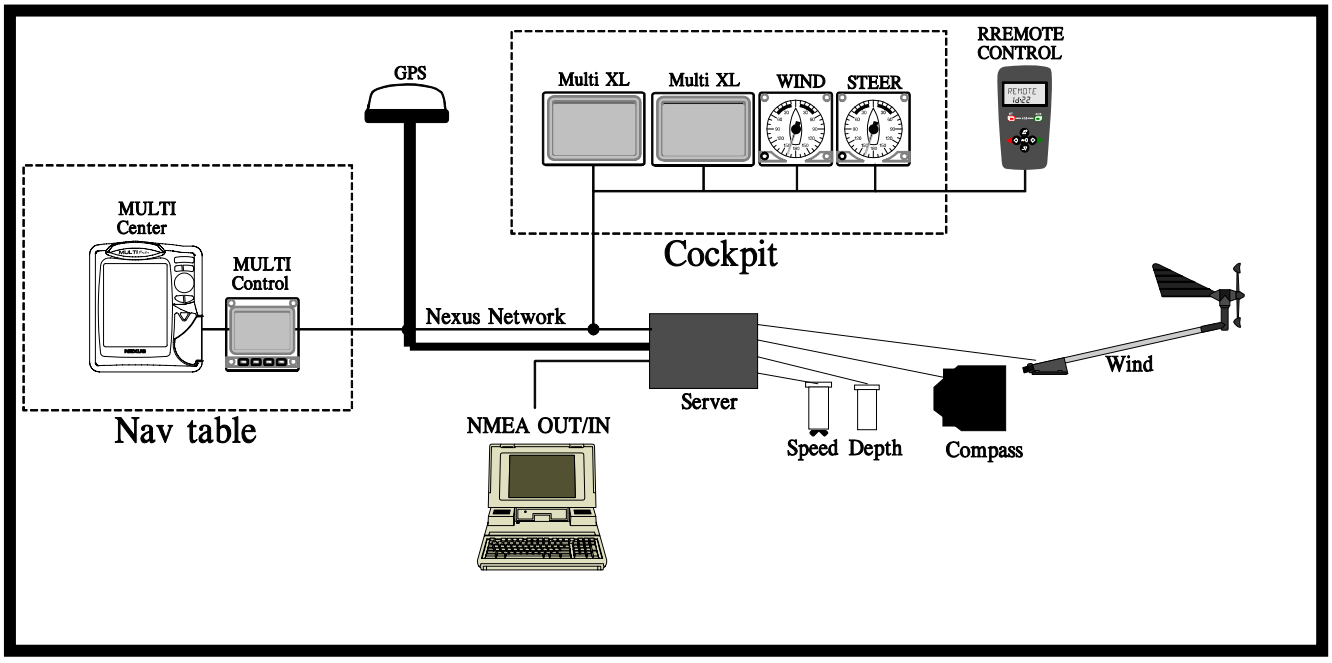
In most instances, repair is achieved by replacing the defective unit according to the SILVA NX2 exchange system. Wind, Compass and GPS transducers can be repaired.

The SILVA NX2 exchange system is a replacement system handled by Authorised Service Agents, this means that the Service Agent stocks NX2 Transducer and Instruments for immediate replacement, giving the customer fast and accurate service.

When returning NX2 Instruments to a Service Agent or Silva Sweden each unit should be followed by a NX2 Return Form, filled in as complete as possible to secure high quality on all NX2 products.

NX2 instruments followed by a complete NX2 Return Form will also pass the Silva administration fast with quick handling and return shipment without any delay.

6.0 NX2 SERVER



The Server is the ”heart” of the NEXUS Navigation Network to which transducers for speed, depth, compass, wind and navigation are connected.

From the Server the single NEXUS cable transmits power and data to the instruments, which repeats the information sent from the Server or other NX2 transducers.

The NX2 Server also have communication possibility to other equipment via NMEA signal protocol.

The Nexus Network is designed with the industry standard RS 485 data bus, which allows you to connect up to 32 NX2 instrument units on the single Nexus Network cable, thereby allowing you the flexibility to easily develop your system. The Nexus Network is capable of carrying data 10 times faster than NMEA 0183.

Network Manager - Principal of operation

Every NX2 Navigation Network need to have a Network Manager. A very typical Network Manager or ”bus-master” is the Server, but even the Autopilot Servo, Wind Data / Compass Data instruments and GPS Navigator instrument can be a ”bus-master”.

A ”bus-master” is responsible for initialisation of the network at start, e.g. call for known units and give them so called ”next-sender” address. This is the identity (ID) for this instrument which (when receiving data) is given right to ”talk” on the network. The instrument then can talk, or direct give away the right to talk by a new ”next-sender” ID etc. The Network Manager also:

- Superintend the Network so if some unit disappears (gone out of order or is taken away) then the Network shall be re-initialised.

- If the bus-master is out of order , one of the other units that is able to be a bus-master, should become a new Network Manager (according to a special procedure).

- If a new unit is added, the bus-master shall take care and the unit will be taken into the ”community” and given its own ID/identity.

The NX2 Server will NOT ask every instrument if they have something to say, only if they stop answering to ”next-sender” packet.

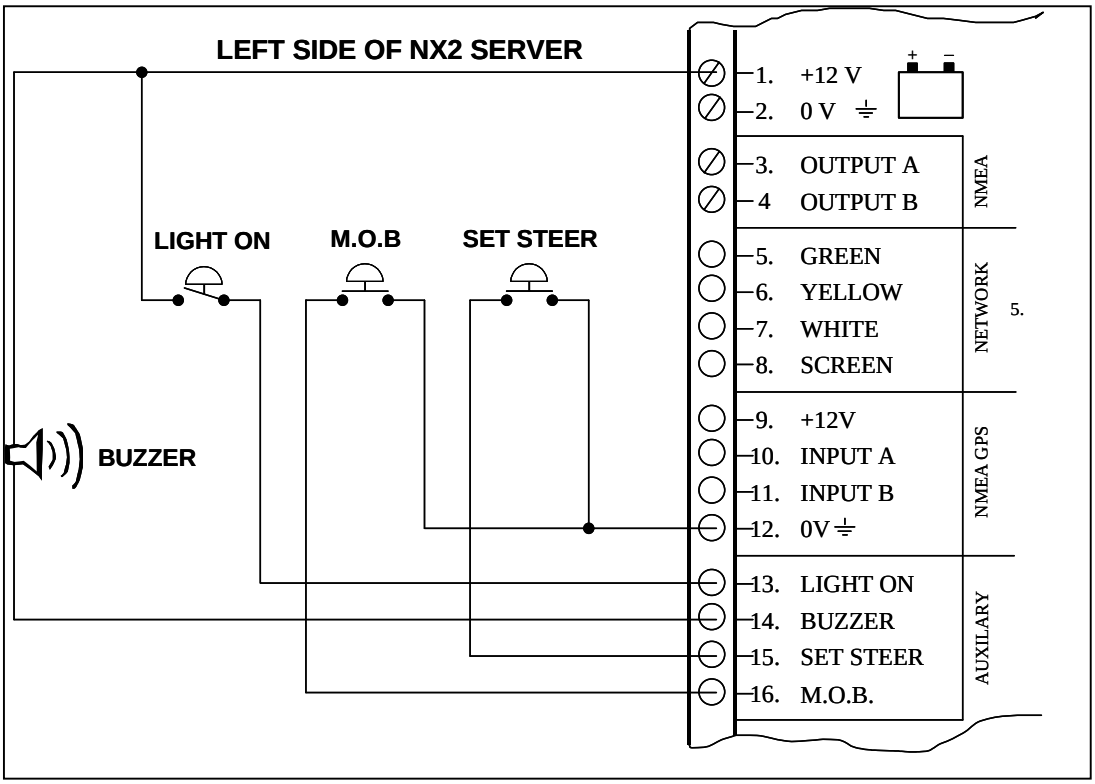
Possible communication errors.

Error 03 is a local error message shown on instruments with LCD display when the instrument is unable to read Nexus data during approximate 10 sec. then it will display Err03.
Example on Err03: Lose wire, or the white and yellow wire are mixed up.

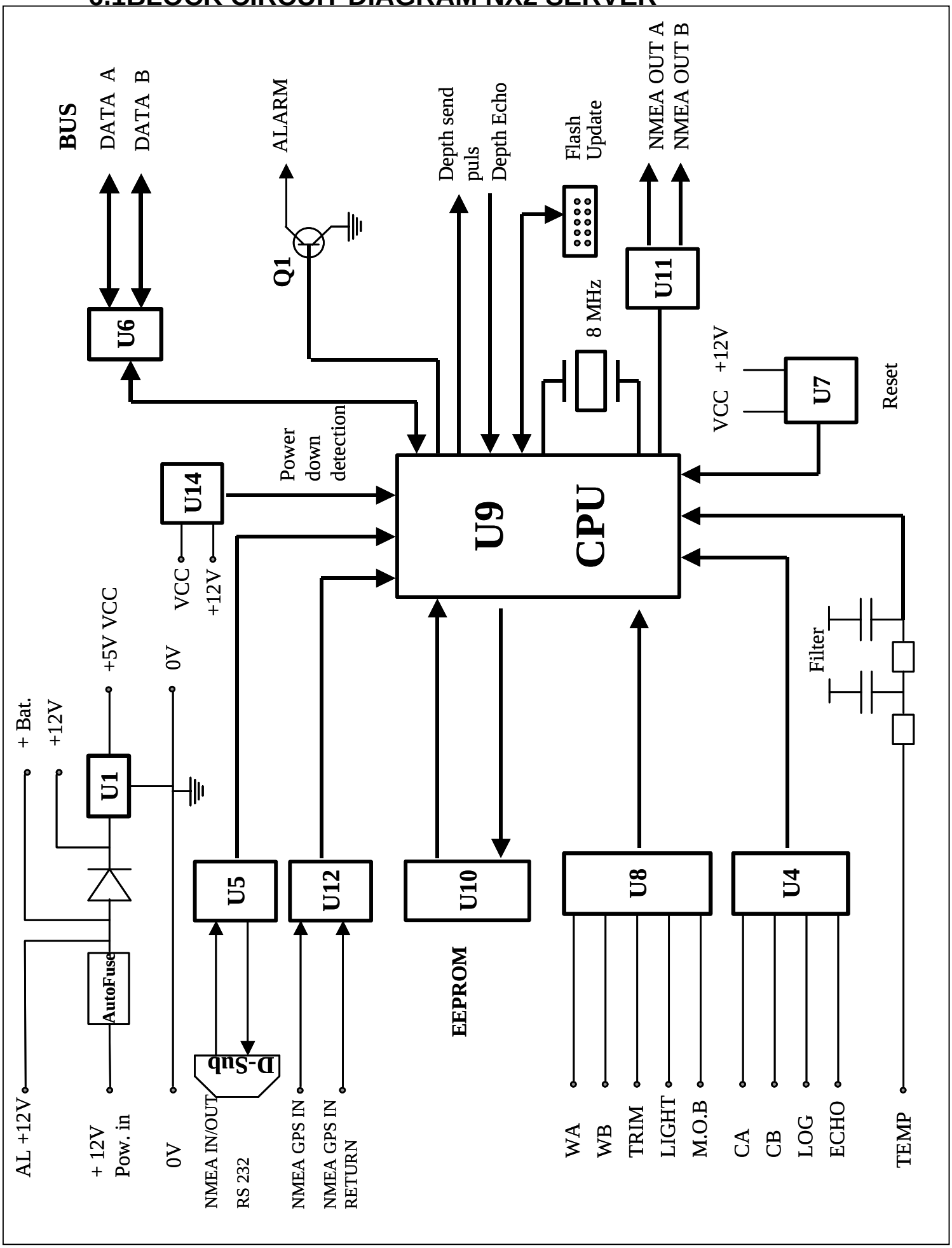
Error 02 is more a hardware problem. It e.g. yellow and white wire are are together and short circuit, or if electronics of Autopilot is bad installed with e.g. long thin wires.
An other typical Err02 error is a bad earthing or incorrect signals e.g. NMEA signals on the bus.

NEXUS network - brief introduction see § 2. For full information see appendix A

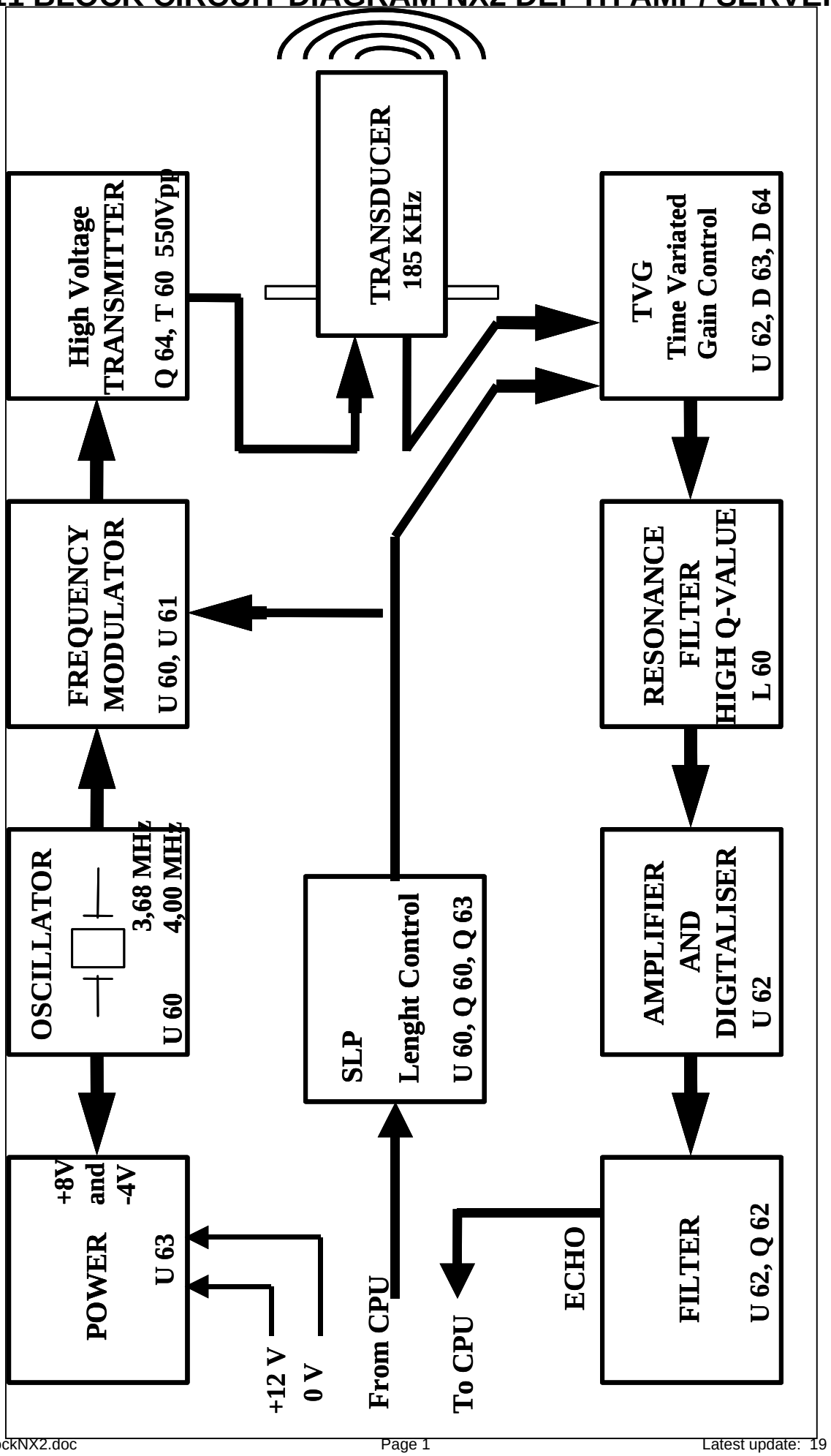
How to connect Light, M.O.B and Steer push buttons:



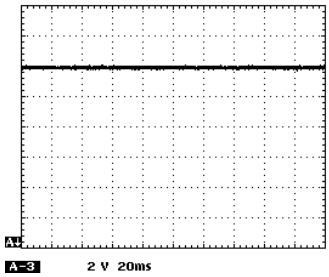
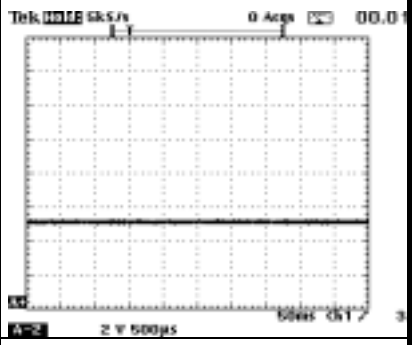
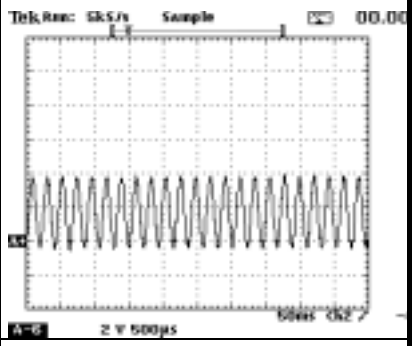
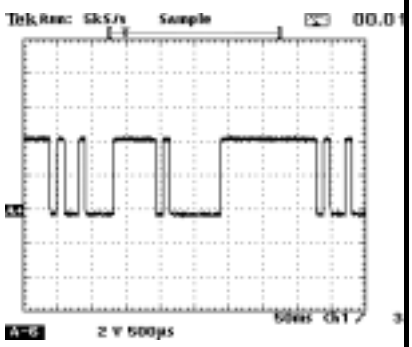
6.1BLOCK CIRCUIT DIAGRAM NX2 SERVER

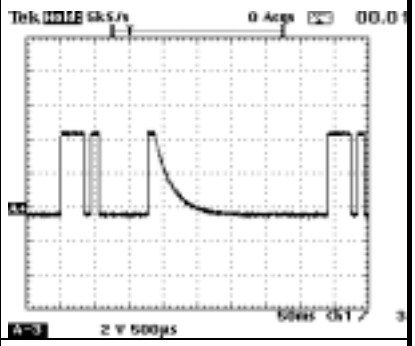
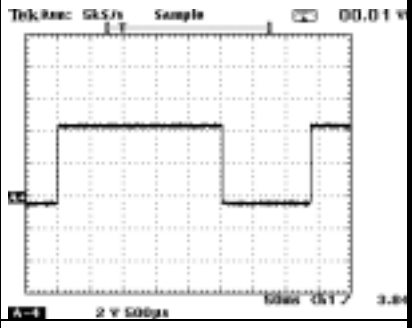
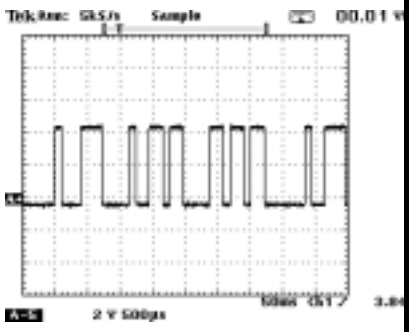
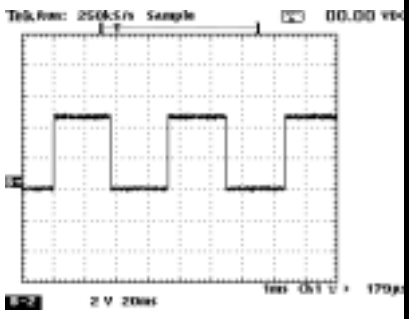


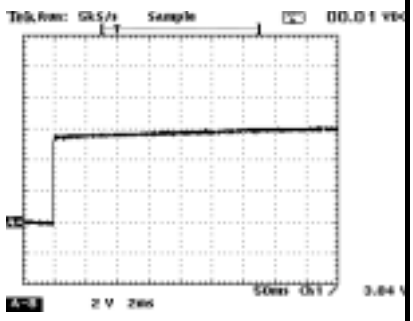
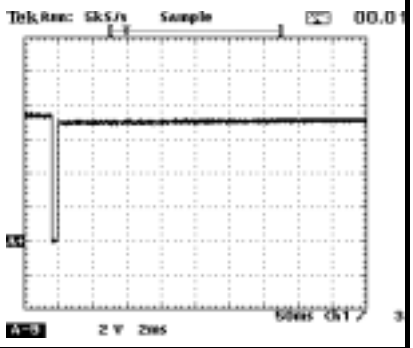
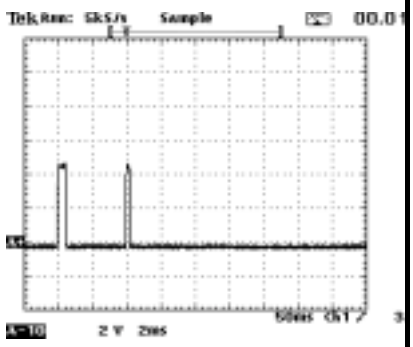
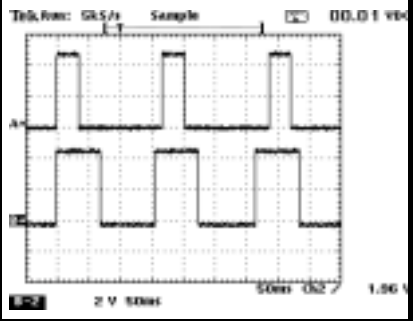
6.11 BLOCK CIRCUIT DIAGRAM NX2 DEPTH AMP/ SERVER

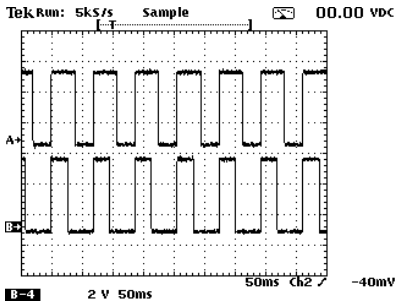
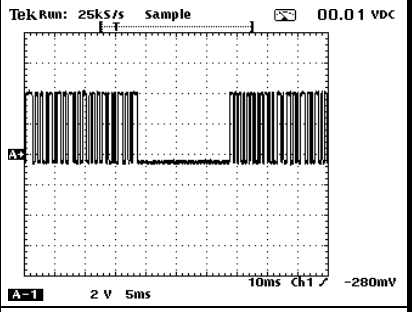
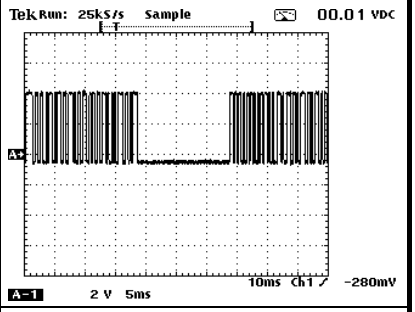
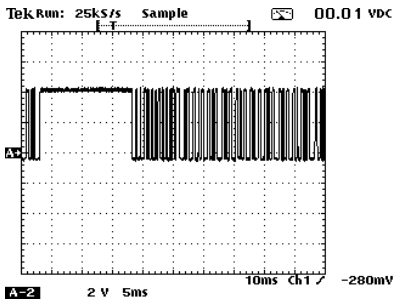


6.2 TROUBLE SHOOTING - TEST WAVE FORMS SERVER

Fault indication	Check signal at:	Possible reason if not Correct waveform	DMM test.	Oscilloscope Correct wave form
Err 02 or Err 03	TP 1 D1	Defect D1	+12 V	
Err 02 or Err 03	TP 2 U1 pin 1	Defect U1	+5 V	
Err 02 or Err 03	TP 3	CPU not running. Defect processor, U9	AC 2,2V	
Err 02 or Err 03	TP 4+5 U6 pin 6 U6 pin 7	No Bus signal out Defect U6	DC 0,6 - 0,8V	

Fault indication	Check signal at:	Possible reason if not Correct waveform	DMM test.	Oscilloscope Correct wave form
Err 02 or Err 03	TP 6 U 6 Pin 1	No Bus to U6 Defect processor U9		
Err 02 or Err 03	TP 7 U 6 Pin2+3	No Bus to U6. Defect processor U9		
Err 02 or Err 03	TP 8 U 6 Pin 4	No Bus to U6. Defect processor U9		
No Speed	TP 9 U8 pin 6	Deffect U8		

Fault indication	Check signal at:	Possible reason if not Correct waveform	DMM test.	Oscilloscope Correct wave form
No Depth	TP 10	Long SPL can indicate no echo. Deffect Depth Amp		
No Depth	TP10	Deffect Depth Amp. Short SPL can indicate OK echo.		
No Depth	TP11	If no echo check Depth Amp.		
No Wind value	TP WA TP WB U4 Pin 4 = chan.A Pin 10 = chan.B			

Fault indication	Check signal at:	Possible reason if not Correct waveform	DMM test.	Oscilloscope Correct wave form
No Compass value	TP CA TP CB U8 Pin 4 = chan.A pin12 = chan.B			
No NMEA out signal on Term. 3	TP 12 NMEA out terminal 3 on J1A	If no NMEA signal on TP12 check TP13 if OK signal defect U11		
No NMEA out signal on D-sub pin 2	TP 14 NMEA out signal on D-sub pin 2	If no NMEA signal on TP14 check TP13 if OK signal defect U 5		
NMEA in test	Connect term.3 NMEA out to NMEA in term. 10 + 11 to ground and check at TP 15 Optocoupl. U12 pin 6.	If no NMEA signal on TP15, defect U 12, Q2, Q3 or D5.		

6.2 SERVER NMEA COMMUNICATION TEST

Connect the Server D-Sub to the PC via a PC-cable.
Chose Hyperterminal - Set up - Settings - Config.

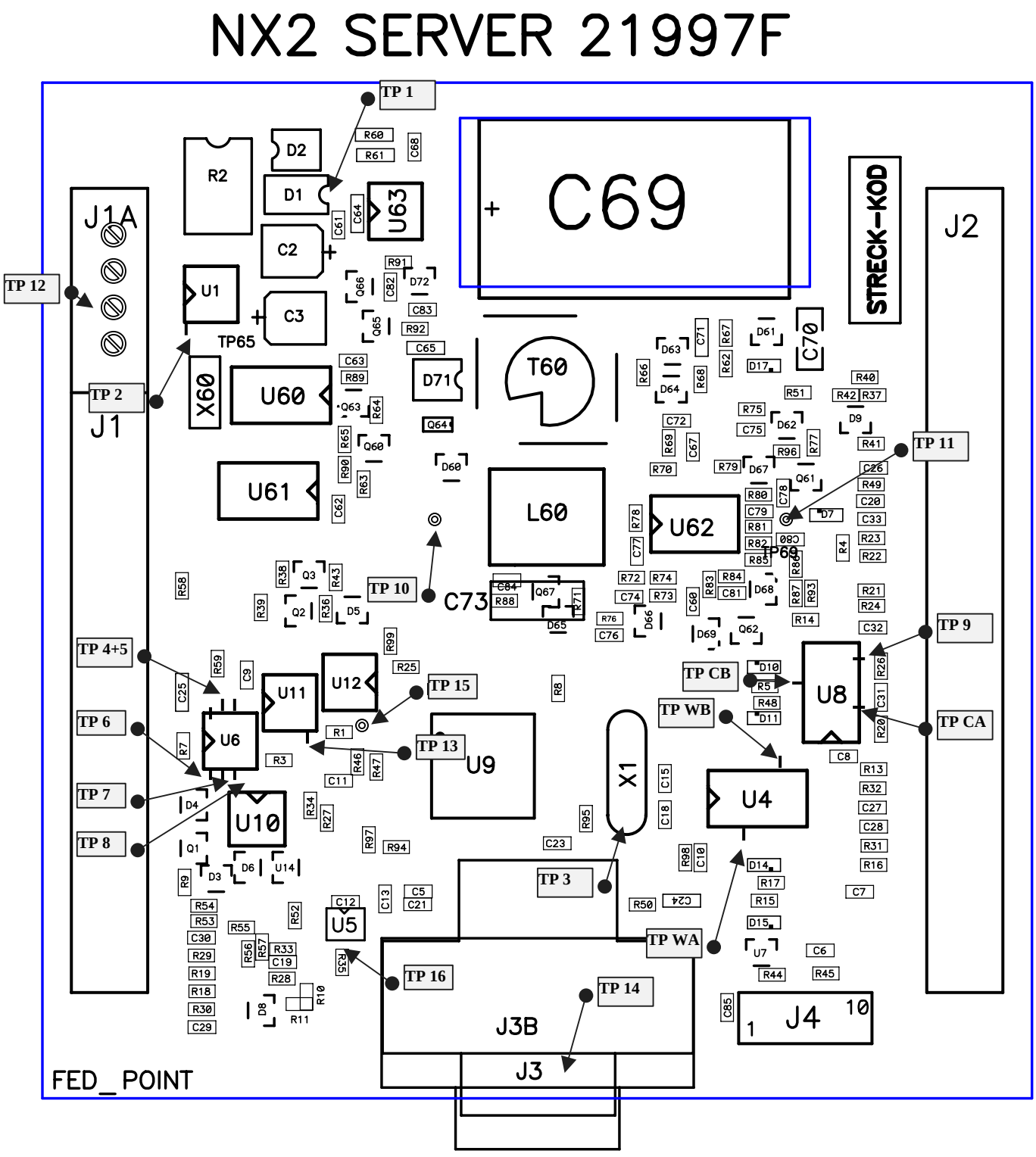
- 4800 bps
- 8 bits
- No parity
- 1 Stop bit
- No XON/XOFF

The Server should send NMEA- sentences continuously. The following, C77 to C92 per below, is transmitted in default setting (see also User Manual 3.11.1)

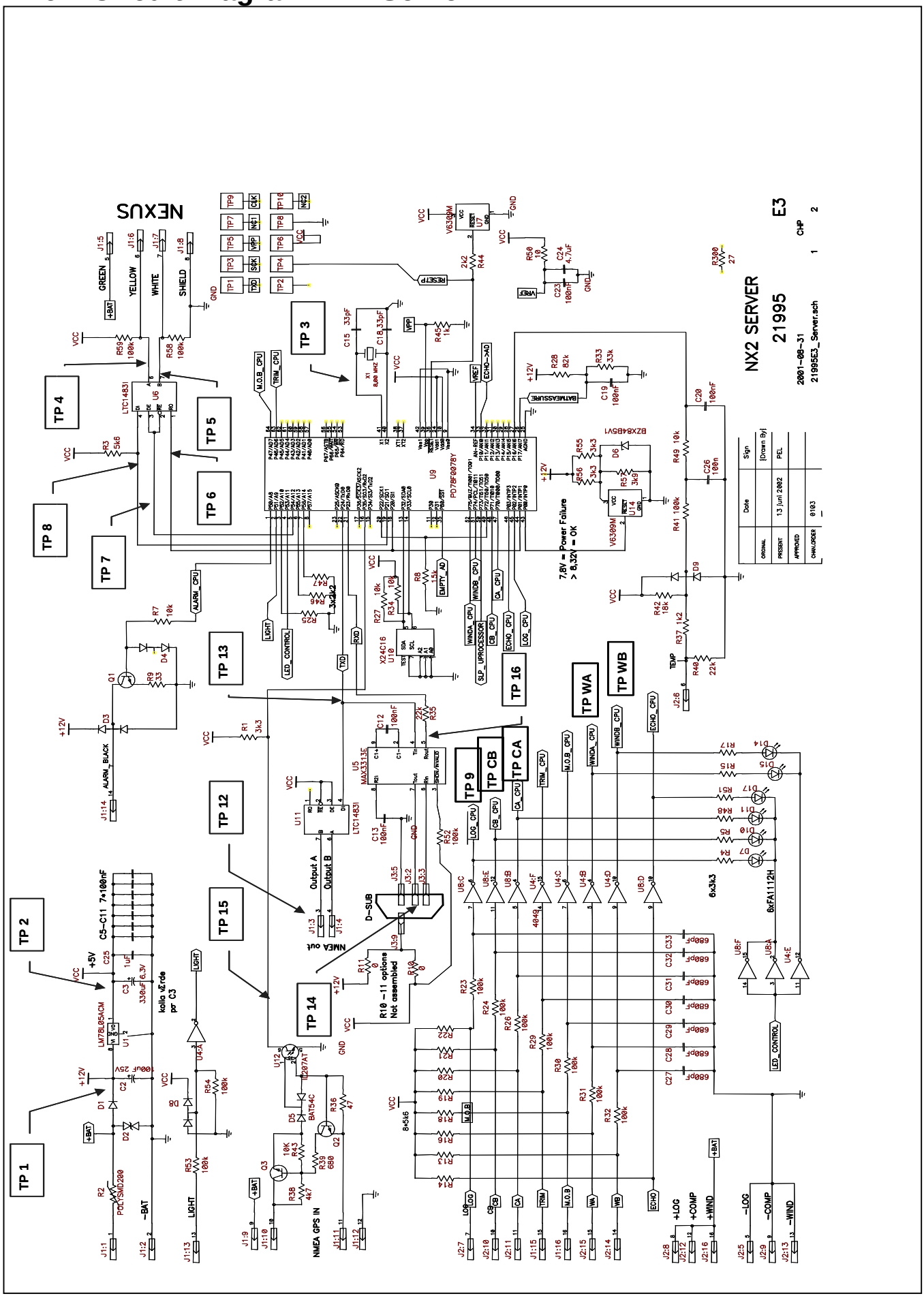
0		(—)	No out signal
1		(APB)	Autopilot B
2		(BOD)	Bearing original destination
3		(BWC)	Bearing and distance to waypoint
4		(BWR)	Bearing and distance, dead reckoning
5	(C77)	(DBT)	Depth measured from the transducers position
6		(DPT)	Depth
7	(C78)	(GLL)	Geographic position
8		(GSA)	DOP and active satellites
9	(C79)	(GSV)	Satellites in view
10	(C80)	(HDM)	Magnetic heading
11	(C81,89)	(HDT)	True heading
12		(MTW)	Water temperature
13	(C82)	(MWD)	Wind direction and speed
14		(MWV)	Apparent wind speed and angle
15		(RMB)	Minimum navigation data
16		(RMC)	Minimum specific GPS- and TRANSIT-data
17			
18	(C83)	(VDR)	Set and drift
19	(C84)	(VHW)	Speed and course through the water
20		(VLW)	Distance travelled through the water
21	(C85)	(VPW)	Speed relative to the wind
22	(C86)	(VTG)	Distance made good and distance over ground.
23	(C87)	(VWR)	Apparent wind speed and wind direction
24	(C88)	(VWT)	True wind speed and direction
25	(C90)	(WCV)	Waypoint closure velocity
26			
27	(C91)	(XTE)	Cross track error
28	(C92)	(ZDA)	Time and date
29		(ZTG) & (UTC)	Time to destination or waypoint.

If no NMEA is sent the test failed and the Server has to be returned to Silva for further tests

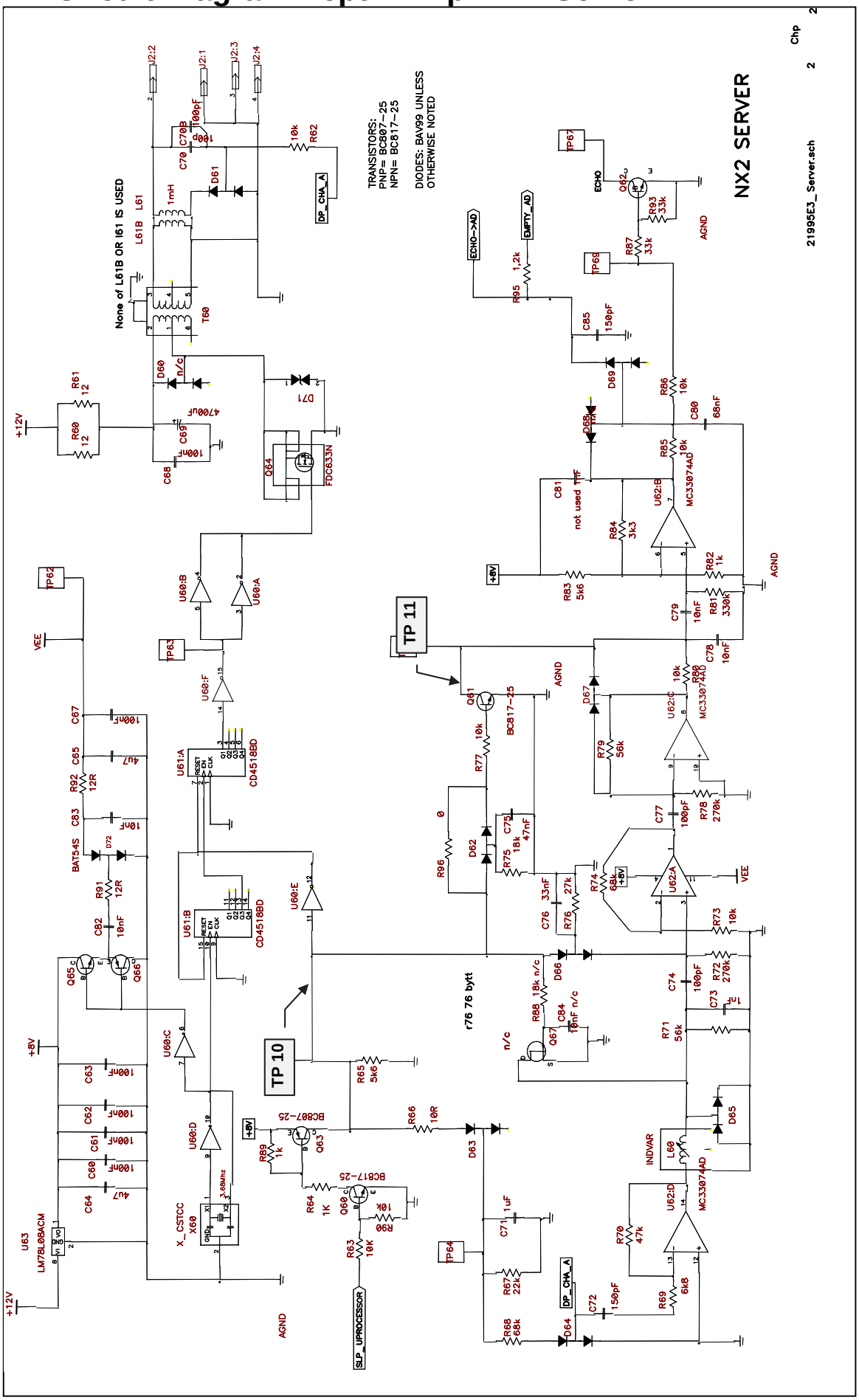
6.3 PCB Layout with Test points – NX2 Server



6.4 Circuit Diagram NX2 Server



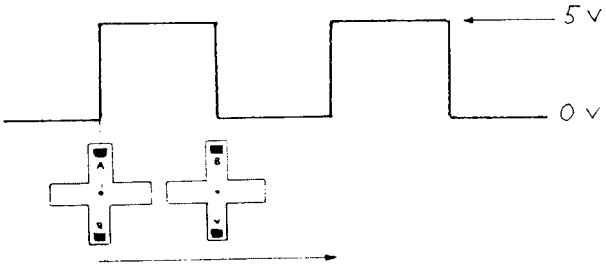
6.41 Circuit Diagram Depth Amp. NX2 Server



7. LOG TRANSDUCER.

Principle of operation

When the impeller of the Log Transducer is rotating there are magnets in two of the blades inducing magnetic power in a Hall element.
This Hall element signal is converted to pulses of 5 V.



The water stream will give 7 pulses/m equal to 12964 pulses per Nautic mile.

Technical specifications

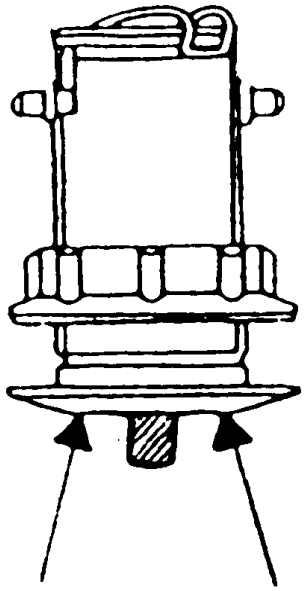
Dimensions:	Through-hull fitting 42 x 86 mm (1 5/8 x 3 3/8")
Transducer cable:	8 m (26,2 ft)
Power supply:	12 V DC (10-18 V)
Power Consumption	12 mW
Accuracy:	± 1 %
Speed range:	0,2 - 30 knots
Temperature range:	Storage: -30° to +80°C (-22° to +176°F) Operation: -10° to +70°C (14° to 158°F)
Connections:	Green - + 12 V Yellow - Log pulse White - Temperature Screen - 0 V Ground

7.1 SERVICE MEASURES

The Log transducer function can be checked by measureing the output pulses, yellow to screen wire by oscilloskop or DMM showing ¨2,5 V when paddle wheel is spinning.
See also § 4.3
If defect, the Log transducer has to be replaced as a complete unit.

Before assuming an electronic fault, ensure that the following is not the reason:

a) Paddle wheel is not rotating freely due to sea grass, particles or bottom paint. Check the opening edge of the through hull fitting.



* If the boat is launched a piece of sandpaper can be wrapt around the lower part of the dummy plug and used for grinding the whole.

b) One ore both paddle wheel magnets are lost or have no magnitic strength.

Replace the paddle wheel if defect. P/N 18490.

TEMPERATURE SENSOR

The Temperature Sensor function is a termistor, which can be checked by measureing the impedance, with a DMM between the White and screen wire:

At 15°C the resstance is about 22kohm
At 20°C the resstance is about 19kohm

8.0 DEPTH TRANSDUCER AND SYSTEM

Principle of operation - Software in the NX2 Server

- Create send-pulses SLP of 0,5uS-2,0mS 3 times per second
- Measure the time between send pulse and returning echo signal.
- If more than one , uses the longest echo
- Calculate the depth to be shown. Based on 0.7m / mSec.
- Calculate the length of the next outgoing SLP

Signal handling

- Every send pulse is formed as burst of high frequency adapted to the transducer frequency (185 KHz) with high energy 550 Vpp
- The returned echo is amplified, filtered and formed to a digitalized ECHO signal to be used for depth calculation in the Software.

Transducer

The mounting and position of the transducer is essential to the final result and capacity of the depth. Internal mounting of the transducer affects the dynamic performance of the depth system. Therefore, the customer has to make sure of that the choice of internal mounting works in his boat to full satisfaction.
If not, he has to make a through hull mounting

Trouble tracing

The Depth reading have to be considered as the most delicate measurement when it comes to Marine Instruments. Not only that the ratio between the weakest and strongest echo is 1 to 100.000 times but also that a digital Depth sounder shall decide which one is the bottom echo, of all echoes coming in.
Depth have to cope with widespread conditions of bottoms, heavy water layers of salt and temperature, boats, mountings, vegetation, fish, disturbances etc. and the system is expected to all the time show the correct value of the water depth.
The advanced signal treatment in the NX2 Server handles these variations to minimise influence of the depth measurement.
In some circumstances, however, transitory disturbances can occur.

Below are listed some explanations or possible technical faults for disturbances to the measurement of depth and how it is expressed on the instrument display.

1. There is no depth reading on the display. Only (- - -) is displayed:
If it has not worked before.

- Connection from Server to transducer broken.
- Check installation, cables and connectors
- Listen for transducer clicking. You should hear 3 clicks per second.

2. Unstable or periods of - - - readings.
If there are no depth echoes for some seconds, the display indicates 3 dotted lines (- - -) until a new echo is received.

- In deep water outside the range of the transducer.
- Combination of deep water and soft bottom makes it difficult to reflect the signal.
- When the boat is heeling heavily, for example when sailing.
- Inside hull mounting, hull to thick or trapped with air. Or to little liquid in pipe.

3. Jumpy or erratic readings.

- In a propeller stream, where air bubbles are created. E.g. when powering astern or when following close behind a power boat.
- When going over shoal water, with uneven and high bottom vegetation.
- In heavy layers of salt or noticeable ranges of water temperatures.
- In heavily agitated water containing particles of sand or some other contamination.
- When a boat is moored in a harbour with other boats around, there can be disturbances from signals from other depth transducers, chains or other mooring equipment.
- Electrical noise in the boat. OK when sailing but not with motor?
- Paint or weed on transducer. Clean at regular intervals.

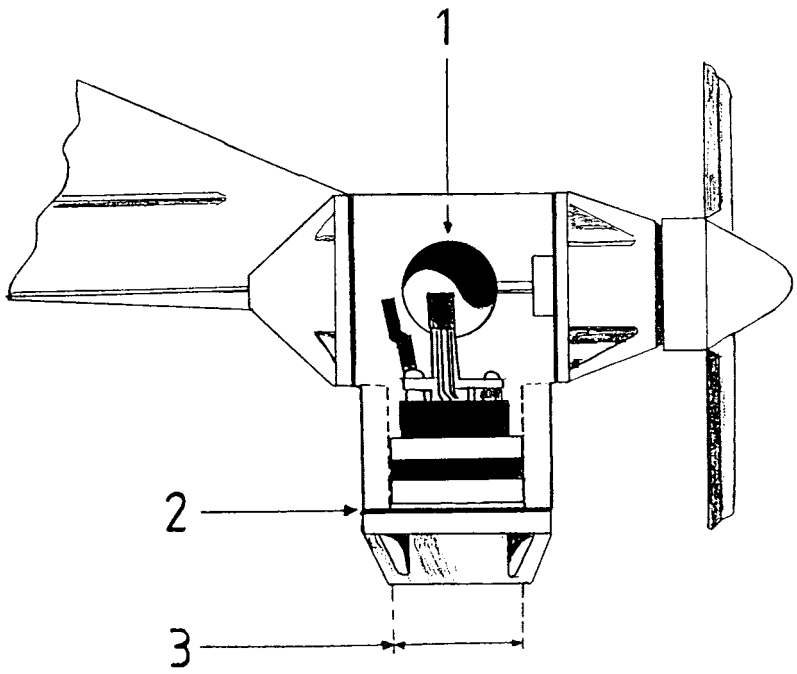
Important: Do not cut or extend the depth transducer cable!

Trouble solving

If no natural cause to wrong or no depth readings can be found the most crucial part is the NX2 Server where the signal processing takes place.
See § 5.6 NX2 Faultfinding Guide and §6.0 Server.

9. WIND TRANSDUCER - MAST TOP UNIT -

The basic principle of the windtransducer is to measure the angle and rotation speed of a black and white ball with two opto sensors. In order to be able to transmit the analog value of an angle there is a need of two channels (a sinus and a cosinus) in order not to get some jumps/skips. Thise skips should otherwise happen at the changeover from 359° to 0°.
On the otherhand a sinuscurve hasn't any skips.
The two opto sensors are displaced in an fixed angle of 90° against eachothers.
The ball with a special design (see figure) is fixed on the propeller-shaft.
When the propeller is rotating the ball is rotating. When wind angle changes the shaft is turning. The light from the opto sensors LED's is reflected from white area but not from the black on the ball to the sensors. This gives the origin for the pulses with different quota high/low signals out from the transducer.
The shape of the black and white area is designed so that pulse quotas from respective channel describes a sinus curve.



The turning angle (wind angle) is transmitted via two signals A and B (sinus and cosinus). One period corresponds to one turn for the propeller. The wind speed is given by the formula:

h_v = (f/3,4) + 0,3

Where f = frequency for channel A or B. Because of friction there is an offset error of 0,3 m/s, i.e. if we measure 3,4 Hz the wind speed is 1 + 0,3 (1,3 m/s), 6,4 Hz gives 2 + 0,3 (2,3 m/s), 34 Hz gives 10 + 0,3 (10,3 m/s) and so on.
Pulsequotas (quota time high/frequency) in percent ($Q_{A\%}$, $Q_{B\%}$) is given by the formula:

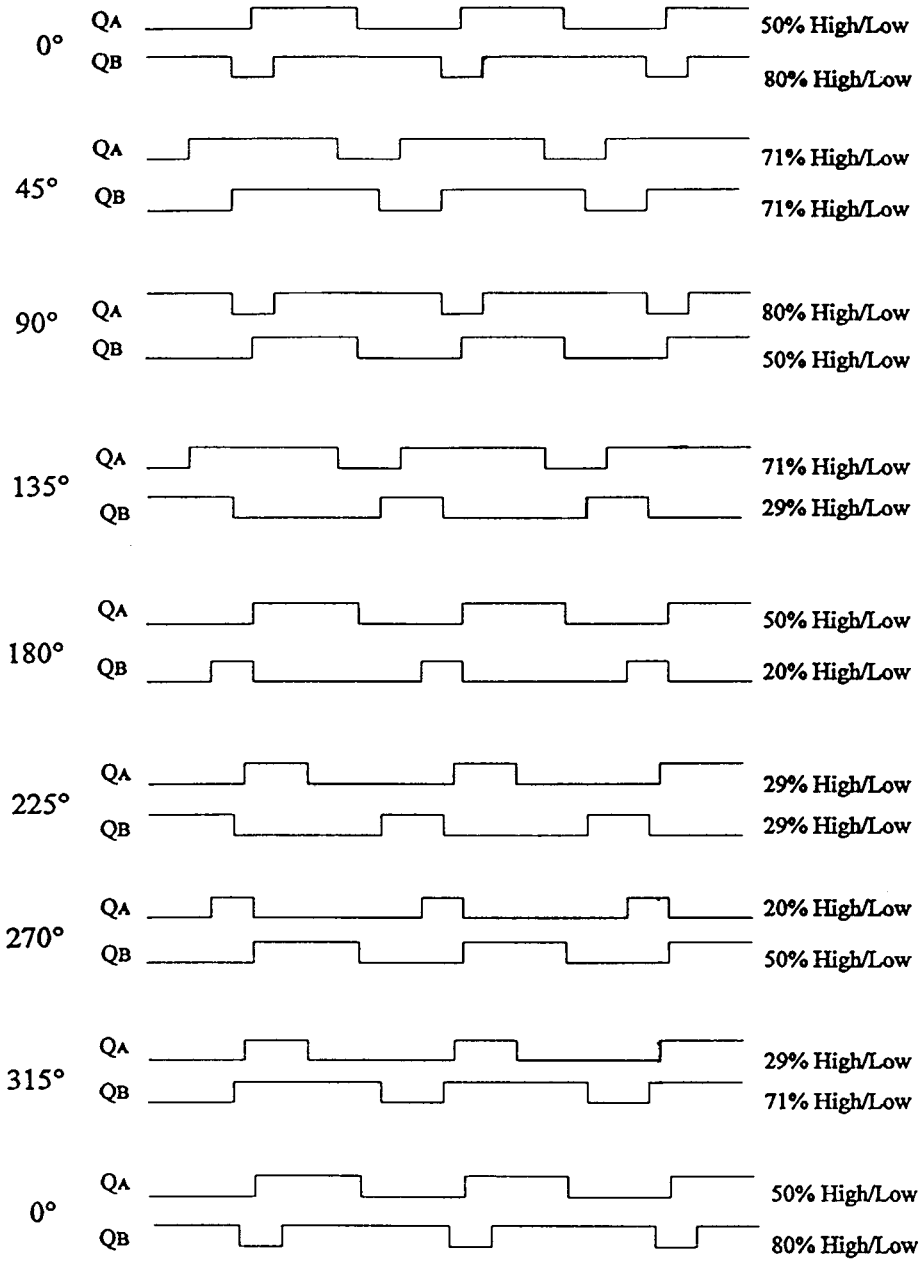
$Q_{A\%}$ = 50 % + 30 % x sinus (α)

$Q_{B\%}$ = 50 % + 30 % x cosinus (α) (cosinus (α) = sinus (α + 90°))

α = wind angle

The two outputs are of the type open collector, i.e. there is a demand of a pull-up resistor to get out an output signal.
Recommended value: 5 - 10 kΩ

SIGNAL WAVE FORM OF WIND-CHANNELS



9.0.1 Calibration of Wind Transducer

To get accurate wind angle read out in the NX2 system the Wind transducer has to be calibrated for the C.55 to C62 settings.

Repair at SILVA Sweden will always be followed by a Calibration Certificate from the Calibration jigg.

9.1 SERVICE MEASURES

The possible faults on a Wind Transducer can be split up in Mechanical and electrical faults.

Mechanical Fault	**Source of error**	**Remedy**	**Calibration needed**	**Chapter**
Propeller broken or lose		Replace Propeller P/N 20091 or Nosecone 20727	- * +	§ 9.1.3 § 9.1.4
Propeller slack		Replace Nosecone P/N 20727	+	§ 9.1.4
Wind vane broken		Replace Vane P/N 18200	-	
Propeller rotation sluggish	Defective horizontal bearings	Replace Nosecone P/N 20727	+	§ 9.1.4
Large slack in vertical bearings or T-house¤		Replace T-house P/N 18898	- *	§ 9.1.5 A
Head rotation is sluggish	Defective vertical bearings	Replace Bearings P/N 20402	- *	§ 9.1.5 B
Missing or faulty wind data	Ball damaged or discoloured	Replace Nosecone P/N 20727	+	§ 9.1.4
Missing or faulty wind data	Damaged/Displaced Opto-reader	Adjust Opto or replace PCB P/N20077	+	§ 9.1.7
Electrical Fault	**Source of error**	**Remedy**		**Chapter**
Missing wind data	Bad or damaged connector	Replace or repair the plug connector	-	§ 9.2
No pulses or only in one channel from the Amplifier	Defect PCB	Replace PCB P/N 20077	+	§ 9.1.7

* if ball or opto element is displaced, new calibration is needed, see § 9.0.1.

¤)Due to the necessity of the freedom to turn with very low friction the mechanical slack can not be zero. If the slack gives a maximum play (difference in height) of the outer edge of the vane that is less than. 3 mm. the measured wind angle is within ± 2° of calibrated value.

Before starting searching for electrical defects in the wind transducer check connections, wires and configuration set-up, i.e. which unit is set to be **Wind Master, C71** (takes the Wind category, see § 2.4)

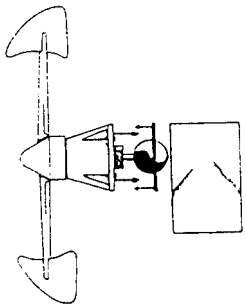
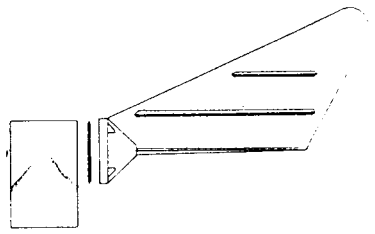
9.1.2 SEALING PROCEDURE

The most determining factor for a long reliable lifetime of the Wind transducer is the tightening of the unit and hereby protecting the bearings from moisture.

The use of new gaskets and Silicon glue in well balanced quantity at the adjacent surfaces and screws will secure tightness. Be sure of that no glue can emerge inside the transducer.

The mast-top unit must, irrespective of which part has been taken apart or replaced, be properly sealed when re-assembled.

Do the following:

Propeller cone/Housing	Gasket 19478 Without gasket new calibration is needed, see § 9.0.1	
Wind vane/Housing	Gasket 19478 or silicone glue	
Housing/Bottom washer	Gasket 19031 Use also silicone glue on both cross section surfaces. Small quantities, avoiding silicone in vertical bearings.	

Put silicone round the outside slit when parts have been screwed together.

9.1.3 REPLACING PROPELLER, Part.No 20091

Dismantling

a) Unscrew the four screws fixing the nose cone.
b) Lift off the nose cone.
Be careful, so that the opto elements are not damaged or displaced.
Turn the direction of the housing to 135° - 180° before lifting off the nose cone.
c) If the defect propeller is still on the axis try with a pointed but strong pliers to keep the axis fixed when unscrewing the old propeller off. Keep the pliers between the ball and bearing without moving the ball as that will change function and calibration.

Put a little glue in the thread of the bolt in the new propeller and screw it tight on the axis.

If the old propeller can not be removed without displacing the ball or damage the nose cone replace the complete Nose Cone, see § 9.1.4.

Re-assembly

a) Put a very thin string of silicone glue Place the four screws and new gasket, art.no 19478. The gasket must be placed against the back side of the cone.
b) Mount the screws and put the nose cone in place. Ensure that gasket is not twisted round any screw.

Important: Remove the wind vane. Check that the opto element is not in contact with the ball or head when turning the head 360E. See illustr. below.

9.1.4 REPLACING NOSECONE, Part.No 20727

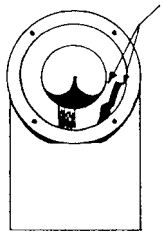
Dismantling

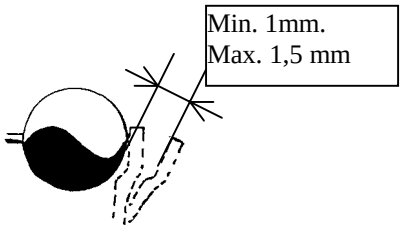
a) Unscrew the four screws fixing the nose cone.
b) Lift off the nose cone.
Be carefull, so that the opto elements are not damaged or displaced.
Turn the direction of the housing to 135° - 180° before lifting off the nose cone.

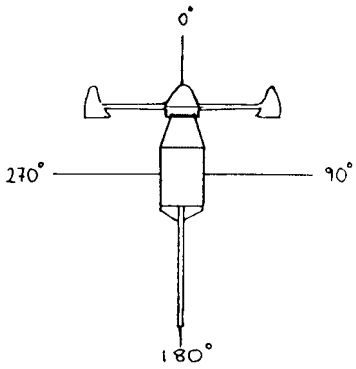
Re-assembly

a) Put a very thin string of silicone glue Place the four screws and new gasket, art.no 19478. The gasket must be placed against the back side of the cone.
b) Mount the screws and put the nose cone in place. Ensure that gasket is not twisted round any screw.

Important: Remove the wind vane. Check that the opto element has a space of 1,0 to 1,5 mm to the ball all around when turning the head 360°. Also check that the opto element do not touch any part of the head.







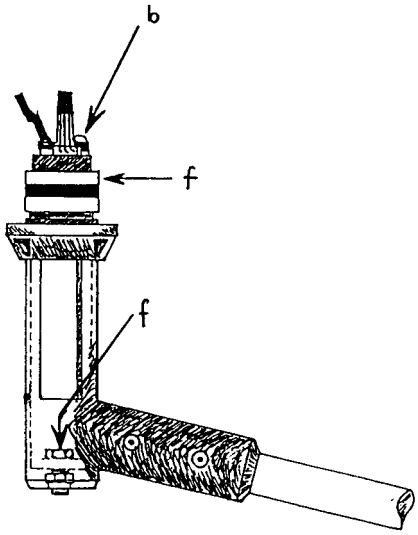
If adjustment is required, press carefully the opto element (down end, not in top end) in necessary direction to obtain smooth rotation of wind head. Check also the four main directions to ensure stable and accurate readings. For calibration see § 9.0.1.

9.1.5 REPLACING THE T-HOUSING, Art.No 18898

Dismantling

a) Unscrew the four screws and lift up the complete transducer head.
b) Unscrew the four screws fixing the nose cone. Lift off the nose cone.
c) Unscrew the four screws fixing the Vane and remove it.
d) Replace the T-housing and Re-assemble

9.1.6 REPLACING VERTICAL BEARINGS, Art.No 20402



Dismantling

a) Unscrew the four screws and lift up the complete transducer head.
b) Unscrew the two screws holding amplifier PCB.
c) Lift up the PCB.
d) Ensure that the transducer unit is disconnected from power supply.
e) Unsolder the four wires.
f) Use the socket wrench for removing the bolt with nut and lift up the inner tube and replace defect bearings.

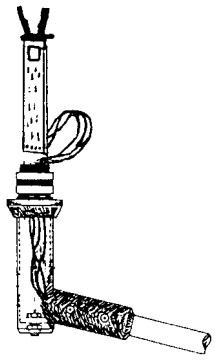
Re-assembly

In opposite order, but note the following:

- Re-solder wires according to § 9.1.7g.
- Be careful with the wires when they are put through the hole in the bottom of inner tube. Bend them as illustrated before the amplifier PCB is pressed down in place.

9.1.7 Replacing amplifier PCB

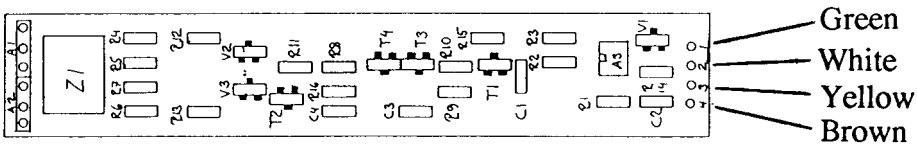
As the opto elements characteristics are adjusted and trimmed in the amplifier during the production, the PCB should be replaced as a complete unit.



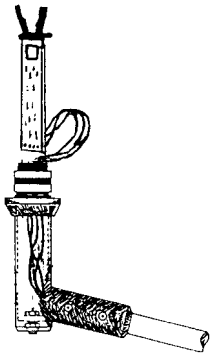
Dismantling

a) Unscrew and lift off the complete head.
b) Unscrew and lift up the amplifier board. Ensure that transducer is disconnected from power supply. Check/Replace PCB
c) Check the+12V supply on green: correct level? If no +12 V on green wire check the plug connector, see § 9.6
d) Check Chanel A, white. Activate the opto element by putting a finger to cover it, back and forth. The level, will now shift between 0 V and 5 V ±0,5 V. Replace the amplifier PCB if the output is constant 0 V or 5 V.
e) Check signal in channel B, Yellow. Same procedure. Replace the amplifier PCB if the output is constant 0 V or 5 V.
f) Un-solder the four wires.

g) Re-solder the wires to the new PCB.



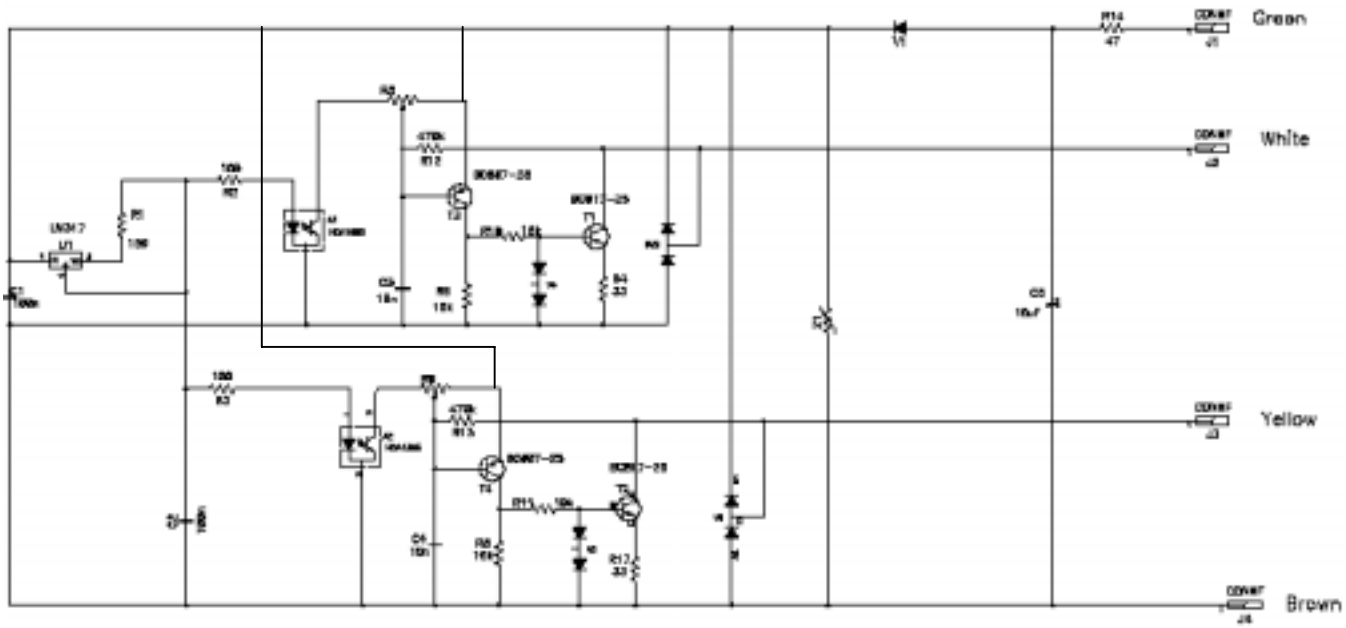
Re-assembly
In opposite order, but note the following:



Be careful with the wires when they are put through the opening in the bottom of inner tube. Bend them as fig. shows before the amplifier PCB is pressed down in place. Be aware of that the component side of the PCB is facing forward.
If the PCB gets stuck in the slots remove the lacquer on the edges of the PCB.

Important: Remove the wind vane. Check that the opto element has a space of 1,0 to 1,5 mm to the ball all around when turning the head 360°. Also check that the opto element do not touch any part of the head. See also § 9.1.4

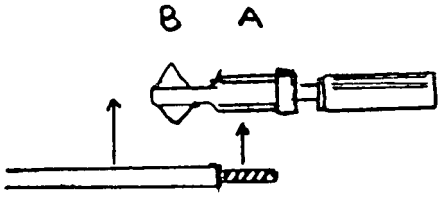
9.4 Circuit Diagram NX2 WIND TRANSDUCER



9.2 Replacing plug connector, art.no 18252

Strip each wire in the cable. Do not cut the isulating covering.

Illustrated.



Place the striped wire end at A and insulating covering at B in the socket device 18251.

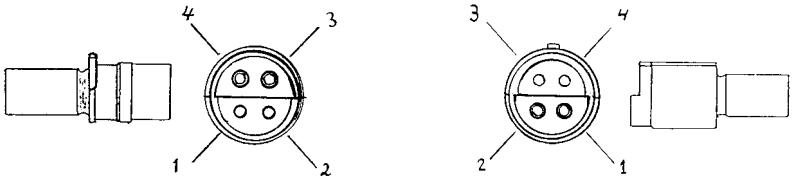
Use a pliers and press the two laps at B round the wire.

Press the two laps over and down at A and solder A.

Same procedure for pin device, art.no 18848.

Pin and socket configuration. The numbers are marked at each pin and socket.

Mast Cable **Transducer**



NX2/NEXUS	**Function**	**Note!! Old Transducer**
1. Green	+ 12 Volt	= Red
2. Brown/Screen	0 Volt/Ground	= Black
3. Yellow	Channel A	= White
4. White	Channel B	= Blue

Press each pin and socket device. Place the cap over the plug connector at place with a screw driver on the rim. Put silicone, 18892, on pins and sockets to make it easier.

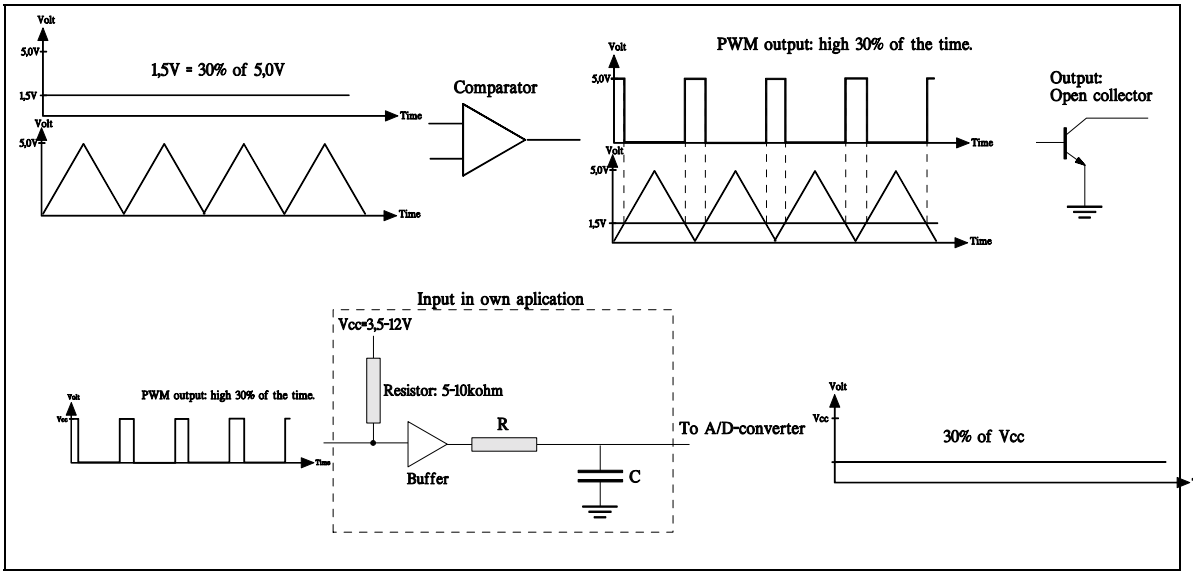
Pull each cable to ensure safe soldering.

NOTE! To seal and tighten the connectors also use silicone grease on the junction at the top of the mast.

10. COMPASS TRANSDUCER

Principle of operation

The magnetic field is measured by use of two coils 90° perpendicular with one ferrite rod in each coil that are forced into saturation by a known current. The known magnetic field is mixed with the outside unknown magnetic field, and the difference are converted into a amplified voltage signal that is compared to a known reference voltage. This reference is created by an internal triangular voltage that is passing a comparator input at a rate of 13 Hz. When the magnetic field signal is compared to the reference, a PWM (Pulse Width Modulation) signal is created. The ratio or variation of each PWM signal are related to the magnetic field strength. The advantage is that the high resolution signal can easily be transmitted up to 100 m with a shielded cable without degradation.



The fluxgate compass will give one sine and one cosine PWM heading signal output.

The two PWM signals (Sine/Cosine) are only represented as a ratio between each other. The pulse frequency is nominal 15 Hz (+/- 2Hz) and a duty cycle of 50% high and 50% low is the same as no outer magnetic field is applied, i.e. the magnetic field is 90° perpendicular to the coil, i.e. sine 0 degree.
The duty cycle quota in percent for the transmitted channels ($Q_{A\%}$, $Q_{B\%)}$ is given by the formula:

$Q_{A\%}$ = 50 % + A % x Sinus (α)
$Q_{B\%}$ = 50 % + B % x Cosinus (α) (cosinus (α) = sinus (α + 90°))
α = Compass heading

A and B are the magnetic flux in percent where $\sqrt{(A^2 + B^2)}$ is constant at an undisturbed geografic spot.
The value of $\sqrt{(A^2 + B^2)}$ is dependent of the magnetic flux on the actual geographical spot.

Signal wave form of Compass transducer see § 9 Wind Transducer
The signal wave form of the compass transducer is similar to that of the Wind transducer.

The two outputs are of the type open collector, i.e. there is a demand of a pull-up resistor to get out an output signal.
Recommended value: 5 - 10 kΩ

NEXUS Network

Compass Transducer connect to the NX2 Server or NX2 Compass Data instrument will give output of 5 deviated compass headings per second on the NEXUS Network.
The NX2 Server will output NMEA 0183 compass data from 1 to max. 4 times per second (selectable).

The Server is operated by use of the NX2 Multi Control, Multi Center or NX2 Remote Control instrument and will perform an Automatic deviation and an Automatic check. Adjustment of the A-fault and local magnetic variation can also be done. The values are stored in 10 year minimum EEprom memory without any need of battery backup.

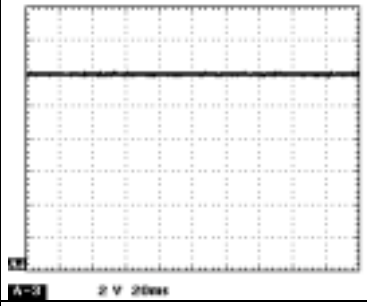
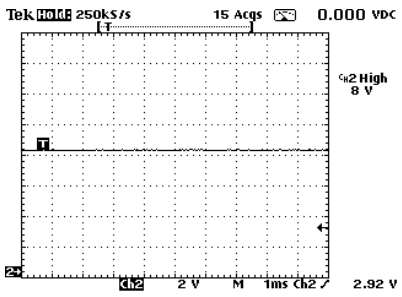
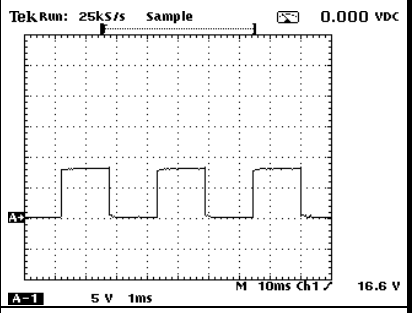
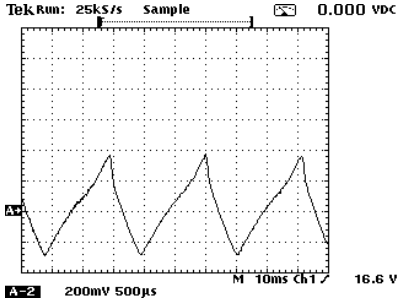
Technical specification

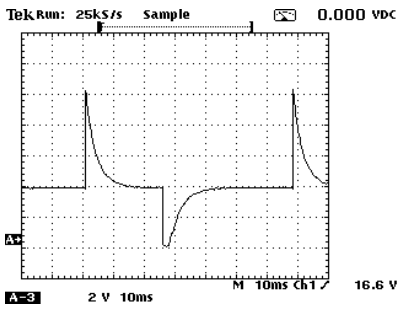
FEATURES: Liquid dampened and fully gimballed sensor, un-sensitive to resonance frequencies at all sea conditions makes it suitable for all applications including autopilots.

Dimensions housing	125 x 140 x 120 mm (5" x 51/2" x 43/4")
Min. Voltage	10.0V (max. 18V nom. 12V)
Power consumption	0.3W
Temperature range	Storage –30 to +80 C, operating –10 to +70 C
Dampening time	0.5s (90° fast turn)
Accuracy	+/- 0.5°
Field strength sensitivity	5 – 80 uT
Maximum vertical inclination	80°
Heel / Pitch	+/-45°

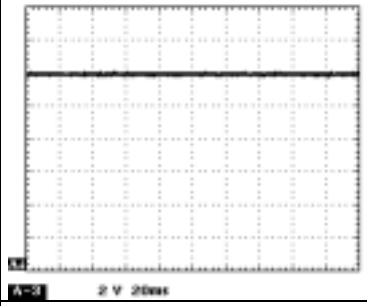
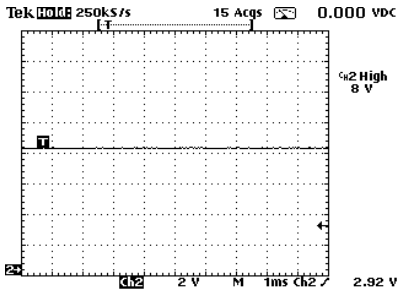
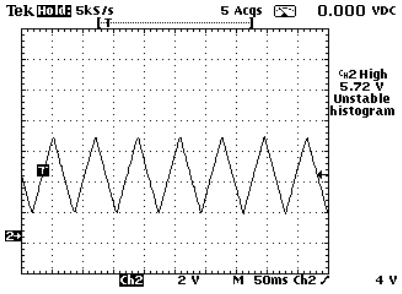
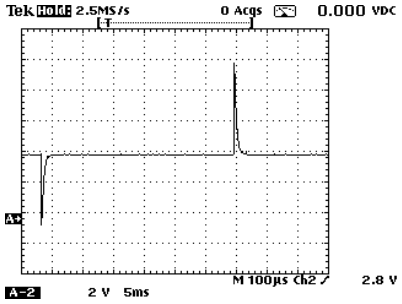
Output PWM frequency for the transducer is nominal 13 Hz (+/- 2Hz).

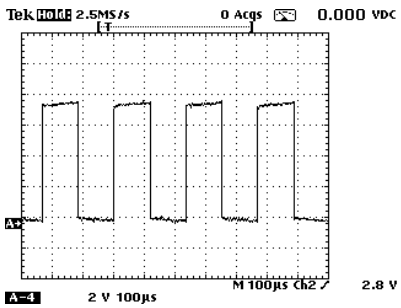
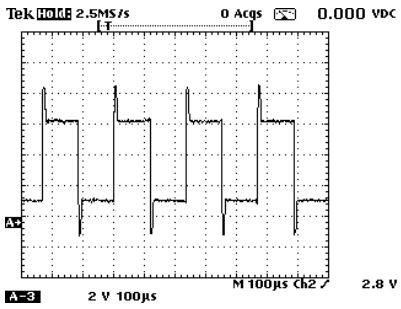
10.2 TROUBLE SHOOTING - TEST WAVE FORMS COMPASS TRANSDUCER 45°

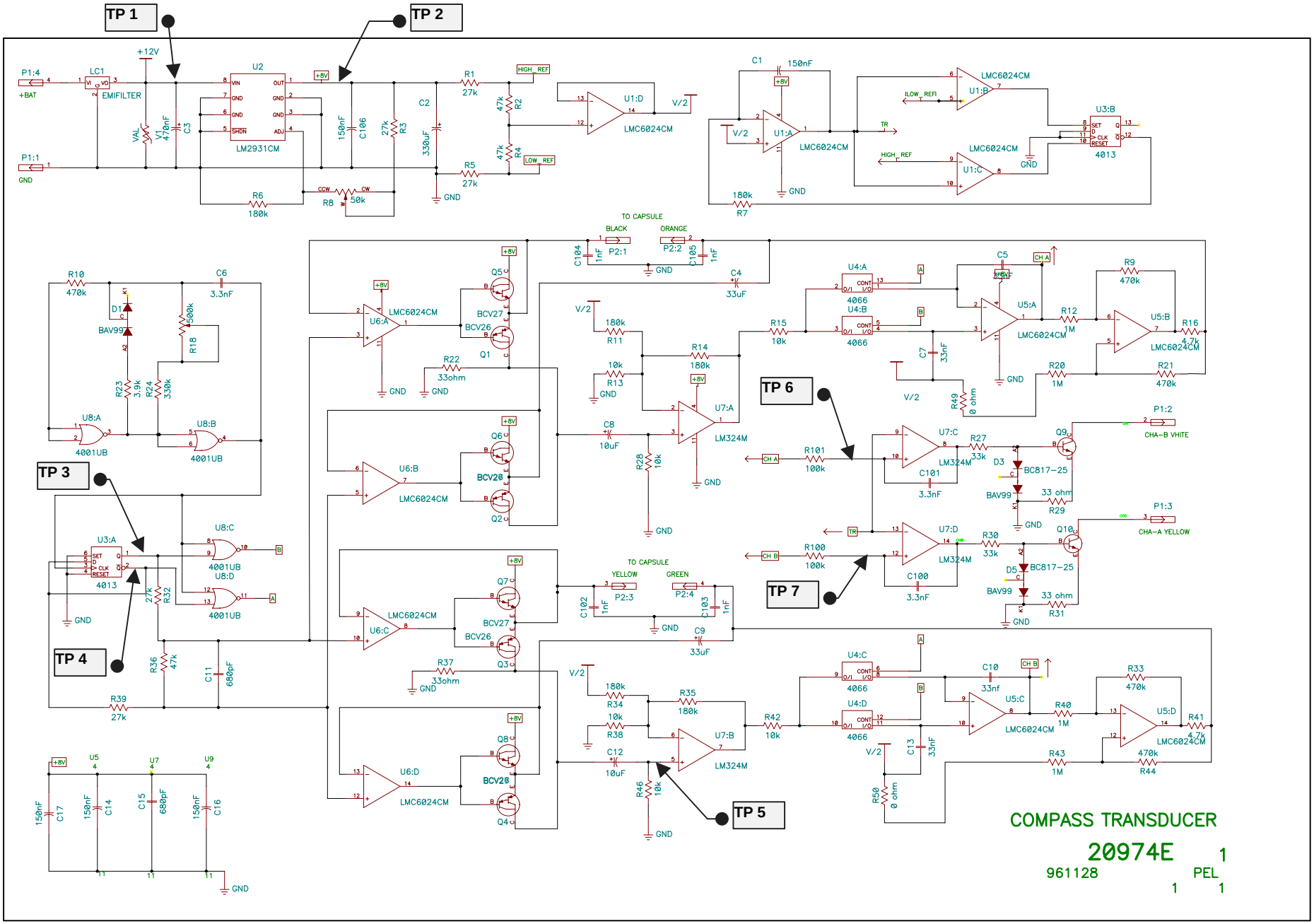
Fault indication	Check signal at:	Possible reason if not Correct waveform	DMM test.	Oscilloscope Correct wave form
No output signal	TP 1	Defect V1 or LC 1	+12 V	
No output signal	TP 2	Defect U2	+8 V	
No output signal	TP 3 + 4 U 3 Pin 1 resp. 2	Defect U3	DC 4 V	
No output signal	TP 5 U 7 Pin 5	No	Not possible (pulse)	

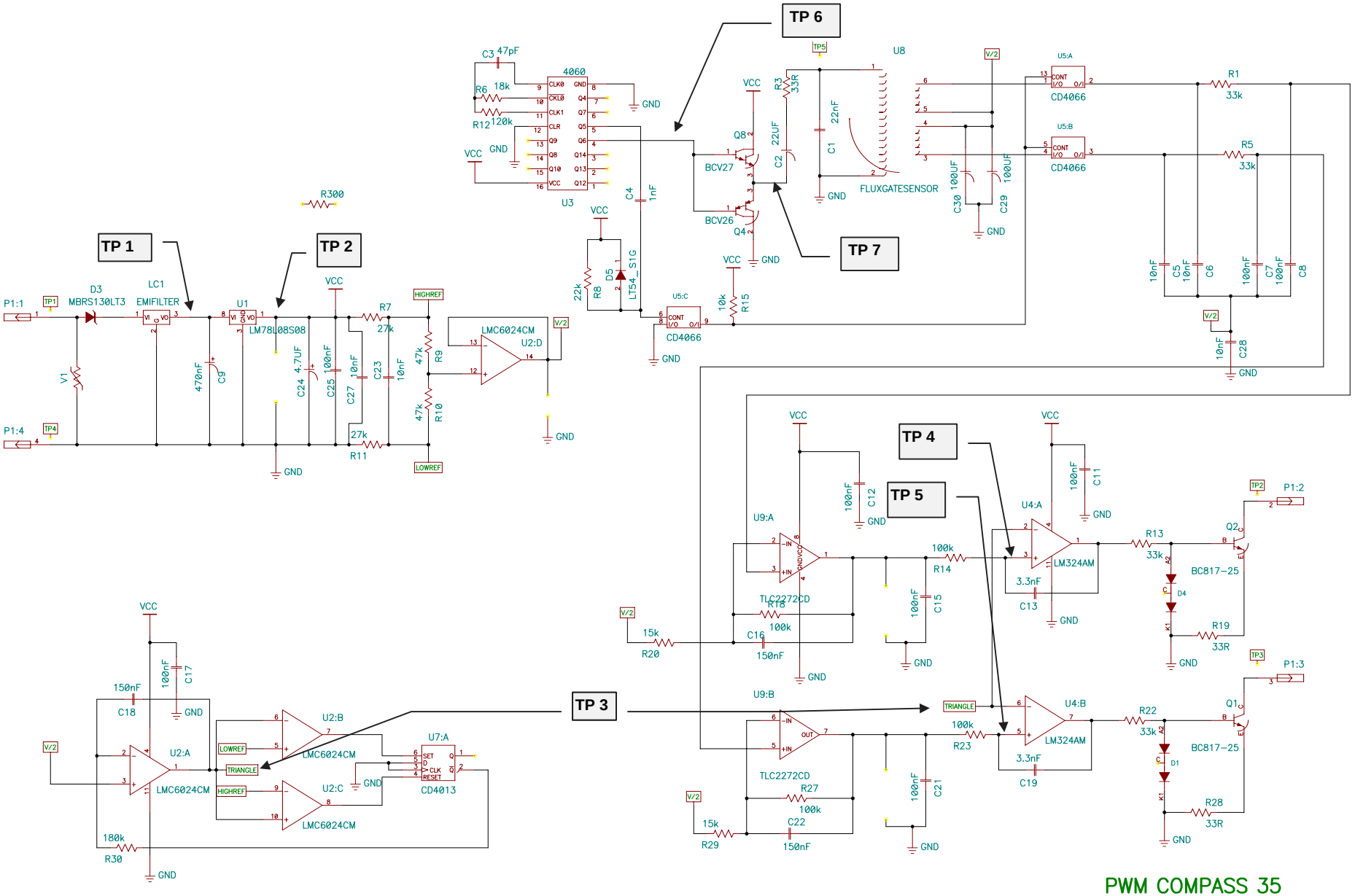
Fault indication	Check signal at:	Possible reason if not Correct waveform	DMM test.	Oscilloscope Correct wave form
No output signal	TP 6 +7 U 7 Pin 10 resp. 12		Not possible (pulse)	

10.21 TROUBLE SHOOTING - TEST WAVE FORMS COMPASS TRANSDUCER 35°

Fault indication	Check signal at:	Possible reason if not Correct waveform	DMM test.	Oscilloscope Correct wave form
No output signal	TP 1	Defect V1, D3 or LC 1	+12 V	
No output signal	TP 2	Defect U1	+8 V	
No output signal	TP 3 U 2 Pin 1 and U4 pin 6	Defect U2	AC 1,4 V	
No output signal	TP 4+ 5 U 4 Pin 3 resp. pin 5	No	Not possible. (pulse)	

Fault indication	Check signal at:	Possible reason if not Correct waveform	DMM test.	Oscilloscope Correct wave form
No output signal	TP 6 U 3 Pin 4		DC 4 V	
No output signal	TP 7 Q8 and Q4 pin 3		DC4 V	


TP 1
TP 2
TP 3
TP 4
TP 5
TP 6
TP 7
+12V
+BAT
EMIFILTER
LM2931CM
LMC6024CM
LM324M
4066
4013
4001UB
BCV27
BCV26
BC817-25
BAV99
TO CAPSULE
BLACK
ORANGE
YELLOW
GREEN
CHA–B VHITE
CHA–A YELLOW
COMPASS TRANSDUCER
20974E 1
961128 PEL
1 1


TP 1
TP 2
TP 3
TP 4
TP 5
TP 6
TP 7
P1:1
P1:2
P1:3
P1:4
D3
MBRS130LT3
LC1
EMIFILTER
U1
LM78L08S08
R300
V1
470nF
C9
4.7UF
C24
100nF
C25
10nF
C27
10nF
C23
27k
R7
27k
R11
47k
R9
47k
R10
HIGHREF
LOWREF
LMC6024CM
U2:D
C3 47pF
4060
R6 18k
R12 120k
U3
C4 1nF
22k
R8
D5
LT54_S1G
BCV27
Q8
BCV26
Q4
R3 33R
C2 22UF
C1 22nF
FLUXGATESENSOR
U8
U5:A
U5:B
U5:C
CD4066
C30 100UF
C29 100UF
R1 33k
R5 33k
10nF
C5
10nF
C6
100nF
C7
100nF
C8
10nF
C28
10k
R15
U9:A
U9:B
TLC2272CD
100nF
C12
100k
R14
R18 100k
C16 150nF
15k
R20
U4:A
U4:B
LM324AM
3.3nF
C13
3.3nF
C19
100nF
C11
R13 33k
R22 33k
R19 33R
R28 33R
R23 100k
R27 100k
C22 150nF
15k
R29
BC817-25
Q2
Q1
D4
D1
TRIANGLE
U2:A
U2:B
U2:C
U7:A
CD4013
150nF
C18
100nF
C17
180k
R30
VCC
GND
V/2
PWM COMPASS 35
21704
C3
990126
M.J

11 INSTRUMENT MULTI, SPEED AND AUTOPILOT

NX2 Multi Control is a multi function instrument that displays a main and a sub-function together. You can easily ”customise” your favourite combination of functions, by using the unique method to move, copy and lock a sub-function.

The instruments large display gives you very good viewing possibilities from any angle, even in bright sunlight. The display and the five push-buttons have red back lighting which you can set to three different lighting levels

The NX2 Multi Control instrument can also be used to remote control other NX2 (and even Nexus Classic) Instruments.

The Speed Instrument can be connected to the NEXUS bus or used stand alone connected to a log transducer.

The Auto Pilot Instrument is the control unit in a NEXUS Auto Pilot system. It can be used as a standalone unit, or as a part in a NX2 network system with the Server. The reference to which the Autopilot shall steer on can be selected, Heading, Wind or towards a Waypoint. Also direct power steer of the rudder.
The Autopilot can be controlled also by the NX2 Remote Control and the Multi Center.
The Compass transducer connected to NEXUS Server will support the Auto Pilot Servo unit (see separate Service Manual) with all information.

Service measures

Silva NX2 instrument series is build according to IP68/IP66 standard which means that the instruments are sealed and can not be opened.
The basic service measures on Multi Control, Speed and Auto Pilot instruments are based on Faultfinding, see §5, replacing defect units according to the NX2 Replacement system.

Technical specifications

Dimensions:	NX2 MULTI Control instrument: 113 x 113 x 23+28 mm (4,4 x 4,4 x 0,9 + 1,1 inch). Server: 110 x 165 x 30 mm (4,3 x 6,5 x 1,2 inch)
Instrument cable:	8 m (26 ft).
Power supply:	12V DC (10-16V). The instruments are polarity protected.
Power consumption at 12 V:	MULTI Control instrument: 9 mA at 12 V=0,11W with maximum lighting: 40 mA at 12 V=0,48W Server: 27 mA at 12 V = 0,3W
Temperature range:	Storage: -30° to +80°C (-22° to +176°F) Operation: -10° to +70°C (14° to 158°F)
Weight:	MULTI Control instrument: 260 gram (9,17 oz). Server: 240 gram (8,5 oz)
Enclosure:	MULTI Control instrument: Water proof acc. to IP 68/IP66 Server: Splash proof
CE Approval:	The products conform to the EMC requirements for immunity and emission according to EN 50 081-1.

12. WIND DATA AND COMPASS DATA INSTRUMENT

The Wind Data and Compass Data instrument can be use stand alone with transducers connected direct to the instruments or in a Network with a NX2 Server. Both the Wind Data and Compass Data instrument has capability to be a Network Manager

Possible transducers for the Wind Data are: Wind transducer, Log transducer, Temperature transducer and Mast rotation sensor. With all transducers connected, you have all wind functions, true and apparent wind angle and true and apparent wind speed. In addition you have VMG and boat speed.

Possible transducers for the Compass Data are: Compass, Log and Temperature transducer. With all transducers connected, you have all Compass functions including Steer functions, dead reconing and boat speed.

There are also multiple trim possibilities with the external trim button for the racers as well as the cruisers.

Both the NX2 Wind and Compass Data the instrument can be used as a Network Manager, or as a Network Repeater, this is set in Calibration C 71 and C 72.

Service measures

Silva NX2 instrument series is build according to IP68/IP66 standard which means that the instruments are sealed and can not be opened.
The basic service measures on the Wind Data and Compass Data instruments are based on Faultfinding, see §5, replacing defect units according to the NX2 Replacement system.

Technical specifications

Dimensions:	NX2 Wind and Compass Data instrument: 113 x 113 x 23+28 mm (4,4 x 4,4 x 0,9 + 1,1 inch).
Instrument cable:	0,4 m (16 inch)
Power supply:	12V DC (10-16V). The instruments are polarity protected.
Power Consumption Instrument:	9 mA at 12 V=0,11W with maximum lighting: 40 mA at 12 V=0,48W
Log- and temp transducer:	12 mW
Wind transducer:	50 mW
Temperature range:	Storage: -30° to +80°C (-22° to +176°F) Operation: -10° to +70°C (14° to 158°F)
Weight:	Compass Data: instrument: 260 gram (9,17 oz) " " transducer: 650 g (23 oz) Wind Data: instrument: 260 gram (9,17 oz) " " transducer: 293 g (10,33 oz)
Enclosure:	Water proof acc. to IP 68/IP66
CE Approval:	The products conform to the EMC requirements for immunity and emission according to EN 50 081-1

13 NX2 ANALOG INSTRUMENTS - ALL

Analog Instruments

All analog instruments are repeaters of digital instruments. The instruments to which you may connect an analog repeater is: Multi and Server, Wind Data or Compass Data. For some analog instruments, you may select from a digital instrument, what you want to be displayed. You may for example select if the Analog wind angle should be true or apparent and the Steer pilot has multiple functions. The NEXUS Network offers a wide range of analog repeaters, with superior readability, particularly at night. Furthermore, this gives you a more active instrument which can show trends and tendencies over the course and the boat performance. The analog Steer Pilot instrument in particular offers unique functions. You need a digital Network instrument to be able to use an analog repeater.

Service measures

Silva NX2 instrument series is build according to IP68/IP66 standard which means that the instruments are sealed and can not be opened.
The basic service measures on all Analog instruments are based on Faultfinding, see §5, replacing defect units according to the NX2 Replacement system

Technical specifications

Dimensions:	NX2 Analog instrument: 113 x 113 x 23+28 mm (4,4 x 4,4 x 0,9 + 1,1 inch).
Instrument cable:	0,4 m (16 inch)
Power supply:	12V DC (10-16V). The instruments are polarity protected.
Power consumption at 12 V:	70-90 mA at 12 V=0,8-1,1W with maximum lighting: 140-160 mA at 12 V=1,7-1,9W
Temperature range:	Storage: -30° to +80°C (-22° to +176°F) Operation: -10° to +70°C (14° to 158°F)
Weight:	260 gram (9,17 oz).
Enclosure:	All Analog instrument: Water proof acc. to IP 68/IP66
CE Approval:	The products conform to the EMC requirements for immunity and emission according to EN 50 081-1.

14. MULTI XL INSTRUMENT

NX2 Multi XL is a enlarged Multi function instrument that displays a main function in 40 mm high figures and a sub-function in 22 mm.
It is easy to ”customise” a favourite combination of functions, by using the unique method to move, copy and lock a sub-function.
This is done from a NX2 Multi Control, Remote Control or Multi Center Instrument.
The instruments large display gives a very good viewing possibilities from any angle, even in bright sunlight. The display have red back lighting which can be set to three different lighting levels.

Service measures

Silva NX2 instrument series is build according to IP68/IP66 standard which means that the instruments are sealed and can not be opened.
The basic service measures on Multi XL instruments are based on Faultfinding, see §5, replacing defect units according to the NX2 Replacement system.

Technical specifications

Dimensions:	Multi XL Instrument: 110 x 154 x 23 mm (4.3 x 6.1x 0,9 inch)
Instrument cable:	8 m (26 ft)
Power supply:	12 V DC (10 - 16 V). The instruments are polarity protected.
Power consumption at 12 V:	Multi XL instrument: 6 mA at 12 V=0,07 W with maximum lighting: 56 mA at 12 V=0,7 W
Temperature range:	Storage: -30° to +80°C (-22° to +176°F) Operation: -10° to +70°C (14° to +158°F)
Weight:	410 gram (14,4 oz)
Enclosure:	Water proof acc. to IP 68/IP66
CE Approval:	The products conform to the EMC requirements for immunity and emission according to EN 50 081-1.

16. REMOTE CONTROL INSTRUMENT

Remote Control instrument can be connected directly to a NX2 instrument on the Nexus Network, or to the NX2 Server, and you do not have to re-calibrate the transducers or the current system set-up.

The Remote Control instrument is more than just a remote control.

- It is a NX2 Multi function instrument in itself, displaying all functions in the Network.
- It can remote control all, or selected Nexus instruments in the Network.
- It can be used at the chart table as the waypoint and rout editor in the Network
- It can be an integrated control unit for the Nexus Autopilot.
- It offers unique trim functions for the sailor.
- It offers a Man Over Board function.
- It offers a built in alarm with eight alarm settings.
- It offers a control of the MAXI repeaters, up to nine units.
- It offers a control of the MULTI XL repeaters.
- It offers the possibility to customise the display with your two favourite functions.
- It can be configured to ”hide” pages you do not want to use, or conceal from curious hands.

Service measures

The basic service measures on all NX2 Remote Control instrument are based on Faultfinding, see §5, replacing defect units according to the NX2 Replacement system

Technical specifications

Dimensions:	Instrument: 150 x 72 x 26 mm (5,9 x 2,8 x 1,0 inch). Bracket: 110 x 79 x 28 mm (4,3 x 3,1 x 1,1 inch)
Instrument cable:	5 m (16 ft)
Power supply:	12V DC (10-16V). The instrument is polarity protected.
Power consumption at 12 V:	13 mA at 12 V=0,15 W with maximum lighting: 70 mA at 12 V= 0,8 W
Temperature range:	Storage: -30° to +80°C (-22° to +176°F) Operation: -10° to +70°C (14° to 158°F)
Weight:	Instrument: 200 gram (7 oz). Bracket: 20 gram (0,7 oz)
Enclosure:	Water proof
CE Approval:	The products conform to the EMC requirements for immunity and emission according to EN 50 081-1 and EN 55022.

18. GPS NAVIGATOR INSTRUMENT

The NX2 GPS Navigator can be used as a separate navigator or integrated in the Nexus Network. It can also be used in combination with other GPS-system through the built in NMEA port.
Using Waypoints, sail-plans and routes can be done not only on the GPS Navigator but also from other Instruments in a connected NX2 Network.

Service measures

Silva NX2 instrument series is build according to IP68/IP66 standard which means that the instruments are sealed and can not be opened.
The basic service measures on NX2 GPS Navigator instrument are based on Faultfinding, see §5, replacing defect units according to the NX2 Replacement system.

Technical specifications

Dimensions:	NX2 GPS Navigator instrument: 113 x 113 x 23+28 mm (4,4 x 4,4 x 0,9 + 1,1 inch).
Instrument cable:	0.4 m (16 inch)
Power supply:	12V DC (10-16V). The instruments are polarity protected.
Power consumption at 12 V:	Instrument: 9 mA at12 V=0,11W with max. illumination: 40 mA at12 V=0,48W
Temperature range:	Storage: -30° to +80°C (-22° to +176°F) Operation: -10° to +70°C (14° to 158°F)
Weight:	Instrument: 283 g (10 oz) GPS Antenna: 250 g (23 oz)
Enclosure:	Instrument: Water proof acc. to IP 68/IP66
CE Approval:	The GPS Navigator Instrument conform to the EMC requirements for immunity and emission according to EN 50 081-1 and EN 55022.

19. GPS ANTENNA

The NX2 GPS Antenna is 12-channel receiver, transmitting position in NMEA 0183 signal format.

Service measures

Silva NX2 GPS Antenna is highly integrated and thoroughly trimmed unit.
This means that the electronics should in case of male-function be replaced in its hole. For Faultfinding, see § 5; replace defect electronics according to the NX2 Replacement system.

Technical specifications

Dimensions:	Diameter: 108 x 49 mm (4,2 x 1,9 inch).
Instrument cable:	10 m (32,8 ft)
Power supply:	12V DC (6 -16V). The instruments are polarity protected.
Power Consumption at 12 V:	100 mA at 12 V=1,2W
Temperature range:	Storage: -30° to +80°C (-22° to +176°F) Operation: -10° to +70°C (14° to 158°F)
Weight:	200 gram (7 oz).
Enclosure:	Water resistant
Communication out:	NMEA 0183
Receiver:	12 channel parallel

20. MULTI CENTER INSTRUMENT

The Multi Center can be the ‘center’ of a boats navigation system, including a chart plotter. The use of the Multi Center is operation through menus similar to a Windows™ program
The Multi Center monitors all boat data on the NEXUS network. Some functions may be displayed in graphs, such as wind direction , wind speed, depth etc.
For the chart plotter Navionics® Navcharts are used with very good world-wide coverage. The Multi Center may be connected to the NEXUS Network or to a NMEA GPS

In the NMEA0183 mode, standard and commonly used GPS navigation and position messages are accepted. When used in the NEXUS Network mode where a NEXUS Server is installed, you will get maximum integration with all information available on the screen of the Multi Center.
The Multi Center has a high contrast super twist LCD with a resolution of 320x240 pixels.
The display may be customised for: special needs, choice of size on the plotter screen, with extremely fast zooming that allows rapid change between overview and detailed zoom level.
The screen amplifier function will automatically optimise the screen and position the boat on the screen with largest part of the chart in front of the boat, regardless of speed and course.
Multi Center gives valuable information even when used without charts. Monitor boat data, wind shifts, edit waypoints and use as a graphical navigator.
The operation of the Multi Center is available in 9 languages

Service measures

The basic service measures on the Multi Center instrument are to replace the following:

- Complete CPU PCB -
- Display unit complete
- Keyboard
- Cable internal

- Instrument front
- Pin connector

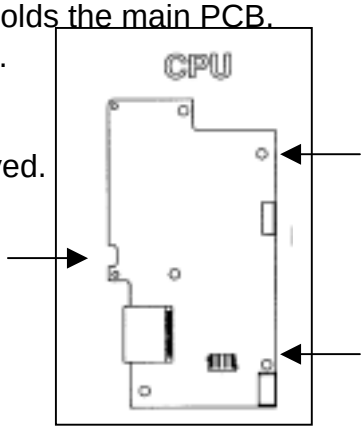
Reset: To reset the unit: Keep the **CLR -**button depressed during start, ON.
NOTE! All settings will be reset to default values and all Waypoints will be erased

Technical specifications

Dimensions:	NX2 MULTI Center: 160 x 185 x 45mm (6,3 x 7,3 x 1,8 inch). Bracket: According to drawing in Operation Manual
Instrument cable:	6 m (19,5 ft).
Power supply:	12V DC (10-16V). The instruments are polarity protected.
Power consumption at 12 V:	84 mA at 12 V = 1 W with maximum lighting: 145 mA at 12 V=1,7 W
Temperature range:	Storage: -30° to +80°C (-22° to +176°F) Operation: -10° to +70°C (14° to 158°F)
Weight:	700 gram (24,7 oz).
Enclosure:	Splash proof
CE Approval:	The products conform to the EMC requirements for immunity and emission according to EN 50 081-1 and EN55022

20.1 Dismantling and re-assembly

- Unscrew the five screws in the back cover.
- Remove the white 8 pin connector from the PCB.
- Remove the 12 wire flat-cable connector from the Display board.
- Unscrew the two screws and remove the metal shield.
- Unscrew the five spacers which holds the main PCB.
- The PCB is fixed by three lockers. Unlock the single on the left side and lift the PCB a bit at the same side. The PCB now can be removed. See illustration.
- Unscrew the two spacers which holds the light guide and the display. The display is also fixed with addessive tape.



Re-assembly

- Do the re-assembling in reversed order of above instruction for dis-mantling and not the following:
- Use an injector with silicone and place a thin string of silicon in the groove and on the seats for the screws.
- Be careful with the threads when screwing the screws.
  The 5 screws should be tighten with a torque of 1 Nm.

The PCB is replaced as a complete unit.

20.2 Spare Parts

21584 I-FRONT	67603 DISPLAY Compl.	67604 CPU PCB Compl.
67607 COVER Cartridge	67605 KEYBOARD Set	67606 Cable Internal
67609 CASING	21592 BRACKET for mont.	67608 SPACER Screw

21652-6 Cable, 6 m with connector. 21653 Connector CXA female 21587 Back Cover

20.3 MultiCenter software update instructions

To do the update a NavChart with a later software program is needed.

1. Turn MultiCenter off.
2. Insert the NavChart into MultiCenter's chart slot.
3. Turn MultiCenter on.
4. Wait for the message "UPGRADE CARTRIDGE FOUND". On the screen you can now verify that you have received the correct version.
5. Press the <ENTER> key to start the update or <CLR> to abort.
6. The MultiCenter will now start to beep, meaning it's copying the NavChart to it's internal flash.
7. When the beep stops there will be a message "UPDATE COMPLETED".
8. Now you should remove the card and hit <ENTER>. This will reboot MultiCenter.
9. Congratulations! The upgrade is completed.

20.5 SPARE PARTS LIST

MULTI CENTER **Art.No 21621**

Art.Nr	Identity	Description	Package	Qty
21584		I-Front		
67603		LCD Display cpl. w.Suppor Assembly		
67604		PCB CPU Complete		
67605		Keyboard Set		
21896		Sheld Plate Internal		
21897		Screw M3x10 Inox		
33394-		Screw M3x10 Inox		
21898		Washer M3		
21899		O-Ring 2,57x1,78 Sh70hr		
67606		Cabel Internal		
21648		Gasket bulkhead		
21652-6		Cable Extern 6 m.w. conector		
21653		Contact CXA female,		
21587		Back Cover		
21592		Bracket for Mounting		
35727		Sreews for Bracket 4x10 INOX		
21828		Front Protection Cover		
67607		Cover Cartridge		
67609		Casing		
67608		Spacer		
		PCB Components		
21768	U2	Smittrigger inverter	SO 14	
22063	U6 + U15	Buffer 74HCT245D	TSSOP	
21034	U8+ U14	IC Op Amp. Comp. LM 393P	SO 8	
21034	U8	IC Op Amp. Comp. LM 393P	SO 8	
20461	U21	Tranciever LTC1483 Bus Circuit	SO 8	
	U22	IC 74VHCT244 Buffert Inverter	TSSOP	Okänd
19758	Q7	Transistor BC807-40 or 25	SOT23	
19759	Q10	Transistor BC817-25 NPN	SOT23	
21746	D7	Diode Schottky MBRS 130LT3		
	D11 - D14	LED for Buttons		
21895	U25- U32	LED Green for Display		
22058	U25- U32	LED Orange for Display		

SURFACE MOUNTED DEVICES - SMD

Components	Capsule type
Resistors, capacitors	1206-07 1206-12 1206-16D
Transistors, Diodes	SOT23-E1
Integrated circuits	SO8 SO14 SO16

21. NEXUS NMEA 0183

NMEA Interface Standards are intended to serve the public interest by facilitating interconnection and interchangeability of equipment, minimising misunderstanding and confusion between manufacturers, and assisting purchasers in selecting compatible equipment.

This Standard defines electrical signal requirements, data transmission protocol and timing, and specific sentence formats for a 4800-baud serial data bus. Each bus shall have only a single TALKER but may have multiple LISTENERs.

Silva is a member of NMEA (National Marine Electronic Association), which with over 350 members represents the most considerable part of the whole marine electronics industry.

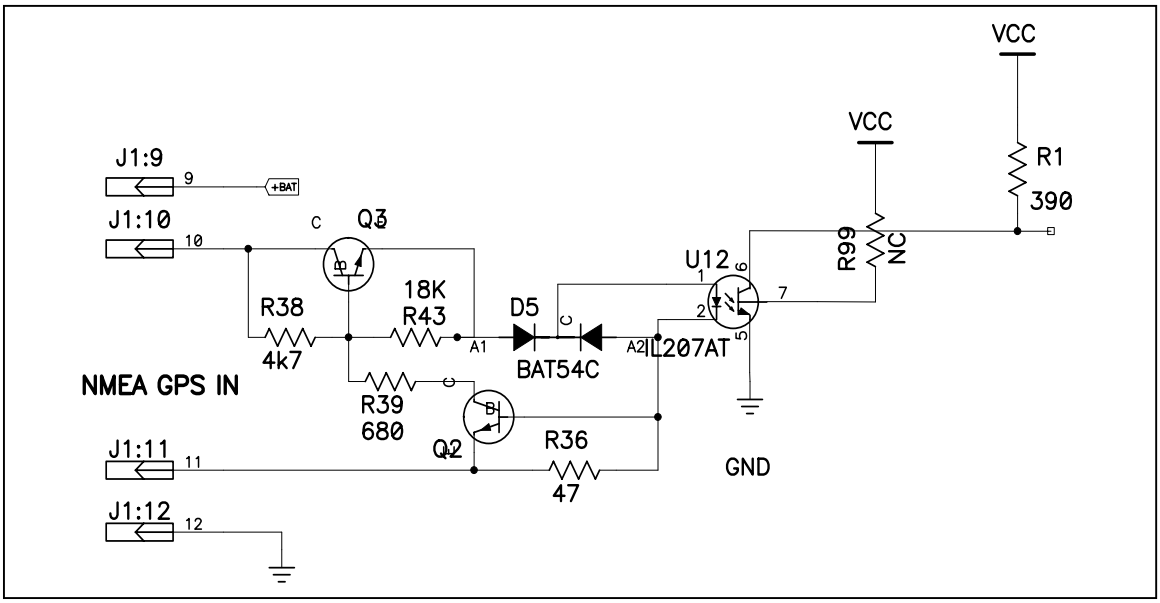
Full information on NEXUS NMEA is available in Appendix C: NEXUS NMEA 0183 Input/Output.
Full information on NMEA 0183 Standard is available in Appendix E: NMEA 0183 Standard for Interfacing Marine Electronic Devices. Not available from Silva.

The units within the NEXUS Network that can send and receive NMEA Sentences are Server Unit, GPS Antenna (send only). GPS Navigator and Multi Center.

21.1 NMEA Input

NEXUS general circuit for NMEA input.

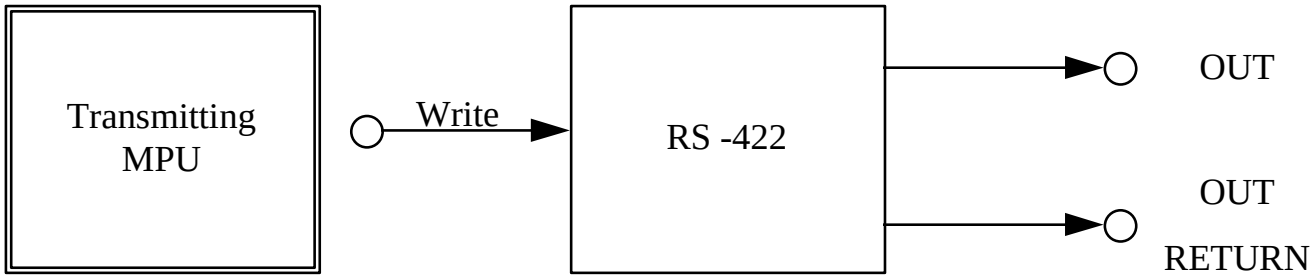
The NMEA input to the NEXUS system can be i.e. an external GPS receiver used to get position, course and speed over ground etc.
Always connect both NMEA input and NMEA input return. If your NMEA GPS only has got one NMEA output, connect the NMEA input return to ground at your NMEA GPS.



Note! Only one NMEA Instrument can be connected to the NMEA Input.
Note! Using NMEA transducers for wind and compass are not recommended as the update rate is slow compared to the very fast Nexus data bus.

21.2 NMEA Output

The NMEA output is utilising the industry standard RS-422. The two wires (yellow and white) are named A and B.



The signal difference between A and B is allowed to be between 3V and 12V.
B has a signal that is always inverted to A => **A=B**

The advantages of the RS-422 is that it is insensitive for disturbances.:
If the signals gets disturbed, both of the signal levels (A+B) are disturbed proportionally i.e. A=33V => B=30V => A-B = 3V
A=3003V => B=3000V => A-B=3V

The Server-Unit is the main NMEA output source for the NEXUS Network. It's the only unit that can send all types of data from the NEXUS Network.

The output is divided into 16 different "time-slots". The wanted NMEA sentence can be selected (or deactivated) individually for each slot. The complete period for all slots are 2 seconds, so the time between each slot is 0.125 sec.

All data that is not available will be sent with null fields.

Checksum is added only where it is mandatory. Talker ID (address character 1 and 2) is always II (Integrated Instrumentation).

The following sentences can be selected (from MULTI Instrument: Remote Control or Multi Center):

The NX2 Server sends NMEA-sentences continuously. The following, C77 to C92 per below, is transmitted in default setting of the NX2 Server (see also User Manual 3.11.1)

0		(- - -)	No out signal
1		(APB)	Autopilot B
2		(BOD)	Bearing original destination
3		(BWC)	Bearing and distance to waypoint
4		(BWR)	Bearing and distance, dead reckoning
5	(C77)	(DBT)	Depth measured from the transducers position
6		(DPT)	Depth
7	(C78)	(GLL)	Geographic position
8		(GSA)	DOP and active satellites
9	(C79)	(GSV)	Satellites in view
10	(C80)	(HDM)	Magnetic heading
11	(C81,89)	(HDT)	True heading

12		(MTW)	Water temperature
13	(C82)	(MWD)	Wind direction and speed
14		(MWV)	Apparent wind speed and angle
15		(RMB)	Minimum navigation data
16		(RMC)	Minimum specific GPS- and TRANSIT-data
17			
18	(C83)	(VDR)	Set and drift
19	(C84)	(VHW)	Speed and course through the water
20		(VLW)	Distance travelled through the water
21	(C85)	(VPW)	Speed relative to the wind
22	(C86)	(VTG)	Distance made good and distance over ground.
23	(C87)	(VWR)	Apparent wind speed and wind direction
24	(C88)	(VWT)	True wind speed and direction
25	(C90)	(WCV)	Waypoint closure velocity
26			
27	(C91)	(XTE)	Cross track error
28	(C92)	(ZDA)	Time and date
29		(ZTG) & (UTC)	Time to destination or waypoint.

Examples of each sentences listed above:

```
$IIAPA,A,A,00.007,L,N,V,V,145.03,M,004
$IIAPB,A,A,00.007,L,N,V,V,147.53,T,004,147.52,T,,T*29
$IIBOD,147.53,T,145.03,M,004,000
$IIBWC,101515,5912.890,N,01812.580,E,147.52,T,145.02,M,15.649,N,004
$IIBWC,,,,,,147.52,T,145.02,M,15.647,N,004
$IIBWR,101516,5912.890,N,01812.580,E,147.52,T,145.02,M,15.647,N,004
$IIDBT,293.52,f,089.47,M,048.36,F
$IIDPT,089.47,0.40
$IIGLL,5926.110,N,01756.171,E,101517,A
$IIHDM,026,M
$IIHDT,029,T
$IIMTW,19,C
$IIMWD,161.77,T,159.27,M,07.01,N,03.61,M
$IIMWV,133,R,07.03,N,A
$IIRMA,A,5926.110,N,01756.171,E,,,0.23,189.47,,,,*00
$IIRMB,A,00.007,L,000,004,5912.890,N,01812.580,E,15.647,147.52,,V*01
$IIRMC,101340,A,5926.115,N,01756.172,E,0.04,063.42,,,*06
$IIVDR,063.42,T,060.92,M,0.04,N
$IIVHW,029,T,026,M,00.00,N,00.00,K
$IIVLW,49626.59,N,,
$IIVPW,0.00,N,,
$IIVTG,063.42,T,060.93,M,0.04,N,,
$IIVWR,133,R,07.03,N,03.62,M,,
$IIVWT,133,R,07.01,N,03.61,M,,
$IIWCV,0.00,N,004
$IIWPL,5503.000,N,01013.450,E,027
$IIXTE,A,A,00.003,L,N
$IIZDA,101341,,,,
$IIZTG,101341,,004
```

Each sentence is ended with a <CR><LF> (Hex 0D 0A).

Notes:

- **BWR** contains exactly the same information as the **BWC** sentence. It does not contain rhumb line data. It is intended as a service for receivers that does not accept the **BWC** sentence.
- **BW1** is a shorter version of BWC where Time and Destination WayPoint Position is not sent (or rather sent as null fields).
- The transmitted sentence will be "BWC" not "BW1" (as can be seen above). It is intended mainly for Silva's MAXI-Repeaters.
- **WPL** (WayPoint Location) is only sent if C74-WPT (in the MULTI-Instrument SET-UP is set to ON). When set to ON each time a **WPL** sentence is transmitted it will contain the next defined WayPoint. When the last defined WayPoint is reached it will restart with the first again....
- All WayPoint IDs are sent as a three digits (minimum) number. It is possible to send (and receive) WayPoints from any block of 100 WayPoints by setting C78-WBN (WayPoint Base Number) equal to the wanted block number.

Example:
If C78 is set to 03 WP-23 will be transmitted as number 323.

Note: All WP IDs will be equally affected.

- ZDA contains only UTC time, not date. The date is not transmitted in any NMEA sentence by the Server.
- RA1 sentence is equal to VHW (Water Speed and Heading) with the major deviation that the boat speed is replaced by the race timer count down until the race-timer shows a positive value (i.e. when the race has started). The Race timer is sent as if it was a negative boat-speed with seconds as decimals. This sentence is only available from NEXUS Server units version 2.5 and later.
-

The only proper use for this sentence is together with the Silva MAXI-Repeaters.

23.0 NX2 MECHANICAL SPARE PARTS AND ACCESSORIES

Art.No.	Description	Designed for:
SPARE PARTS NX2 SERVER		
21997	PCB	NX2 Server
20583	Bottom plate	NX2 Server
22166-902	Inside cover	NX2 Server
20588-901	Front cover	NX2 Server
34657	Screw PT35, for PCB	NX2 Server
22123-16	Connection terminal 16-pole	NX2 Server
22123-12	Connection terminal 12-pole	NX2 Server
22122	Connection terminal 4-pole	NX2 Server
22124	Connector, 9-pole D-SUB Female	NX2 Server
22121	Pin Connector 4-pole	NX2 Server
SPARE PARTS DIGITAL AND ANALOGUE INSTRUMENTS		
22056-1	Instrument cover	All NX2 Instrument
21027	Cover over connecting plug, large diam. 60 mm	All NX2 Instrument
22140	Mounting Kit - Cover, Bolt Grip knob, Paste etc.	All NX2 Instrument
22139	Drill Template	All NX2 Instrument
22046	Gasket back	All NX2 Instrument
22047	Grip knob for instrument mounting	All NX2 Instrument
22048	Stud bolt for instrument mounting	All NX2 Instrument
20608	4-pole jack plug (grey-yellow-white-ground)	NX2/Nexus Classic
22121	4-pole pin plug fo Server/Transducer	NX2 Server
20539-1	Power supply cable, 3 m, black	NX2/Nexus Classic
20539-3	Power supply cable 3 m, red	NX2/Nexus Classic
20535	Connector Set, 5 pcs 0,75 mm + 5 pcs 0.25 mm	NX2/Nexus Classic
22065	Cable for PC connection D-SUB + D-SUB	NX2/Nexus Classic
LOG AND DEPTH TRANSDUCERS		
21439	Log/Temp with O-rings and lock wire	
19915-8	Depth 185KHz, removable, with o-rings and lock wire	
18029	O-ring 26,2x3	
18028	Lock wire	
18490	Paddle wheel std. red	
21154	Paddle wheel high speed blue	
18990	Dummy plug, with o-rings and lock wire	
18884	Through hull fitting with nut, plastic	
18005	Nut only for above (art.no 18884)	
19216	Through hull fitting with nut, Brass	
19038	Kit for inside hull mounting of depth transducer	
18892	Silicon grease 6gr.	
21453	Connection Box Wind Data	

Art.No.	Description	Designed for:
WIND TRANSDUCER (Masttop unit)		
20727	Nose cone complete	Nexus Wind Transducer
67518	Ball for Wind transducer	Nexus Wind Transducer
20091	Propeller	Nexus Wind Transducer
20077	PCB amplifier board	Nexus Wind Transducer
20402	Bearing 25x20x4	Nexus Wind Transducer
18630	Spacer 25x23x4	Nexus Wind Transducer
18898	Transducer housing	Nexus Wind Transducer
19478	Gasket 35x0,5 rubber	Nexus Wind Transducer
19031	Gasket 35x0,25 paper	Nexus Wind Transducer
18200	Vane	Nexus Wind Transducer
19288	Screw RXS 2,2x9,5	Nexus Wind Transducer
19219	Inner tube	Nexus Wind Transducer
19248	Mastpipe cpl. with cable etc.	Nexus Wind Transducer
19218	Tension screw, plastic	Nexus Wind Transducer
19224	Nut M16 plastic	Nexus Wind Transducer
19221	Clamp ring	Nexus Wind Transducer
19242	Tube pin FRP 5x20	Nexus Wind Transducer
19210	Attachment	Nexus Wind Transducer
18252	Plug connector	Nexus Wind Transducer
18839	Capacitor 10uF, 25V Lyt	Nexus Wind Transducer
67400-15	Mast top adapter 15 degree aluminum, for wind transducer	

COMPASS TRANSDUCER (Fluxgate)		
20864	Box under part with cable	
20021	Box upper part	
18533	Fluxgate capsule	
18021	Screw B4x13, for capsule	
18540	Screw M4x12, for upper/under part	
20317	Gasket 3x420	
19931	Connector 4-pin, brown	
19777	Cable, capsule/PCB	
20976	PCB	
21546	Upgrade kit to NEXUS Fluxgate from old fluxgate	

SPARE PARTS GPS ANTENNA 21970		
22064	El-nic, Receiv.engine+mainPCB cpl. mounted in Top cover	
21993-901	Bottom with cable	
20984	O-ring	

ACCESSORIES

22120-1	NX2 Server cpl. With 3m. power cables
21556	Connection box Nexus Network
21453	Connection box Wind Data /Compass Data, incl. 6 m cable (6-pole)
20081	External alarm buzzer, for Nexus Server
19763	Remote push button, for external M.O.B. or Trim function
20443	Nexus extension cable, per meter
21266-8	Nexus cable 8 m, with wire protectors each end
21266-03	Nexus cable 0,3 m, with wire protectors each end
20594	Nexus mast cable 25 m
21754-4050	Instrument panel 405mm, without predrilled holes
21754-4052	Instrument panel 405mm, predrilled for 2 x 110x110mm instr. + 1 x Multi XL
21754-4720	Instrument panel 472mm, without predrilled holes
21754-4721	Instrument panel 472mm, predrilled for 4 x 110x110mm instr.
21754-4722	Instrument panel 472mm, predrilled for 1 x 110x110mm instr. + 2 x Multi XL
21754-5900	Instrument panel 590mm, without predrilled holes
21754-5901	Instrument panel 590mm, predrilled for 5 x 110x110mm instr.
21754-5902	Instrument panel 590mm, predrilled for 2 x 110x110mm instr. + 2 x Multi XL
19763	Remote push button
19038	Internal mounting kit for depth transducer
19216	Through hull fitting bronze incl. nut
21154	Paddlewheel blue with axel, high speed 0-50 kts
67400-15	Mast top adapter 15 degree aluminum, for wind transducer
18500	Through deck connector 7-pole
18501	Through deck connector 4-pole
18252	Connector 4-pole for soldering
20966	Connector 4-pole, NEW model with screw connection

For other spare parts, see the separate Electronic Spare Part Export Price List.

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NX2 Return Form

We need the following information attached to each NX2 Product returned for replacement or Credit. The ¤ marked information are mandatory. Unless those are filled in, no action is taken and no Credit is made.

Name or number of customer: .....

Ref.No:

Order No:

¤ **Serial No:**	¤ **Prefix:**	¤ **Number:**	**Version:**	**ID No:**

¤ **Warranty claim:** **Yes** ☐ **No** ☐ **Confirmed purchase date:** .....

¤ **Customer Damage:** **Yes**☐ **No**☐ **Mechanical: Minor**☐ **Major**☐ **Electrical**☐

¤Customers detailed fault description. How does the fault show itself?¤

.....

Tests Digital Instrument
Starts with +12V OK☐Fail☐ **LCD** OK☐Fail☐ **Light** OK☐Fail☐ **Buttons** OK☐Fail☐
Buzzer OK☐Fail☐ **Error: Err02**☐ **Err03**☐ **Other Err.....**☐ **OtherFault**

Test Analoge Instrument
Starts with +12V OK☐Fail☐ **Light** OK☐fail☐ **Pionter "lose"** ☐ **Not correct value**☐
Not same value as on Multi Control☐ **OtherFault**

Tests Server
Power+12V OK☐Fail☐ **Communication test** OK☐Fail☐
Transducer input test: LogOK☐Fail☐ **Compass** OK☐Fail☐ **Wind** OK☐Fail☐
Depth OK☐Fail☐ **PC port communication** OK☐Fail☐ **OtherFault:**

¤Silva Agent fault description. How does the fault show itself?¤

¤Confirm Customer descriptionYES☐**NO**☐

Required action: .....

Remarks:

To be filled in by Silva:			
Customer Damage:	**Yes** ☐ **No** ☐ **Mechanical: Minor** ☐ **Major** ☐ **Electrical:** ☐		
Confirmed Fault:			
Silva Sweden action:			
Silva Tests:	**Test 1**☐ **Test 2**☐ **Test 3**☐ **Test 4**☐ **Test 5**☐ **Test 6**☐		
Credit reduction:		**Date and sign of Silva approval:**	
Claim Order No:			

¤ Product sent from: **Company / Country / Customer No at Silva**

¤ Your reference, date and sign: .....

Thank you in advance!