R/V FALKOR

2013

GUIDE TO SCS DATA SENSORS AND FORMATS
SCS v 4.6.0

By

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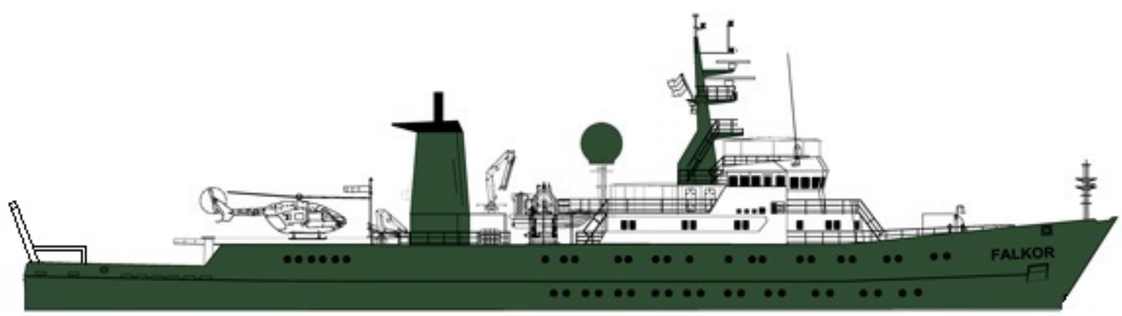


SCHMIDT OCEAN INSTITUTE

Purpose

The purpose of this document is to describe the R/V Falkor Scientific Computer System (SCS) as configured in 2013. The intent of this report is to provide a comprehensive listing of all system components, configuration, calibrations and data formats. This document will be updated yearly, so please use the corresponding reference when working with the data, as configurations and calibrations may change from one field season to the next.

Background

Schmidt Ocean Institute (SOI) is a not for profit organization that supports research and exploration projects that help expand the understanding of the world's oceans. SOI aims to foster a deeper understanding of our marine environment through colaboratingon technological advancements, promoting data-rich observation and intelligent analysis, and implementing the open sharing of information. R/V Falkor is named after the character in the popular children's book, The Neverending Story, by Michael Ende (1979). SOI aims to maintain and operate R/V Falkor as a multi-functional global class ocean research platform suitable for a variety of scientific projects that fit within the scope of our mission. Our operational model is based on supporting scientific research at sea by providing the collaborating research teams with free access to our research vessel, on-board equipment, and associated technical support in exchange for a commitment to openly share the resulting scientific data and communicate the research findings.

Vessel Specifications

Table 1. *Vessel specifications and general arrangement are available online at: http://www.schmidtocean.org/story/show/47*

Callsign	ZCYL5	Max Transit speed	12 knots
Builder	1981 Orenstein & Koppel AG Lübeck, Germany	Mapping speed	8 knots
Renamed	March 6, 2012	Total Accommodations	42
Length (LOA)	82.9 m (272 feet)	Deck Officers	4
Breadth	13.0 m (43 feet)	Licensed engineers	3
Draft	5.116 m (17 feet)	Crew	12 + 2-3 technicians
Gross Ton	2024 GRT	Scientists	18
Air Draft:	23.52m (77 feet)	Fuel Capacity	103,258 US gals / 383.3 m3 / 329.6 MT
Main propulsion	(2) MWN Diesel Engines each @ 3,944 hp / 2,941 kW (@ 750 rpm), driving four highly skewed controllable pitch propellers	Power	(2) shaft generators at 650KVA / 500kW, (1) diesel generator at 650KVA / 500kW / 50Hz feeds an Atlas 100kVA converter to provide 480VAC 60Hz an Atlas 25kVA converter to provide clean power
Range @ 12 kts	13,000 nautical miles (estimated)	Endurance with 40 personnel aboard	40 days

Introduction to SCS

The Scientific Computer System (SCS) software was developed at NOAA Headquarters specifically for the NOAA fleet. There are several non-NOAA ships that utilize SCS to log data. SCS is a data acquisition system designed for oceanographic and fisheries applications. The C^{++} based software package is run through point and click menu bars. The SCS package utilizes Graphical User Interface (GUI) technology in the form of time series graphs and directly calls ArcView graphing capabilities.

SCS is capable of sending data displays to remote stations (SCS Client) throughout the labs over the ship's network. In addition, ASCII data strings can be sent via RS-232 cable or over the Ethernet. The SCS workstations can provide time series graphs of all acquired data to monitor quality and detect issues. Several variables can be plotted against each other in real time X-Y plots. Data can be output in a wide variety of formats. Data output formats include:

- raw data files in binary form
- ASCII data for easy transfer to PC environment

SCS data is generally only collected while the ship is underway. Some of the sensors that are connected to SCS may be connected to other systems. As the ship progresses in its missions, there may be additional sensors added or subtracted to the ship's suite, models changed or the organization of the data modified. Please use this document on a cruise-by-cruise basis. As these changes are made they will be incorporated into the data archive.

SCS Acquisition is generally started before the ship leaves the dock, or as it is getting underway, and shut down after the ship reaches the pier, or very close to the pier. This may vary depending on time constraints for delivering the data package. (If person carrying the data has to get off the ship quickly, the data will be stopped sooner, otherwise it is on until the ship reaches the dock).

However, sometimes during a cruise, Acquisition has to be stopped to troubleshoot or modify a sensor. This will break up some of the data, in particular, the events. Some cruises may have more files than others due to stopping and restarting SCS. This is avoided as much as possible because so many things need to be restarted each time. The files logging the raw data are set to break once a day at GMT midnight to make acquisition, plotting, processing and transfer easier.

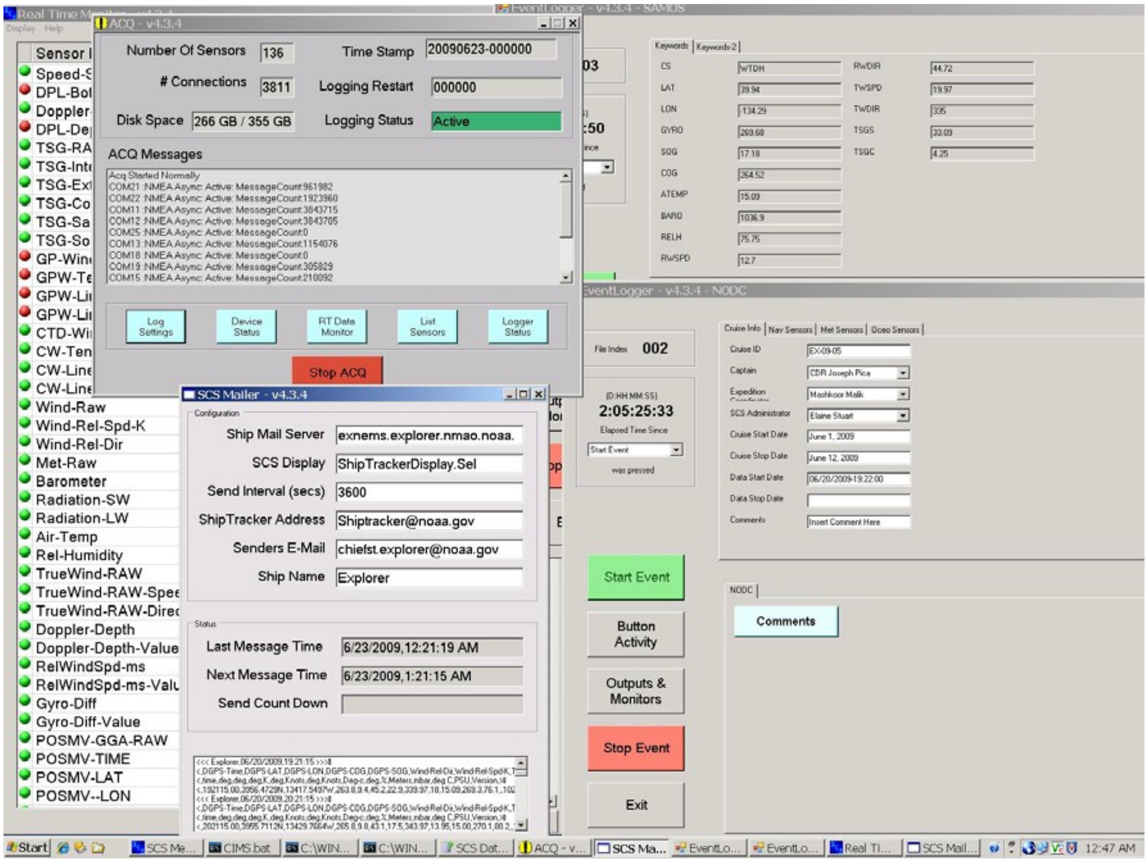


Figure 1: Screen grab of SCS Acquisition machine with events, mail messages, logging and real-time monitor windows. There are a lot of things going on at one time on the Acq machine, so the marine technicians are the only group to work with this machine during a cruise. Scientists can use client machines to build plots and view the real-time data.

Client machines are available for the scientific parties to use during a cruise. Since the marine technicians are the only personnel trained in operating SCS, they are the only ones designated to do so. Otherwise, having visitors using the acquisition machine could result in accidental data loss. Instead, the scientists can use designated work stations in the lab spaces to view the data and run events as necessary. The Falkor has a dedicated screen (SCS Server 2) on the video matrix to view the meteorological and oceanographic data, or for recording weather or other data while surveying.

Sensors

Naming Convention:

The following describes the various groups of sensors currently on board the Falkor and their configurations, both as systems and as individual sensors. This includes layout, location, descriptions and data output.

Each of the sensors are named with the following convention:
COM##-Sensor
  COM##-Sensor-SentenceLabel-RAW
    COM##-Sensor-SentenceLabel-Value

The COM ports are where the sensor is connected to the system. It helps the Technicians to keep these in order for configuration and troubleshooting. Each sensor is named by Type or Model because there may be several. For example, there are several Navigation sensors, so they are named BridgeData, CNAV, and Seapath. Each sensor may have a number of 'sentences' or messages that they can use to transmit data. Each of those are labeled so that you know which information is coming from which sentence. The final label is the value, or the field of the sentence. These are important to know when you are bringing data into excel. Which column represents each variable. These variables are listed in each section of this document.

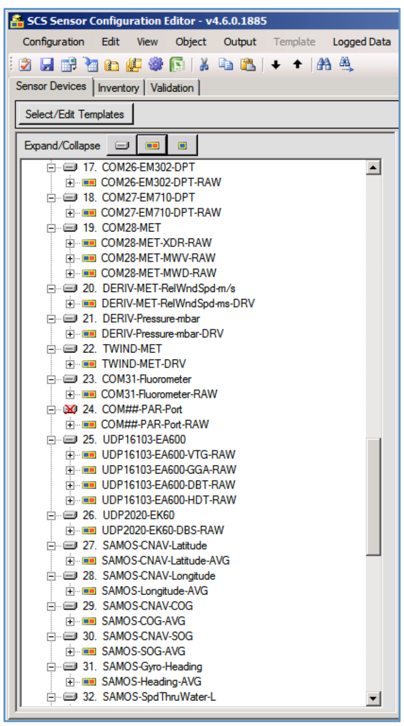
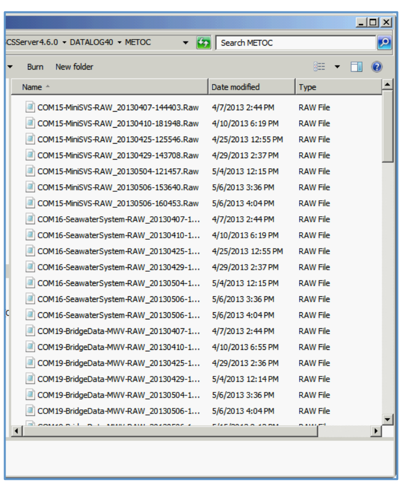
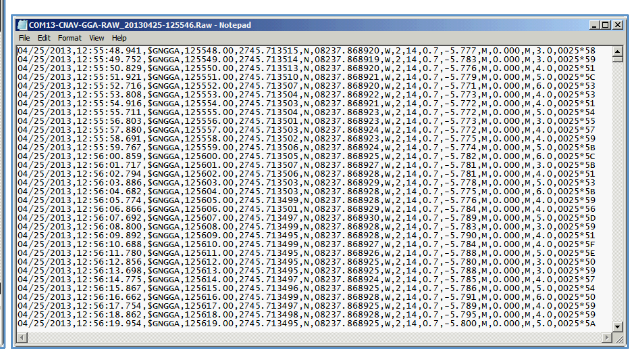


Figure 2: From Left to Right, The SCS Sensor Configuration file. What a typical folder in SCS Data looks like, showing the files listed by COM/Sensor/Sentence. A typical *.RAW data file.

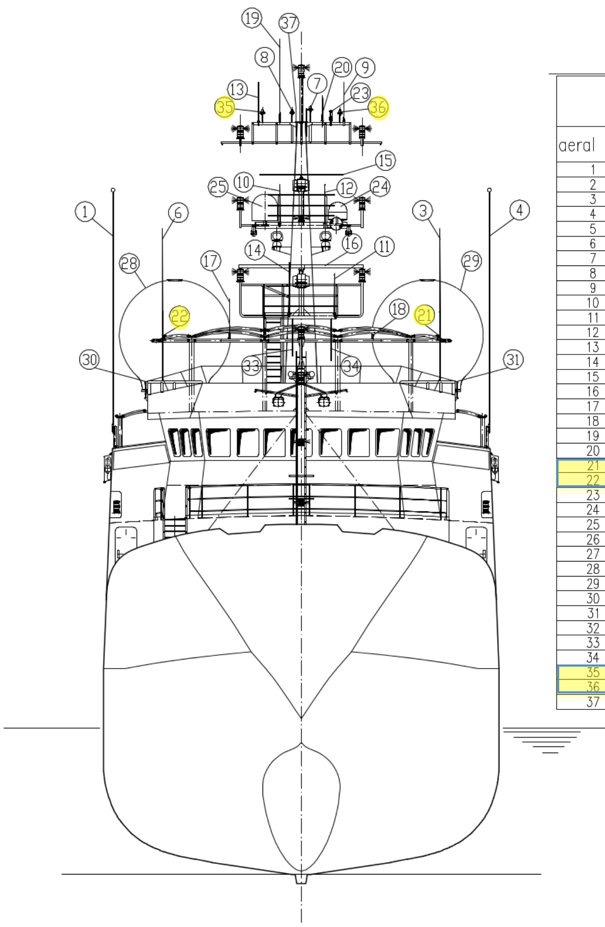




Use this guide to determine which variables are in which fields in a RAW data file. You can also determine which sensors are the best to use, and which sentences from those sensors will provide the data that you are looking for!

Navigation:

SCS logs the ship's navigation equipment from the bridge as well as survey-specific navigation systems installed on the main deck.



Antenna–list SPS FALKOR

aeral no.	description	type	supplier
1	MF/HF 1 TX/RX Antenna	AT82	Raytheon Anschütz
2	MF/HF 1 Antenna Tuner	ATU5215	Raytheon Anschütz
3	MF/HF 1 DSC Antenna	AR55T	Raytheon Anschütz
4	MF/HF 2 TX/RX Antenna	AT82	Raytheon Anschütz
5	MF/HF 2 Antenna Tuner	ATU5215	Raytheon Anschütz
6	MF/HF 2 DSC Antenna	AR55T	Raytheon Anschütz
7	Inmarsat MINI–C GMDSS	TT3026C	Raytheon Anschütz
8	Inmarsat MINI–C GMDSS	TT3026C	Raytheon Anschütz
9	VHF 1 TX/RX	CX4	Raytheon Anschütz
10	VHF 1 DSC	CX4	Raytheon Anschütz
11	VHF 2 TX/RX	CX4	Raytheon Anschütz
12	VHF 2 DSC	CX4	Raytheon Anschütz
13	VHF 3 TX/RX	CX4	Raytheon Anschütz
14	VHF Air TX/RX	AV8	Raytheon Anschütz
15	X–Band Radar 8 ft	LPR–A25/G624364/G625925	Raytheon Anschütz
16	S–Band Radar 12 ft	LPR–A1/G625917/G625926	Raytheon Anschütz
17	VHF AIS TX/RX	CX4	Raytheon Anschütz
18	GPS AIS	AT575	Raytheon Anschütz
19	Weather Fax RX	Fax–5 with 2,6m whip antenna	Raytheon Anschütz
20	NAVTEX RX	NWA – 333	Raytheon Anschütz
21	DGPS 1	MGL – 4	Raytheon Anschütz
22	DGPS 2	MGL – 4	Raytheon Anschütz
23	Weather Sensor	Quatro / IND	Raytheon Anschütz
24	Inmarsat Fleet Broadband	TT3052A	Raytheon Anschütz
25	Inmarsat Fleet F77	TT3008A	Raytheon Anschütz
26	EPIRB	TT406	Raytheon Anschütz
27	GMDSS Battery Box	606	Raytheon Anschütz
28	V–SAT	Seatel 9797	Triton Technical
29	SAT TV	Seatel 9497	Triton Technical
30	GSM Antennas–Procom	CXL 900/1800/1900	Triton Technical
31	GSM Antennas–Procom	CXL 900/1800/1900	Triton Technical
32	WIFI Bridge Antenna– Procom	CXL 2400–1/I	Triton Technical
33	WIFI Antenna– Procom	CXL 2400–6/I	Triton Technical
34	UHF Antenna– Procom	CXL 70–3/h	Triton Technical
35	GNSS antenne	GPS–702–GG–N	Kongsberg
36	GNSS antenne	GPS–702–GG–N	Kongsberg
37	VHF Direction Finder		Raytheon Anschütz

Figure 3: *FALKOR antenna layout as delivered. CNAV antenna installed after delivery and not displayed on this diagram. DGPS = Bridge Navigation DGPS, GNSS = Scientific Seapath 320.*

Figure 4: *Navigation Antenna Layout as of 2012.*

SAAB DGPS-Receiver, type R4: Bridge Navigation system. There are two antennas, one on the port side flying bridge bimini and one on the starboard side flying bridge bimini.

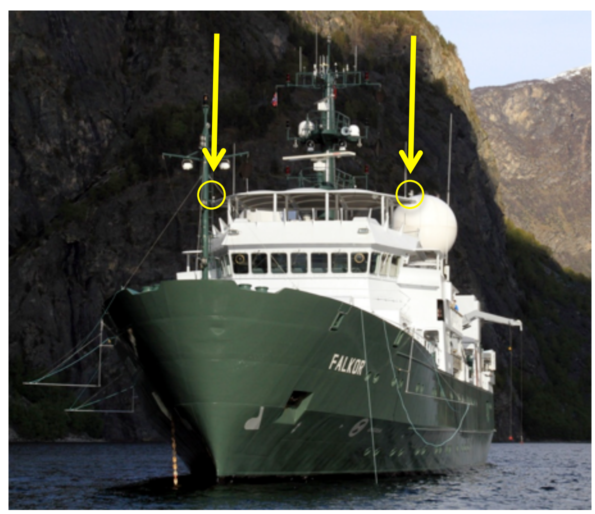


Figure 5 Left, bridge navigation antennas mounted on the flying bridge bimini frame looking aft, starboard and port, respectively.

Figure 6: Right, location of the antennas relative to the ship.

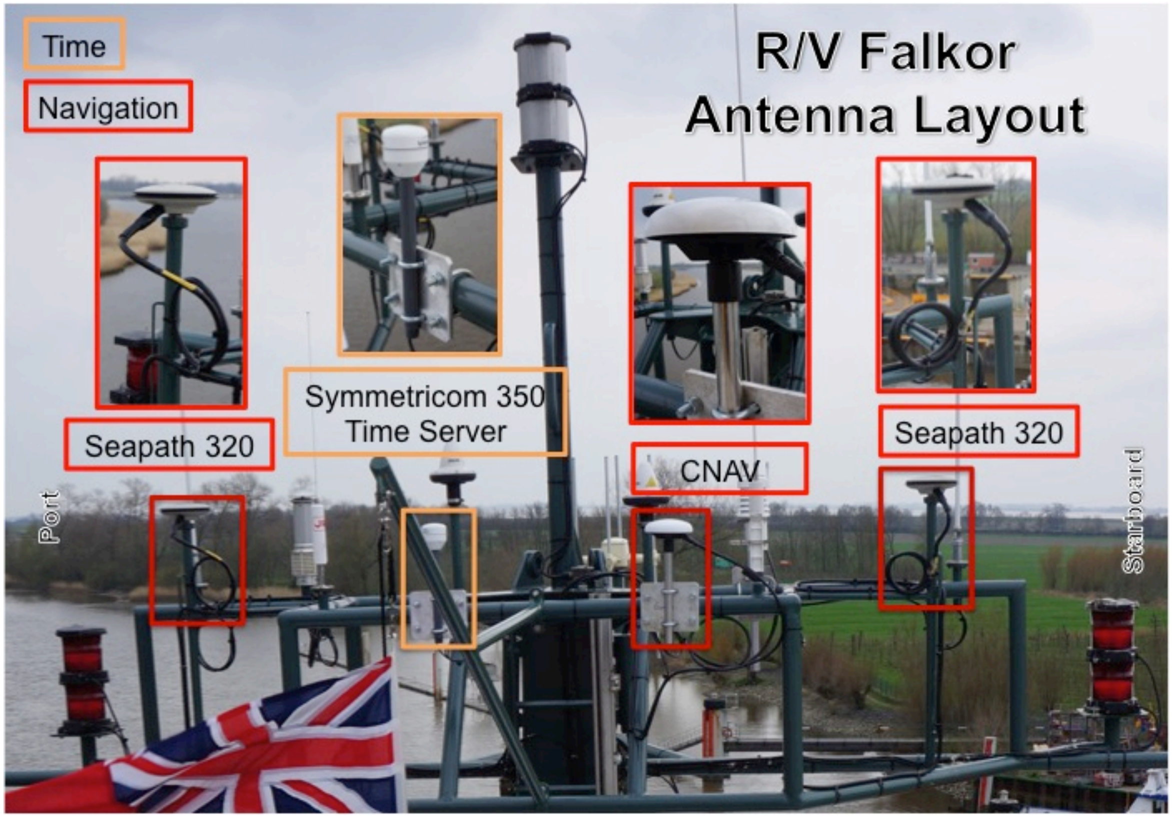


Figure 7: *Scientific navigation antenna layout as of 2012.*

CNAV: A dynamic Digital Global Navigation Satellite System (DGNSS) precise point positioning system[1] by C & C Technologies.

The CNAV is our primary scientific navigation positioning system, with capabilities of a decimeter or better[1]. The CNAV provides the Seapath320 with RTCM messages to give improved accuracy. The Seapath 320 position and attitude data are utilized by the multibeam sonars. The CNAV display is located in the rack room. The antenna is located on the starboard side of upper main mast.

Figure 8: C-Navigator II display with CNAV 3050 receiver.

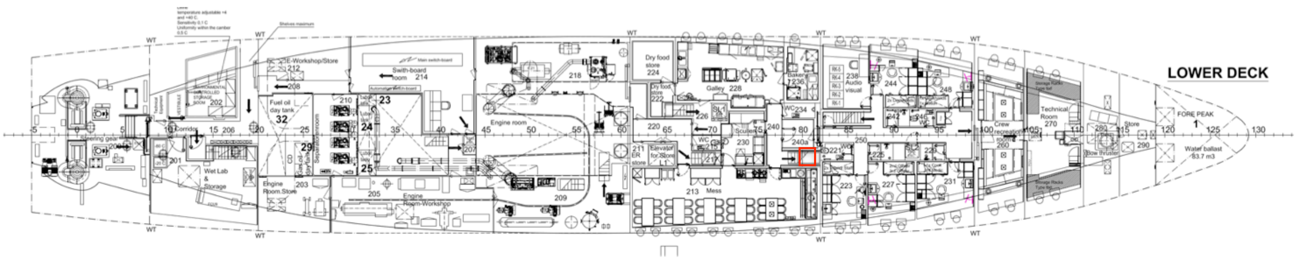
Kongsberg Seatex Seapath 320: The Seapath Motion Reference Unit (MRU) is located in a cubby on the starboard side of the passageway between the mess and the forward stairs on the 2nd deck (just before the watertight door). The antennas are on the port and starboard side of the main mast. The deck unit and Human

[1] http://www.cnavgnss.com/site.php

Interface are in 322 rack 1. Seapath provides position and attitude data to all of the sonar systems. It is also connected to the CTD computer for use with the XBT and CTD. The position and attitude data are also distributed to other systems via an overland splitter.

The Navigation Reference Point is located on the top of one of the MRU units. There are two MRU units, one for science and one for the Helideck Monitoring System on the bridge. They are clearly labeled.

Figure 9: MRU and Gyrocompass location on the main deck. Under the stairs, accessed through main passage forward of the scullery.



Figures 10 & 11: *View of the Seapath MRU mounted on the bulkhead after the door is removed.*

Raytheon Anschuetz STD 22 Gyrocompass: The gyrocompass feed goes both to the bridge and to NMEA splitters. The data is then broadcast via a network patch panel. The gyro data is also fed into the multibeam systems.

http://www.raytheon-anschuetz.com/product-range/product-detail/39/Standard-22-Gyro-Compass-System

Figure 12: *Gyrocompasses sitting below the MRUs.*

Navigation Data Outputs: National Marine Electronics Assoication (NMEA) standard

http://www.nmea.org/

The first two letters in the sentence label (ex: $GPGGA) will vary based on the instrument. Possible prefixes are GP (For Global Positioning System: GPS), GN (Global Navigation Satellite Systems) and IN (Integrated Navigation). The format of the message is usually the same except where noted.

$--GGA, Global Position System Fix

BridgeData, CNAV, Seapath320, USBL (*Altitude on USBL is depth of beacon)

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	Global Positioning System Fix Data	$GPGGA
4	Time	GPS Time	170834 = 17:08:34 UTC
5-6	Latitude	Degrees, decimal minutes, N/S	4124.8963,N = 41d 24.8963'N
7-8	Longitude	Degrees, decimal minutes, E/W	08151.6838,W = 81d 51.6838'W
9	Fix Quality	The Quality of the GPS Fix: 0 = Invalid 1 = GPS fix 2 = DGPS fix	2
10	# Satellites	Number of satellites tracked	6
11	HDOP	Horizontal Dilution of Precision	1.5
12-13	Altitude	Height above sea-level in meters **(*Altitude on USBL is depth of beacon)**	234.5,M
14-15	Height over WGS84	Height above WGS84 ellipsoid in meters	-25.1,M
16	DGPS stale interval	Time since last DGPS update in seconds	9
17	DGPS Station	ID Number of the DGPS station	25
18	Checksum	2-byte XOR sum of data to check for transmission errors	*4D

http://www.oceandatarat.org/?page_id=723

$--GLL, Geographic Position, Latitude/Longitude Data

CNAV, Seapath320

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	Global Position, Latitude/Longitude Data	$GPGLL
4-5	Latitude	Degrees, decimal minutes, N/S	4124.8963,N = 41d 24.8963'N
6-7	Longitude	Degrees, decimal minutes, E/W	08151.6838,W = 81d 51.6838'W
8	Fix Time	Time of position fix UTC	225423 = 22:54:23
9	Data Valid	Is data active (A) or void (V)	A
10	Checksum	2-byte XOR sum of data to check for transmission errors	*4D

$--VTG, Track Made Good and Speed Over Ground

BridgeData, CNAV, Seapath320

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010

2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	Track Made Good, Ground Speed	$GPVTG
4-5	TMG T	Track made good, True	054.3,T
6-7	TMG M	Track made good, Magnetic	032.3,M
8-9	SOG N	Speed Over Ground, knots	008.3,N
10-11	SOG K	Speed Over Ground, kilometers/hour	016.3,K
12	Checksum	2-byte XOR sum of data to check for transmission errors	*0E

$--HDT, Heading, True

BridgeData, Seapath320, Gyro

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	Heading, True	$HEHDT
4	Heading, true	Heading in degrees, true	64.3
5	True Designation	Static Text designating the heading is in reference to true North	T
6	Checksum	2-byte XOR sum of data to check for transmission errors	*2E

$--ROT, Rate of Turn

BridgeData, Seapath320, Gyro

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	Rate of Turn	$HEROT
4	Rate of turn	Rate of turn in degrees/min, "-" means turning to port	7.8
5	Data Valid	Is date valid (A) or void (V)	A
6	Checksum	2-byte XOR sum of data to check for transmission errors	*7B

$--GSA, GPS DOP and Active Satellites

CNAV, Seapath320

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	Global Positioning System Dilution of Precision and Active Satellites	$GNGSA
4	Mode	M: Manual, forced to operate in 2D or 3D A: Automatic, 3D/2D	A
5	Mode	1: Fix not available 2: 2D 3: 3D	3
6	SV ID	IDs of Satellite Vehicles used in position fix (null for unused fields)	19
7	PDOP	Positional Dilution Of Precision	1.7
8	HDOP	Horizontal Dilution Of Precision	1.0
9	VDOP	Vertical Dilution Of Precision	1.3
10	Checksum	2-byte XOR sum of data to check for transmission errors	*35

$--ZDA Date & Time

BridgeData, CNAV, Seapath320

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	Date and Time	$GPZDA
4	UTC Time	Hhmmss.ss	202221.04
5	Day	01 to 31	03
6	Month	01 to 12	12
7	Year	Year	2013
8	Local Zone	00 to +/- 13 hours	+4
9	Local zone minutes	Same sign as hours	+4

$--RMC Recommended Minimum Specific GPS Data

Seapath320

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	Recommended minimum specific GPS Data	$INRMC
4	Time	UTC of position fix	220516
5	Data Status	Data status (V=navigation receiver warning)	A
6	Lat	Latitude of fix	5133.82
7	Hemisphere	N or S	N
8	Lon	Longitude of fix	00042.24
9	Hemisphere	E or W	W
10	SOG	Speed over ground in knots	173.8
11	COG	Track made good in degrees True	231.8
12	Date	UTC date, ddmmyy	130694
13	Variation	Magnetic variation degrees (Easterly var. subtracts from true	004.2
14	Direction	E or W	W
15	Mode	Positioning system Mode indicator: ““W72” – WGS 72 “W84” – WGS 84, “IHO” – IHO terminology, reference ellipsoid, “999” – user determined reference ellipsoid, “S85” – SGS85, “P90” – PE90	D
16	Checksum	2-byte XOR sum of data to check for transmission errors	*70

http://www.gpsinformation.org/dale/nmea.htm#BWC

$--GST GPS Pseudorange Noise Statistics

CNAV, Seapath320

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	GPS Pseudorange Noise Statistics	$GNGST
4	UTC Time	UTC time of associated GGA fix	024603.00
5	RMS deviation	Total RMS standard deviation of ranges inputs to the navigation	3.2
6	Semi-major deviation	Standard deviation (meters) of semi-major axis of error ellipse	6.6
7	Semi-minor deviation	Standard deviation (meters) of semi-minor axis of error ellipse	4.7
8	Semi-major orientation	Orientation of semi-major axis of error ellipse (true north	47.3
9	Latitude error deviation	Standard deviation (meters) of latitude error	5.8
10	Longitude error	Standard deviation (meters) of longitude error	5.6
11	Altitude error deviation	Standard deviation (meters) of latitude error	22.0
12	Checksum		*58

$--GBS GNSS Satellite Fault Detection

Seapath320

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	GNSS Satellite Fault Detection	$GNGBS
4	Time	UTC HHMMSS.ss	201735.48
5	Lat Error	Latitude error expected	-0.04
6	Altitude error	Altitude error expected	-0.03
7	Satellite PRN		74
8	PRON Probability		0
9	Est bias		-14.54
10	S of bias		9.48

$--GNS GNSS Fix Data

Seapath320

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	Global Navigation Satellite System Fix Data	$GNGNS
4	Time	UTC HHMMSS.ss	204337.48
5	Lat	Latitude	2204.26053
6	Hemisphere	N/S	N
7	Lon	Longitude	09220.864400
8	Hemisphere	E/W	W
9	Mode Indicator	order of characters in the Mode Indicator is: GPS, GLONASS, other satellite systems N = No fix A = Autonomous mode D = Differential mode P = Precise mode is used to compute position fix R = Real Time Kinematic F = Float RTK E = Estimated (dead reckoning) mode	DD
10	# Satellites	Total number of satellites in use	17
11	HDOP	HDOP calculated using all the satellites used in computing the solution	0.7
12	Antenna Altitude	Meters re: geoidal mean sea level	-7.18
13	Geoidal Separation	Geoidal Separation: the difference between the WGS-84 earth ellipsoid surface and mean-sea-level (geoid) surface; "-" = mean-sea-level surface below ellipsoid.	-12.93
14	Age of differential data	Null with prefix GN	Null
15	Diff. Station ID	Null with prefix GN	Null
16	Checksum		*45

http://geostar-navigation.com/file/geos3/geos_nmea_protocol_v3_0_eng.pdf

$--DTM Datum Reference

Seapath320

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010

2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	Global positioning/navigation datum reference	$INDTM
4	Local Datum	""W72" – WGS 72, "W84" – WGS 84, "IHO" – IHO terminology reference ellipsoid, "999" – user determined reference ellipsoid "S85" – SGS85, "P90" – PE90	
5	Local Datum Sub Code	Local Datum Subdivision Code	
6	Lat Offset	Latitude offset in minutes	
7	Hemisphere	N/S	
	Lon Offset	Longitude offset in minutes	
	Hemisphere	E/W	
	Altitude offset	Altitude offset of antenna in meters	
	Reference Datum	"W84" – WGS84, "W72" – WGS72, "S85" – SGS85, "P90" – PE90	

ftp://ftp.transasusa.com/Navigation%20Software/NS-3000_Manuals/Supplement.pdf

$PRDID, RDI Proprietary Heading, Pitch, Roll

Seapath320

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	RDI Proprietary, Heading, Pitch, Roll	$PRDID
4	Pitch	Vessel Pitch in degrees, "+" = bow up.	1.21
5	Roll	Vessel Roll in degrees, "+" = port up	0.12
6	Heading	Vessel Heading in degrees, true	254.32
7	Checksum	2-byte XOR sum of data to check for transmission errors	*7D

Fake NMEA sentence Label specific to the USBL:

$PSONALL Underwater Vehicle Tracking

USBL

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	USBL system beacon positioning output	$PSONALL
4	Beacon	Beacon Name as created in USBL software	
5	Offset	Offset on the vehicle the position relates to	
6	Time	HHMMSS.ss, UTC	
7	Easting	Easting	
8	Northing	Northing	
9	Depth	In meters	
10	Heading	Degrees True	
11	COG	Course over ground, degrees True	
12	Compass	T = True, M= Magnetic, G= Grid	
13	Pitch	Vehicle Pitch	
14	Roll	Vehicle Roll	
15	Speed	Vehicle Speed	
16	PosAcc	Position Accuracy	
17	Dpt Acc	Depth Accuracy	

Further Information:

http://www.saabgroup.com/R4-GPS--DGPS--Navigation-System/

http://www.cnavgnss.com/site.php
http://www.km.kongsberg.com/seapath320
http://www.sonardyne.com/products/positioning/ranger2.html

Meteorological:

Vaisala WXT520: The weather data comes from a sensor mounted on the upper level of the main mast. The Vaisala WXT520 collects wind direction and speed as well as air temperature, relative humidity and pressure. The sensor is directly connected to the bridge Helideck Monitoring System (HMS). The data is then output from the HMS 100 to the network and brought into SCS.

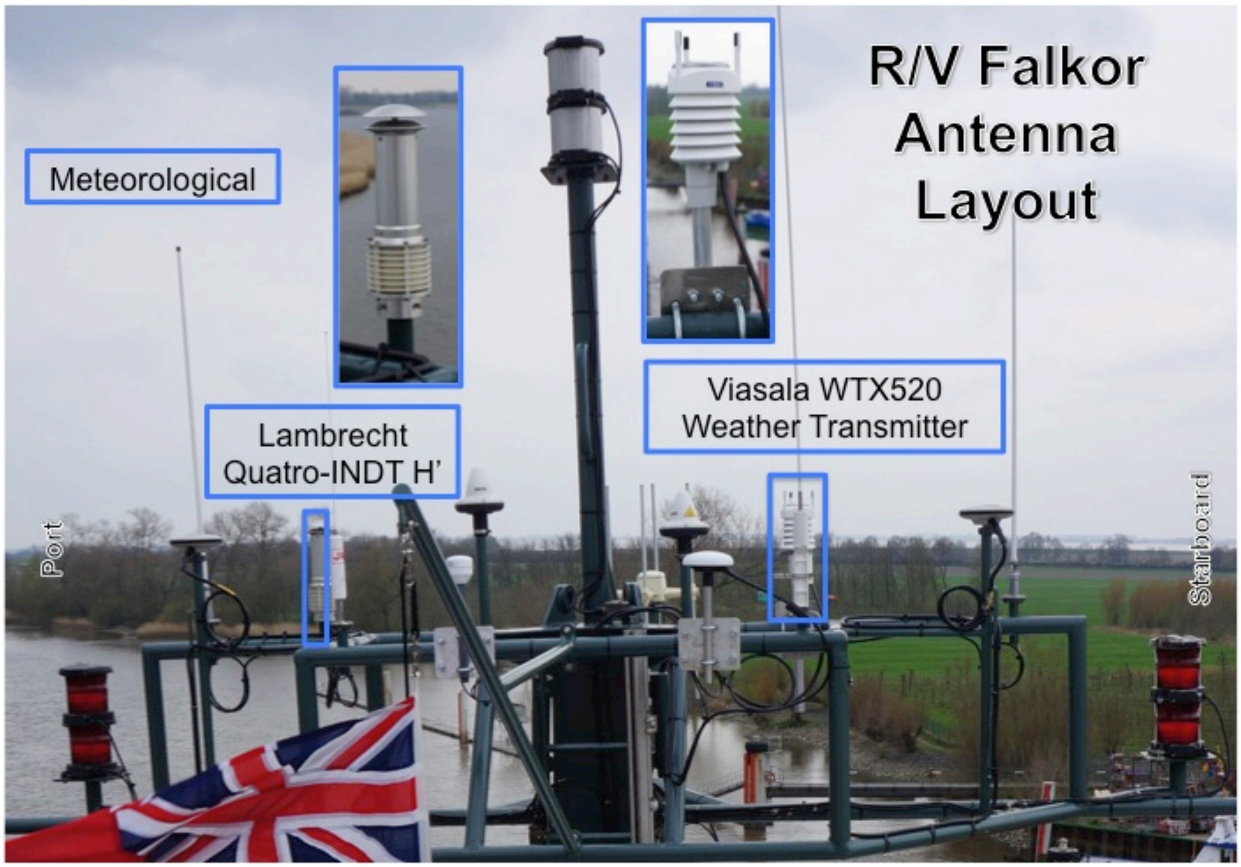


Figure 13: *SCS Met Sensor Layout as of 2012. The Vaisala WXT520 (right) goes to the HMS and SCS and provides Wind speed and direction as well as pressure, temperature and humidity. The Lambrecht wind data is recorded, but the meteorological data is only connected to the bridge display.*

Lambrecht QUATRO IND-H': The second sensor, the Lambrecht QUATRO IND-H' measures wind speed and direction, as well as pressure, air temperature and relative humidity. The met data is only connected to the bridge display on the navigation station. The wind data is then output to the bridge's Raytheon navigation system and sent through the network in the **BridgeData** string. This sensor is for navigation only, and does not get calibrated.

Biospherical Surface Photosynthetically Active Radiation (PAR) Sensor : A PAR sensor with a spherical receiver that is equally sensitive to photons from all direction measures Quantum Scalar Irradiance (QSI). An alternative term for this quantity is "Photosynthetic Photon Flux Fluence Rate" (PPFFR). QSI or PPFFR are defined as the integral photon flux of photons in the 400–700 nm wavelength interval at a point in space from all directions around the point.

Figure 14: *Biospherical Surface sensors, mounted on arms extending from the lower radar platform.*

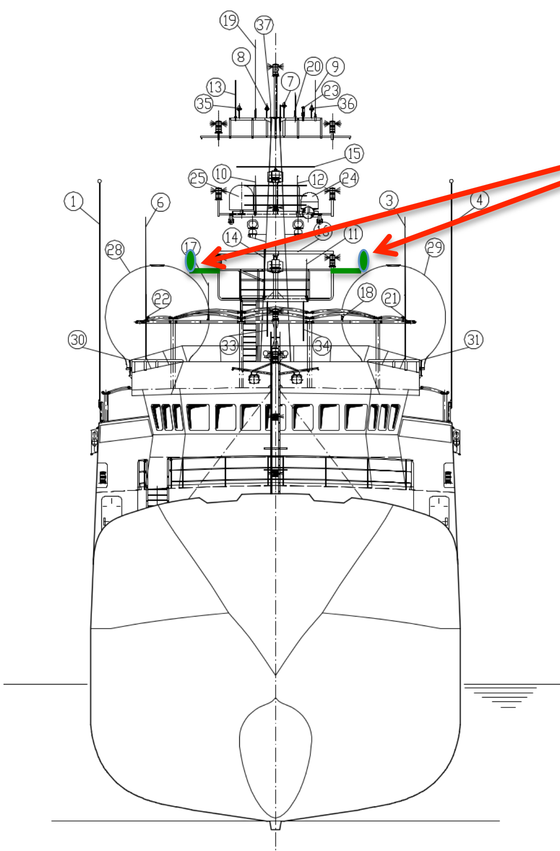


Figure 15: *PAR sensors locations, mounted on arms extending from the lower radar platform on the main mast.*

Met Data Output:

$--MWV, Relative Wind

Vaisala WXT520, Lambrecht QUATRO IND-H'

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	Acoustic Wind Sensor	$WIMWV
4	Wind Direction	Wind Direction in degrees	154.3
5	Direction Reference	Wind Direction Reference, R = Relative, T = True	R
6	Wind Speed	Wind Speed	16.4
7	Speed Units	Wind Speed Units, K = km/hr, M = m/sec, N = kt	K
8	Sensor Status	Sensor Status, A = Valid, V = Void	A
9	Checksum	2-byte XOR sum of data to check for transmission errors	*0A

$--MWD, True Wind

Vaisala WXT520

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	Acoustic Wind Sensor	$WIMWD
4	Wind Direction	Wind Direction in degrees True	174.5
5	Direction Reference	Wind Direction Reference, T = True	T
6	Wind Direction	Wind Direction in degrees Magnetic	174.3
7	Direction Reference	Wind Direction Reference, M=Magnetic	M
8	Wind Speed	Wind Speed knots	10.5
9	Speed Units	Wind Speed Units, N = kt	N
10	Wind Speed	Wind Speed meters/sec	5.2
11	Speed Units	Wind Speed Units, M = m/sec	M
12	Checksum	2-byte XOR sum of data to check for transmission errors	*0A

$--XDR, Met Sensor

Vaisala WXT520

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	Acoustic Wind Sensor	$WIXDR
4	H	For Humidity in next field	H
5	Humidity	Humidity value in %RH	91.2
6	P	P = Percent	P
7	Sensor ID	UU	UU
8	P	P = Pressure in next field	P
9	Pressure	Pressure value in Pascals	100770
10	P	P=Pascals	P
11	Sensor ID	QNH	QNH
12	C	C=Temperature in next field	C
13	Air Temperature	Air Temperature value in degrees Celcius	23.7
14	C	C= Celcius	C
15	Sensor ID	TA1	TA1

16	Checksum	2-byte XOR sum of data to check for transmission errors	*3D

Met Data Output:

$--PAR Not currently installed.

Biospherical PAR

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier		
4			
5			

Further Information:

http://www.vaisala.com/en/products/multiweathersensors/Pages/WXT520.aspx
http://www.biospherical.com/PAR

Oceanographic:

***Scientific Seawater System*:** This system was designed to run a continuous flow of seawater through several instruments to measure the properties of the surface water. The intake for this system in is the bow, and the equipment (pump, plumbing and external temperature probe) are all located forward of the bow-thruster room.

Generally, all sensors are turned on as soon as the ship is in clear water when leaving port and run for the duration of the cruise. Running the system in an environment prone to chemicals from ships and land facilities can damage the sensitive sensors. Sometimes, when the ship is in rough weather, the seawater system may catch an air bubble, which can disrupt the data, or require the system to be shut down temporarily. These occasions can be easy to identify by plotting the two temperature measurements—if the TSG temperature is high (like 5°C difference) then there is likely no flow in the system, which allows the TSG temperature to increase to room temperature, while the remote probe will stay at ocean temperature. This, of course, will vary with the local ocean temperatures.

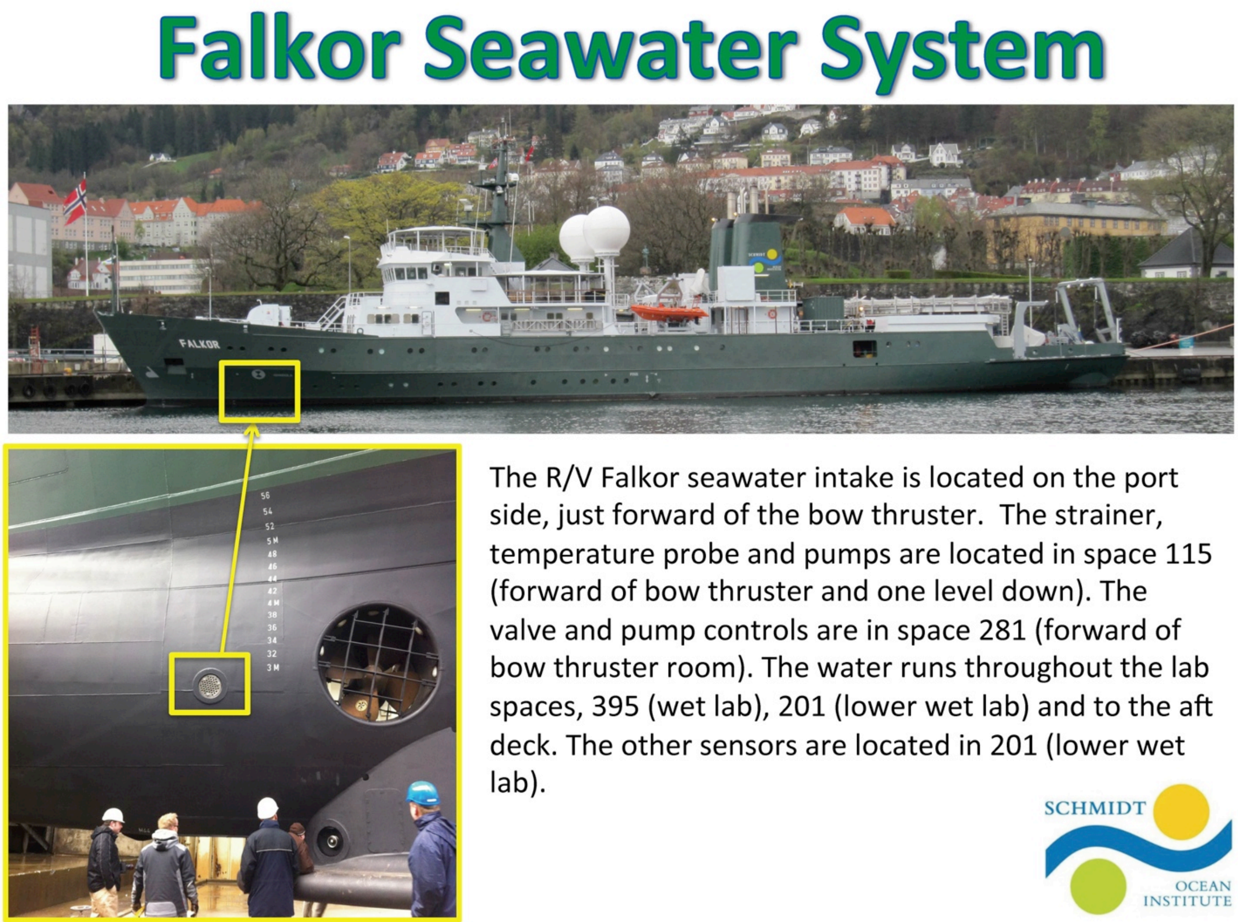


Figure 16: *Position of the scientific seawater system intake, just forward the bow thruster on the port side.*

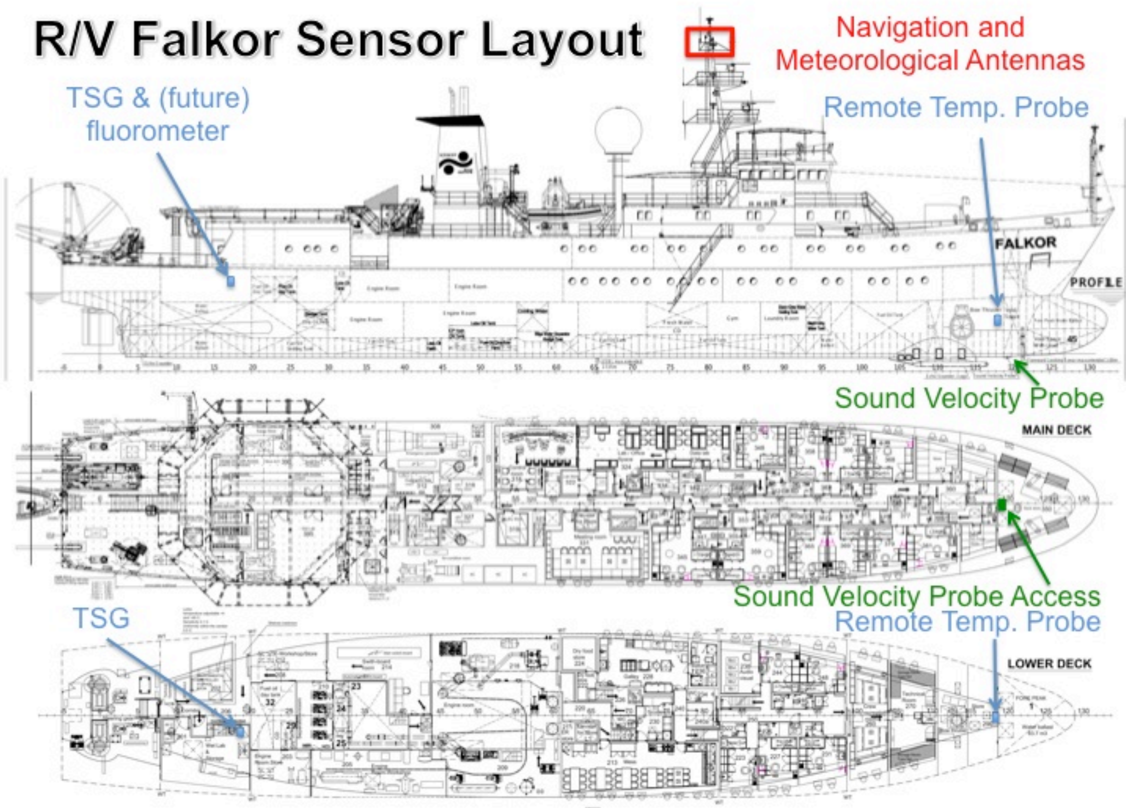


Figure 17: *Scientific Seawater System sensor locations.*

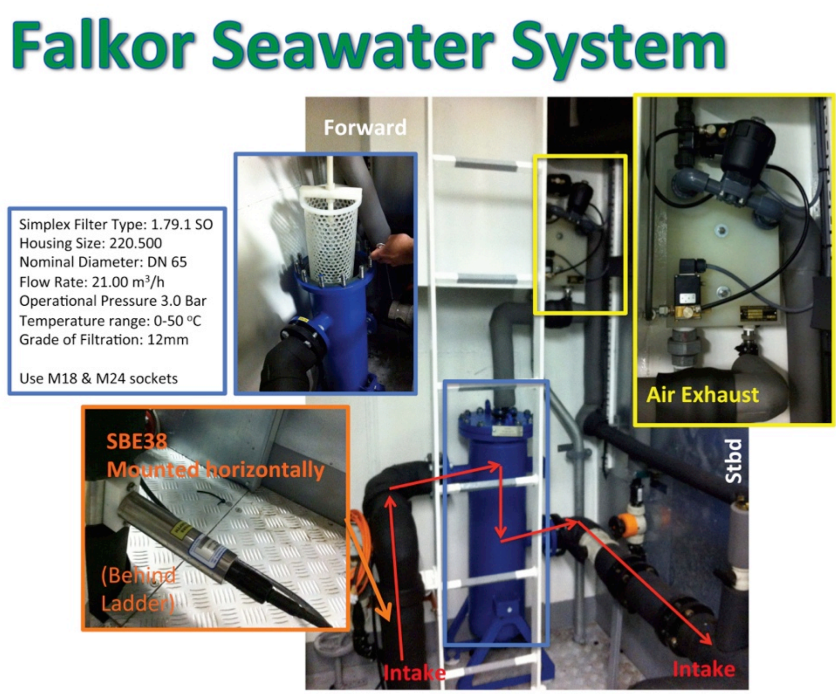


Figure 18: *Scientific Seawater System flow diagram from intake, in space 281, looking forward.*

Figure 19: *Scientific Seawater System valves, pumps, gagues and fresh water flush, in space 281, looking aft.*

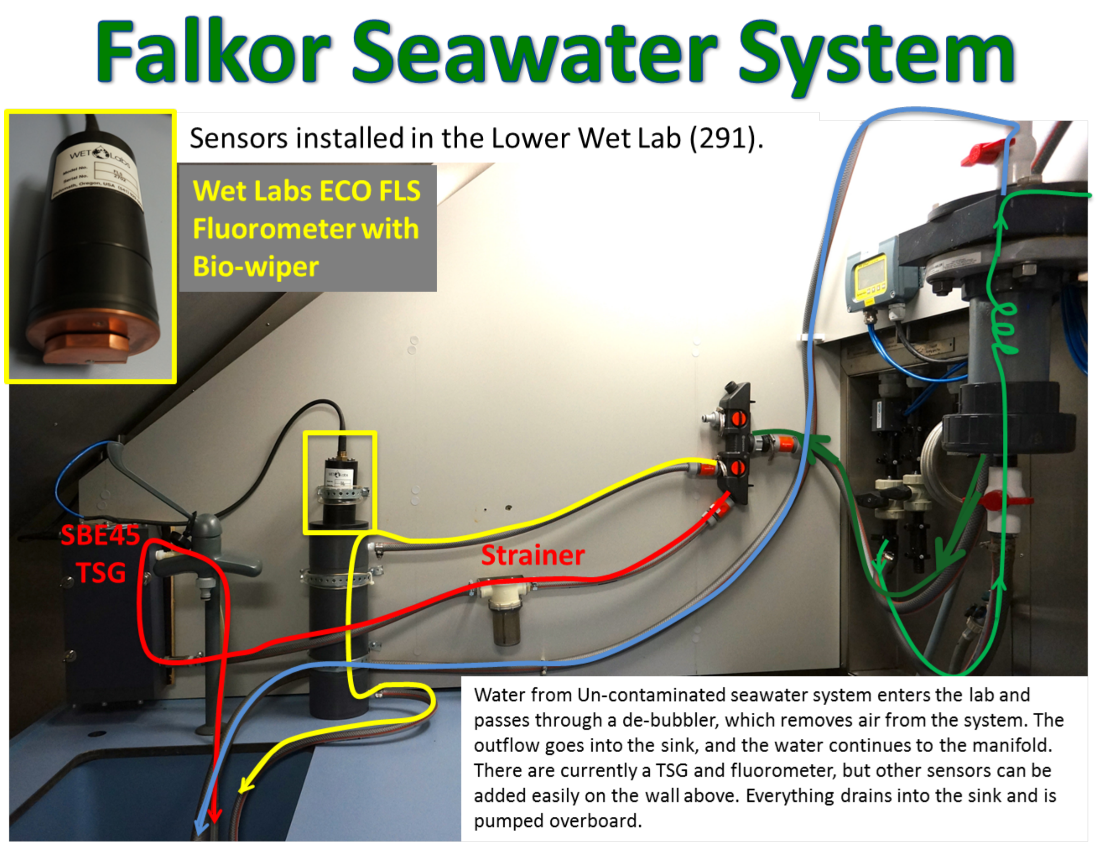


Figure 20: *Scientific Seawater System in the lower wetlab. The water comes from the bowthruster room, down the starboard side of the ship, into the wetlab. It then travels first through a de-bubbler (to remove any remaining air), then through a strainer (one is on, the other is off. The second one is turned on so that the first can be turned off for cleaning without disrupting flow). The water then enters the TSG, exits the TSG and is drained overboard.*

SBE 38 Remote Temperature Probe: The 'external' or remote probe, SBE 38 measures temperature as close to the system's intake as possible. When we send 'sea surface temperature' data, we primarily use this sensor. This temperature is used to calculate sound velocity with the TSG.

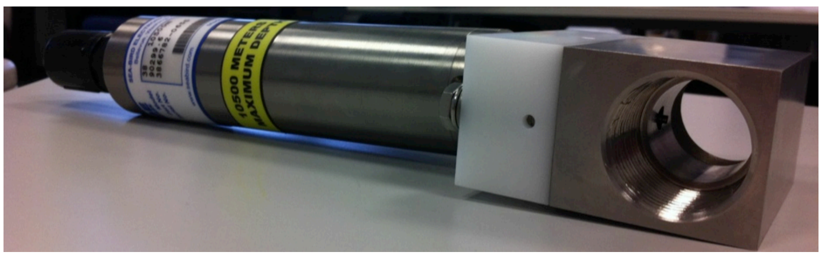


Figure 21: *SBE 38 Remote Temperature Probe.*

SBE 45 Micro Thermosalinograph *(TSG):* The TSG measures temperature and conductivity. With these two measurements, it calculates salinity. With the salinity from the TSG, and the temperature from the remote probe, it calculates sound velocity. Using the remote probe makes sound velocity calculations more accurate because the temperature at the TSG can be affected slightly as it travels through the ship to the wet lab.

Figure 22: *SBE 45 Micro Thermosalinograph.*

Seawater System Data Output:

TSG

SBE 45 Micro Thermosalinograph

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	t1=	Temperature from TSG in wet lab (°C)	29.373
4	c1=	Conductivity from TSG in wet lab (S/m)	5.62268
5	s=	Salinity from TSG (psu) in Wet Lab	34.0032
6	sv=	Sound Velocity from TSG in wet lab (m/s)	1543.579
7	t2=	Temperature from external probe in 281. (°C)	29.5264

Further Information:

http://www.seabird.com/

Valeport MiniSVS Sound Velocity Probe: The Sound Velocity Probe (SVP) is accessed in the forward deck store, by the aft bulkhead behind the workbench. It sits in a pipe welded to the ship's structure. Strapped into a weighted jacket, it is lowered with a cable (not the data cable) and the probe face sticks out past the hull to measure sound velocity close to the transducers. The probe can then be pulled out of the tube for inspection and cleaning, even while the ship is underway. This sensor is calibrated annually.

Figure 23: Left, Valeport MiniSVS probe. Right, SVP secured in its tube.

Figure 24: View of the Valeport MiniSVS probe as it extends out of the hull.

SVP Data Output:

SVP

Valeport MiniSvS Sound Velocity Probe

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sound Velocity	Sound Velocity	1456.99

Further Information:

http://www.valeport.co.uk/Products/SoundVelocity/SoundVelocityDetails

Seabird 9/11 plus Conductivity Temperature and Depth (CTD): CTDs are standard oceanographic systems on most ocean-going research vessels. This system provides a profile of the water column, measuring the chemical and physical properties of the water.

The CTD data is logged using the Seabird Seasave software, and also logged in SCS as a backup. It is helpful to view the CTD depth on a real time plot with winch wire out. It is also useful for comparing sea-surface temperature between the SBE 38and SBE 9plus. The CTD is a 6800m rated sensor with dual temperature and conductivity sensors. It can accommodate up to 8 auxiliary sensors. We currently have 2 SBE 43 dissolved oxygen, a WetLabs ECO FLNTU fluorometer/turbidity sensor and a C-Star Transmissometer. Due to the nature of CTD casts, the auxiliary instruments can change frequently within a cruise or between cruises, so the data are not accommodated in SCS. It would require frequent reprogramming, which would interrupt the bulk of the data being logged on SCS. The primary sensors are therefore the only ones logged by SCS. These include pressure, depth, conductivity, temperature, salinity and sound velocity.

The CTD frame and SBE 32 carousel can accommodate up to 24 12L OTE Niskin water sampling bottles.

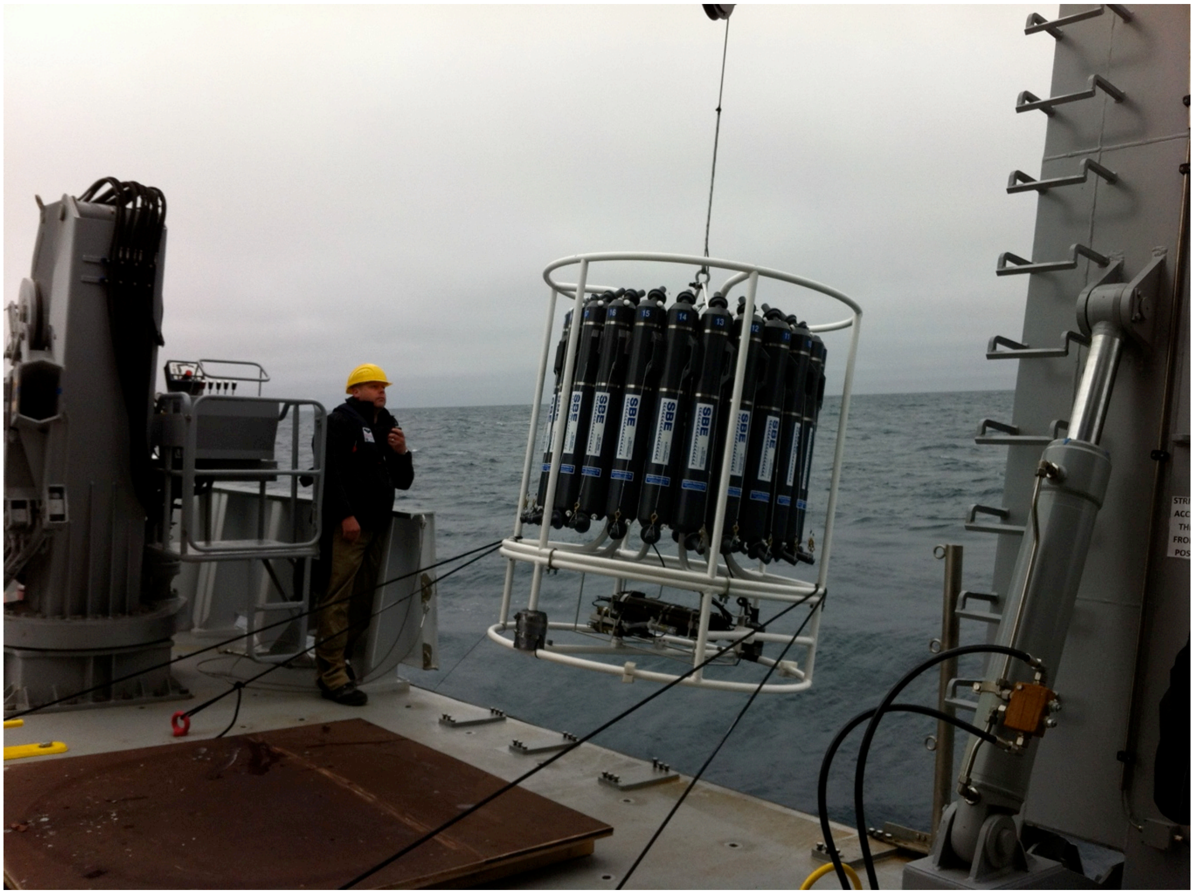


Figure 25: CTD being deployed with the J-Frame.

CTD Data Output:

CTD

SBE 9plus with dual T&C (3plus and 4C) plus Auxiliary sensors

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Pressure	Pressure (db)	12.29
4	Depth	Depth (m)	12.19
5	Temperature 1	Primary Temperature (°C)	13.86
6	Temperature 2	Secondary Temperature (°C)	13.85
7	Conductivity1	Primary Conductivity (S/m)	3.20
8	Conductivity2	Secondary Conductivity (S/m)	3.18
9	Salinity 1	Primary Salinity (psu)	32.15
10	Salinity 2	Secondary Salinity (psu)	32.15
11	Sound Velocity 1	Primary Sound Velocity (m/s)	1499.86
12	Sound Velocity 2	Secondary Sound Velocity (m/s)	1499.84

Further Information:

http://www.seabird.com/

Winch:

There is one winch on board, but with two drums. The drums can be swapped out while the ship is dockside. There is a 3/8” wire rope and a .322 CTD cable. The CTD winch is used for vertical CTD casts or tow-yos (where the CTD package is towed and raised up and down to cover a greater horizontal area).

MacArtney MASH CTD Winch was installed to primarily support hydrographic operations, but can be used for deploying a variety of equipment using the J-Frame or the A-Frame.

Figure 26: *CTD Winch with .322 cable drum being fitted. The winch is located on the 4th deck aft, forward of the helideck.*

Winch Data Output:

RD, Winch

CTD Winch

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	Winch	RD
4	Tension	(lbs)	27.8621
5	Line Rate	(m/min)	0
6	Line Out	(m)	-6.75666
7	Checksum	Checksum	1533

Further Information:

http://www.macartney.com/systems/launch-and-recovery/winches

Sonars:

All of the sonars are installed in the fin-shaped keel type structure, referred to as the Gondola. This structure was designed to be aerodynamic, in an effort to avoid bubble sweep-down past the transducers. Bubble sweep-down occurs when bubbles (churned up from the ship moving through the water) get sucked down under the hull. When they pass the transducers, the air blocks the transducers from receiving the signal, causing a loss of data.

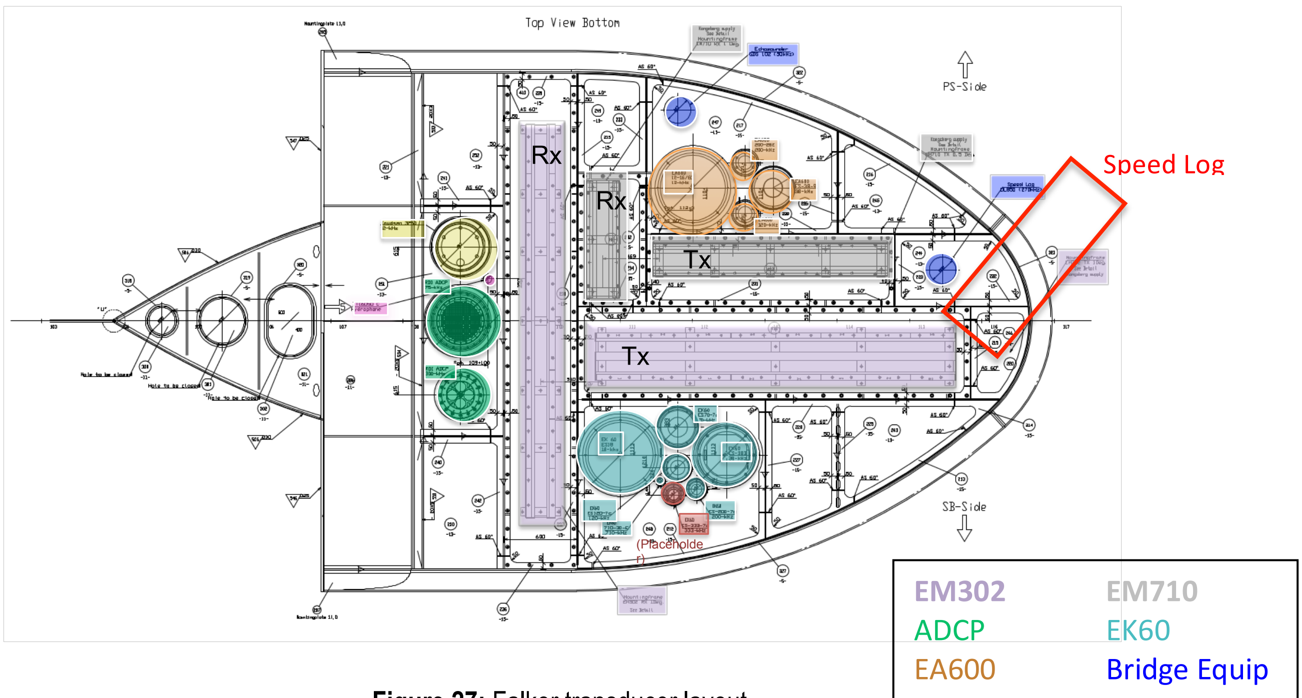


Figure 27: Falkor transducer layout.

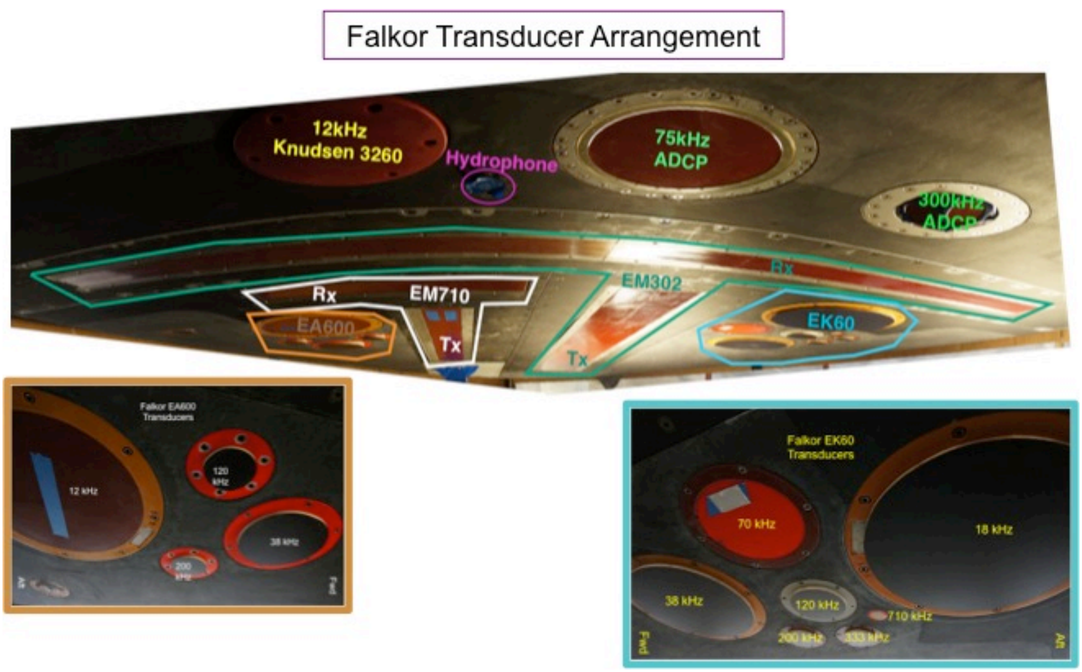


Figure 28: A view of the Falkor Transducers from below the Gondola looking forward.

Navigation Sounders

Kongsberg Maritime Skipper DL850 Dual Axis Doppler Speed Log: Provides forward/aft (+/-) and port/starboard (+/-) ship speed measurements, both over ground and through water. The speed range is from 0-40 knots on both axis. The echo sounder has a max range of 100m.

Data Output:

$--VBW, Speed Through Water and Speed Over Ground

BridgeData

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	Speed Through Water and Speed Over Ground	$VDVBW
4	Longitudinal Water Speed	Speed Ahead, through water, "-" means astern (kts)	10.4
5	Transverse Water Speed	Speed to Starboard, through water "-" means port (kts)	0.35
6	Water Data Status	A = Valid, V = Void	A
7	Longitudinal Ground Speed	Speed Ahead, over ground "-" means astern (kts)	8.3
8	Transverse Ground Speed	Speed to Starboard, over ground "-" means port (kts)	0.25
9	Ground Data Status	A = Valid, V = Void	A
10	Stern Transverse water speed	Speed astern through water, "-" means astern (kts)	0.3
11	Stern water speed status	A = Valid, V = Void	A
12	Stern transverse ground speed	Speed astern over ground "-" means astern (kts)	0.3
13	Stern ground speed status	A = Valid, V = Void	A
14	Checksum	2-byte XOR sum of data to check for transmission errors	*1C

Scientific Echo sounders

All of the following echo sounders are from Kongsberg Maritime. In normal mapping operations, the data from each of the sounders are recorded on the local acquisition machines in the Kongsberg file formats for more in-depth processing. They are recorded on SCS for use with displays, quality assurance and data transfers to the SOI website Falkor Status page. If you want to process any of these data for acoustic surveys, you will need the files in the native formats.

EM302 Deep water multibeam sonar: The EM302 is used for seafloor bathymetry, seafloor backscatter and water column backscatter. This sonar's optimal depth is 1000-6000m, but it can log data from 10-8000m.

EM710 Shallow water multibeam sonar: The EM710 is used for seafloor bathymetry, seafloor backscatter and water column backscatter. This sonar has higher resolution in more shallow depths, and its operating range is up to 2000m, but it tends to stop collecting useful data by 1500m.

EK60 Split-beam fisheries sonar: The EK60 sonar is generally used for studying the plankton or fish in the water column. There are the following frequencies: 12kHz, 38kHz, 70kHz, 120kHz, 200kHz and 710kHz.

EA600 Single-beam hydrographic sonar: The EA600 is not frequently used for logging data. It's primary function is to find the bottom quickly before an ROV dive or CTD cast or to compare to another sonar. There are the following frequencies: 12kHz, 38kHz, 120kHz and 200kHz. The 12kHz EA600 is one of two transducers that will collect data to the bottom of the Marianas Trench, roughly 11,000m in depth.

For further information about any of the Falkor echo sounders, please see a marine technician.

Data Output:

$--DPT, Depth of Water

This message produces a single value for the depth of the seafloor. On the multibeams, this is the depth at nadir. For the EA600, the frequency used in this output is selected in the system configuration, and will be noted within the file. For the EK60, the frequency is noted in the file name before the sentence label.

Kongsberg EM302, EM710, EA 600

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	Depth of Water	$VDDPT
4	Depth	from transducer, (m)	2128.56
5	Offset from Transducer	+' = distance from transducer to waterline, '-' = distance from transducer to keel	3.4
6	Maximun Range Scale in use	(m)	200
7	Checksum	2-byte XOR sum of data to check for transmission errors	*52

$--DBS, Depth Below Surface

This message uses the transducer depth (draft of vessel) to determine the depth of the seafloor relative to the surface. For the EA600, the frequency used in this output is selected in the system configuration, and will be noted within the file. For the EK60, the frequency is noted in the file name before the sentence label.

Kongsberg EA 600, EK60

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	Depth Below Surface	$VDDBS
4	Depth in feet	Depth in feet	6983.46
5	f	f=feet	f
6	Depth in meters	Depth in meters	2128.56
7	M	M=meters	M
8	Depth in Fathoms	Depth in Fathoms	1163.91
9	F	F=fathoms	F
10	Checksum	2-byte XOR sum of data to check for transmission errors	*54

$--DBT, Depth Below Transducer

This message is used for the depth of the seafloor strictly below the transducer—NOT taking into account the draft of the vessel. For the EA600, the frequency used in this output is selected in the system configuration, and will be noted within the file. For the EK60, the frequency is noted in the file name before the sentence label.

Kongsberg EA 600, EK60

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	Depth Below Transucer	$VDDBT
4	Depth in feet	Depth in feet	6983.46
5	f	f=feet	f
6	Depth in meters	Depth in meters	2128.56
7	M	M=meters	M
8	Depth in Fathoms	Depth in Fathoms	1163.91
9	F	F=fathoms	F
10	Checksum	2-byte XOR sum of data to check for transmission	*54

D1-12kHz, D2-38kHz, D3-120kHz, D4-200kHz

Since the output frequency for the DPT, DBS and DBT files on the EA600 are determined in the system configuration (which may be forgotten to be changed) these files produce depth information for each of the 4 frequencies.

Kongsberg EA 600

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	Depth for a specific frequency	D1-12kHz
4	D#	Header (2 characters), where # indicates the channel number	D1
5	Time	HHMMSSss, when ping is transmitted	03165662
6	Depth	In meters	964.10
7	Reflectivity	Reflectivity	-14
8	Transducer Number	always 1	1
9	Athwartships angle	Not used in EA600, always 0	0
10	Transducer Frequency	Should indicate same frequency as in the file name	12
11	Transducer Depth	Draft as entered into the EA600 configuration	5.63
12	Constant SVP	SVP manually entered into EA600 configuration	1469.0
13	Checksum	2-byte XOR sum of data to check for transmission errors	*4

Further Information:

http://www.km.kongsberg.com/

Derived:

A 'Derived' sensor is one that is created from an existing sensor—there is a mathematical adjustment or calculation made. This is used to calculate the sensor's value in another unit (ex: Relative wind speed is output from the sensor in knots, but if someone needs meters/second then it would be derived). Another example is to calculate true wind. We cannot directly measure true wind on a moving vessel (as the ship moves forward, it creates wind), but we can measure the components that are used to calculate it. SCS takes Ship's SOG, COG, heading, relative wind speed and relative wind direction and calculated true wind direction and speed with a built-in algorithm. Other examples of derived sensors are those that take averages. SCS sends SAMOS and Webship data every day/hour. These data are averaged over a period of time to provide more accurate readings. Taking a snapshot of data would be more prone to outliers, which could negatively impact and improperly represent the data over a period of time.

The following are the data outputs for the current derived sensors:

$DERIV, True Wind

Calculated from RAW Sensor Data

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	Derived Sensor	$DERIV
4	True Wind Speed	Calculated Value (kts)	15.86
5	True Wind Direction	Calculated Value (deg)	132.12
6	Relative Wind Speed	RM Young (kts)	16.1
7	Relative Wind Direction	RM Young (deg)	79.1
8	SOG	CNAV (kts)	1.75
9	COG	CNAV (deg)	46.8
10	Heading	Gyro 1 (T)	46.8

$DERIV, Relative Wind Spd-kts

Relative Wind Speed m/s converted to knots

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	Derived Sensor	$DERIV
4	Value	Relative Wind Speed (m/s)	8.28
5	Relative Wind Speed	Relative Wind Speed (kts)	16.1

$DERIV, Pressure-mbar

MET sensor units conversion from Pascals to mbar

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	Derived Sensor	$DERIV
4	Value	Relative Wind Speed (m/s)	8.28
5	Relative Wind Speed	Relative Wind Speed (kts)	16.1

$DERIV, *Various Sensor Averages for SAMOS

SAMOS (FSU) collects climate data in 60 second averages.

Column	Name	Description	Example Data
1	SCS Date	Date data was recorded by SCS	7/8/2010
2	SCS Time	Time date was recorded by SCS	04:23.3
3	Sentence Identifier	Derived Sensor	$DERIV
4	Value	Calculated Average	29.36
5	Base Value	Raw Sensor Value	29.36
6	Sum	Sum of Measured Values	117.44
7	# of values to Average	# of values to Average	4

***Derived Sensors include: Latitude, Longitude, SOG (kts), COG (T), Gyro (T), Air Temperature (°C), Relative Humidity (%RH), Barometric Pressure (mb), Relative Wind Speed (kts), Relative Wind Direction (deg), True Wind Speed (kts), True Wind Direction (deg), TSG Salinity (psu), TSG Conductivity (S/m), TSG Temperature (°C), TSG External Probe Temperature (°C). Others may be added over time.**

Over time, as data purposes evolve, there may be more derived sensors. These will always be indicated with a $DERIV at the beginning of the raw data. Please contact the marine technicians onboard for questions regarding new or undocumented derived sensors: mt@soi-falkor.org.

Underway Data Transfers

There are several sets of data that the ship transmits during a cruise:

SOI Shiptracker

The SCS Navigation data is sent to the NMEA PC on board the ship. There is an event that runs in the background to extract the data and send it via an ftp server to SOI shoreside, where it is then uploaded onto the website. This data can be found on the Falkor Status or Expedition Map pages.

www.schmidtocean.org

Shipboard Automated Meteorological and Oceanographic Systems (SAMOS)

SAMOS is at Florida State University. This group does climate studies, and reports to the ship if they find any discrepancies with the sensors or data. This data is collected via an SCS event, and the files that are generated are sent to SAMOS via the SAMOS mailer, built into the SCS menu, on a daily basis. The data that is collected in this event are averaged over a period of 60 seconds.

Sensor Value	Parent Sensor	Units
Call Sign	Metadata	ZCYL5
Latitude	CNAV	4124.8963,N = 41d 24.8963'N
Longitude	CNAV	08151.6838,W = 81d 51.6838'W
Speed Over Ground (SOG)	CNAV	Knots
Sensor Value	Parent Sensor	Units
Course Over Ground (COG)	CNAV	Degrees Magnetic
Heading	Gyro 1	Degrees True

Air Temperature	Viasala	°C
Barometric Pressure	Viasala	mb
Relative Humidity	Viasala	% RH
Relative Wind Speed	Viasala	Knots
Relative Wind Direction	Viasala	Degrees (relative to bow, where bow =
True Wind Speed	Viasala	Knots
True Wind Direction	Viasala	Degrees True
Sea Surface (External)	SBE 38 Remote Temperature	°C
Sea Surface Temperature	SBE 45 Micro Thermosalinograph	°C
Conductivity	SBE 45 Micro Thermosalinograph	S/m
Salinity	SBE 45 Micro Thermosalinograph	psu

Further Information:
http://samos.coaps.fsu.edu/html/

Data Management:

CRUISEDATA DIRECTORY STRUCTURE STANDARD

This is the standard structure of directories and data files for every FALKOR cruise. Highlighted in yellow are the folders that contain the SCS data. The data will remain in this structure once it reaches the archive.

AcousticSystems
- ADCP300KHZ
- ADCP75KHZ
- EK60
- EA600
- EM302
- EM710
- KNUDSED_SBP
- USBL

Oceanography
- CTD
- ROVCTD
- SVP
- XBT

Products
- Dashboard Data
- Tracklines

PublicData
- Photos
- Line Plans
- ROV
  - DIVE###
    - BlueViewSonar
    - CTD

Framegrabs
MS1000
Sonar
SDHD
Stills

SCSData

- DataMonitorLogs
- EventData
  - (ex: SAMOS):
    - Button Activity.txt
      - Stop and start of event
    - MetaDataSensorDescription.csv
      - Header and respective equipment name (name given to sensor in SCS)
    - Event Report File
      - Starting values, units for each sensor.
    - Samos.txt
    - SAMOS_###.hdr
    - SAMOS_###.txt
    - SAMOS-OBS_###.elg
      - Actual data file, comma delineated.
- MAILER
- METOC
- NAV
- Reports
- SAMOS
- SONAR
- VEHICLES
- WINCH

Contacts:

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