Midnight

Systems Manual

Jan 2021

Note: this document is supplementary to the installation and user documents supplied with units fitted to the boat.
No information from those manuals is included in this document.
Supplied with this document are three wiring schematics; accessories.pdf, tankTimer.pdf and WinchHydraulics.pdf.
Descriptions of all other wiring is contained in this document.

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Instruments

There are two communication protocols, on separate twin-pair busses, used to distribute instrument data.
- NMEA183 connects the VHF radio, the auto-pilot, the Navman GPS, the radar/chart plotter and the Navman Multi instrument on the external helm instrument pod.
- Navbus, the proprietary Navman protocol, is used to interconnect all Navman instruments.

GPS

Two GPS receivers are installed above deck.
The unit in the short pole between the dorades above the forward cabin, is a Furono unit and supplies the radar/chart plotter.
The unit installed on the starboard, pilot-house, dorade housing, is a Navman unit and supplies GPS data to the autopilot and the VHF radio. (NMEA183)
Power to the GPS units is supplied respectively by the auto-pilot control unit and the radar/chart plotter.

Sailing

The primary sailing instruments, wind, boat speed, depth and auto-pilot, are located on the instrument cluster at the inside helm.
All sensors connect directly to the the relevant instrument.
Output data from the instruments is distributed via Navbus to the sailing instruments on the external helm.
The Navman Multi instrument located at the external helm may be setup to read both Navbus and NMEA183 data.
The auto-pilot instruments at both helms may be used to display rudder angle, GPS position, etc, without requiring that the auto-pilot hydraulic pump is switched on.
Power to all the sailing instruments and auto-pilot control unit is from the "Instruments" breaker on the BEP 12V panel.

Auto Pilot

The Navman auto-pilot control unit is located on the forward wall inside the cupboard with the folding door at the inside helm.
There are two head units connected to the unit; the visual display unit mounted on the outside helm and the standard unit at the inside helm. Both units have the same control functionality and both may be used simultaneously.
The fluxgate compass for the controller is mounted on the front of the main mast, above the spinnaker pole fitting; the gyro unit is mounted on the bulkhead wall under the stairs leading from pilot house to galley (basically, the centre pivot of the boat).
Power to the control unit is from the "Instruments" breaker on the BEP 12V panel; power to the hydraulic pump, from the "Auto Pilot" breaker.

Radar/Chart Plotter

A Furono unit combines radar and chart plotter functionality.
There are many display combinations possible for the unit, the default is plotter.
The User Manual, located with all the boat documents in the galley outside cupboard, describes in detail how to setup and utilise the functionality.
The radar transmitter unit is located on the main mast. If unstepping the mast is required, the main radar cable must first be disconnected from inside the transmitter unit housing, and withdrawn from the mast (removable panel next to mast inside the boat).
Power is from the "RADAR" circuit breaker on the BEP 12V panel.

Radio

The Standard Horizon VHF radio has considerable functionality, including inbuilt AIS receiver, DSC, Emergency location broadcast, Loud Hailer, etc.
A remote microphone, able to control all the functionality and display AIS data is mounted at the remote helm.
(The installed VHF unit has now superseded in the USA, but identical units are still available (date of writing) from Whitworths).
The horn for the loud hailer is located under the radar mounting bracket, on the main mast.
Power is supplied by the "VHF" circuit breaker on the BEP 12V panel.

The "SSB" circuit breaker on the panel is wired to a terminal block on the back wall of the split door cupboard at the inside helm location. This was included to allow the installation of an SSB transceiver in that cupboard. Control cables and RG50AU coax run from that cupboard to the upper cupboard on the starboard side of the aft cabin. An aerial tuning unit for the SSB would be installed in this cupboard.

Anchor

A remote anchor winch control unit and chain counter is located on the external helm instrument pod.
NB raising/lowering the anchor must only be done from this instrument, or the pendant control at the winch location. Simultaneous control is NOT supported.
Power for the instrument is supplied by the winch control system, in the bosun's locker.
The chain sensor consists of a magnet installed in the chain gypsy and an electronic unit installed in the winch base.
Control, sensor data and power are supplied to the instrument via a multi-core cable, running direct from the outside helm to a terminal block located on the wall adjacent to the winch battery in the bosun's locker. (forward cabin)

Sensors

All instrument sensors connect directly to the relevant instrument, located on the *inside helm instrument cluster*. Sensor data from the internal helm instruments is delivered via the Navbus to the instruments on the external helm instrument pod.
The boat speed and depth sensors are located under the lift up panel in the forward cabin.
The wind sensor is co-located with the Windex, at the top of the mast.

Electrical

BE VERY AWARE when working with the electrical system, that there are THREE independent 230 volt power sources on the boat.

The primary electrical system on the boat is 12 Volt DC, provided by 6 x 2 Volt Sonnenschein cells, type A600S 8 OPzV 960, located in the keel in a sealed and vented area beneath the galley access steps. Battery capacity is 960 Ampere Hours at the 100 hour rate.

A Victron Energy MultiPlus 12/3000/120 Charger/Inverter provides 120 amps for multistage adaptive battery charging and 3kVA 230 Volt AC supply from the inverter. The remote control is located on the inside helm forward wall, starboard of the 12V panel.

Shore power is isolated by a Victron Energy 3kVA isolation transformer.

The MultiPlus and Isolation transformer are located behind the 12V control panel.

A MasPower 6kVA diesel powered alternator (genset) provides ships power 230 volt supply.

Separate, 12 V no-maintenance starter batteries are installed for each of the main engine and the genset; a third 12 V battery, located in the forward locker, is used to power the anchor windlass and is charged by the solar cell array.

Solar

The 120 Watt solar panel connects to a two way switch located in the forward panel of the passage berth behind the dining table. One direction switches the solar panel output to a solar regulator in the central helm battery compartment, connected to the house battery. The other direction switches the panel output to a solar regulator, mounted on the port side of the forward wall in the forward cabin. This regulator connects to the anchor winch battery via a fuse located in the locker. Note that the lamp switch on the solar regulator, controls the light in the forward locker.

Wind

The wind turbine connects to the 12 v supply via a fuse in the fuse box behind the galley steps. The turbine brake may be activated from either the switch on the utility panel, above the side of the freezer, or by the switch located on the starboard side bedhead panel. Both switches must be enabled, for the generator to function.

Genset

The genset remote panel is only active when the indicator on the genset controller shows automatic operation. Whenever the genset local control panel power is powered off, the default at power on is manual operation and to enable the remote panel, automatic must be selected. There is a 10 sec delay after switching the remote (or manual) start to on, before

the engine runs.

Lighting

Lighting throughout the boat and on the mast (except for the steaming light) is provided by LED lamps.
White and red lamps in the cabins are MR16 format (same format as house type LED bulbs), allowing for easy replacement.
Accent lights under the cupboards in the galley and in the starboard side deck overhang (pelmet lights) are multi-led units, chosen for their low profile.

Forward Cabin

Lighting in the forward cabin is provided by 6 x 3 watt 12 volt warm white LED lights, controlled by the switch just inside the door.
The "Cabin Lights Fwd" breaker on the BEP 12v distribution panel isolates this circuit.

Forward Head

A switch on the right hand outside of the door, controls the 3 watt 12 volt warm white LED light in the head. The "Toilet LT" breaker on the BEP 12v distribution panel isolates this circuit.
The red light is controlled by the pilot house companionway, red, switch. Both red and white lights may be on together,

Pilot House

Lighting is provided by either five red 3 watt 12 volt LED lights, or by fourteen warm white 3 watt 12 volt LED lights. The switch on the starboard side of the companionway switches on the red lights (3 in the pilot house, one in the galley and one in the forward head) and inhibits switching on the white lights. The switches on the port side of the companionway control the white lights; one switch turns all lights on, the second turns all lights off, except those over the table.
A separate Red LED lamp is installed above the shelf where the VHF is mounted; the switch is under the overhang, just aft of the VHF.
Galley lights are controlled by the bottom switch located to the right of the gas detector, mounted on the wall above the gas stove. The top switch controls the aft deck strip light.

The "Cabin Lights Mid" breaker on the BEP 12v distribution panel supplies power to the pilothouse.

Pelmet Lights