

FUEL 3100

Installation and Operation Manual



NAVMAN



Warnings

1. Every effort has been made by the manufacturer to ensure that the materials used in the NAVMAN fuel flow transducer will operate reliably with different fuel mixtures. The manufacturer or its distributors can not be held responsible for fuel formulation or any affect this may have on the performance and durability of the fuel flow transducer.

2. NAVMAN fuel flow transducers must NOT be used with diesel engines. Refer to the separate installation instructions supplied with the fuel flow transducer for more information.

FCC Statement

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a normal installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an output on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced technician for help.
- A shielded cable must be used when connecting a peripheral to the serial ports.

Important

It is the owner's sole responsibility to install and use the instrument and transducer(s) in a manner that will not cause accidents, personal injury or property damage. The user of this product is solely responsible for observing safe boating practices.

The NAVMAN fuel flow transducers have been specifically developed for use in marine applications with gasoline inboard and outboard engines and are not warranted for any other type of application. NAVMAN fuel flow transducers must NOT be used with diesel engines.

Warning

This fuel flow transducer will create additional back pressure in a fuel system of 1/2" of mercury at 19.8 US gallons/hour (75 litres/hour) consumption and 1" of mercury with a 39.5 US gallons per hour (150 litres/hour) consumption. It is the owners responsibility to ensure that fitting of this fuel flow transducer does not cause fuel starvation which may lead to poor engine performance.

NAVMAN NZ LIMITED DISCLAIMS ALL LIABILITY FOR ANY USE OF THIS PRODUCT IN A WAY THAT MAY CAUSE ACCIDENTS, DAMAGE OR THAT MAY VIOLATE THE LAW.

This manual represents the FUEL 3100 as at the time of printing. Navman NZ Limited reserves the right to make changes to specifications without notice.

Governing Language: This statement, any instruction manuals, user guides and other information relating to the product (Documentation) may be translated to, or has been translated from, another language (Translation). In the event of any conflict between any Translation of the Documentation, the English language version of the Documentation will be the official version of the Documentation.

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Contents

1 Introduction	4
1-1 How the fuel flow transducer works	5
1-3 Cleaning and maintenance	5
2 Operation	6
2-1 Turn on and off	6
2-2 The keys	6
2-3 The Backlight level	6
2-4 Low Fuel Alarm	6
2-5 Battery Alarm	6
2-6 Simulation mode	6
2-7 Key Reference	7
3 The Main Display	8
3-1 Fuel data	8
3-2 Speed data	8
3-3 Changing data quickly	8
3-4 Port and Starboard data options	9
4 The Setup Menus	10
4-1 Entering setup mode	10
4-2 Changing a setting	10
4-3 Fuel setup (FUEL)	10
4-4 Speed setup (SPEEd)	12
4-5 Backlight setup (LAmP)	14
4-6 Alarms setup (ALArm)	14
4-7 Units setup (UnItS)	14
5 Installation	15
5-1 What comes with the FUEL 3100?	15
5-2 Tank / Engine Configurations	16
5-3 Installing the display unit	16
5-4 Installing the Fuel Flow Transducer	17
5-5 Power and Wiring	17
5-6 Testing the installation	18
5-7 Resetting to factory defaults	18
Appendix A - Specifications	19
Appendix B - Troubleshooting	20
Appendix C - How to contact us	21

Units

This unit is set up with default units of US Gallons, knots and nautical miles.

Please refer to section 4-7 Units setup, to change the units.

1 Introduction

Congratulations on choosing a NAVMAN FUEL 3100. For maximum benefit, please read this manual carefully before installation and use.

The FUEL 3100 measures and displays the fuel flow in real time for a single or twin engine boat. It can calculate and display the:

- amount of fuel used
- amount of fuel remaining
- fuel flow rate

There are also Low Fuel and Battery alarms. With twin engine boats, the FUEL 3100 allows comparison between the flow rates of each engine to achieve maximum synchronisation.

If the optional speed transducer is connected (or any other instrument that reads speed data, such as the SPEED 3100) the FUEL 3100 can also show the:

- fuel economy
- boat speed
- trip log and total log

Knowing the fuel economy can help determine the optimum throttle settings and maximise on fuel savings.

Note that it is **essential** to update the fuel readings in the FUEL 3100 after a partial or full refill, or after manually removing fuel, to maintain accurate electronic readouts.

The FUEL 3100 can also be customized with the Setup menus to suit your boat and preferences.

An installed FUEL 3100 usually has two parts:

- the display unit.
- the fuel flow transducer, which is connected to the fuel line and wired to the display unit. (A twin engine installation will need an extra fuel flow transducer.)

The FUEL 3100 is powered from the boat's main power supply.

The FUEL 3100 is part of the NAVMAN family of instruments for boats, which includes instruments for speed, depth, wind, and repeaters. These instruments can be connected together, using NavBus, to form an integrated data system for a boat.

The FUEL 3100 can also send, share, and receive NMEA data from NMEA compliant instruments. (See section 5-5 Power and Wiring.)

1-1 How the fuel flow transducer works

The fuel flow transducer is inserted into the fuel line between the fuel tank and the engine. A small turbine inside the fuel flow transducer measures the rate of the fuel flow into the engine. This information is relayed through the fuel flow transducer cable and shown electronically on the display unit.

1-2 Cleaning and maintenance

Calibration of the FUEL 3100 after installation is **essential** to provide the best possible performance.

Re-calibration of the FUEL 3100 is recommended after the first 100 engine hours to allow moving parts to 'wear in'.

Clean the display unit and any plastic transducers with a damp cloth or mild detergent. Avoid abrasive cleaners, petrol or other solvents.

Put the protective cover over the FUEL 3100 when it is not being used.

2 Operation

2-1 Turn on and off

Turn the FUEL 3100 on and off with the boat engine's ignition switch. The FUEL 3100 does not have its own power switch. When it is turned off, any changes made to the settings are retained.

If **SIM** flashes at the bottom left corner of the display, the FUEL 3100 is in simulation mode (see section 2-6 Simulation mode).

2-2 The keys

The FUEL 3100 has four keys, labelled **ESC**, **ENT**, **√** and **∧**. In this manual:


- **Press** means push the key for less than one second.
- **Hold** means hold the key down for two seconds or more.

2-3 The Backlight level

There are five different backlight levels. See section 4-5 Backlight setup, for more information.

2-4 Fuel alarm


The FUEL 3100 can be set to sound an alarm when the level on the fuel tank is below the set alarm level. (see section 4-6 Low Fuel Alarm setup).

When the alarm sounds, the internal beeper sounds, the  symbol, the relevant fuel gauge on the display both flash and any external beepers or lights operate.

Press **ESC** to mute the alarm.

2-5 Battery alarm

The FUEL 3100 can be set to sound an alarm when the battery voltage is below the set alarm level. (see section 4-6 Battery Alarm setup).

When the alarm sounds, the internal beeper sounds, the  symbol flashes and any external beepers or lights operate.

Press **ESC** to mute the alarm.

2-6 Simulation mode

Simulation mode allows the user to become familiar with the FUEL 3100 off the water. In Simulation mode, the FUEL 3100 generates data internally and ignores input from the transducers. The word **SIM** flashes at the bottom left corner of the display.

To turn Simulation mode on or off:

- 1 Turn the power off.
- 2 Hold **ESC** while turning the power on.

2-7 Key Reference

Special Modes

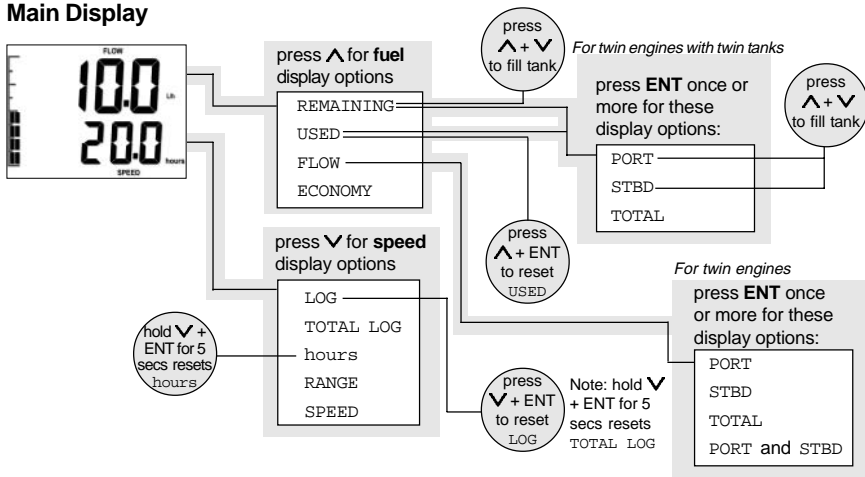
Power On + hold **ESC**

Turn Simulation mode
On Or OFF

Power On + hold **ENT + V**

Reset factory defaults

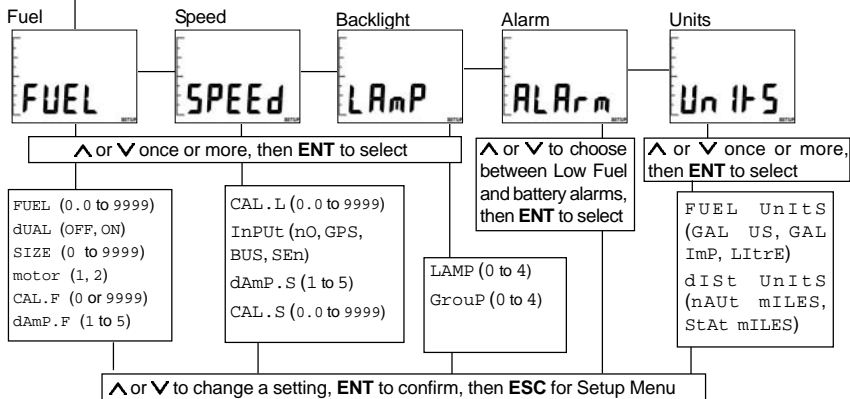
Main Display



Setup Menus

ENT + ESC for setup mode

^ or V once or more, then **ENT** to select a setup menu



3 The Main Display



3-1 Fuel data

The fuel data shows one of the following fuel options:

- REMAINING (fuel remaining)
- USED (fuel used)
- FLOW (rate of fuel flow through the transducer)
- ECONOMY (distance travelled per unit of fuel used)

Press **▲** once or more to change the fuel data option that is currently displayed (e.g., from USED to FLOW).

If your boat has port and starboard fuel data options, press **ENT** to change between the PORT, STBD, and TOTAL fuel readouts on the main display.

3-2 Speed data

The speed data shows one of the following speed options (if optional speed input is available):

- LOG (trip distance)
- TOTAL LOG (total distance)
- hours (total engine hours)
- RANGE (estimated distance that can be travelled on the remaining fuel)
- SPEED (boat speed)

Press **▼** once or more to change the speed data option that is currently displayed (e.g., from SPEED to LOG). **Note:** *hours can be displayed with or without speed input.*

Warning

Fuel consumption can change drastically depending upon the boat loading and the sea conditions. Always carry adequate fuel for the journey, plus a reserve.

3-3 Changing data quickly

Changing the fuel units:

Hold **▲** to change the units on the fuel data option that is currently displayed (e.g., to change between US gallons and litres). **Note:** *when "gal" is displayed, this could be US gallons or imperial gallons. Check the units menu to confirm and change if required. See section 4-7 Units setup.*

Changing the speed units:

Hold **▼** to change the units on the speed data option that is currently displayed (e.g., to change between nautical miles and statute miles). The log units will change automatically to correspond with the new speed units.

Resetting the trip log or total log:

When the desired log is displayed, hold **▼** and **ENT** together to reset the reading to 0.0.

Refilling the fuel tank:

After refilling the fuel tank to maximum, press **▼** and **▲** together while fuel remaining is displayed sets REMAINING (fuel remaining) to full. See section 4-3 Fuel setup for setting your tank size.

Note: On boats with dual fuel tanks, check that the tank **displayed** (PORT or STBD) is the tank to be reset.

Note: This method is **not** recommended for boats with underfloor fuel tanks. See section 4-3 Fuel setup.

See section 4-7 Units setup, for more information about customizing the FUEL 3100 to suit your boat and preferences.

3-4 Port and Starboard data options

The port and starboard data options available depend upon your boat configuration, as follows:

- Single fuel tank / single engine / single fuel transducer - **no** port and starboard data options available.
- Single fuel tank / twin engines / twin fuel transducers - port and starboard readouts for the fuel FLOW option **only**.
- Twin fuel tanks / twin engines / twin fuel transducers - port and starboard readouts for **all** the fuel data options.

In addition, the fuel gauge splits into two columns; the left column shows the fuel level in the port fuel tank and the right column shows the fuel



level in the starboard fuel tank.

If your boat configuration can support port and starboard readout capability, see section 4-3 Fuel setup, to set it up.

To display the port or starboard fuel data on the Main Display, select the required fuel data option then press **ENT** to change between the **PORT**, **STBD** and **TOTAL** readouts.

To choose port or starboard data on the Fuel setup menu or Low Fuel Alarm setup menu, select the required option and press **ENT**, then press **▲** or **▼** to change between **PORT** and **STBD**. Press **ENT** again to make changes.

4 The Setup Menus

Use the setup menus to customize the FUEL 3100 to suit your boat and preferences.

4-1 Entering setup mode

Press **ESC** and **ENT** together to enter setup mode. Then press **∇** or **▲** once or more to show each of the setup menus:

- **FUEL** (Fuel) See section 4-3.
- **SPEED** (Speed) See section 4-4.
- **LAMP** (Backlight) See section 4-5.
- **ALARM** (Low Fuel and Battery Alarm) See section 4-6.
- **UNITS** (Units) See section 4-7.

Press **ENT** to select a setup menu and show the current setting.

4-2 Changing a setting

When the required setup menu is displayed, press **ENT**. The current setting will blink on and off.

Increase or decrease the value of the setting by pressing **▲** or **∇**. (Holding a key will change a numeric setting more quickly.)

Press **ENT** to confirm the new value or **ESC** to return to the previous setting without saving any changes.

4-3 Fuel setup (FUEL)

Use this to specify the settings for:

- remaining fuel (**FUEL**)
- number of fuel tanks (**dUAL**)
- fuel tank capacity (**SIZE**)
- number of engines (**motor**)
- fuel calibration (**CAL . F**)
- fuel flow transducer dampening (**dAMP . F**)

If your boat has port and starboard fuel data options, press **ENT**, then press **▲** or **∇** to change between the **PORT** and **STBD**. Press **ENT** again to make changes.

Setting remaining fuel (**FUEL**)

Select **FUEL** to update the setting for the remaining fuel. On boats with dual fuel tanks, check that the fuel tank **displayed** (**PORT** or **STBD**) is the fuel tank to be reset.



It is **essential** to update this setting whenever any fuel is added or removed. Otherwise, all the fuel readings and the Low Fuel Alarm become meaningless.

Quick refill

To reset the fuel **REMAINING** setting to the maximum tank size, press **∇** and **▲** together.



Note: It is often very difficult to refill underfloor fuel tanks to the same level twice, due to air pockets. Because of this, owners of boats with underfloor fuel tanks are recommended to use the following method to update the setting.

1. Before doing a partial or full refill, or before removing fuel from the fuel tank (e.g., by siphoning it off): note the fuel **REMAINING** reading.
2. Note how much fuel is added or removed.
3. Change the remaining fuel (**FUEL**) setting to show how much fuel is now in the tank.

Setting number of fuel tanks (**dUAL**)

Select **dUAL** to set the number of fuel tanks.



If the boat has twin fuel tanks, select **ON** automatically activate the port and starboard data options.

If the boat has only one fuel tank, select **OFF**.

Setting fuel tank capacity (**SIZE**)

Select **SIZE** to specify the capacity of the fuel tank. On boats with dual fuel tanks, check that the fuel tank **displayed** (**PORT** or **STBD**) is the fuel tank to be set.



It is recommended that the fuel tank capacity is measured by draining the fuel tank and then filling it to capacity. After filling, note the the reading from the fuel dispenser's gauge.

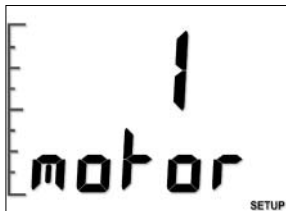
Note: It is often very difficult to refill underfloor fuel tanks to the same level twice, due to air pockets.

Warning

Fuel consumption can change drastically depending upon the boat loading and the sea conditions. Always carry adequate fuel for the journey, plus a reserve.

Setting number of engines (motor)

Select **motor** to specify the number of engines on the boat.



There is a choice of 1 or 2. If 2 is specified, the port and starboard fuel **FLOW** options are automatically activated.

Fuel calibration (CAL.F)

Select **CAL.F** to calibrate a fuel flow transducer. Calibrating the fuel usage is essential for accurate fuel measurements.

Twin engine installations require each fuel flow transducer to be calibrated. This can be done at the same time with two portable tanks, or at different times using one portable tank.

Calibrating the fuel flow transducer(s) requires accurate measurement of the fuel consumption. This is best done using a small portable tank. At least 4 gallons (15 litres) of fuel should be used to ensure an accurate calibration. The more fuel used, the more accurate the calibration.

To calibrate the fuel flow transducer:

1. Connect the portable tank(s) to the engine through the fuel flow transducers.
2. Run the engine and display **USED** (fuel used) on the Main Display.
3. Press **ENT** and **▲**. To reset the reading to 0.
4. Run the engine at normal cruising speed until a **known** amount of fuel, at least 4 gallons (15 litres), has been used per engine.
5. The **USED** readout shows the apparent amount of fuel used.
6. Select the **FUEL** setup menu, then press **▲** or

▼ until **CAL.F** is displayed, then press **ENT**. (On boats with dual fuel tanks, select the fuel flow transducer to be calibrated: **PORT** or **STBD** then press **ENT**.)



7. If the **CAL.F** readout does not match the **known** amount of fuel used, alter the readout to match the known amount by pressing **ENT** then **▲** or **▼**. Once you have the correct value displayed, press **ENT** to save the correct value. (Otherwise, press **ESC** to exit.)

Setting Fuel Flow Transducer Damping (dAmP.F)

Select **dAmP.F** to average the fuel flow transducer readout over a selected time period. This is known as damping. It avoids rapid changes in the fuel data that is displayed, e.g., as the boat travels across waves.



Choose between 1 to 99 seconds of damping.

Select the required damping level. One second gives the most sensitive reading, however shows the most fluctuations.

4-4 Speed setup (SPEED)

Speed displays and functions are only available if an instrument has speed input from GPS (via NMEA), NavBus or an optional speed transducer.

Use this to specify the settings for:

- source of the speed input data (INPUT)

- calibration by log (CAL . L)
- calibration by speed (CAL . S)
- speed transducer damping level (dAMP . S)

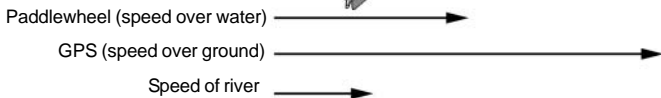
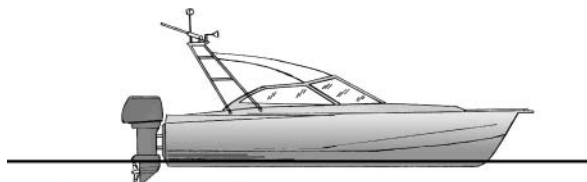
The CAL . L and CAL . S options are available only if SE n is specified as the source of the speed data.

Speed input via GPS versus paddlewheel.

GPS speed readings measure speed over ground. Paddlewheel transducers measure speed through the water. As they calculate the speed differently, the displayed speed, trip log, economy and range differ for each type. As a GPS receiver measures speed over the ground, it is more suitable and accurate for the economy and range calculations than the paddlewheel speed.

Example 1:

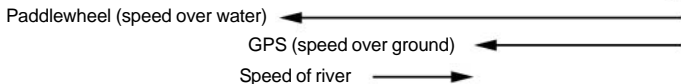
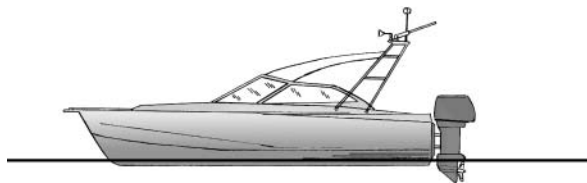
Time travelled: 1 hour
Speed of river: 5 knots
Fuel used: 3 gallons
Fuel remaining: 50 gallons



	Speed displayed	Trip log	Economy	Range
Paddlewheel (speed over water)	10 knots	10 nm	3.3 nm/gal	165 nm
GPS (speed over ground)	15 knots	15 nm	5.0 nm/gal	250 nm

Example 2:

Time travelled: 2 hours
Speed of river: 5 knots
Fuel used: 6 gallons
Fuel remaining: 50 gallons



	Speed displayed	Trip log	Economy	Range
Paddlewheel (speed over water)	15 knots	30 nm	5.0 nm/gal	250 nm
GPS (speed over ground)	10 knots	20 nm	3.3 nm/gal	165 nm

Setting the speed input source (InPUt)

Note: if connection via NavBus, the speed input is automatically selected.

Select InPUt to specify the source of the speed input.



Note: A speed reading from the optional speed transducer is the speed that the boat is moving through the water. A speed reading from a GPS is the speed over the ground. If there is any water current then these two speeds will be different.

There is a choice of:

- NO (No speed input available). If this is selected, the only option available on Speed data will be engine hours (HOURS).
- GPS (NMEA - from other instruments). **Note:** a GPS readout gives the speed over the ground. This will produce a different fuel ECONOMY reading when compared to input from a paddlewheel speed transducer.)
- SEN (optional paddlewheel speed transducer connected directly to the FUEL 3100. See section 5-5 Power and Wiring.)

Select the source of the speed data. Note: NavBus is automatically detected.

Note: If calibration is required when another instrument is the source of the speed data, use the calibration procedure described in that instrument's manual.

Setting the speed transducer damping level (dAmP.S)

This speed setup option is for use with transducers directly connected to the FUEL 3100 and is only available if SEN is selected as the speed input source.

Select dAmP.S to average the speed readout (damping) over a selected time period. Damping avoids rapid changes in the speed data displayed; e.g., as the boat travels across waves.

Choose from one of five damping levels:

- 1 (6 seconds)
- 2 (12 seconds)
- 3 (18 seconds)
- 4 (24 seconds)
- 5 (30 seconds)



Select the required damping level. Level 1 gives the most responsive reading but also shows the most fluctuations.

Speed calibration by log (CAL.L)

Select CAL.L to use the log to calibrate a paddlewheel speed transducer that is connected directly to the FUEL 3100. (SEN must have been selected as the source of the speed input.)

1. Reset the trip log, LOG, to 0. Press ENT + V when LOG is displayed.
2. Travel a **known** distance in a straight line at a speed between 5 and 20 knots. Best results are achieved in calm conditions and with minimal current (best at high or low tide). Tidal effects can be reduced by making the trip once in each direction, parallel to the current, to average the distance.



3. Select SPEED, then CAL.L. The FUEL 3100 readout shows the apparent distance travelled.
4. If the readout does not match the known distance, alter the readout to match the known distance. (Otherwise, press ESC to exit.)
5. Press ENT to save the correct value.

Speed calibration by boat speed (CAL.S)

Select CAL.S to use the boat's speed through the water to calibrate a paddlewheel speed transducer that is connected directly to the FUEL 3100. (SEN must have been selected as the source of the speed input.)

Note that for accurate calibration:

- The speed from another paddlewheel transducer should be between 5 and 20 knots.
- Best results are achieved in calm conditions and

with minimal current (best at high or low tide).

Therefore, travel at a constant, **known** speed and calibrate the speed as follows:

1. Select **SPEED**, then **CAL . S**. The **FUEL 3100** readout shows the apparent speed measured.



2. If the readout does not match the known speed, press **ENT** then alter the readout to match the known speed. (Otherwise, press **ESC** to exit.)
Note: After **ENT** is pressed, it does not matter if the boat's speed changes.
3. Press **ENT** again to save the correct value.

4-5 Backlight setup (LAmP)

Use this to set the backlight level and backlight group number.

Select the **LAmP** setup menu, then select **LAmP** to set the backlight level. There is a choice of five backlight levels: 00 (off) to 04 (bright). 03 is the default.

Select **Group** to set the backlight group number. There is a choice of 0, 1, 2, 3, 4.

4-6 Alarms setup (ALArM)


Use this to set the trigger level for the Low Fuel and Battery alarms.

Low fuel alarm


1. Select the **ALArM** setup menu. (On boats with dual fuel tanks, the Low Fuel Alarm can be set separately for each fuel tank. Press **ENT**, then **V** or **^** to change between **PORT** and **STBD**, then press **ENT** again.)



2. Enter the fuel level that will trigger the alarm and press **ENT** to confirm.


The Low Fuel Alarm is on whenever a fuel level greater than 0 is entered. It is shown by the black  symbol in the top left corner of the display unit.

When the alarm sounds, the internal beeper sounds,


the  symbol, the relevant fuel gauge on the display both flash and any external beepers or lights operate. Press **ESC** to mute the alarm.

Battery alarm

1. Select the **ALArM** setup menu.
2. Press **ENT**, then **V** or **^** to select battery alarm setup, then press **ENT** again.
3. Enter the battery voltage level that will trigger the alarm and press **ENT** to confirm.

The Battery Alarm is on whenever a voltage level greater than 0 is entered. It is shown by the black  symbol in the top left corner of the display unit.



When the alarm sounds, the internal beeper sounds, the  symbol flashes and any external beepers or lights operate.

Press **ESC** to mute the alarm.

4-7 Units setup (UnItS)

Use this to choose the units for the:

- Fuel: **FUEL UnItS** (GAL US, GAL Imp, LitRE)
- Log: **dIST** (nAut, mILES, StAt mILES)

Select the **UnItS** setup menu, then select the required units.



Selecting a unit for the log automatically sets the corresponding unit for speed. For example, selecting **StAt mILES** automatically sets the speed unit to **mPH**. The **FUEL 3100** is set up with US Gallons, knots, and nautical miles as the default.

5 Installation

Warnings

1. NAVMAN fuel flow transducers are NOT suited for EFI (electronic fuel injection) engines with fuel return lines to the tank.
2. NAVMAN fuel flow transducers are designed for use with marine gasoline inboard and outboard engines. They must NOT be used with Diesel engines.

Correct installation is critical to the performance of the unit. It is vital to read the entire installation section of this manual, and the documentation that comes with any optional other parts, before starting the installation.

For more information, refer to the installation instructions supplied with the transducer, or consult your NAVMAN dealer.

5-1 What comes with the FUEL 3100? Standard configuration

- FUEL 3100 display unit
- Protective cover
- Fuel flow transducer and cable 8 m (26¼ ft)
- 2 plastic clips for the fuel flow transducer
- Warranty card
- Mounting template
- This *Installation and Operation Manual*
- *Fuel Transducer Installation Manual*



Display unit



Protective cover



Fuel flow transducer and cable



Plastic clips

FUEL 3100 options:

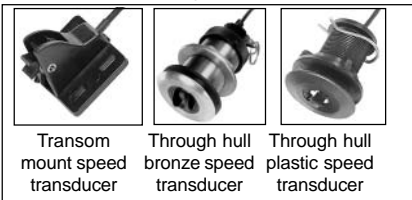
- Additional FUEL 3100 display unit, includes this manual (Can use second display unit to repeat fuel data).
- FUEL 3100 twin engine upgrade kit.



Note: Upgrades from single engine to twin engine applications. Comes with one fuel transducer and 'T' connector. The 'T' connector is marked 2 (connects to port transducer) and 3 (connects to starboard).

FUEL 3100 speed transducer options

Available in the following ready-to-install kits:



Note: Speed data can also be input from most other NAVMAN products that output speed data via NavBus or NMEA; or most other brands via NMEA.

Other options

- External beepers and/or lights (see section 5-5 Power and Wiring).
- For systems of several instruments, wiring and connectors are required (see section 5-5 Power and Wiring, or the *NavBus Installation and Operation Manual*).
- NAVMAN's NavBus junction box for increased control and simplified system building.



NavBus junction box (See section 5-5 Power and Wiring)

Cables

- 4 m (13 ft) speed transducer extension cable.

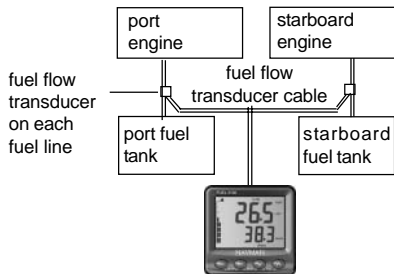


Note: For the latest information on all options and accessories, see www.navman.com or contact your nearest NAVMAN dealer.

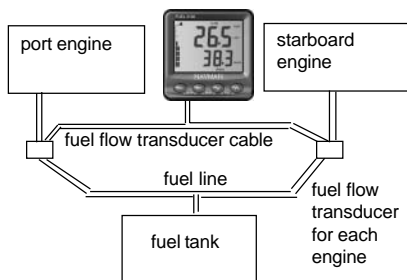
5-2 Tank / Engine Configurations

The FUEL 3100 can be used with the following fuel tank / engine configurations:

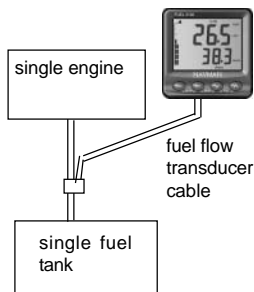
- Twin fuel tanks / twin fuel lines / twin engines / twin fuel transducers (below).



- Single fuel tank / twin fuel lines / twin engines / twin fuel transducers (below).



- Single fuel tank / single fuel line / single engine / single fuel transducer (below).



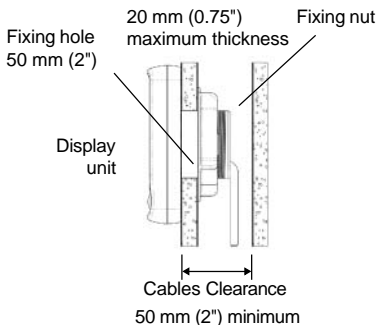
5-3 Installing the display unit

Warnings

1. The display unit is waterproof from the front. Protect the rear from water, otherwise water might enter the breathing hole and damage the display unit. The warranty does not cover damage caused by moisture or water entering the back of the display unit.
2. Ensure that any holes cut for the installation will not weaken the boat's structure. If in doubt, consult a qualified boat builder.

- 1 Choose a location for the display unit that:
 - is easily seen and protected from damage
 - is at least 100 mm (4") from a compass and at least 500 mm (19.5") from a radio or radar antenna.
 - is away from engines, fluorescent lights, power inverters and radio or radar transmitters.
 - is accessible from the back; a minimum clearance of 50 mm (2") is required at the back (see mounting diagram).
 - protects the back of the unit from moisture and water.
- 2 The unit must be mounted on a flat panel less than 20 mm (0.75") thick. Stick the mounting template in place. Drill a 50 mm (2") fixing hole through the centre hole in the template. Note that the template allows space around the display unit for the protective cover.
- 3 Remove the fixing nut from the back of the display unit. Insert the stud at the back of the display unit through the mounting hole. Hand tighten the fixing nut.

Side view of display unit mounting



5-4 Installing the Fuel Flow Transducer

Install the fuel flow transducer after the FUEL 3100 display unit is in position.

Refer to the separate installation instructions supplied with the fuel flow transducer.

5-5 Power and Wiring

The display unit requires a power supply between 10.5 and 16.5 V DC power.

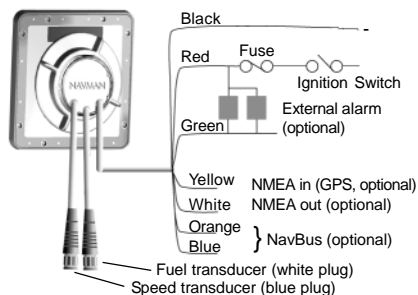
The FUEL 3100 must be powered from the ignition switch (not the auxiliary switch or battery) for the Engine Hours Counter to function properly.

Fit to the engine ignition switch supply via a 1 A fuse.

The FUEL 3100 alarm output is switched to ground, 30 V DC and 250 mA maximum. If any external alarms require more than 250 mA DC total, fit a relay.

Wiring a single unit

Wire the FUEL 3100 as shown below if it will be



used as a single unit:

Tape or cover any unused wires or connectors to protect them from water and keep them from shorting together.

Wiring a system of several units

Several NAVMAN instruments can be connected together to share data. There are two ways of connecting instruments together, NavBus or NMEA.

NMEA

NMEA is an industry standard for marine instrument connections. Data sent by one instrument over an NMEA line can be read and displayed by another instrument that accepts NMEA 0183 Version 2 data.

Speed (RMC) can be received from another instrument via NMEA and displayed by the FUEL 3100.

Note: A speed reading from a paddlewheel sensor is the speed that the boat is moving through the water. A speed reading from a GPS is the speed over the

ground. If there is a current then these two speeds will be different.

NavBus

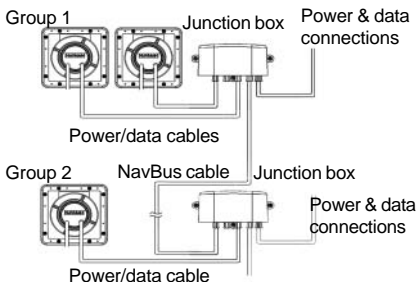
NavBus is a NAVMAN proprietary system that allows systems of several instruments to be built using a single set of transducers. It is high speed and allows a wide range of data to be shared by the instruments.

When instruments are connected by NavBus:

- if the units, alarms or calibration are changed in one instrument, then the values will automatically change in all instruments of the same type.
- each instrument can be assigned to a group of instruments. Then, if the backlight setting is changed in one group, it will automatically change in other instruments in the same group. However, changing the backlight setting in an instrument in group 0 will not affect instruments in different groups.
- if an alarm sounds, mute it by clearing the alarm on any instrument which can display that alarm.

For more information, refer to the *NavBus Installation and Operation Manual*.

With several instruments, use the optional junction boxes to simplify wiring, as shown below:



Tape or cover any unused wires or connectors to protect them from water and keep them from shorting together.

5-6 Testing the installation

To check out the installation:

- Power on the boat (and any instruments) to check that the FUEL 3100 is working.
- See section 4-3 Fuel setup, to select:
 - the number of tanks
 - the number of engines (this activates the port and starboard options when relevant).
 - the fuel tank size(s).
- See section 4-7 Units setup, to select:
 - the fuel units
 - the log units.
- If the unit is part of a system of 3100 series instruments connected by NavBus, set the backlight group number (see section 4-5 Backlight setup).
- On boats with twin engines, check the installation of the port and starboard transducers by starting the port engine. Confirm the fuel flow from the port fuel tank is being displayed as port engine fuel usage on the instrument. (If it is being displayed as starboard engine fuel usage, swap over the fuel flow transducer connectors on the 'T' connector.)
- Take the boat for a trial run to check the data inputs.
- Calibrate the fuel (see section 4-3 Fuel setup).
- Calibrate the speed (see section 4-4 Speed setup).

Re-calibration of the FUEL 3100 is recommended after the first 100 engine hours.

5-7 Resetting to factory defaults

All settings may be reset to the manufacturer's default settings (see below).

To reset to factory defaults:

- 1 Turn the power off.
- 2 Hold **ENT + V** while turning on the power, and continue to hold for at least five seconds.

Log units	knOtS
Fuel units	GAL US
Speed damping	2
Fuel damping	3
Low Fuel Alarm	OFF
Battery Alarm	OFF
Trip log	0
Total log	0
Simulation mode	OFF
Backlight Level	0
Backlight Group	1
Number of motors	1
Dual tank	OFF
Sensor	NO
Tank size	0

Appendix A - Specifications

Physical

- Case size 113 mm (4.4") square.
- LCD display 82 mm (3.2") wide, 61 mm (2.4") high; twisted nematic.
- LCD digits 30 mm (1.2") high on top line, 20 mm (0.8") high on bottom line.
- Four operator keys, laser etched.
- Backlighting for display and keys, amber, four levels and off.
- Operating temperature 0 to 55°C (32 to 131°F).
- Fuel flow transducer cable 8 m (26.25 ft).
- Power Cable 1.1 m (3.25 ft).

Electrical

- Power supply 10.5 to 16.5 V DC, 30 mA without backlighting, 80 mA with full backlighting.
- External alarm (beeper and/or light output, switched to ground, 30 V DC and 250 mA maximum).

Fuel

- Displays fuel used, fuel remaining, rate of fuel flow, and the fuel economy.
- Range 0 to 9999 with resolution of 0.1 unit for the first 999 units, thereafter resolution of 1.0 unit.

Log

Displays trip log and total log.

- Range 0 to 9999 miles or nautical miles.

Engine Hours

- Displays 0.0 to 9999.

Speed (if optional speed transducer installed)

- Displays current speed, average speed, maximum speed.
- Range 0 to 100 knots (0 to 115 mph).
- Speed resolution of 0.1 unit.
- Adjustable damping for speed and log gives stable readings in all sea conditions by averaging the readings. Damping values available are:
 - 1 (6 seconds)
 - 2 (12 seconds)
 - 3 (18 seconds)
 - 4 (24 seconds)
 - 5 (30 seconds)

Calibration

- Fuel can be calibrated. Speed can also be calibrated if the optional speed transducer is installed.

Interfaces

- External alarm.
- NavBus connection to other NAVMAN instruments.
- NMEA 0183 instruments. 0183 outputs: PTTKV, VHW, XDR, VLW; input RMC.

Standards compliance

EMC compliance

USA (FCC): Part 15 Class B.

Europe (CE): EN50081-1, EN50082-1, EN55024, EN55022, ISO7637-1.

New Zealand and Australia (C Tick): AS-NZS 3548.

- Environment: IP66 from front when correctly mounted on the bulkhead.

Wire	Signal
Red	Power positive, 12 V DC, 100 mA maximum
Black	Ground/Shield (NMEA common)
Green	External alarm, switched to ground, 30 V DC and 250 mA max.
Orange	NavBus +
Blue	NavBus -
White	NMEA (output)
Yellow	NMEA (input)

Appendix B - Troubleshooting

This troubleshooting guide assumes that this manual has been read and understood.

It is possible in many cases to solve difficulties without having to send the unit back to the manufacturer for repair. Please follow this troubleshooting section before contacting the nearest NAVMAN dealer.

There are no user serviceable parts. Specialized methods and testing equipment are required to ensure that the unit is reassembled correctly and is waterproof. Repairs to the unit must only be carried out by a service centre approved by Navman NZ Limited. Users who service the unit themselves will void the warranty.

More information can be found on our Website: www.navman.com

1 FUEL 3100 will not turn on:

- a Power/data cable is damaged or disconnected. Perform a visual check.
- b Fuse is blown or circuit breaker has tripped. Replace the fuse or reset the circuit breaker.
- c Battery voltage is outside the range 10.5 to 16.5 V DC. Check the battery voltage using a multimeter.

2 The word SIM flashes at bottom left corner of screen, values displayed are unexpected:

- a The FUEL 3100 is in simulation mode (see section 2-6 Simulation mode).

3 Fuel reading is wrong or erratic:

- a Check for leaks in the fuel line or in the fuel pickup in the tank.
- b Fuel transducer cable is unplugged or damaged. Perform a visual check.
- c Calibration is incorrect (see section 4-3 Fuel setup).
- d The fuel REMAINING reading is incorrect. The fuel tank capacity (SIZE) may be incorrect, or the fuel REMAINING setting may not have been updated after a refill. See section 4-3 Fuel setup.
- e The fuel flow transducer may have been mounted too close to the fuel pump, or may be subject to excessive vibration. Refer to the installation instructions supplied with the fuel transducer.
- f The Fuel Flow Transducer damping ($d_{AMP} \cdot F$) value is not suitable for the engine. Check that the value is not set to zero, and then try increasing the value until a steady flow rate is shown. See section 4-3 Setup > Fuel.

4 Speed reading is wrong or erratic:

- a Speed transducer cable is unplugged or damaged. Perform a visual check.
- b Calibration is incorrect (see section 4-4 Speed setup).

- c Interference from electrical noise may be affecting the FUEL 3100. Review the installation (see section 5-3 Installing the display unit, and section 5-4 Installing the Fuel Flow Transducer).

5 Low Fuel Alarm sounds when fuel tank full:

- a The fuel REMAINING reading is incorrect. The fuel tank capacity (SIZE) may be incorrect, or the fuel REMAINING setting may not have been updated after a refill. See section 4-3 Fuel setup.

6 The display unit fogs:

- a Moist air has entered the breathing tube at the rear of the unit. Air the boat or run the FUEL 3100 with backlight fully on.
- b Water has entered the breathing tube. Return the FUEL 3100 for servicing.

7. Flow indicates no fuel or low fuel

- a) Check that the fuel cable connectors are securely plugged in and the collar is locked in place. The collar must be locked in place to give a watertight connection.
- b) A fuel transducer may be clogged. If so, remove the transducer from the fuel line and gently blow through it in the opposite direction to the fuel flow. A fuel filter between the fuel transducer and the fuel tank must be installed as per the fuel installation guide. Failure to do so will void the warranty.
- c) Inspect the fuel cable from end to end for damage such as cuts, breaks, squashed or trapped sections.
- d) Check that the fuel filter is clean.

8. Fuel used or remaining seem inaccurate:

- a) In rough seas, fuel may surge back and forth through the fuel transducer, resulting in incorrect readings. Try installing a one-way valve between the fuel transducer and the fuel tank.
- b) The Remaining fuel value must be reset after every refuelling (see section 4-3 Fuel Setup).
- c) The fuel tank may not refill to the same capacity each time due to air pockets. This is particularly noticeable with underfloor tanks.
- d) Fuel transducers wear out over time and should be replaced after every 5000 litres of fuel.

9. A twin engine installation shows only one flow rate:

- a) Check that the number of engines is set to 2. See section 4-3 Fuel Setup.

10. There is no reading for fuel economy:

- a) The boat must be travelling through the water to generate an Economy reading.
- b) Check that the paddlewheel on the transducer is spinning freely, and that the two magnets in the paddlewheel are still in place.

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NAVMAN

