



*TARGET*  
**MARINE  
STEERING  
COMPASS**

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## **INTRODUCTION**

The TARGET COMPASS is supplied complete with display unit and sensor unit, and is intended for operation on 12 volt ship's supply.

## **PRE-TEST OF INSTRUMENT**

Before mounting the units, check that the instrument is complete and undamaged. Connect the sensor unit to the display unit and apply 12 volts. Confirm that a reading is shown on the display.

## **INSTALLATION OF SENSOR**

The sensor measures the direction of the Earth's weak magnetic field, and so is sensitive to other magnetic fields which can affect the unit's accuracy. It should therefore be positioned carefully. Select a sensor position as far as possible away from large ferrous objects such as engines, and items such as DC motors or loudspeakers which have powerful permanent magnets in them. Check also for small ferrous objects close to the mounting location such as screws, nails, hinges etc. These can become magnetised and cause errors. When a likely location has been found, a check for reasonable accuracy can be made with a hand bearing compass to confirm its suitability.

The magnetic sensor itself is gimballed within the housing. To accommodate pitch and roll motions most effectively, mount the sensor as near to horizontal as possible. For best performance in rough weather conditions, it is also advisable to mount the sensor in a position (usually amidships) that minimises lateral accelerations due to pitch and roll. Avoid mounting the sensor high above the water line because doing so also increases pitch and roll accelerations. The sensor is waterproof to CFR-46 standard. Ensure the sensor does not become submerged.

Position the sensor unit and mark and drill pilot holes for the mounting screws to allow the sensor to be rotated to align it exactly with the vessel's axis. Now mount the sensor carefully in position using non-magnetic screws. The rotational position of the sensor should be chosen to ensure that the arrow points as close as possible fore-and-aft.

## **INSTALLING THE DISPLAY**

Select a convenient position for the display on a panel or bulkhead. The site must be flat and the cavity behind the panel must remain dry at all times. (The cable entry is deliberately not sealed to ensure adequate ventilation to prevent misting of the display).

The positions for the fixing holes can be marked on the panel using the drill template which is an integral part of the packing carton. Before drilling, check that there is sufficient space behind the panel to route the cables and to allow access to tighten the wing fixing nuts.

Drill the five holes and check that the unit fits. Connect the cables as shown on Figure 1 before finally fixing the unit in position. It is wise to use a fused supply to provide protection should a fault occur. The current consumption is very small, so any supply with a 1/4-Amp fuse is more than adequate.

A sponge rubber seal is provided which should be fitted into the slot in the back of the unit. It is important that the rubber seal makes good contact with the panel to prevent water getting behind the unit and entering the cavity behind the panel.

Fit the instrument into the panel and tighten the four wing nuts finger-tight only.

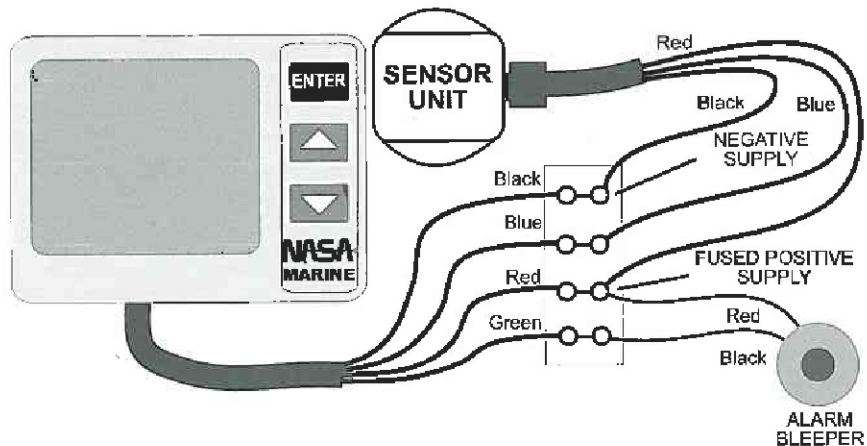


Figure 1 - Wiring Installation

It is good practice to run the cables vertically downwards from the unit, even if they later have to rise to connect to the vessel's supplies. Doing so prevents any water that might get onto the cables from running back along the cables and into the unit.

#### NORMAL OPERATION

When power is applied to the Target Compass, it executes a comprehensive internal test routine. It then displays the heading. When first powered up, the displayed heading may not be correct until the Compass alignment is done (see Engineering, page 5). A typical display is shown on Figure 2.

#### SWITCHING THE BACKLIGHTING

Backlighting is provided to allow the unit to be seen at night. The backlighting is switched on and off by a single press on ENTER.

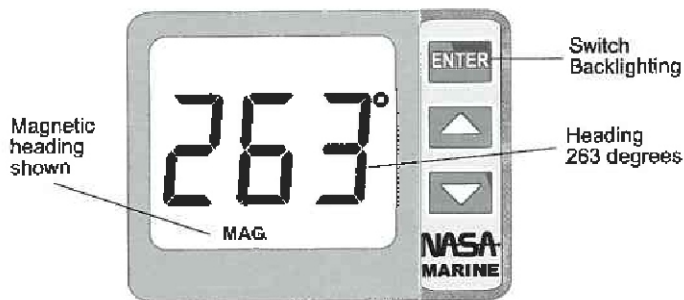


Figure 2 - Normal operation display.

### CHANGING THE DAMPING

When the vessel is affected by rapid variations of heading in rough seas, a more heavily damped display can be selected instead of the normal lightly damped display. Press ENTER and UP together to switch between heavily and lightly damped modes. The display shows "L" (for Light damping), "A" (for Average damping), or "H" (for Heavy damping) for two seconds after the keys are released to indicate which mode has been selected. Successive presses of the two keys switches between the three damping settings.

### ASSISTED STEERING

Assisted steering means using the Target Compass to show errors from a chosen heading, and the direction to steer to bring the vessel back to the chosen heading, which is marked by the lubber line at all times.

When the vessel's heading is within the pre-set error limits, the dead-ahead indicator is lit to show that all is well (see Figure 3), and no steering adjustment is required. This is the display when assisted steering is started.

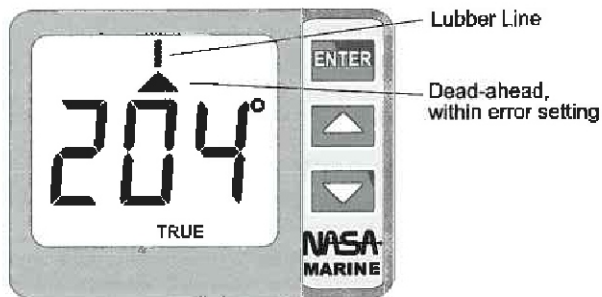


Figure 3 - Dead-ahead indication.

Steering chevrons light whenever the heading error is greater than 3°. As the error builds up, more steering chevrons are lit to indicate the increasing strength of steering needed to correct the heading error. Three are shown on Figure 4a. If the error exceeds 21°, the central chevrons clear in sequence to indicate how far "Off the Scale" the steering correction is needed. 30° of error are shown on Figure 4b.

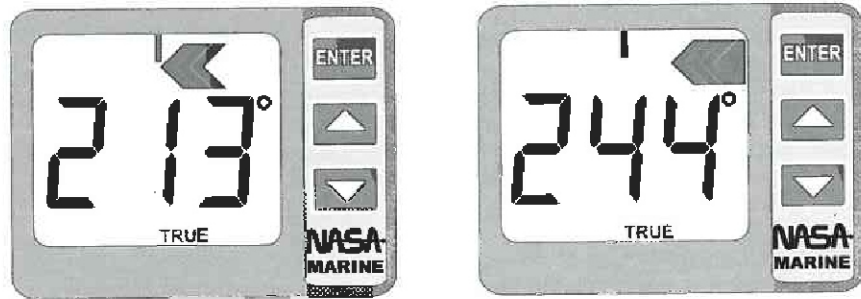


Figure 4a & 4b - Three and ten-chevron Steering Indications

If the error increases beyond 180°, the error display reverses to show that the shortest route back to the desired heading is now using the opposite tiller.

#### **SETTING THE DESIRED HEADING**

Bring the Vessel to the desired heading, and press UP and DOWN together to log that heading. The display changes as shown on Figure 3. The logged heading is the heading shown when the UP and DOWN buttons are FIRST pressed.

The dead-ahead symbol indicates that the vessel's heading is within the error setting.

#### **SWITCHING ASSISTED STEERING OFF**

At any time, while Assisted Steering is operating, pressing UP and DOWN together switches it off.

#### **HEADING ALARM**

When Assisted Steering is in operation, an alarm can be set to sound whenever the heading exceeds a pre-set amount from a chosen heading. The chosen heading is the heading logged when assisted steering was selected. Alarm operation is inhibited when Assisted Steering is off. The alarm, when set, sounds whenever the heading is at or outside the alarm setting to port or starboard.

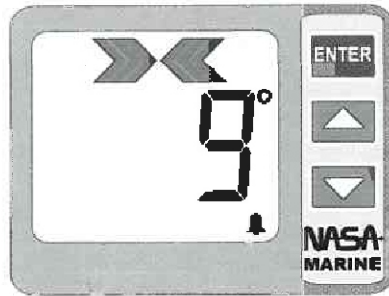


FIGURE 5 - Alarm Boundaries set at +/- 9°

The alarm setting can be altered at any time during normal operation by pressing UP to increase its value, or DOWN to decrease it. The alarm boundaries are shown by the steering chevrons, as shown on Figure 5, for two seconds when the key is released, whereupon the display returns to the normal steering display.

#### **SETTING OR STOPPING THE ALARM**

During assisted steering, press UP to switch the alarm on and DOWN to switch it off. The bell symbol shows when the alarm is on.

Whenever the alarm is on, and the heading during assisted steering is outside the boundaries set at the desired heading, the alarm sounds, and the bell symbol flashes.

#### **ENGINEERING**

Engineering settings means those adjustments which seldom need changing, but which affect how the unit operates. The settings (as are all those which can be selected in normal operation too) are stored even when the power is disconnected. There are three operating characteristics which can be set in Engineering: Magnetic or True heading display; Magnetic Variation; and Compass error (deviation) compensation settings.

Engineering mode is entered by holding down the ENTER button while turning on the power. The Engineering mode displays "En" (for Engineering) for two seconds when the button is released. When the two seconds is up, the Magnetic variation is shown in degrees. The present set-up is shown as "MAG." (for magnetic readings) or "TRUE" (for true readings). Note that the magnetic variation affects only true readings, and need not be corrected as described below if magnetic bearing readings are required.

Any of the following settings can be done when in Engineering. If more than one different setting is to be done, it is necessary only to return via the "En" display between different adjustments or settings, as described below.

#### **ADJUSTING MAGNETIC VARIATION**

The Earth's magnetic variation varies from year to year, and from place to place. The appropriate variation value can be found by reference to Almanacs, maps, or charts. The variation is the offset of magnetic North from true North. If the Magnetic North (the

variation) is West of true North, enter it as a positive number. Conversely, if it is quoted as East of true North, enter a negative variation value.

If not already in Engineering ("En" displayed), hold down the ENTER button while turning on the power to put the unit into the Engineering mode. The display shows "En" (for Engineering) for two seconds. The display then changes as shown in Figure 6 to show the stored magnetic variation and whether the unit is operating in Magnetic or true modes (Figure 6 shows Magnetic operation, and an Eastward variation of 6.3°).

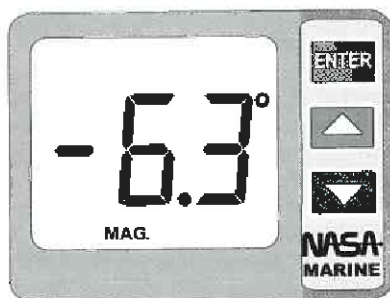


FIGURE 6 - Magnetic Variation Display

Positive numbers represent Westward variations, and negative numbers (as shown on Figure 6) represent Eastward variations. Each press of UP or DOWN alters the stored variation in steps of 0.1°. If the total variation is greater than  $\pm 9.9^\circ$ , the fractional part of the angle is altered, but cannot be shown.

Press UP or DOWN to change the stored variation value to the correct value. Note that changing the magnetic variation has no effect on the accuracy of the compass's compensation (see page 7).

If it is desired to end Engineering adjustments, press ENTER to return to normal heading indication, using the revised magnetic variation value.

#### **MAGNETIC OR TRUE READOUT**

If not already in Engineering ("En" displayed), hold down the ENTER button while turning on the power to put the unit into the Engineering mode.

Press ENTER and UP together to switch between Magnetic and True display of the compass readings. When True is selected "TRUE" is displayed, and the variation shown is used to correct the readings made by the sensor. When Magnetic is selected, "MAG." is displayed as shown on Figure 6. In Magnetic indication mode the variation value is ignored.

If it is desired to end Engineering adjustments, press ENTER to return to normal heading indication.



## COMPASS ERROR (DEVIATION) CORRECTIONS

In common with all magnetic compasses, the presence of magnetic objects in the vessel distorts the earth's magnetic field nearby, and can affect the accuracy of readings by different amounts at various points of the compass.

Detecting and correcting these errors is known as "Compass Swinging". Compass swinging in the Target Compass is achieved by sailing the vessel in a circle at a constant turn rate in still water, so it is best to select calm conditions. During the constant-rate turn, the errors are detected in the instrument and logged. When a full set of values from a 360° turn are available, the corrections - the compass deviations - are calculated and permanently stored. The factory default deviation settings are all zero, so if it is found that there are significant errors at some points of the compass, these errors should be compensated by swinging the compass.

Compass swinging in the Target Compass has two phases:

- establishing a constant turn rate
- continuing at the same rate to log the deviations

Compass swinging is an Engineering function. To enter Engineering, hold down the ENTER button while turning on the power. The display shows "En" (for Engineering) for two seconds, and then the stored magnetic variation. Now press all three keys together to start Compass swinging.

The swing must be performed by sailing CLOCKWISE in a circle at a constant rate. (If the turn is anticlockwise, the turn bars all point left, to indicate that correct results cannot be achieved.) The display shows the turn rate in degrees per second. Any fixed value between 0.5° and 2°/second is acceptable, and the most important thing to achieve is a CONSTANT rate within this range. It can usually be achieved with a fixed throttle setting and a fixed rudder setting. If the rate of turn is too fast, the steering bars flow to the left (to indicate "slow down"), whereas they flow to the right ("speed up") if the rate of turn is too slow. When a rate between 0.5° and 2°/second is settled on, the turn bars return to their rest position, without moving, to indicate that the turn rate is satisfactory. At 0.5°/second, a full 360° degrees will, of course, take 12 minutes to execute, and at 2°/second a full 360° will take only 3 minutes. The accuracy of the compensation is better at lower turn rates.

When a steady turn rate has been established, press ENTER to enter the error logging phase. The display changes to show a rotating symbol and a progress count, starting at 9. All the previous compensation values are immediately cleared. If it desired simply to clear the settings, simply press any key during the swing to return to Engineering.

As the constant-rate turn proceeds, the progress indication counts down. It is vital to maintain the previously-chosen constant turn rate during this phase. When the progress indication falls to zero (after turning just over 360°), the swing is complete, and the compass deviation values are automatically calculated and stored. The display returns to normal Compass mode to show that swinging is finished and that it is no longer necessary to continue the constant-rate turn.

## **HEADING ADJUSTMENT**

It may be necessary to make a minor adjustment to the sensor alignment to ensure that the Compass correctly measures the vessel's heading. If an adjustment is found to be needed, accurately point the vessel to a known heading. Either MAG. or TRUE is displayed to remind the user which physical alignment of the vessel is to be used.

If the display does not show the known heading, the sensor unit must be rotated slightly to bring the display into alignment. Slacken the sensor unit's mounting screws sufficiently to allow the unit to be turned, and rotate it until the display shows the known heading. Then re-tighten the sensor unit's mounting screws to lock the compass calibration at that position.

## IMPORTANT READ THIS BEFORE UNPACKING INSTRUMENT

Prior to unpacking this instrument read and fully understand the installation instructions. Only proceed with the installation if you are competent to do so. Nasa Marine Ltd. will not accept any responsibility for injury or damage caused by, during or as a result of the installation of this product. Any piece of equipment can fail due to a number of causes. Do not install this equipment if it is the only source of information and its failure could result in injury or death. Instead return the instrument to your retailer for full credit. Remember this equipment is an aid to navigation and not a substitute for proper seamanship. This instrument is used at your own risk, use it prudently and check its operation from time to time against other data. Inspect the installation from time to time and seek advice if any part thereof is not fully seaworthy.

### LIMITED WARRANTY

Nasa Marine Ltd. warrants this instrument to be substantially free of defects in both materials and workmanship for a period of one year from the date of purchase. Nasa Marine Ltd. will at its discretion repair or replace any components which fail in normal use within the warranty period. Such repairs or replacements will be made at no charge to the customer for parts and labour. The customer is however responsible for transport costs. This warranty excludes failures resulting from abuse, misuse, accident or unauthorised modifications or repairs. In no event shall Nasa Marine Ltd. be liable for incidental, special, indirect or consequential damages, whether resulting from the use, misuse, the inability to correctly use the instrument or from defects in the instrument.

If any of the above terms are unacceptable to you then return the instrument unopened and unused to your retailer for full credit.

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**Proof of purchase may be required for warranty claims.**

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