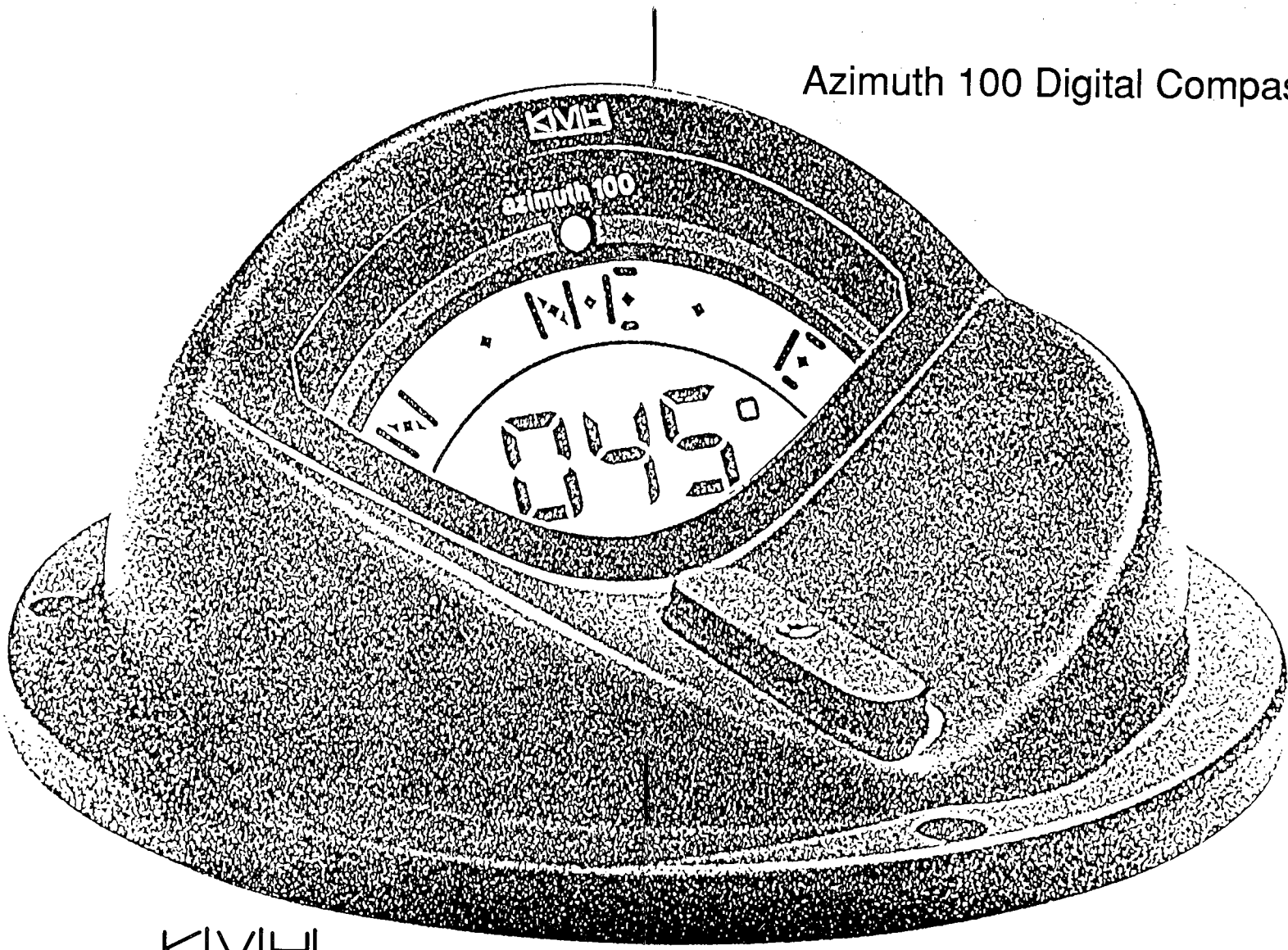
OWNER'S MANUAL

Azimuth 100 Digital Compass



KVH

Congratulations!

You have purchased one of the most advanced compasses available. The Azimuth 100 is a microprocessor-controlled system designed to provide you with accurate heading information in an easy-to-read manner. Both the fluxgate sensor and the LCD display are enclosed within one watertight, self-contained unit. The unique toroidal fluxgate sensor gives you accuracy far superior to that of a conventional card compass while eliminating the problems of spin, swirl, overshoot, sluggishness and instability which make a conventional card compass difficult to read.

Should you have any questions, comments or suggestions, please direct them to:

Azimuth 100.
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Contents

*B*efore you begin.....

As you start unpacking your box containing your new Azimuth 100, most often thoughts run as follows, "out of the box and into the boat as quickly as possible." But **before** you jump into your installation:

1. **Please read this manual thoroughly**. The correct installation of the Azimuth 100 is of utmost importance to its accuracy and precision, and most of all, to your enjoyment of your new electronic compass.

2. **Please send your warranty card back to ensure validation of your warranty.**

Serious damage, inaccuracies, or loss of warranty can result from incorrect installation.

I. INSTALLATION

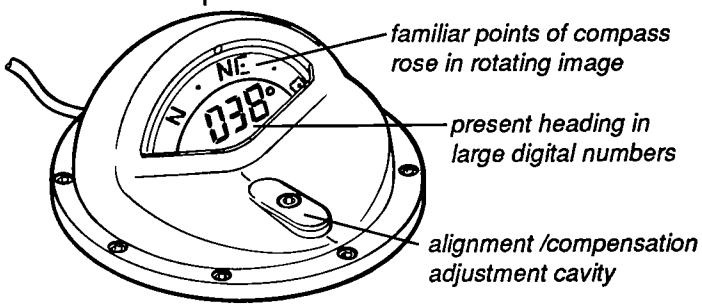
Azimuth 100.

The Azimuth 100 system consists of one flush-mounted component. Parts enclosed are:

- sensor/display unit with 10' cable (with 4 leads)
- 3 #8 self-tapping mounting screws
- plastic adjustment screwdriver
- allenhead wrench
- template (for alignment/compensation)

The only tools required are :

- Drill
- 9/64" and 1/4" drill bits
- Pencil
- Phillips Screwdriver



Following are step-by-step instructions for correct installation of the Azimuth 100. Make sure that whoever is going to install your Azimuth 100 is familiar with these installation instructions.

1. Choosing a Location

A good location for the Azimuth 100 compass is anywhere you would find a conventional card compass - a place visible to the helmsman steering the boat. The **ideal** location also includes:

- a location where it can be mounted as close to level as possible

- a location with as little magnetic interference as possible. Try to keep it away from:
  - magnets (in speakers, microphones)
  - metal (gears, keys, flashlights, tools)
  - motors
  - wiring
  - electronics

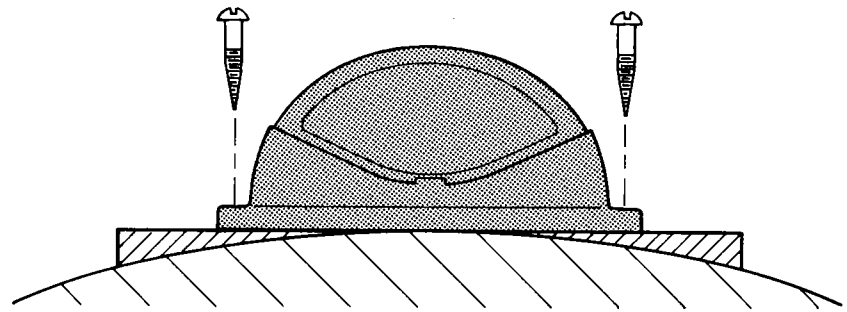
If your old card compass worked properly in its location, then the Azimuth 100 will work as well or better in that same location. The Azimuth 100 is less susceptible to interference from nearby metal than a conventional compass. Any **minor** deviation (less than 15° on any 1 heading) caused by nearby metal can be compensated out using the compensation screws. *(**Compensation**, page 18)*

Note: Do not mount the Azimuth 100 within

approximately 3 feet of a card compass as the magnet in the card compass will affect the accuracy of the Azimuth 100. The distance between the two compasses varies depending on the magnetic strength of the card compass onboard.
An easy way to determine this distance is to power the Azimuth 100 and bring it towards the card compass keeping the Azimuth 100 steadily pointing in the same direction. You will notice an obvious error caused by interference from the card compass when you get too close to it. Move the Azimuth 100 back until you do not get this error. Do not move the Azimuth 100 any closer to the card compass than this. This method will work to test for any type of interference.

2. Mounting the Azimuth 100

Mounting the Azimuth 100 is critical to the performance of the system on your boat. The Azimuth 100 is gimballed for heeling angles up to 30°, therefore **it is important that it is mounted to within a few degrees of level.**



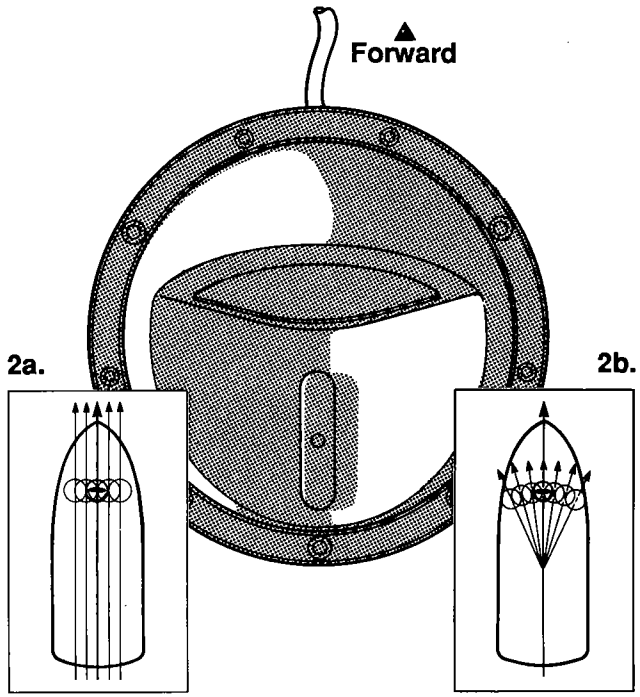
The Azimuth 100 is a flush mount system. It can replace a conventional compass by being located over the hole where the conventional compass was located or positioned on the dash. A wedge or a block can be used to level the unit if needed.

After finding the most visible and convenient location for the Azimuth 100 on your boat,

there are two mounting options. These are:

A Parallel to the fore/aft centerline of the boat *(see illustration 2a)* , or

B At an angle (up to ±40°) to the fore/aft centerline of the boat. *(illustration 2b)*



The mounting position you choose determines the type of adjustments you will be making on your Azimuth 100. They are critical to the Azimuth 100's performance, so make sure that you follow each step for the mounting option you have chosen.

After you have determined the correct spot for your Azimuth 100, proceed as follows:

1. Drill 9/64" holes through the 3 mounting holes in the base of the compass.

2. Drill a hole for the cord either exiting out the back or directly below the unit.

3. ***Azimuth 100 mounted parallel:***
   Place #8 screws into 3 mounting holes and tighten the Azimuth 100 down to your boat. **Do not overtighten!**

   Azimuth 100 mounted at an angle:
   Place paper template under compass before temporarily screwing down. Follow detailed instructions on template.

3. Making the Connections

Now that you have the Azimuth 100 in place, you are ready to connect it to power and do the final adjustments for its accuracy on your boat.

The Azimuth 100 cable has four leads attached to colored wires. Each wire has the following function:

red	+12 Volt*
black	ground
green	damping
white	light

1. Connect the **red wire lead** to a +12V DC power source which is fused (1 amp) or a current breaker (1 amp). There is no internal fuse in the Azimuth 100 to protect it from current overloading.

2. Connect the **black wire lead** to ground.

3. Connect or do not connect the **green wire lead** to ground based on the following:
   There are 2 damping options for your Azimuth 100: **standard** damping and **high** damping (slower response). Your boat size as well as your personal preference will determine which setting to pick.
   Refer to the following chart for general damping guidelines:

Boat Size	Damping Level
16'- 25' boats	**high** damping (ground wire)
25' - up	**standard** damping (do not ground wire)

As you use your Azimuth 100 compass, you will quickly determine which damping level you prefer. Under certain conditions, at very high speeds or in rough seas you may find that you prefer the **high** damping level, while under most other conditions the **standard** level is the most stable and responsive. Unlike a conventional compass, damping does not diminish the accuracy of the Azimuth 100, but controls the

** Use only a +12V DC power source*

averaging period over which the compass displays information.
If you would like to have selectable damping easily accessible for the Azimuth 100, do the following: Connect the damping wire (green) to one side of a 2 position toggle switch and the other side of the switch to your boat's ground.

Note: **Do not** connect +12V DC power to the green wire or the toggle switch as this will damage the circuitry of your Azimuth 100.

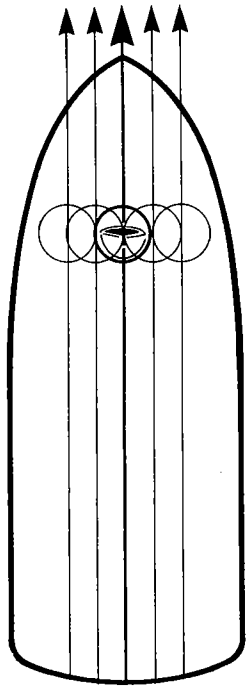
4. Connect the **white wire lead** to one of the following on your boat:
   - existing panel switch for instrumentation lighting
   - compass light switch
   - If you do not have a light switch on your boat you may use a 2 position toggle switch to make one: Connect the white wire of the Azimuth 100 to one side of this switch. Connect the other side of the switch to your fused +12V DC power source.

4. Testing

All compasses, whether card or electronic, need to be checked for compensation once installed on your boat. The Azimuth 100 is no exception. Testing allows you to determine whether you need to compensate and/or align your Azimuth 100 compass. The Azimuth 100's accuracy on your boat is determined by checking its heading readout against at least 4 known headings or a **recently** compensated compass.

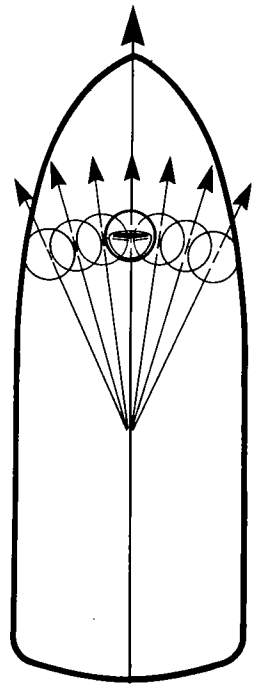
Note: *If using another compass to compensate the Azimuth 100, make sure the compass has recently been compensated and is in the exact location in which it was compensated. Most "factory" compasses are not compensated, so do not use one as a reference unless* ***you*** *have had it compensated. Never move the compass in close proximity to the Azimuth 100 as this will affect the accuracy of the Azimuth 100.*

If you have mounted your Azimuth 100 parallel to the centerline of the boat,



you may now check the Azimuth 100's heading readout against at least 4 known headings (N S E W) from a chart or a recently compensated compass. If the compass heading is off, the Azimuth 100 will have to be compensated and/or aligned for your boat. *(turn to* **Compensation**, *page 18)*

If you have mounted your Azimuth 100 at an angle to the centerline of the boat,



mark on the template under the Azimuth 100 where the compass' **forward** (where cord exits) is pointing. Remove compass and draw a cross as indicated in instructions on template. Reposition compass over template and screw down. *(paper will be removed after compensation)* Turn to **Alignment**, page 28.

5. Compensation

ALL COMPASSES MUST BE CAREFULLY CHECKED AGAINST KNOWN REFERENCES OR BE COMPENSATED BY A PROFESSIONAL COMPASS ADJUSTER BEFORE BEING USED FOR NAVIGATION.

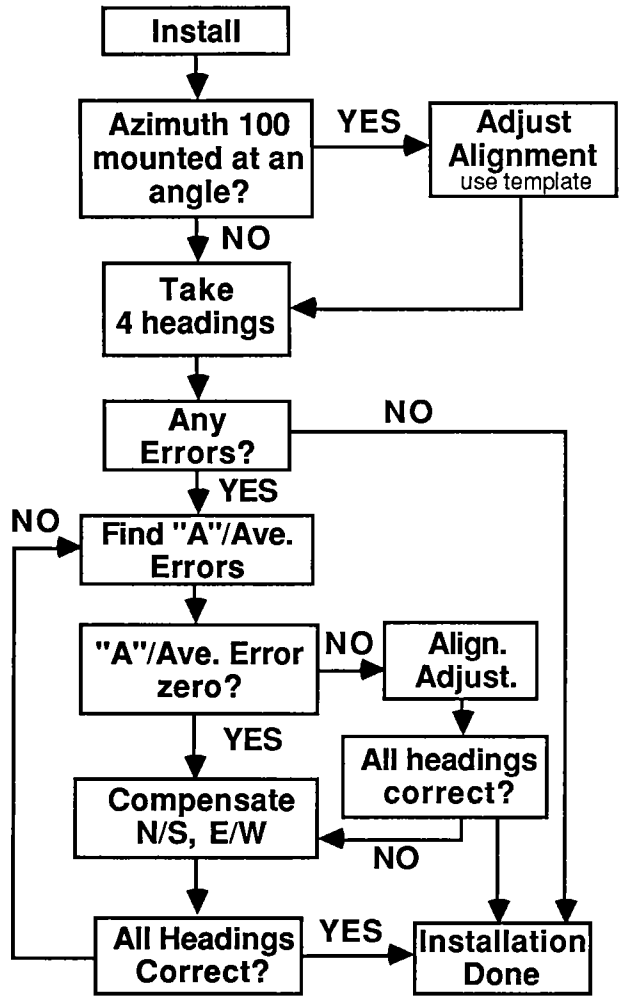
Although each Azimuth 100 is carefully calibrated at the factory during manufacturing, you may find that it is showing errors due to metal and magnetism in your boat.

It is best to have a professional compass adjuster compensate your compass. Give the following instructions to your compass adjuster (if he is not familiar with the Azimuth 100). If you are already familiar with how to adjust conventional compasses, you will find that compensating the Azimuth 100 is done in exactly the same manner as with a conventional compass. To compensate your Azimuth 100 do the following:

1. Before adjusting anything, **point your boat*** to North, South, East, and West, get Azimuth 100 readings for each heading, and **write them down.**

If you have mounted the Azimuth 100 at an angle to the boat's centerline, **point the Azimuth 100 to NSEW. See detailed instructions on template.*

Installation Flow Chart



2. Now you must determine whether you need to compensate and/or align your compass. Take the 4 headings you wrote down and subtract the known headings from them.

Example: Azi.100 - Ref. = error

004° - 000° = +4°
178° - 180° = -2°
093° - 090° = +3°
269° - 270° = -1°

2a. If the four errors are the same for all four headings: ***Example:*** *+3°, +3°, +3°, +3°* then you have a simple *Alignment ("A" Coefficient) Error (+3°)* and your Azimuth 100 needs alignment adjustment, not compensation.
(Turn to **Alignment Before/Instead of Compensation,** *page 32).*

2b. If the four errors are not all the same, then add the four errors up:

If this equals zero, then you need compensation only. *(Go to* ***3****, page 21)*

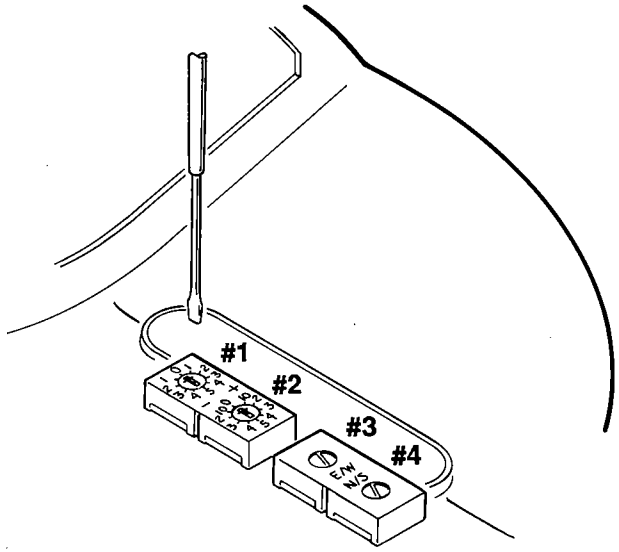
If this does **not** equal zero then divide this number by 4. (Round fractions up or down to the nearest degree.)

Example:
(+4)° + (-2)° + (+3)° + (-1)° = (+4)°
(+4)° ÷ 4 = +1°.
+1° is the ***"A" Coefficient/Average Error.***
Before compensating your compass you must first adjust your compass by eliminating the *"A" Coefficient/Average Error* from all headings.
(Turn to **Alignment Before/Instead of Compensation**, *page 32).*

3. The compensation screws control electronic adjustment coils inside the sensor, but the effect is identical to moving the compensating magnets in a conventional compass.

4. Unscrew the cover on top of the unit using the provided hex tool. Make sure that when you are finished compensating you securely refasten the central cover so that your unit remains waterproof. Inside the cavity you will

notice that there are 2 alignment switches (#1 & #2) and 2 compensation screws (#3 & #4).



The compensation screws, #3 for E/W(east/west) and #4 for N/S (north/south) work in exactly the same manner as the compensation screws in a conventional compass. At this stage, you are compensating out **deviation errors** caused by the boat or objects on the boat. Be careful you do not have objects near

the compass that could cause deviation. Move any objects which are not permanently fixed or mounted (like tools, keys, other magnetic devices) or make certain that these objects are all in their normal storage positions.

5. To compensate the Azimuth 100 you must determine the deviation from your 4 known headings(after removing the *"A" Coefficient/ Average Error*, if any). Turning the two compensation screws will cancel out the deviation. Remember that what you add to East, gets subtracted from West and vice versa. The same is true for the North/ South adjustment.
Use the enclosed **plastic** screwdriver to turn the screws.

Read through the following example for a step-by-step description on compensating an Azimuth 100. Final compensation instructions continue after this example.

***Example**: After cancelling out any "A" Coefficient/Average Error, we have the following deviations from the reference headings:*

Azi 100	-	Ref.	=	Error	+	(-("A"))	=	Dev.
004°	-	000°	=	+4°	+	(-(+1)°)	=	+3°
178°	-	180°	=	-2°	+	(-(+1)°)	=	- 3°
093°	-	090°	=	+3°	+	(-(+1)°)	=	+2°
269°	-	270°	=	-1°	+	(-(+1)°)	=	- 2°

*As you can see, after cancelling out the "A" Coefficient/Average Error (+1°), there is a pattern to your deviation: N/S(+3/-3) and E/W(+2/-2) are **symmetrical**. To compensate, first point your boat* to one of your known headings, say (000°). In our example, pointing at 000°, the compass would read 003° (after adjusting for the "A" Coefficient/ Average Error) Carefully adjust the N/S screw until it reads 000°. By turning the screw you are actually cancelling out the +3° deviation by rotating the N/S screw -3°. Because what you add/subtract to North gets subtracted/added from South, you*

for Azimuth 100's mounted at an angle, **point the Azimuth 100.*

*have taken care of your southerly deviation of -3° **at the same time** by adding +3° to it. Even so, check your southerly reference heading just to make sure. Do not worry about 1° differences as they can be difficult to consistently adjust for.*

Now correct for the E/W deviation in the same manner. Point your boat to your known easterly heading 090°. In this position your Azimuth 100 would read 092°. Carefully adjust the E/W screw until the display reads 090°. As with the N/S adjustment, you have also compensated for your westerly deviation, but check to make sure.*

*In some cases, you will find your deviations are **not symmetrical** between N/S and E/W. If you find yourself in this case, you must compensate by "splitting the difference" between the two headings to get your compass as accurate as possible on your boat.*

for Azimuth 100's mounted at an angle, **point the Azimuth 100.*

Alternate Example:

Azi.100 - Ref. = Error + (-("A")) = Dev.			
356°	- 000°=	-4° + (-(+1)°)	= -5°
184°	- 180°=	+4° + (-(+1)°)	= +3°

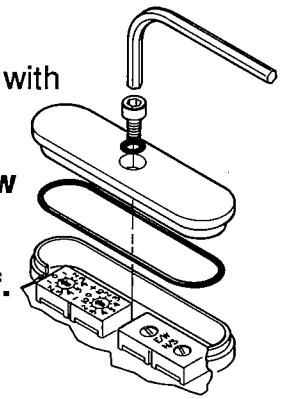
In this case, the N/S(-5/+3) errors are not symmetrical. To compensate the compass as accurately as possible, you need to even out the error. You want to get as close to zero for each heading as possible. You could subtract 3° from your southerly heading to get no deviation, but then you would have a -2° deviation on your northerly heading (-5° + 3° = -2°). The best adjustment would be to add/subtract +4° to your northerly/southerly headings to get a 1° error for both. Remember that what gets added to one side gets subtracted on the other and vice versa:

N: *-5° + 4° = -1°* ***S:*** *+3° - 4° = -1°*

As you can see, this gets you closer to 0° of error on ***both*** *headings and would be the best solution. Although you are not able to get rid of all of the error, you have evened out the error and in this case, this is the best that you can expect to achieve. If this is not acceptable, the only solution is to either move objects causing interference around the Azimuth 100 or move the Azimuth 100 itself.*

6. When you're done compensating the 4 cardinal points, check the intercardinals. Although you can't compensate them directly, you should record the deviations in the **Deviation Chart** *(page 40).*

7. Replace the cover with its O-ring **making sure to securely refasten the screw with its O-ring so that your unit remains waterproof.**

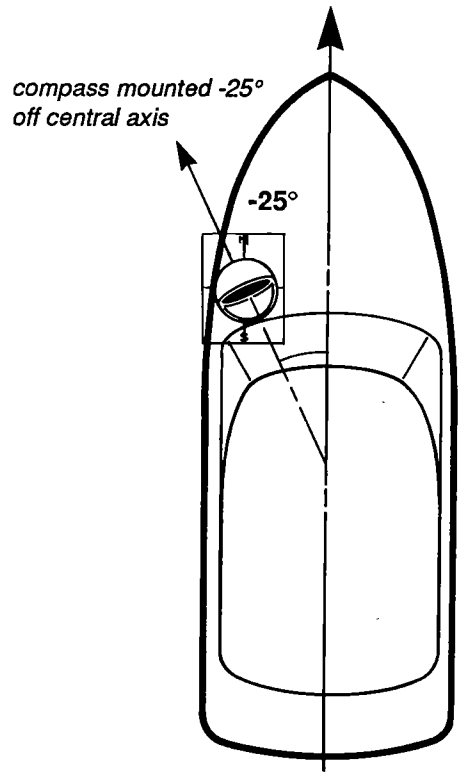


Never open the main housing as this will void your warranty.

6. Alignment

A conventional magnetic compass has to be pointed exactly forward. The Azimuth 100 can be mounted off to the side and at an angle to the boat's central axis and adjusted electronically. If you want to do this, you must make an "offset" adjustment to realign it to your boat. The Azimuth 100 can be positioned at an angle up to 40° to the left or to the right of the boat's central axis. This is done by using the alignment switches (1 & 2) in the inner cavity of the unit. *(see illustration, page 22)* The first switch is the 1° switch. It changes the heading in 1° increments from -4° to +5°. The second switch is the 10° switch. It changes the heading in 10° increments from -40° to +50°.

Example: *a boat's dash is positioned so that the best location for the Azimuth 100 is to the left of the boat's steering wheel at approximately 25° off the central axis (turning axis) of the boat. Therefore, even if the compass needs no compensation, its heading would read (-)25° off in all directions.(see illustration, page 29) To adjust for this offset you must electronically add 25°. Using the alignment switches:* ***2*** *turns to the* ***right*** *(+20°) on the10° switch and* ***5*** *turns to the* ***right*** *(+5°) on the 1° switch gives you (+)25°. You can adjust the "position" of your Azimuth 100 for practically any location.*

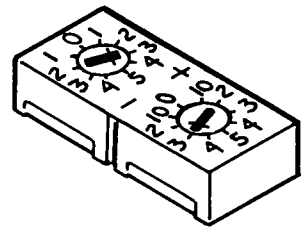


If you need to adjust your compass' "offset" using the alignment switches, do the following:

1. Unscrew the cover on top of the unit using the provided hex tool. Inside, you will notice that there are 2 alignment switches (1 & 2) and 2 compensation screws (3 & 4) You will be using the alignment switches. *(see illustration, page 22)*

2. Determine how many +/- degrees your compass' position is off the central axis of the boat by using the angle the compass points to on the template. *(see illustration on template)*

3. Using the **plastic** screwdriver provided, turn the 10° switch and the 1° switch to the left or right to cancel out the amount of +/- degrees off the boat's central axis. ***Example 1:*** *-25° off axis would take 2 turns to the right on the 10° switch (+20°) and 5 turns to the right on the 1° switch (+5°) (+20°+ +5° =+25°)* ***Example 2:*** *+27° off axis would take 3 turns to the left on the 10° switch (-30°) and 3 turns to the right on the 1° switch (+3°). (-30°+3° = -27°)*



4. Now check the Azimuth 100's heading readout against at least 4 known headings (N S E W) from a chart or a recently compensated compass. If the Azimuth 100's heading readouts are showing errors, it will have to be compensated and/or further aligned for your boat. *(Turn to* **Compensation**, *page 18)*

5. If your Azimuth 100 does not need compensation, replace the cavity cover with its O-ring **making sure to refasten the central cover screw with its O-ring so that your unit remains waterproof.**

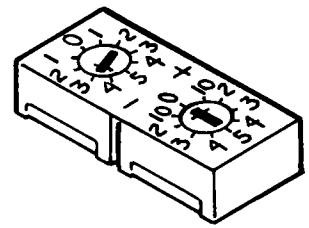
7. Alignment Before/Instead of Compensation

If you were compensating your Azimuth 100 and determined that you had an **"A" Coefficient /Average Error** then you would treat the problem as if your compass were mounted at an angle to your boat's central axis a set amount of degrees. To realign the compass to your boat electronically, you make an offset adjustment using the alignment switches located in the inner cavity of the Azimuth 100 .

To do this:

1. Unscrew the cover on top of the unit using the provided hex tool. You will notice that there are 2 alignment switches (1 & 2) and 2 compensation screws (3 & 4). You will be using the alignment switches for this adjustment. *(see illustration, page 22)* The first switch is the 1° switch. It changes the heading in 1° increments from -4° to +5°. The second switch is the 10° switch. It changes the heading in 10° increments from -40° to +50°.

2. To correct for an *"A" Coefficient/ Average Error* , turn each switch to the left or to the right to total the **opposite** of your error.
Example 1: *(page 20, #2a) If +3° is your "A" Coefficient Error then 3 turns to the left (-3°) on the 1° switch (#1) would cancel out this error.*



Example 2: *(page 21, #2b) If +1° is your "A" Coefficient/Average Error then 1 turn to the left(-1°) on the 1° switch(#1) would cancel out this error.*

If you have already used the alignment switches for mounting your Azimuth 100 at an angle to the boat's central axis, then further adjustment for cancelling out an *"A" Coefficient/Average Error* is done by adding the **opposite** of the error to the "offset" adjustment that the compass is already adjusted for.

Example: *If you mounted your compass 25° to the left of the boat's central axis (-25°) then when you aligned the compass, you adjusted the alignment switches (+)25° (see page 28-9). When checking whether your Azimuth 100 needed compensation, you determined that the Azimuth 100 had an "A" Coefficient/Average Error of +1°. If your error was +1° then add its opposite, (-)1° to your alignment adjustment:*
(+25)° + (-1)°=(+24)°. Set the alignment switches to (+)24°.

3. After you have adjusted the switches, recheck the Azimuth 100's heading readouts. If it is still showing errors, you may need to compensate it. If so, refer back to **Compensation**, *page 21, #3.*

   If **not**, replace the cavity cover with its O-ring **making sure to refasten the central cover screw with its O-ring so that your unit remains waterproof.**

II. USING YOUR AZIMUTH 100

Your Azimuth 100 gives you digital heading information as well as conventional directional information on an analog display. The Azimuth100's large liquid crystal display is very easy to read and eliminates the need for the helmsman to be directly over his compass in order to get an accurate compass reading. You will find that the precise digital read-out combined with the familiar points of the compass rose displayed as a rotating image on the upper part of the display make the Azimuth 100 one of the easiest compasses to steer to.

Happy Boating!

III. TECHNICAL APPENDIX

1. Technical Specifications

Performance

Accuracy	±3°
Temperature Range	-10°F to +150°F

Power Supply

Voltage Requirements	12V DC
Current Consumption	60 mA light off 120 mA light on

Dimensions

Diameter	6 1/4" base
Height	2 3/4"

Weight

Display	12 ounces

2. Troubleshooting

Most of the problems you'll have with the Azimuth 100 result from the following problems:

1. **low battery voltage**
2. **incorrect installation**
3. **poor electrical connections**

By first checking these 3 areas, most compass problems can be easily solved. If not, a troubleshooting guide follows:

Problem(s):
Backlight out
Segments dim or missing from LCD
Segments blurry
Random segments appear
All segments appear
No reading on display

1. Check 12V DC power supply as battery voltage may be too low. If so, charge battery.

2. Make sure power supply is 12V DC.

3. Check red(+12V DC), black(ground) and white(light) wire leads to 12V DC power source for clean connections.

4. "Noise" may be present in the line. A noise filter can be placed on the power cable to prevent this. Consult your dealer or the KVH factory.

5. Call KVH factory.

Problem(s):
Heading jumps erratically or too slowly
Heading inaccurate
Heading jumps randomly; unstable
Heading freezes

1. Check 12V DC power supply as battery voltage may be too low. If so, charge battery.

2. Check to make sure you are using a 12V DC power supply.

3. Check all 4 wire leads for good, clean connections

4. Check that you have the correct damping level for boat size and/or boating conditions
(see #3 , page 12-13)

5. Compensation screws and/or alignment switches may be misadjusted. Check a known heading against the Azimuth 100's heading readout. If the heading is off, recompensate and/or realign the compass.
*(see **Compensation**, page 18 and/or **Alignment**, page 28 or consult a professional compass adjuster.)*

6. Check installation of Azimuth 100. It may be mounted near ferrous metal, other external magnetic influences or near a changing magnetic field(motor, windshield wipers, etc.)
*(see **Choosing a Location**, page 7)*

7. Call the KVH factory.

3. Deviation Chart

Actual Heading	Azimuth 100 Reading	Error
000		
015		
030		
045		
060		
075		
090		
105		
120		
135		
150		
165		
180		
195		
210		
225		
240		
255		
270		
285		
300		
315		
330		
345		

Yacht_____ Compensated by_____

Date_____ Local Variation_____