



Datamarine®
Precision Marine Instruments

OWNERS MANUAL FOR THE

S-100KL

L.C.D. digital knotmeter

INTRODUCTION:

Datamarine is proud to present its S-100KL, a digital microprocessor based knotmeter/log with a liquid crystal display. The S-100KL has been designed and built with care and precision to meet the needs of sailors and those boaters who require a flush mounted waterproof speed instrument.

Once installed and calibrated, the S-100KL will give its owner accurate speed and incremental distance measurements. Datamarine also offers an accessory totalizing counter (A-180) which connects to the S-100KL and gives a non-resettable total mileage reading and a remote mounted OFF-ON-BRIGHTNESS control of cockpit mounted instruments.

The ultimate accuracy of the S-100KL is directly related to the position and installation of the thru-hull impeller. Take a few moments to read through this short installation and operation manual to familiarize yourself with your new instrument.

GENERAL INFORMATION:

The Model S-100KL is a digital knotmeter/log instrument using a liquid crystal display for low power consumption and excellent readability, even in bright sunlight. The display is also backlighted for night operation. Character height is 0.5 inches. A Quartz crystal time base guarantees accuracy.

The instrument has two modes selected at the front panel. The speed mode is a speed readout from 0.0 to 35.0 knots (or 40.0 mph). Distance mode is a resettable distance readout from 0.0 to 1000 miles. Distance mode will reset at 1000 miles and continue to recycle automatically, or it can be reset back to zero at any distance using the front panel RESET switch. Each mode (speed or distance) is shown on the display with an indicator next to SPEED or DISTANCE. This indication is highly visible at night (with night lighting) as well as in daylight.

This instrument will also drive a 12Vdc log totalizer (A-180) directly from a connector on the rear panel. The totalizer drive is set at the factory to provide 1/10 mile intervals.

A single calibration adjustment on the rear panel is all that is necessary for final setting of the instrument at the time of the installation trials.

SPECIFICATIONS:

- a. **Knotmeter:** 0 to 35.0 knots (or 40.0 mph) operational limit for designed accuracy.
Digitally averaged.
Accuracy: $\pm 1\%$ of speed when calibrated to hull.
- b. **Log:** 0.0 to 99.9 then 100 to 999 miles with manual reset from the front panel and auto reset at 1000 miles.
Accuracy: $\pm 1\%$ of indicated distance. An output is available on the rear of the unit to drive an electromechanical totalizer (A-180). The log uses a common calibration adjustment with the knotmeter.
- c. **General:** **Display:** 2½ digit liquid crystal with 0.5" character height, backlighting for night operation.
Controls: A front panel switch selects speed, distance and reset. A rear panel switch selects OFF, DAY and NIGHT operation.
Rear panel calibration controls.
Provisions to connect remotely mounted power and lighting controls.
- d. **Environment:** Operation (0 to 55 degrees C) for specified accuracy. Storage (-40 degrees C to 70 degrees C).
- e. **Power Requirements:** 10 to 16Vdc, 150mA day operation, 250mA night operation.
- f. **Protection:** Reverse and overvoltage protected to ± 20 Vdc.
- g. **Optional Impellers:** SX-125 Bronze. Similar to standard SX-115 in size and shape.
- h. **Case:** Waterproof from front; splashproof from rear.
- i. **Safety:** The product shall contain no materials hazardous to operators in normal use. No sharp edges or dangerous voltages should be exposed in normal use.
- j. **Other Features:** Up to six units may be operated from one impeller with no interaction.

OPERATION:

After installation and calibration, as discussed in the following sections, operation of the S-100KL is automatic. Referring to the back panel, one will note the following:

CALIBRATION CONTROLS: These should be adjusted at installation as described under the following section entitled *CALIBRATION*.

LOG OUTPUT JACK: This is a 12v pulsed output for an accessory electromechanical counter/log (A-180). Pulse is 12v. 0.5 amp source max. for 50 milliseconds, each 0.1 mile.

OFF-DAY-NIGHT SWITCH: Used for control of instrument. *OFF* denotes no power to instrument. *DAY* turns instrument on without backlighting. *NIGHT* turns instrument on with *green* backlighting. Power drain is minimal in day mode.

POWER: 12v d.c. (0.150 ampere) connections with in line 1 amp fuse to ship's battery. Power connections available for

remotely mounted OFF-ON-NIGHT brightness control.

Front panel controls are limited to mode selection switch, reset-speed-distance.

SPEED: When in this position the S-100KL will display speed. At the same time distance will be accumulated in the instrument's memory for display when switched to distance.

DISTANCE: When the switch is in this position the S-100KL will display a continually updated distance, up to 1000 miles at which point auto re-set will occur.

RESET: Momentary contact for manual resetting incremental log.

The front panel of your S-100KL is scratch resistant and the housing has a hard coat anodized finish. You may clean and wipe the face panel as you would other parts of the boat. Do not, however, spray the rear panel connections.

The liquid crystal display of your new instrument has been thoroughly tested and manufactured for the marine environment. Under extreme temperatures, however, the display will become unreadable. Extreme heat (above 190 degrees F) will tend to black out the display (display will become operational again when temperature is reduced) while extreme cold (below 10 degrees F) will slow the digits to a point where they will "freeze" on one number. This is normal and should be expected by the new owner. As noted in the specifications, storage temperatures are higher and lower than the above mentioned operation temperatures.

In normal operation a small amount of heat will be generated by the night lighting of the S-100KL. This will not harm the instrument and may be desirable even in daylight while operating in colder temperatures.

Your S-100KL has a front panel cover to help protect the face and the liquid crystal display when the instrument is not in use. This pro-

TECTIVE cover should be used whenever your boat is left for a period of time or when conditions warrant added instrument protection.

INSTALLATION:

The S-100KL is intended to be permanently installed in a cabin bulkhead or instrument console. It will be watertight and theft proof when properly installed. Select a location on a flat surface which is easily seen by the helmsman while in his normal steering position.

Saw a 4 $\frac{1}{8}$ " diameter hole in the panel for clearance of the body of the instrument. Remove the clamp ring from the instrument. Apply a small amount of waterproof bedding compound around the outer edge of the hole and press the instrument into place. Make sure that panel markings line up horizontally.

Next, place the clamp ring on the S-100KL's body, from the inside, and press against the bulkhead or console. Tighten the set screws

to the instrument housing then the set screws against the bulkhead to hold the S-100KL in place.

Service of the instrument may be accomplished by removing the "spring retaining ring" from the rear panel, unscrewing the hex switch boot on the front panel and, sliding the electronics package out through the back of the instrument housing. This eliminates the need to break the instrument's waterproof seal.

POWER CONNECTION:

The 12 volt d.c. power for the S-100KL should be connected using the power cord provided. The RED leads goes from the "12v" terminal to the ships POS (+) power and the BLACK lead is connected from the "NEG" terminal to the ships NEG (-) power. The "lamp" terminal (which is jumped to the 12v terminal) is only used when the accessory remote lighting control (A-180) is connected. The S-100KL is protected

against polarity reversal. The instrument's power cord is fused with a 3AG-1; 1 ampere fuse. Do not use any other size. With the S-100KL switched on, the display should light and show 0.0 with the transducer disconnected or with the transducer connected and the boat at standstill.

Note that your S-100KL is designed and warranted for operation on 12 volt battery systems only. Excess voltage can seriously damage the instrument and void the warranty.

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TRANSDUCER INSTALLATION AND OPTIONS:

The most important aspect of installation is the proper choice of location of the thru-hull impeller transducer in your boat. Operation and accuracy of the instrument are largely determined by the location of the impeller with respect to hull flow characteristics. The following is some detail concerning the considerations involved.

CAUTION — A BRONZE TRANSDUCER MUST NOT BE INSTALLED DIRECTLY ONTO A STEEL OR ALUMINUM HULL. SPECIAL PRECAUTIONS ARE NEEDED TO AVOID DAMAGE DUE TO ELECTROLYSIS OF DISSIMILAR METALS.

GENERAL CONSIDERATIONS:

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As you know, a hull moving through water will create a boundary layer of water, immediately adjacent to the hull, which is moving along with the hull because of friction drag.

Datamarine research has shown that the boundary layer effects are related to velocity (boat speed), waterline length or distance aft of the bow, surface condition of the hull (foul or fair), hull shape, and angle of keel. Generally, flow aft of midships is unreliable for speed measuring purposes.

Boundary layer effects in the normal ranges of yacht speed are directly proportional to speed. This means that once installed, you can calibrate the S-100KL at one speed and thereafter it should be accurate at all speeds of interest.

ACCESSIBILITY:

Accessibility is a major consideration in selecting a hull location for the transducer. This is vitally important. Be certain to select a location which allows free access to the transducer from within the yacht. From time to time, you may want to remove the impeller for inspection or cleaning. This is a simple and safe operation when the yacht is in the water if the fittings are easily reached and if space allows hand and arm movements. Each time the impeller or plug is removed, you will take on a quart or two of water. Life is more pleasant if this water can drain directly to the bilges for pumping.

Naturally, you should be able to observe the installed thru-hull fitting and prudence dictates that it should be regularly inspected along with all the other thru-hull fittings installed in your yacht.

MOUNTING RECOMMENDATIONS:

Our recommendations for the location of the thru-hull fitting for the transducer are obvious by now. Select a location as far forward and as deep as you can which:

- a). keeps the transducer submerged during all normal boat attitudes and motions, and heel angles,
and
- b). is freely accessible and visible from within the yacht. See figure 1.

INSTALLATION OF THE THRU-HULL FITTING:

To install the thru-hull fitting, follow these steps: Drill a $\frac{1}{8}$ " pilot hole in the center of the selected location. This should be done from

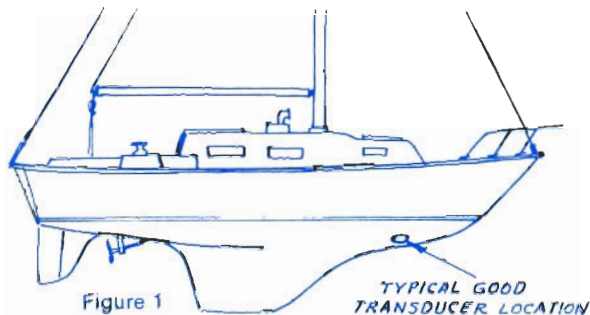
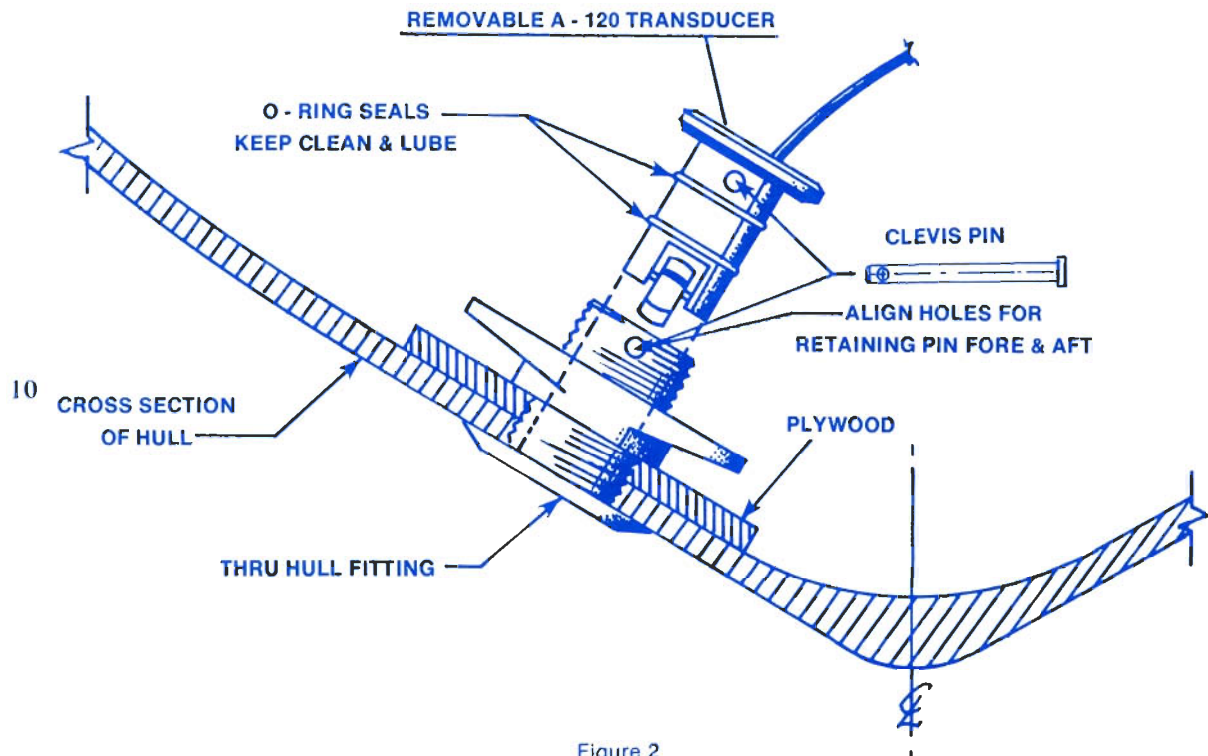


Figure 1

TYPICAL GOOD
TRANSDUCER LOCATION

inside to ensure accessibility. Next, using a hole saw, make a hole $2\frac{1}{16}$ " in diameter using the pilot hole as a guide. The body of the thru-hull fitting should fit snugly through the hole.

It is recommended that a block of $\frac{1}{4}$ " or $\frac{3}{8}$ " plywood be drilled ($2\frac{1}{16}$ " diameter) and mounted between the hull and wing nut. This acts as a locking device on rigid hulls such as fiberglass. It also provides a compliant interface to accommodate variations in hull inner surface, (see figure 2).



Permanently install the thru-hull fitting using a small amount of bedding compound under the flange on the outside. Be sure to align the fitting so that the holes for the retaining pin are pointed fore and aft. Tighten snugly. **BUT DO NOT OVER TIGHTEN** the nut from the inside of the boat. Overtightening will eventually cause distortion of the fitting and may ultimately result in a poor fit of the plug-in impeller assembly. Snug it down as tightly as possible by hand — **DO NOT USE A WRENCH**. Finally, apply a coat of anti-fouling paint to the fitting where it is exposed to water if fouling is a concern with your boat.

At this point, we urge you to install either the plug or the impeller assembly into the thru-hull fitting as a precaution against launching the yacht with the hole open. The retaining pin should be installed to keep the plug or transducer securely in place. Be sure the arrow on the impeller assembly is pointed forward. The O-rings provided should be installed in the two grooves of both the impeller

transducer and the plug. Silicone grease or jelly will help seal the O-rings and ease removal of the assembly. Keep the plug handy.

Next, the 10' long coaxial cable should be installed in the yacht to connect the transducer to the instrument. Secure the cable at the transducer end so that the connector will not be lying in bilge water even when heeled.

Once the cable is connected between the transducer and the instrument panel, the S-100KL is ready to operate.

TRANSDUCER MAINTENANCE:

The transducer parts are susceptible to fouling by marine growth and organisms as is any other underwater part of your boat. We have applied a coat of effective anti-fouling paint to your S-100KL impeller assembly. This coat should last the first season in most waters.

We urge you to flush the impeller assembly and its cavity with fresh water under pressure whenever the boat is hauled and to renew the anti-fouling paint as necessary.

You may order replacement parts for the S-100KL transducer as follows:

- #A-120 Complete transducer Assembly
- #P-121 Impeller and Shaft Only
- #P-122 Retaining Pin Only
- #P-123 O-Ring Seal Only (2 required)

ACCURACY AND CALIBRATION:

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The accuracy of the S-100KL, as previously noted, is dependent on proper transducer operation as well as calibration. The system is capable of measuring speed over a 0.3 to 35 knot range with an accuracy of 1%. The distance measurement is also 1%.

Please note that speed, and therefore distance, are measurements through the water and not necessarily "over the ground." Currents can add or subtract to give the effective value. Thus, any navigational exercise requires that knowledge of the currents over the course travelled be used to compute final speed and distance.

The calibration controls located on the rear panel are used to adjust the instrument's microprocessor to the particular hull and location of the transducer. As discussed under INSTALLATION, the impeller in the transducer does not measure the exact speed through the water because of boundary layer effects. Fortunately, the effect is proportional to speed so that a calibration at one speed is good over the full range. However, calibration should be done at typical cruising speeds; for example, a displacement hull should be calibrated at somewhat less than hull speed while a planing cruiser should be calibrated at the most economical speed on plane.

Calibration of the instrument is done with one adjustment for both speed and distance. The calibration controls are located on the rear panel and are labeled "CAL." The Factory adjustment was for nautical miles and for a typical installation of the impeller. Since the exact performance may vary from one installation to another, it may be necessary to re-

calibrate the S-100KL when it is installed on your yacht. Here is a method for checking the calibration and recalibrating if necessary:

1. Select a course of known exact distance with fixed markers which can be passed close by and accurately sighted. Preferably this course would not be exposed to severe current or water turbulence. Also, depths over the course should be 20' or more to allow free hull flow to develop (shallow water slows a boat noticeably). Ideally, the course should be in the range of 1.0 to 5.0 miles in length such that a controlled two-way run does not take too long. Nautical or statute miles should be used as is appropriate for the units desired, i.e., statute miles for Miles per Hour and nautical miles for Knots. A two-way calibration run is preferred as it eliminates the errors caused by currents and winds.
2. On a relatively calm (no wind) day, make a two-way timed run between marker "A" and marker "B". Steer the most accurate, straight line course possible. Select a speed which is a moderate cruise speed for your yacht. Keep the speed and trim as constant as possible. Your instrument will be calibrated by comparing measured distance to actual two-way distance. The rear panel mode switch changes the LCD speed display to distance while in the CAL position. By using distance instead of speed for calibration, very precise calibrations are possible.
3. Ensure that the rear panel Mode switch is in the NORM position and the rear panel switch is in the "OFF" position. Bring the boat up to constant speed and when exactly abeam of marker "A", turn the instrument on ("Day" position). Turning the unit off just before the calibration run resets all internal counters and readies the unit for calibration. Do not turn the unit off again until calibration is complete.
4. When marker "B" is abeam, move the rear panel Mode switch to the CAL position. This locks the distance travelled into

the instrument's memory and prevents any distance changes while in the CAL position. This "lock-out" action allows the boat to be turned around and set up on the reciprocal course.

5. When marker "B" is exactly abeam, move the rear panel Mode switch back to NORM. Internal counters will again count up course distance. Steer an accurate course back to marker "A."
- 14 6. When marker "A" is exactly abeam, move the rear panel Mode switch to CAL again. This again locks in the total distance travelled. The digital speed display will not read the total two-way distance travelled.
7. Compare the distance shown with the two-way distance found from a local chart. Calibrate your instrument in nautical miles and the speed will be displayed in knots. Alternately, you may calibrate the distance in statute miles and the speed will be displayed in statute miles per hour.

8. Move the calibrate adjustment with a small screwdriver until the display shows the correct distance. Be sure the locking nut is loosened and retightened as necessary. Disregard the A-180 distance counter if installed.
9. Move the rear panel control back to "Normal". Calibration is now complete.

NOTE: A blank page is furnished in the back of this manual for recording calibration notes.

GENERAL SERVICE HINTS & CAUTIONS:

1. When installing the impeller assembly into the thru-hull fitting be sure the arrow on the transducer is *pointed forward*. Silicone grease or jelly will help seal and ease removal of the assembly.
2. *Always insert* the retaining clevis pin and attach the cotter ring to secure the transducer or plug in the thru-hull fitting. Keep the plug handy.

3. The S-100KL is not designed to operate with any transducers except the one(s) supplied for it by Datamarine. Any attempt to match or calibrate to any other type of transducer is at the owner's risk. The S-100KL is designed and warranted for operation on 12 volt battery systems only.

4. Should your S-100KL fail to operate at all, check power wiring. When power is applied in the proper voltage range and polarity, the numeric display should appear.

5. Should your S-100KL suddenly lose its calibration, reading lower than actual speed, or display only 0.0 knots when underway, the following should be checked.

- a. Transducer connections: a small amount of water (especially salt water) will effectively short out the transducer signals. Check cables, dry out connections.
- b. Impeller: should be removed and inspected for non-fouled, undamaged, free turning condition. Keep the

thru-hull plug handy at all times. Spin the impeller by hand to verify that operation is restored.

- c. The S-100KL instrument: if the impeller and impeller cable seem proper but the display continuously shows 0.0 when the impeller is turned by hand, check the instrument by disconnecting the cable. With a metal pin or wire rapidly short the inner connector to the outer body of the coaxial connector. When this is done, the instrument should show a number other than 0.0. If it does, the impeller or the cables are faulty and should be checked again. If the S-100KL does not indicate a number, it is faulty and must be serviced.

At this point your dealer or the factory service department is recommended.

The transducer assembly contains a magnetic pickup coil and a solid state pre-amplifier which cannot be repaired. As stated above,

the transducer may be simulated by a rapidly repeating short circuit of the coax with the transducer disconnected. Using this method, the troubleshooter should be able to isolate a fault in the S-100KL instrument, the cable or connectors, or the impeller assembly. Once isolated, the fault can be corrected by servicing the instrument or replacing the cable or transducer.

- 16 6. If it ever becomes necessary to return your S-100KL to a Datamarine dealer or the factory for service or repair, please be sure to include your proper return address and a concise statement of the malfunction. Also, please mention boat size, type and make.
7. Be sure that the warranty card is properly filled out and returned to the factory at time of purchase and installation.

WARRANTY CONSIDERATIONS

PLEASE NOTE

WARRANTY WILL BE VOIDED BY:

- * IMPROPER FUSES
- * OVER-VOLTAGE DAMAGE
- * PHYSICAL DAMAGE
- * SALT WATER IMMERSION
- * IMPROPER ATTEMPTS AT REPAIR
- * USE OR STORAGE IN TEMPERATURES BEYOND THOSE SPECIFIED

**FOR PROMPT FACTORY SERVICE,
MAIL OR SHIP TO:**

Datamarine International, Inc.
Service Department
53 Portside Drive
Pocasset, MA 02559 USA
Telephone (617) 563-7151

(Include return address and symptoms, and
transducer and installation factors)

**REPAIRS OUT OF WARRANTY WILL
BE PERFORMED AT MODEST COST
FOR LABOR AND PARTS. THE IN-
STRUMENT WILL BE RETURNED TO
ADDRESS SPECIFIED WITH A C.O.D.
CHARGE FOR SERVICE AND
FREIGHT.**

Please refer to complete Warranty Statement
and Service Program enclosed with product
shipment.

CALIBRATION NOTES

Warranty

All Datamarine products are covered by a 12 month limited warranty and a subsequent four year service program. Please refer to the complete warranty statement or consult your servicing Datamarine dealer. Please be sure to complete and return the warranty registration card at the time of purchase.

Datamarine®

Precision Marine Instruments

Datamarine International Inc., 53 Portside Drive, Pocasset, Mass. U.S.A. 02559

A-S100KL2381-1K

S100KL

Digital Speedometer/Log

PACKING LIST:

1. Instrument
2. Speed transducer assembly with cable, plug, O-rings, and retaining pin
 - _____ SX 115 (P-116 nylon thru-hull)
 - _____ SX 125 (P-126 bronze thru-hull)
 - _____ SX 155 (P-133 transom mount with bracket and hardware)
Delete plug and O-ring
3. 6' power cord with 1 amp. fuse
4. A-170 protective cover
5. Set screw kit
6. Instruction manual, warranty card
7. Limited warranty and four-year warranty sheets

Datamarine International, Inc.

53 Portside Drive

Pocasset, MA 02559 USA