Owner's

Handbook

for

SONIC SPEED INSTALLATION

BROOKES & GATEHOUSE

SONIC SPEED INSTALLATION BOOK

CONTENTS

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SONIC SPEED INSTALLATION BOOK

1 DESCRIPTION

Sonic Speed determines the speed of the boat through the water by transmitting and receiving ultrasonic pulses between two transducers mounted approximately in a fore-and-aft line, under the hull. The time of flight for pulses with and against the water flow is different by a very small amount. This difference is sensed and converted to speed for connection to the instruments. The method of processing ensures the speed output is independent of water temperature and salinity.

The sonic speed unit requires a single adjustment to set the circuitry to accept the transducer spacing in any particular installation. Transducer spacing may vary from 0.8 to 1.2 metres. Final calibration is achieved in Hercules.

Because Sonic speed measures water flow in a large area relatively far from the boat hull, the results are substantially independent of hull fouling, heel angle and water flow disturbances. No maintenance is required.

The Sonic Speed transducers presently available restrict installation to fin-keel yachts only. A single Sonic Speed system is superior in performance to twin underwater units with heeling switch.

NB The XTL Fin is now available to provide Sonic Speed accuracy for boats without a fin keel.

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2 SONIC SPEED TRANSDUCER INSTALLATION

CAUTION

Sonic Speed transducers are robust, reliable units with a potential life of many years. However, damage caused during installation may result in early failure. In particular:-

- The cables must not be bent sharply or abraded.
- The forward transducer must not cut or shaped in any way. The aft transducer may have its neoprene extension cut and shaped to match the shape of the leading edge of the keel.
- Transducer active faces must not be filled. One or two coats of antifouling paint, applied thinly, will not affect operation.
- Transducers must not be subject to excessive stress, e.g. hammered or forced into a tight space.

2.1 Examine the transducers

Examine the two transducers and identify the "active areas" from which the sonic pulses are transmitted and received. When installed these areas must face each other squarely and free from obstruction.

2.2 Siting the transducers

Survey the yacht to establish the correct positions for the transducers. The absolute spacing between the active areas of the transducers MUST lie between 0.8 and 1.2 metres. The aft transducer is mounted centrally in the leading edge of the keel. The forward transducer should be sited as close to the centre line as possible but offsets up to 5cm are permissible to clear structural features. Excessive deviations from the centre line will generate speed differentials from tack to tack. (This can be corrected with the Hercules System).

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2.3 Keel Transducer Installation

a) Cut cavity allowing generous clearance.

b) Cable entry is best trough an 8mm hole drilled or cast in keel. Alternatively groove the leading edge of the keel approximately 7mm wide x 10mm deep. Drill trough at the earliest practical point.

c) Half fill cavity with epoxy or polyester filler and position transducer. **Active area must face forward transducer squarely within 10 degrees.** A Sonic Speed installation tool is available from B&G Service Department to aid accurate alignment.

d) Bed the cable into groove, leaving remaining cable inside hull.

e) Fair in transducer and cable with extra filler. The neoprene extension to the transducer active face should be cut with a sharp wet knife to match the shape of the leading edge of the keel. Ensure an unobstructed view of the forward transducer.

f) Fill around cable entry inside hull o ensure complete watertightness.

g) Finish with antifouling to suit. Transducers may be antifouled all over.

2.4 Forward transducer installation - composite hulls

As for keel transducer, without reference to groove. Forward transducer must face keel transducer squarely within 10 degrees.

2.5 Forward transducer installation - aluminium hulls

At the selected position for the forward transducer, weld a turned or fabricated aluminium housing as shown in the sketch, inside the hull and cut a suitable hole through the skin.

The forward transducer is bedded in this cavity with filler.

Installation should be carried out as above, but in addition the whole worked area should be given two coats of 2-part epoxy paint inside and our before antifouling.

2.6 Identify cables

Mark the cables, if necessary, to identify fore and aft transducers.

3 SONIC SPEED ELECTRONIC INSTALLATION

This is quite straightforward. Transducer cable length is 5 metres as supplied. This may be cut or extended, up to 10 metres maximum. It will usually be convenient to locate the Sonic Speed electronic unit amidship, in a place not subject to excessive water hazard. The electronic unit is fully sealed but the cable terminal area is only waterproof when the unit is fixed firmly to a smooth surface.

Ensure that the fore and aft transducers are correctly connected. Power (12v or 24v) is taken to the same supply on the ship's electrical panel as the instruments. Signal in connected directly to the instrument control unit in the same manner as the normal underwater unit.

4 SETTING UP AND CALIBRATION

To set transducer spacing, detach the Sonic Speed unit and remove the cover over the cable termination space. With all connections made and power applied, the red light in the terminal area should be lit when the spacing adjustment control is correctly set.
NOTE:SONIC SPEED CAN ONLY OPERATE WITH THE TRANSDUCERS IN WATER

To adjust the spacing, rotate the control **slowly** to find a position where the light comes on. The scale will help if the transducer spacing is known. Once the approximate position is found **very** slowly adjust the control each way until the light just goes out. Note carefully the position in each case, and finally set the control to midway between these two extremes (the light should now be on).

Over the range of correct operation of the spacing adjustment control (approx 30 degrees) calibration is affected by about 5%, so once set, the control should not be readjusted unnecessarily.

The spacing control should never be used to change the calibration. It must always be set as accurately as possible to its mid position of correct operation, with calibration adjustments carried out at the instrument control unit.

NOTE: Sonic Speed readings are meaningless if the spacing control is not set to within its range of correct operation. The red light must be **ON.**

Calibration is achieved in the normal manner AT THE INSTRUMENT, as detailed in the instrument Operator's Manual.

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5 OPERATING CHARACTERISTICS

In normal operation, Sonic Speed will appear much like a normal log except in its ability to operate at very low speeds. Reverse speed is also sensed up to 4 knots.

Technically, the worst enemy of sonic systems is water aeration, which is the acoustic equivalent of fog. During heavy aeration such as ship's propeller wake, Sonic Speed senses any failure in reception and holds the previous good speed output until correct operation is re-established. This process is usually not apparent, but when following a motor vessel for extended periods, speed changes may not be recorded correctly. In later systems the speed drops to zero after approximately one minute of incorrect operation.

The red "transducer spacing" light in the terminal area of the Sonic Speed unit directly indicates the state of the sonic operation. It goes out during sonic failure (provided the spacing control is set correctly). If incorrect operation is suspected, detach the Sonic Speed unit, remove the terminal cover and observe the operation of the light in operation. In normal conditions it is quite normal for the light to go out intermittently as impurities in the water are encountered. Do not adjust the spacing control unnecessarily.

NOTE: If the "transducer spacing" light will not operate, a failure in the electronics is the most likely cause, although transducer failure is also possible. Always suspect the Sonic Speed control unit first.

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6 FAULT FINDING

6.1 Speed will not exceed 4 knots (approximately)

Transducer connections swapped: will restrict maximum speed reading to approximately 4 knots. Reverse connections to cure.

6.2 Random speed readings (early system) or zero speed

Normally due to Sonic failure, perhaps as a result of transducer spacing mis-set. Abnormal (or zero) speed readings will be obtained if Sonic Speed is switched on during adverse conditions (e.g. starting an engine or while entering a harbour following in another vessel's wake).

6.3 Speed indicated when vessel is stationary

Zero error: Indication of speed when the boat is completely static in the water. (Be cautious - even a very slow tidal drift can represent a few tenths of a knot. No speed instrument has been able to indicate such slow speeds up to now). This fault is an electronic failure and the electronic unit must be replaced.

6.4 Transducer failure

Failures to date are rare and have been caused by damage as a result of fouling underwater obstructions.

Diagnosis: First check power connections etc. The current drawn by the Sonic Speed unit should be approximately 70mA.

Next: Sustitute the Sonic Speed unit to establish that there is a transducer failure. Double check by testing the Sonic Speed unit separately (see section 7). If the forward transducer is removable, it may be substituted, and the failure located to the individual transducer.

If the forward transducer is fixed, the failure can only be located with special test equipment (see section 7). Lifting the vessel will be necessary in any case to replace the failed transducer.

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7 TEST EQUIPMENT

Special test equipment is being developed to assist accurate fault diagnosis. Consult Service Department at Romsey for latest information.

7.1 Sonic Speed unit - testing away from vessel

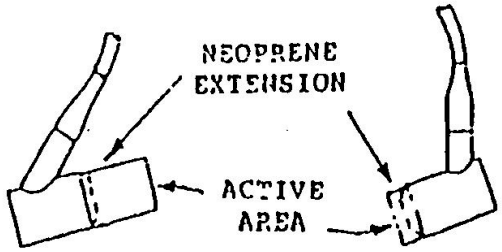
A very simple test set may be made by inserting a pair of transducers into opposite ends of a 1 metre length of clear flexible tubing approximately 15mm inside diameter. The tube is filled with water before the second transducer is inserted, taking care to eliminate all air. The tube should be kept reasonably straight in operation.

With this arrangement, the "transducer spacing" light should operate continuously when the spacing control is adjusted, and speed readings should settle to less than 0.1 knot within 20 seconds.

7.2 Transducer Testing

The same water tube technique may be used to check out transducers before installation. It may also be possible to check installed transducer, with the vessel out of the water by connecting the transducer faces via a water pipe.

NOTE: The transducers are electrically identical. The only difference between fore-and-aft is the angle of cable entry into the transducer bodies.



KEEL OF AFT TRANSDUCER
184-00-008
COMPLETE WITH 5m OF CABLE

FORWARD TRANSDUCER
184-00-015
COMPLETE WITH 5m OF CABLE

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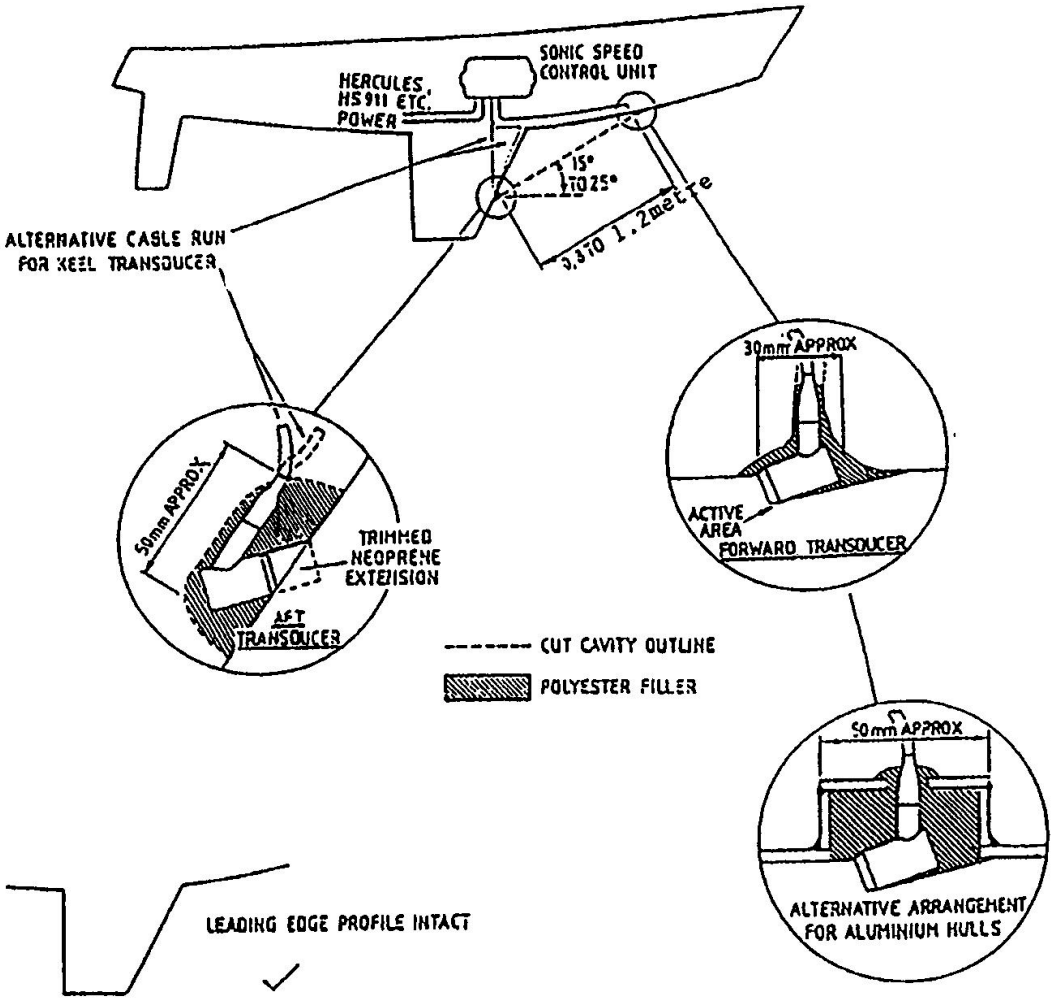

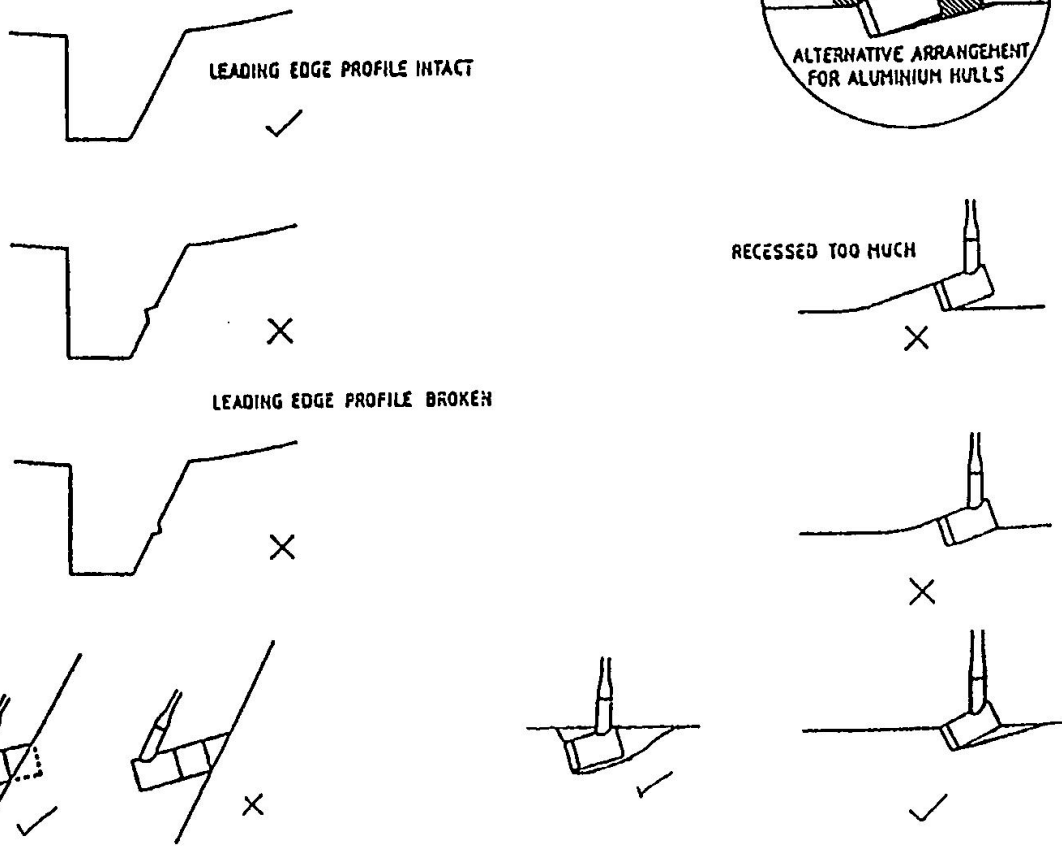

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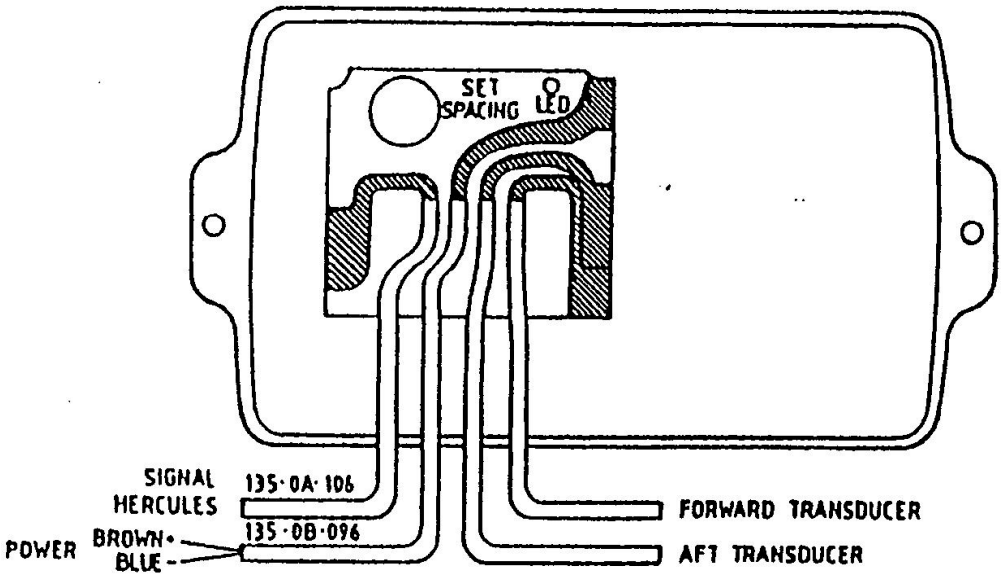
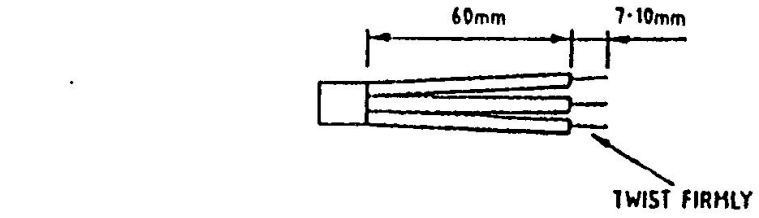
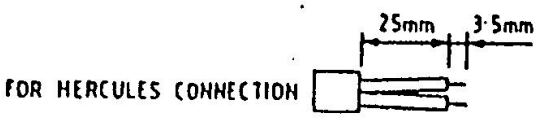


DETAILS OF CABLE STRIPPING





CONNECTIONS DIAGRAM

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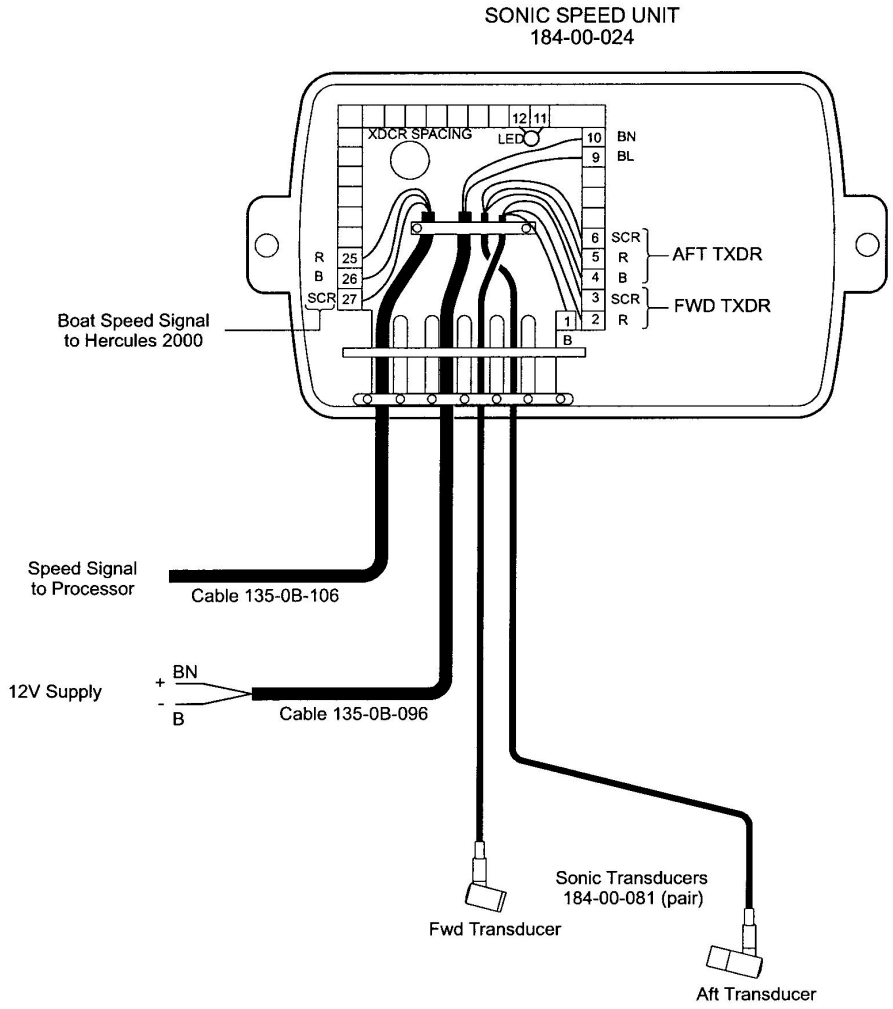
4.2 INSTALLATION DATA SHEETS

SONIC SPEED UNIT & SONIC TRANSDUCERS
ELECTRICAL INSTALLATION SHEET



- To minimise interference the Sonic Speed Unit should be mounted away from high current carrying cables and components, e.g. starter motor, generators, etc.
- All cable screens must be connected as shown to minimise radio and radar interference
- The Sonic Speed installation must be setup and calibrated before use. The sonic tranducers must be in water to do this. Refer to Sonic Speed Handbook IH-0222 for details.
- All cable runs to be clear of depth cables or any other cables likely to cause interference.
- The Sonic Tranducer cables may be shortened as required (supplied length 5m).

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