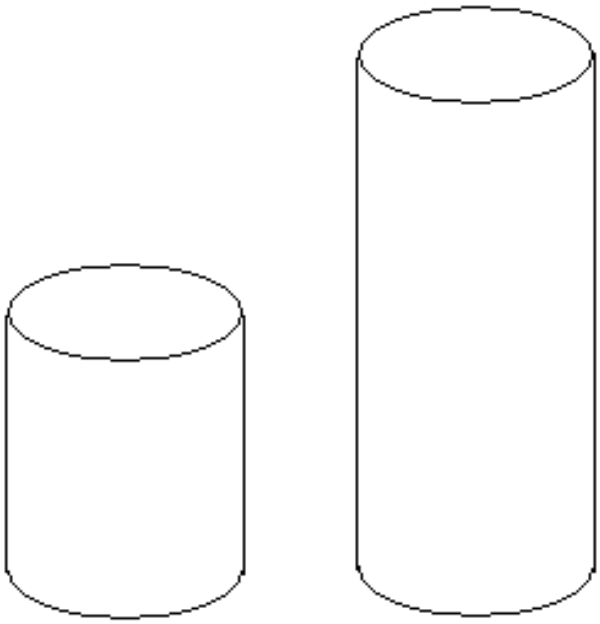
LENGTH BAR SET

FOR USM

OPERATORS HANDBOOK (PART NO. 34340) Issue 1

(ENGLISH)



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PART NUMBERS COVERED BY HANDBOOK

This handbook covers Length Bar Set part number 61117.

INTRODUCTION

Two bars are supplied: The shorter bar (approx. 3" or 76mm) is called "length bar 1" or "Cal Bar 1".
The longer bar (approx. 6" or 152mm) is called "length bar 2" or "Cal Bar 2".

The purpose of the Length Bar Set is to enable the USM system zero to be set. The setting of the system zero allows results from one USM to be used with another USM without error; this is particularly important should any part of the USM system become damaged.

The system zero is affected by the USM, the Transducer lead and the Transducer. If any of these 3 items change the system zero will be affected.

This handbook is written to detail use of the Length Bar Set; for full details of the USM operation please refer to the USM operators handbook.

To keep the length bars protected when not in use, store in case supplied.

If the length bars are damaged in any way they will need recalibrating.

SET UP INSTRUCTIONS

ITEMS REQUIRED

The USM, transducer lead & transducer that require a system zero.
Ideally a temperature controlled environment set at 20°C (68°F).
Length Bar Set.
Couplant.
Thermometer to measure +/-0.5°C.
Calculator.

PROCUDURE

1. Before use allow all items to temperature stabilise, for a minimum of 1 hour.

NOTE: **Handling of the transducer & length bar set can affect their temperature, so giving wrong results. It is essential that during the stabilisation period and during testing that the transducer & length bars are handled as little as possible.**

2. Connect up the USM to the transducer.

3. Use a small amount of liquid ultrasonic couplant between the transducer and short length bar.
   Place the transducer on the shorter length bar.
   Seat the transducer directly and completely on the length bar.
   Ensure all trapped air and excess couplant is squeezed out.

4. Power up the USM. The use of mains power is recommended eliminate problems with a low battery.

OPERATING INSTRUCTIONS

On the USM follow "SET UP" to find "MEASURE SYSTEM ZERO".
Select to show following screen:

F1	TEMPERATURE 20.0	F1
F2	TEMPERATURE FACTOR 60.0	F2
F3	CONTINUE	F3

ENTER TEMPERATURE

In an ideal situation the ambient temperature will be 20°C (68°F) and the length bars will be at this temperature. Measure the length bar temperature to within +/-0.5°C and enter the value.

TIP: If working in an 'inch' unit; temperature will be shown as "F" for Fahrenheit
If working in an 'mm' unit; temperature will be shown as "C" for Celsius.
If the wrong unit is shown, proceed to changing the VELOCITY, then return to set the temperature.

ENTER TEMPERATURE FACTOR

The temperature factor value depends on the thermal properties of the length bar material.
Unless stated on the length bars, use the following values:

For a value "F" for Fahrenheit use a Temperature Factor of 55.
For a value "C" for Celsius use a Temperature Factor of 99.

MAIN SCREEN

Select 'continue' to show the main screen.
The screen will display similar to this:

F1	CAL. BAR 1 3.0016	 3.0014	F1
F2	CAL. BAR 2 5.9982	 5.9980	F2
F3	VELOCITY 5890000	SYS ZERO 12.0	F3

The KNOWN LENGTH is shown on the left & the ULTRASONIC LENGTH is shown on the right.

VELOCITY / SYSTEM ZERO

Press F3 from the main screen to show:

F1	**VELOCITY** **5890000**	**F1**
F2	**SYSTEM ZERO** **12.0**	**F2**
F3	**OPTIMIZE SYSTEM ZERO** **5890000**	**F3**

If the velocity of the length bar is known, enter the value.
If the velocity is not known, initially use 232000 (for an 'inch' unit) or 5890000 (for an 'mm' unit).

TIP: If the velocity number is 6 digits long it will be taken as an 'inch' unit.
If the velocity number is 7 digits long it will be taken as a 'mm' unit.

Return to the main screen.

LENGTH BAR 1 (CAL BAR 1)

1. Ensure transducer is on the shorter length bar.
2. Select CAL BAR 1.
3. Enter KNOWN LENGTH from length bar certificate.
4. Measure ULTRASONIC LENGTH and press ENTER to save value.

LENGTH BAR 2 (CAL BAR 2)

1. Ensure transducer is on the longer length bar, or follow TIP below.

TIP: It is possible to use 1 length bar to complete both length bar measurements.

The advantages of this method include:
1. Eliminates touching the transducer & Length bar between measurements.
2. Eliminates potential inconsistencies in couplant application.
3. Faster to complete measurements.

For CAL BAR 1 enter KNOWN LENGTH & measure ULTRASONIC LENGTH as normal.

For CAL BAR 2 enter LNOWN LENGTH as exactly twice the value of Length Bar 1.
The ULTRASONIC LENGTH will measure a "double echo" to obtain the correct result.

2. Select CAL BAR 2.
3. Enter KNOWN LENGTH from length bar certificate.
4. Measure ULTRASONIC LENGTH and press ENTER to save value.

OPTIMIZE SYSTEM ZERO

1. In the “velocity / system zero” screen press OPTIMIZE SYSTEM ZERO.
   The USM will create a system zero. This value is stored for all subsequent measurements.

2. If the KNOWN LENGTH & ULTRASONIC LENGTH for both CAL BAR 1 & CAL BAR 2 match to within +/-0.002mm or +/-0.0002 inch then the procedure is finished.

   If the lengths do not match complete the following:

   (A) Check the temperature

   Measure the length bar temperature.
   Ensure the correct TEMPERATURE value has been entered in the correct units.

   (B) Check the temperature factor.

   Ensure the correct TEMPERATURE FACTOR value has been entered in the correct units.

   (C) Update the ultrasonic lengths

   Repeat ultrasonic measurements of the length bars.
   Use OPTOMIZE SYSTEM ZERO.

   If the lengths still do not match, the velocity may need to be updated:

   (D) Update the velocity

   Calculate a new velocity by using:

   $$\text{New VELOCITY} = \text{old VELOCITY} \times \frac{(\text{KNOWN LENGH 2} - \text{KNOWN LENGTH 1})}{(\text{ULTRASONIC LENGTH 2} - \text{ULTRASONIC LENGTH 1})}$$

   Enter the new VELOCITY into the USM.
   Press OPTOMIZE SYSTEM ZERO.