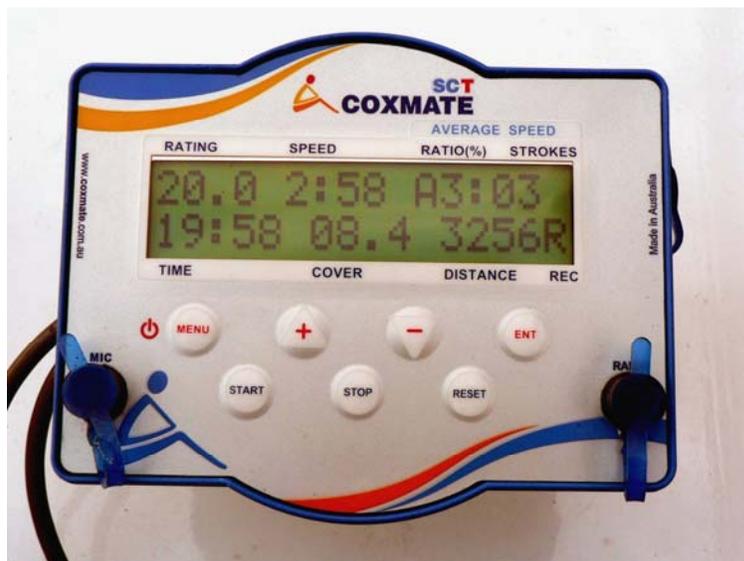


COXMATE

ADVANCED ELECTRONICS FOR ROWING

Coxmate SCT Manual



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1. Introduction

The **Coxmate SCT** is a sophisticated instrument for both coxes and coaches. It provides an array of 'in boat' functions for the cox, and, the ability to capture detailed information on the crew's performance, transfer it to a PC and analyse it. The following summarises the features:-

- Audio amplifier for communication from cox to crew
- Includes input for external radio to enable coach to crew communication.
- Stroke rate sensor
- Stroke rate logging and recall (does not require PC)
- Stroke counter
- Timer/Stopwatch
- Storage and recall of timed intervals (does not require PC)
- Pace boat – indicates boat position to a virtual boat.
- Metronome
- Either impeller or GPS Speed Sensor
- Display of:-
 - Speed
 - Cover (distance covered per stroke)
 - Rating
 - Time (stop watch)
 - Distance covered
 - Strokes count
 - Speed Ratio(not available with GPS): Ratio of minimum to maximum velocity through each stroke
 - Average Speed – this can be displayed in place Stroke count and Ratio above
- 'Microrecord' of up to approx one hour of rowing -only accessible through PC. A detailed record of boat performance is stored. **SCPCCoxmateSC** analysis software enables an individual stroke or a 2000 metre race, to be graphically analysed. The following variables can be graphed against time, distance or stroke count:-
 - Rating
 - Speed
 - Cover(distance between strokes)
 - Speed ratio(not available with GPS)

The cable harness, speakers, stroke sensor, microphone and battery charger used on the **Coxmate SCT** maintain compatibility with those used on the **Coxmate AA, SR, SRT** and **SC**. All the **Coxmate** control units can be connected to an existing Nielsen Kellerman® Cox-Box™ or Cox-Vox™ cable harness, stroke sensor and speakers.

Many improved features have been incorporated into the **Coxmate SCT**:

- Sophisticated battery management with indication of charge level.
- Increased battery capacity and voltage – increasing audio power, reducing distortion, increasing efficiency and increasing battery operating time.
- Automatic power down if speakers are not connected and there is no pulse from seat/stroke sensor – avoids accidental flattening of batteries.
- Stroke rate displayed to 0.1 strokes per minute.
- Storage of detailed data (Microrecord) on over 2,000 strokes. This can be transferred to and analysed on a PC
- Automatic retention of volume setting when turned off/on.
- Large versatile 2 x 16 digit alpha numeric display with backlight. Backlight can be turned on/off.

- Integrated stop watch/timer.
- Metronome function provides audible pulse at preset rate.
- Short circuit protection of speaker output
- Easy replacement of rechargeable batteries.
- **Coxmate** harness accommodates up to 4 speakers – providing even sound level through boat, and enabling cox to communicate with crew but not the competing crew alongside.
- The **Coxmate** SCT is supplied with a magnetic mounting plate. This is permanently mounted in boat. The cox only has to 'drop' the SRT unit into place – no electrical connectors used.

In addition to the **Coxmate SC** control box features detailed above, the cable harness has also been improved:

- All connectors are fitted with strain relief to protect against damage during connection/disconnection.
- All cables are double insulated to provide additional mechanical protection.
- All copper wires are tinned to reduce corrosion.
- All connectors are fitted with visual markers to assist in aligning of two halves during connection.
- The connectors which are left disconnected, eg the section connector, are fitted with protection caps.

2. Components

The **Coxmate SCT** system comprises a number of components :

- **Coxmate SCT-Kit**. Includes microphone, manual, charger, carry case, mounting plate, and silicone grease.

The following components are supplied separately:

- **SCPCoxmateSC** analysis software with PC link for connection to PC. This includes a USB converter. Link can be connected to PC's serial or USB port.
- **Cable harness** for four(**CH4-SR/SC-Kit**) or eight(**CH8-SR/SC-Kit**). Kit includes seat sensor.
- **Coxmate SC-XP Speed Sensor Kit with impeller speed sensing**. There are 3 versions SC-XP-2m, SC-XP-7m and SC-XP-14m. These have different cable lengths and are for bow coxed four, stern coxed four and eight, respectively.
- **Coxmate SC-GPS Speed Sensor Kit with GPS speed sensing**.

3. Operation

This section will cover the following topics:

- 3.1 Charging/Battery Management**
- 3.2 Power On/Off**
- 3.3 Speed Sensor**
- 3.4 Display and Menu Selection**
 - 3.4.1 Battery**
 - 3.4.2 Backlight**
 - 3.4.3 Volume**
 - 3.4.4 Status and Timer/Stopwatch**
 - 3.4.5 Radio**
 - 3.4.6 Recall**
 - 3.4.7 Metronome**
 - 3.4.8 Calibrate**
 - 3.4.9 Memory(Connect to PC)**

3.1 Charging and Battery Management

To maximize battery life, it is recommended that the battery be fully charged and discharged for its first two cycles. To charge the unit, connect the Coxmate charger to the small jack socket on side of control box. It will take around 10 hours for a full charge. Once charged, the charge current will be reduced to a trickle. The unit can be left permanently connected to charger without degrading batteries. Even if unit is **Off**, batteries will slowly discharge. It will take 2-3 weeks to fully discharge. The battery monitoring system provides a number of functions:

- Monitors and displays charge level
- Controls charging regime, to maximize battery life
- Provides warning if battery charge falls below 10% and 5%. It will also provide warning if charge is below 15% when unit is turned on
- Turns backlight off if battery level is below 10% - to preserve battery.

In normal operation the SCT will run for approx 10 hours without backlight and approx 7 hours with backlight. If a GPS speed sensor is used these runtimes will be reduced to 7 and 5 hours respectively.

Over time it is possible for the battery % figure to accumulate an error. To reset reading, it is necessary to fully discharge batteries. A special function is included to facilitate this – it has to override the automatic powerdown – see section **3.4.1**. Once this is initiated, system will stay on until batteries are fully discharged. The battery % value will then be reset to zero.

If unit is left unused for long periods, to maintain batteries in good condition, it is important to charge it periodically ~every 2months.

3.2 Power ON/OFF

ON: The power is turned on to the unit by pressing and holding down the **[Menu]** key until display turns on. This key has an adjacent marking **[On/Off]** indicating this function. On power up the system will display “Welcome to Coxmate” for 1 second then “Firmware VX.XX, 15th Nov 04 14:19hr” for 2 seconds, and then default to **status display** described in section **3.3.4**, .

If as GPS speed sensor is connected, unit will display ‘Connect to GPS.. Connecting...’. This indicates the unit is establishing communications with the GPS. Once the GPS has fixed on enough satellites this display will disappear. The led light on the GPS will also flash until GPS has connected to satellites. Once it has fixed on satellites, light will go steady.

OFF: The unit is turned OFF either by holding the **[Menu]** key down for 2 seconds, or, no seat/stroke sensor pulse or keystroke is received for 5 minutes.

If the unit is being charged it will display ‘**Charging**’ and ‘**Battery %**’.

Speed Sensor

Both impeller and GPS based speed sensors are available. They each have advantages, and the selection will depend on individual rowing locations and coaching preferences.

A summary of the relative benefits:

- GPS requires no calibration, and is not affected by weed or any other water conditions. It is not vulnerable to damage when boat shell hits submerged objects. It is very simple to install. GPS measures land speed, and is not ideal in moving water.
- Impeller measures speed through water. This makes it more suitable for moving water. It measures speed every few milliseconds, making it suitable for studying stroke speed profile, providing speed ratio and a more qualitative of rowing technique.

The impeller speed sensor comprises a small impeller attached to the bottom of the shell with double sided tape, and an electronic pick up, mounted inside the shell. The electronic pick up stores the calibration data for speed sensor. This pick up would normally reside in the boat. This means different **SCT** units can be used in the same boat, without the need to recalibrate speed sensor. The speed information is transmitted back to **SCT** unit. Details of installation and operation are covered in Section 4. The speed sensor is supplied with a nominal calibration. To provide a greater accuracy it is recommended the sensor be calibrated in the boat –see section 3.4.8.

The GPS speed sensor mounts on small metal plate behind cox. It requires no calibration.

Display and Menu Selection

Display Summary – Menu

▲ ▼ to scroll
through menu

-
1. Battery
▲ ▼
 2. Backlight
▲ ▼
 3. Pace Set Up
▲ ▼
 4. Status DEFAULT SCREEN
▲ ▼
 5. Radio Set Up
▲ ▼
 6. Recall
▲ ▼
 7. Metronome
▲ ▼
 8. Calibrate
▲ ▼
 9. Memory(Connection to PC)
▲ ▼
 10. Set Up

The default on **POWER UP** is the **status display** as shown in Display 4.1 This display is the one the cox would use in normal operation of the unit.

If the **[Menu]** key is pressed, the display will show:

Display 4.0

M	E	N	U					1	3	:	0	5	:	4	5
4	.	S	T	A	T	U	S								

The **[▲]** and **[▼]** keys will scroll through the menu options – as shown in section 3.4. If the **[Menu]** key is pressed repeatedly the display will return to the **status display** (Display 4.3). The 13:05:45(hour:min:sec) is the current time. This time alternates with the date.

Each of the menu options will now be described:-

3.4.1 Battery

Display 1.0

M	E	N	U					1	3	:	0	5	:	4	5
1		B	A	T	T	E	R	Y					X	X	%

Note: 'XX %' shows how much charge is in batteries.

[Ent] is held down for 4 seconds

Display 1.1

↓

B	A	T	T	E	R	Y									
D	I	S	C	H	A	R	G	I	N	G			X	X	%

The unit will stay **ON** with backlight on until battery is fully discharged. This process can not be operated with the battery charger being connected. The discharging will stop if unit is turned **[Off]**.

3.4.2 Backlight

Display 2.0

M	E	N	U				2	4	-	N	O	V	-	0	4	
2		B	A	C	K	L	I	G	H	T				O	F	F



[Ent]

'OFF' is current status



Display 2.1

B	A	C	K	L	I	G	H	T		X	X			O	F	F
+		0	N								-			O	F	F



[Menu]

[Ent]



[▲] and [▼] buttons will turn backlight
ON and **OFF**.

:

Display 2.2

C	O	N	T	R	A	S	T			X	X						
+		U	P								-			D	O	W	N

[Ent] or [Menu]

XX is the contrast value for display. [▲] and [▼] buttons will adjust value

Note: If the backlight is set to '**OFF**', then it will still come on when a key is pressed, but will turn '**OFF**' 20 seconds after last key is pressed. The **Backlight** will default to **OFF** on power up. Backlight will turn **OFF** if battery level is below 10%.

3.4.3 Pace Boat

Display 3.0

M	E	N	U					X	:	X	X	/	5	0	0
3		P	A	C	E		B	O	A	T				O	N

↓
 'ON' is status of Pace Boat. X:XX/500 is the speed setting for the Pace Boat in time per 500 metres. It will display as X.XXm/s if unit has metres per second set for speed display.

[Ent]



Display 3.1

P	a	c	e	S	e	t		X	:	X	X	/	5	0	0
+		U	P						-			D	O	W	N

Note: 'X:XX' is set speed for Pace Boat, and will flash. /500 is speed units. If m/s selected m/s will be displayed.

[▲] and [▼] buttons will adjust value.

[Menu]

↓
 To Display 3.0

[Ent]



Display 3.1

P	A	C	E		B	O	A	T						O	N
+		O	N						-			O	F	F	

'ON' is current status. [▲] and [▼]
 turn Pace Boat On and OFF

[Ent] or [Menu]



To Display 3.0

3.4.4 Status

Display 4.0

M	E	N	U				2	4	-	N	O	V	-	0	4
4		S	T	A	T	U	S								

↓
[Ent] or on **POWER UP**
 ↓

Display 4.1

STROKES/MIN				SPEED				AVERAGE RATIO				SPEED COUNT			
X	X	.	X	X	:	X	X	X	X			X	X	X	X
X	X	:	X	X	X	X	.	X	X	X	X	X	X	X	R
TIME				COVER				DISTANCE				REC			

Notes:

- **Display 4.1** is the default display, i.e. it comes up on power up, or repeated pushing of **[Menu]** key.
- The 'TIME' displays stop watch value. When the timer is running, the time is displayed in seconds. When the timer is stopped the time is displayed to 0.1 second. The **start**, **stop** and **lap/reset** operate in the same way as a conventional stop watch. The **stroke count** and **distance** displays are reset and run at the same time as the timer. The start of the stopwatch requires either two presses of the **start** button, or one press of the **start** button and a pulse from the **seat/stroke** sensor. When the **start** button has been pressed once, '**SET**' will be displayed. This reverts to time once timer starts running. When the **LAP** is on, '**LAP**' will be displayed adjacent to time, in place of **Cover**. When **Timer/Counter** is '**SET**', ready to start, **Strokes/min**, **Ratio**, **Count**, **Speed**, **Cover** and **Distance** displays will be blank. The **RECORD** functions operate whenever the timer is running and an '**R**' is displayed in bottom right of display. The '**R**' will change to a flashing '**F**' if memory is full, and recording will stop. The menu system can not be entered whilst the timer is running.
- **RECORD:** There are two **RECORD** functions. The first records rating and time intervals -section 3.4.6 explains how this operates and how data can be recalled. This stores limited data on rating and timer intervals. Data will be stored, and is only overwritten if timer is restarted after having been **reset**. The second is the **MICRORECORD**. This records boat speed approximately every 25 milliseconds. Approx one hour of data can be stored. This data can only be accessed through a PC, using **Coxmate PC Link** and **Coxmate Analysis Software**. This software enables rowing records to be annotated eg with crew list and weather conditions. The **SC** also has a real time clock, so all records are time and date stamped. The software enables the rowing data to be graphed and compared. Rating, cover, speed ratio and speed can be graphed against distance time or stroke count. The fine time resolution means the velocity profile from individual strokes can be analysed, and a number of strokes overlayed on same graph. Alternatively the same variables can be displayed over 2000 metres or more. More detail is available from www.coxmate.com.au. If the **Timer** is running and no stroke is sensed for 30 seconds, the '**RECORD**' will be suspended – as if **stop** button had been pressed. If **start** button is pressed **Timer** and '**RECORD**' will resume.
- **Cover** (distance travelled in a single stroke) will be displayed to two decimal places, i.e. X.XX m if **timer** value is less than 10 minutes. If time exceeds 10 minutes, cover will be displayed to one decimal place i.e. XX.X. **Cover** is updated every stroke.

- Display will show volume level if either [▲] or [▼] is pressed- this enables volume to be adjusted. Display will revert to Display 4.1 after 2 seconds from last adjustment.
- [Ent] key will mute audio when display is on **status** screen .
- **RATIO** is the % speed ratio during a stroke - the minimum velocity divided by the maximum velocity multiplied by 100. It is updated every stroke,. Even if timer is not running..
- **SPEED** is displayed in either metres per second (m/s) or time per 500 metres (mm:ss). The user can select their preference when the **SC** is connected to PC. The speed reading is updated each stroke and is the average speed of the stroke. If there is no seat sensor pulse for 12 seconds, speed will be updated, and thereafter every 12 seconds until seat sensor pulse is received.
- The **ratio** and **stroke count** display can be replaced with **average speed**. This is the average speed since the **timer** was started. The display will show eg '4.32.2' – if speed is selected to metres per second, or '1:53.4' if speed selected to time/500m. This display can be toggled between **ratio** and **stroke count** and **average speed** by pushing the **start** button when the timer is running. The default display state for either **ratio** and **stroke count**, or, **average speed** can be selected in PC.
- **Splits:** The **SC** can have a split distance (none, 50,100,200,250,500 or 1000 metres) programmed – when it is connected to PC. If this distance was set to 500 metres, then when each 500 metre interval had been completed, the display would flash '**split**' in place of cover. The **rating**, **ratio** and **speed** would then display the average value for the 500 metres. The '**split**' details will be displayed for 10 seconds, or until **start** button is pressed. The split distance can be set via PC or through Menu system, '10 Set Up'
- **PACE BOAT:** If Pace Boat is on, then when timer is ready to run it will display 'SET' and 'PACE' in place of 'TIME' and 'COVER' respectively. Once timer starts the following display will appear:

STROKES/MIN				SPEED											
X	X	.	X		X	:	X	X		+	X	X	.	X	m
X	X	:	X	X		P	A	C	E		X	X	X	X	R
TIME				COVER				DISTANCE				REC			

The '+XX.Xm' shows the distance boat is ahead (+) or behind (-) the Pace Boat. The display will continue until the timer is stopped.

3.4.5 Radio

The Set Up Menu (Item 10) lets you configure the unit for an internal or external radio – Due to frequency allocations Internal radio versions are only available in Australia. If there is no internal radio, unit will be factory set up for external radio. The following describes set up for internal radio option. If unit is set up for external radio, the only function available will be volume adjustment.

The default states for Internal radio are radio OFF, Volume 50% and Channel 19. The defaults for external radio is 50%volume.

Display 5.0

M	E	N	U					1	3	:	0	5	:	4	5
5		R	A	D	I	O									

↓
[Ent]
↓

Display 5.1

R	A	D	I	O						O	N	/	O	F	F
S	C	R	O	L	L			+		-					

↓ [Ent] [▲] and [▼] will scroll through: [Menu]

ON/OFF * VOLUME
CHANNEL SELECT*

* (only when selected to SC-R on PC software)

If ON/OFF selected from scrolling on Display 5.1

Display 5.2

R	A	D	I	O									O	F	F
+		O	N							-			O	F	F

OFF shows the status of RADIO.
are used to turn it ON and OFF.
[Menu] or [Ent]

[▲] and [▼]

↓
↓
To Display 5.1

If **CHANNEL SELECT** selected from scrolling on Display 5.1

Display5.3

R	A	D	I	O		C	H	A	N	N	E	L		X	X
S	E	L	E	C	T			+			-				

Channels 1 through to 40 are available.
A channel with minimum voice traffic on it should be selected. This channel must be synchronised with coach's radio.
'**XX**' shows the selected channel. A default channel can be set from PC.

↓
[Menu] or [Ent]



To Display 5.1

If **VOLUME** is selected from scrolling on Display5.1

Display5.4

R	A	D	I	O		V	O	L	U	M	E		X	X	%
+		U	P							-		D	O	W	N

'**XX**' shows the volume setting.



[Menu] or [Ent]



To Display 5.1

Note: If external radio is used, ON/OFF and Channel selection are not required and are not available.

3.4.6 Recall

The **Recall** function is a similar way as the **SR** model. The SR can only store one record, but the SC can store up to eight. The volume of data stored in this function is limited, but can be accessed without connecting unit to a PC. The **MICORECORD** data can only be accessed via a PC.

Display 6.0

M	E	N	U					1	3	:	0	5	:	4	5
5		R	E	C	A	L	L								

[Ent]

Display 6.1

R	E	C	O	R	D			N	O		0	1				
+		N	E	W	E	R					-	O	L	D	E	R

[Ent]

Up to 12 records can be stored.
Recovering the data to display will take a few seconds.

[Menu]

R	E	C	A	L	L						R	A	T	I	N	G
+		R	T	N	G						-			I	N	T

[Ent]

The ▲(+) and ▼(-) keys enable **RATING** or **INTERVAL** details to be selected. The one selected eg **RATING** in above sample will be displayed on top line. Display 6.2 shows **RATING** and Display 6.3 shows **INTERVAL**

[Menu]

Display 6.2

R	A	T	I	N	G		X	X	.	X		F	R	O	M
Y	Y	:	Y	Y		t	O		Z	Z	:	Z	Z		

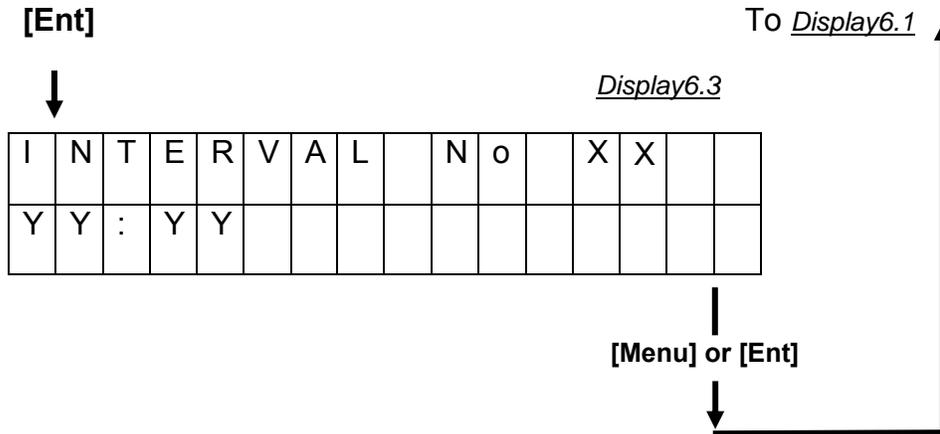
Note: This **recall** feature should not be confused with the **RECORD** function. The recall always stores rating for the last period the **timer** run. This feature is the same as that available on **SR** model:

[Menu] or [Ent]

The first display for **RATING** recall is the average rating (XX.X) over the total time period (ZZ:ZZ). The start time (YY:YY) will be zero. If the ▼ button is repeatedly pressed the display will then step through and display the rating for each recorded period. The first four

periods are 15 seconds, and subsequent ones are 30 seconds. For the first 15 second interval, Y:YY will be 0:00 and Z:ZZ will be 0:15; X:XX will be the average rating over this period. The second would be 0:16 for Y:YY and 0:30 for Z:ZZ. The maximum number of intervals is 80, the last being 38:30 for Y:YY and 39:00 for Z:ZZ.. The ▲ and ▼ keys will scroll through these intervals. It is unlikely the last interval will be the full 15 or 30 seconds. In this case the actual time value will be displayed. The RECALL recording function always operates when the timer is operating. The recalled information is only cleared when the record becomes the oldest i.e. more than eight. The eighth record will be cleared when timer is next started. All data is kept, even if unit is powered down. The RECALL function can only be accessed once timer has been stopped.

From Display 6.1 if **INTERVAL** is selected:



Each time the **LAP** is initiated when the timer is on, the unit will record the time interval which has elapsed since the last time the **LAP** was initiated. Up to 20 elapsed interval times can then be recalled as shown above. The ▼ and ▲ buttons can be used to scroll through the recorded times. Interval No1 is the time between the timer starting and the first time the **LAP** is pressed. If the cox wanted to record the times for the eight 250 metre segments of a 2000 metre, then he would press **LAP** at the end of each of the 250 metre segments. When the **LAP** is pressed the time display will freeze. To release this freeze, the cox must push the **LAP** a second time. It is only the initiating of the **LAP** which will define the start and end of the timed interval.

3.4.7 Metronome

Display 7.0

M	E	N	U					1	3	:	0	5	:	4	5
5		M	E	T	R	O	N	O	M	E					

↓
[Ent]

Display 7.1

M	E	T	R	O	N	O	M	E		X	X		O	F	F	
▲		U	P							▼			D	O	W	N

↓ Note: [▲] and [▼] adjust the rate – in pulses per minute. 'XX' will flash.

[Ent]

Display 7.2

M	E	T	R	O	N	O	M	E		X	X		O	F	F
+		O	N							-			O	F	F

↓
[Ent] or [Menu]

Note: 'OFF' on top line indicates status of the Metronome. This status will flash. ▲ and ▼ turn metronome ON and OFF.

The volume of the metronome pulse is deliberately kept low, and is unaffected by volume control.

3.4.8 Calibrate

This process is not required for GPS speed sensor.

Whilst the impeller **speed sensor** is provided with a nominal calibration, this will be affected by hull shape, and location on the boat. To achieve a high degree of accuracy, it is necessary to perform an 'in boat' calibration. The **Coxmate speed sensor** is an intelligent device and once calibrated, will remember the value. This means that this calibration information stays with the sensor in the boat. If a different SC unit is used, no recalibration will be required.

The calibration requires the boat to be rowed over a known *Measured Distance*, eg 1000 metres. It is better if a running start is used i.e. the boat is at speed as it starts the 1000 metres. It is also recommended that the boat be rowed at a reasonable pace i.e. at least firm pressure. The cox starts the **timer** as he/she starts the 1000 metres, and stops the **timer** as he/she reaches the 1000 metre mark.

If there is a current in the water, then it is recommended the calibration be conducted in both directions over the same stretch of water. This will minimise any error caused by the current. The timer can be stopped after 500 metres and restarted (without **resetting**) for the second 500 metres. Provided the *Measured Distance* is 1000 metres, be it a single stretch of 1000 metres or two at 500 metres, then the calibration can be updated by using the **AUTO CALIBRATION** detailed on the next page - [Display 8.1 and 8.2](#). In this case the **timer** must **not** be used or reset until calibration has been completed.

If the *Measured Distance* is not 1000 metres then the new **calibration constant** has to be calculated and entered manually.

In theory any distance could be used for the *Measured Distance*. However between 200 and 2000 metres is recommended. The following example demonstrates how the new **calibration constant** is calculated:

If the *Measured Distance* was 500 and the *Distance Recorded* as shown on display was 530 metres. The actual and the recorded distance are then used to determine the adjustment required to the **calibration constant (K)**.

$$\text{New calibration constant, K} = \frac{(\text{Old K value}) \times (\text{Measured Distance})}{(\text{Distance Recorded on STATUS display})}$$

In the above example, if the Old **K** value was 1.004, then the New **K** value is calculated as follows:-

$$\begin{aligned} \text{New K value} &= \frac{1.004 \times 500}{530} \\ &= 0.9472 \end{aligned}$$

This new **K** value can then be entered into the **COXMATE SR** unit as described in following page, [Display 8.4](#). If the value is obviously way out of range, it will not be accepted.

Display 8.0

M	E	N	U				1	3	:	0	5	:	4	5
1	0		C	A	L	I	B	R	A	T	E			

↓
[Ent]

Display 8.1

C	A	L	I	B	R	A	T	I	O	N		A	U	T	O
+		A	U	T	O				-		M	A	N		

↓
[Ent]

[Menu] To Display 8.0

Display 8.2

N	E	W					K	=	X	.	X	X	X	X	
E	n	t		T	O				C	O	N	F	I	R	M

If [Ent] is pressed, K is updated.
If [Menu] is pressed, K update is aborted.
Display will display either 'K UPDATED'
or 'K NOT CHANGED' for 1 second.

[Menu] or [Ent]

For the **AUTO CALIBRATE** to be used, the boat must have been rowed and timed over 1000metres.

If there is no distance recorded, 'NO DISTANCE RECORDED' will be displayed. If distance is out of range, 'DISTANCE OUT OF RANGE' will be displayed.

If **MANUAL CALIBRATE** selected on Display 8.1

Display 8.4

K					=	X	.	X	X	X	X				
+		-		T	O		A	D	J	U	S	T			

[▲] and [▼] are used to increase/decrease span value
If [Ent] is pressed, K is updated with new value.

If [Menu] is pressed, K update is aborted.
Display will display either 'K UPDATED' or 'K NOT CHANGED' for 1 second.

[Menu] or [Ent]

To Display 8.1

The adjustment speed of the **K** value will increase if the **[▲]** and **[▼]** buttons are held down.

3.4.9 Memory/Computer Link This selection provides information on how much memory is available, The ability to clear memory and the setting up of SC for connection to a PC.

Display 9.0

M	E	N	U					1	3	:	0	5	:	4	5
9		M	E	M	O	R	Y								

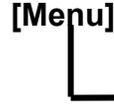


Display 9.1

M	E	M	O	R	Y			P	C		C	O	N	N	
S	C	R	O	L	L			+			-				



[▲] and **[▼]** will scroll through:
CONNECT - enables connection to PC
CLEAR - clears memory
AVAIL - shows memory available

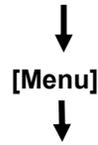


The last two options are self explanatory and require no further explanation.

If the **CONNECT function** is selected, then the following will be displayed:

Display 9.2

M	E	M	O	R	Y			A	V	A	I	L		5	0	%
S	C	R	O	L	L			+			-					



To *Display 9.0*

Note: display will automatically go to *Display 9.3* when unit detects it is connected to computer

Display 9.3

M	E	N	U				1	3	:	0	5	:	4	5
W	A	I	T	I	N	G	F	O	R	P	C			

The message will change to **PC Connected**, when the SC and the PC establish communications. If the SC memory is instructed to be cleared by PC, then there will be a message **Clearing memory**, whilst this is occurring. This will take around 30 seconds.



To Display 9.0

3.4.10 Set Up

This selection enables various functions eg speed units and date to be selected or entered. If you have the PLink kit, most of these set up functions can also be performed on PC.

Display 10.0

M	E	N	U				1	3	:	0	5	:	4	5
1	0	.	S	E	T	U	P							



[Ent]



Display 10.1

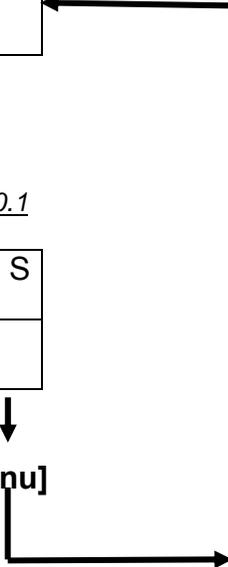
S	E	T	U	P	S	P	D	U	N	I	T	S
S	C	R	O	L	L	+	-					



[Ent]



[Menu]



[▲] and [▼] will scroll through:

- SPD UNITS –the selection of units speed is displayed in, either X.XX m/s or X:XX time per 500m. Factory default is time per 500m.
- Display – The default display. Either Speed Ratio and Stroke Count, or Average Speed since timer started. If timer is not running, display will revert to Speed Ratio and Stroke Count. Cox can toggle between two options by pressing [Start] button, when timer is running. Factory default is Average Speed. Speed Ratio will not be displayed if GPS speed sensor fitted.

- Split Distance. If a split distance eg 500m is set, display will show “SPLIT” and time taken for split distance, average Rating and Speed see section 3.4.4. Split distance can be set to none, 50,100,200,250,500 or 1000 metres. The factory default is ‘None’
- Selection of either GPS or Impeller speed sensor.
- External or Internal radio. This will be set in factory, depending on whether an internal radio is fitted or not. If no radio is being used unit will still be set to external.
- Date and time setting.

4.0 Installation

There are up to five components which require permanent installation into the boat; The **speakers**, the **cable harness**, the **seat/stroke sensor**, the **speed sensor and the magnetic mounting base**. The **control box** and **microphone** are only installed when the boat is in use. Normally the cox will take the **control box** and **microphone** into the boat when they are going for a row.

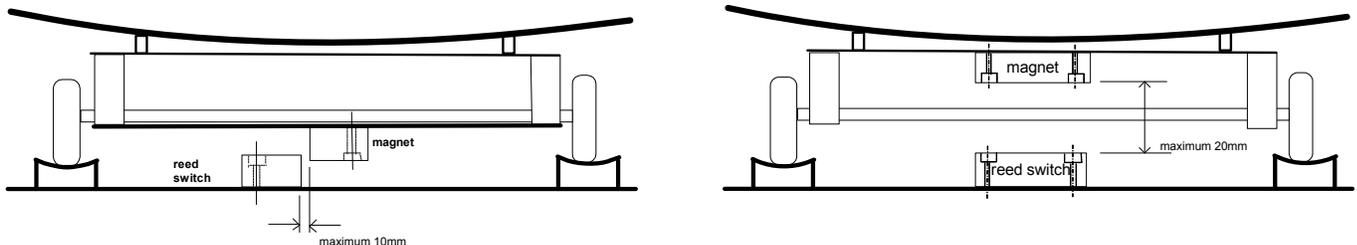
4.1 Speakers and Harness

The speakers are mounted under or near bow, 3, 5 and 7 in an eight, and bow and 3 in a four. The **speakers** are fitted with screws or double sided tape. Two stainless steel screws with nuts and washers and double sided tape(in recent shipments) are provided for this purpose. If surfaces are suitable it is easier to fix **speakers** using the double sided tape. If using tape ensure surfaces are clean and dry. A gentle abrasion of surfaces will help adhesion. Self adhesive cable clips are provided with speakers for retaining cables.

The **speakers** connect together via the rubber 2 pin connectors. To minimize any corrosion, especially in salt water applications, it is important that both the rubber and metal parts of the mating surfaces have a light coating of silicon grease applied. The four pin rubber connector is permanently connected to the magnetic base. These permanently made connectors should be greased once a year. Any connectors used more regularly, eg the section connector for eights, should be greased monthly.

4.2 Stroke/Seat Sensor

This has two components, a **magnet** and a **reed switch** (the one with the wires connected). The **magnet** mounts under the seat of stroke or bow, and the **reed switch** mounts on the frame/platform under the seat, such that the magnet passes over the **reed switch** every stroke. The **reed switch** should be positioned at approximately the mid point of the seat slide. The **magnet** should pass directly over the **reed switch** if mounted as shown in the first option below. Each of the two components has two holes, and can be fitted with two screws or double sided tape. The following sketches show two options for the orientation of the reed switch and magnet. The exact arrangement will depend on the structure of seat and slide.



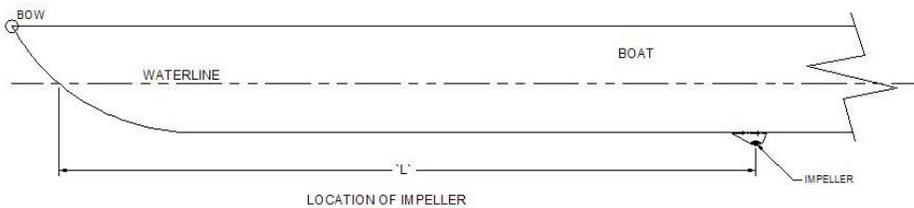
Schematics Showing two Mounting Arrangements of Seat/Stroke sensor

4.3 Speed Sensor

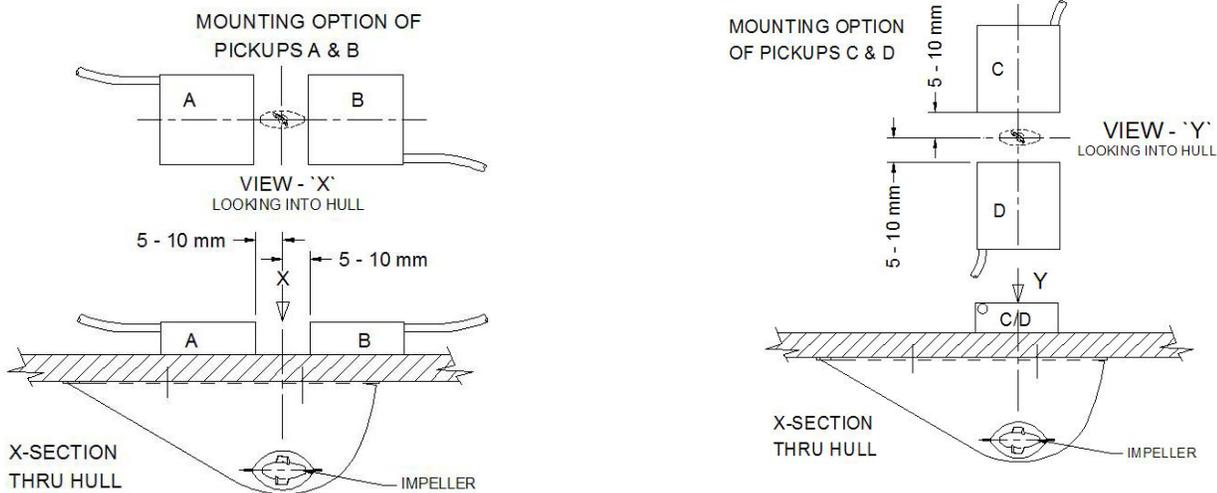
There are two options for speed sensing; Impeller and GPS:

Impeller:

The speed sensor comprises a small magnetic impeller which mounts to the outside of the shell, and an electronics pick up/conditioning unit to transmit speed signal to **SC** control unit. The conditioning unit can also be used with the Nielsen Kellerman impeller unit supplied with Speed Coach™ unit – however this would require a different calibration constant, and would have to be calibrated. The nominal calibration figure supplied with sensor, assumes it is mounted 2.0 metres from the bow at the waterline (L=2m). However as this is only a nominal calibration, it is not critical, provided 'in boat' calibration is performed. It is important to mount the speed sensor as far forward as possible. As the sensor gets further from the bow, so does the degree of turbulent noise. This noise appears on the instantaneous speed curve, and reduces its value for analysis. Practical access restrictions may limit how close to bow sensor is mounted. If access was not a problem then a distance less than the 2 metres eg 1 - 1.5 metres would be preferable.



The mounting of the speed sensor impeller and pick up is shown in following diagram.



Four mounting arrangements, A,B, C and D are shown. To assist in positioning the sensor in respect to the impeller, a magnet may be helpful – place magnet eg stroke sensor magnet, on inside of hull and determine position on outside of hull with a small piece of magnetic material eg a paperclip. The location of the pick up is relatively tolerant. However the alignment of the impeller fin is critical – it must be in line with the hull. It is helpful to use a long straight edge or a piece of string to align fin. It is generally recommended for the fin to be mounted at or near the centreline of the hull. The fin is normally affixed with double sided tape. If you are using the tape, carefully mark intended position of fin on hull with a pencil. It is important to position fin correctly first time -once backing tape is removed from fin, and it is stuck to boat, it is difficult to reposition it. The fin has two holes in it, so it can also be fitted with 2 x 3mm screws. The advantage of using screws is it makes it easy to remove and refit fin. Some boatbuilders are looking at providing the threads built into the hull for this purpose. When double sided tape is used

for affixing fin, the hull must be clean and dry. If the unit is removed from boat, then apply a steady force, to ease fin off. Wrenching it off without care may result in damage to the gel coat or paint finish.

The impeller spins within an enclosed 316 stainless steel fin. This fin provides mechanical protection for the impeller. The impeller is fitted with brass bushes, so it is less affected by spinning at speed if boat is being towed. However for long distances it is recommended to tape impeller to stop it spinning. The impeller and fin should be kept clear of weed or other foreign material. The fin may generate some audible noise. This is not of concern. The pick up is connected to the SC via a 4 pin waterproof connector. The mounting of pick up is shown in diagram. It is supplied with double sided tape. The inside of boats is sometimes difficult to stick due to residual materials. It is important for the surface to be thoroughly cleaned. It may need a slight abrading to remove foreign materials and ensure a clean surface. An alcohol swab is provided to assist. If the double sided tape does not work, then duck tape, or standard adhesive sealants can be used. The SC-XP speed sensor cable is available in several lengths, depending on boat type. This cable must be fed through the boat to the cox's position.

GPS:

The GPS unit is supplied with a small stainless steel plate. This plate should be fixed on upwards facing surface of boat, where there is no obstruction above it, eg behind cox on top of stern cover. Ensure mounting point is within the GPS cable length (~2m) from SCT unit. This plate is supplied with double sided tape for affixing. The GPS module has a magnetic base for mounting to plate.

When SCT is first powered up it will take around 1 minute for GPS to fix on satellites. During this time SCT will display 'Connect to GPS.. Connecting...' and GPS led will flash.

5.0 Maintenance and Fault Finding

The only routine maintenance required is **the cleaning of the gold plated magnetic contacts**. These can be cleaned with a rag and methylated spirits. If this is insufficient, then they can be lightly abraded. They are made from gold plated marine grade 316 stainless steel – thus even if gold plating is worn off, it will not effect operation. Smearing silicone grease on contacts will help prevent corrosion. It is a good idea to rinse off any salt water with fresh water. All the harness 2 and 4 pin rubber connectors should be wiped with the silicone grease provided. The grease should be wiped on both the rubber parts of the connector and the metallic pins – the syringe can be used to force the grease into the female pins – this will ensure a clean contact. If there is a section connector which is regularly used, then it should be greased monthly.

If you have an impeller speed sensor, then you should be careful to avoid any physical impact, on or off the water, and it is wise to occasionally check it is well stuck to shell. If it is not, then replace double sided tape – available from Coxmate.

The following is a list of potential problems with suggested actions:

PROBLEM	ACTION
No display on power up	Check unit is charged. If not, charge. Unit will display 'charging' when it is connected to charger this may take a while to appear if the battery is completely flat. If no display check charger either by trying a different charger or measuring the voltage on charger jack plug – should be approx 17VDC in centre referenced to the outside metal surface of the jack plug.
No stroke rate reading	Check magnet and reed switch are fitted and in correct position. Check cable is not damaged and reed switch is plugged in to cable harness. The reed switch can be checked with a multimeter, by measuring across the two pins. These should normally be open circuit except when the magnet is close to reed switch, when the circuit will close.
No audio output	Ascertain if problem with microphone, unit or harness: To check harness and unit, turn it on – it will beep on power up. If this occurs, then fault is with microphone. If there is no beep then plug unit into another harness to determine if fault is in harness or unit. Visually inspect 4 pin rubber connectors, to ensure pins have not been bent, broken or pushed into connector body. If you have a multimeter measure the resistance between the top pair of pins on the 4 pin cable harness connector -should be between 2 and 8 ohms. If microphone is not working, inspect connector.
One or more speakers not working	Check speaker connections, connector in middle of harness for sectionable boats, and connector to control box. Each speaker is 8 ohms impedance. This can be checked with a multimeter.
No 'charge' indication	Check charger connected. There will be a feint hiss if charger is connected – place against ear to hear. If batteries have been left flat for a long period it may take some hours before 'charging' message appears.
Battery will not hold charge	Check battery charger – approx 16VDC in centre referenced to the outside metal surface of the jack plug. If charger OK and batteries are more than two years old, replace batteries. These should be same type as original ones, available from www.coxmate.com.au
Battery charge indication is erratic.	Batteries may be getting old and losing some of their capacity. The capacity can be modified to offset. Please consult service@coxmate.com.au for details.
Unit turns off unexpectedly when battery is charged	The unit is programmed to turn itself off there is no seat sensor signal for 5 minutes – If you don't have seat pulse, then pressing any button on unit will reset 5 minute timer.
No Speed reading Impeller Version	Go to calibration – if unit displays calibration number, then it is communicating with speed pick up. This confirms cable and connectors are OK. The fault is either due to the impeller not working, its being too distant from pick up, or pick up circuit is not working. These can be checked by blowing on impeller to cause it to spin. The easiest way to do this is to start timer, blow on impeller, and see if the distance reading has increased. Remember it will only accumulate distance if the timer is running. If there is no increase in distance, and impeller/sensor are correctly positioned relative to one another, then replace pick up.
No Speed Reading GPS Version:	Check led indicator on GPS unit is on. This led will flash when GPS is looking for satellites, and go steady once it has locked into them. If the light does not go steady, make sure you have clear line of sight to sky.

Due to continuing development, specifications may change without notice.