The Coxmate HC Manual

Version V1.20

Contents:

1. Quick Start

You've got unit installed in boat, and you are ready to go. Press **On** button to turn it on and row! Unit will display rate and speed in time per 500m. If you start the timer – press **start**, and start rowing, timer will start and distance and time will also be displayed. It's that easy. **Stop** and **Reset** buttons will stop and reset timer!
The above assumes unit is configured as supplied. The more complex functions are 'locked' out – to avoid accidently getting into functions you are not familiar with. To 'lock'/ 'unlock' unit, press **Ent** button 5 times when unit is displaying 'Rdy' (Ready) on lower right quarter. In this state, the operating Mode (RUN, PACE, W'KOUT) can not be changed and the only Set Up function available is manual calibration. This is accessed by pressing **Menu** button twice when 'Rdy'.
If you want to do more, read on.

2.Introduction:

The HC is designed to provide clear information on rowing performance for scullers.

Features:

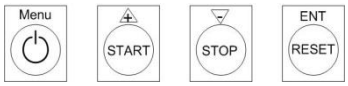
- High contrast display with switchable backlight.
- Integral pick up for Polar Heart Rate monitors – no separate antenna required.
- Uses AAA batteries – Approx 250 hours runtime without backlight and 100 hours with backlight on. Typically this would give one year's operation between battery changes.
- Configurable Feature Display; variables include: Rating, Speed, Average Speed, Distance, Stroke Count, Dist/Stroke, Heart Rate and Ratio(minimum speed/maximum speed for each stroke).
- The HC has a substantial memory for storing data and a real time clock for time/date stamping rowing records. Data can be stored in 'micro mode'(speed recorded every 20mS) or 'macro mode' (details of each stroke recorded). In micro mode up to 4 hours and in macro mode over 60 hours rowing can be recorded. An optional PC link and Analysis Software package is available.
- Includes both PACE boat to race against, and WORKOUT modes. The HC has 6 Workout programmes. Each Workout has up to 60 steps. Speed, Rate and heart rate can be programmed against time or distance. Workout programmes can be edited on HC, but PC Link and Analysis Software make task easier and provide more options – eg infinite number of workout programmes can be stored on PC.
- A second HC unit can be used as a slave to first, enabling data to be displayed to more than one crew member.
- The mounting is compatible with NK Speedcoach ® . The HC can be mounted directly onto an existing NK mounting. If NK impeller is used and HC is set to NK, the existing NK calibration setting can be used.

- System has auxiliary switch input – this can be used to start, stop and reset timer. The switch is waterproof, and can be mounted for foot or leg operation.
- The HC micro impeller is a significant improvement over existing impellers, dramatically reducing drag, susceptibility to damage and weed contamination.
- The HC provides improved accuracy of speed by linearising the signal from impeller. A different linearization curve for the Coxmate Micro and NK impeller is programmed into unit.
- An optional GPS calibrator unit can be purchased – just row 250 metres in a straight line, and HC will automatically calibrate itself.
- Will operate with or without a seat sensor – suitable for kayaks, surf boats, dragon boats etc..

3. Operation:

3.1 The Basics

Inputs: The HC connects, via the mounting bracket, to a speed sensor, a seat sensor and an auxiliary input – a waterproof switch operated by rower's leg/foot.

Buttons: Four buttons 

provide two sets of functions:

- [Menu], [▲], [▼]) and [Ent] for configuring unit
- ON/OFF for power, and [Start], [Stop] and [Reset] for timer control

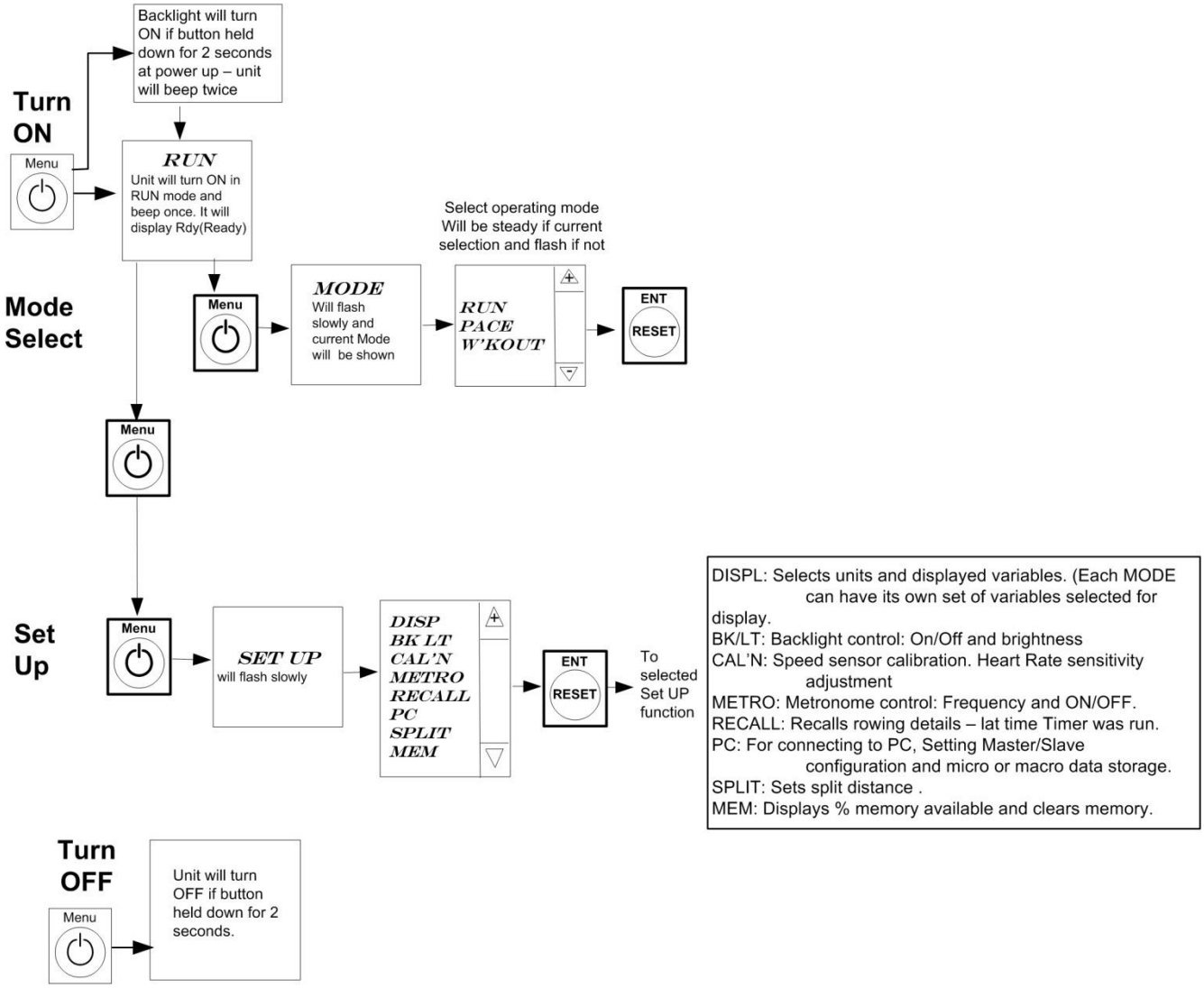
The display:

Feature Display, for displaying selected variable(s). If more than one selected, it will switch between selections each stroke, or every 4 seconds if no stroke.
Display options are shown in table below:

	MODE		
VARIABLE	RUN	PACE	W'KOUT
AV SPD	✓	✓	
STEP			✓ *
♥	✓	✓	✓
RATIO	✓	✓ *	✓
DIST	✓	✓	
DIST/STROKE	✓	✓	✓
STROKES	✓	✓	✓

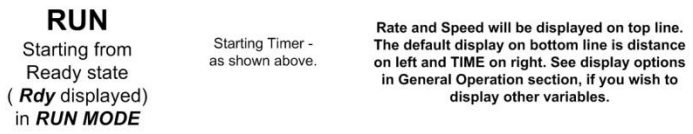
*These selections are mandatory

3.2 Flow Chart:

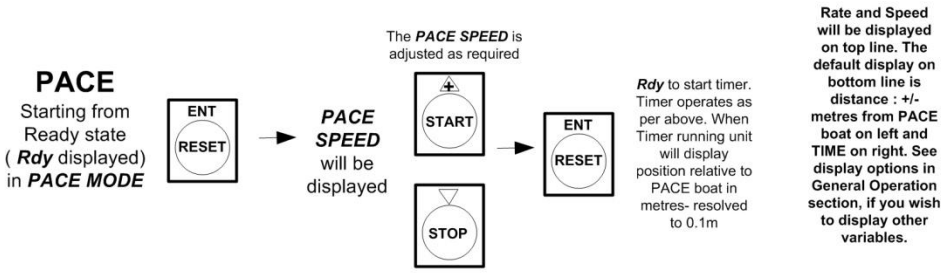


3.3 Operating Modes:

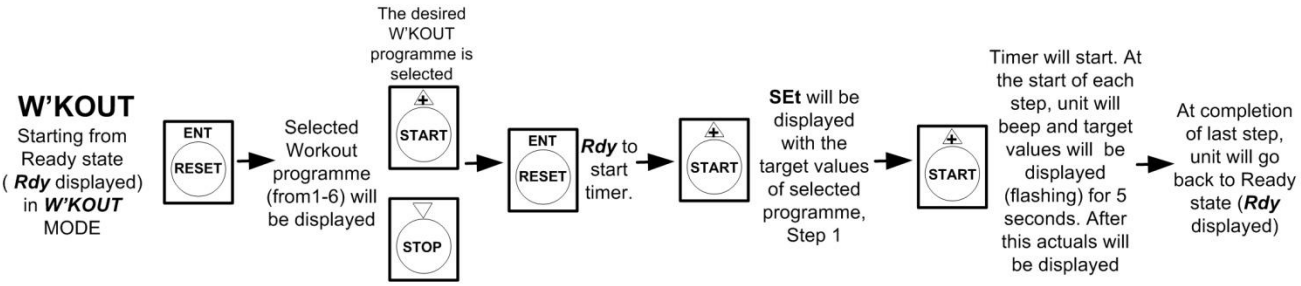
RUN



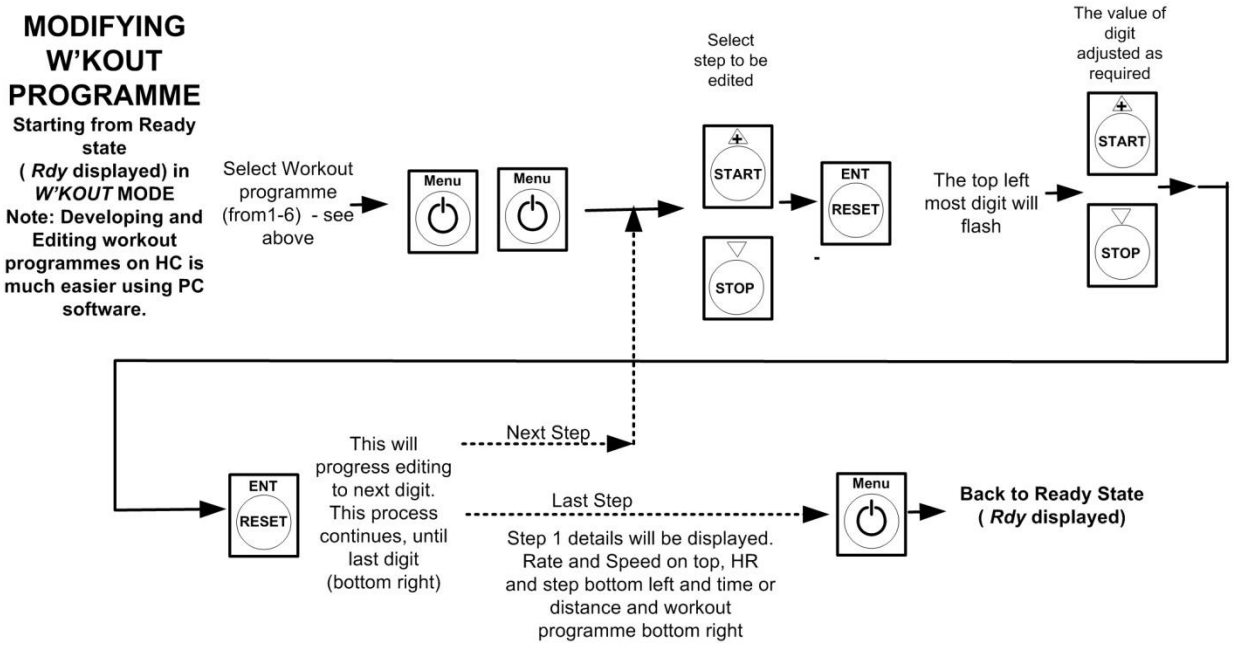
PACE



WORKOUT



Note: If ***Ent*** button pressed during workout, programme will hold, and HOLD will be displayed. Pressing ***Ent*** again will release HOLD. This feature is handy if you have to stop during your workout, eg to make a turn.

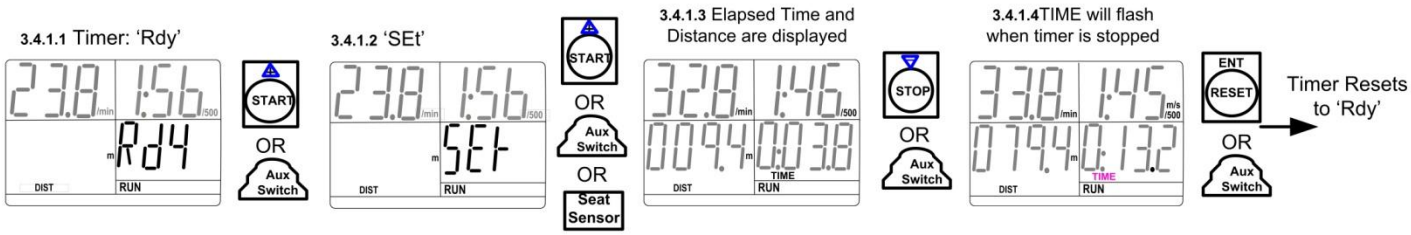


3.4 Examples

Note: The characters on the HC display will be flashed for specific purposes. These are represented by:

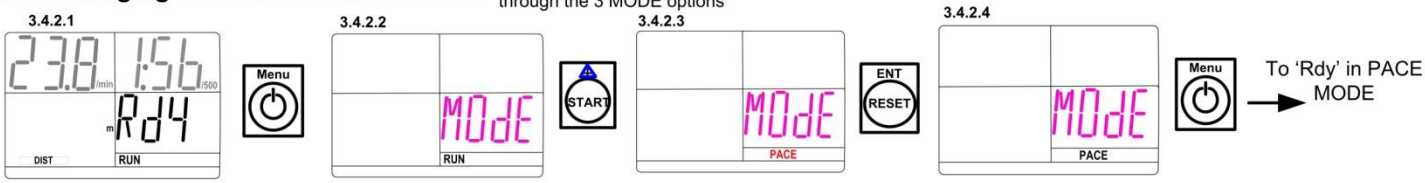
FAST FLASH **SLOW FLASH**

3.4.1 Using Timer: (Unit in RUN MODE, set to display TIME and DISTANCE and READY - 'Rdy')



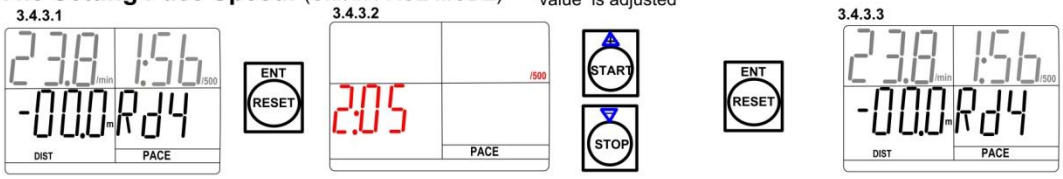
3.4.2 Changing Mode: From RUN to PACE

The '+' and '-' buttons will step through the 3 MODE options



3.4.3 Setting Pace Speed: (Unit in PACE MODE)

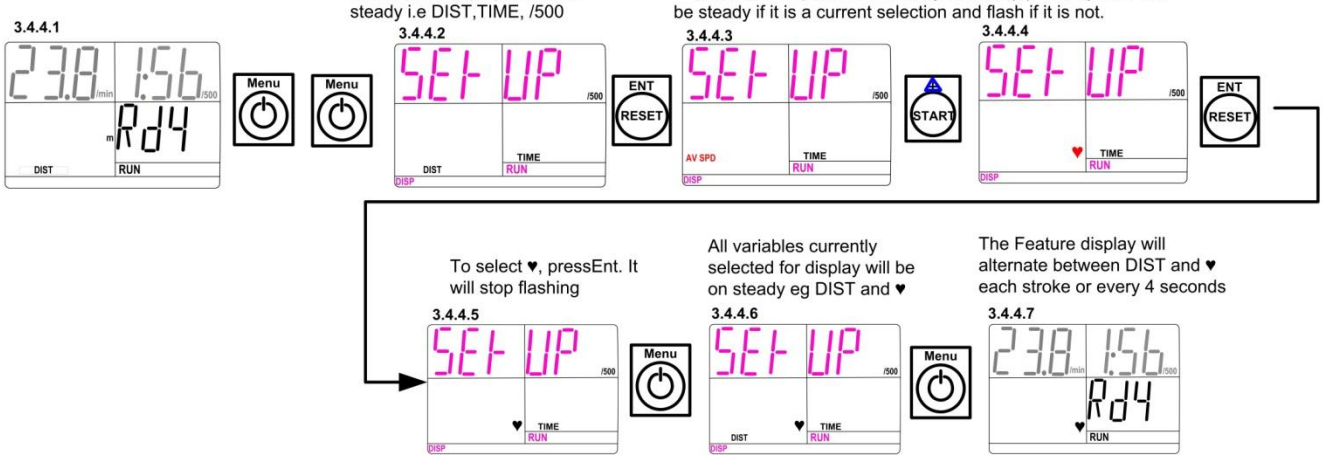
PACE speed value is adjusted



3.4.4 Changing Display variables: Add ♥ to Feature Display(lower left) in RUN MODE

All variables and units currently selected for display will be on steady i.e DIST,TIME, /500

The first of the selection options: AV SPD is shown. Use '+' and '-' buttons to step to the variable you want (♥). The symbol will be steady if it is a current selection and flash if it is not.

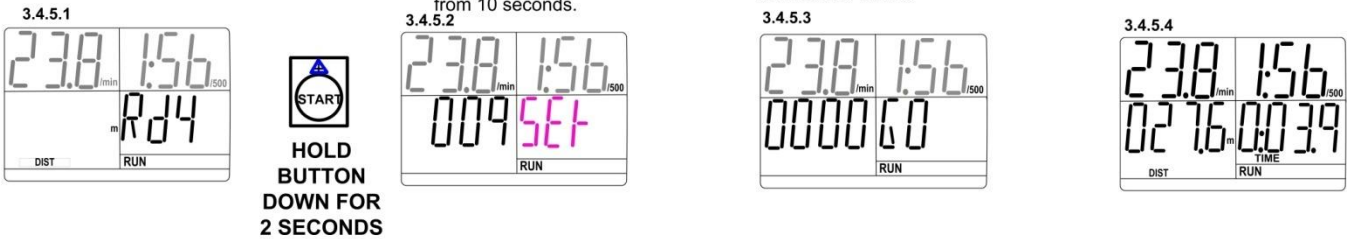


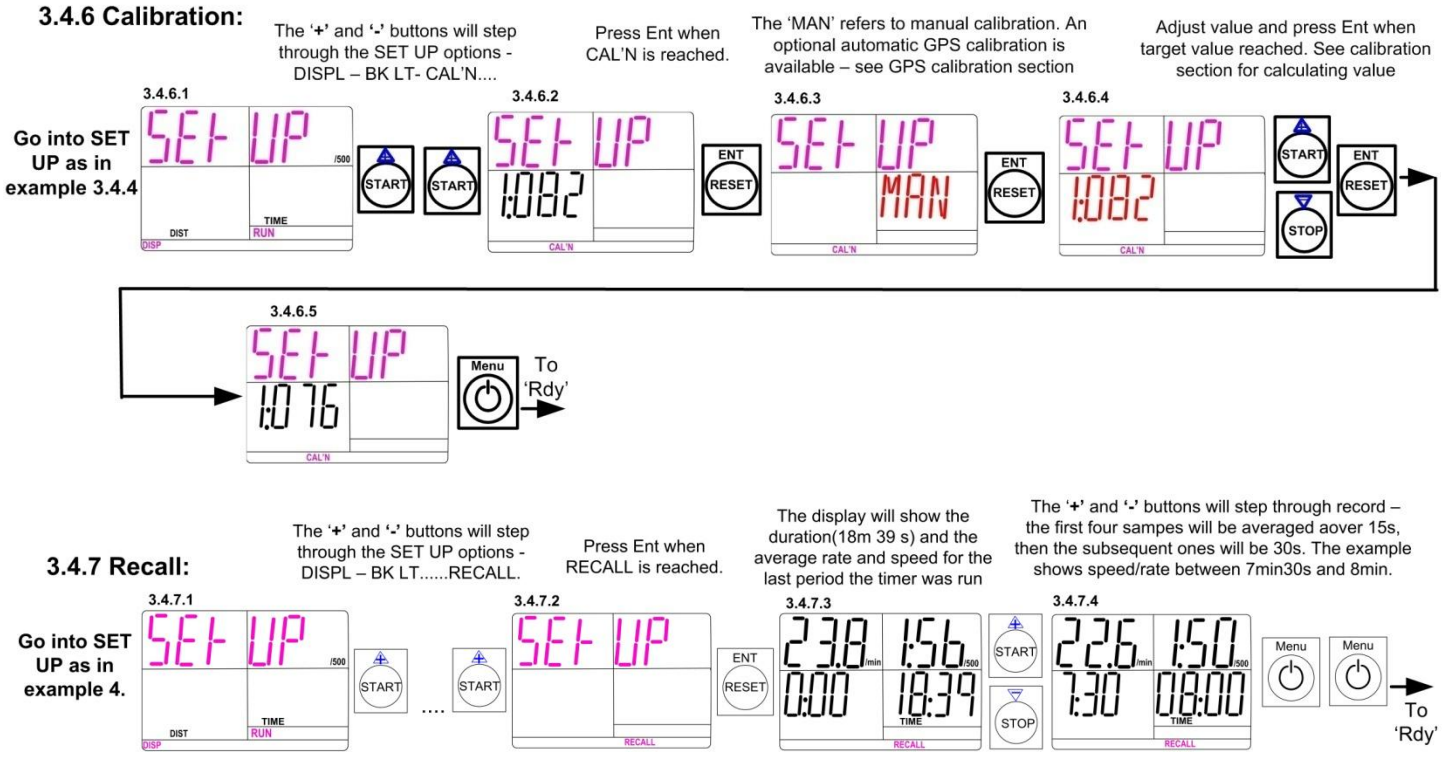
3.4.5. Using Delayed Start for Timer:

HC will 'BEEP' and count down from 10 seconds.

When 10 seconds has elapsed HC will 'BEEP' and briefly display 'GO', before timer starts.

TIMER runs as normal





4. Heart Rate

The unit will display heart rate from either a Polar T31 or T31C or compatible chest strap. The Polar T31C or Sigma brand are preferred as they have a longer range.

The Polar straps produce a very low level signal, and it is easily interfered with by external sources. This is not normally a problem on the water, but may be a problem in a building where there are many electrical devices, and any testing should be done on or near water. The HC has four sensitivity settings, and the system will operate best at the highest sensitivity setting, subject to the noise not causing a problem. If extraneous noise is causing problem, then the sensitivity should be reduced eg go to setting 2 instead of 3. The downside of this is it reduces the range, and it becomes more critical to mount HC closer the rower. The factory setting for sensitivity is 2, this will give a range of ~1100mm for T31C strap. To change sensitivity setting go to **SEt UP** as in above examples. Keep scrolling across options on bottom row (DISP – BL LT – CAL....MEM) and press [▲] once more. It will then display CAL and ♥. Pressing Ent will enable you to change setting.

5. Calibration

Getting Started: If your Coxmate Micro impeller is fitted as per installation instructions, then get on the water and row. The unit will provide speed within a few percent. Fine tuning can be achieved by rowing over a known distance, and adjusting K value as described in Section 2 Example 6. The new K value is determined as follows:

$$\text{New K} = (\text{Old K}) \times \frac{\text{(known distance)}}{\text{(distance recorded on HC)}}$$

An example: Old K= 1.000. You row over 500metres known distance, and the HC registers 480metres.

$$\text{New K} = 1.000 \times \frac{500}{480} = 1.042$$

In Depth:

The Coxmate HC offers significant improvements in accuracy and ease of calibration. When you have mastered the basics above, read on!

To ensure you are getting accurate speed readings, the HC offers a number of special features. The HC unit is supplied with a default K value of 1.000, and configured for a Coxmate Micro impeller – the standard one supplied by Coxmate. If installed as recommended – 3 metres from bow waterline - this will give an accuracy of a few per cent without any in- boat calibration, assuming it is correctly mounted. If an NK impeller is being used, then the HC should be configured for an NK impeller, and the same accuracy will apply. Finer calibration can be achieved by rowing over known distance – see description above, or using an optional Coxmate GPS calibrator. The HC has 3 impeller

selections: Coxmate Micro impeller (**CMt**), NK impeller (**nK**), and a special (**SPEC**) which is available for other impellers.
Impellers do not provide a linear change in frequency with change in speed, and this non linearity is different for different impellers. The selection of impeller ensures the correct linearising curve is applied, increasing accuracy.
Selecting Impeller. Go to Example display 3.4.6.3. and press [▼] twice. '**SEL IMP'**, will be displayed. Press Ent, and you can scroll through the 3 options: Coxmate Micro impeller (**CMt**), NK impeller (**nK**), and a special (**SPEC**). The special is provided for future use.
To use GPS for auto calibration, go to Example 3.4.6 (Calibration), display 3.4.6.3. Press [▼], it will briefly indicate it is connecting to GPS and display '**GPS'**. Press Ent and '**GO**' will be displayed. Start rowing in straight line – the calibration start is triggered by speed exceeding ~2.5m/s. When you have travelled 250 metres, unit will display '**turn'.** Turn and row back the other way for 250 metres. Press Ent, and new K value will be displayed. If you are on still water with no significant wind, then you only need to row until '**turn'** is displayed and press Ent twice – it will bypass second 250 metre leg, and display new K value.

6. Operating without Seat Sensor

If you are in a vessel which does not have a seat sensor eg a kayak, then the unit must be set up accordingly: Go to Example 3.4.6 (Calibration), display 3.4.6.2. Hold **[Ent]** button down for 3 seconds. If unit operating with seat sensor display will show **0000** (lower left), and **SS** (lower right). The **0000** can be adjusted with [▲] and [▼] buttons. The value can be adjusted between **0000** and **0050**. If the value is not **0000** then lower right will display noSS (no seat sensor). The setting of this value will depend on type of craft. For kayaks it will be low ~2 or 3, and for a sculling boat it will be ~10-20. The lower value will give a greater sensitivity to small speed variations through stroke, and the higher value will make unit less sensitive to false triggering due to turbulent noise. Mounting impeller near to bow will always improve reliability if noise is a problem.

7. Changing Timer 'Auto' stop

If no strokes are detected, the timer will automatically stop – this avoids wasting memory. The default for this is 30 seconds. However in some circumstances, eg when surfing a wave in a surf boat, this may last longer than 30 seconds, and you may wish to keep Timer and recording running. To adjust this auto stop period, go to Set Up and Metro (Metronome). Hold **[Ent]** button down for 3 seconds. Lower left will show StOP and lower right the auto stop period. Press **[Ent]** then use [▲] and [▼] buttons to step through options between 5 seconds and 30 minutes.

8 Speed Ratio(Check Factor)

The 'Ratio' value displayed is the percentage ratio of minimum to maximum speed for each stroke. It indicates the degree of 'checking' – the higher the value the less the checking. This value is influenced by the level of turbulent noise. Whilst the HC has complex filtering to remove the noise component, the quality of this reading will always be improved with a 'clean ' signal eg with impeller mounted near bow. This reading is averaged over 5 strokes.

9. Memory/Data Storage

The HC stores rowing data whenever the Timer is running. The data stored includes speed, heart rate (if used), rate and speed ratio. The data can be store in either **Micro** detail, where speed is recorded every 20mS, or **Macro** detail, where the average speed for stroke is recorded. In **Micro ,** approx 4 hours of rowing can be stored, and, in **Macro** approx 60 hours (over 100,000 strokes!) can be stored. Each time Timer is started a new record, which is time and date stamped is created. There is no practical limit on the number of records which can be stored. Unless impeller is mounted in a position where there is little noise, and you are interested in analysing the stroke speed profile, then **Macro** should be selected. All the rowing data can be downloaded to PC and analysed with Coxmate PC Analysis Software- PC Interface and software is optional extra.
To check how much memory has been used, to clear memory, or to select **Micro** or **Macro** detail, go into **Set Up** and select (use [▲], [▼] buttons) **MEM.** It will display memory used eg '5% USEd' . Press Ent again and it will display 'CLR?'. Press Ent to clear memory. To change **Micro**/ **Macro;** when memory used eg '5% USEd' is displayed, hold Ent key down for 2 seconds, and use [▲], [▼] buttons to select either **Micro** or **Macro.**

10.Backlight

The backlight can be turned on by holding **On** button down for 2 seconds when turning unit on. Unit will beep twice. Alternatively backlight can be turned On/Off and brightness adjusted (from 1 to 10), by going into **Set Up** and select (use [▲], [▼] buttons) **BK LT.**

11. Metronome

The Metronome can be set and turned On/Off by going into **Set Up** and select (use [▲], [▼] buttons) **METRO .**

12. Master/Slave and PC Connection

To have unit communicating with PC, go into **Set Up** and select (use [▲], [▼] buttons) **PC.**
To use HC in master/slave configuration, you need the **HG-Mstr/Slave-Mtg** and two HC's. One is set to Master and the other Slave. The Slave display will then mimic the Master. To set units up for Master/Slave, go into **PC .... Set Up,** and hold **Ent** button down for 2seconds. The [▲], [▼] buttons will scroll through the three 3 options – **Std..SLvE... MASt .** Press Ent to make selection. To operate Master/Slave, Slave unit must be turned ON after it is connected and Master is ON. If unit is not being used in Master/Slave configuration it should be set to **Std.**

13.Recall

If you don't have a PC, and want a quick look at your rowing data for the race you just had, then you can use the Recall. It stores rate and speed for the last record i.e. the last time the timer was run. Example 3.4.7 shows how this is used.

14.Split

If a SPLIT distance is set, the HC will beep each time the distance has been rowed, and display the Time Average Speed and Rate for the distance. The display will flash this data for 5 seconds, and then resume normal operation. To set Split distance go into **Set Up** and select (using [▲], [▼] buttons), **SPLIT.** Press **Ent,** and [▲], [▼] buttons to scroll through **nOnE. 100,250** and **500** metres. Press **Ent** to select.

15. Real Time Clock

The unit has a built in real time clock. This only shows time and date on power up. Its main purpose is for time and date stamping of records which are transferred to PC. To adjust/set time, press **Ent** when time is displayed on power up.

16. Batteries

The unit runs on 3 x AAA standard alkali batteries. This gives around 250 hours run time without backlight and 100 hours with backlight. In most circumstances this will give around a year's operation. If unit is not operating there is a very small current drain – it would take around one and a half years for new batteries to go flat. If unit is not being used for a long period of time it is recommended the batteries be removed. The unit is fitted with a large capacitor. This provide a time window of around 5 minutes in which to change batteries, without losing any memory or settings eg date/time.
To replace batteries, remove battery cover by undoing the two screws. Before refitting cover, make sure gasket is undamaged, clean and in its groove.

17. General Maintenance

The unit should be washed in warm soapy water to clean it. Ethyl alcohol(methylated spirit) and propyl alcohol (propanol) can be used, but others organic solvents, especially aromatics and acetone, should be avoided as they will damage unit. The display window should be treated with care as it can be easily scratched.
The electrical contacts are made from silver plated 316 stainless steel. They should stand out ~1.5mm from surface of box. If they have suffered physical damage, then they can be carefully repositioned using a fine pair of pliers. If this happens too often, there is a risk of them breaking.
If contacts – on HC or docking station - are not making electrical connection, then they should be carefully cleaned with alcohol swab or similar. If this is not effective, then they can be lightly abraded to remove any corrosion.

18. Resetting

If the unit locks up for any reason, then CPU can be reset by removing power. Either remove batteries for ~ 5 minutes, or for a quicker solution, reverse the polarity of one of the batteries – this will cause instant reset – then return battery to normal polarity.

