

Manual handheld controller



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Important

Read the manual carefully before using the cycle and save it for future use.

Monark Exercise AB

Monark has 100 years' experience of bicycle production. The Monark tradition has yielded know-how, experience, and a real feel for the product and quality. Since the early 1900s, Monark's cycles have been living proof of precision, reliability, strength and service. These are the reasons why we are now the world leader in cycle ergometers and the market leader in Scandinavia in transport cycles.

We manufacture, develop and market ergometers, exercise bikes, transport bikes and specialized bicycles. Our largest customer groups are within health care, sports medicine, public authorities, industry and postal services.

For more information: www.monarkexercise.se



Description of the handheld controller

The handheld controller is used to control and program Monark 831 E, 839 E and 939 E.

Display

Options on the display;

- 1 Fitness test
- 2 Man./Work test
- 3 Seq.programs
- 4 Analog control
- 5 Calibration
- 6 System
- 0 Exit

Keyboard layout

Used keys:

Key 1 - 9: menu choice and numeric input

Arrow key up/down: scroll function

Dot key: decimal input

Del.key: delete function

Enter: enters input

Special function during fixed protocols:

Key 9: increase step on force/power level

Key 6: decrease step on force/power level

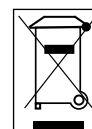
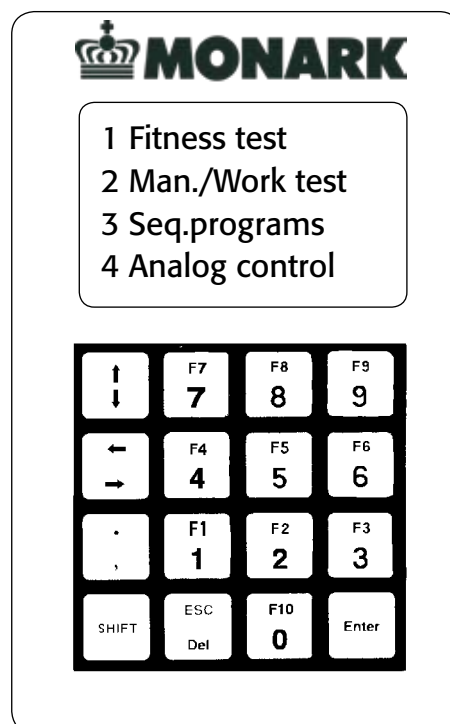
Key 3: start/stop program

Key 7 8 9: increase level

Key 4 5 6: decrease level

Ergometer continuous memory

To ease operation of the ergo meter, several “variables” are stored in “nonvolatile memory”. These variables are restored to normal memory each time power is applied to the ergometer.



Protocol operation

A protocol operation cycles the ergometer through a predefined workload sequence, automatically. The protocol may be designed to alter the workload according to time or a physiological response such as heart rate. Several of the protocols may be modified or customized by the user to suit specific needs.

The programmed sequence of workload may be set to provide a varying workload. The rate of change of the workload may be specifically set in some protocols. Still other protocols may exercise the subject to a maximum (or submaximal) effort to determine an index of fitness (oxygen consumption).

A protocol may terminate based on the passage of time or the satisfaction of a specific physiological conditions such as a “steady state” heart rate. For details, refer to the specific protocol operation description.

At the conclusion of a protocol, a summary is printed, if the optional external printer is installed. This report includes various identification data: the protocol name, the subjects age, weight, sex. In addition, test results are printed, including the predicted maximum heart rate, the actual steady state heart rate, the maximum workload and the “VO₂ max”. The VO₂ maximum is expressed both as a total body usage in l/minute and per kg of body weight in ml/kg/minute. If a printer is not available, only the VO₂ max data, both in l/min and ml/kg/min are displayed. The interpretation and meaning of the VO₂ max data is specific to the design of the particular protocol. Certain protocols are simply programmed exercise and therefore are not designed to measure VO₂. Please refer to the specific protocol description prior to attaching any significance to the reported value.

The computer controller for the ergometer can perform different protocols in addition to strict manual operation. Four protocols have been preset and four are partly preset. Several preprogrammed protocols measure oxygen consumption at steady state: the Astrand, using a single workload, the YMCA, using multiple branching workloads (“YMCAs Way to Physical Fitness” bicycle test) and the Bruce and Naughton, using multiple increasing workloads (treadmill protocols adapted to bicycles ergometry).

Additional preprogrammed protocols, not designed to measure VO₂, provide timed increasing workloads (ramp and incremental) and a heart rate training program in which a target heart rate is set and the ergometer attempts to maintain the target rate by varying the applied workload accordingly.

All protocol operations enable the heart alarm feature. The alarm value is preset to 220 - age. During the test set-up procedure, the maximum heart rate may be changed depending on the subjects exercise prescription or other constraints.

If the heart rate exceeds the alarm value, a beeping tone will be heard until the heart rate falls below the alarm point or the alarm is disabled. When the alarm sounds, the workload is removed, automatically, to prevent overstressing the test subject.

The alarm feature may be disabled, particularly if the protocol does not require monitoring of the subject’s heart rate. If heart rate is not being monitored, start the protocol and then disable the alarm.

The automatic protocol attempt to exercise the subject at specific oxygen consumption levels. The ergometer achieves this by producing a braking force which, in normal individuals, requires the consumption of the desired volume of oxygen. Note that most protocols express the VO₂ in ml/kg/min, therefore, the total VO₂ required is calculated using the subjects weight and subsequently converted to a power workload. The table below shows the nominal work equivalent to various oxygen consumption rates.

<i>Work load (Kpm/min)</i>	<i>Oxygen uptake (L/min)</i>
<i>300</i>	<i>0.9</i>
<i>600</i>	<i>1.5</i>
<i>900</i>	<i>2.1</i>
<i>1200</i>	<i>2.8</i>
<i>1500</i>	<i>3.5</i>
<i>1800</i>	<i>4.2</i>
<i>2100</i>	<i>5.0</i>
<i>2400</i>	<i>5.7</i>

Printer report

If a parallel printer (DOS compatible) is connected to the Ergometer a hard copy test report may be obtained, documenting the protocol progress at preset time intervals. At the end of a fixed protocol, a calculation is prepared.

NOTE!

The auto printout function must be enabled for the printer to operate outside fixed protocols. To change the time interval between successive printouts, see System menu.

Sample Report:

Monark Ergometer 839E. Åstrand - Report: xx Page: 1

Name:

Test:

Date:

Sign:

Age: 43 years Weight: 82.0 kg Sex: Male

Max. Heart Rate(bpm):177

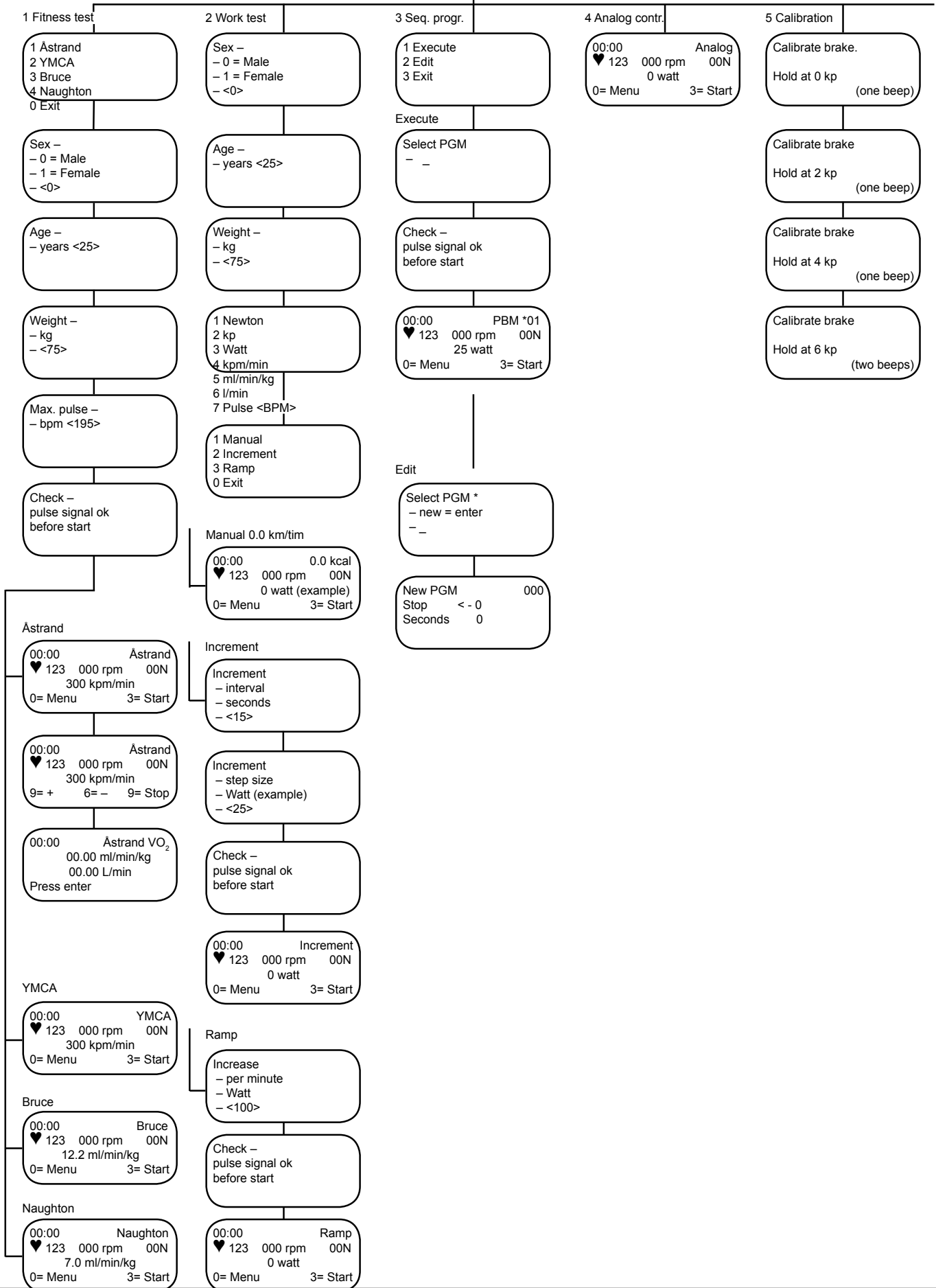
Time	RPM	BPM	N	kcal	km/h	km	Ref.
00:30	64	82	04	01.0	23.1	0.2	1500kpm/min
01:00	64	107	38	08.0	23.1	0.4	1500kpm/min
01:30	57	127	43	16.0	20.4	0.6	1500kpm/min
02:00	53	139	46	25.0	19.1	0.8	1500kpm/min
02:30	52	143	47	33.0	18.7	1.0	1500kpm/min
03:00	53	151	48	41.0	19.1	1.1	1500kpm/min
03:30	53	150	46	50.0	19.1	1.3	1500kpm/min
04:00	51	153	48	58.0	18.3	1.4	1500kpm/min
04:30	52	154	48	67.0	19.8	1.6	1500kpm/min
05:00	53	155	46	75.0	19.0	1.7	1500kpm/min
05:30	54	157	46	83.0	19.5	1.8	1500kpm/min
06:00	57	156	43	92.0	20.4	2.0	1500kpm/min

Measured heart rate (BPM) : 156

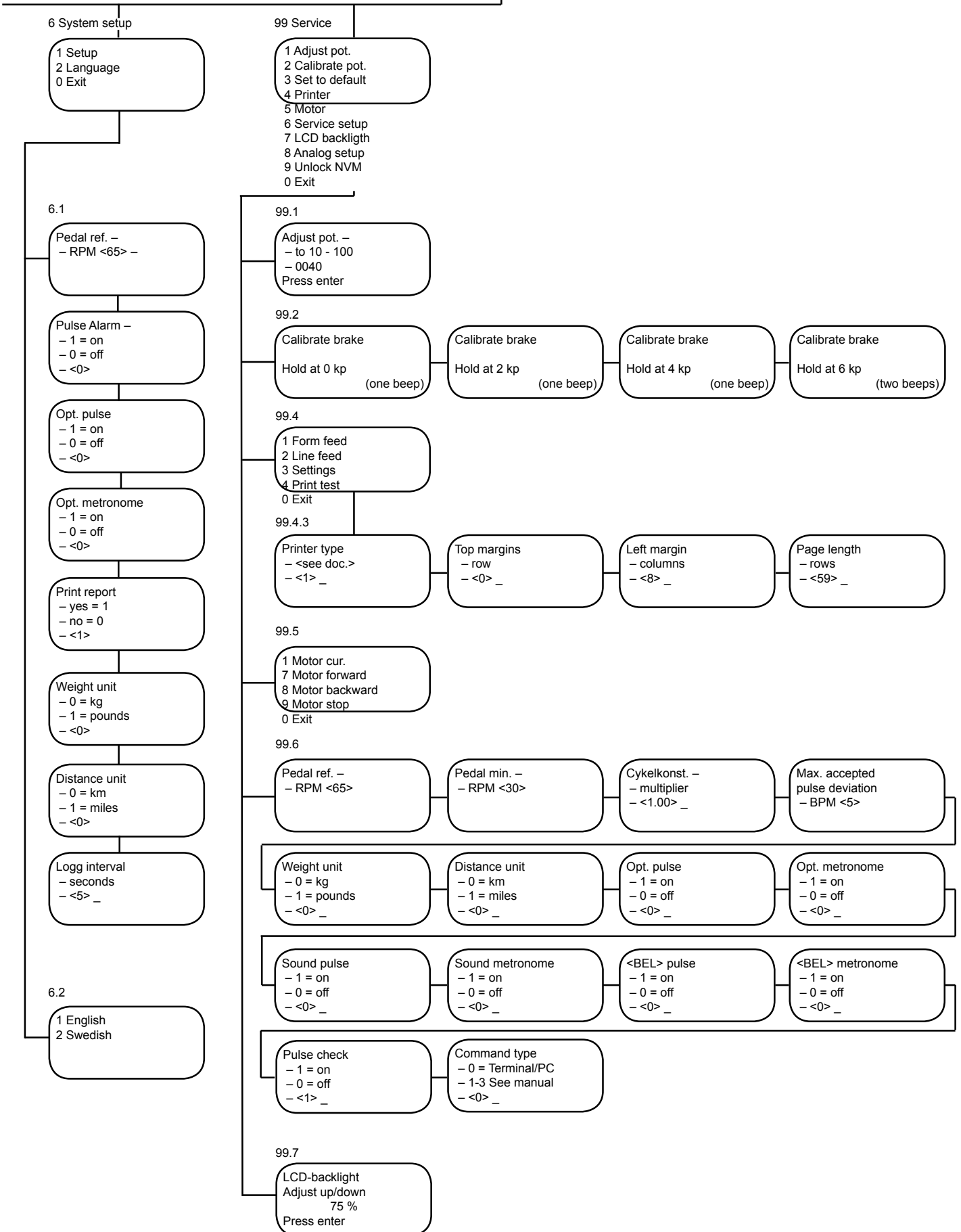
Calculated maximum V02: Max: 49.4 ml/kg/min 4.05 l/min

Menu system

- 1 Fitness test
- 2 Man/Work test
- 3 Seq. programs
- 4 Analog control
- 5 Calibration
- 6 System setup
- 99 Service (hidden)



- 1 Fitness test
- 2 Man/Work test
- 3 Seq. programs
- 4 Analog control
- 5 Calibration
- 6 System setup
- 99 Service (hidden)



Menu 1: Fitness test

1 Fitness test
 2 Man/Work test
 3 Seq. programs
 4 Analog control
 5 Calibration
 6 System setup
 99 Service (hidden)

Choose 1 Fitness test.

1 Fitness test

1 Astrand
 2 YMCA
 3 Bruce
 4 Naughton
 0 Exit

Choose fitness test.

Sex –
 – 0 = Male
 – 1 = Female
 – <0>

Choose male (0) or female (1). Press enter.

Age –
 – years <25>

Choose age. Press enter.

Weight –
 – kg
 – <75>

Set weight. Press enter.

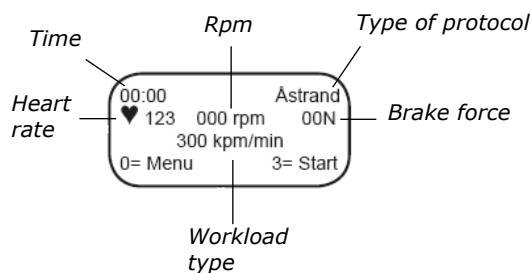
Max. pulse –
 – bpm <195>

Set your maximum heart rate. Press enter. (Default value is 220 - age.)

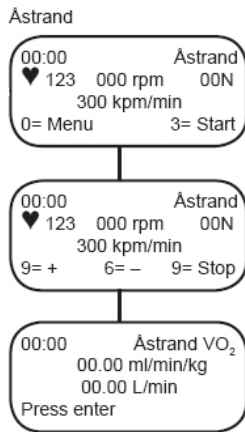
Check –
 pulse signal ok
 before start

Wait a few seconds while the computer check the pulse signal.

How the display looks at the various test is shown at respectively test. Here shows a general picture of the facts that appear in the display during a test.



Åstrand Protocol



Push "3" to start the test.
Push "0" to finish the test.

During the test. "9" = increase the load, "6" = decrease the load, "3" = stop the test.

The results after finished test.

At the end of the fifth minute, the heart rate is recorded. If, by the end of the next minute, the heart rate is within 4 bpm of the previous observations, the protocol is finished. If not, the test continues until the pulse rate has been within four beats for one minute. Note: If the heart rate is erratic or the workload is improperly adjusted for steady state exercise, the test will fail to complete. Of course, the protocol may be interrupted by the START/STOP key (key 3), although the error message "Test Aborted" and no calculation of VO_2 max will result.

The maximum oxygen consumption is obtained through the look up of the steady state heart rate and workload in the appropriate male or female table of "Predicted VO_2 Max from Heart Rate and Workload". This estimate is then multiplied by a factor which is related to the age of the test subject. The factor is found in the following table according to the predicted maximum heart rate:

The Åstrand protocol is designed to determine maximal oxygen consumption by exercising the test subject at a submaximal workload and measuring the steady state heart rate. The workload, in conjunction with the resultant heart rate, is compared to the predicted relationship, adjusted for age and sex and a maximal oxygen consumption is computed.

The protocol defines nine workloads at which the test subject may be evaluated. The workloads for male subjects span 300 kpm/min to 1500 kpm/min in 150 kpm/min steps. The workloads for females cover 300 kpm/min to 900 kpm/min in 75 kpm/min steps.

The workload selection is preformed manually during the first two minutes of the test. The workload should be difficult enough to elicit a steady heart rate of at least 120 bpm. If too high a workload is chosen, the subject may not be able to complete the minimum of six minutes necessary to reach steady state conditions. The protocol has been designed to test individuals with a normal mechanical efficiency during steady state; very high workloads can only be preformed aerobically by individuals with a very high work capacity.

During the workload selection interval, the workload should be increased until the heart rate varies no more than 4 bpm and is consistently greater than 120 bpm.

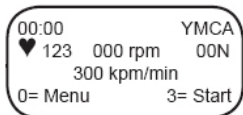
<i>VO₂ Correction Factor</i>	
<i>Max pulse</i>	<i>Factor</i>
<i>over 200</i>	<i>1.12</i>
<i>191-200</i>	<i>1.00</i>
<i>181-190</i>	<i>0.93</i>
<i>171-180</i>	<i>0.83</i>
<i>161-170</i>	<i>0.75</i>
<i>151-160</i>	<i>0.69</i>
<i>less than 151</i>	<i>0.64</i>

Performance:

- Instruct test subject about the protocol and adjust the chestbelt for reliable pulse.
- Follow menu instructions and start test.

YMCA Protocol "Y's way to physical fitness"

YMCA



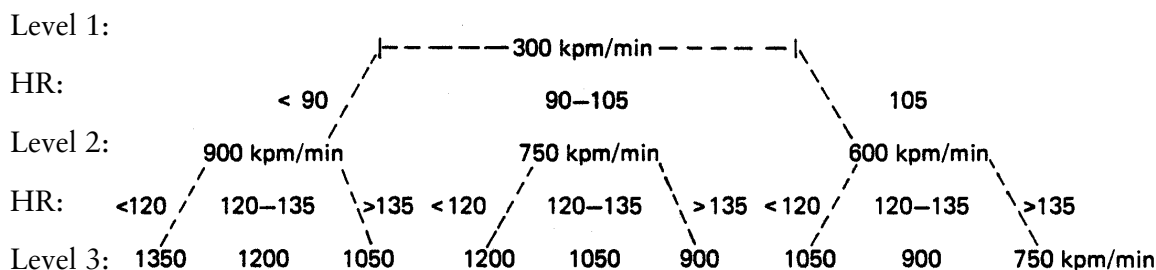
Push "3" to start the test.
Push "0" to finish the test.

The YMCA protocol is based on the "Y's Way to Physical Fitness" bicycle test. The design is a submaximal test, using branching multiple workloads in which the next workload is determined by the steady state heart rate elicited by the previous level. For details, refer to the "Workload Branching" tables, later in this section.

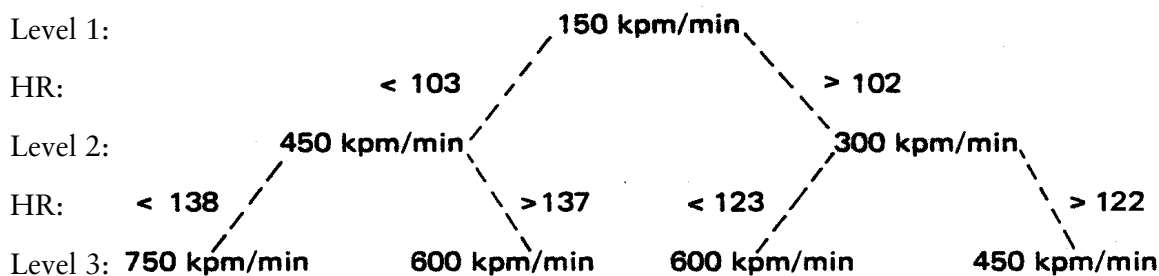
Every three minutes the workload is advanced until the subject has completed three levels, requiring a total of nine minutes. If the subject has an abnormally high heart rate response to the initial workload (100 bpm or more), the test is terminated at the end of the second level. If the operator senses that the subject is experiencing difficulty completing the third level of the protocol, the START/STOP key (key 3) may be used to conclude the test early. If the test is stopped prior to the completion of the second level, an error message is displayed, indicating that the test was "aborted" and no calculation of VO_2 max is possible.

At the conclusion of the test, estimates of the VO_2 max and the maximum workload are extrapolated from the data collected during the previous two levels. The VO_2 max is reported on the display and the maximum workload contained in the report, available only if the optional external printer is installed.

Male:



Female:



Note: Stated HR values are at the end of each level.

The protocol will terminate automatically under two circumstances;

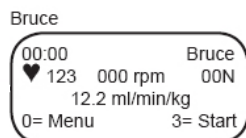
- 1) Nine minutes (3 levels) have been completed, or
- 2) Six minutes (2 levels) have been completed and the heart rate elicited by the first level was 110 bpm or more.

In addition, START/STOP may be used to end protocol operation after six minutes if the subject is having difficulty.

Performance:

- Instruct test subject about the protocol and adjust the chestbelt for reliable pulse.
- Follow menu instructions and start test.

Bruce Protocol



Push "3" to start the test.
Push "0" to finish the test.

Bicycle ergometers measure total oxygen consumption relatively independent of body weight. Since the test subject's body weight is supported by the saddle, the total work performed is a function of only the resistive force and the pedal speed. At the same power setting, all test subjects will have approximately the same oxygen consumption.

On the other hand, the treadmill measurement of oxygen consumption includes the test subject's weight as a component of the total work and therefore measures oxygen consumption per kilogram of body weight. At a given incline and speed, each subject will have approximately the same VO_2 per unit of body weight.

The well known Bruce treadmill maximal oxygen consumption protocol has been converted for use on a bicycle ergometer, taking into account the differences between the treadmill and the bicycle devices. The ergometric workload is computed using the test subjects body weight to calculate the total VO_2 at each stage of work, adjusting the power settings accordingly. The total oxygen consumption is calculated from the VO_2 (ml/kg/min) for the stage multiplied by the body weight in kilograms. The workload is then selected from VO_2 workload table in the "Protocol Operation" section.

The protocol increases the workload every three minutes from warm-up stage to successively more difficult levels until the subject can no longer perform the test. At that time, the START/STOP key (key 3) is depressed to conclude the protocol. The protocol does end automatically if a subject is capable of completing Stage VII (79.9 ml/kg/min), an unlikely event.

The workload of the final stage is then converted to the equivalent VO_2 max and reported, both as total consumption in l/minute and per body weight in ml/kg/minute. If the subject has not completed at least one minute of the protocol has been completed at termination, a "Test Aborted" message is displayed.

The stages of the Bruce protocol are as follows:

Stage	Speed/ mph	Grade %	VO_2 ml/kg/min
<i>Warm up</i>	<i>1.7</i>	<i>5</i>	<i>12.2</i>
<i>Stage I</i>	<i>1.7</i>	<i>10</i>	<i>17.4</i>
<i>Stage II</i>	<i>2.5</i>	<i>12</i>	<i>24.8</i>
<i>Stage III</i>	<i>3.4</i>	<i>14</i>	<i>34.4</i>
<i>Stage IV</i>	<i>4.2</i>	<i>16</i>	<i>43.8</i>
<i>Stage V</i>	<i>5.0</i>	<i>18</i>	<i>56.7</i>
<i>Stage VI</i>	<i>5.5</i>	<i>20</i>	<i>68.2</i>
<i>Stage VII</i>	<i>6.0</i>	<i>22</i>	<i>79.5</i>

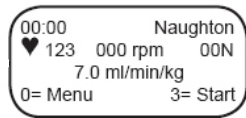
The protocol will terminate automatically if Stage VII is completed. Normal termination is accomplished by depressing START/STOP key (key 3) when the subject can no longer perform the work. If the subject has not completed at least one minute at the final workload, the previous workload is used. If less than one minute of the protocol has been completed at handheld controller, a "Test Aborted" message is displayed. The program automatically selects the current or previous workload, as appropriate.

Performance:

- Instruct test subject about the protocol and adjust the chestbelt for reliable pulse.
- Follow menu instructions and start test.

Naughton Protocol

Naughton



Push "3" to start the test.
Push "0" to finish the test.

The standard Naughton Protocol (reference 5) is a two minute incremental test. The test is extremely similar to the Bruce protocol with two simple exceptions: the stages are two minutes in duration instead of three and the incremental VO_2 between stages is linear (3.5 ml/kg/min). The stages represent discrete oxygen consumption levels generally referred to as "METS".

The stages of Naughton protocol are as follows:

Stage	Speed/mph	Grade %	VO_2, ml/kg/min
<i>Stage I</i>	2	0	7.0
<i>Stage II</i>	2	2.5	10.5
<i>Stage III</i>	2	7.0	14.0
<i>Stage IV</i>	2	10.0	17.5
<i>Stage V</i>	2	14.0	21.0
<i>Stage VI</i>	2	17.5	24.5
<i>Stage VII</i>	3	12.5	28.0
<i>Stage VIII</i>	3	15.0	31.5
<i>Stage IX</i>	3	17.5	35.0

The operation of the protocol is otherwise identical to the Bruce protocol.

Performance:

- Instruct test subject about the protocol and adjust the chestbelt for reliable pulse.
- Follow menu instructions and start test.

Menu 2: Manual/ Work test

Manual use

1 Fitness test
2 Man/Work test
3 Seq. programs
4 Analog control
5 Calibration
6 System setup
99 Service (hidden)

Choose 2 Man/Work test.

Manual 0.0 km/tim

Check –
pulse signal ok
before start

Wait a few seconds while the computer check the pulse signal.

00:00 0.0 kcal
♥ 123 000 rpm 00N
0 watt (example)
0= Menu 3= Start

Push "3" to start the test.
Push "0" to finish the test.

2 Work test

Sex –
– 0 = Male
– 1 = Female
– <0>

Choose male (0) or female (1). Press enter.

Age –
– years <25>

Choose age. Press enter.

Weight –
– kg
– <75>

Set weight. Press enter.

1 Newton
2 kp
3 Watt
4 kpm/min
5 ml/min/kg
6 l/min
7 Pulse <BPM>

Choose type of work load.

1 Manual
2 Increment
3 Ramp
0 Exit

Choose type of test.

Workload - Force setting

The workload can be set in Newtons (N) or kp. Power is in this mode depending on the pedal rpm.

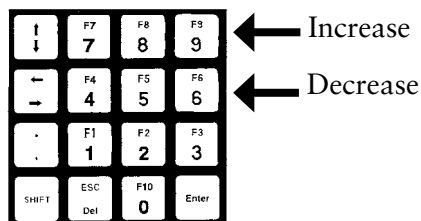
Workload can be increased or decreased with keys 7/4, 8/4 and 9/5.

- Key 7/4, increase / decrease step 1.00 kp or 10 N
- Key 8/5, increase / decrease step 0.10 kp or 1 N.
- Key 9/6, increase / decrease step 1.00 kp or 0.1 N.
- Press start/stop when finished.
-

Workload - Power setting

Power level can be set in watts or kpm/min. Power level is not depending on pedal rpm.

- Key 7/4, increase/decrease step 100 watts or 100 kpm/min.
- Key 8/5, increase/decrease step 10 watts or 10 kpm/min.
- Key 9/6, increase/decrease step 1 watts or 1 kpm/min.
- Press start/stop when finished.



Workload - VO₂

This is also a type of power setting. The advantage in this mode is that the workload can be set in ml/min/kg which means that the power is related to the subjects body weight. A certain level of ml/min is always the same as a given power level. See table in chapter "Testing - general".

- Key 7/4, increase/decrease step 10 ml/min/kg or 1 l/min.
- Key 8/5, increase/decrease step 1 ml/min/kg or 0.1 l/min.
- Key 9/6, increase/decrease step 0.1 ml/min/kg or 0.01 l/min.
- Press start/stop when finished.

Workload - HR related <BPM>

The Heart Rate program is designed to adjust the workload in an attempt to maintain a desired heart rate. This is achieved by increasing the workload from zero, at the start, using incremental steps. How fast the power is adjusted is depending on how far away the actual heart rate is from the desired heart rate.

At heart rate lower than the desired setting the workload will increase with 60 W (375 kpm/min) per minute until the test subject's heart rate is higher than 75 % of the desired heart rate. The power will then increase at 30 W (180 kpm/min) per minute until the actual heart rate is within 5 bpm from the desired value. The power is kept at a constant level as long as the test subject's heart rate is within ± 5 bpm from the programmed heart rate value increment. The work test continues until the it is stopped by the start/stop key (key 3).

The target heart rate is entered as part of the test preparation. Default value is 120 bpm. The target training rate may be changed to suit the training program by just entering the value on the keyboard.

- Key 7/4 increases/decreases 100 bpm.
- Key 8/5 increases/decreases 10 bpm.
- Key 9/6 increases/decreases 1bpm.

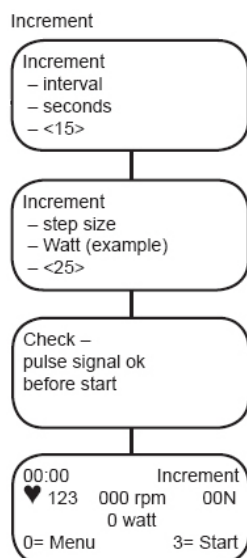
NOTE: The maximum target heart rate that can be set is 90 % of the calculated max. heart rate (220 - age).

The resultant workload which is determined by the computer to maintain the target heart rate, may be used as a basis for comparison over time, in an effort to objectively evaluate the effectiveness of training program.

Set-up test subject and follow menu.

Protocol operation may be terminated by depressing START/STOP key (3).

Incremental Protocol



Choose the interval length in seconds. Press enter.

Select load increase per step. Press enter.

Wait a few seconds while the computer check the pulse signal.

Push "3" to start the test. Push "0" to finish the test.

The incremental protocol consists of a series of workloads which are constantly increasing with time. Under control of the incremental, the ergometer exercises the test subject to a maximum workload. The rate at which the workload rises can be preset.

The type of work: power or force may also be preset as desired. The incremental protocol may be used to create a linearly increasing workload test such as a modification of Naughton protocol. The Naughton may be viewed as an incremental protocol with a work type of VO_2 and a rate of 3.5 ml/kg/min every two minutes.

Set the subjects age, maximum heart rate, sex, weight and selects the protocol.

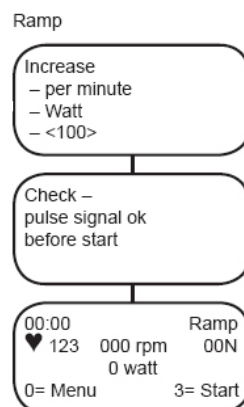
Type of workload must be programmed. This stores the time and workload rate of change in continuous memory. Each step is calculated from the previous step plus the step time and step work, constantly increasing.

During executions of the protocol, the INCREASE and DECREASE keys (key 9 or 6) may be used to advance or retard the protocol. In this manner, if a workload is too easy, the protocol may be advanced in a non-linear fashion until the workload is as desired.

Performance:

- Instruct test subject about the protocol and adjust the chestbelt for reliable pulse.
- Follow menu instructions and start test.

Ramp Protocol



Select load increase per minute. Press enter.

Wait a few seconds while the computer check the pulse signal.

Push "3" to start the test. Push "0" to finish the test.

The Ramp protocol is very similar to the incremental protocol in that it is based on a continuously increasing series of workloads. The major difference is that the Ramp protocol steps are extremely fine, making the tension from one workload step to the next nearly imperceptible.

Ramp protocol are sometimes employed to provide a very rapid rise in workload in an attempt to determine the maximum workload which a test subject can achieve without significant elevation in blood lactic acid from anaerobic metabolism. Due to the rapid rise in workload, there is little fatigue, although the medical risk may be high if an extremely high workload is attained too quickly.

Similar to the incremental, the ramp protocol must be programmed prior to running. The programming is slightly different in that the workload increase per minute is entered rather than the step time and step work increments.

Operation is similar as well, except that the protocol may not be advanced or retarded.

Performance:

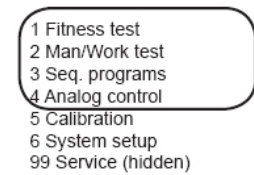
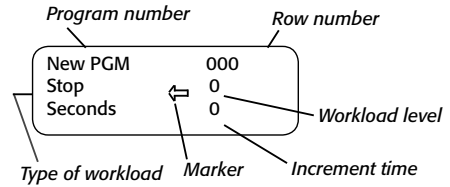
- Instruct test subject about the protocol and adjust the chestbelt for reliable pulse.
- Follow menu instructions and start test.

Menu 3: Sequence programs (user defined protocols)

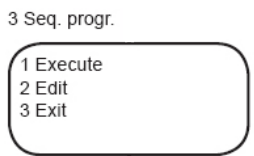
The operator may custom design his own exercise protocols and store them in computer memory. This extra ordinary feature makes it possible to provide 10 additional protocols which may be set-up as special purpose, readily available protocols. These protocols may be power or force type, time based designs. This flexibility enables the user to program several versions of the hills and valleys (increasing and decreasing workload) type of exercises and / or modifications to the Bruce / Naughton type protocols or different types of incremental work tests. The possibilities are virtually limitless.

Make new program:

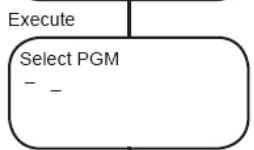
- Choose 3 "Seq. program" in the main menu.
- Choose 2 "Edit".
- Choose new program by pressing ENTER.
- The display looks as below.



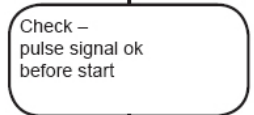
Choose 3 Seq. programs.



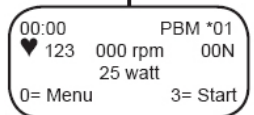
- 1 Execute (start program)
- 2 Edit (edit an existing program)
- 3 Exit



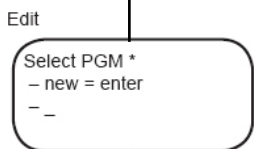
Choose an existing program. Press enter.



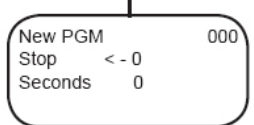
Wait a few seconds while the computer check the pulse signal.



Push "3" = start test. Push "0" = return to main menu.



Edit an already existing program, alt. create a new.



The marker (arrow in the display) indicates which position can be edited. When creating a new program begin to change "stop" to desired workload. This is done by the keys 1 - 5.

Key 1 = Newton, key 2 = kp, key 3 = watts, key 4 = kpm/min and key 5 = ml/kg/min. Key 0 = Stop which is used to end the program.

Example:

Choose i.e. kp (key 2) and press ENTER. The marker turns to the right where workload level can be set. Type say 1.5 and press ENTER. Marker moves to position seconds. Enter say 300 (= 5 minutes). Marker moves up and indicates row number. Press ENTER and number increases automatically one step. Marker moves to type of workload again. The same as before is set by just pressing ENTER. A change can be done by pressing key 1-5 until the right type of workload shows up and then press ENTER. Marker moves to workload level. Enter level, Enter seconds a.s.o. until the program is long enough.

When the program is to be finished move the marker to point at type of workload and change with key 0 which is Stop and then press ENTER. Programming is finished and program number (0 - 9) must be Entered. Back to menu again.

NOTE: If a figure already containing a program is used this will erase the old program.

Execute program:

Begin with 3 "Seq. programs" in the main menu and then 1 "Execute". Choose an existing program and press ENTER.

It is recommended to have a note about different program types and numbers. However it is possible to take a look in advance at a program. Do as under "Edit an existing program". If it says "stop" in work load position there is no program stored under that number. Use ESC key and try with a new number.

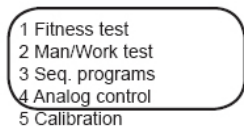
Edit an existing program:

Press 2 = Edit.

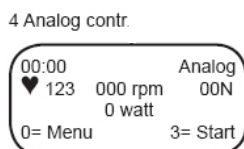
Choose program number. Step through the program with the ENTER key and make desired changes. Then go to workload setting and change to Stop (key 0) and then press ENTER.

NOTE! After editing an old or new program turn off the computer for correct download of data.

Menu 4: Analog control

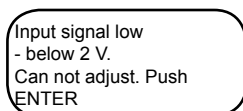


Choose 4 Analog control.



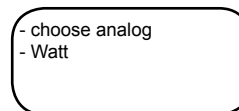
Instructions how to connect an external ECG device with analog control.

1. Get the correct analog cable for the ECG device in use.
2. Connect the cable to the output for analog control on the ECG equipment.
3. Connect the other end of the cable to the analog input on the ergometer.
4. Switch on power for the External equipment and the Monark Ergometer.
5. Start the analog control program on the external device and set a power that corresponds to a voltage of minimum 2.5 Volt (normally corresponding to 250 watts). This has to be done to be able to calibrate the power setting on the bike with the signal that comes from the External device.
6. Push '99' on the handheld unit. You will then come to the service menu.
7. Then push '8' – Set analog.
8. Choose '3' – Watts. If the analog signal from the External device has not been set to earlier indicated signal level the display will show as follows:



If this is the case – start again from point 4.

9. On the display the following will show up:



Put in the corresponding watt value from the External device and press ENTER. The display will now return to the Service menu.

10. Press '0' – Exit – to get back to the main menu.
11. Press '4' – Analog control. The display will now show in line three the power in watts, that corresponds to the power which is set on the External device.
12. When setting up the ergometer next time you only need to push '4' – Analog control – since the set up already is saved in the memory of the bike.

Menu 5: Calibration electronics

1 Fitness test
2 Man/Work test
3 Seq. programs
4 Analog control
5 Calibration
6 System setup
99 Service (hidden)

Choose 5 Calibration.

5 Calibration

Calibrate brake.
Hold at 0 kp
(one beep)

Hold the pendulum at 0 kp. Wait for one beep.

Calibrate brake
Hold at 2 kp
(one beep)

Move the pendulum to 2 kp and hold it there. Wait for one beep.

Calibrate brake
Hold at 4 kp
(one beep)

Move the pendulum to 4 kp and hold it there. Wait for one beep.

Calibrate brake
Hold at 6 kp
(two beeps)

Move the pendulum to 6 kp and hold it there. Wait for two beeps.
The calibration is done.

Under menu 5 you calibrate the electronics. For further instructions, see chapter "Calibration electronics" in the ergometer's manual.

Menu 6: System

Menu options:

- 1 Set-up
- 2 Language
- 0 Exit

- 1 Fitness test
- 2 Man/Work test
- 3 Seq. programs
- 4 Analog control
- 5 Calibration
- 6 System setup
- 99 Service (hidden)

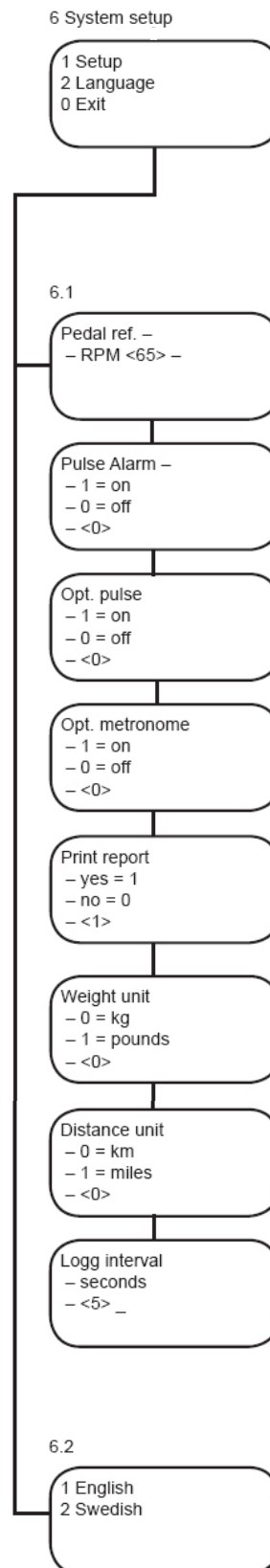
Choose 6 System set-up.

1) Set-up

- Pedal ref.:** Metronome setting
Default setting <65> rpm.
- Pulse alarm:** on/off
- Optical pulse:** on/off
- Optical metronome:** on/off
NOTE! If both optical pulse and optical metronome are set to on, only optical pulse will be set to on.
- Print report:** on/off
Test report to printer.
When running fixed protocols the printer is automatically set to on.
- Weight unit:** Can be set to
0 = kg, 1 = pounds
- Distance unit:** Can be set to
0 = km, 1 = miles
- Logg interval:** Time delay for every printout row,
1 - 655 seconds can be set here.
Default setting <15> sec.

2) Language

- 1 English
- 2 Swedish



Menu 99: Service menu (hidden)

1 Adjust pot. (potentiometer)

If any service regarding the pendulum has been done the correct potentiometer position can be checked here.
Follow display instructions.

2 Calibrate pot.

After adjusting potentiometer a calibration shall be performed here. Also after setting to default in the service menu a calibration has to be done here.
Follow display instructions.

3 Set to default

Erases the memory. Formats and sets some data to default.
NOTE! A calibration must be performed after this action.

4 Printer

Form feed:
Line feed:
Page setting: Lines and margins can be set here.
Print report: To check printer connection.

5 Motor

Motor current limit.
Motor forward, backward and stop.

6 Service set-up

Pedal ref.: Metronome setting

Pedal min.: Lowest pedal rpm to obtain workload on the bike can be set here.
Default setting is 30 rpm.

Cyclekonst.: This value can be adjusted so that the power on the bike can be corrected to the pedals or to the flywheel.
NOTE! In the Åstrand test the power is calculated on the flywheel. Default setting is 1.00 which means there is no extra adjustment done for transmission loss. If for example setting is 1.04 this means that loss is calculated to 4 %.

Max. accepted pulse deviation: This figure is the deviation allowed during steady state to calculate a test.
Default setting <5> bpm.

Weight unit: 0 = kg, 1 = pounds

Distance unit: 0 = km, 1 = miles

Opt. pulse: on/off

Opt. metronome: on/off

Sound pulse: on/off

Sound metronome: on/off

<BEL> pulse: on/off

<BEL> metronome: on/off

Pulse check: on/off

Command type: 0 Handheld controller / PC
 1 Siemens Megacart (Ergomedic 940 compatible command set)
 2 Others (Ergoline compatible command set, requested load value)
 3 Others (Ergoline compatible command set, current load value)

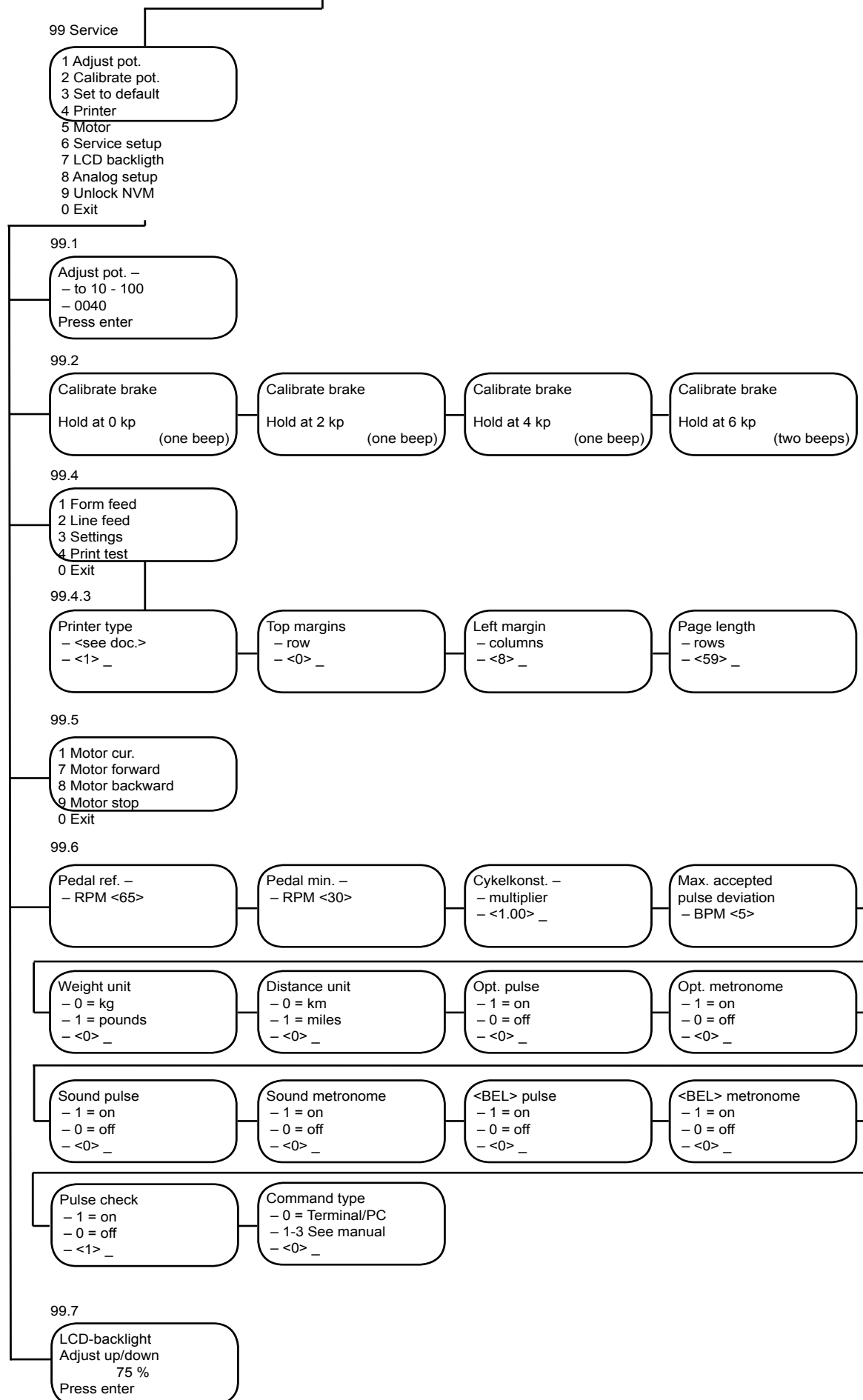
7 LCD backlight Increase or decrease with left/right arrow key

8 Analog set-up See "Technical Reference Manual".

9 Unlock NVM Fabric service

- 1 Fitness test
- 2 Man/Work test
- 3 Seq. programs
- 4 Analog control
- 5 Calibration
- 6 System setup
- 99 Service (hidden)

Choose 99 Service.



Troubleshooting guide

Symptom	Probable Cause/Corrective Action
The display is not working.	Check that power adapter is plugged into proper voltage AC outlet and that the power connector is plugged into the ergometer's controller.
Display lights up but does not respond to keyboard.	Turn off power, wait 10 seconds and reapply power.



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