User Manual EM-Series Race Clock

User manual for race clock types:
EM700
EM706
EM800
EM806
EM850
EM856
EM900
EM906
EM950
EM956

and LED-types:
LC6
LC10
EML806
EML856
EML906
EML956

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Raceclock SW Version 1.9

Table of Contents

1 Introduction

1.1 Operation

The race clock can be controlled by the control panel, by wired remote control, by wireless remote control(optional) or via a serial command interface (optional).

The clock has three operating modes: Race, Setup and Selftest. After power up the clock is in race mode and can be used directly using the settings as saved last time in memory.

The operating settings can be changed in the setup menu.

1.2 Power Up

When the power is switched on a display test is carried out. After this test the clock enters the race mode and displays the time of the raceclock, normally 0:00 after power up.

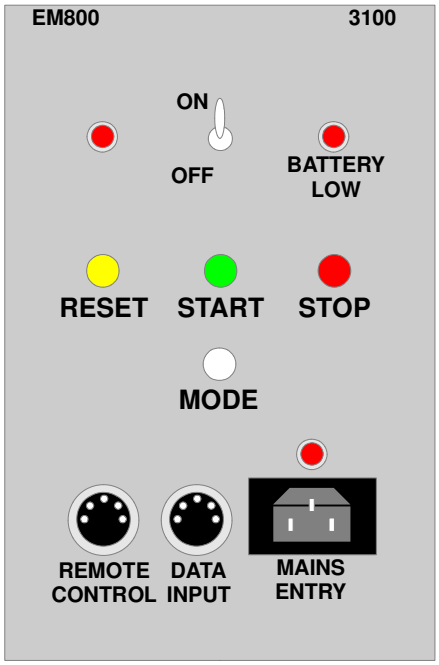
When the setup menu is locked, this will be shown during power up by displaying [LoCH] for a short time.

1.3 Control Panel

The control panel contains the following elements:

- on/off switch
- four push-buttons: start/stop/reset/mode
- three LEDs: power/battery low/mains connected
- remote control connector
- data communication connector
- mains entry

The upper line provides the model type and the serial number.



1.4 Remote Control

A wired remote control can be connected to the standard race clock. This standard remote control has 4 buttons with the same functions as the buttons on the control panel.

2 Race Mode

In race mode the clock has the following functions:

Function	Button	Description
Start	Green	Start or restart the clock.
Stop	Red	Stop the clock.
Reset	Yellow	Reset to 0:00 or to a preset time, when the clock has stopped.
Split/Lap	White	Split or laptime, when the clock is running.
Mode	White	Go to the edit/setup menu, when the clock has stopped. The settings are described in paragraph 3.1 and 3.2.

3 Setup Mode

In the setup menu the control is as follows:

Function	Button	Description
Change or increase	Green	Change or increase the current parameter.
Change or decrease	Red	Change or decrease the current parameter.
Reset to 0 or escape	Yellow	Reset parameter to 0 or escape to race mode
Next parameter	White	Go to the next parameter. After the last parameter it return back to race mode.

3.1 Parameters to Edit the Race Time

Parameter	Display	Description
Edit or Setup	Ed it	Choose between edit and setup.
Tens of hours	0	Hours: 0 – 24 or 0 - 99
Hours	00	Hours: 0 – 24 or 0 – 99
Tens of minutes	00 0	Minutes: 0 - 59
Minutes	00 00	Minutes: 0 – 59
Tens of seconds	00 00 0	Seconds: 0 - 59
Seconds	00 00 00	Seconds: 0 – 59

3.2 Parameters Setup Menu

Parameter	Display	Description
Edit or Setup	SEtUP	Choose between edit and setup.
Mode	ModE r	Mode Raceclock
	ModE d	Mode Time of day clock
	ModE C	Mode Counter
	ModE S	Mode Scoreboard
	ModE P	Mode Protocol (Data communication)
24H or 99H	24H	After 23:59:59 follows 0:00
	99H	After 99:59:59 follows 0:00
Count mode	Cnt U	Counting Up
	Cnt d	Counting Down

	CnE 1	Counting down repeatedly, Interval mode.
	CnE S	Counting down and Stops at 0:00
	CnE C	Counting down to 0:00 and then starts to count up
Display mode	diSP A	Automatic switching between hours/minutes/seconds display and minutes/seconds/hundredths display
	diSP h	Display time in hours/minutes/seconds
	diSP n	Display time in minutes/seconds/hundredths
	diSP t	Display time in minutes/seconds/thousandths (only LC10)
	diSP d	Display time in seconds/hundredths
	diSP S	Display time in seconds
Preset hours	0	Preset hours: 0 – 24 or 0 – 99
	00	
Preset minutes	00 0	Preset minutes: 0 – 59
	00 00	
Preset seconds	00 00 0	Preset seconds: 0 – 59
	00 00 00	
Split or lap time	SPLt 0	No split available
	SPLt C	Cumulative split time
	SPLt L	Lap time
Output signals (Optional)	Sign o	No signals
	Sign F	Output active when the clock is stopped
	Sign S	Output active when the clock is started
	Sign 2	Output is active when the clock reaches 0:00
	Sign A	Output is active at start, stop and 0:00
Display intensity (LED clocks only)	Int 0	0 = Automatic in case of internal light sensor, 1 = Lowest intensity, 8 = Highest intensity
Sleep	SLP n	n = nothing, Y = Switch of the display for sleep-mode. By pressing START, STOP, RESET or MODE, the display is switched on. (only LC- and EML-types)
Setup Lock	LoCH 0	0 = Setup menu can be entered, 1 = Setup menu is locked. When the menu is locked, this is shown by displaying [LoCH] during powerup. This can be reset by pressing RESET during this message.

4 Selftest Mode

The race clock has an internal selftest mode. In this mode the clock gives some information about itself and make some tests available. This mode can be entered by shortly pressing the MODE button during the power-up. It will start by giving its model type information. Go to the next item by pressing the MODE button.

Parameter	Display	Description
Model type	EM800	Model type of the clock. Here EM800
Serial number	3107	Serial number of the clock. Here 3107
Mode	Mode r	Application mode of the clock. Here R for Race clock.
Software version	u 140	Software version
Battery	bAtt 1	Battery internal: 0 = no, 1 = yes
Battery voltage	12_80	Actual battery voltage in [V] +/- 0.2V. This value is unfiltered and can vary.
Light Sensor	Ldr 0	Internal light sensor (LED-types only): 0 = no, 1 = yes
Sensor value	00000	Light sensor value
Input test	i2	Input test: 1 = start, 2 = stop, 3 = reset
Output	OUt 0	Output available: 0 = no, 1 = yes
Display test	8	Display test: tests one digit at a time. Go to the next digit by pressing START.
RF Communication	rFc 0	Wireless RF communication internal: 0 = no, 1 = yes

5 Application Examples

5.1 Edit Time

When the time is stopped, the time can be edited by the following:

1. Press MODE. The display shows "Ed it".
2. Press MODE. The display shows now the tens of hours digit: "0 ".
3. Change this digit by pressing START or STOP.
4. Press MODE to go to the next digit and carry out step 3.
5. At the last digit the following is for example possible: " 12 34 56". Press MODE to go after the last digit back to race mode. The display shows shortly "------". After which the edited time is shown, from which can be started: " 12:34:56"

5.2 Setup Stopwatch

When the time is stopped, the raceclock can be setup as a stopwatch by the following:

1. Press MODE. The display shows "Ed it".
2. Press START or STOP to change this to "SEtUP".
3. Press MODE to go to the first parameter: "ModE r".
4. When the parameter is not 'r' ('r'), change this by pressing START or STOP until it is.
5. Press MODE to go to the next parameter: 24 or 99 hour display. The preference for this parameter is 99 hour display: " 99H".
6. Press MODE to go to the next parameter: Count (Cnt). Set this to "Cnt U".
7. Press MODE to got to the next parameter: Display (Disp). Set this to "d iSP A" (A = Automatic)
8. Press MODE to go to the next parameter: Preset. The display shows the tens of hours: "0 ". Press MODE until all digits are shown: "00 00 00". Change the digits by pressing START of STOP to 0.
9. Press MODE to go to the next parameter: Split (SPLT). Set this to "SPLt 0" (0 = Off/no split or lap-times)
10. Press MODE to go to the next parameter. Depending on the model/type the parameters may vary. Press MODE until the display show shortly: "------". After this, the raceclock is ready for use with its new settings showing: " 0.00". The stopwatch can be operated by START, STOP and RESET.

5.3 Timer

Go to the setup menu and use the following settings:

- Count mode: Counting down and stop (Cnt S)
- Display mode: Automatic (disp A)
- Preset to: The time to be count down from.
- Split mode: Off (Splt 0)

Go back to race mode. Use the RESET button to set the clock to the preset time. When the START button is pressed, the clock starts to countdown to zero.

5.4 Marathon

In case of long races, the raceclock is used as running time clock. It is started and most of the time runs the whole race without stopping.

You can use the following settings:

- Count mode: Counting up (Cnt U)
- Display mode: Display time in hours/minutes/seconds (disp h)
- Preset to: 0 00 00
- Split mode: Off (Splt 0) or Cumulative (Splt C)

The split-button can be used to generate a split-time. The clock continues running in the background. The display of the background clock can be resumed by pressing START.

The time on the race clock can be adapted by stopping it, pressing the MODE button. Then the stopped time is shown in hours/minutes/seconds. This time can be modified to a new time. When the seconds are modified, press MODE again. The clock is now back in race mode. The clock can be started from the new time. This function can be useful when there are multiple races at a time, which were started at different times.

5.5 Time of Day

Go to the setup menu and use the following settings:

- 24H
- Count mode: Counting up (Cnt U)
- Display mode: Display time in hours/minutes/seconds (disp h)
- Preset to: Time of day, for example: 14 30 00

Go back to race mode. The clock can be started, stopped and reset by the buttons of the control panel or a remote control.

6 Internal Battery and Charger

The race clock has an internal rechargable 12V battery and a suitable charger. The clock can be charged by connecting it to mains using a suitable power cord. When it is connected to mains the LED above the power-entry will light.
When the clock is active and the "battery low" LED starts to light, the clock can still be used for some time (hours, when the battery is healthy). This "battery low" indicator means the battery should be recharged.
When the clock keeps on running without recharging, it will stop itself at a certain battery voltage. It will go to a low energy profile to protect the battery. The display is stopped.
The charging time of an battery in "battery low" state is about 4 to 12 hours, dependending on the type. A longer charging time does not cause damage to the battery. The charger automatically regulates the necessary loading current.
When the battery is fully charged, it keeps its energy for about 12 months. After such a long period it should be recharged.
The battery must be recharged within 1 or 2 days after usage. When the clock is used in fully charged state for less than a few hours, the clock doesn't have to be recharged.
The clock can run when it is connected to mains. While running, the charging proces itself will take more time.

Warning:
The clock does not have to be charged when no energy is used. This can shorten the lifetime of the battery.
The clock may never be stored with a completely low battery. This causes permanent damage to the battery.

When the clock is used at low temperatures, the time of operation decreases. The lower the temperature, the shorter the clock can run on the built-in battery. The clock can not run on its internal battery at temperatures below -25 ° Celsius.

7 Maintenance

The housing is made of aluminum and is coated against corrosion.
The front plate is non-reflecting acrilate. Clean the front plate with a moist soft cloth, do not use abrasives or solvents.
The digits are electromagnetic components with nylon bearings. Do not use oil on these bearings.

To check the raceclock, the selftest can be used.

If a certain function does not work, check if the buttons do not stick. A remote control can sometimes be used to work around the failure of a control panel button.
If the digits do not function properly (defect shaped figures) the battery indicator has to be checked first first. When it is active, the battery should be recharged.
The battery has a limited lifetime, which is depends mainly on the usage. See chapter 6.

When the problem can not be solved by recharging, a selftest or cleaning, contact your supplier for help or advice.

8 Available Options

There are several options available for the EM-series race clocks. These options consist out of other operating modes, which makes the race clock more versatile.

8.1 Time of Day Clock Mode

Besides the race time, the clocks can contain a mode which displays the time of day in hours, minutes and seconds.

8.2 Counter Mode

A counter mode provides functionality to count ticks, up or down with an adjustable tick size.

In counter mode the clock has the following functions:

Function	Button	Description
Start	Green	Increase the counter with one step.
Stop	Red	Decrease the counter with one step.
Reset	Yellow	Reset the counter.
Mode	White	Go to the setup menu.

By pressing MODE after power-up the race clock can be put into setup-mode. The following parameters are available:

Parameter	Display	Description
Mode	ModE C	Counter mode
Stepsize	1	Stepsize, here 1
Preset	25	Preset value, e.g. number of laps, here 25
Counter mode	Cn 0	Manual mode
	Cn 1	Automatic counting up 1 step per second.
	Cn 2	Automatic counting down 1 step per second.
Display intensity (LED clocks only)	Int 0	0 = Automatic in case of internal light sensor, 1 = Lowest intensity, 8 = Highest intensity
Setup Lock	LoCH 0	0 = Setup menu can be entered, 1 = Setup menu is locked. The setup menu can be unlocked by pressing RESET during powerup.

8.3 Scoreboard Mode

A scoreboard mode provides functionality to show two scores on the display. On the left side the home score; the guest score on the right side.

In scoreboard mode the clock has the following functions:

Function	Button	Description
Start	Green	Increase the home score.
Stop	Red	Increase the guest score.
Reset	Yellow	Reset the scores.
Mode	White	Go to the setup menu.

8.4 Protocol Mode

A protocol mode can provide a serial command interface, which interpretes several protocols of external timing equipement.

There are several protocols available.

There are several types of serial communication available.

By pressing MODE after power-up the race clock can be put into setup-mode. The following parameters are available:

Parameter	Display	Description
Mode	ModE P	Protocol mode
Protocol	Prot E	Eraton protocol, suitable for a.o. TUP9000 timer
	Prot H	TAG-Heuer HL960/990 protocol, suitable for a.o. CP520/CP540
	Prot F	Suitable for as interface to FinishLynx computer
	Prot M	Master/slave protocol in case of multiple clocks
Function	Func 0	Default display (in case of Eraton protocol without '.' en ':').
	Func t	Display protocoldata as racetime in hours/minutes/seconds (Eraton protocol only)
	Func d	Display protocoldata as time-of-day in hours/minutes/seconds (Eraton protocol only)
	Func S	Display protocoldata as time in seconds and 1/100 sec. (Eraton protocol only)
	Func n	Display number TUP9000 (Eraton protocol only)
	Func r	Display ranking TUP9000 (Eraton protocol only)
	Func P	Display penalty TUP9000 (Eraton protocol only)

	FUnc U	Display time, number, penalty and ranking TUP9000 (Eraton protocol only)
Display intensity (LED clocks only)	Int 0	0 = Automatic in case of internal light sensor, 1 = Lowest intensity, 8 = Highest intensity
Setup Lock	LoCH 0	0 = Setup menu can be entered, 1 = Setup menu is locked. The setup menu can be unlocked by pressing RESET during powerup.

9 Accessories

There are several accessories available for the EM-series race clocks.

9.1 Wired Remote Control

The wired remote control contains the same four buttons as the control panel. The cable length is 10 meters. The wired remote control can be connected directly to the race clock.

This device does not contain a battery.

9.2 Wireless Remote Control

The wireless remote control contains the same four buttons as the control panel.

The raceclock requires a built-in receiver and antenna to make use this type of remote control.

It has a range of about 100 meters.

This device contains a standard 9V alkaline battery. It has to be replaced once per year. Do not use a rechargable battery, because these types of batteries have a high self-discharge rate.

9.3 Tripod

The race clock has four M8 bolts at the bottom side. They can be used for mounting on the tripod. The tripod is delivered with wing-nuts to fasten the tripod plate to the bottom-side bolts of the race clock.

9.4 Flight Case

There are flight cases available for the different types of race clocks. These cases protect the clocks during transport.

9.5 Signal Horn

The race clock can be extended with an output, which can be used to connect a signal horn. A signal can be generated at different conditions: start, stop, at reaching 0:00 at count down or in all three conditions.

10 Specifications

10.1 Conditions

Operating temperature: -15 to 50 ºC

Storing temperature: 0 to 70 ºC (max 90% humidity)

10.2 Timing Specifications

Timebase: Quartz Crystal

Accuracy: Calibrated to 1 ppm at 20 ºC

Frequency stability: ±30 ppm over operating temperature range

Aging: ±3 ppm max per year

Operating temperature range: -20ºC to +70ºC

10.3 Connections

Remote control connector: 5 pin, XLR, female

Pin	Signal	Type	Description
1	STOP	Input	
2	RESET	Input	
3	COM		Common (-)
4	SPLIT/MODE	Input	
5	START	Input	

Output connector (if available): 3 pin, XLR, female

Pin	Signal	Type	Description
1	NC		
2	OUT+	Output	
3	OUT-	Output	

Communication connector (if available): 9 pin, Sub-D, male

Pin	Signal	Type	Description
1	NC		
2	RXD	Input	Data in
3	NC		

4	NC		
5	GND		Ground
6	NC		
7	NC		
8	NC		
9	NC		

Communication connector (if available): 4 pin, Amphenol, male

Pin	Signal	Type	Description
1	NC		
2	NC		
3	RX	Input	Data in
4	GND		Ground

10.4 Electrical Specifications

Supply Voltage: 90 – 264 V AC, 47 – 63 Hz
Power max battery powered types: 20 W
Power entry: IEC Inlet, EN60.320

Battery Voltage: 12 V
Battery type: Lead acid
Battery capacity: 3.2 .. 17 Ah depending on model

10.5 Mechanical Specifications

Type	Digit	Width [cm]	Height [cm]	Depth [cm]	Weight [kg]	Tripod Interface	Eye Bolts
LC10	10 cm LED	57	15	6	2.5	Small	-
EM700	10 cm EM	61	21	17	8.5	Yes	-
EM706	10 cm EM	71	21	17	9.5	Yes	-
EM800	15 cm EM	87	31	21	15	Yes	optional
EM806	15 cm EM	100	31	21	16.5	Yes	optional
EML806	15 cm LED	87	31	21	12	Yes	optional
EM850	15 cm EM	87	31	27	23	Yes	2
EM856	15 cm EM	100	31	27	25	Yes	2
EML856	15 cm LED	87	31	27	18	Yes	2

EM900	25 cm EM	146	46	21	28	Yes	2
EM906	25 cm EM	163	46	21	31	Yes	2
EML906	22 cm LED	115	31	21	14	Yes	2
EM950	25 cm EM	146	46	32	44	Yes	4
EM956	25 cm EM	163	46	32	47	Yes	4
EML956	22 cm LED	115	31	27	19	Yes	2

Housing material: Aluminum (LC10 ABS)

Protection index: IP54, dust and rain proof

11 Warranty

The EM-series race clocks are accurate and durable products, which are produced with a lot of care and attention. When treated carefully they will last for years.
Checking and repairing should be carried out by skilled persons.

The race clocks have a two years warranty on proper operation without manufacturing failures.
The built in battery has a warranty period of one year on manufacturing failures.
The warranty expires when the clock is opened or when parts are dismantled or replaced by other than original components without authorisation.
Damage or fracture of the plastic front plate is not part of the warranty.

In case of a defect during the warranty period, this should be reported to your supplier.
In case of an accepted warranty claim, the clock should be delivered duty paid. If not, repair will not be considered.

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