multitronics CL-950E

Multitronics CL-950E is a multifunctional trip computer designed for water vehicles with gasoline injection and carburetor engines. Multitronics CL-950E record, calculate, and display the distance travelled, the average speed, the average fuel consumption, and real-time fuel consumption, display the diagnostic trouble codes of ECU.

IPS display
Eye-catching and high resolution IPS display 4,3".
The display of the device is glued to the protective glass to prevent fogging inside the case.

Multifunctional color display
You can customize the display, color scheme and parameters.

A range of 1, 2, 4, 6 or 9 parameters can be selected for displaying in a digital, graphic, arrow or progress bar mode.

The side info panel shows 4 user-chosen parameters for continual monitoring.

Standard mount
Mounts in a 85 mm standard opening, front panel installation size 129,5 x 103,5 mm.

Environmentally sealed frame
All-weather dust and liquid protected frame with IP64 level (against water splashing).

Waterproof

Built-in GPS speed sensor
Equipped with the GPS speed sensor which allows to get accurate measurements of the water vehicle speed, calculate the fuel consumption for a trip and forecast mileage before the fuel tank is empty.

Built-in accelerometer
The accelerometer controls the pitch and roll angles of your water vehicle to prevent a capsize as well as calculates the optimal trim angle of the engine and helps easy access to the gliding mode.

Wide range of external connections
Supports connection to other sensors: the tilt (trim) sensor - to monitor and adjust its optimal position, the fuel flow sensor (for carburetor engines), the injection plug (for injection engines) or the ignition coil interrupter (for carburetor engines), the fuel level sensor, the temperature sensor.

Compatible with NMEA2000
Build your NMEA2000 network: the trip computer receives engine data via the original manufacturer's protocol and communicates it to your chartplotter via NMEA2000 network.
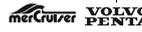
Supports original communication protocols
Multitronics CL-950E is designed for communication with water vehicles equipped with boat motors including Yamaha, Honda, Suzuki, Evinrude etc. via original manufacturers' protocols as well as with other injection type engines compatible with NMEA2000. Also supports J1939 protocol (MerCruiser, Volvo Penta, Crusader, Flagship Marine, Ilmor Marine Engines, Indmar, Kodiak Marine, Marine Power etc. compatible with SAE J1939). Takes readings of engine parameters like fuel consumption, temperature, engine hours, service data, faults etc. Moreover, Multitronics CL-950E is compatible with any injection (connection to injection plug is required) or carburetor (connection to mechanical interrupter or electronic switch is required) type of engine.

Immediate fault warnings
Each time the ECU detects a fault, the trip computer immediately warns about it displaying the fault code and its description. Thus you will know whether you must take actions right away or can continue your trip.

Internet updates
You can customize automatic software updates on Multitronics CL-950E via mini-USB, memorize your settings and transfer them to the newer versions.

FREE UPDATE

Engine performance monitoring
When any of the engine performance parameter (rpm, temperature, trim, tank etc.) exceeds the previously set boundaries the trip computer issues a warning signal and displays the data of the exceeded parameter.

Contents

Button layout

Button assignments	
Button	**Assignment**
F	**Press and release** (less than 2 sec) - To call out the "Hot Menu" **Press and hold** (more than 2 sec) - To adjust the screen brightness, cyclic switch (for "Parameters Display" and "Average Display")
ESC	- To undo the action; - To exit to the previous menu
PAR	**Press and release (less than 2 sec)** To cyclic switch between the displays: "Parameters"/ "Average" / "Service Interval" "Parameters Display": momentary engine performance parameters (fuel consumption, engine coolant temperature etc.). "Average Display": average parameters for a given time period (trip, 24 hours). "Service Display" : service interval reminder, fault codes reading and clearing. **Press and hold (more than 2 sec)** To switch to the "Settings Display": setting the on-board computer, protocol choice, warnings, display etc.
∧ ∨	To move UP/DOWN the menu; - To choos various parameters combinations in the "Parameters Display"; - To increas and decreas the editing parameter in the "Settings Display".
SET	To change the type of the "Parameters Display" (digital, graphic, arrow) Enter the sub-menu; Command to change the selected parameter; To confirm the change of a parameter

1). Compatible engines and displayed parameters

Multitronics CL-950E shows different sets of parameters depending on the engine type and selected communication protocol. However there are common parameters which it displays regardless of the engine type or protocol and identical for all protocols which are listed in the table below.

	Common parameters regardless of the selected protocol						
1	Trim, degree	7	Average consumption per 100 km per trip	13	speed
2	Roll, degree	8	Trip cost	14	rpm
3	Trip time	9	Date/Time	15	consumption l/100km; l/h
4	Fuel consumed per trip	10	Remaining fuel	16	temperature (external sensor, option)
5	Mileage per trip	11	Mileage prognosis	17	trim
6	Average speed per trip	12	Battery voltage		

YAMAHA

HPDI:
Z150, LZ150, VZ150
Z175, LZ175, VZ175
Z200, LZ200, VZ200

Z225, LZ225, VZ225
Z250, LZ250, VZ250
Z300, LZ300, VZ300
EFI 4-stroke:
F30, F40

F50, FT50, T50
F60, FT60, T60
F70, F75, F80, F90, F100
F115, FL115, LF115
F150, FL150, LF150

F200, FL200, LF200
F225, FL225, LF225
F250, FL250, LF250
F300, FL300, LF300
F350, FL350, LF350

	Yamaha basic parameters				
1	Engine rpm	13	Oxygen sensor voltage *	5	Knocking control count
2	Intake manifold pressure *	14	Fuel pressure *	6	Fuel pressure minimum
3	Throttle position	15	Idle control position *	7	System failures
4	Throttle position 2 *		*If the parameter is missing you will see "---",	8	Engine ID
5	On-board voltage		depends on the engine		Yamaha engine hours
6	Injection time		Yamaha additional parameters	1	0-1000 rpm
7	Ignition advance angle	1	Atmosphere pressure	2	1000-2000 rpm
8	Engine temperature, degree *	2	Total engine hours	3	2000-3000 rpm
9	Intake air temperature		Yamaha service records	4	3000-4000 rpm
10	Water temperature* (coolant analogue)	1	Maximum engine speed	5	4000-5000 rpm
11	Engine oil pressure *	2	Over rev. count	6	5000-6000 rpm
12	Speed	3	Overheat count	7	6000-7000 rpm
		4	Low oil pressure count		+ Faults reading and reset

SUZUKI

DF15A/20A (s/n:310001...)
DF40/50 (1999...)

DF40A/50A (s/n:110001...)
DF60A (2010...)
DF60/70 (1998...)
DF70A/80A/90A (2009...)

DF90/115 (2001...)
DF100 (2009...)
DF140 (2002...)
DF150/175 (2006...)

DF200/225/250 (2004...)
DF250S (2008...)
DF300 (2007...)

	Suzuki basic parameters				
1	Engine rpm	7	6000-7000 rpm	16	NO.OF SP SENSOR FAILURE
2	Intake manifold pressure	8	Total (hours)	17	NO.OF TP SENSOR FAILURE
3	Throttle position sensor*	9	Total (minutes)	18	NO.OF NEUTRAL SW FAILURE
4	On-board voltage		Suzuki service records	19	NO.OF CHECK CODE WIRE FAILURE
5	Injection time	1	NO.OF MAP SENSOR FAILURE	20	NO.OF CMP FAILURE(VVT_STDB)
6	Injection advance angle	2	NO.OF CKP SENSOR FAILURE	21	NO.OF CMP FAILURE(VVT_PORT)
7	Cylinder temperature	3	NO.OF IAC VALVE FAILURE	22	NO.OF VVT ADVANCE FAILURE(S)
8	Intake air temperature	4	NO.OF CMP SENSOR FAILURE	23	NO.OF VVT ADVANCE FAILURE(P)
9	Idle control position	5	NO.OF INTAKE FAILURE	24	NO.OF OCV FAILURE(VVT_STDB)
	* If the parameter is missing you will see	6	NO.OF SYL. TEMP. SENSOR FAILURE	25	NO.OF O2 SENSOR FAILURE
	"---", depends on the engine	7	NO.OF IAT SENSOR FAILURE	26	NO.OF TRIM SENSOR FAILURE
	Suzuki engine hours	8	NO.OF EX. TEMP. SENSOR FAILURE(S)	27	NO.OF KNOCK SENSOR FAILURE
1	0-1000 rpm	9	NO.OF OVER-REVOLUTION	28	NO.OF OIL PRESSURE SW FAILURE
2	1000-2000 rpm	10	NO.OF LOW OIL PRESSURE	29	NO.OF OCV FAILURE(VVT_PORT)
3	2000-3000 rpm	11	NO.OF OVERHEAT(GRADIENT)	30	NO.OF WATER IN FUEL
4	3000-4000 rpm	12	NO.OF OVERHEAT(TEMP.)	31	NO.OF O2 SENSOR HEATER FAILURE
5	4000-5000 rpm	13	NO.OF LOW BATTERY VOLTAGE	32	System failures
6	5000-6000 rpm	14	NO.OF FUEL INJECTOR FAILURE	33	Engine ID
		15	NO.OF EX. TEMP. SENSOR FAILURE(P)		+ Faults reading (without reset)

HONDA

BF 115A (2005-2006)
BF 115D (all years)

BF 130A (2005-2006)
BF 135A (2004-2006)
BF 135A4 (all years)
BF 150A (2004-2006)

BF 175A (2003-2007)
BF 250A (all years)
BF 40D (all years)
BF 50D (all years)

BF 75A (all years)
BF 90D (all years)
BFP 60A (all years)

	Honda basic parameters				
1	Engine rpm	3	Atmosphere pressure sensor	19	Charge indicator
2	Engine oil temperature	4	Injection error sygnal	20	Pump control
3	Intake air temperature	5	State of the heated lambda probe (air sensor pressure)	21	Inlet air bypass valve
4	Intake pressure sensor	6	Lambda probe heating	22	Number of VTEC triggers
5	Throttle position sensor	7	Current mix changes (short term correction of the mix based on air sensor)	23	Engine hours
6	On-board voltage	8	Lambda probe heating current	24	Engine hours on 100% throttle
7	Injection time	9	Idle speed valve, neutral	25	Engine hours on trawl
8	Injection advance angle	10	Idle speed valve, trawl	26	Engine hours at idle
9	Left cylinder temperature	11	Engine noise level	27	Число тревог уровня масла
10	Right cylinder temperature	12	Ignition detonation delay angle	28	Engine hours on afterburn
11	Idle valve position	13	Signal on the starter button	29	VTEC counter
12	Faults reading and reset	14	Neutral sensor	30	Engine hours in interrupted run time
	Honda additional parameters	15	Emergency switch	31	Time of inlet air bypass valve
1	Generator	16	Insufficient oil pressure	32	Number of motor starts
2	Current of the idle speed valve	17	Excess oil pressure	33	Coolant temperature, sensor 4 (air sensor heater)
		18	Water separator		+ faults reading and reset

NMEA2000

water vehicles compatible with NMEA2000.

1	rpm	6	Battery voltage	11	Gear
2	Fuel pressure	7	Fuel consumption	12	Faults
3	Engine oil pressure	8	Engine hours	13	Trim
4	Engine oil temperature	9	Engine load	14	Voltage
5	Engine coolant temperature	10	Fuel level in the tank		+ faults reading (without reset) ( )

EVINRUDE

All motors *E-TEC, FICHT, DI* from 1999 to 2018

E-TEC: 25HP, 30HP, 40HP, 50HP, 55HP, 60HP, 65HP, 75HP, 90HP, 115HP, 130HP, 150HP, 175HP, 200HP, 225HP, 250HP, 300HP.

FiCHT: 75HP, 90HP, 115HP, 135HP, 150HP, 175HP, 200HP, 225HP, 250HP.

DI: 100HP, 115HP, 135HP, 150HP, 175HP, 200HP, 225HP, 250HP

	Evinrude basic parameters					
1	rpm	18	Oil injection	36	Поправка по времени
2	Cylinder 1 temperature	19	Oil supply frequency	37	Калибровка дросселя
3	Inlet air temperature	20	Oil consumption	38	Ignition Volts
4	Throttle %		**Evinrude service records**	39	Eng Serial Number
5	Trim	21	running-in mode	40	Eng Model Number
6	Battery voltage	22	Ignition key on hours	41	Eng Model Suffix
7	Fuel consumption	23	Ignition key on minutes	42	Eng Horsepower
8	Cylinder 2 temperature	24	Ignition key on seconds	43	EMM Serial Number
9	Oil pressure	25	Engine run time hours	44	Eng Max Spd(rpm)
	Evinrude additional parameters	26	Engine run time minutes	45	Max Temp port
10	Switch on neutral переключатель на нейтрали	27	Engine run time seconds	46	Max Temp stbd
11	Water in fuel	28	EMM run time hours	47	EMM Max Temp
12	Pressure	29	EMM run time minutes		**Evinrude diagnostic data (the Service Interval display)**
13	EMM temperature	30	EMM run time seconds	48	Current trouble codes
14	Charge current	31	Bootstrap	49	Saved trouble codes
15	System voltage	32	No oil period	50	Trouble codes history
16	Throttle volt	33	Number of starts	51	RPM profile (by usage time)
17	Water pressure	34	Oil type	52	Temperature profiles (for 1, 2 cylinders, EMM)
		35	Running-in duration		*+ Faults reading and reset*

SAE J1939:

Water vehicles with engines suporting SAE J1939: MerCruiser, Volvo Penta, Crusader, Flagship Marine, Ilmor Marine Engines, Indmar, Kodiak Marine, Marine Power и др.

	J1939 parameters				
1	Speed	15	Effective gear ratio		Rail fuel pressure
2	RPM	16	NOx level		Rated Friction - Torque Percentage
3	Consumption /100	17	O2 level		Maximum torque
4	Consumption / h	18	NOx sensor status		Limit RPM
5	Engine coolant temperature	19	Heater failure		Fuel temperature
6	Engine control mode	20	NOx sensor failure		Oil level
7	Retarder mode	21	O2 sensor failure		Coolant pressure
8	Actual retarder torque	22	Required % coolant fan speed		Coolant level
9	MAX retarder torque	23	Coolant fan status		Parking brake
10	ABS is active	24	Coolant fan speed		Atmosphere pressure
11	Gearbox output speed	25	Front axle speed		Exhaust gas temperature
12	Gearbox input shaft speed	26	Mechanical fault lamp status		Automatic transmission filter replacement
13	Accelerator Pedal Idle Position Sensor	27	Immediate stop red lamp status		Automatic transmission oil resource
14	Current torque	28	Fault Warning Yellow Lamp Status		ECU trouble codes, reset trouble codes
		29	Emission fault lamp status		*+ Faults reading and reset*

10/11Corvet

Motors with ECU ABIT 10/11 Corvet (utility vehicles, all-terrans, trikes, water vehicles).

	Korvet basic parameters				
1	Ignition advance angle	2	Estimated gear ratio	13	Engine operation time when the permissible temperature is exceeded
2	Fuel injection pulse duration	3	Additional fuel supply	14	Coolant pressure
3	Coolant temperature	4	Canister purge valve position	15	Oil pressure
4	Throttle position	5	Absolute pressure	16	Fuel temperature
5	Estimated gear number in the gearbox	6	Total fuel supply	17	Exhaust gas temperature 1
6	The actual position of the idle speed control	7	Set idle speed	18	Exhaust gas temperature 2
7	Fuel pressure	8	Average L-probe correction factor	19	Oil temperature #2
8	Engine oil temperature	9	L-probe correction factor	20	Coolant temperature #2
	Korvet additional parameters	10	Total engine running time	21	Current air/fuel ratio
1	Уровень сигнала детонации	11	Mileage	22	Target air/fuel ratio
		12	Engine operation time when the permissible speed is exceeded	23	ECU trouble codes, reset trouble codes
					+ faults reading and reset

Universal

Any petrol injection engine with electronic ignition control; no connection to the engine control unit, without diagnostics.

	Universal mode (without diagnostics)				
1	Roll, degree	7	Average consumption per 100 km per trip	13	Speed
2	Pitch, degree	8	The cost of trip	14	Engine RPM
3	Trip time	9	Date / time	15	Fuel consumption l/100 km; l/h
4	The amount of fuel used per trip	10	Fuel tank level	16	injection time
5	Trip mileage	11	fuel mileage forecast	17	temperature (external sensor, optional)
6	Average speed per trip	12	battery voltage	18	trim

Carburetor

Carburetor engine with mechanic interrupter or electronic switchboard, without diagnostics.

	Parameters for carburetor ingines				
1	Roll, degree	5	Average speed per trip	9	Engine RPM
2	Pitch, degree	6	Date / time	10	temperature (external sensor, optional)
3	Trip time	7	Battery voltage	11	Trim
4	Trip mileage	8	Speed	12	Fuel consumption l/100 km; l/h

Transmits to NMEA2000 network

List of parameters which the trip computer transmits to NMEA2000 network (can be transmitted to the chartplotter).

	NMEA2000 (water vehicles compatible with the NMEA200)				
1	Engine RPM	6	Battery voltage	11	Number of gear
2	Fuel pressure	7	Fuel consumption	12	ECU trouble codes
3	Engine oil pressure	8	Engine hours	13	Trim
4	Engine oil temperature	9	Engine load	14	ECU voltage
5	Coolant temperature	10	Fuel tank level		

2. Installation and connection

ATTENTION!
To install the device use the fasteners provided in the kit so as not to damage its enclosure and sealing!
1. **<u>Disconnect the battery</u>**.
2. Insert the device in a spare room in the dashboard (standard diameter – 85 mm)
3. Fasten the U-shaped bracket to the mounting screws of the device on the back side of the dashboard and tighten the mounting nuts firmly fixing the device to the dashboard. It is assumed that the dashboard is not more than 15 mm thick. If your dashboard exceeds this limit, cut off the ends of the bracket to secure the device.

Attention! If installation of the device requires disassembling of some elements of the dashboard, refer to the manual of your water vehicle to determine the correct sequence of actions when dismantling and installing the interior elements.

2.1. Cables and connectors

To connect Multitronics CL-950E to the diagnostic connector of the corresponding engine manufacturer, it is equipped with various cables and connectors (you should choose the appropriate cable type when purchasing the device).

2.2. Multitronics CL-950E connector pinout

protective cover for the mini-usb (to update the software and configure the device from a computer)

6-pin connector

5-pin connector

temperature sensor*option
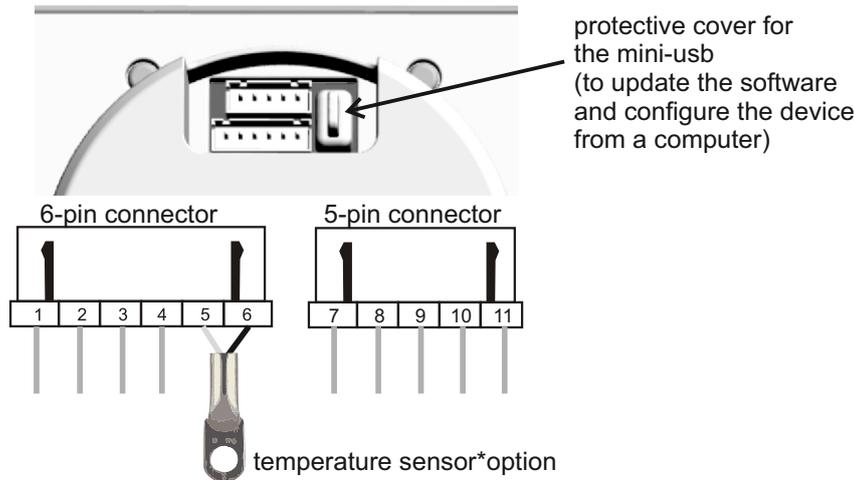
pin №	purpose
1	trim (motor angle sensor)
2	+12V battery
3	K-line / fuel sensor (for carburetor)
4	GND (mass)
5	temperature sensor (signal)
6	temperature sensor (mass)
7	ignition lock / speed sensor
8	fuel sensor
9	CAN-Low
10	CAN-High
11	injection plug / interrupter (for carburetor)

outside temperature sensor (*) - option.
Can be used to take temperature readings of the:
- **engine** (mounted directly to the engine, only for carburetor engines);
- **seawater** (mounted outside the boat in water, the upper part of the sensor with a wire mustn't be submerged in water);
- **air** inside the cabin of the boat (mounted inside the cabin).

After connection is completed, select the established connection option in: Settings display-Sources-Signature Temp.

2.3. Types of diagnostic connectors

diagnostic connector (male)
HONDA
(view from the contacts side)

diagnostic connector (male)
SUZUKI
(view from the contacts side)

diagnostic connector (female)
YAMAHA
(view from the contacts side)

diagnostic connector (male)
EVINRUDE
(view from the contacts side)
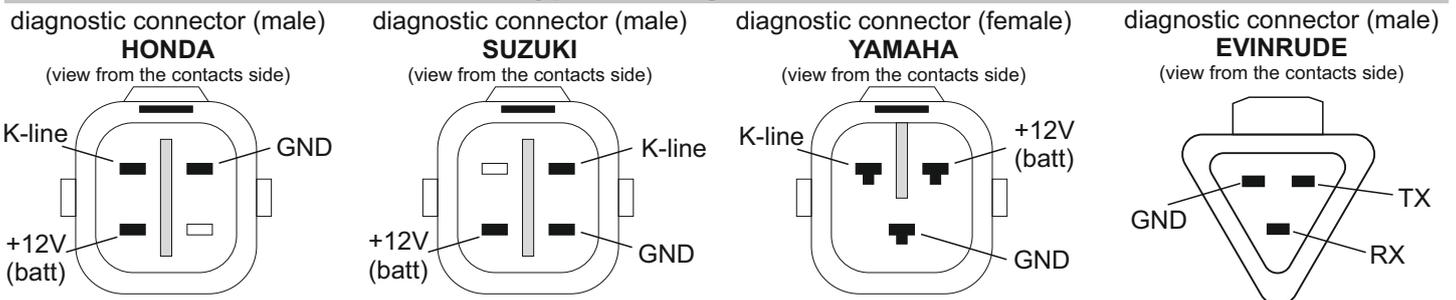
If the engine is equipped with a different diagnostic connector, it is possible to "twist" contact to contact in accordance with their assignments (see detailed information in the connection diagrams).

To simplify the connection of Multitronics CL-950E different types of adapter cables are available when purchasing the device:

Honda - adapter cable with 4-pin connector for Honda motor diagnostics;
Suzuki - adapter cable with 4-pin connector for Suzuki motor diagnostics;
Yamaha - adapter cable with 3-pin connector for Yamaha motor diagnostics;
Evinrude - adapter cable with 3-pin connector for Evinrude motor diagnostics;
Universal - adapter cable for free connection (without connector) - to establish connection (by "twisting" method) with injector engines communicating via the following protocols: J1939, NMEA2000, Korvet and Universal.
*Carburetor* - adapter cable for free connection (not equipped with the connector) - for connection (using the "twisting" method) to carburetor engines.

2.4.1 Sequence of connection of one Multitronics CL-950E

Connection using *Yamaha / Suzuki / Honda* cables

6	black	temperature sensor (option) → air temperature / water temperature
5	white	
4	brown	ground
3	blue	K-line — to diagnostic connector
2	yellow	+12V
1	purple	to trim sensor (trim)

to ignition lock — red — 7
to fuel sensor — зеленый — 8
not used ✕ grey — 9
not used ✕ orange — 10
to ignition plug (if desired) — black-green — 11
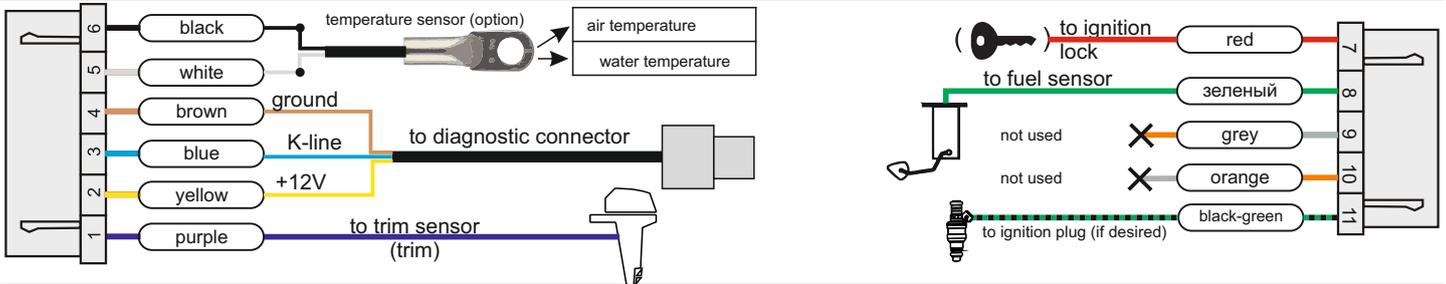
Connection using the *Evinrude* cable

6	black	temperature sensor (option) → air temperature / water temperature
5	white	
4	brown	ground
3	blue	TX
2	red	+12V
1	purple	to trim sensor (trim) (*if desired*)

to diagnostic connector

to ignition lock — black-green — 7
to fuel sensor — green — 8
not used ✕ grey — 9
not used ✕ orange — 10
RX — yellow — 11
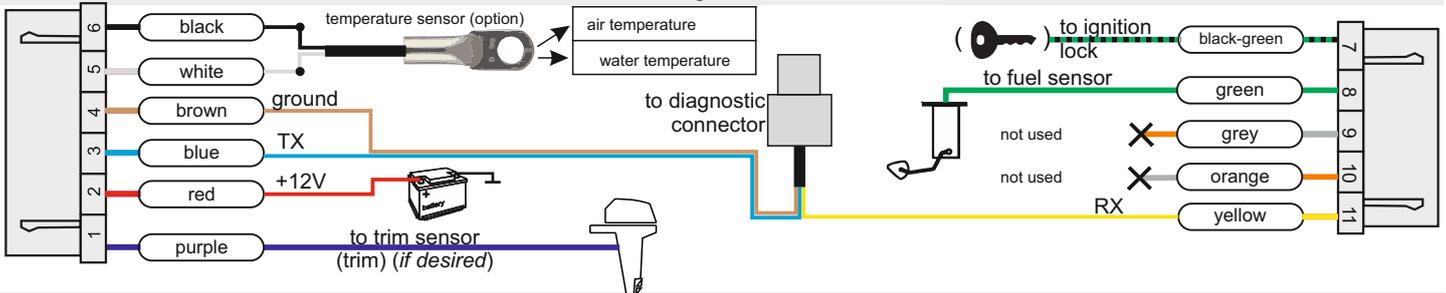
Connection using a *Universal cable (for the 1939 protocol)*

6	black	temperature sensor (option) → air temperature / water temperature
5	white	
4	brown	ground
3	black-green	✕ not used
2	yellow	+12V
1	purple	to trim sensor (trim)

to engine

to ignition lock — red — 7
to fuel sensor — green — 8
CAN-high — grey — 9
CAN-low — orange — 10
to injection plug (if desired) — blue — 11
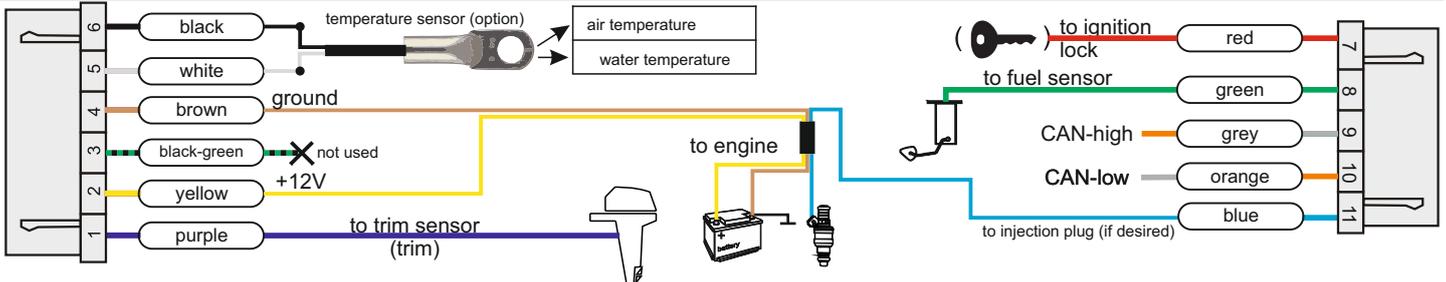
Connection using a *Universal cable (for the Korvet protocol)*

6	black	temperature sensor (option) → air temperature / water temperature
5	white	
4	brown	ground
3	black-green	K-line
2	yellow	+12V
1	purple	to trim sensor (trim)

to engine

to ignition lock — red — 7
to fuel sensor — green — 8
not used ✕ grey — 9
not used ✕ orange — 10
to injection plug (if desired) — blue — 11
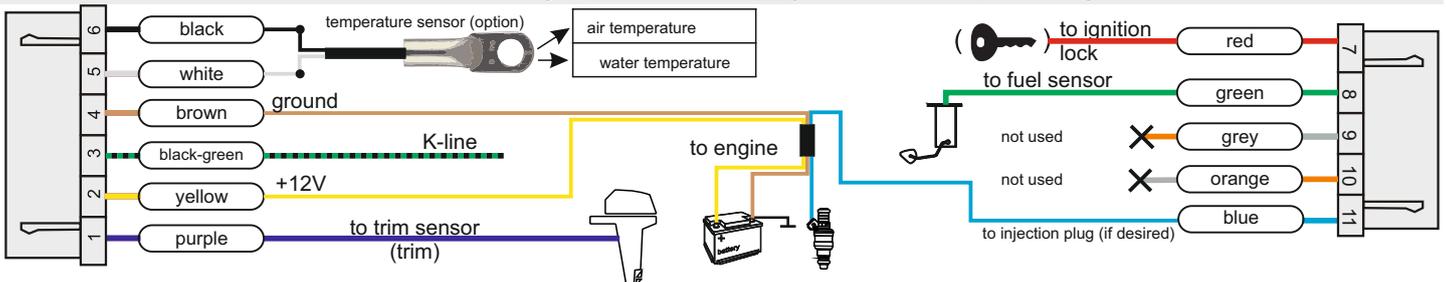
Connection using a *Universal cable (for the Univ. protocol)*

6	black	temperature sensor (option) → air temperature / water temperature
5	white	
4	brown	ground
3	black-green	✕ not used
2	yellow	+12V
1	purple	to trim sensor (trim)

to engine

to ignition lock — red — 7
to fuel sensor — green — 8
not used ✕ grey — 9
not used ✕ orange — 10
to injection plug — blue — 11
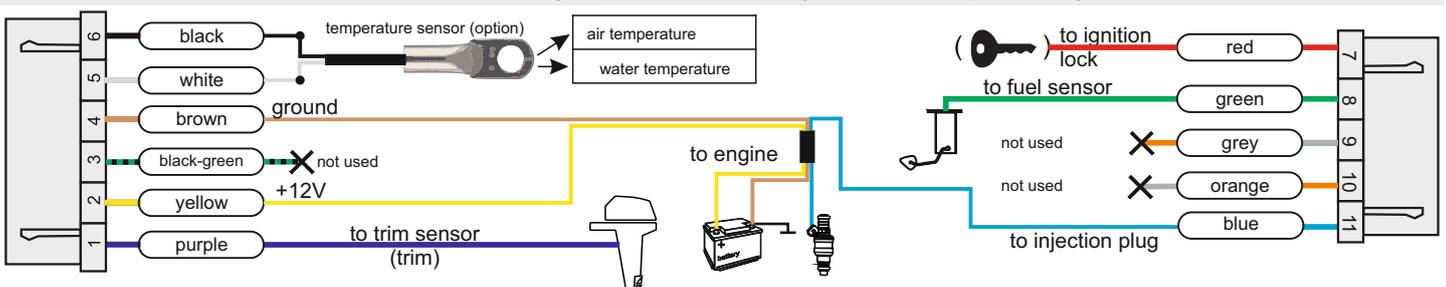
Connection to the fuel level sensor (in the absence of a fuel level indicator)

When connected directly to the fuel level sensor it is required to install a pull-up resistor 470 ... 510 Ohm on + 12V battery.

R1 = 470...510 Ohm
+12V
green — 8
to the fuel level indicator
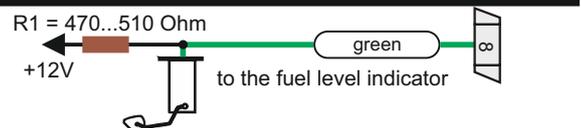
Establishing connection using a _Carburetor cable (for the Carb. protocol)_

6	black
5	white
4	brown
3	black-green
2	yellow
1	purple

temperature sensor (option)

→ air temperature
→ water temperature
→ motor temperature

ground

fuel sensor*

+12V

to trim sensor
(trim)

to engine

Ignition coil

BB central wire

L1   L2

K1

contact group or electronic switch board

11	blue
10	orange
9	grey
8	green
7	red

to ignition coil interrupter

✗ not used

✗ not used

to fuel sensor

(🔑) to ignition lock

* To calculate the fuel consumption Multitronics CL-950E can be connected to a flow-through fuel consumption sensor which performs from 700 to 20,000 pulses/liter (should be calibrated).
The fuel sensor must be purchased separately.

2.4.2. Connecting and installing NMEA2000.

To establish connection with the NMEA2000 network of a water vehicle there are 2 types of Multitronics NMEA 2000 cables (optional):
NMEA2000-M - with a male connector for connecting to the splitter (connection tee) of the NMEA2000 network;
NMEA2000-F - with a female connector for connecting to the NMEA2000 connector of a chartplotter.

Connection to the NMEA2000 network with a _Universal cable (for the NMEA2000 protocol)_
Variant 1 - connecting to the connection on the engine

6	black
5	white
4	brown
3	black-green
2	yellow
1	purple

temperature sensor (option)

→ air temperature
→ water temperature

ground

✗ not used

+12V

to trim sensor
(trim) (if desired)

to engine

11	blue
10	orange
9	grey
8	green
7	red

to injection plug (if desired)

CAN-high

CAN-low

R1=120 Ом *

to fuel sensor

to ignition lock

yellow

blue

male connector
Multitronics NMEA2000-M

to connector on motor
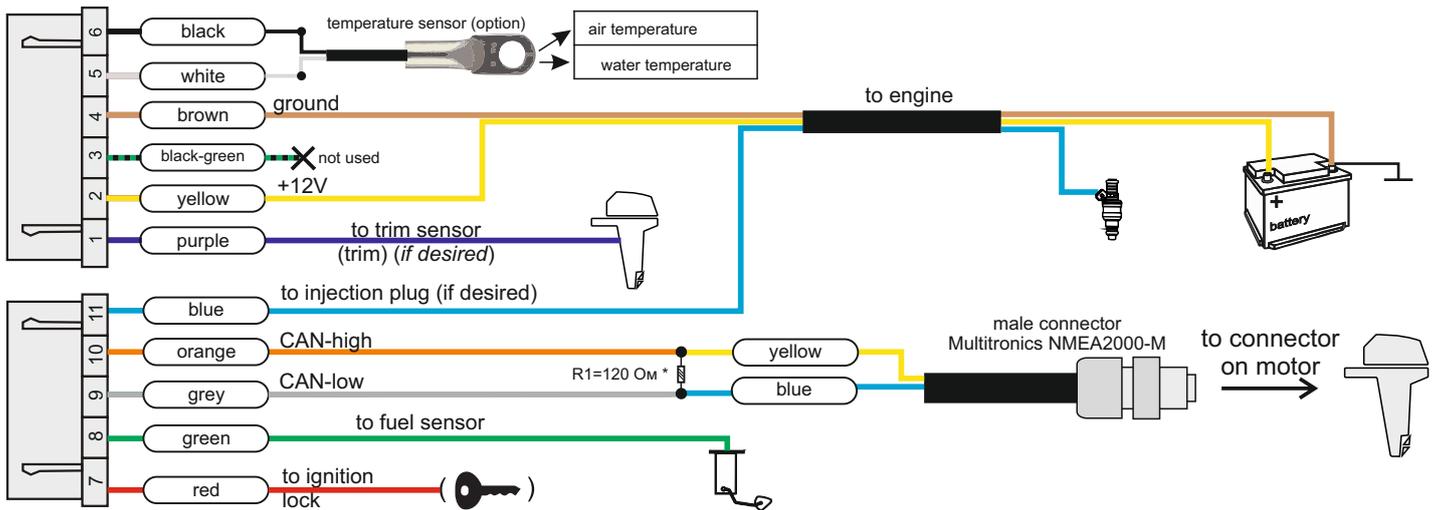
* While connecting to the connector on the engine it is mandatory to install a resistor R1 = 120 ohm otherwise the device will not work.

Connection to the NMEA2000 network with a _Universal cable (for the NMEA2000 protocol)_
Variant 2 - connecting to the network splitter

6	black
5	white
4	brown
3	black-green
2	yellow
1	purple

temperature sensor (option)

→ air temperature
→ water temperature

ground

✗ not used

+12V

to trim sensor
(trim) (if desired)

to engine

11	blue
10	orange
9	grey
8	green
7	red

to injection plug (if desired)

CAN-high

CAN-low

to fuel sensor

to ignition lock

yellow

blue

male connector
Multitronics NMEA2000-M

to NMEA2000 splitter
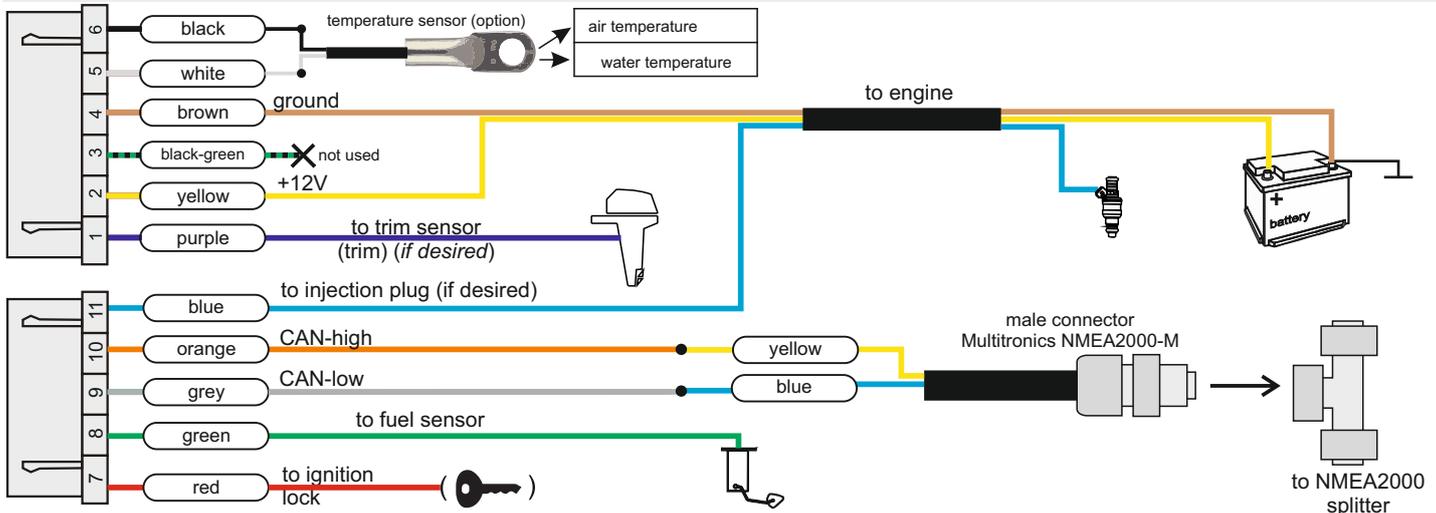
* While connecting to the splitter (connection tee) of the NMEA2000 network, installation of the resistor R1 is not required. Standard 120 ohm plugs must be used in the network.

2.4.3. Building your NMEA2000 network

Multitronics CL-950E takes readings of parameters via the diagnostic line of the engine and transmits the processed data to the NMEA2000 bus allowing to display this data on the screens of other devices (for example, a chartplotter) or to create a network of several trip computers and ensure their simultaneous operation.

This technology gives advantage of integrating into the NMEA2000 network even those engines that do not support the NMEA 2000 format (except J1939 protocol). Parameters of the engine operation of your water vehicle can be displayed on a chartplotter.

To activate data transition into the NMEA2000 network proceed the following steps after Multitronics CL-950E has been mounted and connected:

1. Turn on the chartplotter and wait till it is booted up.
2. Make to following changes to the settings of the device: "Settings display-Control-Conversion to NMEA-ON"
3. Turn off the ignition and wait till the screen of the Multitronics CL-950E is off then turn on the ignition (start the engine)
4. Select the engine parameters on the chartplotter according to its manual instructions.

Connection to engines without NMEA2000 and data transmission to the chartplotter
(on example of *Yamaha, Suzuki or Honda cables)*
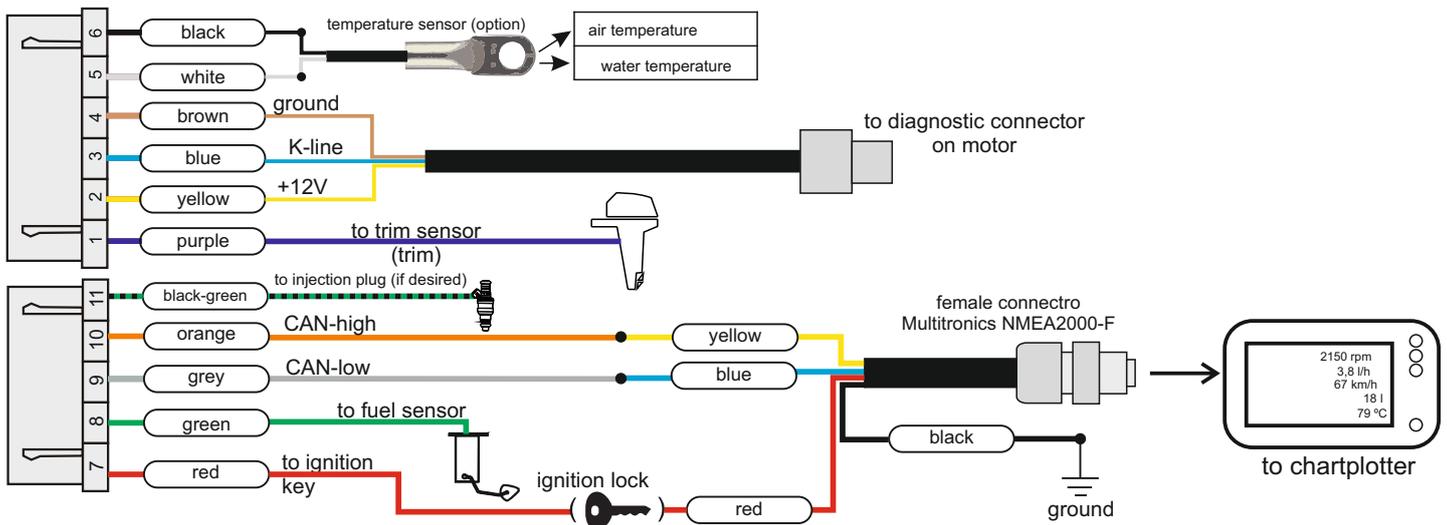
2.4.4. Building the NMEA2000 network with several computers

When The Multitronics CL-950E is specified as the main computer it reads parameters from the engine diagnostic line and transmits the processed data to the NMEA 2000 bus, which allows this date to be displayed on screens of other trip computers thus creating a network of several trip computers and ensuring their simultaneous operation.

Such parallel operation can be build up by one set of cables which connects the main trip computer to the engine, other connections can be made with ordinary wires.

This example illustrates screens of several trip computers built into one network and showing the following information:

speed, rpm, trim, roll, trim, fuel residue, engine and water temperature, voltage, time, fuel consumption
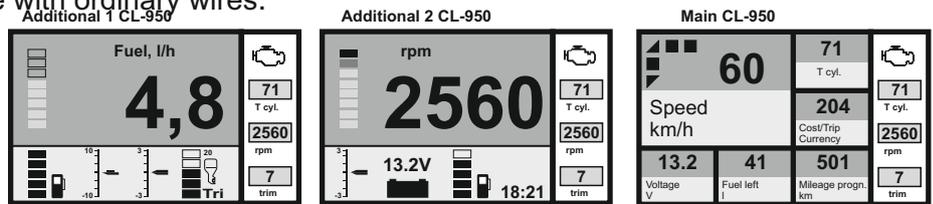
illustration of connection of several computers via *Yamaha, Suzuki* and *Honda* cables

CL-950E - main   CL-950E - additional 1
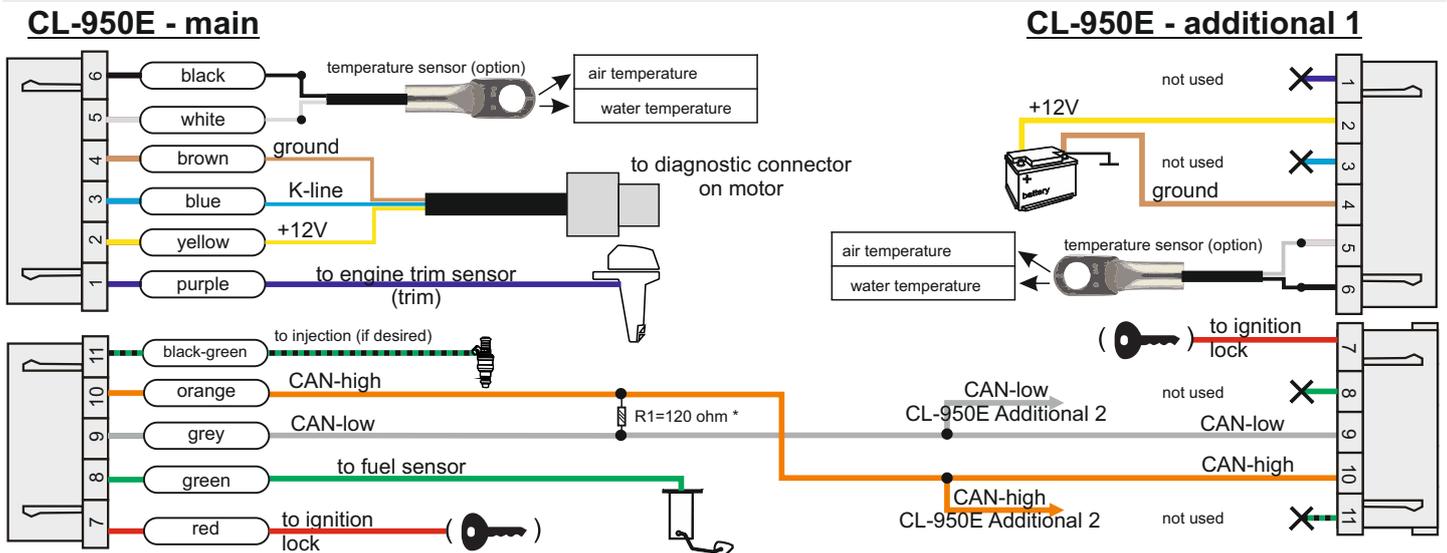
* When connecting several trip computers to each other, installation of at least one resistor R1 = 120 ohm is mandatory otherwise computers will not work.

2.5. Connection of Multitronics GPS speed sensor (option)

speed sensor

MULTITRONICS
- red → +12V
- yellow → ignition
- white → speed
- green → ground
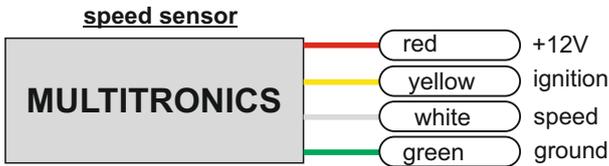
+12V - connection to the battery
ignition - connection to the ignition lock (electricity supply while the engine is running)
speed - connection to the speed center input of the trip computer
ground - connection to mass (ground)

It is possible to combine the outputs "+12V" and "Ignition", in this case the speed sensor will start working as soon as power is supplied (establishing connection with satellites can take some time).

If you choose separate connection of the "+12V" and "Ignition" outputs connecting them to assigned sockets, the trip computer retains the GPS speed sensor working for 5 minutes after the ignition is turned off, which reduces the time to search for satellites during short stops.

Attention! Performance of the GPS sensor may deteriorate when the vehicle is blocked by surrounded objects or in bad weather conditions. After long idle periods "cold" switching may take a few minutes.

Connection of an external speed sensor to the Multitronics CL-950E is optional and should be performed in case of unstable GPS signals reception by the built-in GPS sensor of the trip computer.

Connect the Multitronics speed sensor to the "Ignition" output of the trip computer and complete the settings:
    Settings display - Sources - Lock - Virt.
    Settings display - Sources - Speed - Sens.

An example of connection using *Yamaha, Suzuki* and *Honda* cables

Pin	Color	
6	black	temperature sensor (option) → air temperature
5	white	water temperature
4	brown	ground
3	blue	K-line → to diagnostic connector on engine
2	yellow	+12V
1	purple	to trim sensor (trim)
11	black-green	to injection plug (if desired)
10	orange	CAN-high — not used
9	grey	CAN-low — not used
8	green	to fuel sensor
7	red	to speed sensor

+12V — battery
ignition lock

speed sensor

MULTITRONICS
- red
- yellow
- white
- green

ground

Connections with other cables is identical to the scheme above.

3). Possible locations of connectors and sensors

To connect the Multitronics CL-950E to the diagnostic connector of the engine, refer to the manufacturer's technical documentation or to a technician experienced with these types of engines.

As a rule the diagnostic connector is located next to the engine control unit (ECU) under a protective cover against moisture and dirt.

The schemes below show the locations of diagnostic connectors and sensors for some types of engines from various manufacturers.

Yamaha (L)F200 / (L)F225
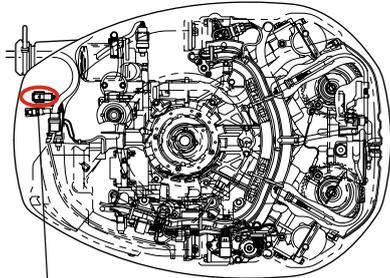
3-pin diagnostic connector

Yamaha F(T)50 / F(T)60

fuses
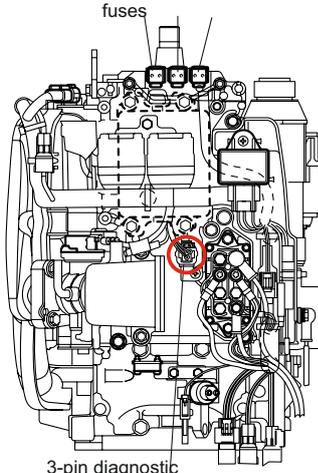
3-pin diagnostic connector

Yamaha F(L)150A
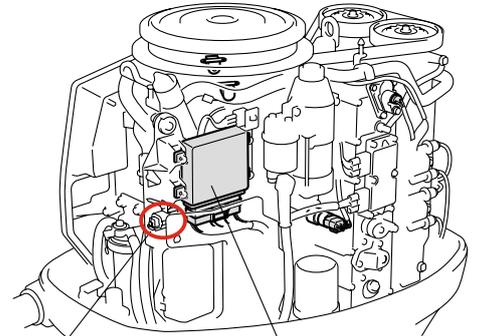
3-pin diagnostic connector

engine control unit

Suzuki DF300

Rectifier & regulator
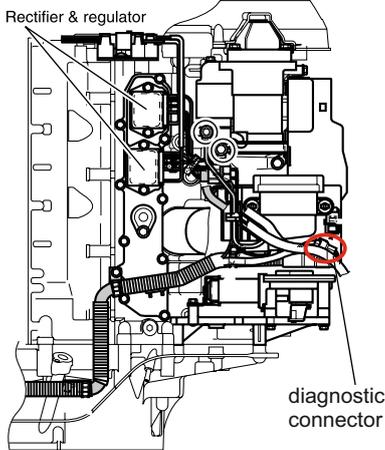
diagnostic connector

Suzuki DF40 / DF50

diagnostic connector

ECM

ECM main relay
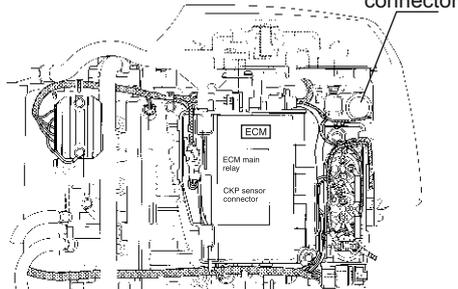
CKP sensor connector

Suzuki DF200/225/250
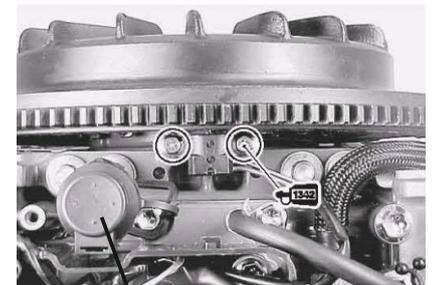
diagnostic connector

Honda BF40D / BF50D
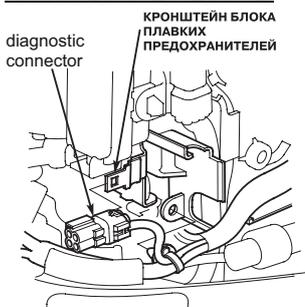
diagnostic connector

КРОНШТЕЙН БЛОКА ПЛАВКИХ ПРЕДОХРАНИТЕЛЕЙ

Honda BF200A / BF225A
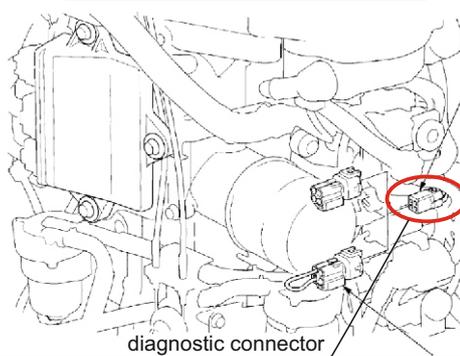
diagnostic connector (red)

Honda BF135A / BF150A
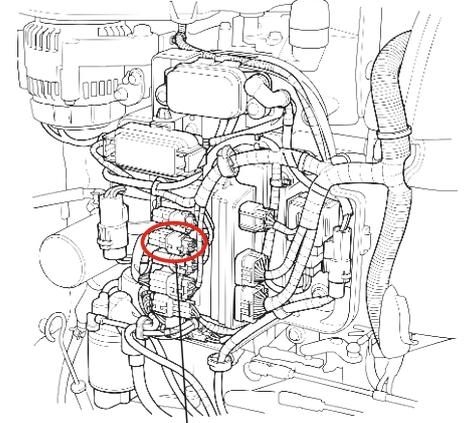
diagnostic connector (red)

Evinrude E-TEC 75, 90 HP
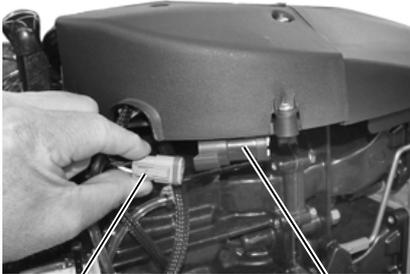
diagnostic connector   protective cap

The "trim" wire must be connected to the signal wire (see the electrical diagram for the engine. In most cases you can determine the proper wire using a tester: one of the wires is the ground, on the second (signal) the voltage varies depending on the position of the engine. The example on the right demonstrates that B is the ground (black) and P is the signal (pink).
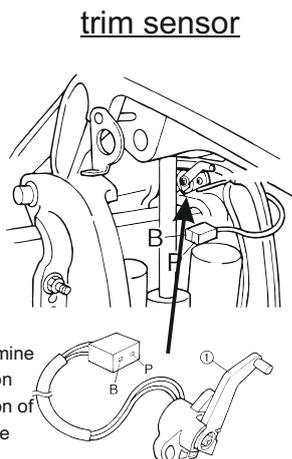
trim sensor

petrol injection plug
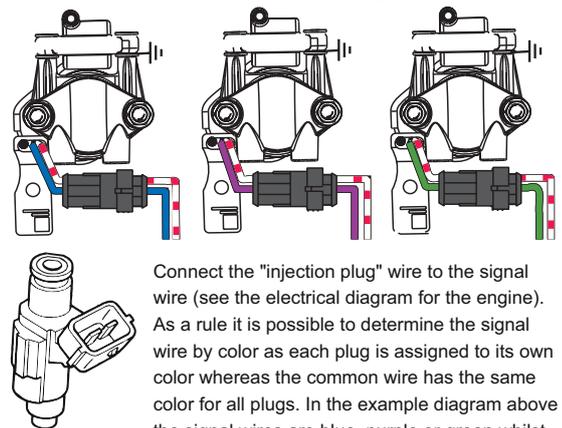
Connect the "injection plug" wire to the signal wire (see the electrical diagram for the engine). As a rule it is possible to determine the signal wire by color as each plug is assigned to its own color whereas the common wire has the same color for all plugs. In the example diagram above the signal wires are blue, purple or green whilst the white-red wire is the ground.

-10-

4. Setting up the trip computer
4.1. Choosing the protocol

1. A few seconds after the trip computer is plugged in the diagnostic connector you will see "Select engine" on the screen.
   - press and release ⌄ ⌃ to find and select the type of the engine to which the trip computer is connected.
   - In order to check that you have selected the correct protocol start the engine, press and release **PAR** to go to the "Parameters display". Press **SET** to select one parameter display and then pressing ⌄ ⌃ check that you can see the rpm and fuel .
- 2. If a wrong protocol has been chosen you should set it manually. To do this turn off the ignition, wait till the screen of the trip computer goes black and select the protocol in the "Settings display":
   - press and hold "**PAR"** then tap a short press on ⌄ or ⌃ until you find the line "Sources" then press and release "**SET**" to confirm
   - tap a short press on ⌄ or ⌃ until you find the line "Protoc." then press and release **"SET"**
   - press and release ⌄ or ⌃ to find the correct protocol then tap a short press on "**SET"**
   - some protocols allow to choose additional parameters influencing diagnostic performance of the trip computer in terms of diagnostics options (calculating fuel etc.).
3. Check that the correct protocol has been selected. To do this start the engine, with a short press on **PAR** go to the "Parameters display". Press **SET** to select one parameter display and pressing ⌄ or ⌃ check that you can see the rpm and fuel. If you see incorrect data repeat procedures 2 and 3: first you should change the protocol type, sub-type etc. (if they exist in the protocol) and only after that choose another protocol. Check if the data of the "Momentary fuel consumption" changes when the rpm varies. Before the calibration has been completed the figures of momentary fuel consumption can not be trusted as it requires calibration for each type of engine.
4. If none of the trip computer protocol shows engine operation parameters correctly it can mean that the diagnostic protocol for this particular water vehicle is not supported.

4.2. Calibration of the speed and traveled distance

Calibration is required if the external speed sensor provides incorrect speed and traveled distance.
There are two possible ways to calibrate the speed and traveled distance.
1. The user does calculations by himself and enters the value of speed correction with up to 0,1% of accuracy.
2. The user enters only the reference amount of the distance traveled and the trip computer automatically calculates the correction with high precision. The sequence of the calibration procedure:
   - Reset the GPS receiver's route parameters.
   - Reset parameters in the "Average parameters display Reset 1": tap a short press on **"TRIP"**, then press and release **"F"** to call out the "Average Hot menu". Select the line "Reset Reset 1 and press **"SET"**. Press **"ESC"** to exit the menu.
   - Drive more than 10 km as per readings of the trip computer (Average parameters display Reset 1) and stop the car.
   - Press and hold **"SER"** to go the Settings display.
   - Press and release ⌄ and ⌃ to select the "Correction" and press **"SET"** to go to the sub-menu.
   - Press and release ⌄ and ⌃ to select the "Ref.mileage". Press **"SET"** to change the value.
   - Pressing on ⌄ ⌃ to choose the correct mileage (as per data of the GPS receiver) and confirm with a short press on **"SET"**.

After performing these actions, the trip computer will automatically and precisely calculate corrections of the speed and mileage. Also the measured mileage in the "Average parameters display Reset 1" will have been replaced with a new value calculated with a new correction equal to the reference value. When correcting the speed readings, momentary and average fuel consumption per 100 km, distance traveled and average speed will be changed automatically starting from the moment the coefficient was set.

4.3. Calibration of fuel consumption

For correct fuel consumption reading, the fuel correction must be performed regardless of the type of selected protocol (except for the carburetor protocol, if not equipped with a fuel sensor). There are two ways to calibrate the fuel consumption:
1. The user does calculations by himself and enters the value of speed correction with up to 0,1% of accuracy.
2. The user enters only the reference value of consumption and the trip computer automatically calculates the correction with high precision. The sequence of the calibration procedure:
   - Refuel the tank until full. When refueling do not let the delivery gun shut off due to splashback until the fuel level reaches the tank neck.
   - Reset parameters in the "Average parameters display Reset 1": with short presses on **"PAR"** select the "Average parameters display" then call out the "Average Hot menu" by a short press on **"F"**. Select the line "Reset Reset 1" and tap a short press on **"SET"**. Press **"ESC"** to exit the menu.
   - Monitoring the fuel consumption readings on the screen of the trip computer (Average parameters display Reset 1) burn out no less than 5 liters of fuel.
   - Refuel again until full tank.
   - Press and hold **"PAR"** to go to the Settings display.
   - Select "Correction" by tapping on ⌄ ⌃. Press **"SET"** to enter the sub-menu.
   - Tapping on ⌄ ⌃ select the "Ref.consumption" and press **"SET"** to change the value.
   - Tapping on ⌄ ⌃ insert the amount of fuel refilled (numbers from the petrol station fuel counter) and press **"SET"**.

The correction will be automatically and precisely calculated by the trip computer.

4.4. Displaying the fuel level

The trip computer has three modes to display the fuel level ("Settings display-Sources-Tank type"):

Calculated: no connection to the fuel sensor is required. After each refueling the user inserts how much fuel has been added to the tank and the trip computer calculates the remaining fuel by deducting the amount of fuel being consumed during the trip. This mode has the ultimate precision as it does not depend on the accuracy of the fuel sensor, the voltage of the on-board network or tilt of the water vehicle. Preliminary calibration of fuel consumption is required.

FLS: requires connection of the trip computer to the fuel sensor.

FLS ECU: the remaining fuel is calculated by the voltage of the factory installed fuel sensor, the data is retrieved from the diagnostic line (for J1939).

"Calculated" mode

- Press and release **"PAR"** to go to the "Parameters display".
- Press **"F"** to call out the "Hot Menu Parameters", select "Fueled" and press **"SET"**.
- Tapping on ⌄ and ⌃ insert the quantity of added fuel and confirm with a short press on **"SET"**.
- Press and release **"ESC"** to exit the "Hot Menu Parameters".

•**Attention!** To speed up the manual input of full tank after refueling "until full tank" select the line "Refuel until full" in the "Hot Menu Parameters" and press **"SET".**

FLS and FLS ECU modes

Using the FLS and FLS ECU modes either involves calibration of the trip computer to the characteristics of the fuel level or displaying the remaining fuel only according to the ECU data without calibration.

The tank can be calibrated in 3 ways:

Calibration by 2 points

The tank calibration is carried out by two extreme points: when the tank is empty and when it is full. Recommended for FLS with linear dependance of voltage on the amount of fuel in the tank.

1. This calibration should be performed when fuel level reaches its minimum (about 5...6 liters) with no pitching of the boat.
2. Avoiding pitching of the water vehicle start the engine, disconnect additional power consuming devices so that the onboard voltage during calibration corresponds to the voltage while moving.
3. Switch to the list of "Sources" in the "Settings display". Make sure that the selected mode is "Tank type FLS ECU" and "Tank Calibr.2".
4. Go to the "Settings display" - "Calibration". Tapping on ⌄ and ⌃ select the parameter "Lin.tank calib." and tap on "**SET**". The trip computer will switch to linear tank calibration process. After calculations are completed, using the buttons ⌄ and ⌃ input the remaining fuel in tank equal to the actual remaining fuel then press short on "**SET**".
5. After exit from the "Settings display" the value of the remaining fuel in tank will be equal to the set value.
6. Refill the tank full up to the neck and burn out 1 liter according to the per trip counter.
7. Repeat steps 2...4. When going through step 4, after calculations are completed, tapping on ⌄ and ⌃ input the remaining fuel in tank equal to the actual remaining fuel after which press and release "**SET**".

Calibration will be completed with the set value of the remaining fuel in tank. The order of setting points for this mode does not matter.

Calibration by 7 points

This calibration process is similar to calibration by 2 points with the only difference that it is possible to add 5 additional points. The order of setting points is not important.

Recommended if the calibration by 2 points does not provide wanted accuracy.

Automatic tank calibration

Performs automatic tank calibration at multiple points in the process of fuel consumption.

Attention! Before starting calibration it is important to make correction of fuel consumption reading otherwise tank tare will be carried out incorrectly!

First set the mode "Tank tare" in the "Settings display-Sources".

1. Refuel until full tank.
2. Go to the "Settings display" - "Correction". Tapping on ⌄ and ⌃ select the parameter "Tank tare" and press and release on "**SET**".
3. The display will show "Tank tare start from_____ l",
4. Using the buttons ⌄ ⌃ input the actual amount of fuel in tank then press and release **"SET"**.
5. The tank calibration has started. Do not refuel until the trip computer displays a notice that the calibration is finished (6 liters as per the on-board computer).

When the tank calibration is in progress the remaining fuel is calculated the same way as in the calculated mode.

The tank calibration can be completed prematurely or with errors in case of incorrect readings from the FLS as a result of strong pitching, sharp turns or an inclined position of the water vehicle. Repeat the calibration. If fails again use calibration by 2 or 7 points or the calculated mode.

Tank uncalibrated

In the FLS ECU mode or if the "tank uncalibrated" has been selected the trip computer reads the amount of the remaining fuel from the ECU (in percent) and multiplies by the tank volume ("sources-full tank") and calibration is not required, the accuracy depends only on the fuel level sensor and the ECU of the water vehicle.

4.5. Reading and reset of fault codes

Reading and reset of fault codes issued by the ECU is only possible if the trip computer works via the diagnostic line. In the protocols "Univ." and "Carb." reading and reset of faults can not be performed.

4.5.1. To view the faults:

- Start the engine, press and release **"PAR"**, wait till connection with the ECU is established (after some time the engine temperature and other data will appear on the screen).
- Go to the "Service display" tapping on **"PAR"** until you reach the service displays.
- Press and release **"SET"** 3 times ("Tr.codes/Diagnost - ECU - ECU trouble codes")
- or from displays **"PAR"** press **"F"**, then pressing on ⌄ select "ECU trouble codes" - **"SET"**.
- Pressing and releasing ⌄ and ⌃ go through the faults (if any). Press **"ESC"** to exit.

4.5.2. Trouble codes reset

- For the following protocols: "J1939, Корвет 10/11, Honda, Evinrude":
- Turn on the engine of the water vehicle (without starting it).
- Go to the "Service display" by tapping on **"PAR"** until you are in the service displays.
- Press twice on **"SET"** ("Tr.codes/Diagnost - ECU").
- Press and release ⌄ to select "Trouble codes reset" (for Evinrude protocol - "Occ. faults reset"),then press **"SET"**.
- If trouble codes fail to reset start again.

- For "Yamaha" protocol:
- codes of earlier occurred faults are stored in the ECU and can be viewed in the "Service display - Tr.codes/Diagnost - ECU - Service records"
- to delete stored fault codes go to the "Service display - Tr.codes/Diagnost - ECU - Diagnostics reset", then press and release **"SET"**, the faults will be deleted from the ECU memory.

For "Suzuki" protocols and "NMEA2000" only faults reading is available, the reset is not possible.
For "Carb." and "Univ." protocols faults reading and reset is not supported.

If a fault is caused by malfunction of the engine system it may reappear. The trip computer only reads and resets the faults issued by the ECU of the engine, it cannot detect faults independently from the ECU. Since the memory of the trip computer is limited, only decoding of basic faults codes is embedded, decoding of extended codes may be unavailable but you can find codes of such faults on our website www.multitronics.ru or in the technical documentation for your water vehicle.
Causes of faults, as a rule, can be found in the technical documentation for the engine.

5). The "Parameters display"

To select instantaneous parameter display press and release the **"PAR"** button. There are several layouts to choose for displaying instantaneous parameters on the screen of the trip computer:
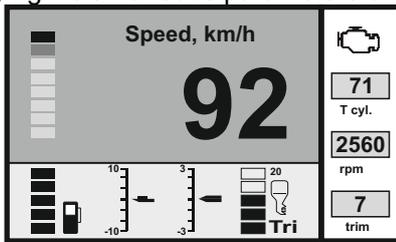
Type 1
Displays 1 parameter in digital form and 4 parameters in graphical form.
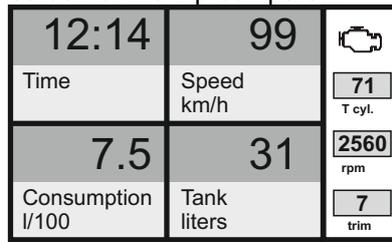
Type 2
Displays 4 parameters simultaneously (multi-display).
Quantity of multi-displays: 6
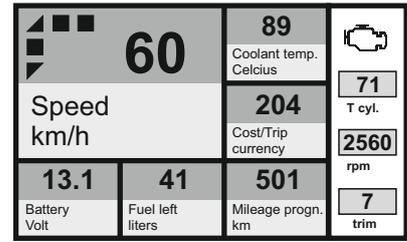
Type 3
Displays 6 parameters simultaneously (multi-display).
Quantity of multi-displays: 1
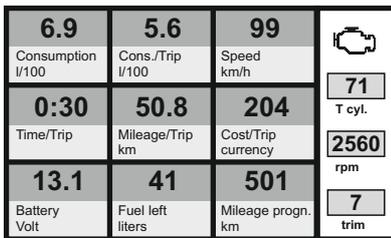
Type 4
Displays 9 parameters (multi-display).
Quantity of multi-displays: 3
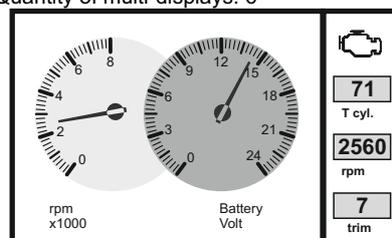
Type 5
Displays 2 parameters simultaneously in the form of arrow pointers.
Quantity of multi-displays: 8
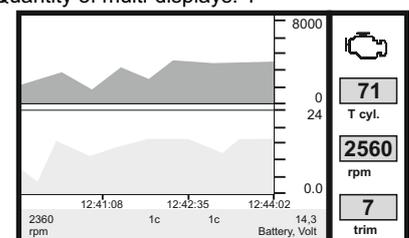
Type 6
Displays 1 or 2 parameters in the form of graphics.
Quantity of multi-displays: 8

To switch between types of displays press and release the **"SET"** button.

To switch between multi-displays of the same type press and release ˅ or ˄.

To change between modes (multi-display settings) go to the "Settings display - Display - Digital/ Graphic/ Arrow".

To call out the "Parameters Hot menu" press and release **"F"**.

Press **"ESC"** to exit the "Parameters Hot menu".

The additional panel on the left shows 4 parameters which can be seen on all displays. To choose required parameters go to the "Settings display - Display - Add.panel".

5.1. List of available parameters

The list of parameters available in the "Parameters display" depends on the protocol through which the trip computer communicates with your water vehicle. If some parameter exists in the list it does not mean that it will be shown for all engines. Possible variants:

1. The parameter can be retrieved within the selected diagnostic protocol and it is supported by the ECU of the engine. In this case it will be shown in the "Parameters display" and will be available for customizing in the multi-display.
2. The parameter can be retrieved within the selected protocol but it is not supported by the ECU of your engine. In this case the parameter will be available when customizing the multi-display but in the "Parameters display" you will see zero value or dashes.
3. The parameter is not supported by the selected diagnostic protocol. In this case you will not see it in the "Parameters display" and it will not be available when customizing the multi-display.

The minimum list of parameters is available in the universal performance mode with injection and carburetor engines when retrieving data from the ECU is not provided for.

Attention! It is impossible to determine which parameters will appear on the screen of the trip computer before connecting it to the engine.

All parameters on the display can be divided into the following groups:
- basic parameters
- additional parameters and service records

It is possible to select basic parameters in the "User's displays" and place them on the display in random order (through the "Settings display" or Params32 program).

Additional parameters and service records can be viewed only in the "Service display".

Basic parameters are the data retrieved by the trip computer from sensors, calculated by the user and received from the electronic engine control unit. Each diagnostic protocol has its own set of parameters which can be viewed in the "User's displays".

Additional parameters are the data retrieved from the electronic engine control unit and serve for more profound diagnostics of electronic engine control systems (additional parameters, bits, sensors ACD etc. can be found in the menu "Service display - Tr.codes/Diagnost. - ECU - Add.parameters". Each diagnostic protocol has its own set of parameters. Parameters from this list are not displayed in the "User's display".

-14-

This menu enables quick access to 10 functions in the "Settings display". To activate it press **"F"** when you are in the "Parameters display" .

By pressing on ∨ ∧ select the wanted line and press **"SET"** to confirm.

To exit the hot menu press and release **"ESC"**.

The hot menu can be customized in the "Settings display": select the line which you want to see in the hot menu, press and release **"F"** then press **"SET"** to confirm. The digit in the line on the left shows the sequence number of the selected line in the hot list.

To clear the hot menu list go to the "Settings display - HotLists clear".

5.3. Countdown

The countdown function helps to determine numerical values of parameters in "the past time". This function is available in graphic displays (type 6) when the engine is off.

1. Go to the "Settings display - Display - Graphic", select "Countdown", press **"SET"**, select "Yes", then press **"ESC"** three times until you reach the graphic display.

2. Using ∨ ∧ move along the graphic. To see other graphics in the wanted time moment select the "Countsdown - No", press **"ESC"** three times to return to the graphic display, pressing on ∨ ∧ select another graphic display. If you want to continue moving along the graphic do step 1.

The vertical line shows the selected time point. Respective values of parameters, time and countdown periods are placed in the bottom line.

If you are in the graphic display when the engine is stopped, by default this function can be called out from the hot menu.

1. Press **"F"** and using ∨ ∧ select the "Countdown" line, by pressing **"SET"** select the variant "Yes", then press **"ESC"** to return to the graphic display.

2. Pressing ∨ ∧ move along the graphic. To see other graphics in the wanted time moment press **"F"** to select the "Countdown - No", then press **"ESC"** to return to the graphic display, tapping on ∨ ∧ select another graphic display. If you want to continue moving along the graphic do step 1.

This function will be turned off automatically after: the engine is switched on (with a physical engine switch), the engine is started (with a virtual ignition lock) or the virtual ignition lock is turned on forcibly.

5.4. Roll and trim

ROLL

15 deg.   -15 deg.

TRIM

15 deg.   -15 deg.
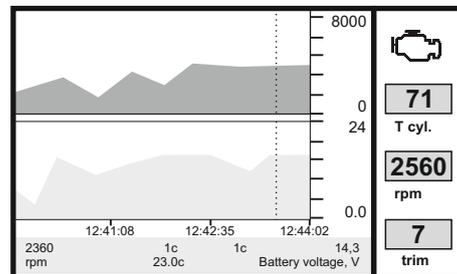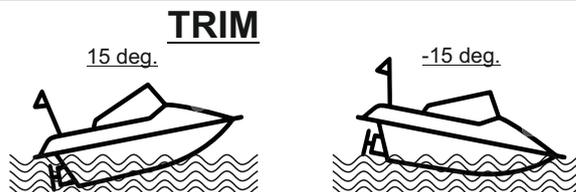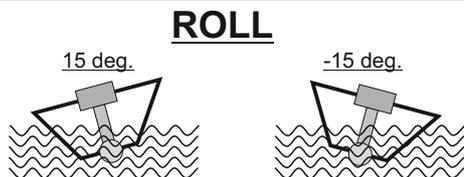
Multitronics CL-950E measures roll and trim angels with the help of the in-built accelerometer and displays these parameters in the "User's displays" which helps to prevent a water vehicle from capsizing, to determine the optimal trim angle of the engine and to pass on to the planning mode.

The roll is the angle of transverse inclination of a water vehicle along the axis of movement:

when positive - tilt to the left;

when negative - tilt to the right.

The trim- is the angle of longitudinal inclination of a water vehicle along the axis of movement:

when positive - upward lift;

when negative - descent down.

Calibration is required before using the accelerometer:

1. Install the device in the panel and tighten the mounting elements. The device must be positioned strictly perpendicular to the axis of movement of the vessel.
2. Position the water vehicle on a flat surface not allowing rocking.
3. Go to the "Settings display - Correction - Incline calibr." and press "SET".
4. Check that the device has been installed correctly and confirm calibration by pressing "SET".
5. After the confirmation window appears the device will memorize the current position of the vessel and in the future the angles of roll and the heading angle (trim) will be calculated relrelatively to the current position of the water vehicle.
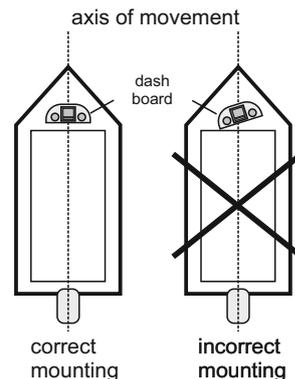
This display is designed for the most comfortable perception of information. Digital representation of parameters is combined with graphical.

To switch between parameters press and release ⌄ or ⌃.
To select parameters that will be shown in the bottom part of the screen go to the "Settings display - Display - Digital - Params setting x 1 - Add.panel sett.".

The additional panel on the right shows 4 parameters which can be seen on all displays. To chose wanted parameters go to the "Settings display - Display - Add.panel".

Examples of customized displays:
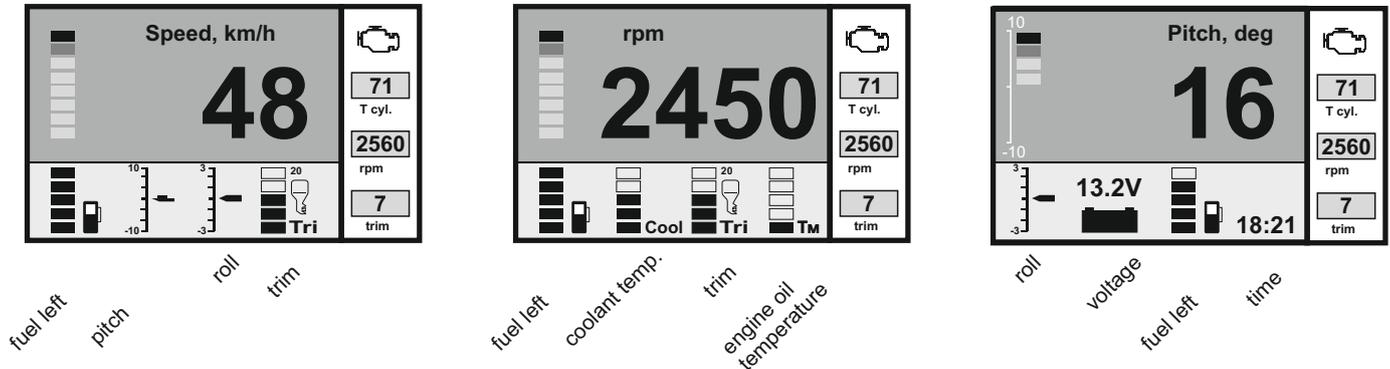
6). The average display

To access the "Average parameters display" press and release the "PAR" button.
All average parameters are divided into 4 displays.
To switch between displays press and release ⌄ or ⌃ .
Reset of average parameters is performed independently.
A short press on the **"F"** button calls out the "Average hot menu".

6.1. The **"Average/Trip"** display. The parameters are calculated per one trip period. Average parameters in this display are reset automatically each time the ignition switch is turned on if an uninterrupted trip has been set. Manual reset of parameters is also possible.

6.2. The **"Average/Reset1"** display. Parameters are calculated from reset to reset. In the "Settings display" you can select the interval of automatic parameter reset from 1 to 99 days. It is possible to set the manual reset only. This display is designed to monitor weekly, monthly or seasonal trip statistics.

6.3. The **"Average/Reset2"** display (Refueling). Parameters are calculated from refueling to refueling. In the mode "Tank calculated" the reset will be performed at any increase of fuel in tank. In the mode "Tank FLS ECU" the reset will be performed at an increase of the fuel in tank not less than 20% of the tank volume. In addition it is possible to set the same reset interval as in the "Average display/reset1.

6.4. The **"Average/Storage"** display. This display is recommended to use for getting general trip statistics. The reset of average stored (cumulated) parameters is not performed.

Each display of the average parameters has a corresponding calculation of trip costs.
The "Average display" shows 7 basic parameters:

Time   - runtime with engine turned on
Mileage   - quantity of covered kilometers
Fuel   - quantity of consumed fuel
Speed   - average speed
Fuel per 100 km   - average fuel consumption per 100 km
Fuel per hour   - average hourly fuel consumption
Trip cost   - cost of trip

Cost = (fuel cost) + (cost of 1 km)*(mileage) +
+ (cost of 1 hour trip) * (time);
*Fuel cost = (fuel consumption per trip) * (fuel cost per 1 liter)*

For any of the six "Average parameters displays" the cost of 1 liter of fuel and the cost of the trip per 1 km and 1 hour are the same and can be set in the "Settings display" - "Average parameters".

6.1. The average hot menu

The "Average hot menu" gives quick access to functions from the "Settings display - Average". To activate the "Average hot menu" press **F** when in the "Average display".

Press ⌄ ⌃ to select the wanted line and confirm by pressing **"SET"**.

To exit the hot menu press and release **"ESC"**.

To customize the hot menu go to the "Settings display": select the line you want to see in the hot menu, press and release **"F"**, then press **"SET"** to confirm. The digit on the left of the line shows sequence of the line in the hot list.

To reset the hot menu go to the "Settings display" - "HotLists clear." - "Average".

7). "Display TS"

To switch to the Maintenance Display, briefly press the "PAR" button.

In the "Display TS" it is possible to read additional service parameters, read and reset fault codes, set the frequency of warnings about maintenance.

A maintenance warning occurs when the parameter becomes zero. After a service, you must manually enter the mileage until the next service, as well as the date of its passage.

The presence of items in the menu depends on the selected diagnostic protocol.

Display TS			
Parameters	**Units**	**Value**	**Description**
Tr. codes/ Diagnost. *(whilst in this menu the trip computer stops calculating and recording values of your trip)*			
ECU			
ECU trouble codes			Takes readings of the ECU fault codes
Trouble Codes Reset			Deletes current fault codes. To perform this function make sure that the water vehiecle's ignition is in on position, the engine is off and the conection between the ECU and the trip computer is established. Available for *J1939, Korvet 10/11, Honda*
Faults recording			Enables faults logging. It's very simple to use the fault log in case of infrequent faults which either clear themselves or the user erases them. When fault codes reappear it is possible to read current faults and simultaniously see the history of these faults in the fault log as well as the relating freeze frame (if the ECU enables it).
Faults Log			After an ECU fault is detected, the log keeps records of the fault code, date and time. If the protocol and the ECU enables to view the freeze frame then the freeze frame is retrieved and recorded in the log. If a new trouble code doubles the one already recorded it is not listed again (initial trouble codes are saved)
		1…7	Lines with saved faults (fault number, date and time) and freeze frames (up to 7 faults/lines).
		Clear Faults Log	Deletes all saved faults data.
Add.parameters			Retrieves all ECU parameters available within the chosen diagnostics protocol (unsupported parameters are displayes as dashes), bits and status flags of switches, ADC of sensors.
Service records			Retrives diagnostic information from the ECU: saved system faults, counters (maximum rpm, overheating, oil pressure, number of engine starts, engine run time), engine ID etc.
Diagnostics Reset			Clears the history log from service records. *Only for Yamaha and Honda*
Occured Faults			Saves trouble codes retrieved from the ECU. *Only for Evinrude*
Occ.Faults reset			Deletes all trouble codes from the ECU. *Only for Evinrude*
Hystorical Faults			Fault log stored in the ECU of the motor. *Only for Evinrude*
Profiles Speed			RPM log with information on ranges and running time of usage. *Only for Evinrude*
Profiles Eng.temp			Temperature log of the first and second engine cylinders, EMM (by time). *Only for Evinrude*
Min.batt.volt.	Volt	6...20	Displays minimum voltage of the battery (normaly at the moment the engine is started).
Min air temp.	°C		Displays the minimum day air temperature.
Max air temp.	°C		Displays the maximum day temperature.
Batt.charge	Volt	6...20	Average battery voltage when the engine is on.
T max	°C		
Service Interval			
TS eng.hours	h	0…3000	Engine hours before the next service interval
TS km*1000	th.km	0...99	Mileage before service interval, *Thousands km*
TS Date	dd.mm.yy	0…9,9	Time before service interval day :month:year.
Use Setup	°C		Maximum device temperature (per day)
TS eng.hours		> Yes No	Turns on/off engine hours based service interval.
Manufacturer`s info			Displays information about the manufacturer and the software version.
Demo mode			Demonstration of features and functions.
Turn on serv.mode			To turn on the maintenance mode (sleep mode: the display turns off, the device does not respond to the keyboard), it is necessary to select this line when the ignition is switched off and press the "SET" button. Use the mode if you want to protect the device from use and reconfiguration if the vehicle is unattended with children or during maintenance. To turn off the maintenance mode, press and hold for at least 5 seconds. the "PAR" button.

Long press the **"PAR"** button to select the setting display.

The menu of the settings section is divided into several subsections (lists) based on the purpose of the functions.

To enter the lists, use the **"Up"** and **"Down"** buttons to select the desired list and shortly press **"SET"** to enter the menu.

The menu is exited by short pressing the **"ESC"** button.

A short press on **"SET"** while a parameter is highlighted will toggle its value. If the parameter has more than two options, it will start flashing and the values are scrolled by short pressing **"Up"** and **"Down"** , to confirm it is necessary to shortly press **"SET"**.

A short press on the **"F"** button from the "Settings Display" will add the selected line to the end of the corresponding list (max 10 lines) of the "Hot Menu" (Settings, Averages).

Resetting (clearing) "Hot Menus" is done from the "Settings Display" - "HotLists clear.". lists".

There are 2 Hot Menus called from different displays:

"Hot menu Parameters" - called from the "Parameters Display", includes settings from the following lists:

    Control
    Correction
    Resources
    Limits
    Time
    Display (only "Graphic - Countdown")
    Voice messages
and "Display TS - Tr. codes/ Diagnost. - ECU - ECU trouble codes".

"Hot Menu Average" - called from the "Display Average", includes settings from the following lists:
    Average parameters

The presence of items in the menu depends on the selected diagnostic protocol.

8.1. Control	
Menu	**Function Description**
Virtual Lock	ON - forcibly turns on the trip computer, starts reading the parameters; OFF - turns off the trip computer and swtiches to the stanby mode
Conv. to NMEA	Starts connection to NMEA2000 based on CAN protocol: the engine operation parameters are scanned through the original manufacturer's diagnostic protocol and using the communication standard of NMEA2000 the received data can be transmitted to other devices (a chartplotter for example). It's possible to network a few Multitronics computers when each computer will show its own scanned parameters and data read from the engine. Thus, it's possible to build your own NMEA2000 network without expensive cables and other original parts. To activate data transmission to NMEA2000 network: 1. Turn on the chartplotter (make sure its software has booted completely). 2. Change this setting to "Off". 3. Turn off the engine and wait till the trip computer display turns off. Then turn on the ignition (start the engine). 4. Choose the engine parameters on the chartplotter according to its manual.
NMEA output addr.	NMEA2000 assigns each trip computer an address. Ensure that your chartplotter recognizes this address. If the address is changed, disconnect the chartplotter from the network and reconnect.
Fan	Forced activation of the engine cooling system fan. To disable the forced ventilation and switch it to the regular mode turn off the ignition. **ON** — forced ventilation is on, the fan provides constant cooling. **OFF** — the fan runs in regular mode. *Only for 10/11Corvet*
Full tank ref.	When this function is called out the tank capacity will be set equal to the previously set capacity in the menu Settings — Sources — Full Tank
Reuelled L	Amount of petrol added to the tank (for eg. figures from petrol pump display at a filling station). Entered volume is added to the volume remaining in the tank.
Now in Tank L	Enter the amount of petrol left in the tank. Entered value replaces the current value.
MileProgn. Econ.	Enables the "Econometer" mode. Starts the econometer. Sets number of kilometers that must be driven on the remaining fuel in tank. When the water vehicle is running, the value of the set mileage on the remaining fuel decreases, and when the zero value is reached, the function is disabled. When the mode is turned on, according to the previously entered settings, appropriate audio messages are heard, accompanied by information output to the device display: the difference between the current calculated and set mileage forecast on the remaining fuel in kilometers "+/- ... km". A positive difference corresponds to an economical trip and indicates that the specified number of kilometers can be run over the set mileage. To disable this function, if it has been started, set the calculated mileage value on the remaining fuel value to zero.
% for inject.	Enables or disables the "Fuel Quality Control" function by injection time: This function enables to: make precise measurements of injection time, compare it to the reference value and show % of the increase. Measurements can be trusted only when the vehicle is fully serviced, fuelled with high quality petrol, the engine is preheated and all electrical components are off (lights, fans etc.). The reference value will be set automatically at idle engine speed (less than 1000 rpm) in 10 seconds after all the above conditions are fulfilled. Increase in the injection time and excessive fuel consumption at idle speed can be caused by deterioration of the fuel system or other engine system, low-quality fuel. This method is recommended to use when the "Injection Time" parameter is displayed.
% consumption	Turns ON/OFF the fuel efficient control function "Fuel Quality Control".
Spark plugs drying	This function is helpful to start the engine in wet and frosty weather. The spark plugs receive impuls from the ignition for 30 seconds which pre-heats the sparks as well as eliminates condensation from the plug gaps. Repeat no sooner than in 3 minutes. To start the drying turn on the ignition and press "SET". *Only for 10/11Corvet*
ECU Reset	This reset is similar to battery disconnecting: ECU reset, faults reset, learning memory is saved. To performed it first turne off the engine. *Only for 10/11Corvet*
Factory Reset	Reset to factory settings.

Ordinal number in the "Parameters" Hot Menu

№	Menu	Function	Value	Function Description
	8.2. Correction			
Ordinal Number in the "Parameters" Hot Menu	**Speed corr.**	Speed Correction (%)	-99,0...+999,9	Independently calculated correction for speed and distance traveled. To find percentage of the correction value the following formular is used: $$correction=((Ref*(100+y\%))/from) - 100,\text{ where}$$ "Ref" - Mileage reference value; "F rom- Measured mileage value in the display "Average/Reset; "y%" - Speed correction value entered before measurements. The correction takes effect from the moment the coefficient is set.
	Cons.corr.	Fuel Consumption Correction (%)	-99,0...+999,9	Independently calculated correction for fuel efficency. To find percentage of the correction value the following formular is used: $$correction=((Ref*(100+y\%))/from) - 100,\text{ where}$$ "Ref." - Fuel consumption reference value; "From" - Measured fuel consumption value in the display "Average/Cumulative"; "y%" - Consumption correction value entered before measurements.
	Ref.mileage	Reference Mileage (km)	10...99,9	Actual mileage value of the water vehicle for automatically calculated correction factor for speed and distance travelled. Uses data received from the GPS navigator (if a built-in GPS module of the device is not used). The procedure for automatic calculation: see 4.2. page 11
	Ref.expence	Reference Fuel Consumption (litres)	5...99,9	Actual amount of fuel consumed to calculate automatically the correction factor for fuel consumption. Value from a filling station or a filling tank should be used. The procedure for automatic calculation: see clause 4.3. page 11
	Air/Water/Engine corr.	Air/Water/Engine Temperature Correction (°C)	-20...20	Correction of the displayed ambient air/ overboard water/ engine temperature (depending on the type of sensor used and settings in "Sources - Signature temp.").
	V Batt.corr.	Battery Voltage Correction (V)	-0,5...+0,5	The entered correction is added to the measured battery voltage.
	Init.milge	Initial Mileage (km)		Created to enter the actual mileage before the trip computer was installed. The entered numbers will be added to the "Total Mileage" parameter of the "Average/Reset" display and it will display the actual mileage of the vehicle, not only from the moment the trip computer was installed.
	Init.time,h	Initial Engine Hours	0…99999	Created to set the real number of the engine operating hours before the trip computer was installed.
	Polarity	Nozzle Polarity	> - +	For correct calculation of fuel consumption, select the polarity of the control signal on the injection plug. If installed properly, the fuel consumption increases with increasing gas. Only for "Display of installations - Sources - Speed Force (or Flow Force)"
	Tachometer	Tachometer Correction	>1 2 4	To correctly indicate the engine revolutions depending on the injection system (sequential, paired or parallel injection), set the coefficient at which the idle speed is correctly displayed. Only for "Display of Installations - Sources - Speed Force (or Flow Force)".
	Lin.tank callib.	Linear Tank Callibration		Launches the linear fuel tank callibration (by 2 or by 7 points), see page 12
	Calibr.7 reset	Reset 7 points Tank Calllibration		Resets the calibration table created during the 7-point calibration process.
	Tank tare	Fuel Tank Callibration		Launches nonlinear fuel tank callibration, see page 12
	Trim cal.min.	Calibration of the Lowerest Position of the Trim Sensor (deg)	-2...-10	Sets the point of the maximum submerged position of the boat engine. To calibrate, turn on the ignition or start the engine, lower the engine as much as possible and enter the value of the angle of its position in degrees (the current value of the trim sensor voltage will be displayed on the screen). Only when connected to the trim sensor.
	Trim cal.max.	Calibration of the Highest Position of the Trim Sensor (deg)	-1...90	Sets the point of the maximum position of the boat engine raised from the water. To calibrate, turn on the ignition or start the engine, raise the engine as much as possible and enter the value of the angle of its position in degrees (the current value of the trim sensor voltage will be displayed on the screen). Only when connected to the trim sensor.
	Incline calibr.	Accelerometer Calibration		Accelerometer calibration (indicates the level position of the vessel for further correct calculation of roll and pitch). Before calibration, place the water vehicle on a flat surface (without waves) and confirm the zero position setting with the "SET" button.

№	Menu	Function	Value	Function Description
8.3. Resources				

<table>

	Menu	Function	Value	Function Description
	Lock	Ignition Switch Source	>Virt. Phys.	**Virt** - No need to connect the on-board computer to the ignition switch. The on-board computer turns on automatically after the engine is turnued on or you can turn it on via "Display Settings - Control - Virt.Lock". The on-board computer turns off when the engine is off. **Phys.** - Connect the on-board computer to the electrical circuit "Ignition".
	Lock Level	Virtual Lock Sensitivity	1 >2 3 Strt	Adjust sensitivity of the virtual ignitio lock. 1 - minimum sensitivity; 3 - maximum sensitivity. Strt - the on-board computer starts working with the ECU immediately when electricity is on. This mode is used when started engined imediately generates power.
	Prot.Defin.	Manual or Automatic Protocol Search	>Auto Manu	**Auto** - automatic attampt to establish comunication with the motor. If fails the on-board computer switches to universal mode. **Man.** - manual protocol search. Used to establish communication between the on-board computer and the motor when the protocol is already known or it fails to find it in atomatic mode and manual search is required.
	Protoc.	Manual Protocol Selection	J1939…Univ.	Chooses a communication protocol when the Manual Protocol Search is selected. Some protocols can add extra diagnostic parameters to the on-board coputer (protocol subtype, engine type, trouble type etc.). Must be changed if it fails to display parameters correctly. Available only when the "Manual Prot." is selected .
	Engine	Engine choise in NMEA2000	All; 1; 2	Choice of engine connected to NMEA2000 network (in case of few engines). *For NMEA2000 protocol.*
	Puls.by rev.	Number of pulses per 1 revoluton	0.5, 1.0, 2.0, 4.0, 8.0	Shows how many pulses the engine generates per 1 revolution. For "Carb" protocol when connected to the ignition coil.
	Exp.calc.	Consumption Calculation Method	>1 2 3	Changes calculating method of fuel consumption (in case of non-compliance with real indicators after calibration or zero value of this parameter). *Only for "J1939" protocol*
	Tank Type	Source for Calculating the Remaining Fuel in the Tank	>Calculated FLS FLS ECU	**Calculated** - does not require connection to the fuel sensor. After each refuelling the user inserts manually how much fuel has been added to the tank and then the trip the computer calculates the remaining fuel quantity deducting the amount of fuel consumed during the trip. This mode is very precise because it does not depend on the performance of the fuel level sensor, the voltage of the on-board network, or the tilt of the water vehicle. The remaining in the tank fuel level can be adjusted in "Settings Display - Control" by selecting one of the following functions: "Refuelling to Full", "Refuelled" or "Now in the Tank", depending on how the fuel volume needs to be adjusted. **FLS** - the amount of the remaining fuel in the tank is read from the fuel level sensor (FLS). Connection to the fuel level sensor is required. In this mode, the remaining fuel is calculated automatically based on the FLS voltage. If FLS doesn't function correctly, "Calculated" function should be used. For proper operation calibration is required (see page 12) **FLS ECU** - the amount of the remaining fuel in the tank is recieved from the diagnostic line, no connection to the fuel level sensor is needed (only for J1939, NMEA2000). Calibration is required for proper operation (see page 12).
	Full Tank	Tank Value Setting (liters)	20...2000	The fuel tank volume. When you select "Refuelling to Full" in "Settings Display - Operation", the tank volume will be set equal to the entered value. If the set value is more than 200, the accuracy of remaining quantity is up to 1 liter (otherwise up to 0.1 liters).
	Compens. Vbatt	On-board voltage compensation	>Yes No	The unit is designed to be connected to a fuel level sensor divider, the upper resistor of which is connected directly to the 12 Volt on-board network, and on which the voltage changes along with the voltage of the on-board network. If "No" is set, the input of the fuel level sensor of the device is designed for connection to the voltage source of the fuel level sensor, which is independent of the change in the voltage of the on-board network.
	Fuel	Calibration Method of the Fuel Tank	>Calibr.2 Calibr.7 Tare. Uncalibr.	**Calibr.2** - the tank calibration is performed by 2 points (when empty and full). It is recommended when FLS has a linear dependence of voltage on the amount of fuel in the tank. Calibration procedure: see page 12. **Calibr.7** - the tank calibration is performed by 7 points. Recommended if "Calibr.2" does not give the desired accuracy. Calibration procedure: see page 12. **Tare** - automatic tank calibration (only after fuel consumption has been calibrated). The tank is automatically calibrated by a variety of points as fuel is consumed. This method has the highest accuracy, though it is very sensitive: errors may occur due to sudden fluctuations or FLS characteristics; if an error occurs, calibration process stops. Calibration procedure: see page 12. **Uncalibr.** - the remaining fuel is read from the ECU (in percent) and multiplied by the tank volume ("Full Tank"), tank calibration is not required, the accuracy depends on the fuel level sensor and the engine ECU (only for "Tank type FLS ECU"). Available only with "Tank type FLS ECU".
	Speed	Source of Speed Reading	>GPS ECU Sensor	**GPS** — Speed data is read from the built-in GPS receiver. **ECU** - Speed data is read from the diagnostic line. **Sensor** - Speed is read from an external Multitronics GPS speed sensor (only if "Lock - Virt." is set).
	Eng.rpm	Source of RPM Reading	>ECU Inj.	**ECU** - Revolutions are read from the diagnostic line, connection to the injection plug is not required. **Inj.** - Revolutions are read directly from the injection plug.
	Fuel cons.	Source of Fuel Consumption Calculation	>ECU Inj.	**ECU** — Fuel consumption is calculated from the data received from the ECU, connection to the injection plug is not required. **Inj.** — Fuel consumption is calculated from the data received directly from the injection plug of the vehicle (only for gasoline engines). Connection to injection plug of diesel engines is unacceptable due to its design features.
	Prognosis	Mileage Forecast on the Remaining Ruel	>Aver. Man 10km	Mileage forecast = remaining fuel in the tank / average consumption per 100 km There are three possible ways to calculate the average fuel consumption: **Average** - Average fuel consumption per 100 km, which corresponds to a long-term average value taking into account the mixed type of driving. **10 km** - Average fuel consumption over the last 10 km, reflecting the operational factor of driving, taking into account possible changes in driving style. **Man.** - Manually entered value of the average consumption per 100 km.
	Ex/100 man.	Value of Average Consumption per 100 km (l / 100 km)	0...30	Manually entered value of the average consumption per 100 km, based on which the mileage on the remaining fuel will be estimated. Available only when "Forecast Man." is set.
	Batt.voltage	Reading Source of On-board Electrical Circuit Voltage	>ECU Sensor	**ECU** — On-board voltage data is received from the engine ECU. **Sensor** — On-board voltage is measured by the trip computer independently at the connection point. *Only for J1939, NMEA2000, Yamaha, Suzuki, Honda, Evinrude*
	Trim	Trim Sensor Voltage	>ECU Sensor	**ECU** — Reads the trim sensor voltage (motor position) from the diagnostic line. **Sensor** — Reads the trim sensor voltage if connected to it directly.
	Temper.sign	Location of the External Temperature Sensor	>air wat eng.	Sets the location where external Multitronics temperature sensor is installed. **Air** — Installed in the interior and measures the inside temperature. **Water** — Installed outside of the water vehicle and measures overboard water temperature. **Eng.** - Installed on the engine and measures the engine temperature (only for carburetor engines; if you choose this setting, a warning signal about engine overheating becomes available)

</table>

Ordinal Number in the "Parameters" Hot Menu

№	Menu	Function	Value	Function Description
				8.4. Limits
	T cool.lim	Engine Temperature Limit (°C)	30...150 >150	If the set limit is exceeded, the trip computer displays a warning message about engine overheating and the value of the exceeded parameter.
	T cylinder lim	Cylinder Temperature Limit (°C)	30...200 >150	If the set limit is exceeded, the trip computer displays a warning message about engine overheating and the value of the exceeded parameter. Only for the "Honda" protocol
	Eng.speed lim	Engine Speed Limit (rpm)	2500...8000 >8000	If the set limit is exceeded, the trip computer displays a warning message about excessive rpm and the value of the exceeded parameter.
	Speed lim	Speed Limit (km/h)	40...200 >200	If the set limit is exceeded, the trip computer displays a warning message about excessive speed and the value of the exceeded parameter.
	Fuel Lev	Low Fuel Level Limit (l)	5...99 >5	If the fuel level in the tank drops below the set limit, the trip computer displays a warning message about low fuel level and the value of the parameter.
	Low batt.volt	Low Battery Voltage Limit (V)	9...13,9 >10,5	If the voltage drops below the specified limit, the trip computer displays a warning message about too low voltage (only when engine is on) and the value of the parameter. No warning at the moment the ignition is being turned on.
	Hi batt.volt	High Battery Voltage Limit (V)	14...16 >15,5	If the voltage exceeds the specified limit, the trip computer displays a message about too high voltage and the value of the parameter.
	Inj/ expense %	Limit of exceeded injection duration and instantaneous fuel consumption per hour at idle speed (%)	1...99 >9	Sets the limit after which the trip computer warns about changes in fuel quality (when the "Fuel Quality Control" function is turned on). **Positive change** - shows percentage of increase in injection time and fuel consumption at idle speed, the fuel is worse than the reference. **Negative change** - displays percentage of decrease in injection time and fuel consumption at idle speed, the fuel is better than the reference. The mode may not work correctly when other electrical components are on.
	Engine heat.	Engine Heating Limit (°C)	10...110 >70	When the engine temperature reaches the set limit, the trip computer issues a warning about sufficient engine heating.
	Consm. 100/h	Instantaneous Consumption Switching Limit	5...15 >10	Speed limit for switching the display of instantaneous fuel consumption from l/hour to l/100 km.
	Arrows Cns/100	Face Dimension When Displaying Instantaneous Fuel Consumption	>24/80 24 80	Face dimension when displaying instantaneous fuel consumption per 100 km. 24/80 — from 0 to 24 at fuel consumption up to 24 l /100 km, from 0 to 80 at consumption over 24 l/100 km 24 — from 0 to 24 at any value of instantaneous fuel consumption 80 — from 0 to 80 at any value of instantaneous fuel consumption
	T eng.oil lim	Engine Oil Temperature Limit (°C)	30…150 >150	If the set limit is exceeded, the trip computer displays a message about the engine oil overheating and the value of the exceeded parameter. Only for "Honda, NMEA2000" protocols
	Trim low lim	Lowest Trim Position Limit (deg)	-9...14 >5	The limit of the warning of the too low engine position (according to the trim sensor).
	Trim high lim	Highest Trim Position Limit (deg)	6...90 >15	The limit of the warning of the too high engine position (according to the trim sensor).

Ordinal Number in the "Parameters" Hot Menu

№	Menu	Function	Value	Function Description
				8.5. Time
	Date	Date Setting	dd.mm.yy	Sets the current date in the format day:month:year. Press repeatedly the " **SET**" button to select a group for editing: «SET» - «▲ ▼» sets the date «SET» - «▲ ▼» sets the month «SET» - «▲ ▼» - «SET» sets the year and exits editing mode
	Time	Time Setting	hh:mm	Sets the current time in the format hours:minutes. Press repeatedly the " **SET**" button to select a group for editing: «SET» - «▲ ▼» sets the hour «SET» - «▲ ▼» - «SET» sets minutes and exits editing mode
	Time	Date and Time Sourse	Man. GPS	**Man.** - The on-board computer displays manaly set date and time. **GPS** — Sets date and time received from the in-built GPS.
	TimeZoneCor. GPS	Time Zone Setting	-12...+14 >3	Sets the time zone to display the correct time. *Only for Time - GPS*
	Time Corr.	Time Correction (sec.)	-30...30 ▶0	**Negative value** - slows down the clock. **Positive value** - speeds up the clock. The adjustment happens once a day for a set number of seconds.
	Alarm	Alarm Setting	hh:mm	Sets the alarm time in the format hour *:minute*. When the alarm goes off you will hear a sound signal and an "Alarm" message on the screen. The alarm sounds for 1 minute or until any button is pressed. The alarm will go off only if the "Alarm Act." parameter is set (see below).
	Alarm	Alarm Activation	▶Pass. Act.	**Pass.** - the alarm is prohibited, the sound signal won't go off and the message will not be displayed on the screen. **Act.** - The alarm is allowed, the alarm will go off at the set time and will sound for 1 min. or until any key is pressed.

Ordinal Number in the "Parameters" Hot Menu

8.6. Display	
Menu	**Functions Description**
Bright.cntrl	Brightness setting: **Time** - adjusts the brightness automatically based on time of day. **Man.** - manual brightness adjustment. To change the brightness press and hold the "F" button (when in the "Display Parameters and Average").
ColorSh.Cntrl	Color scheme setting: **Time** - adjusting the color scheme automatically based on time of day. **Man.** - manual color adjustment. For manual change of the color scheme.
Day	"Day" mode setting. Only with the "Bright.cntrl - Time" or "ColorSh.Cntrl - Time"
Night	"Night" mode setting. Only with the "Bright.cntrl - Time" or "ColorSh.Cntrl - Time"
Color scheme	Manual choice of the colour scheme (Day /Night)
Color palette **(C. 1...16 R G B)**	RGB color palette setting: R - red color, G - green color, B - blue color.
Refresh Speed	Setting the screen refresh rate from 1 to 4 times per sec. Note that screen refresh frequency depends on the speed the trip computer comunication via protocol, not on the settings chosen.
Brightn./Day	Brightness level during the day - select manual or auto switch in the "Bright.cntrl" menu
Brightn./Night	Brightness level at night - select manual or auto switch in the "Bright.cntrl" menu
Digital	
Color Setting	Setting the color scheme of the "Displays Parameters" type 1, 2, 4.
Odd Line Text	Font color in odd lines (or parameter in odd position) selection.
Even Line BkGnd	Background color in even lines selection.
Even Line Text	Font color in even lines (or parameter in even position) selection.
Even Line BkGnd	Background color in even lines selection.
Frame	Frame colour for displays Type 2 and Type 4 selection.
Active Menu Text	Active menu or parameter font color selection.
Active Menu BkGnd	Active menu or parameter background color selection.
Hot Menu Text	Selection of the ordinal number font color in the Hot Menu
Bott.Panel	Selection of the bottom panel color of the Display type 1
x4 type	Color selection for the "User's Display" type 2
x6,x9 type	Color selection for the "User's Display" type 3, 4
Params setting x4	Setting up the multi-display of the "Parameters" display type 2; enabling/disabling the Displays viewing
Params setting x9	Setting up the multi-display of the "Parameters" display type 4; enabling/disabling the Displays viewing
Params setting x1	Turning on/off parameters viewing in the "User's Display" type 1 Selection of parameters displaying on the additional panel at the bottom of the screen.
Params setting Aver	Turning on/off the "Average Display" viewing
Params setting x6	Turning on/off the "User's Display" type 3 viewing, setting up the multi-display function
ProgressBar	The value of the progress bar scale in the Display type 1 and 3. **Max** - the maximum value of the scale is equal to the maximum possible value of the parameter. **Bounds** — the maximum value of the scale is equal to the set limit of the parameter warning (Settings Display - Limits).
Graphic	
Color Setting	Setting the color scheme of the "Displays Parameters" type 6
Axes Text	Line color of horizontal and vertical axes selection
Axes BkGnd	Background color of displays the "Parameters" type 6 selection
Chart 1 Color	Chart 1 (top) color selection
Chart 2 Color	Chart 2 (bottom) color selection
Titles BkGnd	Selection of the background color for chart titles.
Params setting	Selecting the parameters to be displayed on the charts; enabling/disabling the Displays viewing
Chart range	**Aut -** recalculation of the max and min values of the parameter depending on its current value. **Max** - chart building is always carried out within the maximum possible limits of the parameter.
Chart period	Setting the time (0.25...99 seconds) after which the parameter chart will be rebuilt. The chart period should be the same for the parameters displayed on the display at the same time.
Countdown	Turning on the "Countdown" function, for details go to page 15
Arrow	
Colors Setting	Setting the color scheme of the "Displays Parameters" type 5
Main BkGnd	Selecting the background color of the displays "Parameters" type 5
Titles Text	Color selection of the title text under the faces
Titles BkGnd	Titles background selection
Left Dial Color	Left dial color selection
Right Dial Color	Right dial color selection
Left Scale Text	Left face numbers color selection
Right Scale Text	Right face numbers color selection
Left Arrow	Left face arrows color selection
Right Arrow	Right face arrows color selection
F/100 24/80	Color selection of the face when the instantaneous fuel consumption rate exceeds 24 liters per 100 km.
Params setting	Selection of parameters to be displayed as faces; enabling/disabling the Displays viewing
Dynamics Smooth / Data	**Smooth** - smooth movement of the arrows occurs with a slight delay when changing the parameter. **Data** - arrows show the current value of the parameter after a sharp change there may be jerks.
Logo	Disable the screensaver when the trip computer is switched on.
Display Sign.	Disable showing the names of the displays: when pressing the buttons only the parameters of the selected display will be seen, the display name is neither seen nor voiced.
Add.panel	Selection of parameters and warnings to be displayed on the sidebar in the "User's Displays".
MomFuelCns	Selection of fuel consumption image: "liters per 100 km" or "km per 1 liter". The change affects only the digital image of the parameter (in the displays "Parameters" and "Averages"), for arrow and graphical image, "liters per 100 km" is always shown.

№	Menu	Function	Value	Function Description
		8.7. Sound Notifications		
	Warnings Log	Warnings Log		The log records the latest time of each warning. The log clears up at 00 hours 00 minutes. Check the log at the end of the trip to analyze emergency situations and monitor events in case the warning sound is disabled during the trip or you missed a warning message.
	Sound freq.	Warnings Log Frequency	2000…5000 >3100	The choice of the tone of sound warnings about the parameters going beyond the limits of the set value (the less the number - the lower the sound, the more the number - the higher the sound).
	Sound off	Disabling Sound Notifications	>No Lock Yes	**No** - sound notifications are produced according to the settings. **Lock** - mute sound notifications completely, including when pressing the buttons, until the ignition is turned off. After turning on the ignition, the sound notifications will be enabled. **Yes** - mute sound notifications completely, including when pressing the buttons, warning messages are produced according to the settings.
	High V batt.	High Battery Voltage Notification	>BB	The first character sets the type of the first alert after the ignition switch is turned on, the second character sets the type of all subsequent alerts before the ignition switch is turned off. Repeated pressing on the "SET" button leads to the selection of a group for editing
	Low V batt.	Low Battery Voltage Notification	>BB	
	Exceeded speed	High Speed Notification	>BB	O - no voice or text messages. N - no voice warnings, only text messages displayed. B - a long "Beep" warning sound and a text message displayed.
	Speed thinning	Speed Thinning Notification (min)	P, 0...99 >0	A speeding warning is blocked for a set period of time if it has been produced several times during a short period of time. P - a tone signal sounds when speeding above the limit (Voice messages - Speed Limit) and the "beep" sound when the speed decreases below the limit. This method allows you to determine the moment of exceeding the speed limit and returning to the permissible speed limit by ear, without distracting from monitoring the surrounding situation.
	Exceeded prm	High RPM Notification	>BB	The first character sets the type of the first alert after the ignition switch is turned on, the second character sets the type of all subsequent alerts before the ignition switch is turned off. Repeated pressing on the "SET" button leads to the selection of a group for editing
	Fuel rem.	Low Fuel Notification	>BB	
	Make TS	Notification of the sevice maintenance date	>B	O - no voice or text messages. N - no voice warnings, only text messages displayed. B - a long "Beep" warning sound and a text message displayed.
	Econometer	Notification in the "Econometer" mode	>BB	The first symbol programs warning signals in case of an uneconomical trip (fuel overspending). The second symbol is for an economical trip.
	Econom. Period		1...20 >2	The period of voicing messages in the "Econometer" mode.
	Full tank	Full Tank Notification	>B	
	%Inj/Exp	Notification of the Function "Fuel Quality Control"	>B	
	Fault	ECU Fault Notification	>B	
	Coolant overheat / **Water overheat** / **Eng.overheat**	Coolant Overheat Notification	>BB	O - no voice or text messages. N - no voice warnings, only text messages displayed. B - a long "Beep" warning sound and a text message displayed.
	Eng.oil overheat	Engine Oil Overheat Notification	>BB	
	Cyl.overheat	Cylinders Overheat Notification	>BB	
	Eng.heating	Engine Heating Notification	>B	
	Trim	Unacceptable Engine Position (Trim)	>OO	
	WaterInFuel	Watre in the Fuel Notification	>BB	
	Keys sound	Mute buttons	>BB	Mute the sound of pressing the buttons. All other warnings work according to the settings.
	Lock sound	Mute Greeting When the Ignition is Turned on	>On Off	Disabling the greeting sound each time the ignition is turned on.

Ordinal Number in the "Parameters" Hot Menu

№	Menu	Function	Value	Function Description
Ordinal Number in the "Average" Hot Menu	Reset Trip			Forced clearing of average parameters per trip
	Reset Reset1			Forced clearing of average parameters in the "Display Average/Reset1"
	Reset Reset2			Forced clearing of average parameters in the "Display Average/Reset2"
	Reset Logs			Forced clearing of the average log and refuelling log.
	Time cost 1h	The cost of 1 hour trip (CU)	0...99,9	The cost of the trip per 1 hour. Estimated in conventional units, i.e. rubles, hryvnia, dollars, etc. (UE - conventional units)
	Dist.cost 1km	The cost of 1 km trip (CU)	0...99,9	The cost of the trip per 1 km
	Petr.cost 1l	The cost of 1 liter of fuel (CU)	0...99,9	The cost of 1 litre of fuel
	AutoReset1	Automatic Reset Period	>manual 1...99 day	After the set period of time, the parameters in the "Average Display/Reset1" automatically reset". When setting "Manual", the parameters reset manually (menu selection "Reset Trip").
	AutoReset2	Automatic Reset Period	>Fefuel. Man. 1...99 day.	Reset the parameters in the "Display Average/Reset2" (from refueling to refueling). Refuel. - reset when refueling (changing the amount of fuel in the tank). For "Tank FLS ECU" - with an increase of about 20% of the volume of the calibrated tank; for "Tank Calculated" - with any positive change.
	Continuous Trip	The duration of continuous trip (min)	0...995 >0	Calculations in the "Display Average/Per trip" do not interrupt if the engine is stopped less than the entered time period. Forced continuation of the trip - "Trip log - Continue" (see below).
	Show trip	Switching to the "Display Medium /Trip" after the engine stops	>-- Yes	When "Yes" is set, each time the engine stops, the display automatically switches to the "Display Average/ Trip" for 5 seconds .
	Auto Log	Automatic trip log recording	>On. Off.	When "On" is set, all trips are recorded in the log automatically, otherwise the recording is possible only in the manual mode. For correct performance, set the current time and date.
	Trip Log			Trip log management ("Display Average/Trip" data)
	Continue		No Yes	To forcibly continue calculation of the average parameters for the trip, it is necessary, without starting the engine and turning on the ignition, to select the "Yes" option with the "SET" button and start the engine.
	Save			Manual recording of average parameters per trip in the trip log when automatic recording is disabled. A short press on the "SET" button displays a list in the format "No. time date"; the average parameters can be saved in an empty cell or replaced with existing ones.
	View			View the trip log.
	Petrol log			Trip log from refueling to refueling (data from the "Display Average Reset2/Refueling")

8.9. HotLists clear.	
Menu	Function Description
Parameters	The "Hot Menu Parameters" cleanup. Pres SET to confirm, ESC to escape.
Average	The "Hot Menu Average" cleanup.

9). Problem solutions

If you experience problems in the operation of the device or in order to restore the factory settings, it is recommended to do a hard reset:
1. Turn off the power to the instrument.
2. With the power off, press the **"SET"** button and, without releasing it, apply power to the device.
3. After the inscription "Reset all settings Perform? Set - yes", confirm the reset by short pressing **"SET"**.

Problem	Cause	Solutions
When the engine is running the parameters related to the operation of the engine are not displayed: RPM, fuel consumption, engine temperature, etc. Except "Univ" and "Carb" protocols.	The trip computer cannot establish communication with the ECU via the diagnostic line	Make sure that the trip computer is correctly and securely connected to the specified contact of the diagnostic pad. Check the model of your control unit. Correct operation is provided only for the ECUs specified in the instructions.
When the ignition is turned on the parameters related to engine operation are incorrectly displayed: engine temperature, throttle, etc.	The communicaion exchange protocol is incorrectly identified .	Choose the correct comunication exchange protocol. If the result is still unsatisfactory use the universal mode of operation.
When the ignition is turned on, the parameters related to fuel consumption are not displayed.	The "Consumption ECU" mode is not selected, or there is no connection to the injection plug in the "Consumption Injection" mode.	Select the "Settings Display - Sources - Consumption ECU". For the "Consumption Injection" mode, establish connection to the ignitions plug. Connect to another plug wire. For carburetor engines when working via the "Carb" protocol fuel consumption cannot be not viewed (there are no necessary sensors).
When the ignition is switched on, neither RPM nor fuel consumption are shown in the "Universal" and the "Consumption Injection" modes, the average parameters are not calculated either.	No connection of the trip computer with the injection plug of the vehicle	Make sure that thetrip computer is correctly and securely connected to the injection plug. Connect to another injection plug wire.
The engine revolutions are displayed incorrectly in the "Universal" or "Inj. Revolutions" modes, (differ by 2 or 4 times).	Revolutions correction has not been carried out for vehicles with parallel or paired injection	Set the tachometer correction 1, 2 or 4: "Settings Display - Correction - Tachometer"
When the ignition is on the speed and mileage are not shown.	The "Speed Sensor" setting is selected while the connection of the trip computer and the speed sensor is not established or the speed sensor is incompatible.	Set the "ECU Speed" or "GPS Speed" mode. When the "Speed Sensor" (speed from the speed sensor) is set, check the correctness and reliability of the connection of the trip computer to the Multitronics GPS speed sensor.
Fuel consumption is shown incorrectly.	The trip computer calibrations are not valid	Set consumption corrections according to the instructions.
The trip computer does not turn on after the ignition switch is turned on.	The "Ignition" wire is not connected.	Connect the "Ignition" wire according to the electrical diagram and activate the setting "Settings Display - Sources - Lock - Phys."
		Use the virtual ignition switch "Settings Display - Sources - Lock - Virt.". The device will be switched on after the engine is started. If you need to turn on the trip computer without starting the engine, go to the "Settings Display - Control - Virtual lock" and select the "On" option.
The device does not turn on after starting the engine.	Insufficient sensitivity of the virtual lock	Adjust the sensitivity of the virtual ignition lock of the trip computer: "Settings Display - Sources - Lock Level".
When the trip computer is connected to the on-board network, nothing is shown on the display	No power supply	Check that there is constant battery voltage at the trip computer terminals.
When selecting the "Tank FLS" or "Tank FLS ECU" mode, the remaining fuel level in the tank of the vehicle is incorrectly displayed	The tank calibration has not been performed.	Perform a linear tank calibration for a full and empty tank. In the case of a non-linear FLS, select the "Tank Calibrated" mode, set the proper correction of the fuel consumption indication and perform a non-linear calibration of the FLS readings.
In the display mode of the calculation tank "Calculated Tank", the remaining fuel level in the tank is constantly displayed - "0 liters".	To use the "Calculated Tank" mode manual input of refuelled fuel amount is required.	After each refueling, manually enter the amount of refuelled fuel.
The program tends to "freeze" during operation.	Loss of communication with the ECU. Interference from high-voltage ignition circuits of vehicles.	Disconnect and connect the device again, if the device still does not respond to the keyboard, perform a general reset of the device. Check the reliability of the connection of the contacts in the diagnostic connector. Check the resistance of the high-voltage wires with the tester, replace them in case of a malfunction. Check the spark plugs, remove carbon deposits or replace bad sparks.
Error codes fail to reset	The engine is running	Stop the engine, turn on the ignition and reset the errors.
Part of the engine fault codes may not be deciphered by the trip computer, but displayed as a code only. For information on decoding such errors see the manufacturer's documentation.		
The moment when the communication is being established, a delayed reaction of the trip computer to the keyboard is possible which is not a malfunction.		
Some minor defects may appear on the screen like tiny red, green or blue spots. They do not affect the performance of the trip computer.		
Due to a small gap between the protective glass and the display of the device, under some conditions, temporary fogging may occur, which disappears as the device warms up. This feature is not a malfunction and does not lead to a malfunction of the device or its failure.		
Correct operation is not guaranteed in case of malfunctions of the ECU sensors of the motor, as well as in case of malfunctions of the ECU itself.		
Correct operation of the device for the "RPM" and "Fuel Consumption" parameters in the universal mode with direct fuel injection (GDI) and K-Jtronic engines is not guaranteed.		

10. Technical specifications

Multitronics CL-950E trip computer
1. Power supply voltage _____ 9...15 B
This device must not be used in systems with carburetor or other engines not equipped with an electronic voltage regulator which provides the same voltage range as the trip computer.
*** Attention!** As carburetor engines normally do not have such regulators it needs to be purchased and installed additionally. Absence of a voltage regulator during operation of the trip computer is guaranteed to lead to its failure and will not be considered a warranty case.

2. Average current consumption:
  in operating mode _____ not more than 0,35 A
  in standby mode _____ not less than 0,03 A
3. Discreteness of information presentation:
  - fuel consumption _____ 0,1 liter;
  - temperature _____ 1°C;
  - engine speed _____ 1...40 rpm*;
  - battery voltage _____ 0,1 V;
  - speed _____ 1 km/h;
  - distance _____ 0,1 km;
  - amount of fuel in tank _____ 0,1 liter;
  - mileage before next service maintenance _____ 1000 km / 1 engine hour
5. Characteristics of inputs for external connections:
  - injection plug   rectangular signal shape, polarity «+ / -»
  - fuel level sensor   resistance 0...500 ohm; voltage 0...15 V; min and max difference not less than 3,5 V
  - fuel consumption sensor   700...20000 pulses per liter (can be calibrated), by default 950 pulse/l (CTP-5)
  - trim sensor   voltage 0...10 V
  - speed sensor   external GPS-sensor "Multitronics"

11. Package contents

1. Multitronics CL-950E _____ 1 unit
2. Set of fasteners for installation into panel
    metal bracket _____ 1 unit
    nuts _____ 2 units
3. Adapter cable for connection _____ 1 unit
4. Quick operation guide _____ 1 unit
5. Warranty certificate _____ 1 unit
6. Shipping box _____ 1 unit

12. Dimensions and labeling

Labeling is carried out by a self-destructing sticker after peeling off on the back of the device. Each Multitronics CL-950E trip computer has an individual sticker.

129,5 mm
103,5 mm
20 mm
30 mm
85 mm

Place of warranty labeling sticker
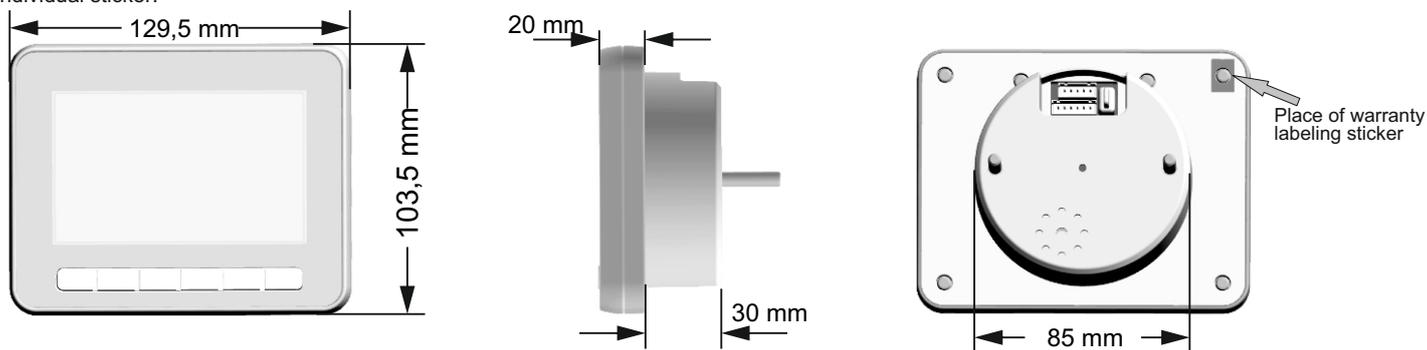
13. Transportation and storage

This device is allowed to be transported by any type of transport that ensures its safety from mechanical and atmospherical damage in accordance with the rules of cargo carriage applicable to this particular type of transport.

The transportation conditions of this device correspond to the group C of GOST 23216-78 in terms of mechanical effects and group 2C of GOST 15150-69 in terms of impact of climate factors.

The device should be stored in the manufacture's packaging under terms of 2C in accordance with GOST 15150-69.

14. Maintenance

- **Attention!** To install the device use the fasteners from the kit so as not to damage connections of the casing or break the sealing!
- Keep the trip computer clean.
- Observe polarity of the supply voltage when connecting the device to the network of the water vehicle.
- Avoid storing the device in the winter outdoors or in an unheated place, it is recommended to remove the device and store it in a warm and dry place.
- The device must not be connected to a network other than the on-board + 12V .
- The device must not be used in systems with carburetor or other engines not equipped with an electronic voltage regulator which provides the same voltage range as the trip computer.
- Do not use the device when the battery is disconnected or the electrical equipment is faulty.
- When starting and turning off the engine or if the electrical equipment of the water vehicle malfunctions, power surges are possible which can lead to malfunction of the device (lack of indication, failure to perform some functions). In this case turn off the power of the device for 10 seconds.
- Avoid getting liquid or foreign objects inside the device.
- If signs of malfunction appear turn off the device and contact service support.

The manufacturer is not responsible for sequences associated with non-compliance by the user with the instructions of use and connection of the device as well as using the device for other purposes.

The manufacturer reserves the right to change the design, technical specifications, appearance, package contents of the device in order to improve its technological and operational parameters without prior notice. .

For more information go to our technical support service:
    tel.:   (495) 743-28-93 (only russian);
    e-mail: support@multitronics.ru;
    website: www.multitronics.ru

EAC