LAPCOM S ALL 10

Instruction manual

Ver.1.1e



PERCUL

FOREWORD

Thank you for purchasing LAPCOM S All 10 and its related products. This product is a racing vehicle measuring instrument that provides the following functions.

S All 10 Specification

Lap Memory	999Lap
Lap Timing	Magnetic or Infrared
Split Times	Up to 6 splits based on buried magnets
RPM	Digital display
Wheel Speed	Optional
Temperature	2ch. Optional
Battery pack	Nickel Metal hydrate standard (Rechargeable)
Battery Life	10 Hours approximate.
Quick charging	Quick charging time 60 minutes with supplied charger. * Trickle charging of 14-15 hours is recommended for full charge.
Hour Meter	5 engines' running time hour meter. * This is available when the RPM is measured.
Odometer	Odometer. * This is available when the speed is measured.
Data Recording	Data recording to a SD memory card for analysis. * Memory card is required. Maximum 32G.
Shift lights	Programmable
Temp Alarms	Programmable
RPM Red line	Programmable
Sampling rate	10 Hz
Battery Alarm & Auto power off	When the battery is running low, a "V" starts flashing on the display and the power lamp will go out in about an hour due to the auto power off function.

For your safety, observe the following

Warning Icons

	**Warning**	Ignoring this may result in death or serious injury.
	**Caution**	Ignoring this may result in injury or physical damage.
	**Alert**	Ignoring this may result in the disruption or suspension of function.

Attention

1. Copying all or part of this manual without permission is strictly prohibited.
2. The contents of this manual may not be modified without prior notice.
3. If you discover any errors, omissions, or any part that is unclear, we would appreciate your advising us.
4. Percul Co. accepts no liability or responsibility for any outcomes resulting from user operation, equipment failure, incorrect operation, or external factors.
5. The warranty is voided if any of these products is disassembled or modified without permission.
6. Do not use this product except in a racing vehicle.

CONTENTS

1) SAFETY INSTRUCTION for USE 3
2) Checking the Product 4
3) Names of Parts 4
Installing and removing the battery pack 5
Inserting and removing SD memory card 6
4) Charging the Instrument 7
5) Installation 9
1. Control unit 9
2. Magnetic sensor 10
3. Pulse lead for RPM 11
4. Wheel speed sensor 12
5. Liquid sensor 12
6. Spark plug temperature sensor 13
7. Intake/exhaust air temperature sensor 13
8. G sensor 14
9. How to connect the external indicator & battery, and the cords 15
10. How to connect to the ECU wheel speed and rpm signal 16
6) Turning the Power On/Off 17
7) Setting of Parameters 18
<Changing the main unit to the parameter setting screen> 18
No.0: Date and time setting 19
No.1: Hour meter, trip meter, and odometer 20
No.2: Backlight 21
No.3: Number of Segments 22
No.4: Sensor Off Timer 23
No.5: Speed Pulse Length 24
No.6: Unit of Speed 25
No.7: Data recording start/stop condition 26
No.8: REV Position 31
No.9: Information lamp and bar-graph full scale 32
No.10 & 11: Temperature Alarm 33
No.12 & 13: Pressure Alarm 34
No.14: Calibration for Steering movement 35
No.15: Calibration for Throttle position 35
No.16: Gear position 35
No.17: Logging interval 38
No.18: Baud rate 38
No.19: Time difference with previous lap, best lap, and target lap 39
No.20: Averaging number of speed and RPM data sampling 42
8) Saving and Transferring Parameter Settings 43
Saving the parameters in the main unit to the memory card 43
Transferring the parameters on a memory card to the main unit 44
9) Selecting the Data Item to Display During Driving 45
10) Monitoring Data during Driving 46
11) Reviewing Data from the Display 47
12) How to delete Driving Data 50
13) How to Initialize the Parameter Settings 50

1) SAFETY INSTRUCTIONS for USE

Warning	- Do not disassemble or modify this device. Doing so could cause a fire, an electric shock, or damage to the device.
	- If anything unusual emanates from the device such as smoke or a strange smell, immediately remove the plug from the power outlet. - Remove the plug from the power outlet before conducting maintenance on this device. Leaving it plugged in could cause an electric shock. Regularly wipe dust from the plug. Leaving it for any length of time could result in fire. - During thunderstorms, stop using the device, remove all cables from the device and the plug from the power outlet.
	- This device uses splash-proof construction. If it gets soaked it could cause a fire or an electric shock. - Do not touch the power outlet with wet hands, as this could cause an electric shock. - Do not modify the AC adapter, and do not bend, twist, damage, or apply heat to any of the cables. - Use only the indicated voltage. Doing otherwise could cause a fire or an electric shock. When using other electric appliances together from the same power outlet, ensure that the total electric current does not exceed the circuit limit. - Do not switch on the power to this device in the presence of inflammable gas or fluids as this could cause a fire. - Do not use this device where the use of such devices is prohibited.

Caution	- Use only the AC adapter supplied. - Correctly insert the plug into the power outlet. Any metal that comes into contact with the AC adapter plug could cause a fire or an electric shock. - Pull the AC adapter plug from the power outlet by the body. Pulling it out by the cord could cause a fire, an electric shock, or damage to the adapter. - Before using these devices, read this User's Guide.

Alert	- During operation, any cables that come loose or any connections that become unstable through vibration could cause a malfunction of this device. Do not apply stress to any of the connector joints. - Do not exceed the prescribed time limit when charging the internal battery. - If the internal battery is completely discharged, it could cause extreme deterioration of the battery's performance and loss of all the stored data in the device.

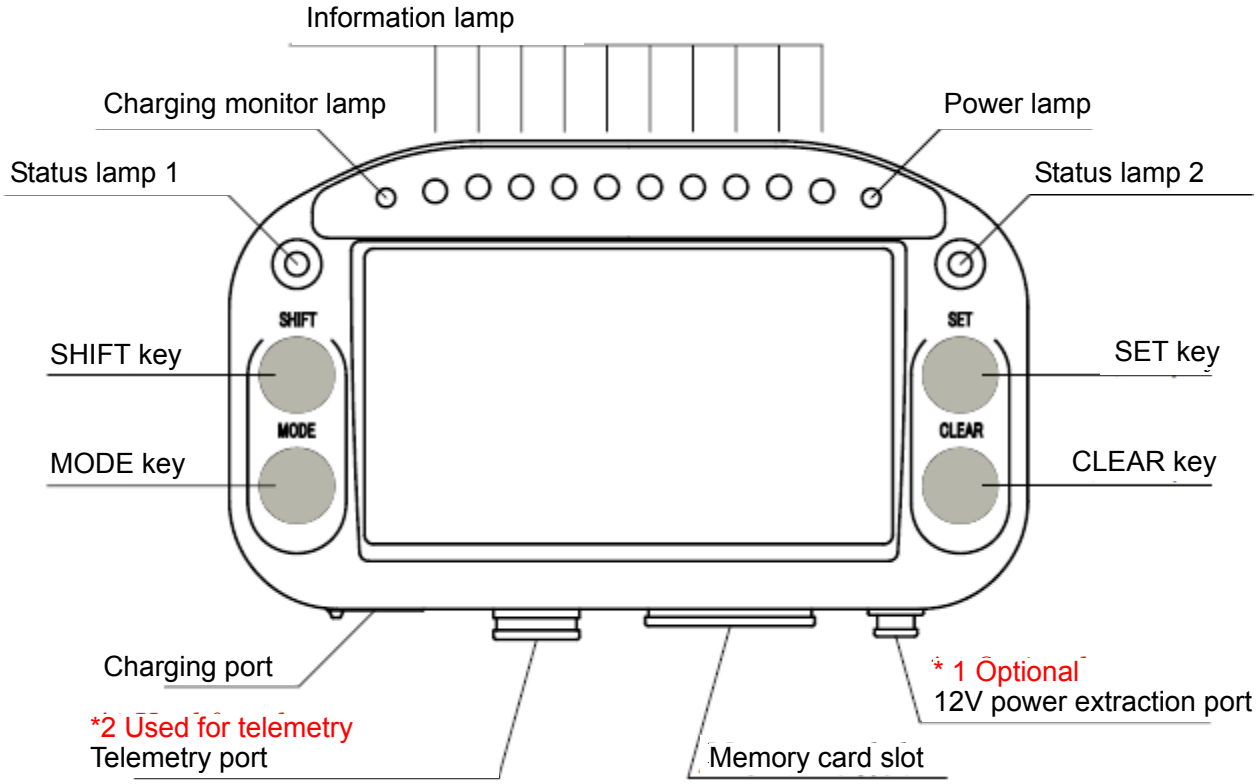
2) Checking the Product

	 Magnetic sensor for kart	 Magnetic sensor for car	 High-sensitive OPT sensor
S All 10 control unit	Lap time sensor (Select one of the above.)		
		・ Instruction manual (this document)	
Pulse lead for RPM	AC adapter		

* If the high-sensitive OPT sensor is selected as the lap time sensor, the optional transmitter is required.

3) Names of Parts

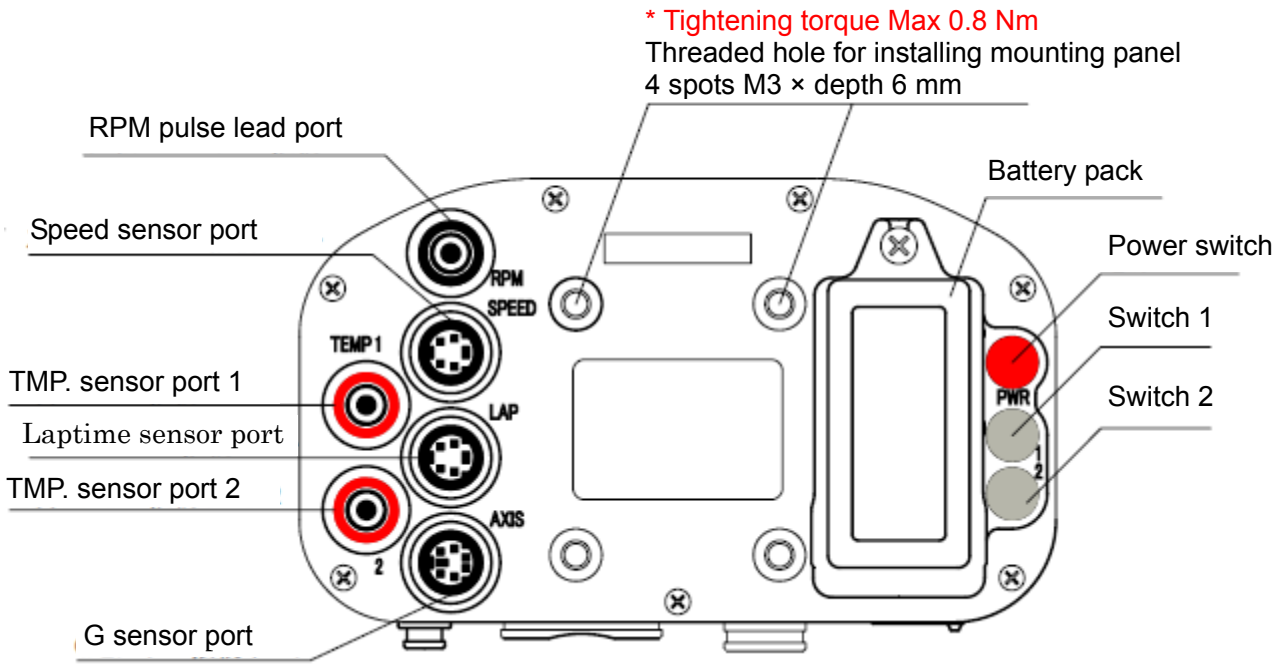
<Front of control unit>



*1. In order to operate using DC 12V power, the optional 05820 external battery module & indicator, and the connection cord must be installed by our company.

*2. When using telemetry, various communication devices are connected

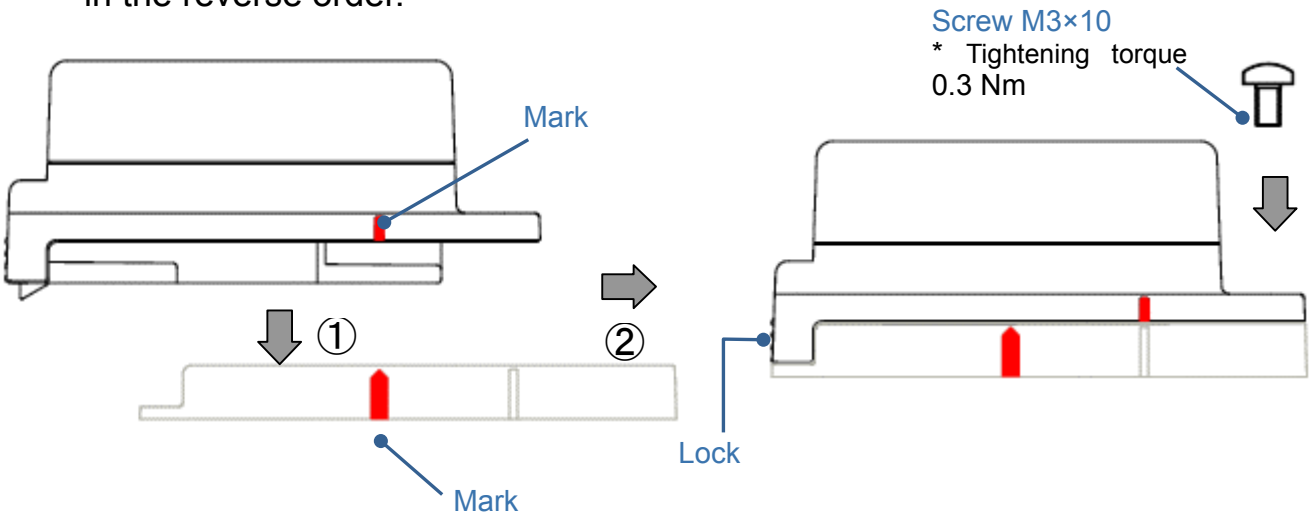
<Rear of control unit>



Installing and Removing the Battery Pack

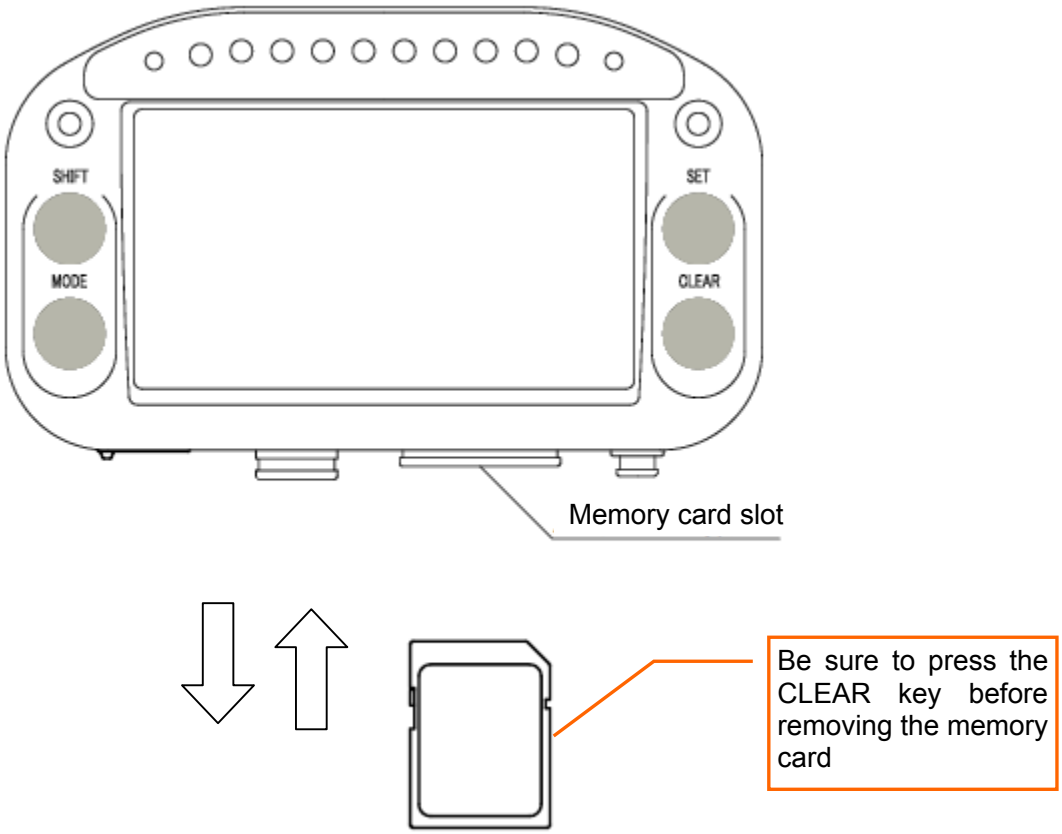
* Be sure to turn off the power before removing the battery pack.

1. Align the marks on the battery pack and main unit, then install in direction ① and slide in direction ②.
2. Check the lock and fasten in place with the screws. To remove, follow the procedure in the reverse order.



* If the battery is removed from the unit for more than 1 minute, the date and lap data will be erased. The date and other data can be backed up, even when the battery level is low.

Inserting and removing a memory card



* Only use reputable branded memory card, or the product may not operate correctly.

* If the label on the memory card is not recessed, the label can sticks on the edge of the card slot and the card cannot be pulled out from the slot. We recommend that you use type of card with recessed label.

1. Before inserting a memory card, first press the CLEAR key and verify that [READY] is displayed.
2. Insert the memory card securely until a click sound is heard.
3. Before removing the memory card, first press the CLEAR key and verify that [READY] is displayed.
4. Pressing on the memory card causes it to protrude slightly. When this occurs, simply pull out the card.

* Before pulling out the memory card, be sure to press the CLEAR key and verify that [READY] is displayed. If the memory card is removed without [READY] indication, the data and/or the memory card may be damaged.

4) Charging the Instrument

* The battery pack can be charged by using the optional 05553 tabletop battery charger.

1. Be sure to turn the power of the unit off, and then insert the DC plug of the provided AC adapter into the charging jack on the unit.
2. When the AC adapter is inserted into the outlet, rapid charging begins. (The charging monitor lamp illuminates.) After rapid charging is completed (the charging monitor lamp turns off), leave the battery connected for 2 – 3 hours for trickle charging until the battery is fully charged. * Rapid charging alone will not fully charge the battery.

* Before using the product for the first time after purchase, be sure to fully charge the unit. Perform trickle charging for 14 - 15 hours after rapid charging ends, leave the charging for 14 - 15 hours for trickle charging in order to fully charge the battery.
* If the battery pack temperature is higher than the temperature of the unit, a safety device activates and charging cannot be started. Wait until the temperature of the battery pack has fallen before beginning charging.

CAUTION: Be sure to observe the following in order to prevent deterioration of the battery.
- ●After rapid charging ends, do not leave the AC adapter connected to the unit for a long period of time.
- ● Charge at a temperature of 5℃ - 35℃.

When the battery pack is fully charged, the unit can be operated for up to 10 hours. If the battery power is low during use, the "V" comment on the display flashes, the automatic power off function activates, and the POWER lamp turns off. Be aware that if the power switch is turned on again before charging the battery, the automatic power off function may not activate sometimes. As a result the battery may become completely discharged, causing the data in the internal memory to be lost.

The battery voltage will be low after the product is just purchased or when the product has not been used for a long period of time. Be sure to charge the battery pack before use. In this case, some time trickle charging may continue without illuminating charging monitor lamp before rapid charging begins. This is not a malfunction. If rapid charging ends quickly and trickle charging begins even when the internal battery is low, and this occurs several times in succession, turn on the power switch and discharge the battery after trickle charging for approximately 15 hours. Repeat this process several times to reactivate the internal battery.

<Important> After using the product, if it will not be used for a long period of time, fully charge the battery before storing the product. Even when the unit power is off, the battery is still consumed at a very slow rate. Be aware that if the product is left disused for a long period of time, the battery may become completely discharged. Be sure to

charge the battery before using the product again.

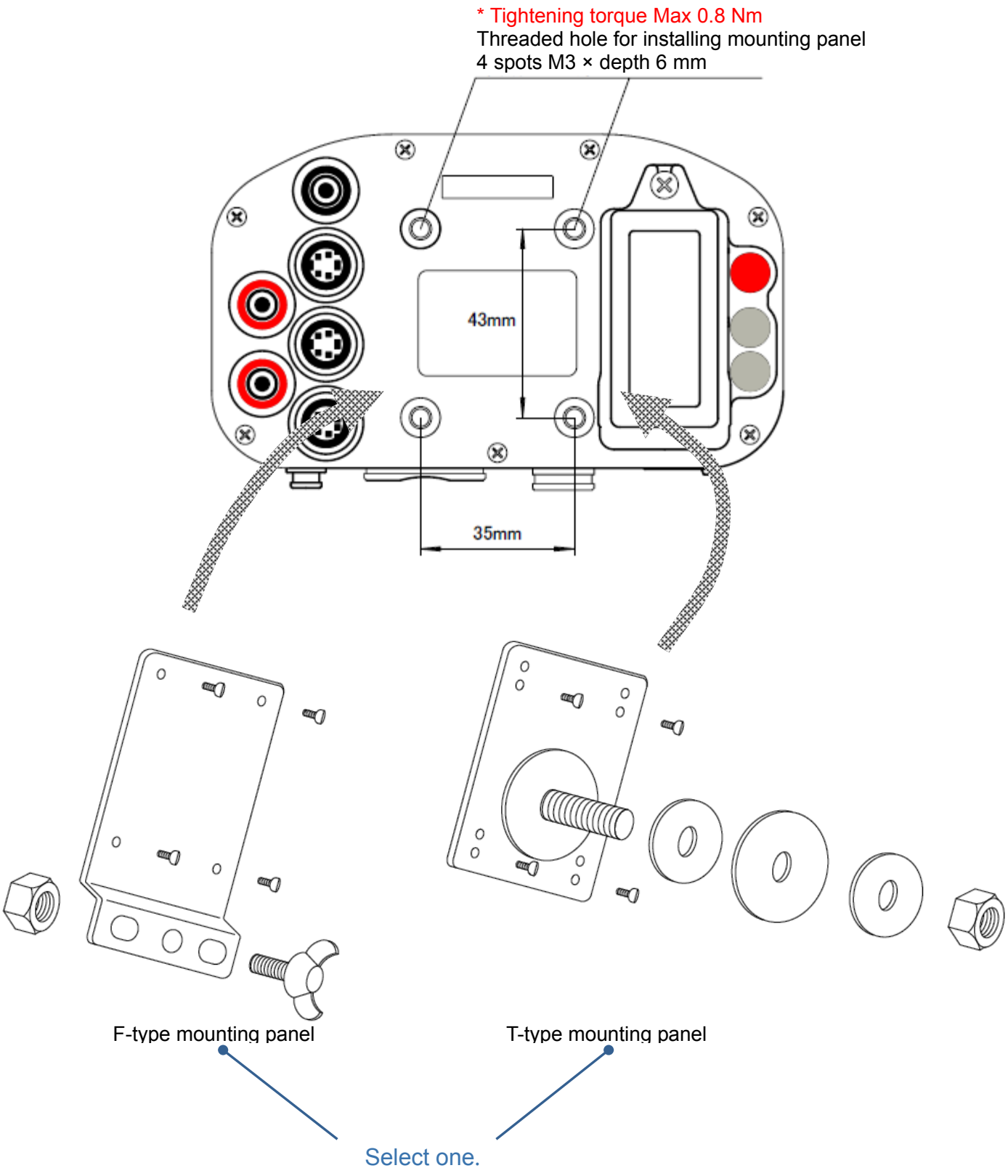
If the unit is not be used for more than one month, remove the battery pack from the unit. The parameter settings will not be lost after removing the battery pack except the calendar & time information, and the data related laptimes from the internal memory will be lost. Before using the unit again, be sure to set the calendar and time first.

The laptimes related data in the internal memory is deleted after approximately 1.5 - 2 months from a fully charged unit status. Be sure to charge the unit once a month to keep the data.

5) Installation

1. Control unit

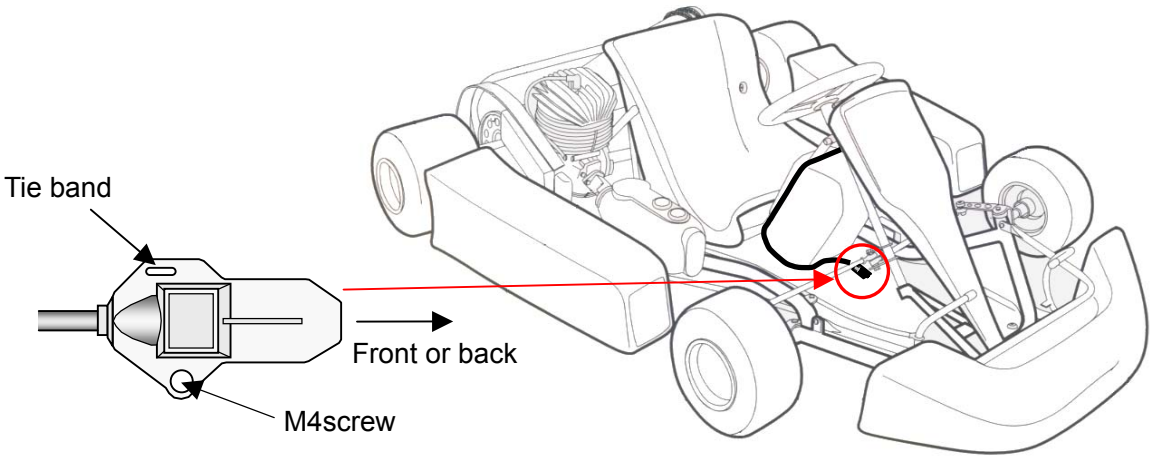
1. Fasten the optional mounting panel onto the main unit using the 4 screws.
2. Install the mounting panel onto the steering wheel or instrument panel.



2. Magnetic sensor (for kart)

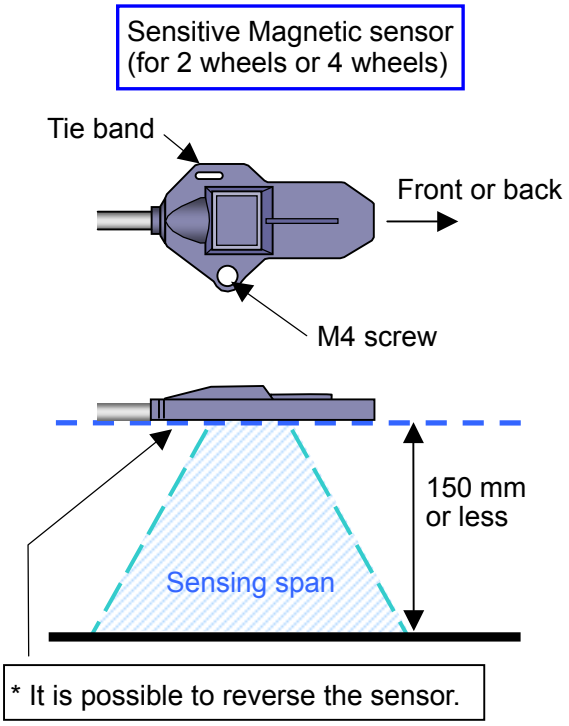
1. Use two-sided tape to attach the sensor on the floor panel. Attach so that the front of the sensor points in the direction of forward travel. (Refer to the installation drawing.) If you want to fasten the sensor securely in place, use M4 screws, tying bands, or covering the sensor by vinyl tape. * The M4 screws and tying bands are not provided.
2. The sensor should be a minimum of 5 cm from any metal of main frame.
3. Connect the magnetic sensor connector to the LAP sensor port on the control unit. At this time, verify that the power switch is off. If the power switch is on, the lap count may start automatically, however this is not an error. Press the CLEAR key to stop the count.

CAUTION: Position the sensor as far as possible from the ignition coil, plug cords, or other items which generate a magnetic field.
Adjust the cables so that they do not contact the pulse lead.



<Sensitive Magnetic sensor (for 2 wheels or 4 wheels)>

1. Use two-sided tape to attach the sensor to the non-metallic part of the car body. Attach so that the front of the sensor points in the direction of forward travel. If you want to fasten the sensor securely in place, use M4 screws, tying bands, or covering the sensor by vinyl tape. * The M4 screws and tying bands are not provided.
2. Install the sensor so that the height above the ground is 15 cm or less. The sensor sensitivity varies depending on the type of magnets installed under the course. We recommend to install the sensor as closer as possible to the ground without interfering with safety mechanism on the vehicle.
3. Connect the magnetic sensor connector to the LAP sensor port on the control unit. At this time, verify that the power switch is off. If the power switch is on, the lap count may start automatically, however this is not an error. Press the CLEAR key to stop the count.



* It is possible to reverse the sensor.



<Example of installation onto a minibike>
In the above photo, the sensor is installed horizontally inside the under cowling of the motorcycle. * The photo shows the under cowling opened.

3. Pulse lead for RPM

1. For Kart engines, replace the spark plug cap with a noise-suppressing product (NGK LB05EMH or equivalent) or use a resistor spark plug.
2. Clip the lead to where RPM is correctly measured such as where all the plug leads are gathered or the ignition coil lead.
3. Insert the pulse lead connector into the REV jack of the control unit.



CAUTION: The RPM pulse lead has not been soldered to the clip to help dampen large engine ignition pulses that may enter the microcomputer of the control unit from the RPM pulse lead. Direct connection will cause damage to the unit, ensure there is no electrical contact between the cable and clip.

4. Wheel speed sensor (* The speed sensor is an **optional part**.)

1. Arrange the supplied magnet triggers around the axle or wheel. Usually 4 to 10 magnets are used. The speed pulse length (outer circumference of tire / number of magnets) should be between 100mm and 999mm. Determine the number of magnets to set the speed pulse length in this range.
2. Affix the magnets with tape. If you mount the magnets on the sprocket or wheel by drilling holes, make sure that this will not reduce their mechanical strength.
3. Install the sensor bracket* on the place for ease installation of the sensor. (For example, on the outside bearing hanger on the brake side of the chassis) Install the wheel speed sensor so that the sensing surface is close to the magnets but not touching them. Any touching would cause damage to the sensor. The distance between the sensing surface and the magnets depends on the installation condition, but a gap of 5mm or under is recommended.
4. Insert the wheel speed sensor connector into the speed sensor jack of the control unit. *Wheel speed sensor bracket and screws are not supplied.

CAUTION: During installation, do not subject the upper resinous part of the sensor to any stress by pinching or wrenching it with a tool.



Example of installation onto a racing kart



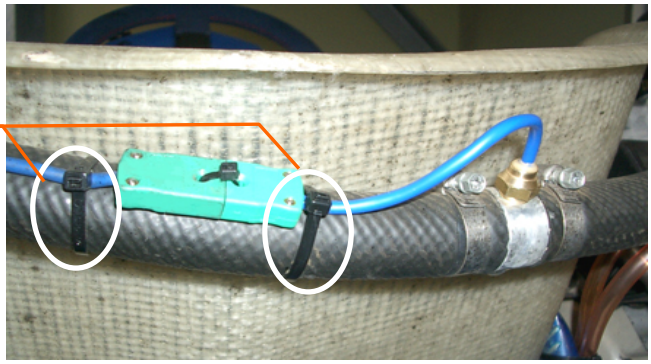
Example of installation onto a motorcycle

5. Liquid sensor (* The liquid sensor and hose joint are **optional parts**.)

1. Cut the radiator hose and install the hose joint to connect the both edges of the cut hose.
2. Fasten the bands* the both sides of the hose joint. * These bands are not supplied.
3. Install the liquid sensor into the hose joint. Bend the spring/cable of the sensor roundly like in the picture below. Fix the both side of the green connectors on the radiator hose.
4. Fix the cable on the radiator side of the vehicle in several points.
5. Insert the liquid sensor connector into the TEMP sensor jack of the control unit.

CAUTION: Keep the sensor away from the engine head. It may occur an error due to the engine noise.

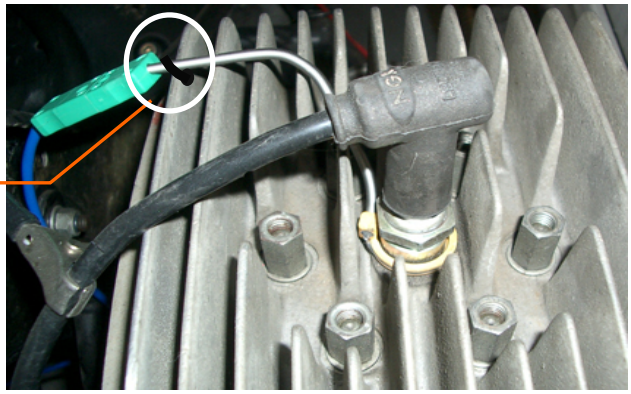
Fasten both sides of the connector.



6. Spark plug temperature sensor (* The spark plug temperature sensor is an **optional part**.)

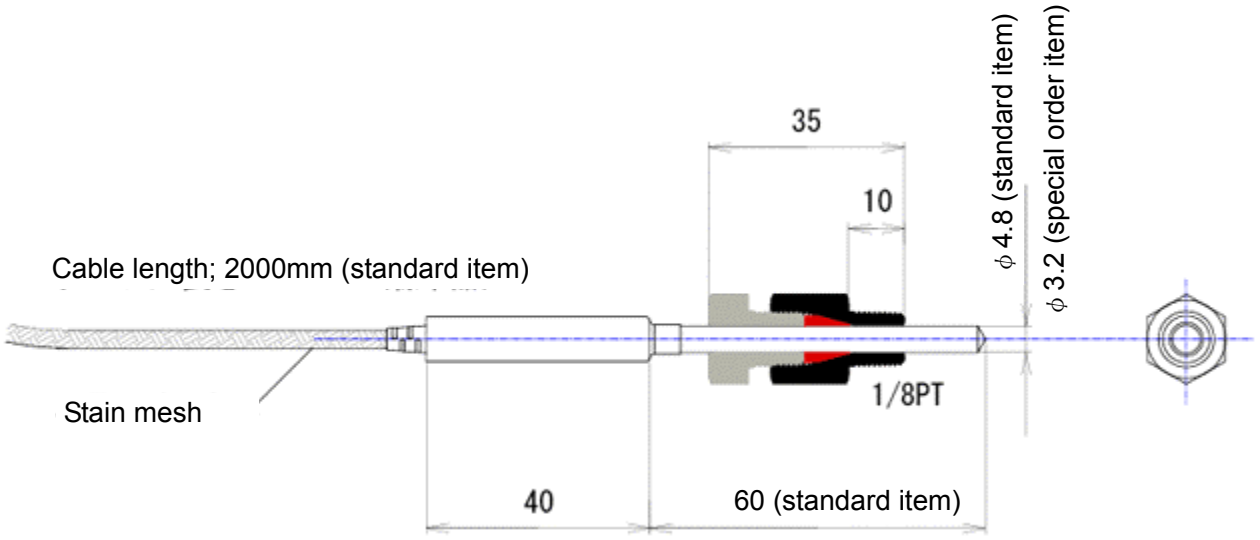
1. Remove the spark plug and ring.
2. Confirm if the sensor ring fits in the spark plug. Fit the sensor ring in the spark plug.
3. Place back the spark plug on the cylinder head and tighten the spark plug.
4. Make a hole in a cooling fin and fix the sensor spring through the hole. See the picture below.
5. Insert the spark plug temp. sensor connector into the TEMP sensor jack of the control unit.

Fasten the sensor to the cooling fin.



7. Intake/exhaust air temperature sensor (* The intake/exhaust air temperature sensor is an **optional part**.)

1. Make a hole in the exhaust pipe. Weld a 1/8PT nut that should be the same metal with the exhaust pipe. The nut for welding isn't provided in the sensor kit. Please provide the nut as per your exhaust requirement.
2. Mount the attached longer nut in the welded nut.
3. Mount the sensor and the attached shorter nut into the longer nut and adjust the length of the sensor head.
4. Fasten the shorter nut to fix the sensor head.



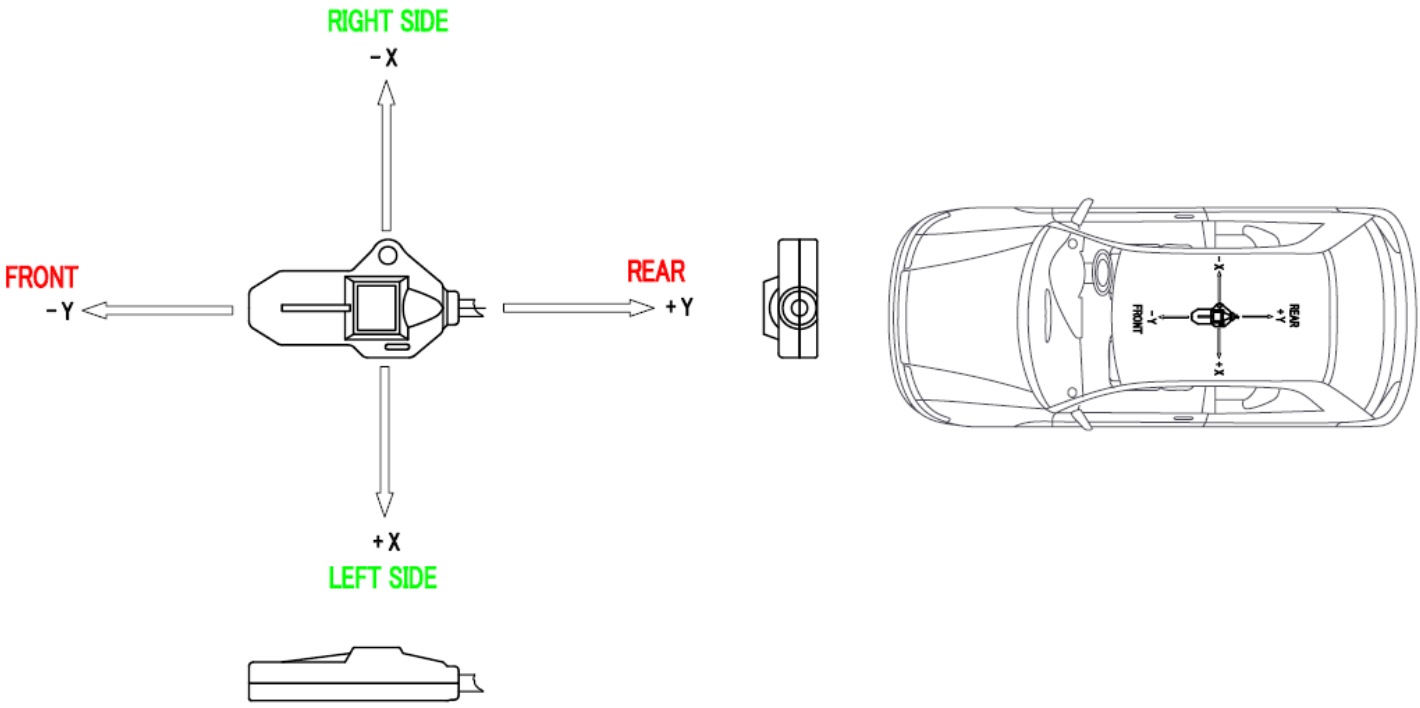
(Order accepted per 5 mm, from 65 mm to 100 mm)

8. G sensor (* The G sensor is optional. Mapping function is not available with S All 10 that records only the maximum G values.)

1. Use two-sided tape to attach the sensor onto a location that is level in the front/back and left/right direction. Attach so that the front of the sensor points in the direction of forward travel. In order to fasten the sensor securely in place, use M4 screws, tying bands, or covering the sensor by vinyl tape. * The M4 screws and tying bands are not provided.
2. Refer to "Selecting the Data Item to Display During Driving" and verify the front/rear and left/right G values. Even if the value shown on the display monitor deviates slightly from 0.00, this will be corrected during driving. (The value at time of shipment is 0.00 – 0.04.)

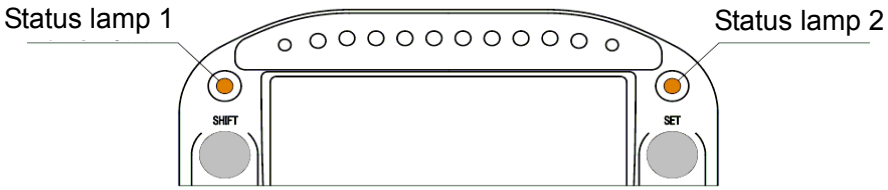
<If malfunction occurs when installed onto a racing kart or similar vehicle>

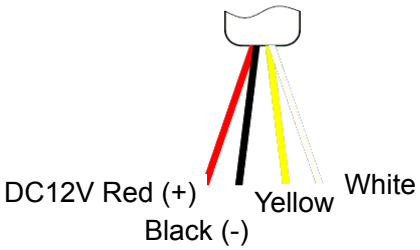
If the sensor is subjected to strong vibration, malfunction may occur. Place low-repulsion urethane (sponge or similar) around the sensor to absorb vibration.



9. How to connect the external indicator & battery, and the cords

* This part is an optional part. It must be installed by PERCUL.





* The current consumption is 50 mA when the external DC 12V power is used. It is 100 mA when the backlight is on.

1. Red: DC 12V (+)
2. Black: (-)
3. Yellow: When voltage (+) is applied, status lamp 1 illuminates. This can be used as a warning lamp or for other purposes.
4. White: When voltage (+) is applied, status lamp 2 illuminates. This can be used as a warning lamp or for other purposes.

Precaution when operation in coordination with the ignition switch

If the ignition switch (LAPCOM main unit) is turned off while logging is in progress, the logging data will be damaged.. Therefore use both 1 and 2 below in order to prevent this from occurring.

1. Setting logging automatic end (parameters 7-1, 7-2, 7-3)

It is necessary to set so that logging is ended before the vehicle enters the pit and the ignition switch (LAPCOM main unit) is turned off.
Or, press the CLEAR key to end logging manually.

2. Operating in combination with a charged battery pack

At the instant when the ignition switch is turned off, the Lapcom main unit power switches to the battery pack and continues operating.

1. Turn on the main unit power switch in advance.
2. Turn on the ignition switch.

10. How to connect to the ECU speed and rpm signal

※ Each signal is a square wave (pulse).

[Precautions]

① The Lapcom control unit should be run by 12V external power supply.
② It is necessary to modify the Lapcom control unit to a dedicated ECU circuit.
③ Depending on the vehicle type and specifications, measurement may not be possible in some cases.
④ If the vehicle has remodelled electrical system or added meters, it may not be able to correctly take in signals from ECU.
⑤ When contacting us regarding ECU connections, please ready the ECU signal explanation manual beforehand. We are unable to provide an answer based on the wiring diagram alone.

[RPM signal]

1. Verify that the RPM signal is being output by the ECU.
   If the voltage level of the RPM signal is low, the *amplifier pulse lead* (our optional parts) is required.

※ If the RPM display is not stable, try to put resistance of 1-3 kilo ohm. This sometimes makes the RPM stable.

2. Connect the red wire of the provided ECU RPM signal cable to the ECU RPM signal. The voltage of the signal should be 4V to 12V.
3. Set the REV position of the control unit.

[Speed signal]

1. Connect the white wire of the provided ECU speed signal cable to the ECU speed signal.
2. Check the speed pulse number, then calculate and enter the speed pulse length.
   <4-wheel vehicle> 1,569.85 / Speed pulse number = Speed pulse length (valid: 100 or higher)
   <2-wheel vehicle> 714.29 / Speed pulse number = Speed pulse length (valid: 100 or higher)

※ If the tire size has been changed from the genuine part size, multiply the above speed pulse length by the tire diameter size increased rate and enter the result. Be aware that depending on the vehicle, the above standard may not apply.

※ When the speed pulse number is 2 pulses, the use of the *speed pulse converter* (our optional parts) is recommended.

※ If the speed pulse length is less than 100, it is possible to modify the control unit to reduce the speed pulse number to 1/4. Please consult with us.

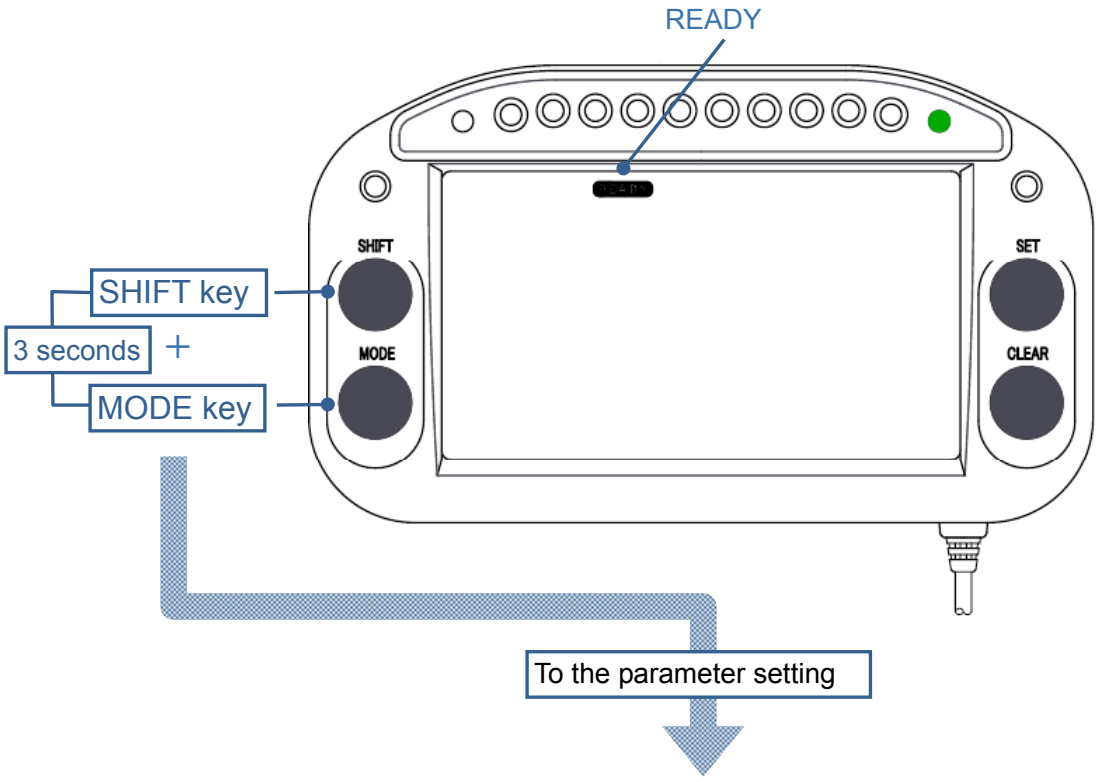
6) Turning the Power On/Off

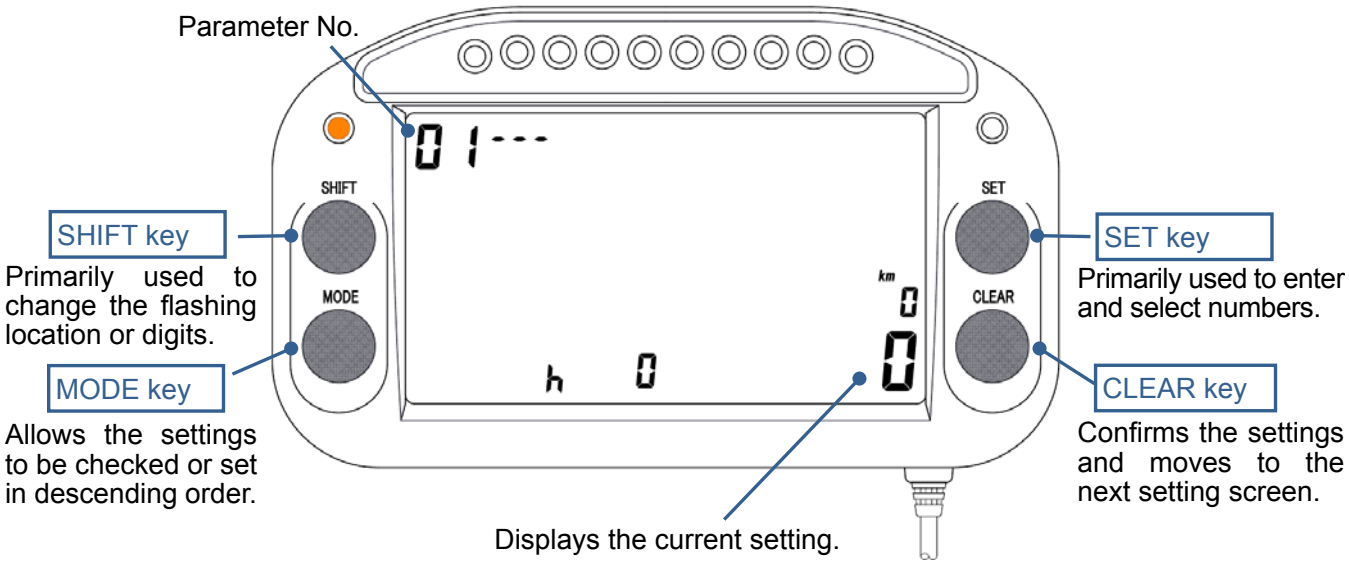
ON: Press and hold the power switch for 1 second.
OFF: Press and hold the power switch for 1 second.

7) Setting of Parameters

<Changing the main unit to the parameter setting screen>

1. Verify that [READY] is displayed on the display screen. If [READY] is not displayed, press the CLEAR key to display it.
2. Press and hold the SHIFT key and MODE key at the same time for 3 seconds to change to the parameter setting screen. The parameter number is displayed at the top left of the display.
3. Press the CLEAR key and set each parameter from No. 0 – 19 in sequence. Press the MODE key to check the parameter No. settings in descending order.
4. When the CLEAR key is pressed and held for 3 seconds, the settings will be saved, the screen returns to the initial screen and [READY] is displayed.





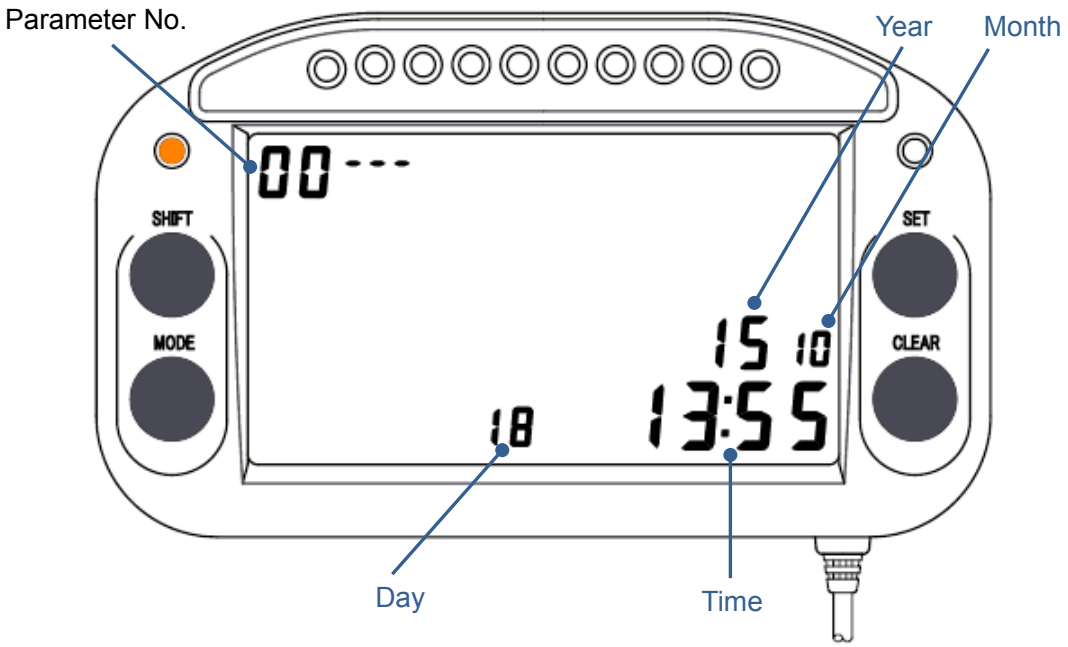
No. 0: Date and time setting

Set the current year, month, day, and time.

* The initial screen on the parameter setting is No. 1. To set No. 0, press the MODE key.

1. The second digit of the year flashes. Press the SET key and enter a number.
2. Pressing the SHIFT key changes the flashing digit to the first digit of the year. In the same way, press the SET key and enter a number.
3. Use the same process to set the month, day, and time in sequence.
4. Press the CLEAR key to move to the next screen. To exit the setting, press and hold the Clear key for 3 seconds.
   * Only the last 2 digits of the year are displayed and set. The time is displayed in 24-hour format.

Setting example: 13:55, October 18, 2015



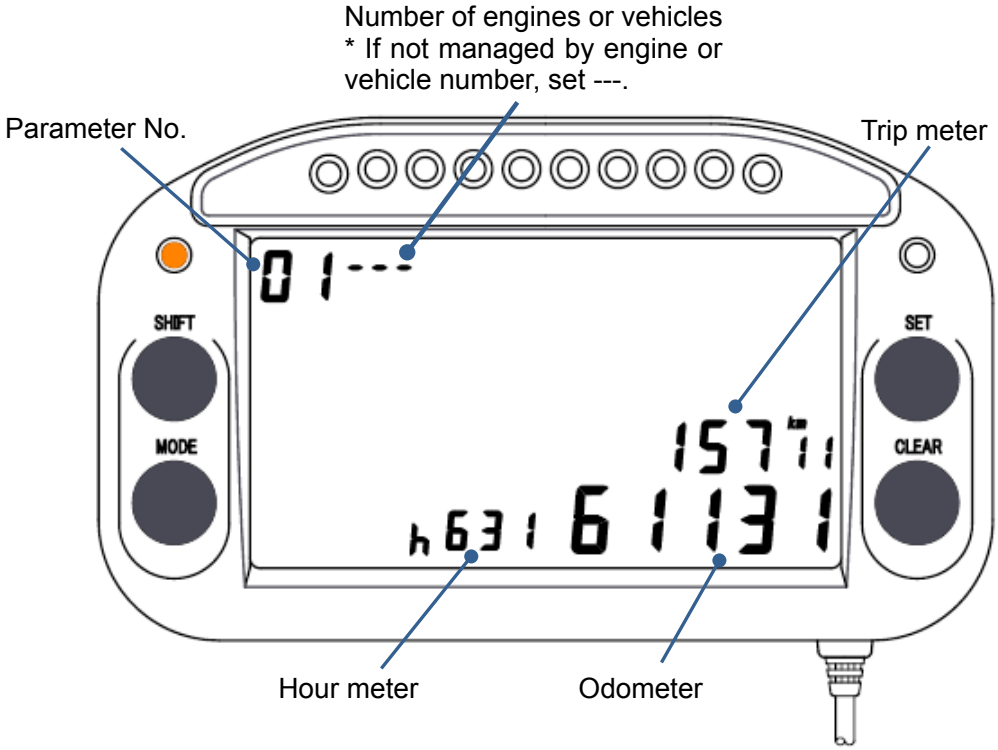
No. 1: Hour meter, trip meter, and odometer

Hour, trip, and odometer data can be recorded and displayed for a maximum of 5 types of engines or vehicles.

* Press the CLEAR key and display parameter No. 1.

1. There is a flashing hyphen or number on the right side of the parameter No. Press the SET key and enter the number of vehicle or engines to register. If the displays will not be managed for different vehicles or engines, set a hyphen.
2. To reset the trip meter, odometer, and hour meter to zero, select on the display the registered No. that you want to reset on the screen and press and hold the SHIFT key for 3 seconds.
   * On the “01---“ display screen, it is possible to reset the only trip meter to zero.
3. Press the CLEAR key to move to the next parameter setting. To exit the setting, press and hold the CLEAR key for 3 seconds.

* The hour meter does not count up when RPM is not being measured.
* The odometer and trip meter do not count up when wheel speed is not being measured.



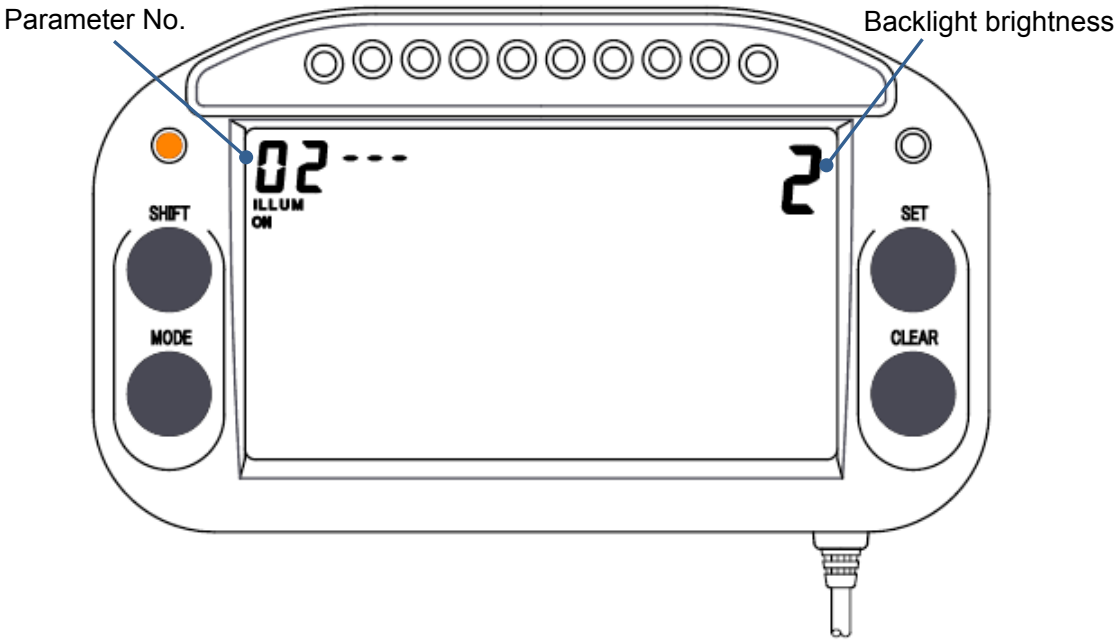
No. 2: Backlight * The backlight is an optional.

Set the backlight brightness.

* Press the CLEAR key and display parameter No. 2.

1. The backlight brightness display flashes at the top right of the screen. Press the SET key and select backlight OFF (0) or ON (1 – 2). 2 is the brightest setting.
2. Press the CLEAR key to move to the next parameter setting. To exit the setting, press and hold the CLEAR key for 3 seconds.

   * When the user changes from the initial screen to the parameter settings screen, the backlight turns on at its brightest setting for 7 seconds, regardless of the backlight ON/OFF setting.

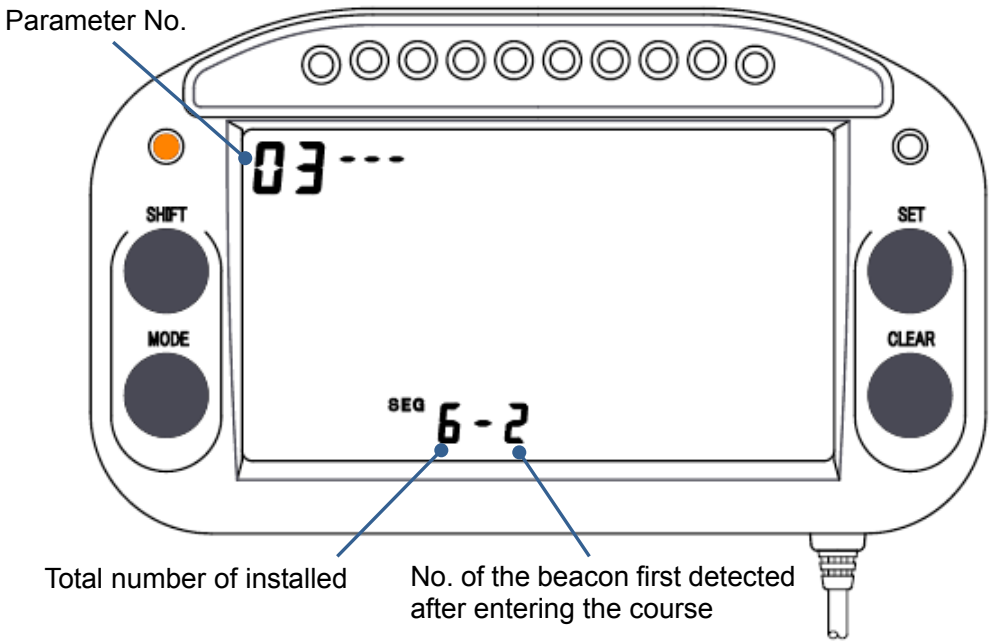


No. 3: Number of Segments

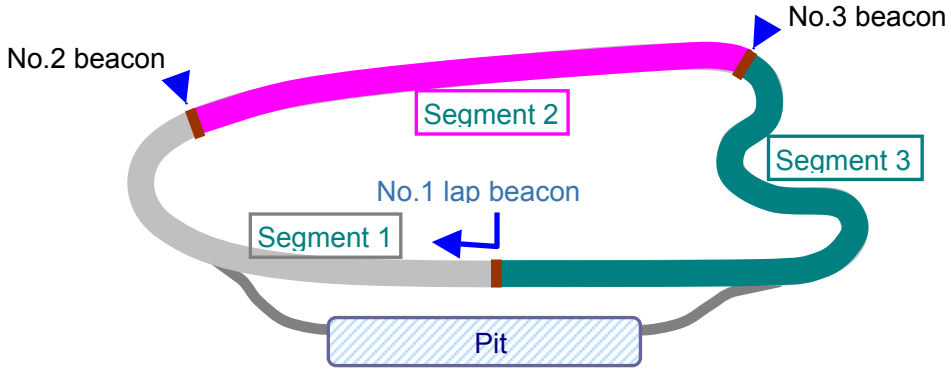
First, set the total number of beacons installed in the course. Next, enter the No. of the first beacon that will be detected after leaving the pit.

* Press the CLEAR key and display parameter No. 3.

1. The total number of beacons in the course flashes. Press the SET key and enter the number.
2. Press the SHIFT key to move the flashing part to the right. Then press the set key and enter the number of the first beacon that will be detected.
3. Press the CLEAR key to move to the next parameter setting. To exit the setting, press and hold the CLEAR key for 3 seconds.



[Setting the No. of the first detected beacon]
If the lap measurement beacon is No. 1, then the course beacon which is first detected after the vehicle leaves the pit is the No. 2 beacon for measuring the No. 2. section.



* If only 1 beacon is installed in the course, set "1 – 1".
* If section times will not be measured, set "1 – 1".

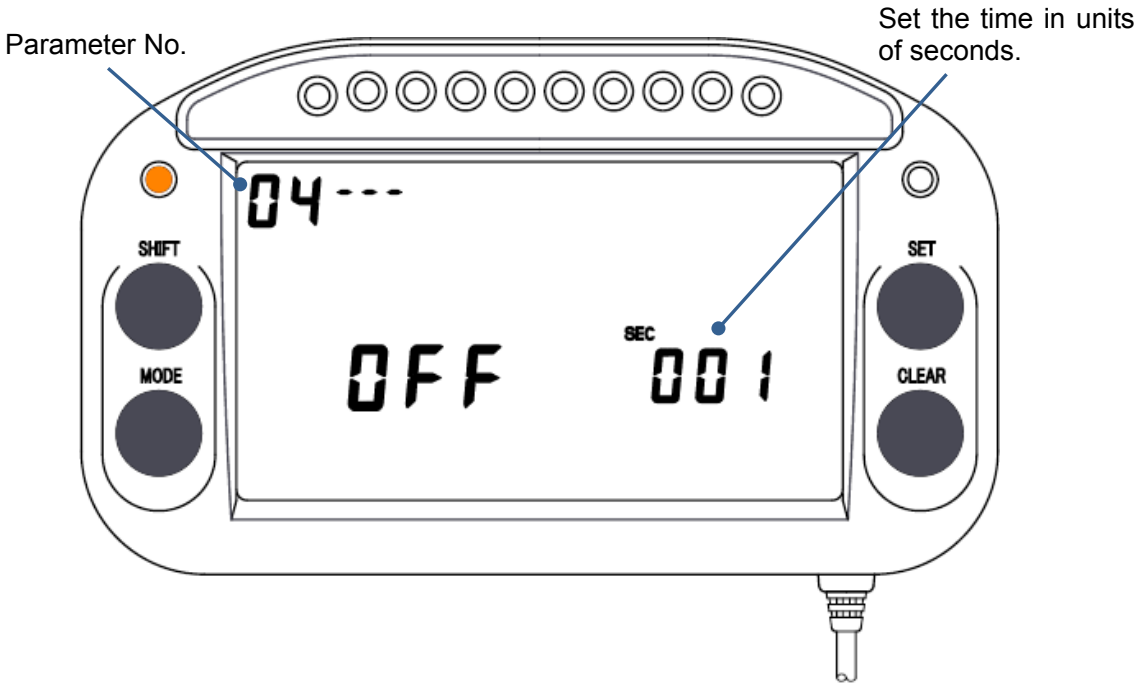
No. 4: Sensor off timer [Default value: 001]

This setting stops the sensor function for the setting period after a beacon is detected. A sensor off time can be set for example when you will measure only the lap time in order to disable the sensor function after the lap beacon is detected.

* Press the CLEAR key and display parameter No. 4.

1. To the right of the “SEC” indication, the 3-digit time setting value flashes. The value changes each time the SET key is pressed. Press the SHIFT key to change the digit, then use the SET key to enter the value. Values are set in 1 second increments, with a maximum value of 599 seconds.
2. Press the CLEAR key to move to the next parameter setting. To exit the setting, press and hold the CLEAR key for 3 seconds.

* For ordinary driving, use the default setting of 001.
* If the set time is longer than the lap time, lap time measurement will not be possible.



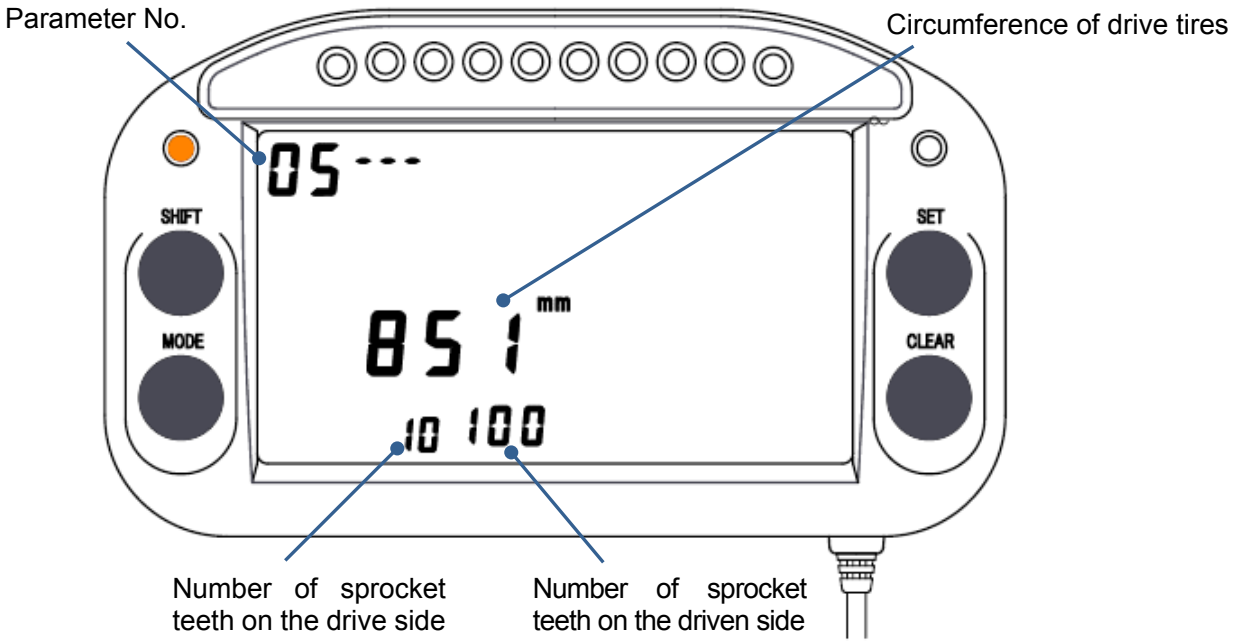
No. 5: Speed Pulse Length

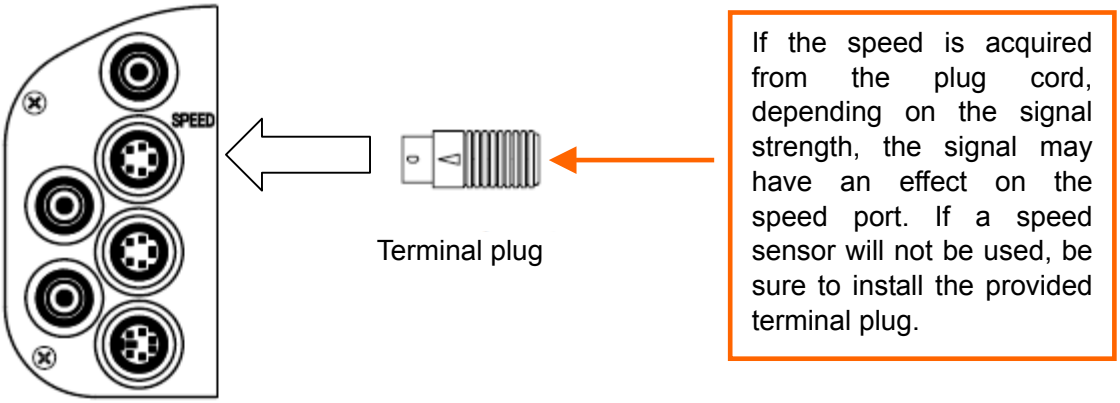
5－－－: Without speed sensor; engine directly connected to drive shaft

In a vehicle such as a racing kart where the engine is connected directly to the drive shaft without a clutch, the wheel speed is calculated from the RPM.

* Press the CLEAR key and display parameter No. 5.

1. There is a flashing hyphen or number on the right side of the parameter No. Press the SET key and enter a hyphen.
2. Press the SHIFT key and move the flashing digit to the circumference of the drive tires, then press the SET key and enter a number.
3. In the same way, enter the number of sprocket teeth on the drive side and the number of sprocket teeth on the driven side.
4. Press the CLEAR key to move to the next parameter setting. To exit the setting, press and hold the CLEAR key for 3 seconds.





5－－1: Using Speed sensor

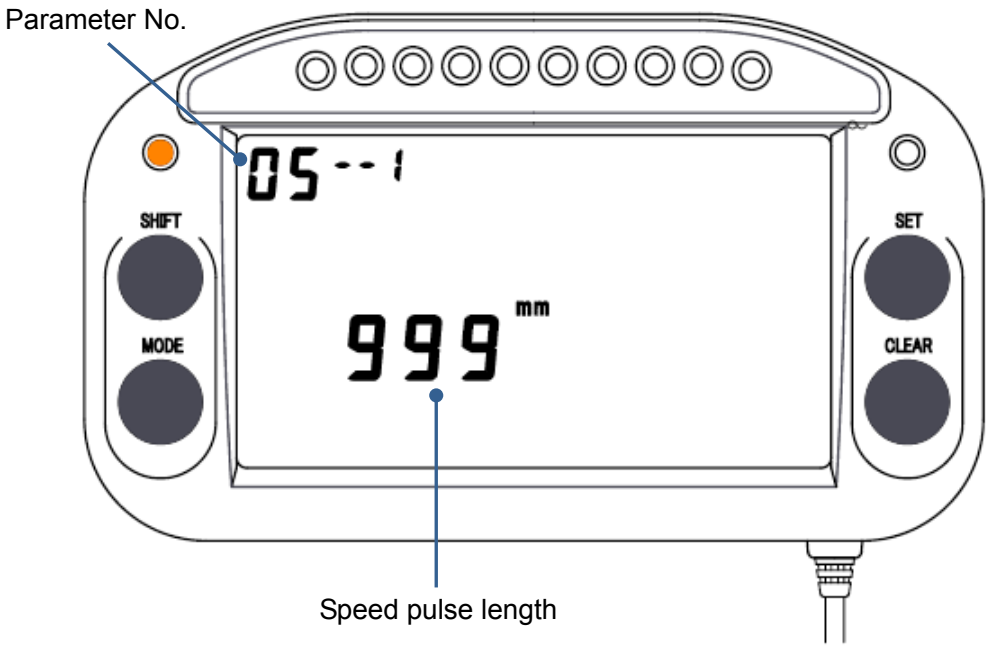
Set as follows when a speed sensor is used to measure the wheel speed.

1. There is a flashing hyphen or number on the right side of the parameter No. Press the SET key and enter 1.
2. Press the SHIFT key and move the flashing digit to the speed pulse length, then press the SET key and enter a number. Enter the value of the measured tire circumference divided by the number of sensor detection triggers as the vehicle speed pulse length.

Speed pulse length = Measured tire circumference ÷ Number of installed magnet triggers

* If the wheel speed signal is acquired from the ECU, refer to the separate provided materials.

3. Press the CLEAR key to move to the next parameter setting. To exit the setting, press and hold the CLEAR key for 3 seconds.



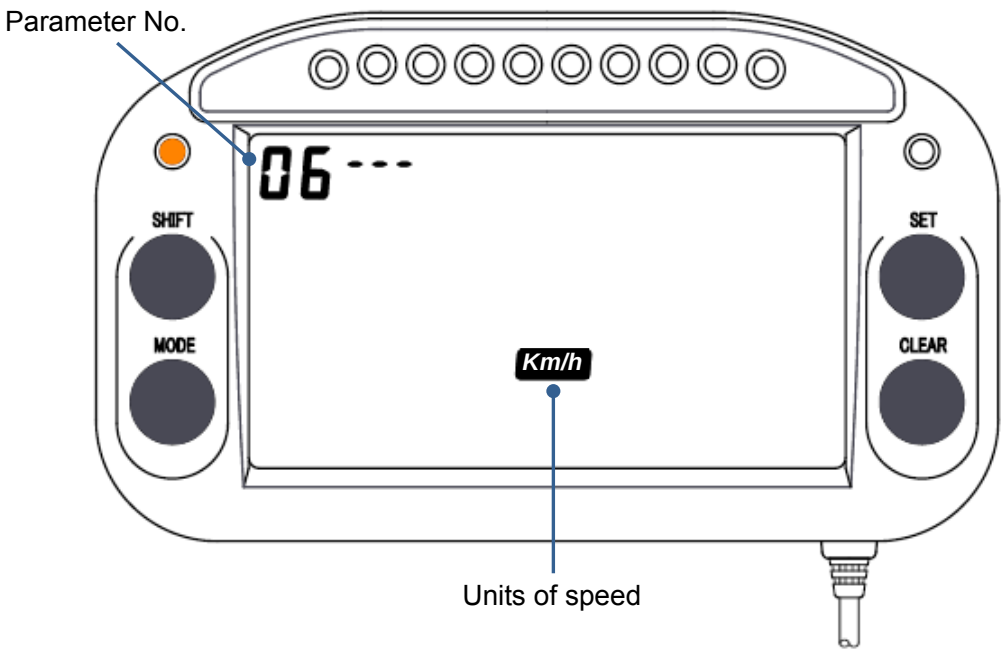
No. 6: Units of Speed

Select km/h or m/h (miles) as the units for wheel speed display.

* Press the CLEAR key and display parameter No. 6.

1. The speed units display flashes. Press the SET key and select the units.
   ※ Press the CLEAR key to move to the next parameter setting. To exit the setting, press and hold the CLEAR key for 3 seconds.

※ If km/h is set, the temperature display is automatically changed to centigrade display. If m/h is set, the temperature display is automatically set to Fahrenheit display.



No. 7: Data recording start/stop condition

* Press the CLEAR key and display parameter No. 7.
* To check the driving data on a PC, the data must be recorded on a SD memory card.

7－－－: Without Memory card. (Measurement and display only)

If the SD memory card is not installed, data recording will not be performed.

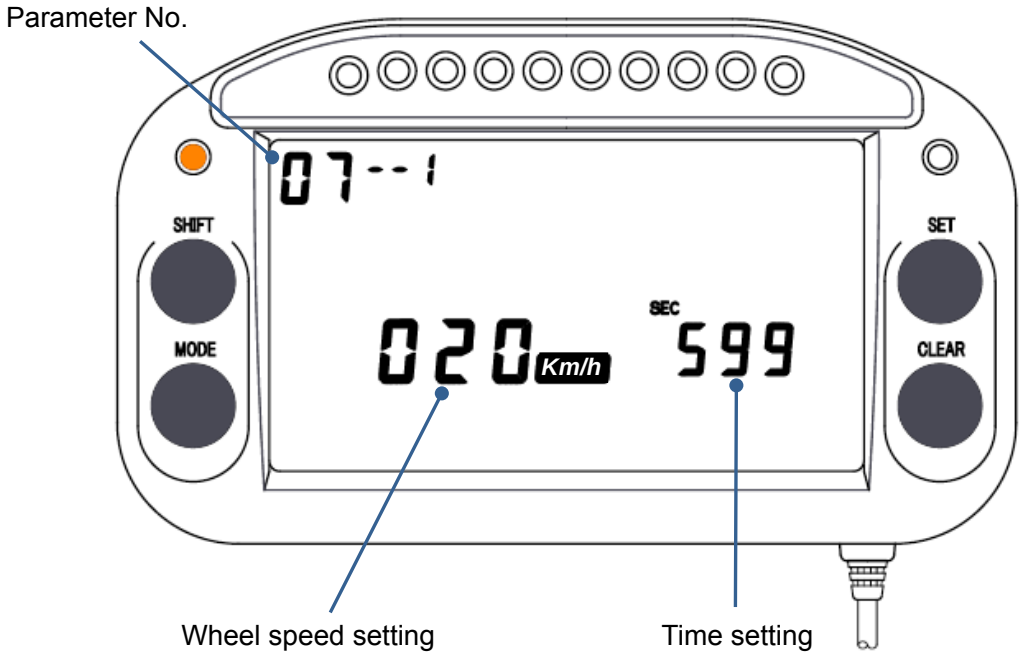
1. There is a flashing hyphen or number on the right side of the parameter No. Press the SET key and enter a hyphen.
2. Press the CLEAR key to move to the next parameter setting. To exit the setting, press and hold the CLEAR key for 3 seconds.

7－－1: Perform recording only of laps where lap time is completed. (Default value: 20 km/h, 599 seconds)

The out-lap and in-lap are not measured.
Only the completed laptime data will be recorded.

* A SD memory card is required.
* Speed measurement is required. Be aware that recording is not possible if the speed is not measured.

1. There is a flashing hyphen or number on the right side of the parameter No. Press the SET key and enter 1.
2. Press the SHIFT key and move the flashing part to the wheel speed display, then press the SET key and enter a number. When the set speed is reached, preparation for recording is started. After the vehicle detects the first lap beacon, recording starts.
3. Next, press the SHIFT key and move the flashing part to the time display, then press the SET key and enter a number. Recording of data is automatically stopped when the length of time set here has passed after the wheel speed drops below the speed set in 2.
4. Press the CLEAR key to move to the next parameter setting. To exit the setting, press and hold the CLEAR key for 3 seconds.



<Example of the above setting>
When the wheel speed exceeds 20 km/h after the vehicle leaves the pit, preparation for recording is started.

After repeated laps, when the vehicle enters the pit road, the speed falls below 20 km/h, and then 599 seconds have passed, recording of data is automatically stopped.

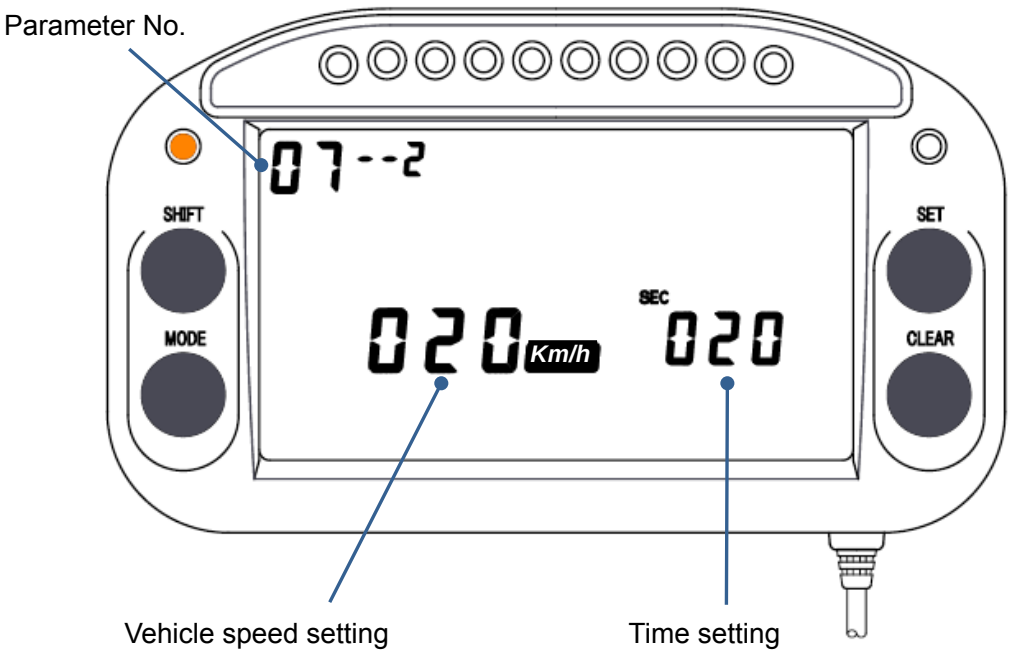
* Do not turn off the power without first stopping the recording of data. The data will be damaged.
* To stop recording of data manually, press the CLEAR key.
* To automatically end recording of data faster when returning to the pit, set a shorter time.
* Be sure to stop recording of data when entering the pit.

7－－2: Recording the lap data from pit exit to pit return.

All lap data is recorded from leaving the pit to returning the pit.

* A SD memory card is required.
* Speed measurement is required. Be aware that logging is not possible if the speed is not measured.

1. There is a flashing hyphen or number on the right side of the parameter No. Press the SET key and enter 2.
2. Press the SHIFT key and move the flashing part to the wheel speed display, then press the SET key and enter a number. When the set speed is reached, recording of data is started.
3. Next, press the SHIFT key and move the flashing part to the time display, then press the SET key and enter a number. Recording of data is automatically stopped when the length of time set here has passed after the wheel speed drops below the speed set in 2.
4. Press the CLEAR key to move to the next parameter setting. To exit the setting, press and hold the CLEAR key for 3 seconds.



<Example of the above setting>

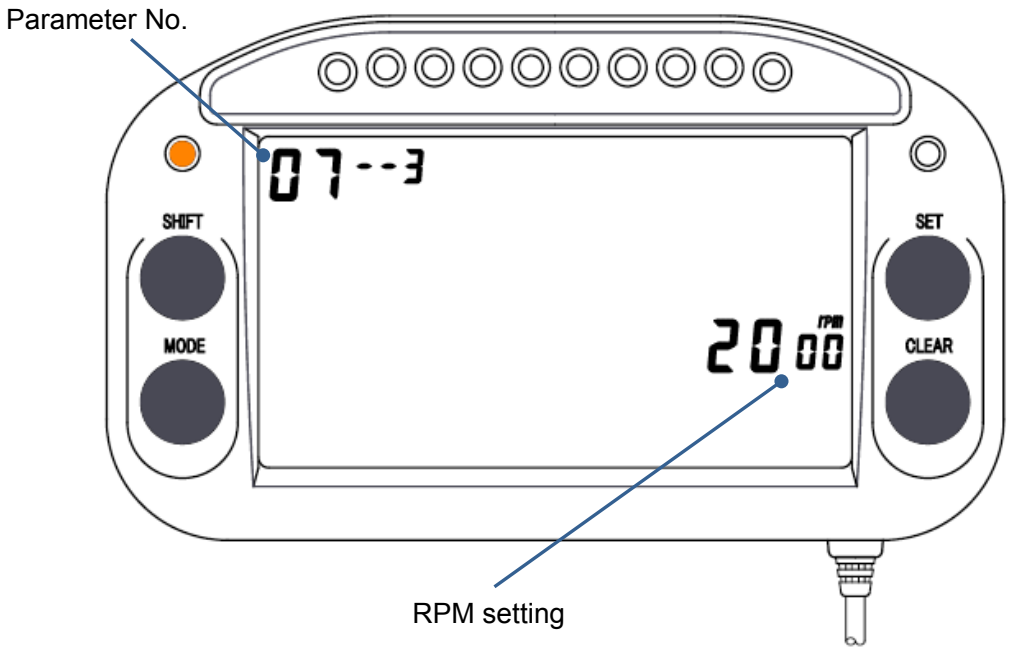
When the wheel speed exceeds 20 km/h after the vehicle leaves the pit, recording of data is started.
When the measurement laps are finished and the wheel speed drops to below 20 km/h on the pit road, and then 20 seconds have elapsed, recording of data is automatically stopped.

* Do not turn off the power without stopping the recording of data. The data will be damaged.
* To stop recording of data manually, press the CLEAR key.
* To automatically end recording of data faster when returning to the pit, set a shorter time.
* Be sure to stop recording of data when entering the pit.
* If the vehicle returns to the course within the set time even after sliding off the course and slowing to below the set speed, recording of data is not stopped.

7－－3: Recording all data from engine start to engine stop

* A SD memory card is required.
* Be aware that recording of data will not be started if the RPM signal is not acquired.

1. There is a flashing hyphen or number on the right side of the parameter No. Press the SET key and enter 3.
2. Press the SHIFT key and move the flashing part to the RPM display, then press the SET key and enter a number. When the set RPM is reached, recording of data is started. When the RPM drops below the set value, recording of data is automatically ended.
3. Press the CLEAR key to move to the next parameter setting. To exit the setting, press and hold the CLEAR key for 3 seconds.



* Do not turn off the power without first stopping the recording of data. The data will be damaged.
* To stop recording of data manually, press the CLEAR key.
* To automatically stop recording of data sooner when returning to the pit, set a higher RPM.
* Be sure to stop recording of data when entering the pit.

No. 8: REV position

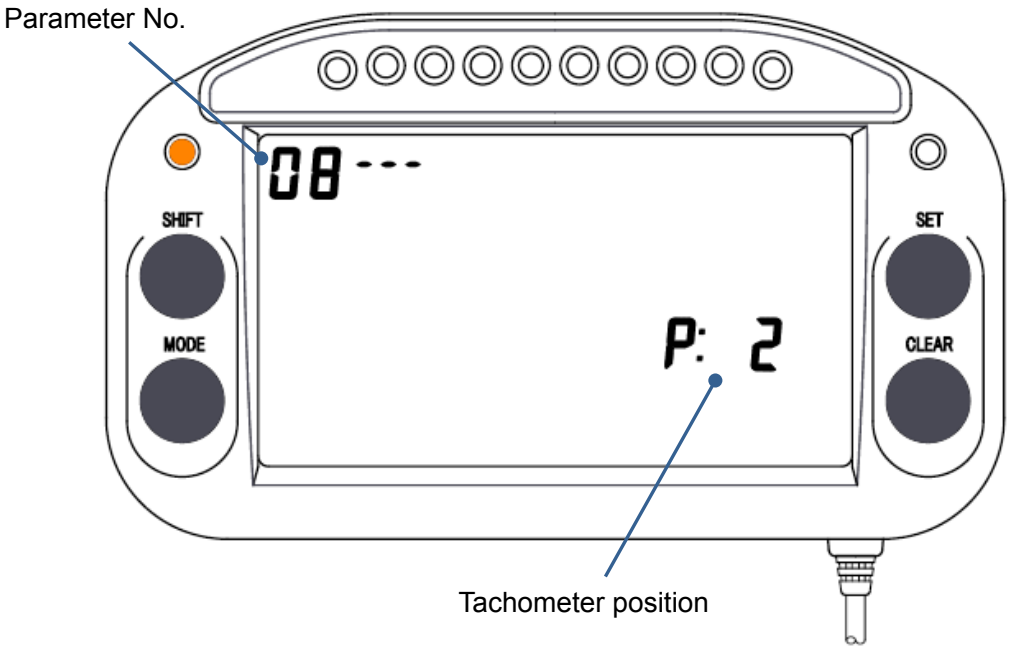
Set the engine type.

* Press the CLEAR key and display parameter No. 8.

1. The tachometer position display flashes. Press the SET key and select the tachometer position. Refer to the list below.
2. Press the CLEAR key to move to the next parameter setting. To exit the setting, press and hold the CLEAR key for 3 seconds.

※ In rare cases, the position listed below may not be suitable. In that case, change the value to the suitable configuration for your engine.

P: 1	4-stroke	1-cylinder
P: 2	2-stroke 4-stroke	1-cylinder 2-cylinder
P: 3	4-stroke	3-cylinder
P: 4	2-stroke 4-stroke	2-cylinder 4-cylinder
P: 6	2-stroke 4-stroke	3-cylinder 6-cylinder
P: 8	4-stroke	8-cylinder
P: 10	4-stroke	10-cylinder
P: 12	4-stroke	12-cylinder

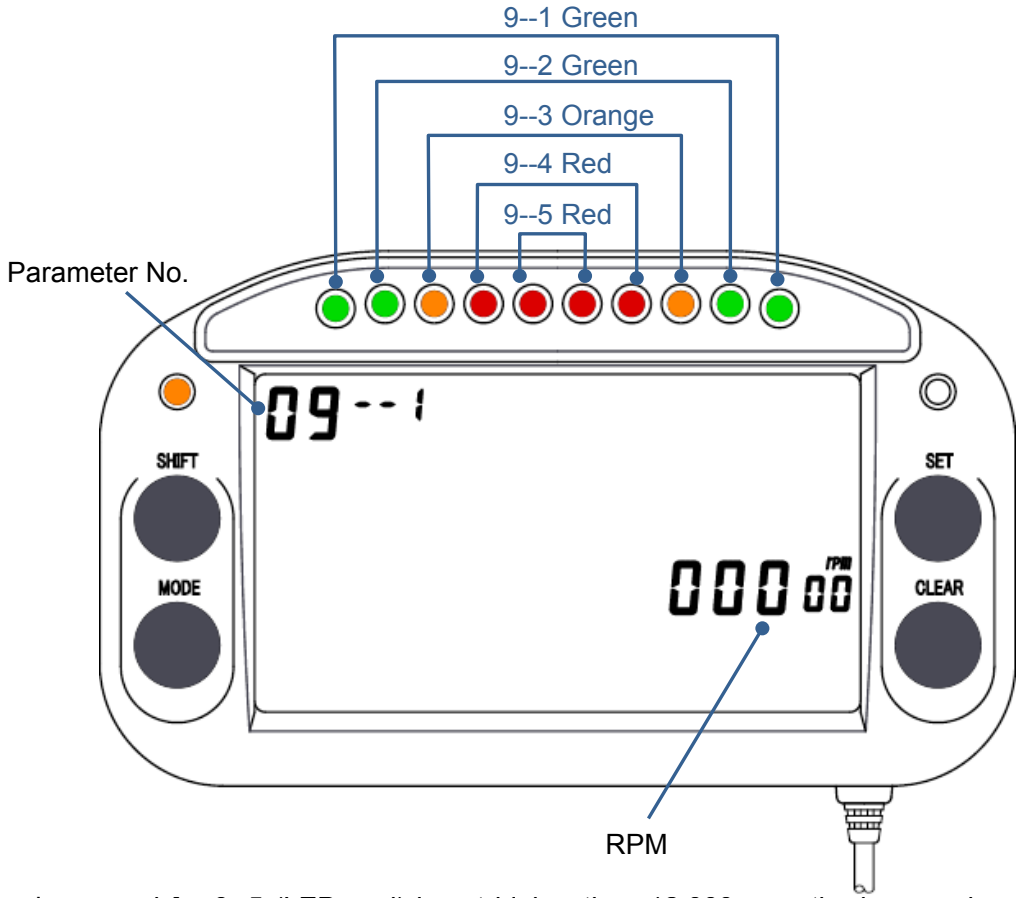


No. 9: Information lamp and bar-graph full scale

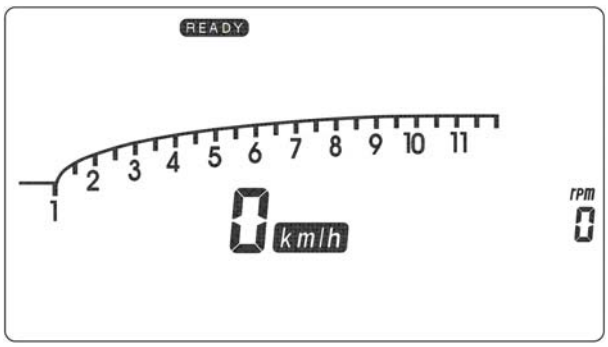
The RPM warning lamp setting can be set for each LED from 9－－1 to 5. When the RPM exceeds the set value, the corresponding LED illuminates.

* Press the CLEAR key and display parameter No. 9.

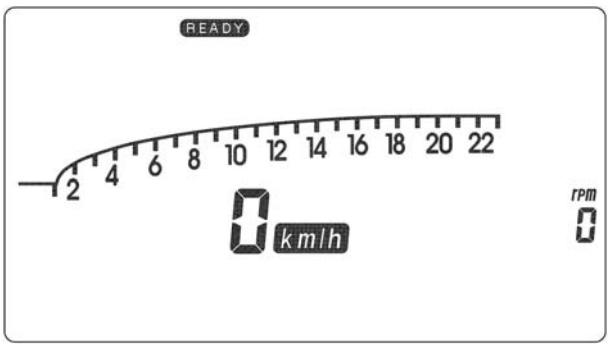
1. There is a flashing hyphen or number on the right side of the parameter No. Press the SET key and enter the LED number to set. For the numbers, refer to the figure below.
2. Press the SHIFT key and move the flashing part to the RPM display. Press the SET key and enter values.
3. Press the CLEAR key to move to the next parameter setting. To exit the setting, press and hold the CLEAR key for 3 seconds.



* If the engine speed for 9--5 (LED: red) is set higher than 12,000 rpm, the bar graph scale is automatically changed from 12,000 rpm display to 23,000 rpm display.



12,000 rpm scale



23,000rpm scale

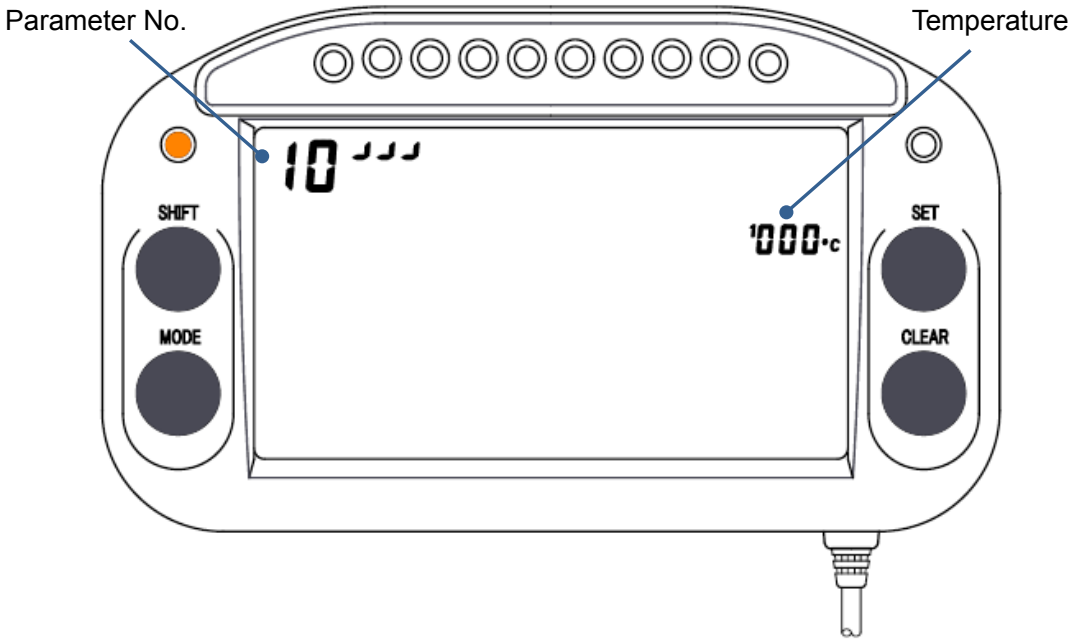
No. 10 (TEMP1) & 11 (TEMP2): Temperature Alarm

* Press the CLEAR key and display parameter No. 10/11.

10┘┘┘ TEMP1 upper limit alarm setting (Default value: 000; alarm disabled)

When the temperature exceeds the set value, ℃ flashes and the orange LED on the right side illuminates.

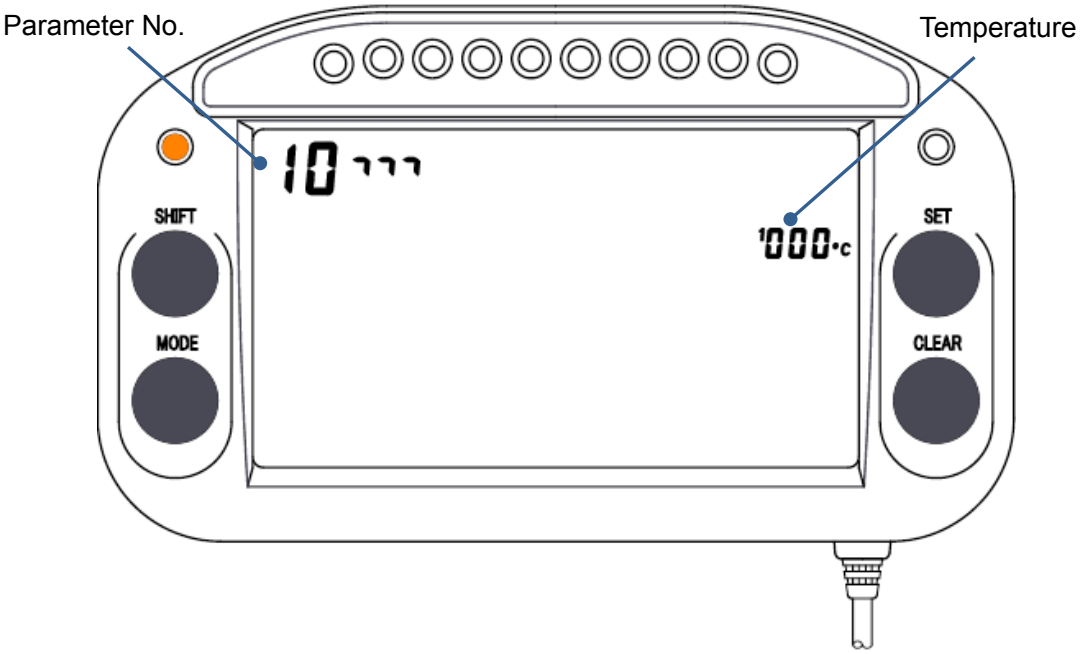
1. The ┘┘┘ (upper limit mark) or ┐┐┐ (lower limit mark) on the right side of the parameter No. flashes. Press the SET key and select ┘┘┘ (upper limit mark).
2. Press the SHIFT key and move the flashing part to the temperature display, then press the SET key and enter a number.
3. To set the TEMP 1 lower limit alarm, press the SHIFT key and move the flashing part to the right side of the parameter No.
4. Press the CLEAR key to move to the next parameter setting. To exit the setting, press and hold the CLEAR key for 3 seconds.



10ㄱㄱㄱ TEMP1 lower limit alarm setting (Default value: 000; alarm disabled)

When the temperature drops below the set value, ℃ flashes and the orange LED on the left side illuminates.

1. The ㄴㄴㄴ (upper limit mark) or ㄱㄱㄱ (lower limit mark) on the right side of the parameter No. flashes. Press the SET key and select ㄱㄱㄱ (lower limit mark).
2. Press the SHIFT key and move the flashing part to the temperature display, then press the SET key and enter a number.
3. Press the CLEAR key to move to the next parameter setting. To exit the setting, press and hold the CLEAR key for 3 seconds.



In the same way, set the No. 11 (TEMP2) temperature upper limit and lower limit alarms.

No. 12 (Press1) & 13 (Press2): Pressure Alarm

* These settings are used for pressure measurement. This function cannot be used with S All & S Lite.

No. 14: Calibration for Steering movement

* These settings are used for measuring the steering angle. This function cannot be used with S All.

No. 15: Calibration for Throttle position

* These settings are used for measuring the throttle position. This function cannot be used with S All.

No. 16: Gear position

* Press the CLEAR key and display parameter No. 16.

16－－－: No gear display

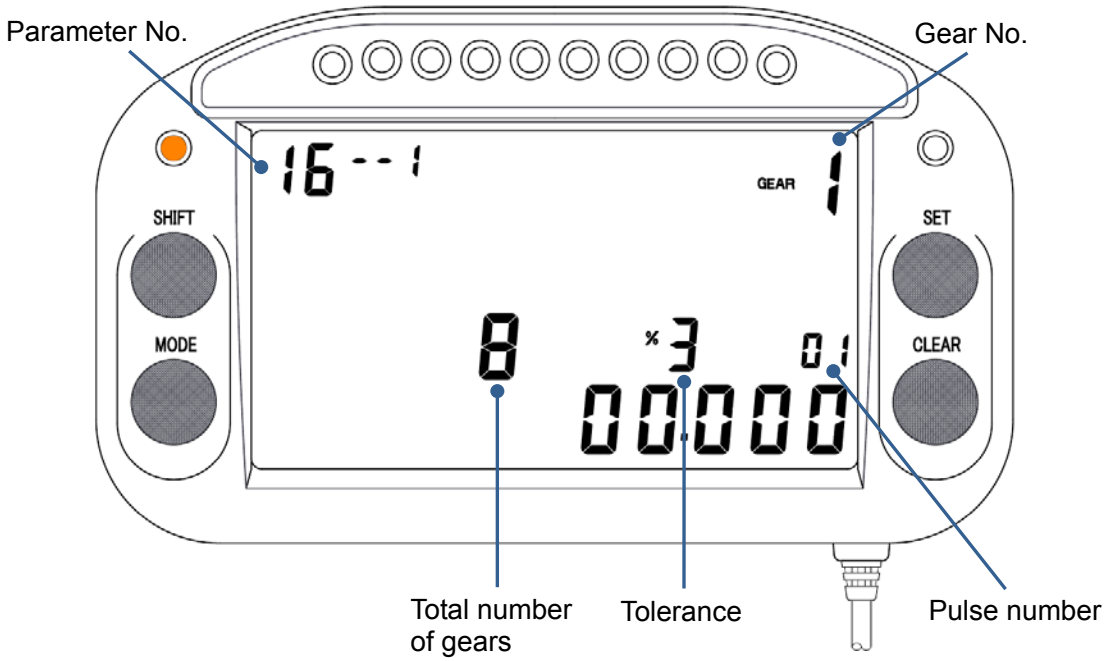
1. There is a flashing hyphen or number on the right side of the parameter No. Press the SET key and enter a hyphen.
2. Press the CLEAR key to move to the next parameter setting. To exit the setting, press and hold the CLEAR key for 3 seconds.

16－－1: Calculate the gear ratios.

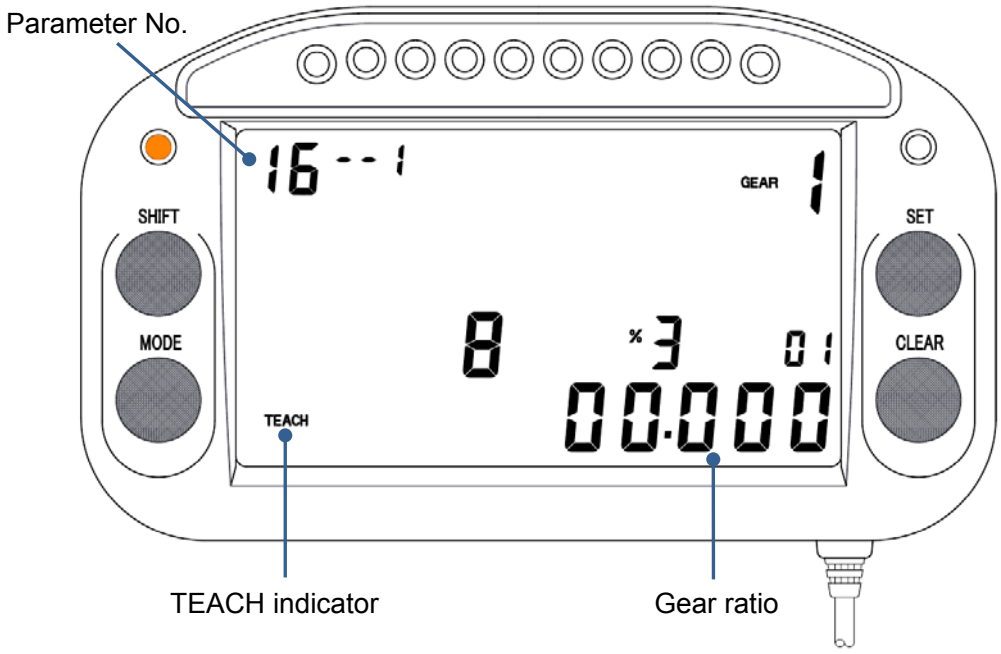
If no information is available concerning the gear ratio for the vehicle, this calculates the final reduction gear ratio for each gear No. during actual vehicle driving.

※ Take the speed signal from a drive-side wheel so that the display will be correct.

1. There is a flashing hyphen or number on the right side of parameter No. 16. Press the SET key and enter 1.
2. Press the SHIFT key and move the flashing part to the total number of gears display. Press the SET key and enter the total number of gears.
3. Press the SHIFT key and move the flashing part to the tolerance display. Press the SET key and enter value. * Begin from 3%.
4. Press the SHIFT key and move the flashing part to the pulse number display. Press the SET key and enter the pulse count.
5. Press the SHIFT key and move the flashing part to the gear No. display. Actually drive the vehicle. Press the SET key and enter "1" for the 1st gear No., then press and hold the SET key until the TEACH indicator turns on. The unit begins calculating. After some time, when the TEACH indicator turns off and a value appears in the gear ratio display, teaching is completed.



6. Repeat the procedure beginning from Step 4, and calculate and set the final gear ratio for each gear in the same way.



7. Press the CLEAR key to move to the next parameter setting. To exit the setting, press and hold the CLEAR key for 3 seconds.

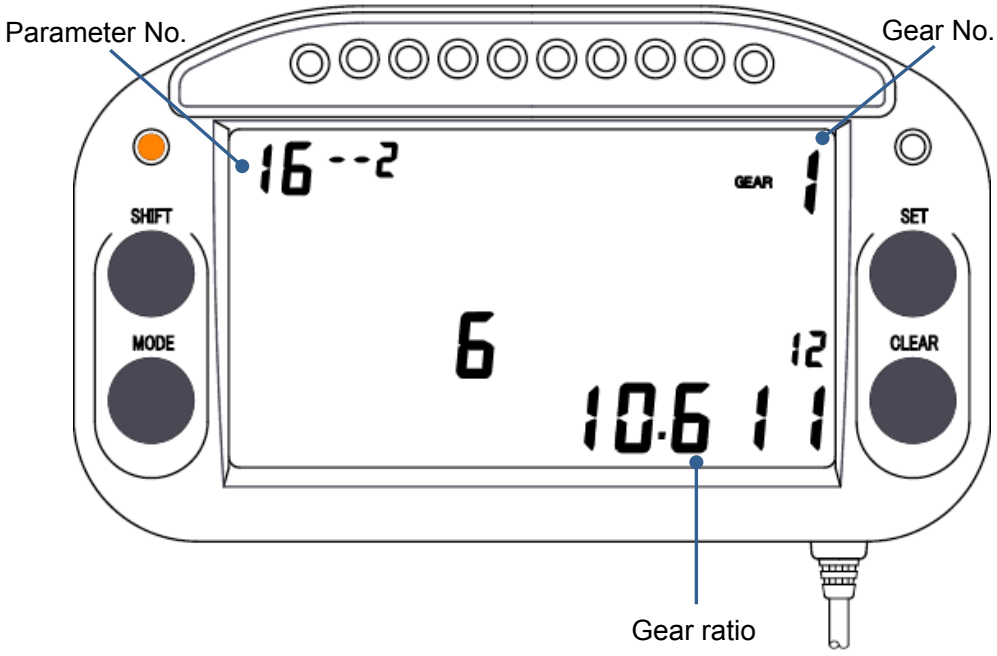
* If the gear ratios between gears are close to each other, variation in the gear display may occur. This may be corrected by reducing the allowable error value.

16－－2: Enter the gear ratios.

If accurate information is available concerning the primary reduction gear ratio, secondary reduction gear ratio, and gear ratio for each gear of the vehicle, directly enter the gear ratio for each gear No.

※ If the vehicle speed is acquired from any wheel other than a drive wheel, the correct gears will not be displayed.
※ The total number of gears and pulse count are set in 16--1.
※ The settings for 16--1 and 16--2 are linked and the parameter information is shared between them. If the gear ratio is changed in either setting, the change is applied to both.

1. There is a flashing hyphen or number on the right side of the parameter No. Press the SET key and enter 2.
2. Press the SHIFT key and move the flashing part to the gear ratio display. Calculate the 1st gear final reduction ratio from the primary reduction gear ratio, secondary reduction gear ratio, and gear ratio of each gear for the vehicle. Press the SET key and enter the number.
3. Press the SHIFT key and move the flashing part to the gear No. display. For 1st gear, press the SET key and enter "1" for the gear No.



No. 17: Logging interval setting

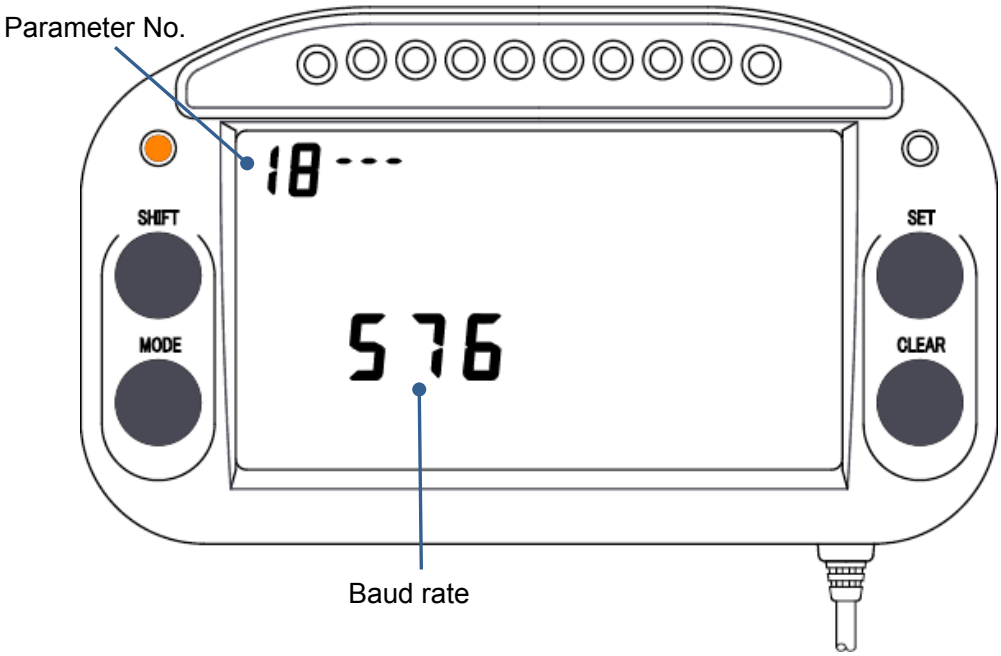
* This is the logging interval setting. This function cannot be used with the S All 10.

No. 18: Baud rate

When telemetry is operated using radio waves, a cellular phone, the internet, or other, set the communications speed here.

* Press the CLEAR key and display parameter No. 18.

1. The baud rate display flashes. Press the SET key and select the correct communications speed setting (96 (9600 bps) – 576 (57600 bps)) for the communications device used.
2. Press the CLEAR key to move to the next parameter setting. To exit the setting, press and hold the CLEAR key for 3 seconds.



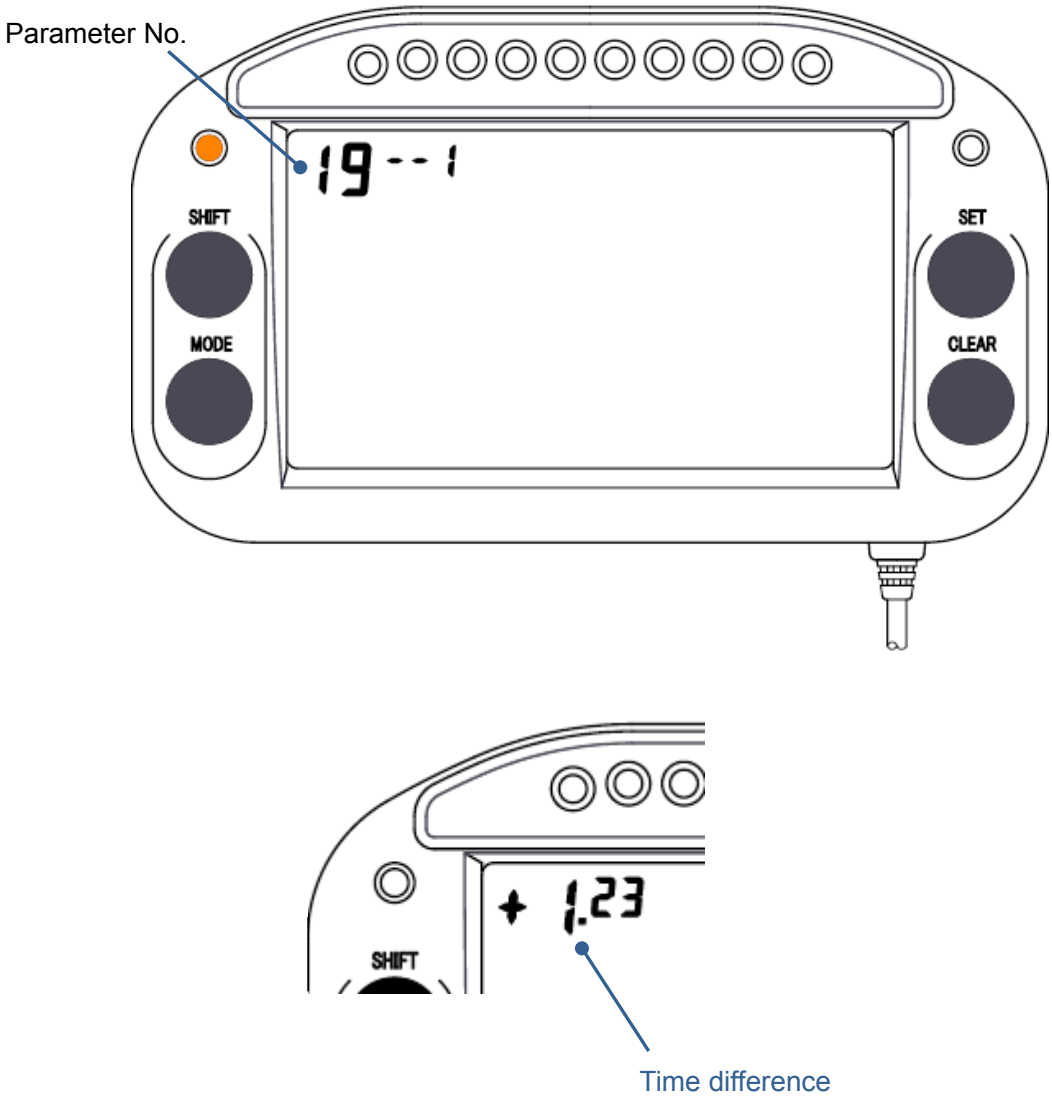
No. 19: (Time Split) Time difference with previous lap, best lap, and target lap

* Press the CLEAR key and display parameter No. 19.

19－－1: Comparison with previous lap

Set to compare the last lap with the lap before the last lap.

1. There is a flashing hyphen or number on the right side of the parameter No. Press the SET key and enter 1.
2. Press the CLEAR key to move to the next parameter setting. To exit the setting, press and hold the CLEAR key for 3 seconds.

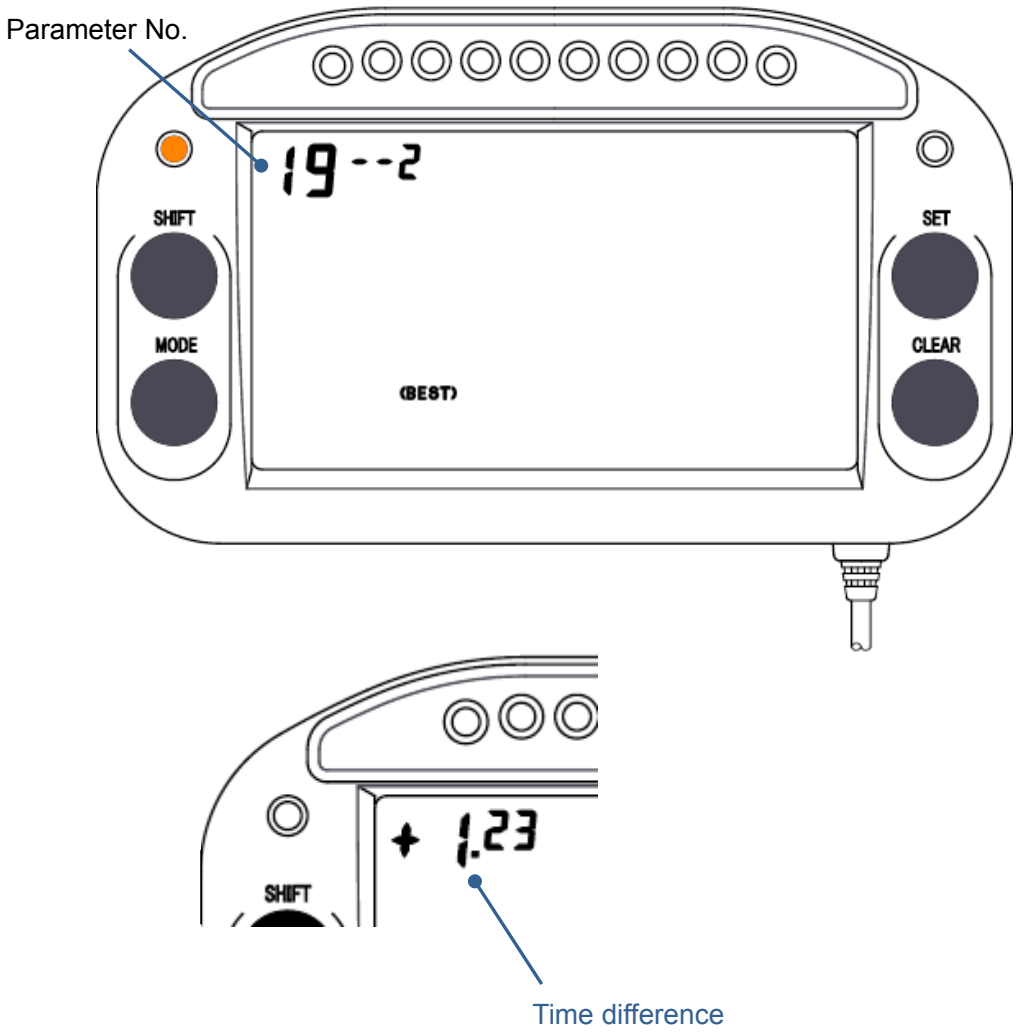


19－－2: Comparison with best time

Set to compare the last lap with the best lap.

1. Display the best lap time after the course is driven. A comparison with the displayed best lap time will be shown.
   ※ Even if the best time is updated during driving, the best time used as the standard for comparison is not updated.

2. Display parameter No. 19 on the parameter setting screen. There is a flashing hyphen or number on the right side of the parameter No. Press the SET key and enter 2. The “BEST” indication turns on.
3. Press the CLEAR key to move to the next parameter setting. To exit the setting, press and hold the CLEAR key for 3 seconds.

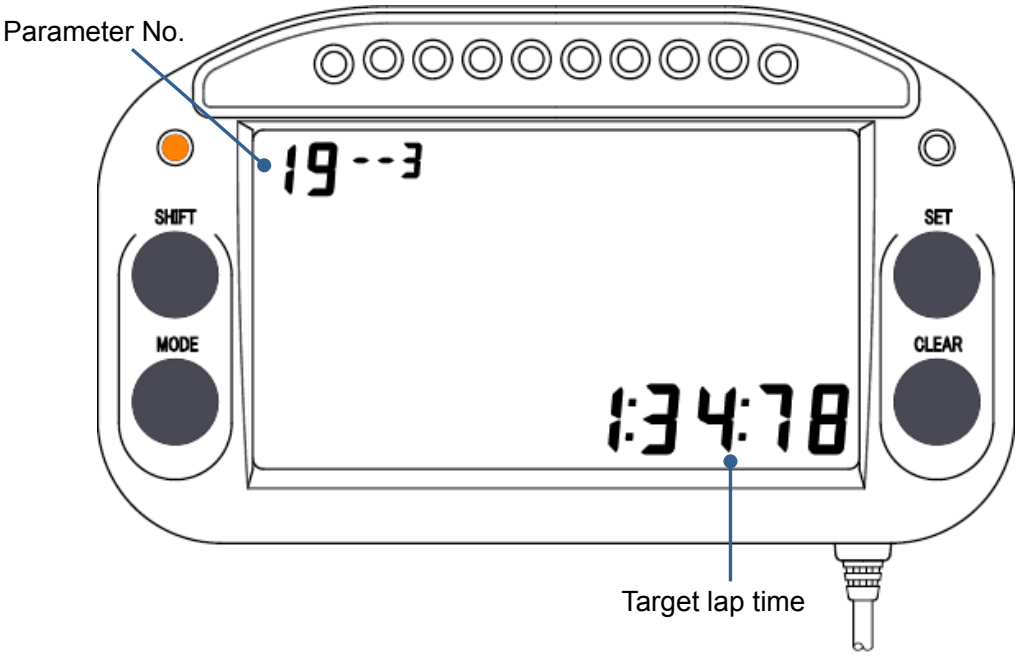


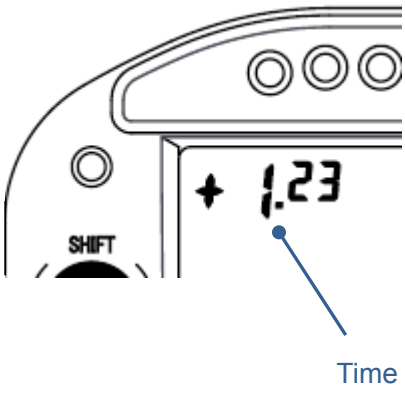
※ To prevent an invalid time being displayed as the best time, delete the invalid time information and display the correct best time.

19－－3: Comparison with target lap

Set to compare the last lap with the setting target lap time.

1. There is a flashing hyphen or number on the right side of the parameter No. Press the SET key and enter 3.
2. Press the SHIFT key and move the flashing part to the target lap time setting. Press the SET key and enter a number.
3. Press the CLEAR key to move to the next parameter setting. To exit the setting, press and hold the CLEAR key for 3 seconds.



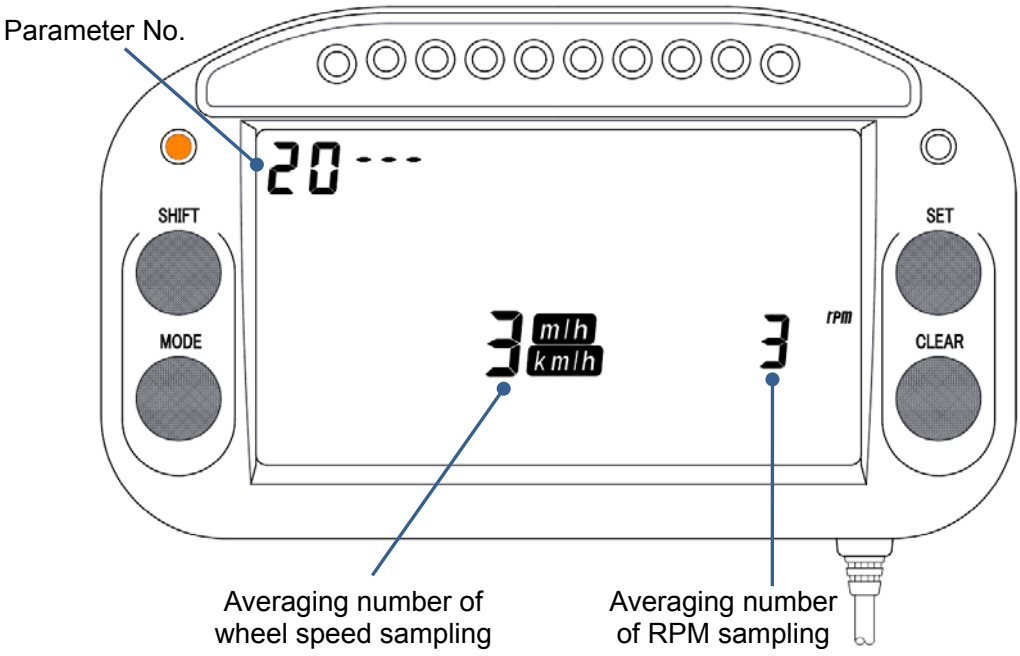


No. 20: Averaging number of speed and RPM data sampling

The sampling average number for wheel speed and RPM can be set. A smaller average number yields better responsiveness.

* Press the CLEAR key and display parameter No. 20.

1. The wheel speed sampling average number display flashes. Press the SET key and enter a number.
2. Press the SHIFT key and move the flashing part to the RMP sampling average number display. Press the SET key and enter a number.
3. Press the CLEAR key to move to the next parameter setting. To exit the setting, press and hold the CLEAR key for 3 seconds.



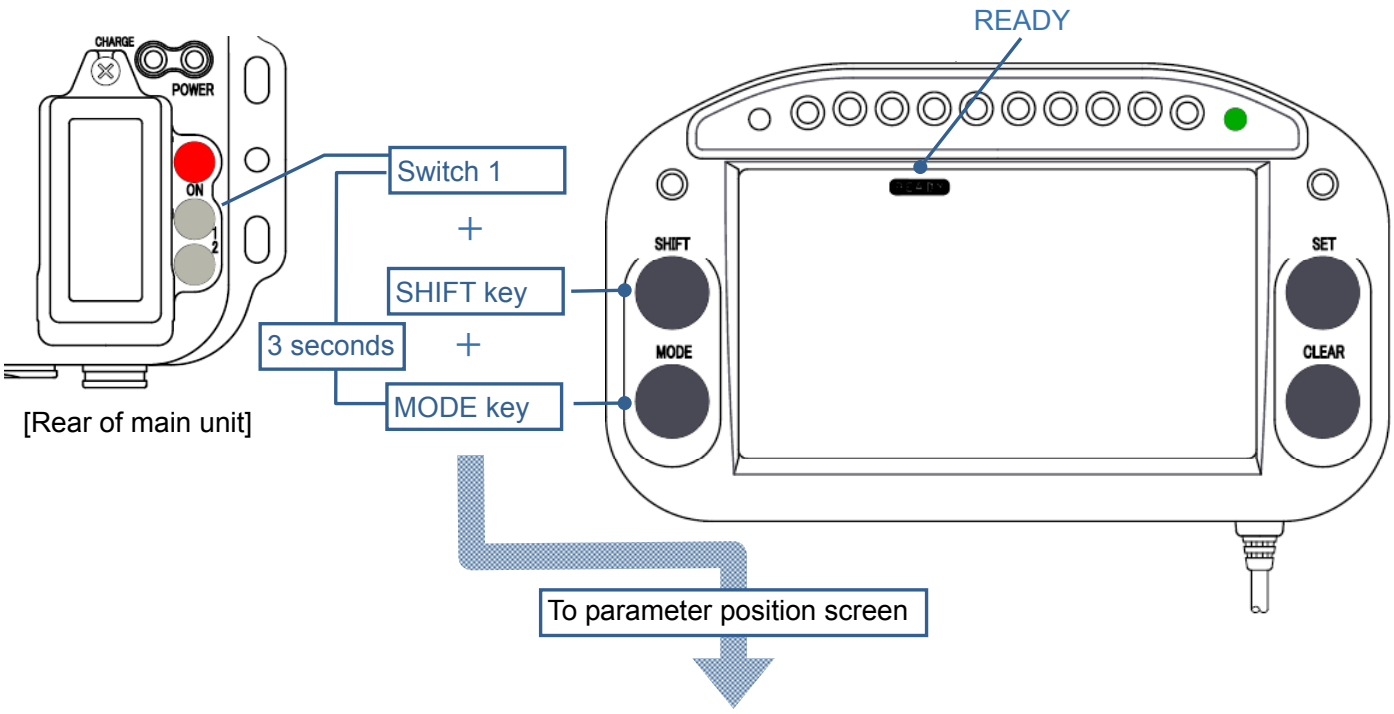
8) Saving and Transferring Parameter Settings

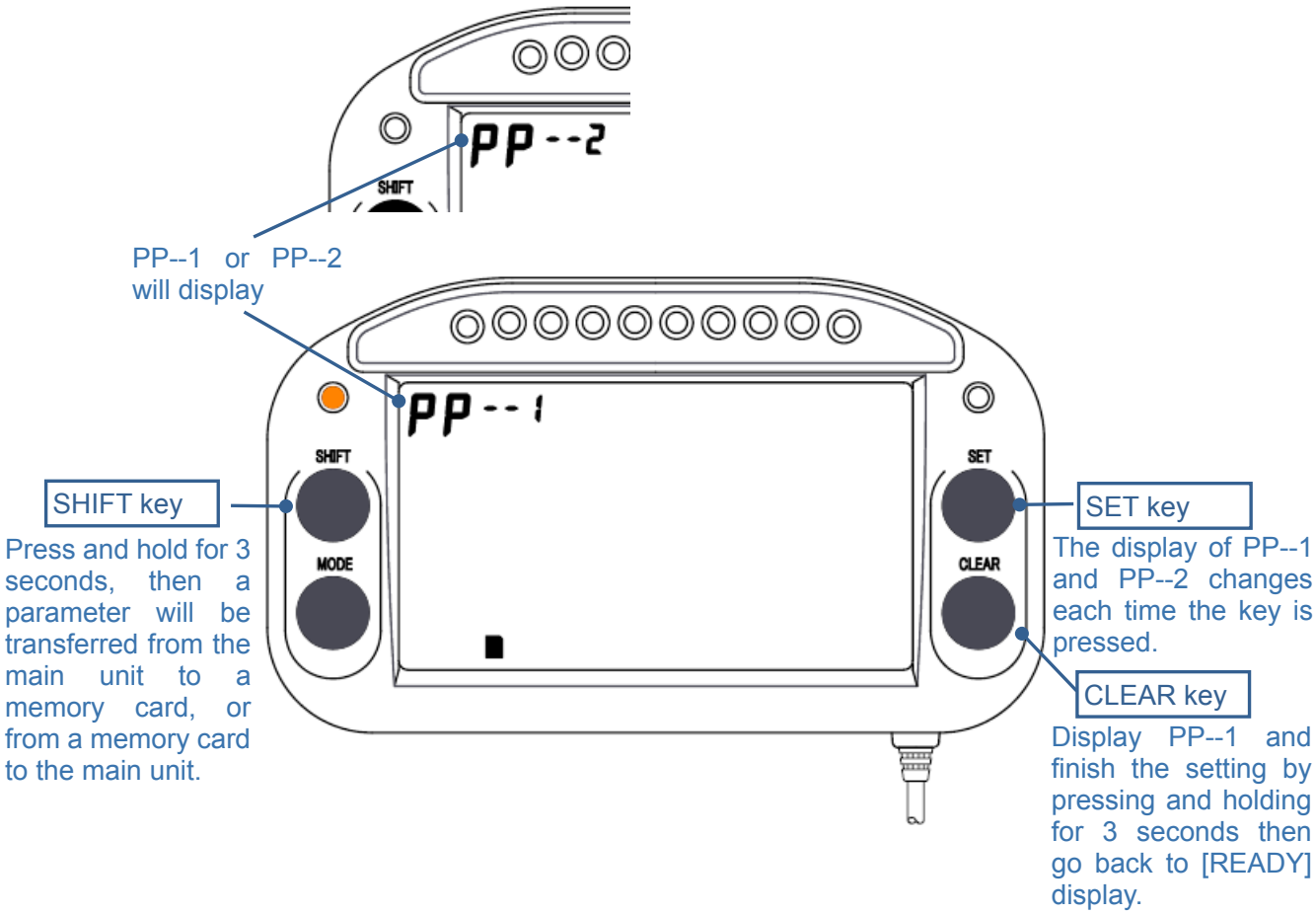
The main unit parameter settings can be saved to a memory card, and the parameter settings on a memory card can be transferred to the main unit.

※ The file name on the memory card is "PARA" and the extension is ".bin".
※ If the file name and extension are changed to anything other than "PARA.bin", the logger will be unable to recognize the file.
※ Do not format the memory card. A formatted memory card cannot be used.
※ If the setting was ended with “PP--2” by pressing the CLEAR key for 3 seconds, it is possible to operate the unit using the parameters saved on the memory card. However, ordinarily, end with “PP--1”, and operate using the parameters in the main unit memory “PP--1".

<Saving the parameters in the main unit to the memory card>

1. Verify that [READY] is displayed on the display screen. If [READY] is not displayed, press the CLEAR key to display it.
2. Insert the memory card into the main unit.
3. Press and hold switch 1, the SHIFT key, and the MODE key at the same time for 3 seconds. The screen changes to the parameter selection screen, and either PP--1 or PP--2 is displayed.
4. Press the SET key and display PP--1.
5. Press and hold the SHIFT key for 3 seconds. The display turns off for an instant, and the parameters in the main unit memory are saved onto the memory card.
6. Verify that PP--1 is displayed, then press and hold the CLEAR key for 3 seconds. The screen returns to the initial screen, and [READY] is displayed.





<Transferring the parameters on a memory card to the main unit>

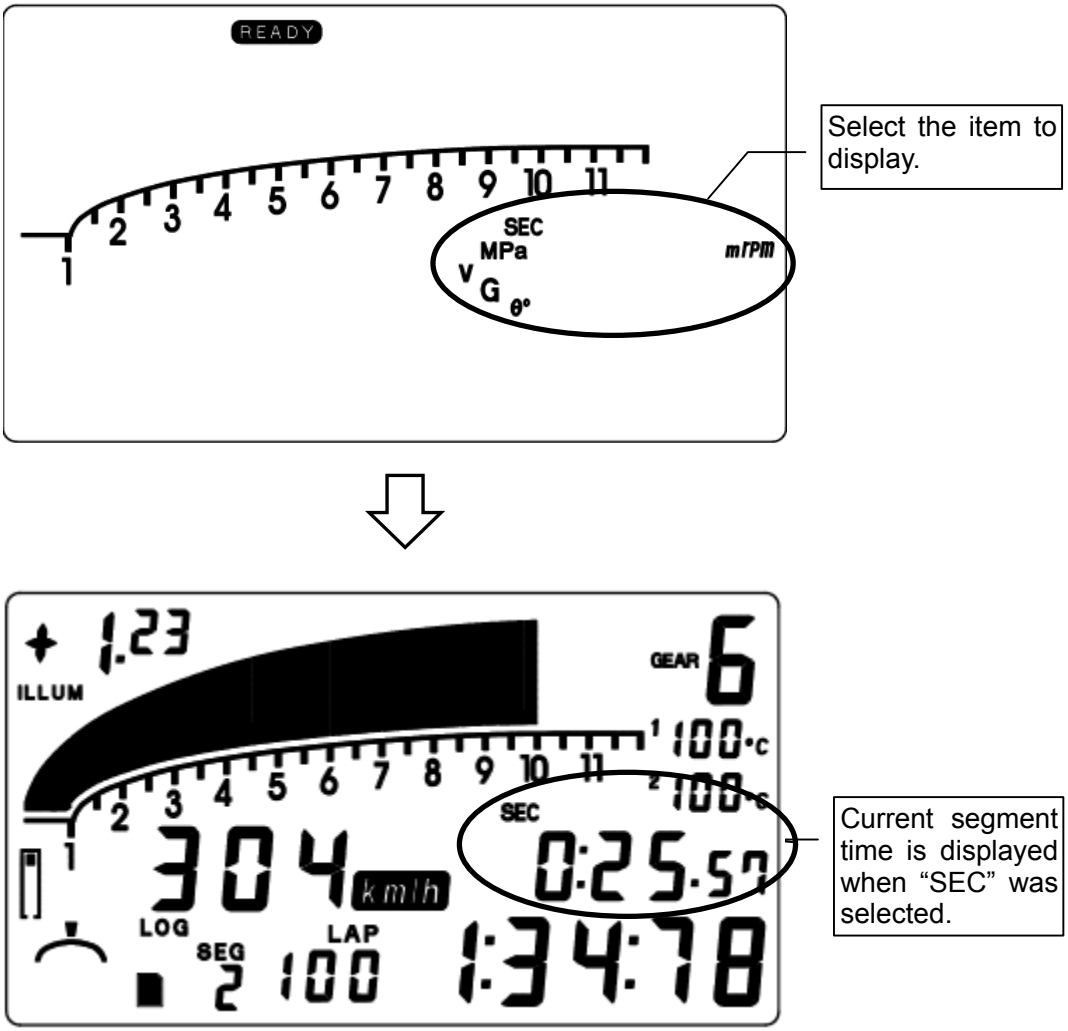
1. Verify that [READY] is displayed on the display screen. If [READY] is not displayed, press the CLEAR key to display it.
2. Insert the memory card into the main unit.
3. Press and hold switch 1, the SHIFT key, and the MODE key at the same time for 3 seconds. The screen changes to the parameter selection screen, and either PP--1 or PP--2 is displayed.
4. Press the SET key and display PP--2.
5. Press and hold the SHIFT key for 3 seconds. The display turns off for an instant, and the parameters on the memory card are transferred to the main unit memory.
6. Press the SET key and display PP--1.
7. Verify that PP--1 is displayed, then press and hold the CLEAR key for 3 seconds. The screen returns to the initial screen, and [READY] is displayed.

9) Selecting the Data Item to Display During Driving

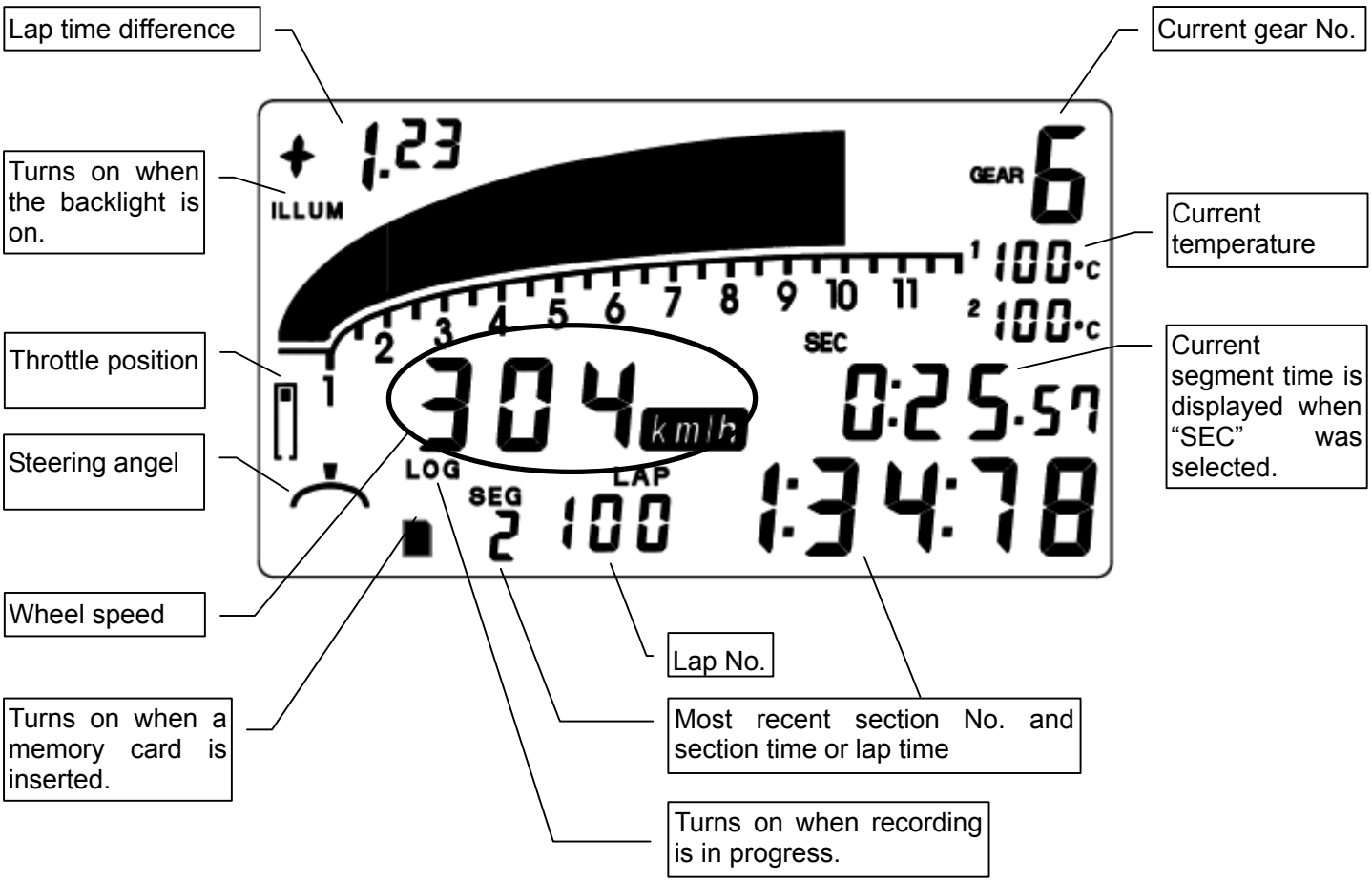
The data item for display during driving can be selected as shown below.

SEC	Current segment time
1Mpa:	Press1 pressure
2Mpa:	Press2 pressure
V	Alternately displays the battery pack and external battery voltages.
◀G▶	Lateral G value
▲ G ▼	Longitudinal G value
θ	Steering angle
m	Distance driven
rpm	Current RPM

Press the SET key. The currently selected item flashes. Press the SET key until the item you want to display is flashing. Press the CLEAR key or wait for a few seconds. Then the flashing stops and the item to display is determined.



10) Monitoring Data during Driving

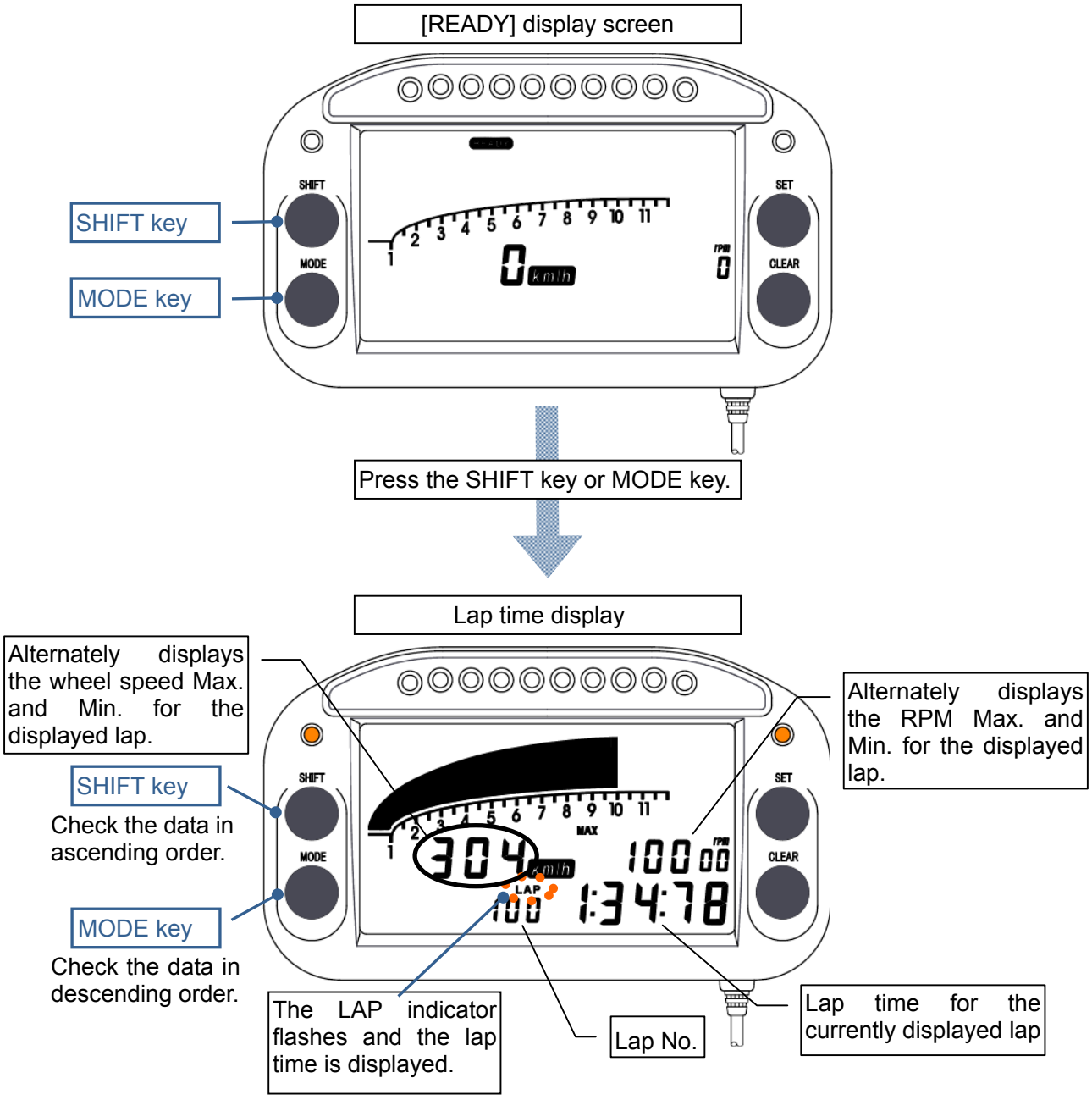


11) Reviewing Data from the Display

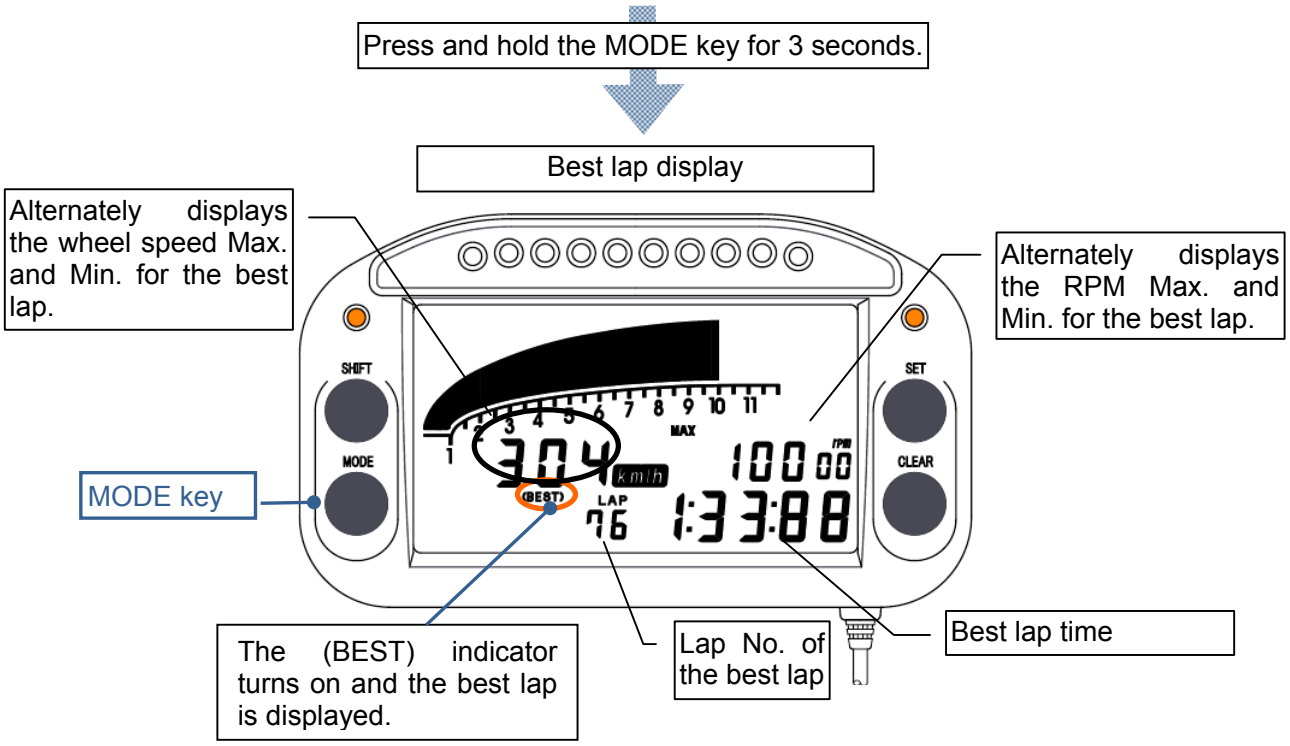
*The temperature is not displayed when the temperature sensor is not connected to the main unit.

① Lap time and best lap display

1.Confirm the [READY] is displayed. Press the MODE key or the SHIFT key. The LAP comment flashes and the lap time is displayed. Press the SHIFT key to display the lap times in ascending order and the MODE key to display them in descending order.

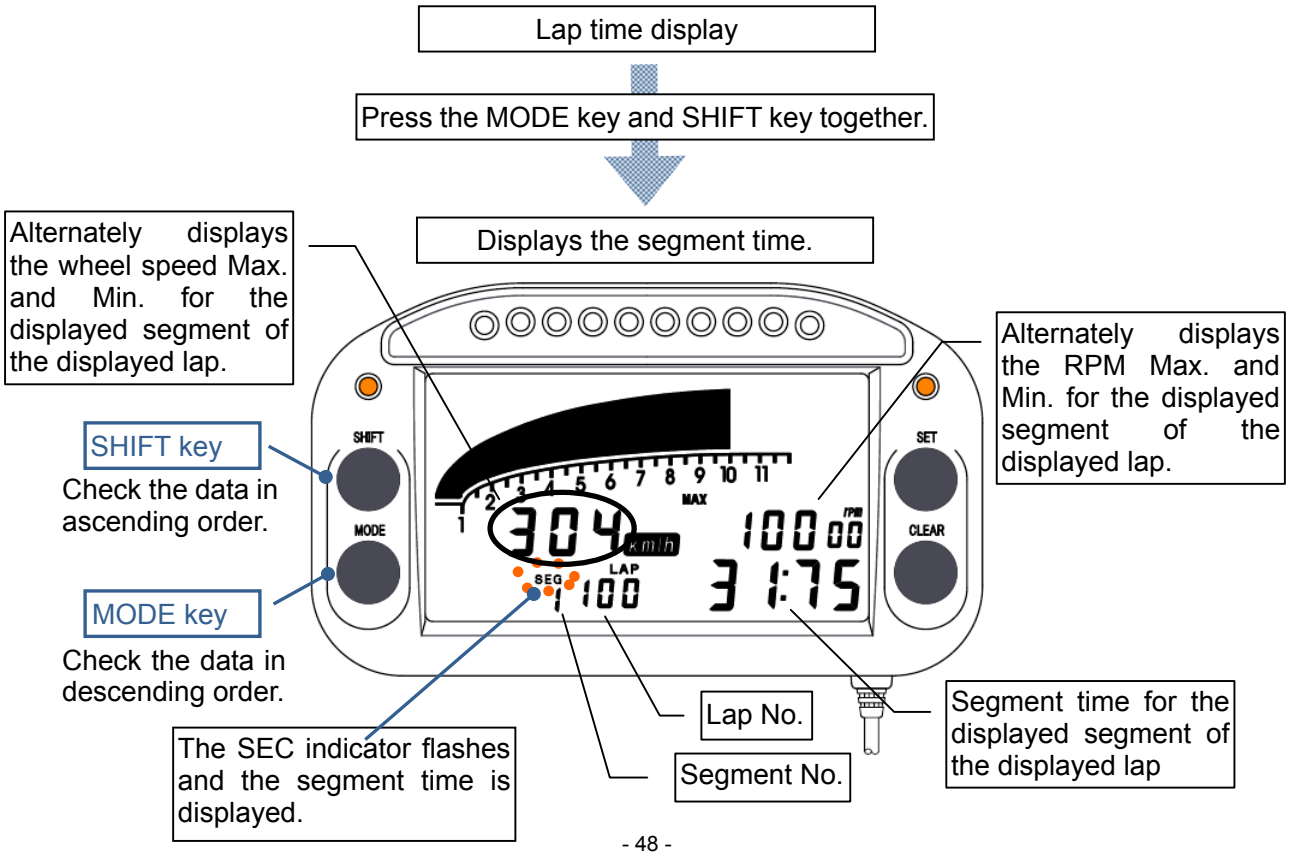


2. To display the best lap, press and hold the MODE key for 3 seconds. The (BEST) comment turns on and the best lap is displayed. Press the MODE key or SHIFT key to return to the lap time display in the procedure 1.

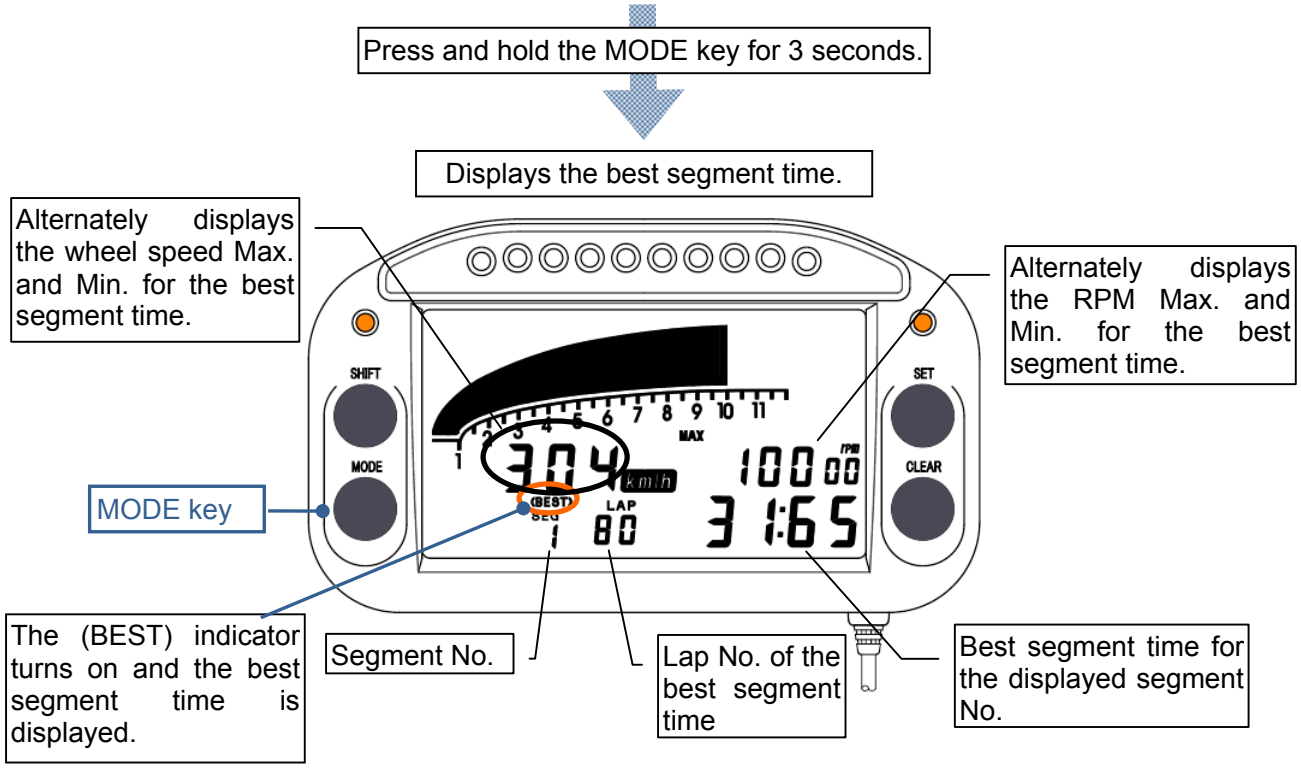


② Segment time and best segment time display

1. When the lap time is displayed, press the MODE key and SHIFT key at the same time. The SEG indicator flashes and the display changes to the segment time display. The segment times for each lap can be displayed in descending order by pressing the MODE key and in ascending order by pressing the SHIFT key.

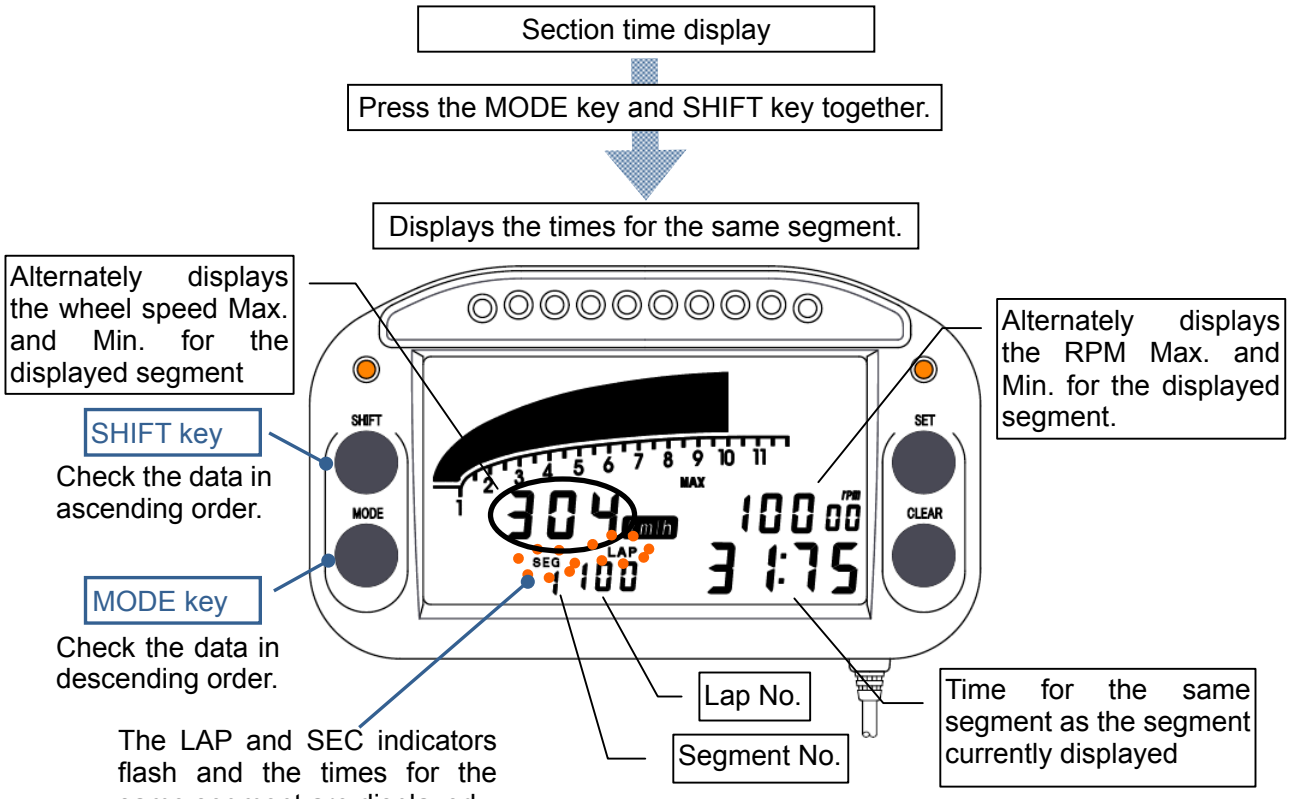


2. To display the best segment time among all laps for the section No. currently displayed, press and hold the MODE key for 3 seconds. The (BEST) indicator turns on and the best segment time is displayed.



③ Same segment times and best segment time display

1. When the section time is displayed, press the MODE key and SHIFT key at the same time. The LAP and SEG indicators flash and the display changes to the display of times for the same section. The section times from each lap for the currently displayed section only can be displayed in descending order by pressing the MODE key and in ascending order by pressing the SHIFT key.



2. In the same way as ②-2., to display the best section time among all laps for the section No. currently displayed, press and hold the MODE key for 3 seconds. The (BEST) indicator turns on and the best section time is displayed. Press the MODE key or SHIFT key to return to the lap time display. (Refer to the figure in ②-2.)

12) How to delete Driving Data

<Erasing the driving data for 1 lap>

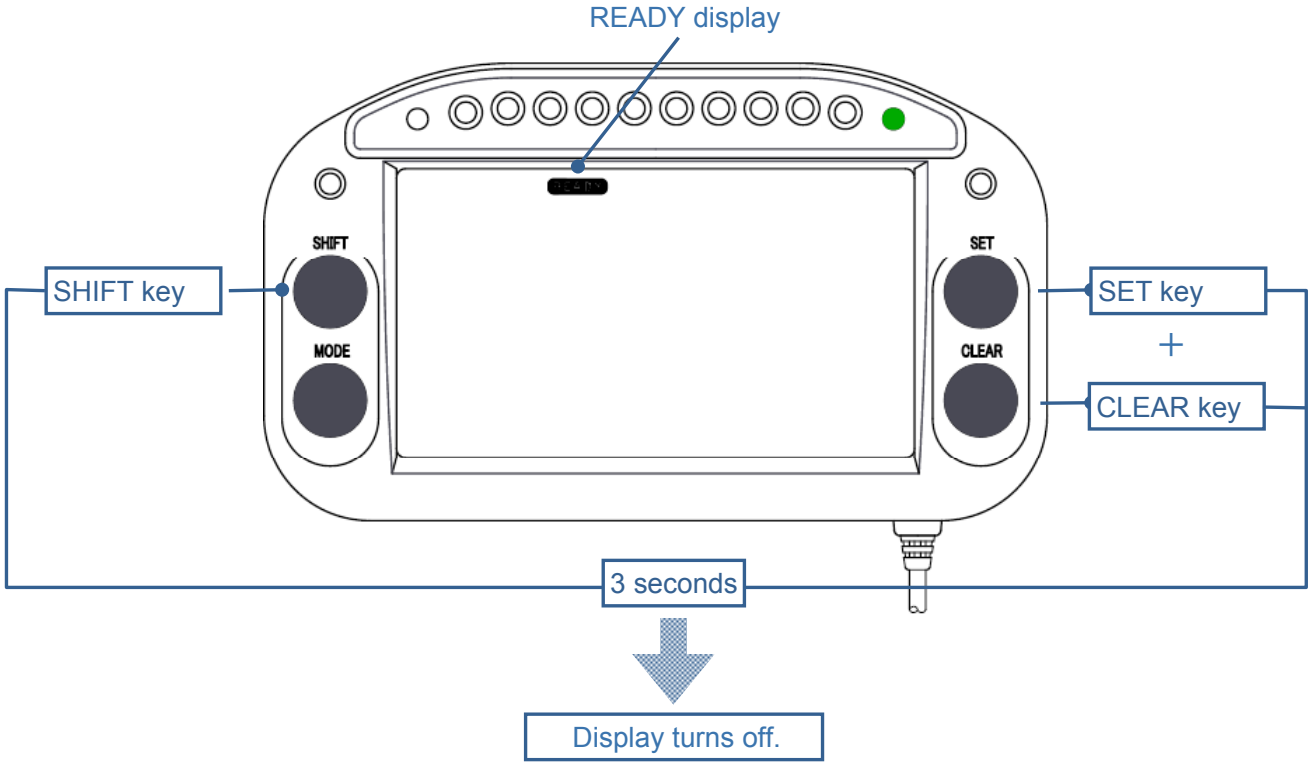
1. Verify that [READY] is displayed on the display screen.
2. Press the MODE key or SHIFT key and display the lap data to erase.
3. Press and hold the SET key and CLEAR key at the same time for 3 seconds. The lap time display changes to [0:00:00] and the data is invalidated.

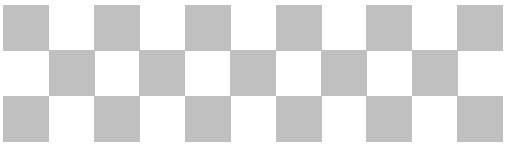
<Erasing all driving data>

1. Verify that [READY] is displayed on the display screen.
2. Press and hold the SET key and CLEAR key at the same time for 3 seconds. The display momentarily turns off and all lap data is erased.

13) How to Initialize the Parameter Settings

1. Verify that [READY] is displayed on the display screen. If it is not displayed, press the CLEAR key to display it.
2. Press and hold the SHIFT key, SET key, and CLEAR key at the same time for 3 seconds. Verify that the display momentarily turns off.





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