LAPCOM

VX-2000

USER'S GUIDE



PERCUL

FOREWORD

Thank you very much for purchasing LAPCOM and its related products.

LAPCOM VX-2000 is a system that effectively supports engine and chassis setup for racing machines. It provides all the desired data such as lap times, speed, engine RPM, G-force, steering, throttle, temperature, pressure, voltage, and course mapping. Most of this data can be monitored on a display by the driver, and logged into the control unit for up to 90 minutes.
*Lite and Basic can log data for up to 20 minutes.

For users who do not have a PC, the stored data, graphs, and course map can be printed with the optional handy printer.

LAPCOM VX-2000 enables PC users to run simulations and analyze the data using our software, Lapcom Terminal and Lapcom Analysis for Windows 95/98/NT.
For more advanced requirements, LAPCOM VX-2000 Hyper Pro Plus is for using the telemetry system with a cellular phone, data transceiver or portable satellite phone (based on the Hayes AT command).

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.

Other Icons

This indicates an action that is not recommended. The proscribed action is shown inside the icon or the icon is placed next to a diagram or sentence. The example at left says, "Do not disassemble".

This indicates a mandatory action. The mandatory action is shown inside the icon or the icon is placed next to a diagram or sentence. The example at left shows that a user must remove the plug from the power outlet.

This indicates an action that should be performed. The necessary action is shown inside the icon or the icon is placed next to a diagram or sentence.

Attention

1. Copying all or part of this manual without permission is strictly prohibited.
2. The contents of this manual may 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.

: Windows 95/98/NT are registered trademarks of Microsoft Corporation.
: Hayes is a registered trademark of Hayes Micro Computer Products Inc.

CONTENTS

CONTENTS

Read Before Use

Instructions for Use ····4

LAPCOM

Products at a Glance ····5
Parts and Installation ····7
LAPCOM Parts and Connectors ····7
Charging with the AC Adapter ····9
Installing the Display and Control Unit ····10
Installing the Optical Sensor ····11
Installing the Pulse Lead for RPM ····12
Installing the Wheel Speed Sensor ····13
Pressure Sensor (Optional) ····14
Temperature Sensor (Optional) ····14
Lambda Sensor Module (Optional) ····16
Displacement Sensors (Optional) ····17
How to Set Parameters ····18
Basic Operation ····18
1 . How to Set the Backlight ····19
2 . How to Enter the Speed Pulse Length ···20
3 . How to Set the Unit of Speed, kph or mph ···21
4 . How to Set the REV Position ····22
5 . How to Set the Shift Lamp ····23
6 . How to Set Red Line and Full Scale ····24
7 . Selection of the Pressure Sensor ····25
8 . How to Set the Alarm for a Pressure Drop ····26
9 . How to Set the Alarm for a Temperature Increase 1 ····27
10. How to Set the Alarm for a Temperature Increase 2 ····28
11. Selection of Vehicle ····29
12. How to Set the Air/Fuel Ratio ····30
13. How to Set the Data Transmission Rate and Baud Rate ····31
14. Selection of Print Form ····32
15. Transmitter Channel and Measurement Mode ····33
16. How to Set Lateral G ····34
17. How to Record the Measurement Pattern ····36
18. How to Set the Auto-off Timer ····38
19. Calibration of the Steering Movement ···39
20. Calibration of the Throttle Position ····39
How to Set the Calendar and Time ····40
Basic Use ····41
How to Measure Segment Data with Transmitters ····42
How to Measure Segment Data by Dividing the Course into Segments of Equal Distance ····44
How to Measure Segment Data by Dividing the Course between Straights and Corners ····46
How to Measure Data within a Distance of 0 to 400m ····49
How to Measure Data for Speeds from 0 to 100kph ····50
How to Confirm, Delete, and Reset Data ····51
How to Print Data ····53

Lapcom Terminal

Installing Lapcom Terminal ····55
Installing for Windows 98 ····55
Data Communication ····61
Connecting to a PC by Cable ····61
Connecting to a PC by Radio Modem ····65
Connecting to a PC by a Mobile Communication Adapter/Modem such as a Cellular Phone ····69
Data Analysis and Simulation ····73
How to Download the Data ····73
How to Analyze the Data ····75
Editing and Recording of Course Data ····78
How to Edit Course Data ····78
How to Record Course Data into LAPCOM ···81
Telemetry ····84

Transmitter

Products at a Glance ····87
Parts ····87
Charging with the AC Adapter ····88
Selection of the Transmitting Code ····88
Installing ····89

Printer

Products at a Glance ····90
Parts ····90
Operating Panel ····91
Connecting the AC Adapter ····92
Charging ····92
How to Set the Paper ····93
How to Set the Dip Switches ····94

Warning

- Do not disassemble or modify this device. Doing so could cause a fire, an electric shock, or damage to the device.
- Do not use this device on any vehicle that is NOT 12VDC with a negative earth. 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 is not waterproof. If it gets wet 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.
- When using this device with an external DC power supply, connect it to the 12VDC power of a negatively earthed vehicle.
- Do not switch on the power to this device in the presence of inflammable gas as this could cause a fire.
- Do not use this device where the use of such devices is prohibited such as inside airplanes or hospitals.

Caution

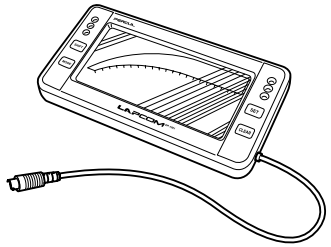
- Use only the AC adapter supplied
- Correctly insert the plug into the power outlet. Any metal that comes into contact with the AC adapter plug could cause a fire or an electric shock.
- Pull the AC adapter plug from the power outlet by the body. Pulling it out by the cord could cause a fire, an electric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

Alert

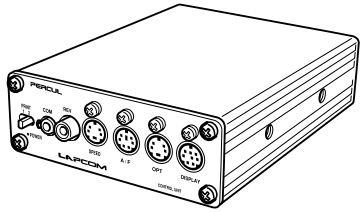
- During operation, any cables that come loose or any connections that become unstable through vibration could cause a malfunction of this device. Do not apply stress to any of the connector joints.
- Do not exceed the prescribed time limit when charging the internal battery.
- If the internal battery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

LAPCOM VX-2000 Standard System Components

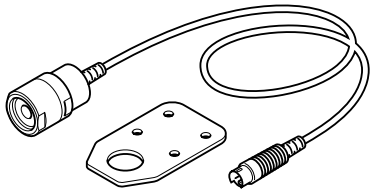
Display



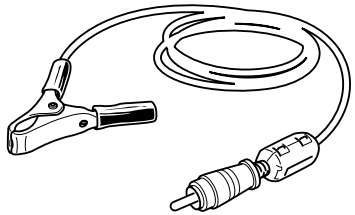
Control unit



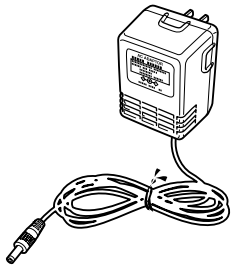
Optical sensor



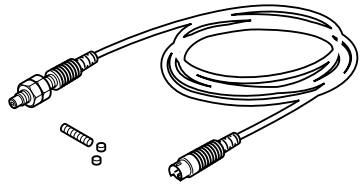
Pulse lead for RPM



AC adapter



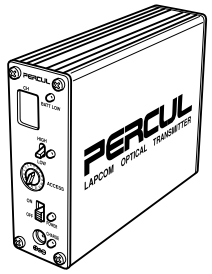
Wheel speed sensor unit



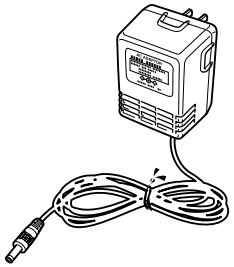
LAPCOM VX-2000's software, Lapcom Terminal for Windows 95/98/NT is not included with this unit. Please download it from Percul's home page at <http://www.percul.co.jp>.

Transmitter TX-100 Standard System Components

Transmitter



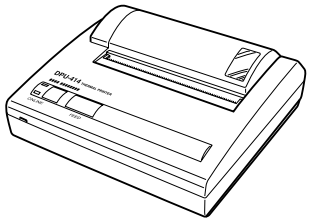
AC adapter



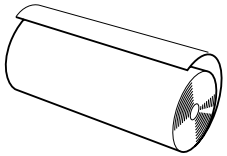
The color cards and hanger are optional.

Handy Printer DPU-414

Printer

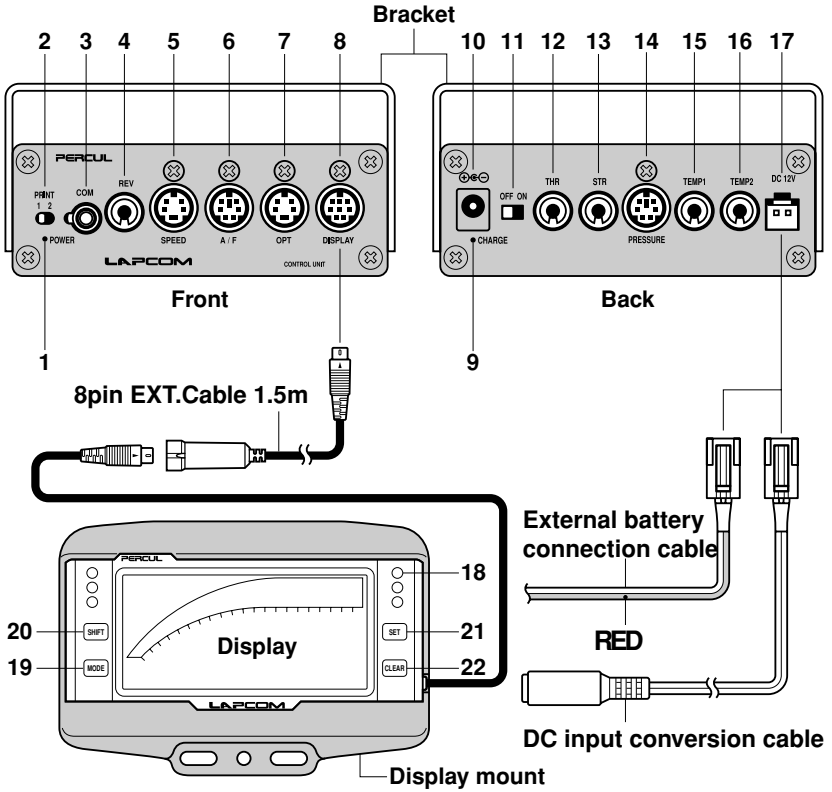


Thermal paper



The printer cable is optional (0581-02 Com port printer cable). The AC adapter is not included with this unit. It is possible to use the AC adapter included with the VX-2000 or TX-100 unit.

LAPCOM Parts and Connectors



1. **Power lamp**
   This lamp lights up when the device is on.

2. **Print switch**
   Use this switch to print the stored data with the optional handy printer.
   Position 1 is for printing graphic data and position 2 for numerical data.

3. **Com port**
   This port is for connecting to the serial port of a PC, data transferring modems/adapters, or the optional handy printer.

4. **REV jack**
   This jack is for connecting the pulse lead to measure engine RPM.

5. **Speed jack**
   This jack is for connecting the wheel speed sensor to measure wheel speed.

6. **A/F jack**
   This jack is for connecting the optional lambda sensor module to measure the air/fuel ratio.

7. **Optical sensor jack**
   This jack is for connecting the optical sensor to measure lap times.

8. **Display jack**
   This jack is for connecting the display.

9. **Quick Charging monitor lamp**
   This lamp lights up when quick charging the internal battery with the AC adapter.
   It does not light up during trickle charging.

10. **Charging jack**
    This jack is for connecting the AC adapter.

11. **Power switch**
    Use this switch to run LAPCOM with the internal battery.
    When running LAPCOM with an external power supply (12V±4V), the external power supply takes priority regardless of whether this switch is turned ON or OFF. If the external power supply is disconnected and the switch is ON, the power supply automatically switches to the internal battery to keep LAPCOM running. When running LAPCOM with an external power supply, it is recommended that the power switch be turned OFF.

12. **THR jack**
    This jack is for connecting the optional linear potentiometer to measure throttle position.

13. **STR jack**
    This jack is for connecting the optional rotary potentiometer to measure steering movement.

14. **Pressure jack (excluding Lite)**
    This jack is for connecting the optional pressure sensor to measure oil or fuel pressure.

15. **Temperature 1 jack**
    This jack is for connecting the temperature sensor to measure the temperature of various parts.

16. **Temperature 2 jack**
    This jack is for connecting the temperature sensor to measure the temperature of various parts.

17. **12VDC jack (excluding Lite)**
    For use with the optional external battery cable (red +, black -) when running LAPCOM from an in-vehicle battery, for backlighting the display at night races, or for directly running a lambda sensor. When connecting the external battery cable to an in-vehicle battery, remove the terminal from the in-vehicle battery to avoid a short circuit. If linking LAPCOM with the ON/OFF switch of the vehicle, connect the external battery cable to an accessory such as the cigarette lighter or audio equipment.

18. **Information Lamps**
    To help with gear change timing, four of these lamps (shift lamps) flash when the engine reaches the RPM set by the user. If the RPM reaches the red line, 6 lamps light up. The lamps also light up as alarms to indicate pressure drops and temperature increases.

19. **MODE key**
    Use this key to display the stored data after races or to change the parameter settings.

20. **SHIFT key**
    Use this key to display the stored data or together with the MODE key to change the display to the default-input screen.

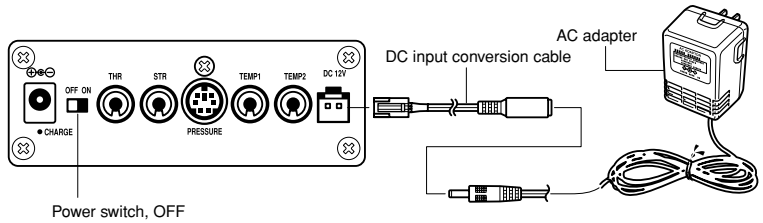
21. **SET key**
    Use this key to select values on the default-input screen or to set the potentiometer displacement.

22. **CLEAR key**
    Use this key to end each mode and to return to the initial display screen.

Charging with the AC Adapter (Lite does not have a 12VDC jack.)

1. Make sure that the power switch is turned OFF.

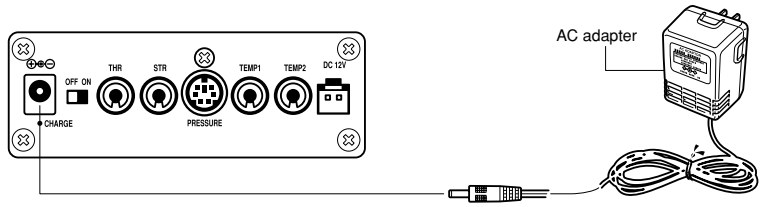
2. When running LAPCOM on a tabletop using the AC adapter, use the optional DC input conversion cable. One end connects to the AC adapter's DC plug and the other end to the 12VDC jack.



3. As soon as the AC adapter is plugged into the power outlet, the power of the control unit is on even if the power switch is turned OFF.

4. If charging the internal battery, insert the DC plug of the AC adapter into the charging jack of the control unit.

5. After plugging the AC adapter into the power outlet, quick charging finishes in about 2 hours, the monitor lamp goes out, and regular trickle charging starts. To fully charge the control unit continue trickle charging for about 10 hours.



Caution
Observe the following instructions to avoid deterioration of the internal battery.
Do not charge the control unit for longer than the recommended time.
Charge within the temperature range of 5 to 40°C.

A fully charged internal battery is capable of running LAPCOM continuously for up to 11 hours. (Lite and Basic can be run for a maximum of 4 hours)
When the battery is running low, a "V" starts flashing on the display and the power lamp will go out due to the auto power off function even though the power switch is still turned ON. When that occurs, turn the power switch OFF and start charging the battery. If the power switch is turned ON again before charging, auto power off will not function and the total discharge of the battery will cause the loss of all stored data in the control unit.

Charge the battery before first using this device or if it has not been used for some time. Quick charging may start after some trickle charging. This is not an error. If quick charging immediately followed by trickle charging occurs over and over even though the internal battery is not charged, activate the battery by turning the power switch ON to discharge it after a 15-hour trickle charge. Repeat this process 2 or 3 times.

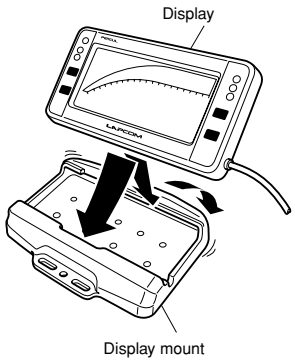
Installing the Display and Control Unit

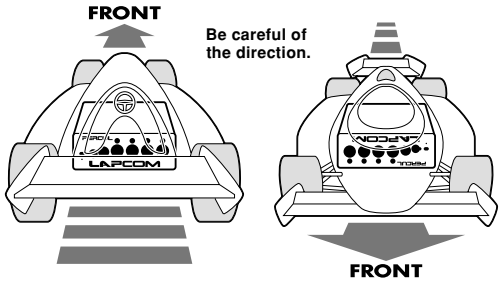
1. Place the display in the optional display mount.

2. Install the display mount on the steering wheel or the instrument panel.

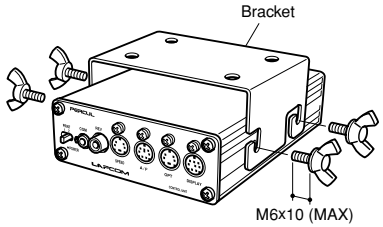
3. An optional bracket is required to install the control unit.

4. The control unit includes a sensor that detects lateral G (excluding Lite). Take note of the left and right orientation of the unit when installing it in vehicles. (For bikes, install the custom-made unit horizontally as well as taking note of the left and right orientation.)





5. Use the supplied bolts (M6 x 10) to install the control unit on the bracket. Using bolts longer than the ones supplied will damage the inside of the control unit.

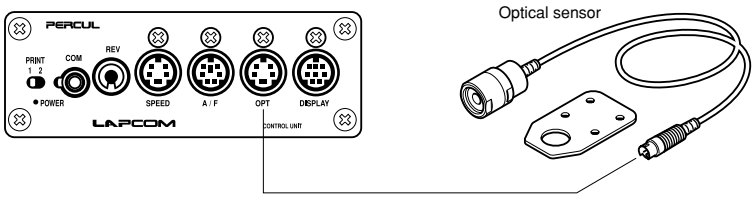


Attention
When it rains take measures to ensure the control unit does not get wet.

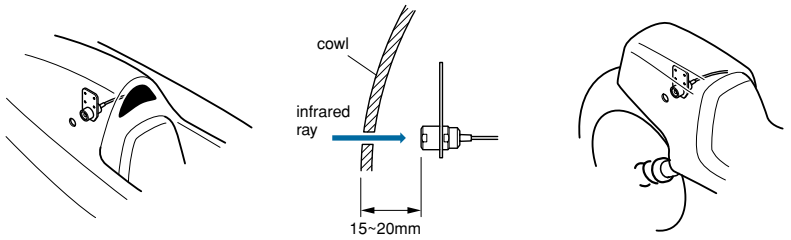
Installing the Optical Sensor

1. Install the optical sensor by drilling a 16ϕ sized hole in the desired place, such as on the body cowling, so that infrared rays from the transmitter strike the front of the optical sensor lens. If installing the sensor on a metallic part of the body such as the roll bar, avoid the effects of noise by insulating the sensor from the car body with the resinous plate supplied. Do not lay the cable close to a spark plug or ignition device, and do not bind the cable together with the pulse lead.

2. Insert the optical sensor connector into the optical sensor jack of the control unit.



Attention
Lap times will not be recorded if strong sunlight shines on the optical sensor, especially from the morning or setting sun.
If that is the case, move the transmitter to a spot where the optical sensor will not be affected by sunlight, or wind about 50mm of masking tape or dark paper around the outside of the sensor's screw to block the sunlight.
For touring cars, installing the sensor inside the car in the shade of the car roof is effective. For formula cars or bikes, drilling an 8 to 10ϕ sized hole in the cowl and installing the sensor about 15 to 20mm inside the surface of the cowl is recommended.



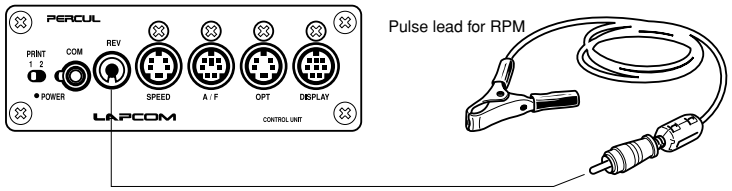
Regularly check the sensor's lens for oil or dust. Clean the lens with a cotton swab as needed.

Installing the 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. To measure the RPM of multi-cylinder engines, clip the lead to where RPM is 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.



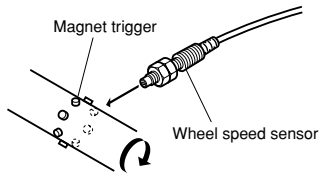
Attention
If the pulse lead cannot be clipped to vehicles in which the ignition coil or spark plug leads are not exposed, enter an ECU (Engine Control Unit) pulse signal in LAPCOM. If the signal voltage is 12V or under, make the connection with an optional RPM amp.
The RPM pulse lead has not been soldered to the clip to help dampen large engine ignition pulses that may enter the microcomputer of the control unit from the RPM pulse lead. If there is any damage that needs repair, ensure there is no electrical contact between the cable and clip.

Installing the Wheel Speed Sensor

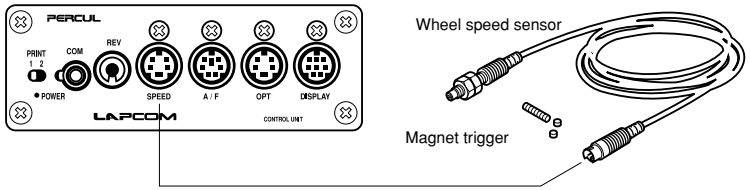
1. Arrange the supplied magnet triggers on the axle or wheel. Usually 4 to 10 magnets are used. The speed pulse length (outer circumference of tire / number of magnets) should be 100mm to 999mm. Determine the number of magnets to set the speed pulse length in this range.

2. Affix the magnets with tape.
Mounting the magnets on the sprocket or wheel by drilling holes may reduce their strength.

3. Install the wheel speed sensor so that the sensing surface is close to the magnets but not touching them. Any contact would cause damage to the sensor. The distance between the sensing surface and the magnets depends on the installation setup, but a gap of 5mm is recommended.



4. Insert the wheel speed sensor connector into the speed sensor jack of the control unit.

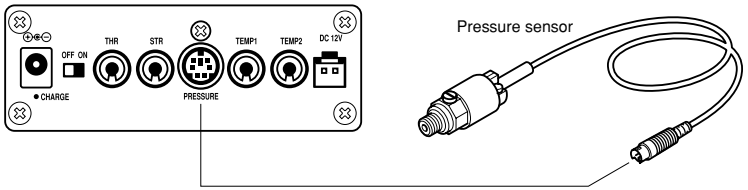


Attention
During installation, do not subject the upper resinous part of the sensor to any stress by pinching or wrenching it with a tool.

Pressure Sensor (Optional): Max 20kg/cm²
(Lite does not have a pressure sensor jack.)

1. The sensor screw has a standard size of 1/8 PT. Install the sensor at the desired place or on the line ensuring there is no loss of pressure.

2. Insert the pressure sensor connector into the pressure sensor jack of the control unit.

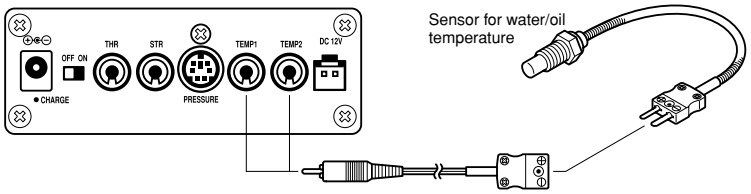


Temperature Sensor (Optional)

Sensor for water/oil temperature ranging from 0°C to 200°C

1. The sensor's screw has a standard size of 1/8 PT. Install the sensor at the desired place.

2. Insert the temperature sensor connector into the TMP 1 or TMP 2 jack of the control unit.

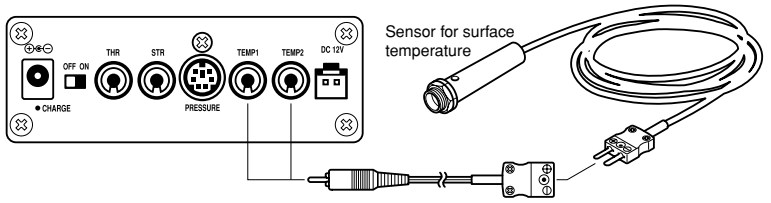


Non-contact sensor for surface temperature with a guarantee of accuracy from 20°C to 100°C

1. The non-contact sensor measures temperature based on the thermal energy radiated from a circular area whose diameter is half the distance from the surface of the object being measured to the sensor's lens. For example, if the distance from a tire's surface to the sensor's lens is 100mm, the sensor measures the thermal energy radiated from a circular area with a diameter of 50mm centered on the axis of the lens, and converts it to a temperature reading. Ensure that the circular area does not run off the surface of the object being measured.
Tires kick up stones and dust by centrifugal force when rotating at high speed. To prevent damage to the sensor or defective measurement, install the sensor at an oblique angle away from the direction of the centrifugal force.

2. If operating continuously for hours, direct the airflow through a hose and onto the lens surface. This prevents dust collecting on the lens.

3. Insert the temperature sensor connector into the TMP 1 or TMP 2 jack of the control unit.

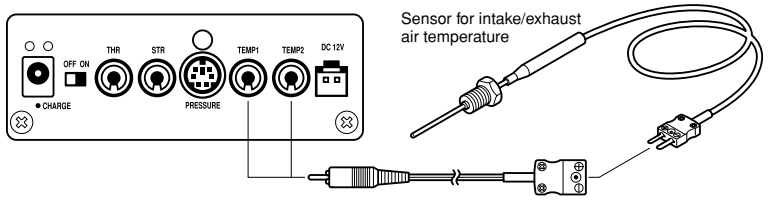


Sensor for intake/exhaust air temperature - 0°C to 1000°C

1. The sensor's screw has a standard size of 1/8 PT. Install the sensor so that the sensing head is seated in the flow of gas to be measured.

2. Insert the temperature sensor connector into the TMP 1 or TMP 2 jack of the control unit.

3. Set parameter number 9 or 10, "Alarm for a Temperature Increase". Please see page 27 or 28.



Attention
LAPCOM VX-2000 automatically switches between low temperature mode (0°C to 200°C) and high temperature mode (201°C to 1000°C) depending on the value set for "Alarm for a Temperature Increase". If the value set is 200°C or under, it operates in low temperature mode in which case temperatures higher than 200°C cannot be measured. Likewise, if the setting is 201°C or higher, it operates in high temperature mode and temperatures under 201°C cannot be measured.

Lambda Sensor Module (Optional)
(Lite does not support the Lambda Sensor module.)

1. The lambda sensor module cannot be run with LAPCOM's internal battery. Connect the control unit to the external power supply (12V-15V). Total electric current consumption while running the sensor is approximately 2A.

2. Avoiding any hot sections in the back of the engine exhaust port where temperatures can reach 800°C or more, weld a nut (M18mm, pitch 1.5mm) or an adapter to the exhaust pipe to install the sensor.

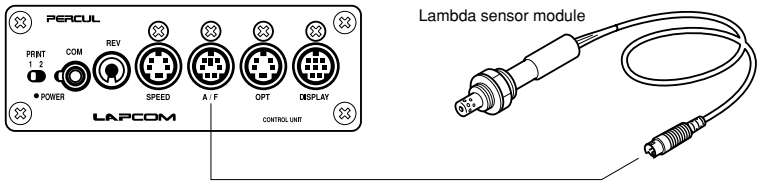
3. Fasten the sensor with a torque of 4.5kg - m

4. Insert the lambda sensor connector into the A/F jack of the control unit.

For a vehicle with an air/fuel ratio controller

1. If a vehicle has an air/fuel ratio controller (TC-6000D of NTK Co.), it is possible to use the controller by connecting the input terminal of an A/F cable (optional) to the output terminal of the controller that has been connected with ECU.

2. Insert the A/F cable connector into the A/F jack of the control unit.



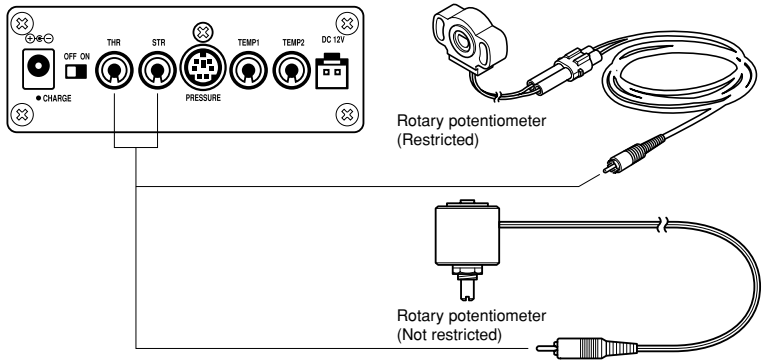
Displacement Sensors (Optional)

Rotary potentiometer for steering movement

1. The sensor has a mechanical rotation angle from 0° for installation to 360° and an electrical rotation angle from 20° to 340°. Although there is a mark near the center (180°) for electrical rotation, it is not necessary to note for installation whether the rotation is right-handed or left-handed. Using a speed reduction mechanism, the sensor is capable of determining whether the rotary direction is the same as or opposite to the steering rotary direction.

2. When installing, ensure that the rotation center of the sensor is in line with the center of the steering movement angle and adjust the right and left displacement angle of the steering within ±160° of electrical rotation.

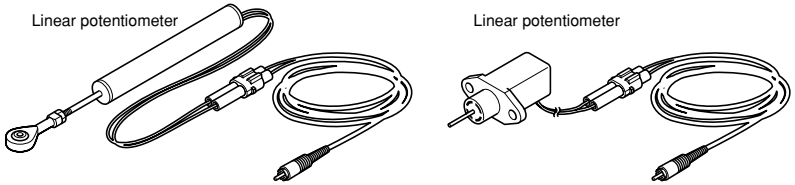
3. Insert the sensor cable connector into the STR jack.



Linear potentiometer for throttle position

1. The maximum and minimum points can be freely set within the sensor stroke. If they exceed the stroke, the sensor will be damaged. When installing, set the measuring object's mechanical displacement (such as the amount of movement of throttle wire) to within the stroke range, and allow some margin for the maximum and minimum points.

2. Insert the sensor cable connector into the THR jack.



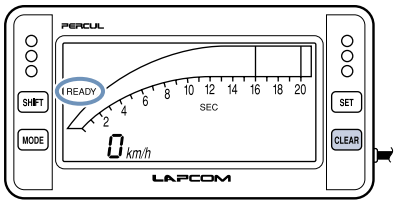
Attention
If using the linear potentiometer to measure steering movement, or the rotary potentiometer to measure throttle position or suspension displacement, read through each instruction handbook for proper use.

Basic Operation

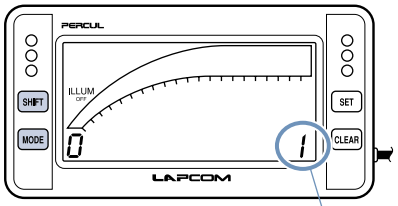
Putting the control unit into parameter input mode using the display keys.

1. Turn on the power to the control unit.

2. Confirm the display's initial screen. READY should appear. If not, press CLEAR to get the initial screen.



3. Press the Mode and SHIFT keys simultaneously for 3 seconds to display the parameter setting screen. The parameter number or calendar should appear on the lower right of the screen.



Parameter number

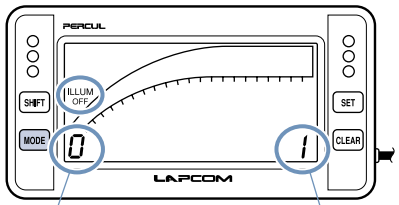
Note
If the optional handy printer is connected to the control unit the current parameter data list can be printed out by moving the print switch to position 2 for one second while the parameter setting screen is displayed.

```
          xxx LAPCOM xxx    ver. 2000
PARAMETER DATA LIST                    PM 02:40 99/10/07
1 Back Light   :   0  ( 0 = OFF   1 = DARK  2 = MIDLE  3 = BRIGHT )
2 Dia Data     : 244  mm/P
3 Kirometer Posi:  0  ( 0 = km/h    1 = m/h )
4 Tacho' Posi  :   6
            0 = P: 1    1 = P: 2    2 = P: 3
            3 = P: 4    4 = P: 5    5 = P: 6
            6 = P: 8    7 = P: 10   8 = P: 12
5 Shift Rev    : 8000  rpm
6 Over Rev     : 9000  rpm
7 Pressuer Scale:  0  ( 0 = 20    1 = 50    2 = 100  kgf/cm^2 )
8 Pressuer Alarm:  0  x 1/10 kgf/cm^2
9  Tmp 1 Alarm :  200  °C
10 Tmp 2 Alarm :  200  °C
11 Model       :   0  ( 0 = Car    1 = Bike   2 = Manual )
12 A/F Conveter : 100  ( 0 = %   100 =LAMBDA  Other  =  A/F )
13 Trans' Late :   S   ( S=0.1 M=0.2 L=0.5 sec    9600  bps )
14 Printer Posi :  0   ( 0 = FROM 1 ~ 6 )
15 LAP ch      :   5   ( - = non TX   H = 0-100km/h   L = 0-400m )
   SEG ch      :   -   ( - = non TX )
   Segment     :   -   ( - = G Forth conv^)
16 G Forth Conv^:  50  x 1/100 G
           Out:  50  x 1/100 G
   Minimum Length:  0  m
17 Open Lap    :   0  m
   High Speed  : 100  km/h or m/h
   Length      : 400  m
18 Auto Off Time: 1:00  sec
   Start Speed :   0  km/h or m/h
```


1. How to Set the Backlight (ILLUM) Default: OFF (Backlight is optional.)

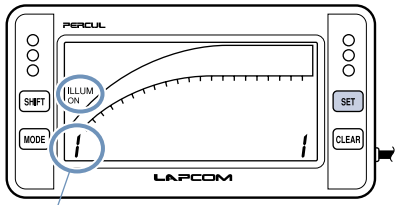
After "Basic Operation", confirm that the parameter setting screen is displayed. The parameter number should appear on the lower right of the screen. If not, return to "Basic Operation" to display the parameter setting screen.

1. Press MODE to display parameter number 1 on the lower right of the screen.



Backlight: OFF Parameter number 1

2. Press SET to select the brightness of the display's backlight: OFF (0), ON (1), ON (2), and ON (3).
Avoid setting the brightness in a well-lit area.



3. If setting other parameters, press MODE to display the desired parameter number.
When finished, press CLEAR.

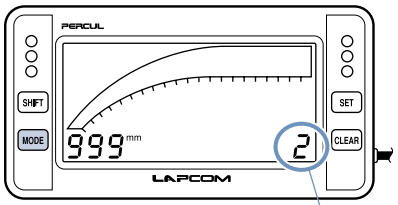
Brightness of Backlight
(Dark) 1→2→3 (Bright)

Note
The backlight is for running LAPCOM at night. Use of the external DC power supply (12V-15V) is recommended. Using the backlight continuously with the internal battery will drastically shorten its operating time.
If the display does not have the optional backlight, do not set the brightness to anything other than the default, OFF (0).

2. How to Enter the Speed Pulse Length Default: 999mm

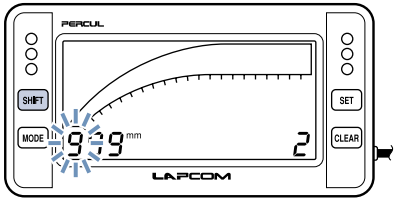
After "Basic Operation", confirm that the parameter setting screen is displayed. The parameter number should appear on the lower right of the screen. If not, return to "Basic Operation" to display the parameter setting screen.

1. Press MODE to display parameter number 2 on the lower right of the screen.

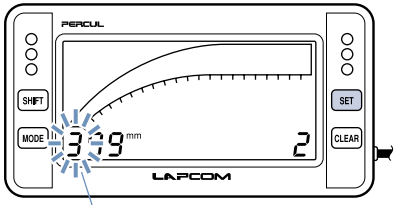


Parameter number 2

2. Press SHIFT until the numerical value to be changed starts to flash.



3. Press SET to select a value. Set the desired pulse length (mm) by repeating operations 2 and 3.



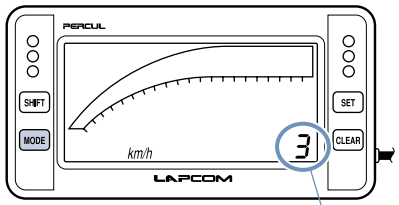
Select a value.

4. If setting other parameters, press MODE to display the desired parameter number.
When finished, press CLEAR.

3. How to Set the Unit of Speed, kph or mph Default: kph

After "Basic Operation", confirm that the parameter setting screen is displayed. The parameter number should appear on the lower right of the screen. If not, return to "Basic Operation" to display the parameter setting screen.

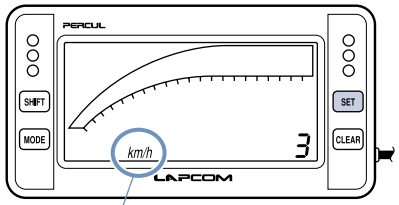
1. Press MODE to display parameter number 3 on the lower right of the screen.



Parameter number 3

2. Press SET to select the unit of speed: kph or mph.

3. If setting other parameters, press MODE to display the desired parameter number. When finished, press CLEAR.

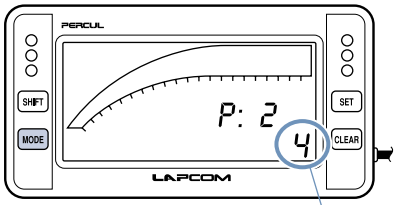


m/h
↑↓
km/h

4. How to Set the REV Position Default: P: 2

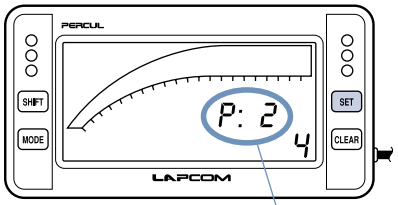
After "Basic Operation", confirm that the parameter setting screen is displayed. The parameter number should appear on the lower right of the screen. If not, return to "Basic Operation" to display the parameter setting screen.

1. Press MODE to display parameter number 4 on the lower right of the screen.



Parameter number 4

2. Press SET to select the desired REV position according to the table below.



Select the REV position.

3. If setting other parameters, press MODE to display the desired parameter number.
When finished, press CLEAR.

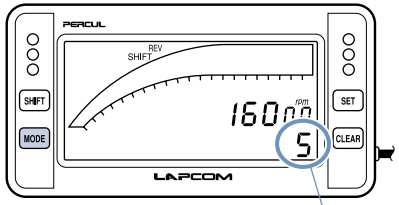
P : 1	4 strokes	1 sylinder
P : 2	2 strokes	1 sylinder
	4 strokes	2 sylinders
P : 3	4 strokes	3 sylinders
P : 4	2 strokes	2 sylinders
	4 strokes	4 sylinders
P : 6	2 strokes	3 sylinders
	4 strokes	6 sylinders
P : 8	4 strokes	8 sylinders
P : 10	4 strokes	10 sylinders
P : 12	4 strokes	12 sylinders

Note
The table may not accommodate certain vehicle types.

5. How to Set the Shift Lamp Default: 16000rpm

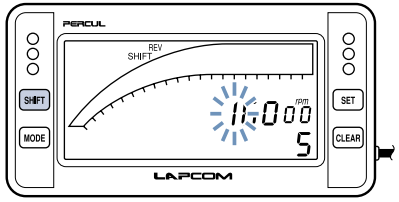
After "Basic Operation", confirm that the parameter setting screen is displayed. The parameter number should appear on the lower right of the screen. If not, return to "Basic Operation" to display the parameter setting screen.

1. Press MODE to display parameter number 5 on the lower right of the screen.

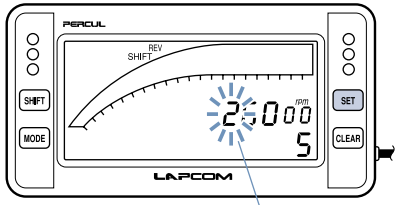


Parameter number 5

2. Press SHIFT until the numerical value to be changed starts to flash.



3. Press SET to select a value. Set the desired RPM, at which point the shift lamps flash to advise of gear change timing, by repeating operations 2 and 3.



Select a value.

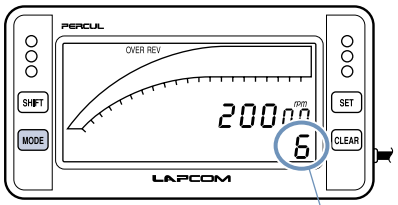
4. If setting other parameters, press MODE to display the desired parameter number.
When finished, press CLEAR.

Note
The RPM set for the shift lamps should be lower than the maximum value of the displayed graph.

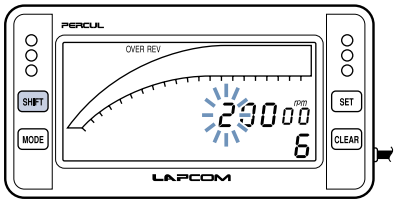
4. How to Set Red Line and Full Scale Default: 20000rpm

After "Basic Operation", confirm that the parameter setting screen is displayed. The parameter number should appear on the lower right of the screen. If not, return to "Basic Operation" to display the parameter setting screen.

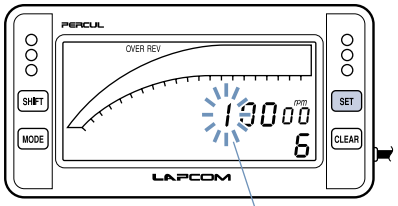
1. Press MODE to display parameter number 6 on the lower right of the screen.



2. Press SHIFT until the numerical value to be changed starts to flash.

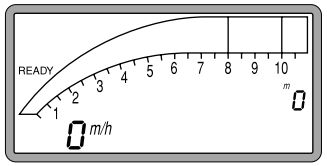


3. Press SET to select a value. Set the desired RPM, at which point the shift lamps light up, by repeating operations 2 and 3.

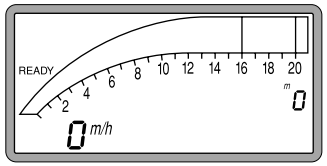


4. If setting other parameters, press MODE to display the desired parameter number.
When finished, press CLEAR.

Note
LAPCOM VX-2000 automatically changes the display's graph scale depending on the RPM set for the red line. Under 11000rpm, a graph from 0 to 11000rpm is displayed. For 11000rpm or over, a graph to 21000rpm is displayed.



Full scale: 11000rpm

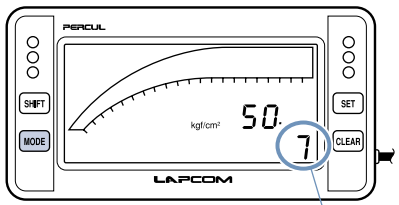


Full scale: 21000rpm

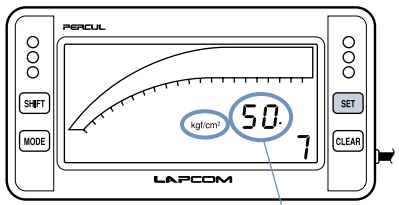
7. Selection of the Pressure Sensor Default: 20kgf/cm²

After "Basic Operation", confirm that the parameter setting screen is displayed. The parameter number should appear on the lower right of the screen. If not, return to "Basic Operation" to display the parameter setting screen.

1. Press MODE to display parameter number 7 on the lower right of the screen.



2. Press SET to select a value from 20kg f/cm², 50kgf/cm², and 100kgf/cm², that corresponds to the maximum rated value of the pressure sensor to be used.

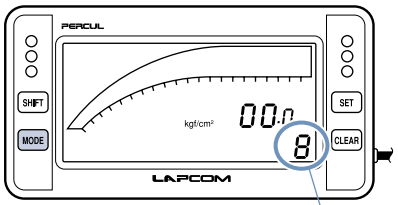


3. If setting other parameters, press MODE to display the desired parameter number.
When finished, press CLEAR.

8. How to Set the Alarm for a Pressure Drop Default: 00.0kgf/cm² (Lite does not have this function)

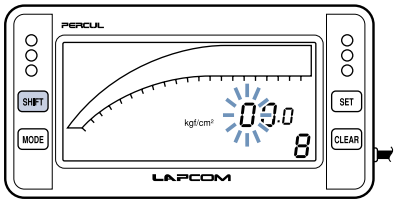
After "Basic Operation", confirm that the parameter setting screen is displayed. The parameter number should appear on the lower right of the screen. If not, return to "Basic Operation" to display the parameter setting screen.

1. Press MODE to display parameter number 8 on the lower right of the screen.

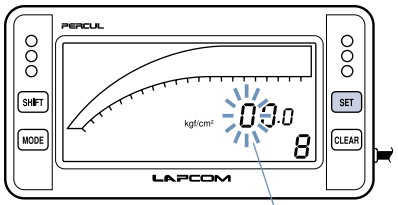


Parameter number 8

2. Press SHIFT until the numerical value to be changed starts to flash.



3. Press SET to select a value. Set the desired pressure for the alarm by repeating operations 2 and 3.
Set the value to 00.0kgf/cm² to turn the alarm function off.



Select a value.

4. The lamps light up if the pressure falls below the set value during engine rotation.
When the engine stops rotating, the alarm will stop.

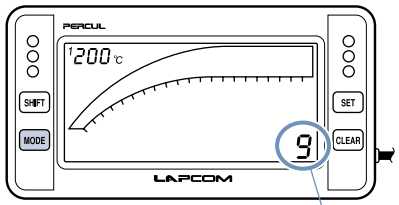
5. If setting other parameters, press MODE to display the desired parameter number.
When finished, press CLEAR.

Note
For Lite, do not set any value other than the default, 00.0kgf/cm².

9. How to Set the Alarm for a Temperature Increase 1 Default: 200°C

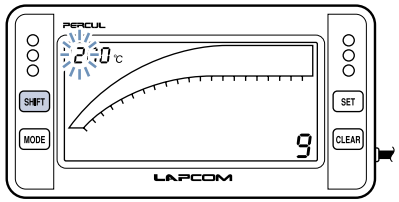
After "Basic Operation", confirm that the parameter setting screen is displayed. The parameter number should appear on the lower right of the screen. If not, return to "Basic Operation" to display the parameter setting screen.

1. Press MODE to display parameter number 9 on the lower right of the screen.

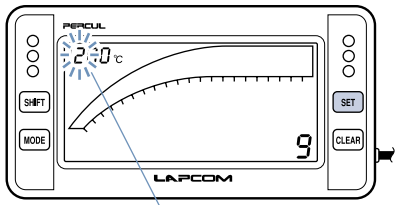


Parameter number 9

2. Press SHIFT until the numerical value to be changed starts to flash.



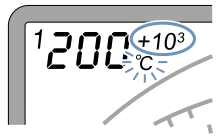
3. Press SET to select a value. Set the desired temperature for the alarm by repeating operations 2 and 3.



Select a value.

Note
If setting to 1000°C or higher, first select a value lower than 1000°C. Then, after pressing SHIFT to make "°C" flash, press SET to display "+10^3".

Set the value to 000°Cto turn the alarm function off.



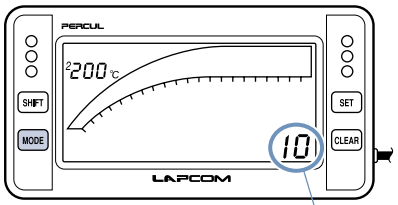
4. If setting other parameters, press MODE to display the desired parameter number.
When finished, press CLEAR.

Note
LAPCOM VX-2000 automatically switches the temperature measurement mode between low (0°C to 200°C) and high (201°C to 1000°C) depending on the value set for the alarm. For 200°C or under, it operates in low mode and cannot measure temperatures over 200°C. For 201°C and higher, it operates in high mode and cannot measure temperatures under 201°C.

10. How to Set the Alarm for a Temperature Increase 2 Default: 200°C

After "Basic Operation", confirm that the parameter setting screen is displayed. The parameter number should appear on the lower right of the screen. If not, return to "Basic Operation" to display the parameter setting screen.

1. Press MODE to display parameter number 10 on the lower right of the screen.



Parameter number 10

2. Press SHIFT until the numerical value to be changed starts to flash.
See "How to Set the Alarm for a Temperature Increase 1", number 2 on page 27.

3. Press SET to select a value. Set the desired temperature for the alarm by repeating operations 2 and 3.
See "How to Set the Alarm for a Temperature Increase 1", number 3 on page 27.

Note
If setting to 1000°C or higher, first select a value lower than 1000°C. Then, after pressing SHIFT to make "°C" flash, press SET to display "+10^3".
See (Note) after operation 3 of "How to Set the Alarm for a Temperature Increase 1" on page 27.

Set the value to 000°C to turn the alarm function off.

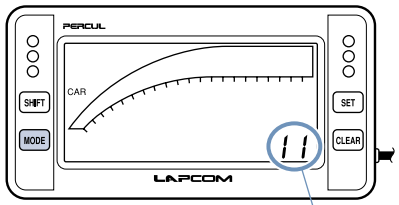
4. If setting other parameters, press MODE to display the desired parameter number.
When finished, press CLEAR.

Note
LAPCOM VX-2000 automatically switches the temperature measurement mode between low (0°C to 200°C) and high (201°C to 1000°C) depending on the value set for the alarm. For 200°Cor under, it operates in low mode and cannot measure temperatures over 200°C. For 201°C and higher, it operates in high mode and cannot measure temperatures under 201°C.

11. Selection of Vehicle Default: CAR (Lite does not have this function.)

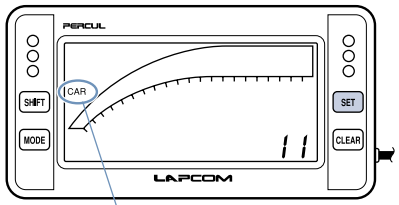
After "Basic Operation", confirm that the parameter setting screen is displayed. The parameter number should appear on the lower right of the screen. If not, return to "Basic Operation" to display the parameter setting screen.

1. Press MODE to display parameter number 11 on the lower right of the screen.



Parameter number 11

2. Press SET to select from CAR, BIKE, or N, to match the vehicle type to be loaded into LAPCOM.



CAR→BIKE→N

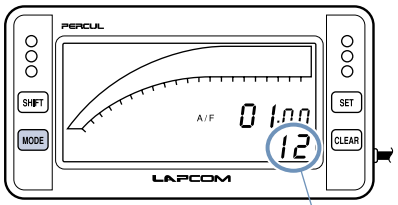
3. If setting other parameters, press MODE to display the desired parameter number.
When finished, press CLEAR.

Note
If using a four-wheeled vehicle, select CAR.
If using a two-wheeled vehicle with LAPCOM VX-2000 for bike, select BIKE.
If measuring data within a distance of 0m to 400m or for speeds from 0kph to 100kph, select N.

12. How to Set the Air/Fuel Ratio Default: 1.00

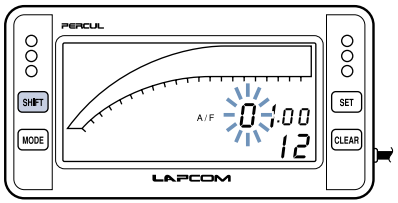
After "Basic Operation", confirm that the parameter setting screen is displayed. The parameter number should appear on the lower right of the screen. If not, return to "Basic Operation" to display the parameter setting screen.

1. Press MODE to display parameter number 12 on the lower right of the screen.

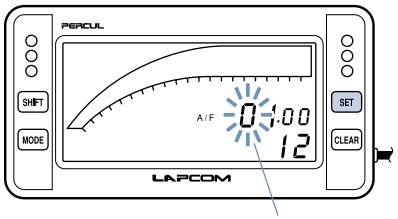


Parameter number 12

2. Press SHIFT until the numerical value to be changed starts to flash.



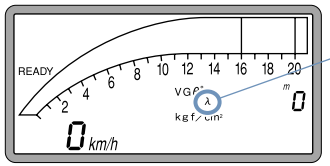
3. Press SET to select a value. Set the desired theoretical value of the air/fuel ratio by repeating operations 2 and 3.



Select a value.

4. If setting other parameters, press MODE to display the desired parameter number.
When finished, press CLEAR.

Note
In our tests, we used fuel with a theoretical value of 14.57 for the air/fuel ratio.
If setting the value to 1.00 (default), the air/fuel ratio is indicated by l.
If setting the value to 00.00, the air/fuel ratio is indicated as a concentration of oxygen in the exhaust gas as a %.



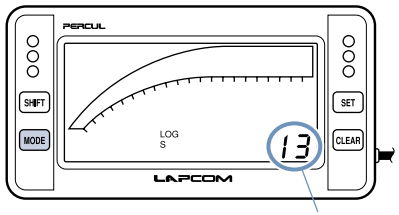
〈Indication with λ〉 VGθ° (λ) kgf/cm²

〈Indication with %〉 VGθ° (%) kgf/cm²

13. How to Set the Data Transmission Rate and Baud Rate Default: S/9600bps

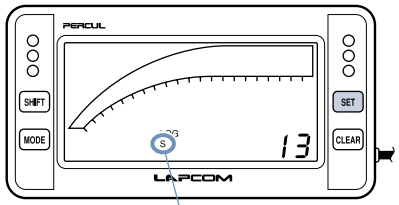
After "Basic Operation", confirm that the parameter setting screen is displayed. The parameter number should appear on the lower right of the screen. If not, return to "Basic Operation" to display the parameter setting screen.

1. Press MODE to display parameter number 13 on the lower right of the screen.



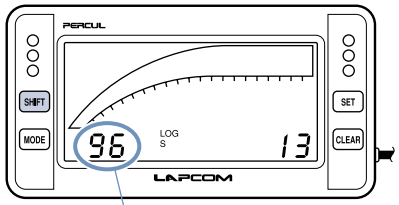
Parameter number 13

2. Press SET to select the data transmission rate: S, M or L, to match the communication speed (baud rate) of the line to be used.
Only the VX-2000 Hyper Pro and Hyper Pro Plus have this function.



S→M→L

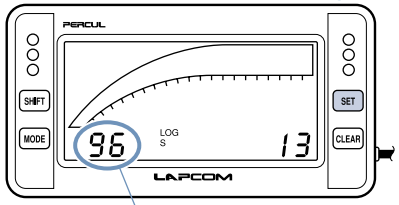
3. When changing the baud rate, press SHIFT to display the currently set baud rate, which appears on the lower left of the screen.



Current baud rate: 9600bps

4. Press SET to select the baud rate: 12 (1200bps) to 115 (115200bps) to match the communication speed (baud rate) of the device to be used.

5. If setting other parameters, press MODE to display the desired parameter number.
When finished, press CLEAR.



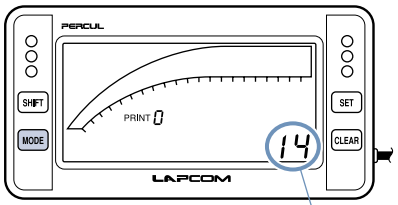
12 (1200bps) ～
115 (11520bps)

Note
The data transmission rate is the data transmission cycle when LAPCOM sends data to a PC via the telemetry system over communication facilities such as radio or cellular phones. If setting S (default), a communication speed of 9600bps or more is required. If using a general radio modem for telemetry, the transmission rate of M or L may be necessary for normal operation.

14. Selection of Print Form (with Optional handy printer) Default: 0

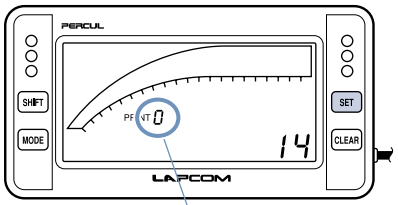
After "Basic Operation", confirm that the parameter setting screen is displayed. The parameter number should appear on the lower right of the screen. If not, return to "Basic Operation" to display the parameter setting screen.

1. Press MODE to display parameter number 14 on the lower right of the screen.



Parameter number 14

2. Press SET to select the desired print form: PRINT 0 to PRINT 6.



0→1→2→3→4→5→6

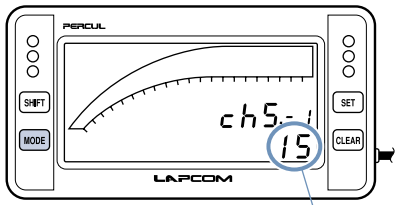
3. If setting other parameters, press MODE to display the desired parameter number.
When finished, press CLEAR.

Note
If PRINT 0 (default) is selected, all the forms from PRINT 1 to PRINT 6 can be generated.
For the details of each print form, see page 54.
If segment times are not to be measured, form 2 is not generated.

15. Transmitter Channel and Measurement Mode

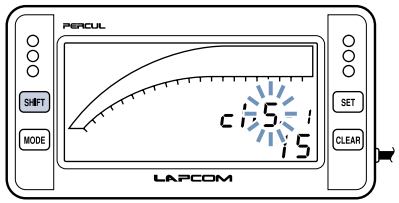
After "Basic Operation", confirm that the parameter setting screen is displayed. The parameter number should appear on the lower right of the screen. If not, return to "Basic Operation" to display the parameter setting screen.

1. Press MODE to display parameter number 15 on the lower right of the screen.

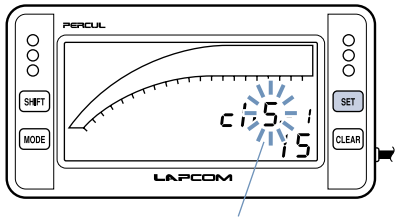


Parameter number 15

2. Press SHIFT to make the channel setting flash.



Pressing the SET key toggles through the channel settings in the following order: 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, A, B, C, D, E, F, -, H, and L.

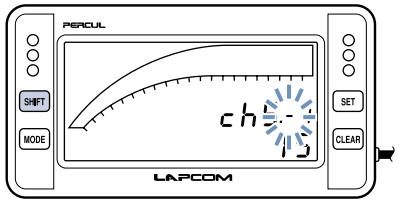


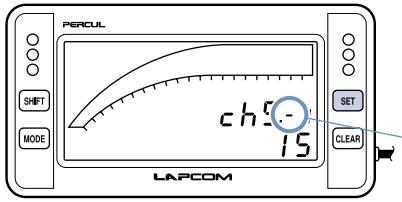
3. Select the desired channel setting to match the measurement conditions and the transmitter channel.

1→2→3→4→5→6→7→8→
9→0→A→B→C→D→E→F→
−→H→L

- : Enables measurement of time by switches or signals from various sensors instead of using a transmitter.
- H : Enables measurement of speed from 0kph to 100kph.
- L : Enables measurement of distance from 0m to 400m.

4. Press SHIFT to start the channel setting of the transmitters located in segments flashing. If measuring segment time by using a transmitter in each segment, press SET to select the desired channel. If not measuring segment time, select "-", and continue with step 5.

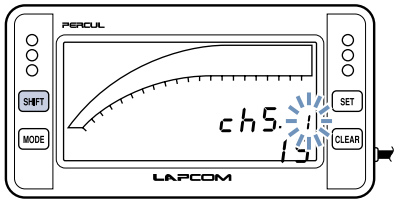


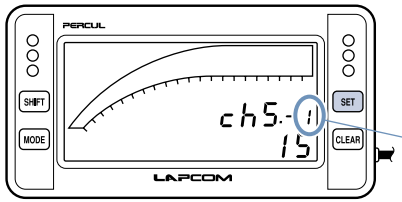


<When measuring segment times with transmitters>
· Select the channel.

<When measuring segment times without transmitters>
· Select " - ".

5. Press SHIFT to start the number of segments value flashing. Setting this number enables the measurement of time for each segment for a course that has been divided into segments of equal distance.
Press SET to select a number or letter as the desired number of segments. A is for 10 segments, B for 11, C for 12, D for 13, E for 14, and F for 15. If the course is not to be segmented, select 1 and go to the setting of parameter number 18. If segments has been set (excluding 1), go to parameter number 17.





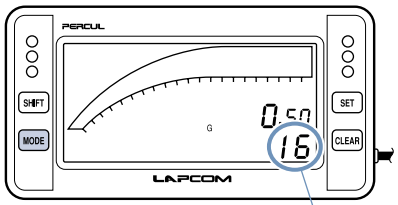
<When measuring segment times by dividing the course into segments of equal distance>
· Select a number or letter from 1 to F.
<When measuring segment times by dividing the course between straights and corners, and course data is to be recorded in LAPCOM>
· Select " - ".
See pages 46 and 82.

Note
When creating and recording course data that is divided into straights and corners by lateral g, refer to page 46 of this manual for how to edit the course data using the LAPCOM VX-2000 and the handy printer without a PC.
If a PC is to be used with the Lapcom Terminal, refer to page 82 of this manual.

16. How to Set Lateral G. Default: 0.5G

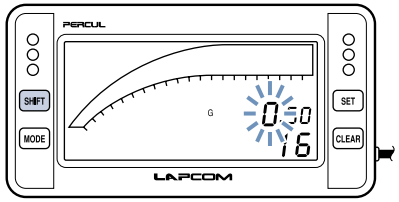
After "Basic Operation", confirm that the parameter setting screen is displayed. The parameter number should appear on the lower right of the screen. If not, return to "Basic Operation" to display the parameter setting screen.

1. Press MODE to display parameter number 16 on the lower right of the screen.



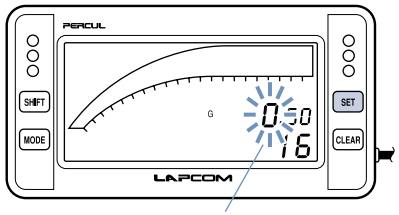
Parameter number 16

2. Press SHIFT until the numerical value to be changed starts to flash.



3. Press SET to select a value. Set the desired lateral g by repeating operations 2 and 3.

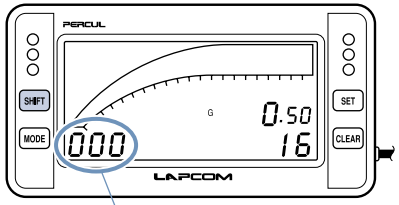
When creating and editing course data, the point where the lateral g is generated beyond the set value is deemed to be the start of the corner.



Select a value.

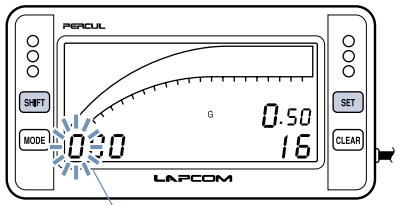
4. Press SHIFT for 3 seconds to display the setting of the other lateral g that is for detecting the corner's end point.

Press SHIFT until the numerical value to be changed starts to flash. Press SET to select a value. Set the desired lateral g by repeating those operations.



Lateral g that is for detecting the corner's end point.

5. By pressing SHIFT for 3 seconds, the value on the lower left of the screen starts flashing.
Set the distance by pressing SHIFT to start the number flashing and then press SET to select a value.
This value is the distance from the corner's start point. Within this distance the reduction of lateral g is ignored and the corner's end point is not recognized. It is set to have many small corners recognized as a big segment. It can be set up to 999m. If this function is not required set the value to 000m.



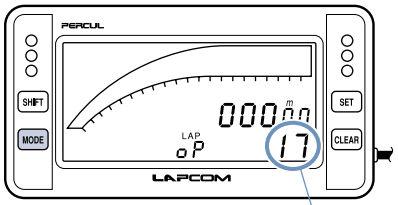
Press SHIFT key to start flashing.
Press SET key to select a value.

6. Go to parameter number 17.

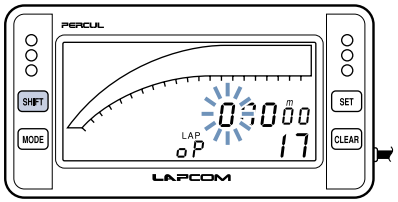
17. How to Record the Measurement Pattern

To measure segment time by dividing a course into segments of equal distance with parameter number 15 when the course distance is known in advance.

1. Press MODE to display parameter number 17 on the lower right of the screen.

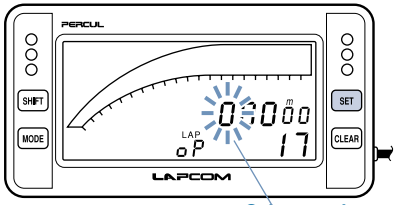


2. To enter the course distance, press SHIFT until the numerical value to be changed starts to flash.



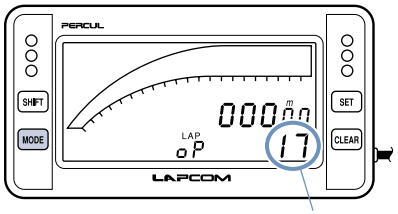
3. Press SET to select a value. Enter the desired course distance by repeating operations 2 and 3.

4. If setting other parameters, press MODE to display the desired parameter number.
When finished, press CLEAR.



To measure segment time by dividing a course into segments of equal distance with parameter number 15 when the course distance is not known in advance.

1. Press MODE to display parameter number 17 on the lower right of the screen.

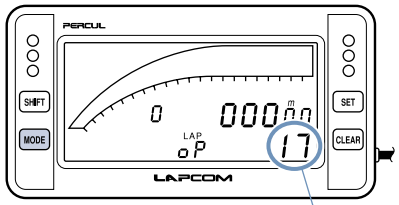


2. Drive the course. After passing the transmitter for the first time, the measurement of the distance starts. After passing the transmitter a second time, measurement finishes and the course distance is displayed on the screen. If the course is not being traced accurately, through spinning or sliding off for example, press CLEAR to cancel the measurement and restart the measurement with the next lap. After finishing the measurement of the course correctly, press CLEAR to record the distance. It is possible to repeat the measurement a number of times until the distance is recorded by pressing CLEAR.

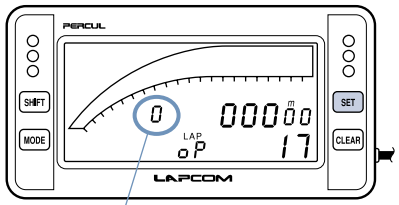
3. Once the distance has been set, the measurement of time is possible.

To measure segment time by dividing a course between straights and corners with parameter number 15 ("-").

1. Press MODE to display parameter number 17 on the lower right of the screen.



2. Press SET to select a record number, 0 to 9, for the measurement pattern.
The measurement patterns are data that include a course map created from driving the course and the positions of segment time measurement points. Up to 10 patterns can be recorded.



3. Drive the course. After passing the transmitter for the first time, the measurement of the distance and lateral g starts. After passing the transmitter a second time, measurement finishes and the distance of the course is displayed on the screen. If the course is not being traced accurately, through spinning or sliding off for example, press CLEAR to cancel the measurement and restart the measurement with the next lap. After finishing the measurement of the course correctly, return to the pit. It is possible to repeat the measurement a number of times until the trace has been correctly completed.

4. Edit the course data. See "16. How to Set Lateral G."

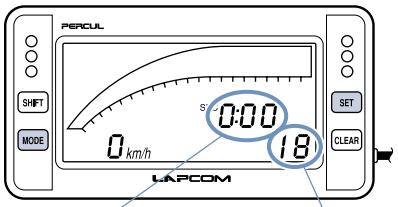
5. Press CLEAR to record the course data.

18. How to Set the Auto-off Timer

After "Basic Operation", confirm that the parameter setting screen is displayed. The parameter number should appear on the lower right of the screen. If not, return to "Basic Operation" to display the parameter setting screen.

1. Press MODE to display parameter number 18 on the lower right of the screen.

2. Press SHIFT to start the numerical value flashing, then press SET to enter a value that corresponds to the lap time. A value up to 9 minutes 50 seconds can be set. If the vehicle does not pass through the measurement section or does not complete a lap within the set time, it will be deemed that the vehicle has slowed down or stopped. Measurement is canceled and logging stops. The default value is 0.00 (10 minutes).

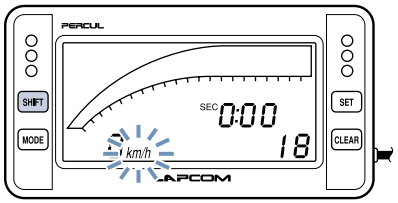


Setting of time Parameter number 18

Note
If only the time has been set (by setting speed to 000kph), the lap time in which the vehicle enters the pit without passing the transmitter will be invalid and not recorded. Only lap time data in which the vehicle passes the transmitter within the set time is valid.
When the vehicle enters the pit without passing the transmitter, it slows down dramatically and stops for a certain period. In order to make this lap time data valid for recording set the speed and time as follows:

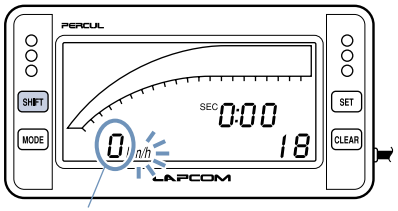
3. Press SHIFT for 3 seconds to start the unit of speed flashing.

4. Press SHIFT again until the numerical value to be changed starts to flash.



5. Press SET to select a value. Set the desired speed where logging stops or starts by repeating operations 4 and 5.

6. Press SHIFT again for 3 seconds to start time flashing.



Select a value.

Note
The speed set should be quite low (excluding 000 kph) compared with regular driving speed.
Setting of time together with speed avoids cessation of logging due to a temporary slow down such as wheel lock during braking.

7. If setting other parameters, press MODE to display the desired parameter number.
When finished, press CLEAR.

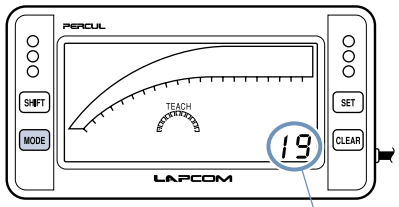
19. Calibration of the Steering Movement

After "Basic Operation", confirm that the parameter setting screen is displayed. The parameter number should appear on the lower right of the screen. If not, return to "Basic Operation" to display the parameter setting screen.

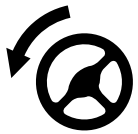
1. Press MODE to display parameter number 19 on the lower right of the screen.

2. Turn the steering wheel full lock to the left then press SET.

3. Then turn the steering wheel full lock to the right and press CLEAR to finish. If the calibration is completed correctly, the indicator is displayed on the screen.



Parameter number 19



SET key



CLEAR key

Note
If the sensor is not being using for steering movement, remove it from the control unit and make the calibration. The indicator will disappear.

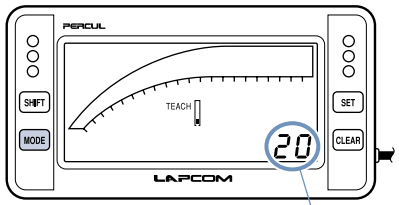
20. Calibration of the Throttle Position

After "Basic Operation", confirm that the parameter setting screen is displayed. The parameter number should appear on the lower right of the screen. If not, return to "Basic Operation" to display the parameter setting screen.

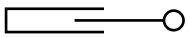
1. Press MODE to display parameter number 20 on the lower right of the screen.

2. Close the throttle then press SET.

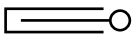
3. Fully open the throttle and press CLEAR to finish. If calibration is completed correctly, the indicator is displayed on the screen.



Parameter number 20



SET key



CLEAR key

Note
If the sensor is not being using for throttle position, remove it from the control unit and make the calibration. The indicator will disappear.

How to Set the Calendar and Time

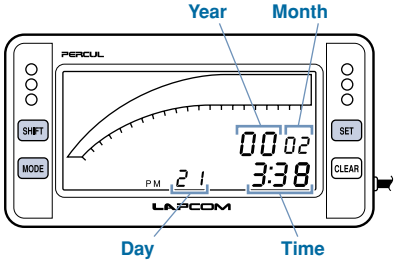
After "Basic Operation", confirm that the parameter setting screen is displayed. The parameter number should appear on the lower right of the screen. If not, return to "Basic Operation" to display the parameter setting screen.

1. Press MODE to display the Calendar. It has been assigned behind parameter number 20.

2. Press SHIFT until the numerical value to be changed starts to flash.

3. Press SET to enter a value. Set the desired year, month, date, and time by repeating operations 2 and 3.

4. Press CLEAR to start the clock.



Basic Use

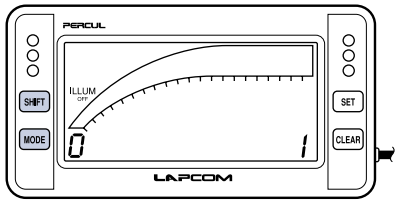
LAPCOM stores data from each sensor based on lap time and wheel speed. Therefore, the measurement of these is indispensable.
See "Parts and Installation" for installation of the sensors.

Getting Ready

1. Turn on the power to the control unit.

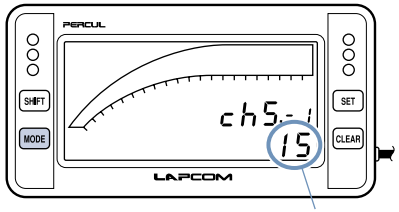
2. Confirm the display's initial screen. READY should appear. If not, press CLEAR to get the initial screen.

3. Press Mode and SHIFT simultaneously for 3 seconds to get the parameter setting screen. The parameter number or calendar should appear on the lower right of the screen. If not, press CLEAR and try again.



4. Press MODE to display parameter number 15 on the lower right of the screen.

5. Press SHIFT to make the channel setting flash.
For the details of this setting, see page 33, "Transmitter Channel and Measurement Mode".



Parameter number 15

6. Press SET to select the transmitter channel, 0 to F, for lap times.
Select " - " if transmitters will not be used to measure segment times.
Select " 1" if the number of course segments is 1.



7. If setting other parameters like auto-off timer, press MODE to display the desired parameter number.
When finished, press CLEAR.

8. Turn on the power to the transmitter. After confirming the channel, install the transmitter.

9. Start driving. As soon as the vehicle passes the transmitter, the monitor lamp lights up and time measurement and data logging starts. LAPCOM can store data for up to 100 laps or a total of 90 minutes. Lite and Basic can store data for up to 20 minutes.

Note
After stopping the vehicle, LAPCOM automatically ends measuring after 10 minutes or the time set in the auto-off timer. To manually end measurement, press CLEAR.

How to Measure Segment Time with Transmitters

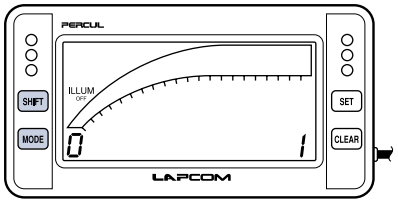
It is possible to accurately measure times by installing the maximum 14 transmitters in the course segments.

Getting Ready

1. Turn on the power to the control unit.

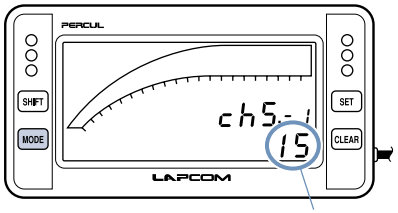
2. Confirm the display's initial screen. Time should appear on the lower right. If not, press CLEAR to get the initial screen.

3. Press Mode and SHIFT simultaneously for 3 seconds to get the parameter setting screen. The parameter number or calendar should appear on the lower right of the screen. If not, press CLEAR and try again.



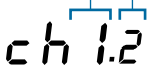
4. Press MODE to display parameter number 15 on the lower right of the screen.

5. Press SHIFT key to make the channel setting flash.
For the details of this setting, see page 33, "Transmitter Channel and Measurement Mode".



Parameter number 15

6. Press SET to select the transmitter channel, 0 to F, for lap times.
Select the transmitter channel to measure segment times.



7. If setting other parameters like auto-off timer, press MODE to display the desired parameter number. When finished, press CLEAR.

8. Turn on the power to the transmitters. After confirming each channel, install the transmitters.

9. Start driving. When the vehicle passes the transmitters for lap times, 2 monitor lamps on the right light up. When passing the transmitters for segment times, a lamp on the left lights up.

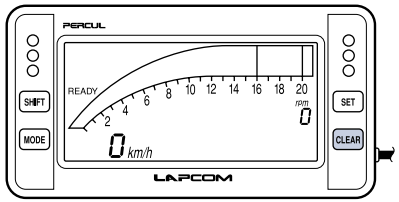
Note
After stopping the vehicle, LAPCOM automatically ends measuring after 10 minutes or the time set in the auto-off timer. To manually end measurement, press CLEAR.

How to Measure Segment Time with Transmitters

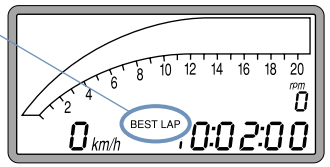
Confirmation of Data

1. Confirm READY appears on the left side of the screen.
If it does not, press CLEAR to display it.

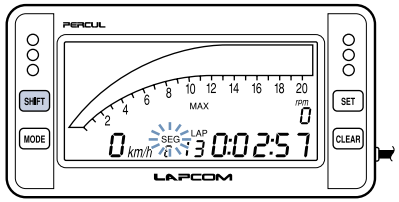
2. Confirm the display's initial screen. Time should appear on the lower right. If not, press CLEAR to get the initial screen.
The displayed data includes lap time, wheel speed, and temperature. Additionally, pressing SET switches the displayed data to lateral g, pressure, or RPM.



3. To display BEST LAP, press MODE for 3 seconds. The best lap is displayed with the descriptor, BEST LAP.



4. If confirming data for each segment, press MODE and SHIFT simultaneously to start SEG flashing.



5. Press MODE to confirm the segment data in order from the most recent lap to the oldest lap. Press SHIFT to reverse the order of laps.

6. If the MODE and SHIFT keys are again pressed simultaneously LAP and SEG flash making it possible to confirm the same segment data for each lap.

7. To display BEST SEG, press MODE for 3 seconds. The best segment lap is displayed with the descriptor, BEST.

8. To return to operation 2, press MODE and SHIFT simultaneously.

9. Press CLEAR to finish the confirmation of data.

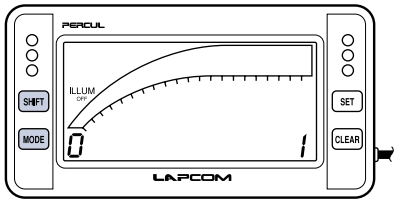
How to Measure Segment Time by Dividing the Course into Segments of Equal Distance

Enter the course distance or measure it by driving. By setting the number of segments of equal distance, it is possible to measure the segment data (maximum of 15 segments) without the need for a transmitter in each segment.

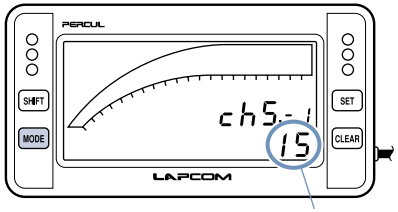
1. Turn on the power to the control unit.

2. Confirm the display's initial screen. READY should appear. If not, press CLEAR to get the initial screen.

3. Press MODE and SHIFT simultaneously for 3 seconds to get the parameter setting screen. The parameter number or calendar should appear on the lower right of the screen. If not, press CLEAR and try again.

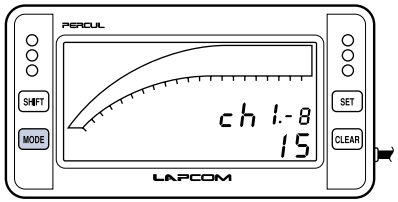


4. Press MODE to display parameter number 15 on the lower right of the screen.

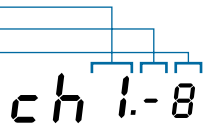


Parameter number 15

5. Press SHIFT to make the channel setting flash.
For the details of this setting, see page 33, "Transmitter Channel and Measurement Mode".

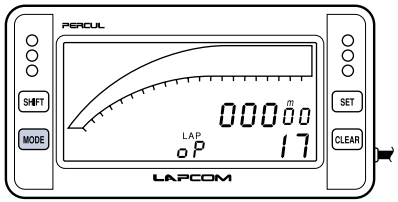


6. Press SET to select the transmitter channel, 0 to F, for lap times.
Select " - " if transmitters will not be used to measure segment data.
Select the desired number of segments.
A is for 10 segments, B for 11, C for 12,
D for 13, E for 14, and F for 15.



7. When the course distance is known in advance, press MODE to display parameter number 17 on the lower right of the screen.
For the details of this setting, see page 36, "How to Record the Measurement Pattern".

8. To enter the course distance, press SHIFT until the numerical value to be changed starts to flash.



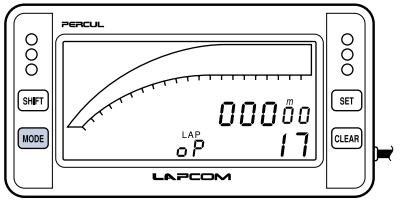
9. Press SET to select a value. Enter the course distance by repeating operations 8 and 9.

10. Press CLEAR to confirm the initial screen with the descriptor, READY.

11. Turn on the power to the transmitter. After confirming the channel, start driving.

12. When the course distance is not known in advance, drive the course to measure its distance.

13. Press MODE to display parameter number17 on the lower right of the screen. Confirm that the distance displayed is 00000m.



14. Turn on the power to the transmitter. After confirming the channel, start driving.

15. After passing the transmitter for the first time, measurement of the distance starts. After passing the transmitter a second time, measurement finishes and the course distance is displayed on the screen. If the course is not being traced accurately, including spinning or sliding off, press CLEAR to cancel the measurement which will restart with the next lap. After finishing the measurement of the course correctly, press CLEAR to record the distance. It is possible to repeat the measurement a number of times until the distance is recorded by pressing CLEAR.

16. When the vehicle passes the transmitters for lap times 2 monitor lamps on the right light up. When passing the transmitters for segment times, a lamp on the left lights up.

Note
After stopping the vehicle, LAPCOM automatically ends measuring after 10 minutes or the time set in the auto-off timer. To manually end measurement, press CLEAR.

How to Measure Segment Data by Dividing the Course between Straights and Corners

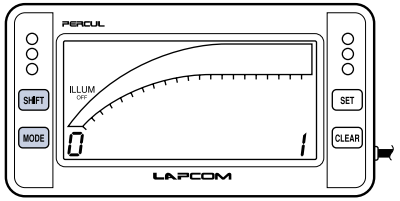
Once the course has been driven to record the data and the edited course data (up to a maximum of 10 courses) has been stored in LAPCOM, it can be called up at anytime making it possible to measure segment data in the same course. Lite cannot obtain and edit the course data.
Because the course data recorded by LAPCOM VX-2000 (excluding Lite) and edited by Lapcom Terminal can be delivered to all models of LAPCOM VX, it is possible to measure the data of all vehicles in the same team under the same condition

Getting Ready

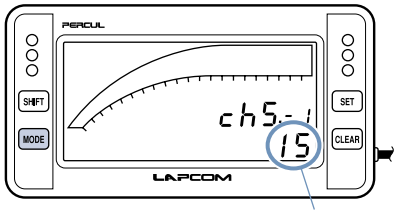
1. Turn on the power to the control unit.

2. Confirm the display's initial screen. READY should appear. If not, press CLEAR to get the initial screen.

3. Press MODE and SHIFT simultaneously for 3 seconds to get the parameter setting screen. The parameter number or calendar should appear on the lower right of the screen. If not, press CLEAR and try again.

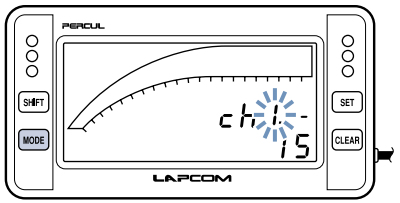


4. Press MODE to display parameter number 15 on the lower right of the screen.

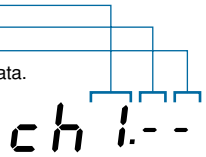


Parameter number 15

5. Press SHIFT to make the channel setting flash.



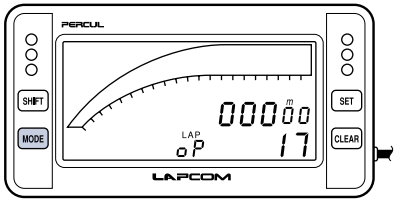
6. Press SET to select the transmitter channel, 0 to F, for lap times.
Select " - " if transmitters will not be used to measure segment data.
Select " - " if the number of segments will not be set.
LAPCOM automatically sets the number of segments based on run data.



How to Measure Segment Data by Dividing the Course between Straights and Corners

7. Press MODE to display parameter number 17 on the lower right of the screen.

8. The flashing number is the course number for recording the course data. Press SET to select the value.



9. If measuring data using course data that has previously been recorded, select that course number. After the recorded course number is displayed, the course distance and the number of the segments will be displayed.

10. Press CLEAR to confirm the initial screen with READY.

11. Turn on the power to the transmitter. After confirming the channel, install the transmitter.

Driving

12. Start driving.

13. If recording and editing new course data, first select the desired course number to be recorded.

14. If selecting a course number that has already been recorded, the course distance and the number of segments will be displayed. If this is the case, press SHIFT to make the number flash and press SET to select the value. Set it to 00000m to delete the previously recorded course data.

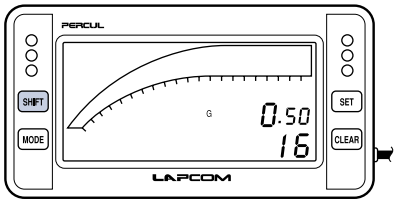
15. Start driving to record the course data.

16. After passing the transmitter for the first time, measurement of the distance and lateral g starts. After passing the transmitter a second time, measurement finishes and the course distance is displayed on the screen. If the course is not being traced accurately, including spinning or sliding off, press CLEAR to cancel the measurement which will restart with the next lap. After finishing the measurement of the course correctly, return to the pit. It is possible to repeat the measurement a number of times until the trace has been correctly completed.

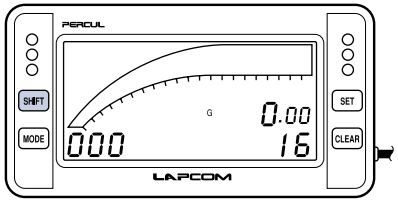
17. Confirm that the course distance is displayed on the screen. Press MODE to display parameter number 16 on the lower right of the screen.

18. Press SET to select a value.

When creating and editing course data, the point where the lateral g is generated beyond the set value is judged as the start of the corner.

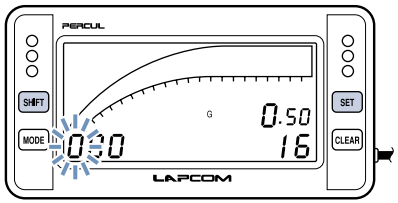


19. Press SHIFT for 3 seconds to display the setting of the other lateral g that is for detecting the corner's end point.



Press SHIFT until the numerical value to be changed starts to flash. Press SET to select a value. Set the desired lateral g by repeating those operations. The lateral g of the corner's end point should be lower than the one for its start point.

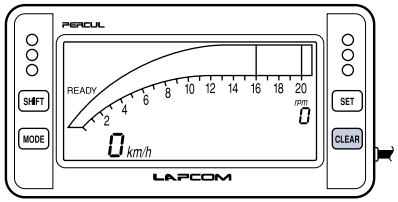
20. By pressing SHIFT for 3 seconds, the value on the lower left of the screen starts flashing.
Set the distance by pressing SHIFT to start the number flashing and then press SET to select a value.
This value is the distance from the corner's start point. Within this distance the reduction of lateral g is ignored and the corner's end point is not recognized. When making many small corners recognized as a big segment, this value is set based on the smallest corner's distance.



21. After connecting the handy printer to the control unit, move the print switch to position 1 for a second to print out the course layout and its edited data.

22. Complete the desired course data by repeating the printing and editing. Press CLEAR to set the final data.

23. After confirming the initial screen with READY, start driving.



Note
After stopping the vehicle, LAPCOM automatically ends measuring after 10 minutes or the time set in the auto-off timer. To manually end measurement, press CLEAR.

How to Measure Data within a Distance of 0 to 400m

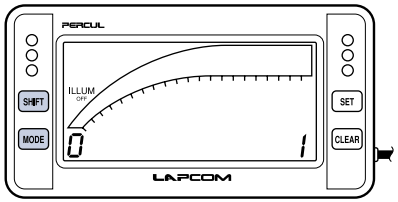
How to Measure Data within a Distance of 0 to 400m

After the simple key operation described below, start driving to begin measurement. LAPCOM automatically recognizes the start and 400m points, and measures lap time and other data within that distance. It is possible to measure segment data by dividing the 400m

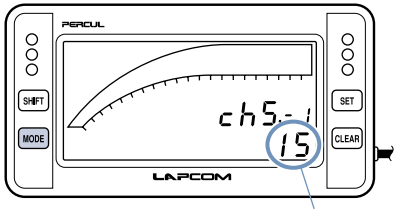
1. Replace the optical sensor with the optional push-button switch and turn on the power to the control unit.

2. Confirm the display's initial screen. READY should appear. If not, press CLEAR to get the initial screen.

3. Press MODE and SHIFT simultaneously for 3 seconds to get the parameter setting screen. The parameter number or calendar should appear on the lower right of the screen. If not, press CLEAR and try again.

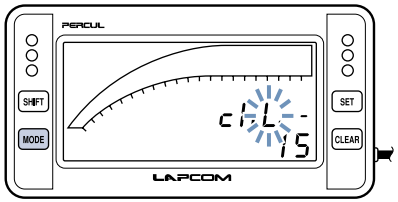


4. Press MODE to display parameter number 15 on the lower right of the screen.



Parameter No.15

5. Press SHIFT to make the channel setting flash.



6. Press SET to select "L".
If transmitters are not being used for segment data, select " - ".
Otherwise, select the channel number.
If the number of segments is not being set, select " - ".
Otherwise, select the number of segments.



7. Press CLEAR to confirm the initial screen with READY.
8. If transmitters are being used for segment data, turn on the power to confirm the channel setting.
9. Move the vehicle to the start line and stop.
10. After confirming that the vehicle has completely stopped, press the push-button switch once.
11. As soon as the vehicle moves off, measurement starts. At the 400m point, measurement stops.
12. If continuing this measurement, repeat from operation 9.

How to Measure Data for Speeds from 0 to 100kph

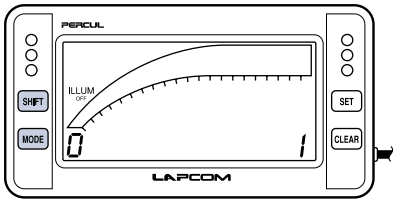
How to Measure Data for Speeds from 0 to 100kph

After the simple key operation described below, start driving to begin measurement. LAPCOM automatically recognizes the start point and the point where the speed reaches 100kph, and measures lap time and other data. It is possible to measure segment data by dividing the 0 to 100kph section equally by speed or by setting up transmitters for segment

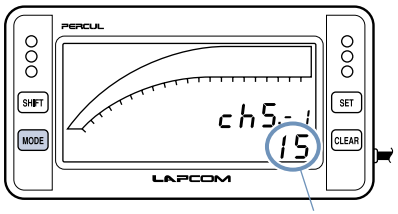
1. Replace the optical sensor with the optional push-button switch and turn on the power to the control unit.

2. Confirm the display's initial screen. READY should appear. If not, press CLEAR to get the initial screen.

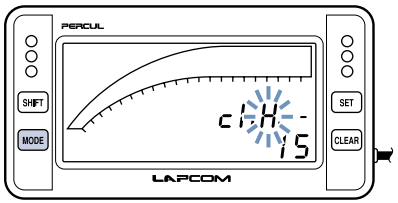
3. Press MODE and SHIFT simultaneously for 3 seconds to get the parameter setting screen. The parameter number or calendar should appear on the lower right of the screen. If not, press CLEAR and try again.



4. kPress MODE to display parameter number 15 on the lower right of the screen.



5. Press SHIFT to make the channel setting flash.



6. Press SET to select "H".
If transmitters are not being using for segment data, select " - ".
Otherwise, select the channel number.
If the number of segments is not being set, select " - ".
Otherwise, select the number of segments.



7. Press CLEAR to confirm the initial screen with READY.
8. If transmitters are being used for segment data, turn on the power to confirm the channel setting.
9. Move the vehicle to the start line and stop.
10. After confirming that the vehicle has completely stopped, press the push-button switch once.
11. As soon as the vehicle moves off, measurement starts. When the vehicle reaches 100kph measurement stops.
12. If continuing this measurement, repeat from operation 9.

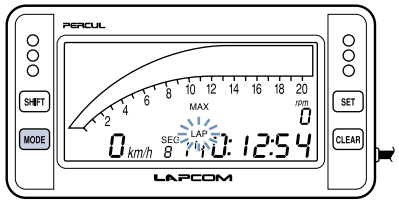
How to Confirm, Delete and Reset Data

How to Confirm, Delete and Reset Data

How to confirm the run data

1. Confirm READY appears on the left side of the screen.
If it does not, press CLEAR to display it.

2. Confirm the display's initial screen. Time should appear on the lower right. If not, press CLEAR to get the initial screen. The displayed data includes lap time, wheel speed, and temperature. Additionally, pressing SET switches the displayed data to lateral g, pressure, or RPM.



3. To display BEST LAP, press MODE for 3 seconds. The best lap is displayed with the descriptor, BEST LAP.

4. If confirming data for each segment, press MODE and SHIFT simultaneously to start SEG flashing.

5. Press MODE to confirm the segment data in order from the most recent lap to the oldest lap. Press SHIFT to reverse the order of laps.

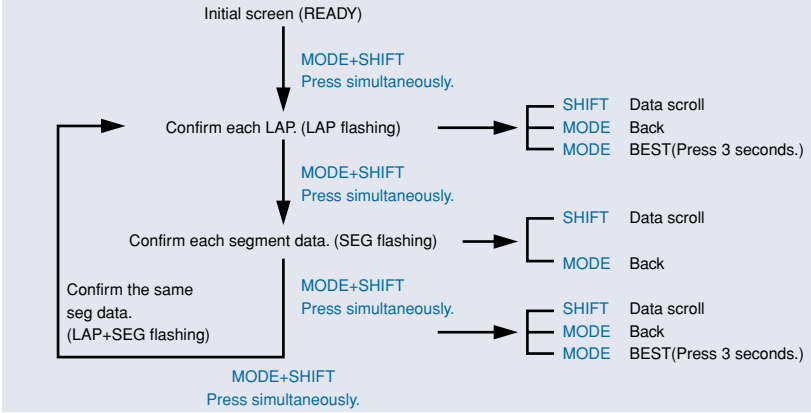
6. If the MODE and SHIFT keys are again pressed simultaneously LAP and SEG flash making it possible to confirm the same segment data for each lap.

7. To display BEST SEG, press MODE for 3 seconds. The best segment lap is displayed with the descriptor, BEST.

8. To return to operation 2, press MODE and SHIFT simultaneously.

9. Press CLEAR to finish the confirmation of data.

(Key operation to confirm segment data)



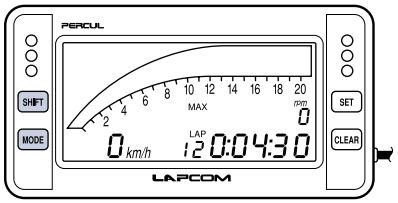
How to delete data

1. Confirm READY appears on the left side of the screen.
If it does not, press CLEAR to display it.

2. Press MODE or CLEAR to display the lap data to be deleted.

3. Press SET and CLEAR simultaneously for 3 seconds.

4. Press CLEAR to finish deleting data.



How to delete all the data in a single block

1. Confirm READY appears on the left side of the screen.
If it does not, press CLEAR to display it.

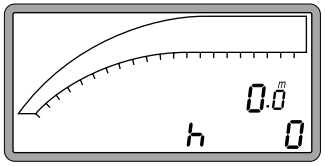
2. Press SET and CLEAR simultaneously for 3 seconds.

How to display and delete engine running time, trip meter, and odometer

1. Confirm READY appears on the left side of the screen.
If it does not, press CLEAR to display it.

2. Press MODE and CLEAR simultaneously. The engine running time, trip meter, and odometer display in turn.

3. If setting to 0, press MODE and CLEAR simultaneously for 3 seconds.



Note
The only way to reset the odometer to 0 is to reset the control unit.

How to reset the LAPCOM system to return it to the original factory settings

1. Confirm READY appears on the left side of the screen.
If it does not, press CLEAR to display it.

2. Press SHIFT, SET, and CLEAR simultaneously for 3 seconds and confirm that the whole screen

Note
If resetting the system, all the default settings and stored data will be lost.

Printing the Data

How to print the data

1. Press CLEAR to display READY on the screen and move the print switch to position 2 for a second to start printing the lap time data list.

2. Press MODE or SHIFT to display the desired lap data. If the print switch is moved to position 1 for a second, graphic related forms including course layout will be printed, according to the setting in parameter number 14.
If the switch is moved to position 2, the LAP-SEGMENT data list will be printed.

3. To cancel printing, press CLEAR.

Note
For the details of the print form setting, see page 33.
If segment times are not measured, form 2 is not printed.
Switch position 1 is for graphic data, 2 for various lists.
For the details of printer operation, see page 94.

```
                    ××× LAPCOM ×××   ver. 2000
LAP TIME DATA LIST                          PM 02:44 99/10/07

LAP  TIME    rpm MIN~MAX   km/h  G MAX  TMP.1 °C  TMP.2 °C  LENGTH m
L 5  1:54.98 3466~ 9060  43~272 -2.83   98~ 102   75~  78   5832.8
L 4  1:55.37 3579~ 8854  48~267 +2.95  100~ 103   74~  77   5817.6
L 3 ×1:54.55 3429~ 8920  48~272 +2.75   99~ 102   73~  77   5826.9
L 2  1:54.92 1770~ 8882  13~267 -2.71   97~ 101   72~  76   5821.5
L 1  1:55.17 3307~ 8901  43~267 +2.67   92~  98   71~  76   5830.8
```

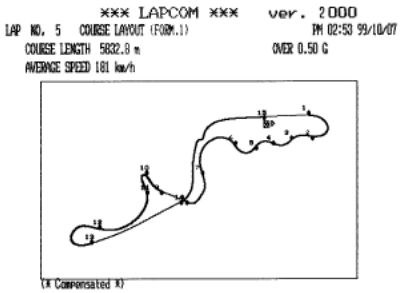
```
                    ××× LAPCOM ×××   ver. 2000
LAP - SEGMENT TIME DATA LIST                PM 03:01 99/10/07

LAP  TIME     1.SEG    2.SEG    3.SEG    4.SEG    5.SEG   rpm MIN~MAX   km/h
L 5  1:54.98 ×0:04.92 ×0:08.17  0:03.49  0:03.45  0:03.44 3466~ 9060  43~272
              0:04.98  0:09.34  0:08.06  0:04.06 ×0:03.89
              0:06.32  0:09.12 ×0:10.81  0:11.57  0:23.26
L 4  1:55.37  0:05.02  0:08.29  0:03.49  0:03.50  0:03.35 3579~ 8854  48~267
              0:04.95  0:09.23 ×0:08.04 ×0:03.97  0:04.34
              0:06.02  0:09.16  0:10.84  0:11.64  0:23.53
L 3 ×1:54.55  0:04.96  0:08.25  0:03.50  0:03.48 ×0:03.27 3429~ 8920  48~272
              0:04.93 ×0:09.14  0:08.11  0:04.00  0:04.16
              0:06.06 ×0:09.10  0:10.86  0:11.69 ×0:23.04
L 2  1:54.92  0:04.99  0:08.19  0:03.48 ×0:03.42  0:03.30 1770~ 8882  13~267
             ×0:04.92  0:09.21  0:08.22  0:04.01  0:04.51
             ×0:05.85  0:09.11  0:10.90 ×0:11.64  0:23.17
L 1  1:55.17  0:04.99  0:08.27 ×0:03.48  0:03.44  0:03.32 3307~ 8901  43~267
              0:04.93  0:09.19  0:08.17  0:04.02  0:04.02
              0:06.14  0:09.13  0:10.92  0:11.89  0:23.26

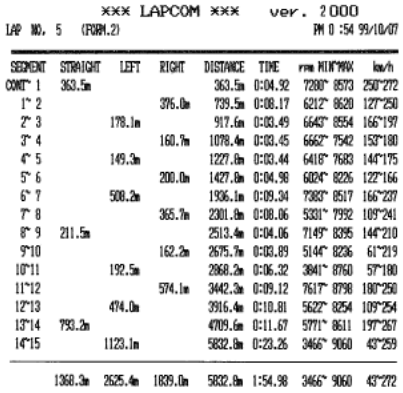
L 3  1:54.55  0:04.96  0:08.25  0:03.50  0:03.48  0:03.27
              0:04.93  0:09.14  0:08.11  0:04.00  0:04.16
              0:06.06  0:09.10  0:10.86  0:11.69  0:23.04
THEO 1:53.66  0:04.92  0:08.17  0:03.48  0:03.42  0:03.27
              0:04.92  0:09.14  0:08.04  0:03.97  0:03.89
              0:05.85  0:09.10  0:10.81  0:11.64  0:23.04
DELA 0:00.89  0:00.04  0:00.08  0:00.02  0:00.06  0:00.00
              0:00.01  0:00.00  0:00.07  0:00.03  0:00.27
              0:00.21  0:00.00  0:00.05 ~0:00.05  0:00.00
```

Printing the Data

· **PRINT 1 Form**

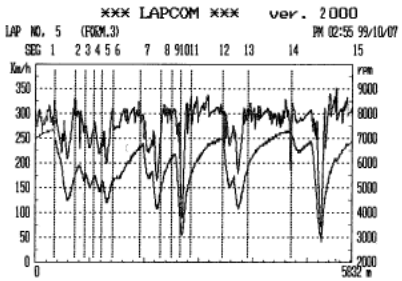


· **PRINT 2**

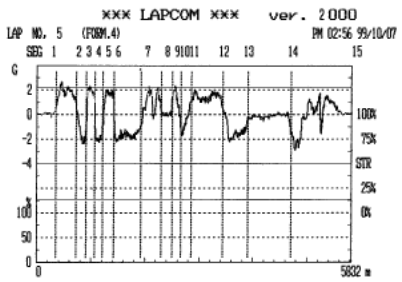


SEGMENT	STRAIGHT	LEFT	RIGHT	DISTANCE	TIME	rpm MIN*MAX	km/h
CONT" 1	363.5m			363.5m	0:04.92	7280" 8573	250"272
1" 2			376.0m	739.5m	0:08.17	6212" 8620	127"250
2" 3		178.1m		917.6m	0:03.49	6643" 8554	166"197
3" 4			160.7m	1078.4m	0:03.45	6662" 7542	153"180
4" 5		149.3m		1227.8m	0:03.44	6418" 7683	144"175
5" 6			200.0m	1427.8m	0:04.98	6024" 8226	122"166
6" 7		508.2m		1936.1m	0:09.34	7382" 8517	166"237
7" 8			365.7m	2301.8m	0:08.06	5331" 7992	109"241
8" 9	211.5m			2513.4m	0:04.06	7149" 8395	144"210
9"10			162.2m	2675.7m	0:03.89	5144" 8236	61"219
10"11		192.5m		2868.2m	0:06.32	3841" 8760	57"180
11"12			574.1m	3442.3m	0:09.12	7617" 8798	180"250
12"13		474.0m		3916.4m	0:10.81	5622" 8254	109"254
13"14	793.2m			4709.6m	0:11.67	5771" 8611	197"267
14"15		1123.1m		5832.8m	0:23.26	3466" 9060	43"272
	1368.3m	2625.4m	1839.0m	5832.8m	1:54.98	3466" 9060	43"272

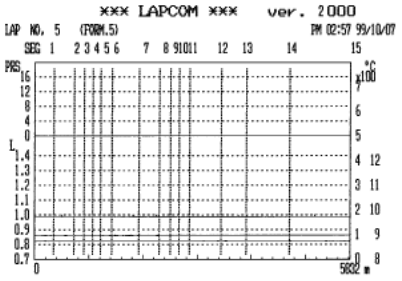
· **PRINT 3**



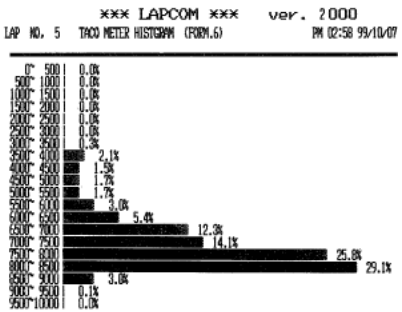
· **PRINT 4**



· **PRINT 5**



· **PRINT 6**



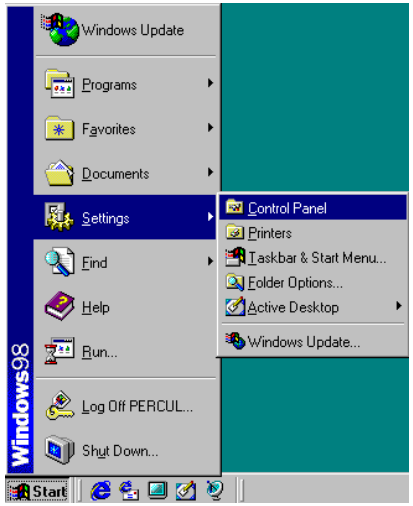
Installing Lapcom Terminal

Installing for Windows 98

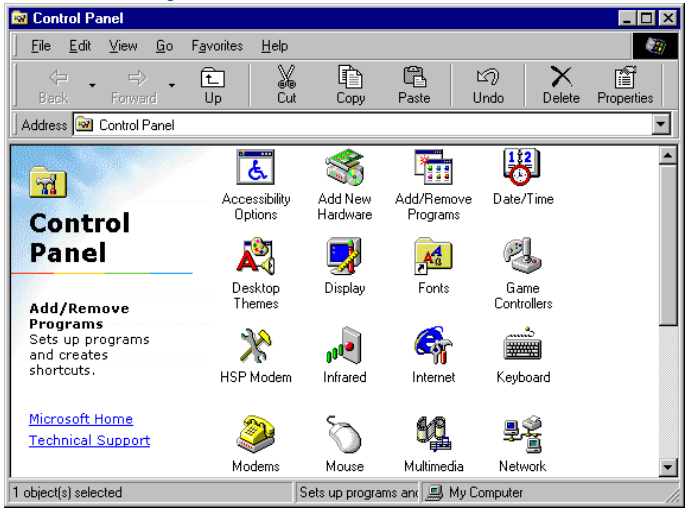
These instructions assume that the hard disk is allocated as the C drive and the floppy disk drive as the A drive. If your allocation is different, change the drive allocations in these instructions to match yours.
When installing LAPCOM Terminal from CD-R, after double clicking the self-extracting executable ZIP file, Installation automatically starts. Please omit the operation from 1 to 11.

1. Get Lapcom terminal's floppy disks #1, #2, and #3 ready.

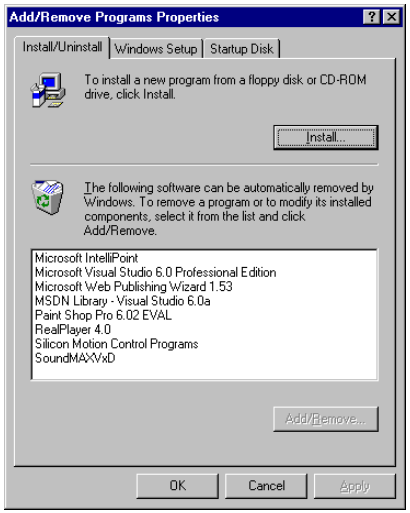
2. After closing all other applications, click Start.
Click Control Panel in Setting.



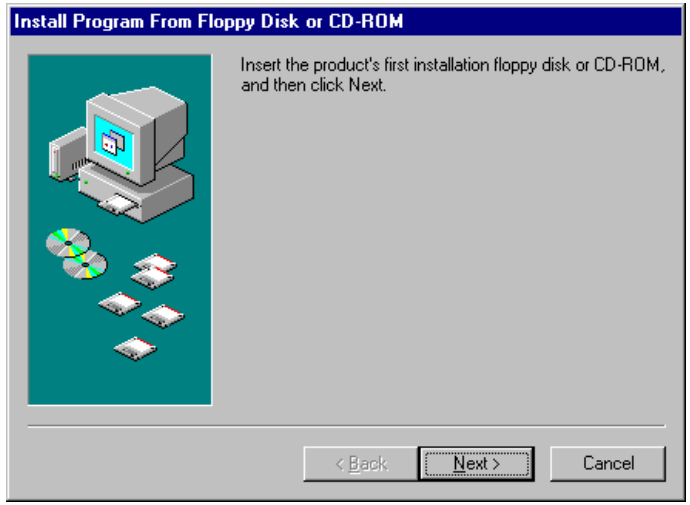
3. Double click the Add/Remove Programs icon.



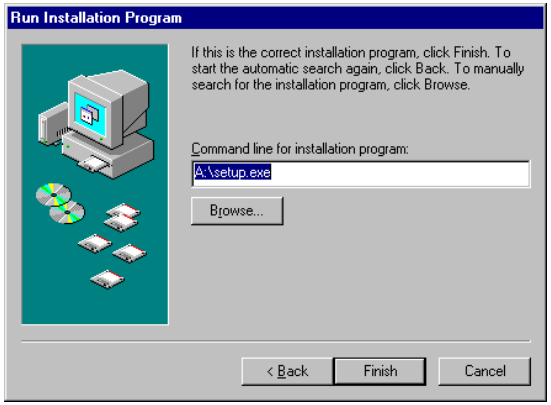
4. Click Install in Add/Remove Programs Properties.



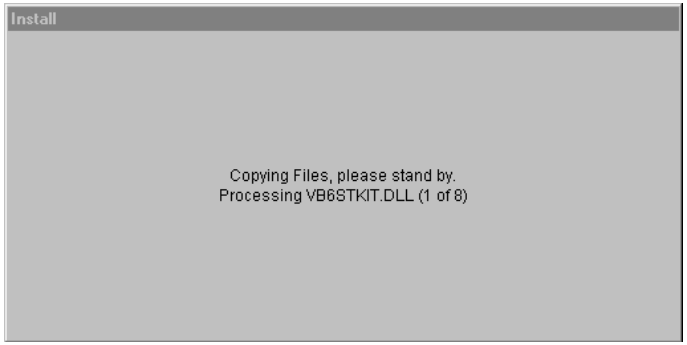
5. Insert disk #1 into drive A then click Next.



6. After confirming "A:/stup.exe" appears on the command line for installation program, click Finish.



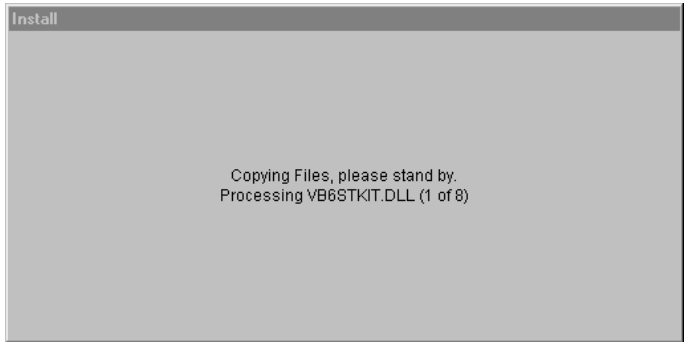
7. Copying of the initializing files starts.



8. Replace disk #1 with disk #2 then click OK.



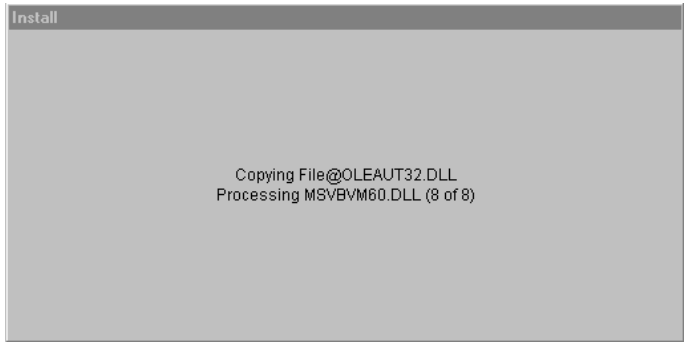
9. Copying of the initializing files starts.



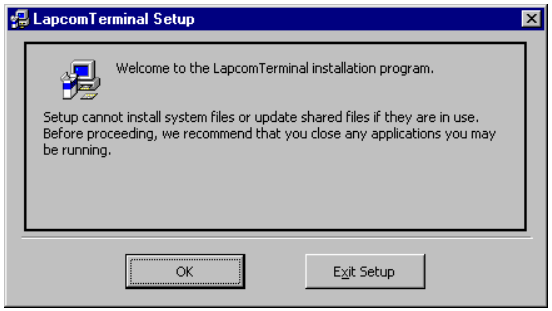
10. Replace disk #2 with disk #3 then click OK.



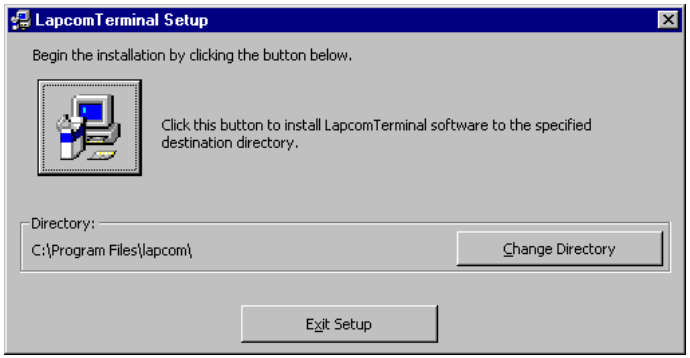
11. Copying of the initializing files starts.



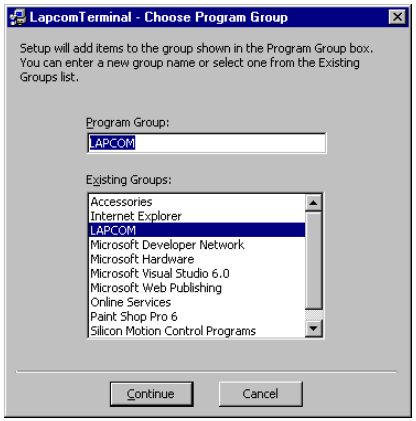
12. Click OK.



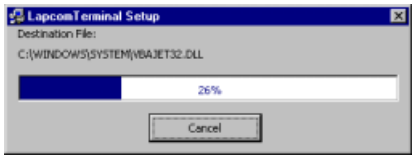
13. The drive name and directory name where Lapcom is to be installed are displayed. If continuing the installation, click the button. If changing the drive and directory enter the desired drive and directory names. Then click the button.



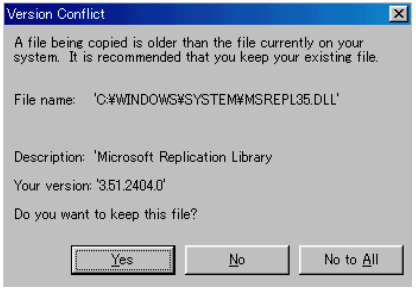
14. Enter the name of the Program Group to be placed on the start menu. It is possible to choose the name from the list of existing groups.



15. Setup starts



16. Click YES.



17. Click OK to finish.



Connecting to a PC by Cable

1. Turn off the power to the control unit.

2. Connect the COM port mini cable to the COM port of the control unit.

3. Connect the RS232C cable to the RS232C port of the PC. Connect the other end of the RS232C cable to the black socket (PC side) of the reverse cable.

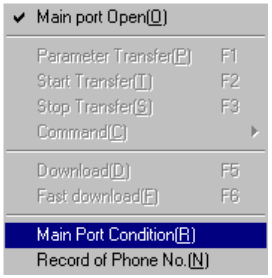
4. Connect the other end of the COM port mini cable to the white socket of the reverse cable.

5. Turn on the power to the control unit.

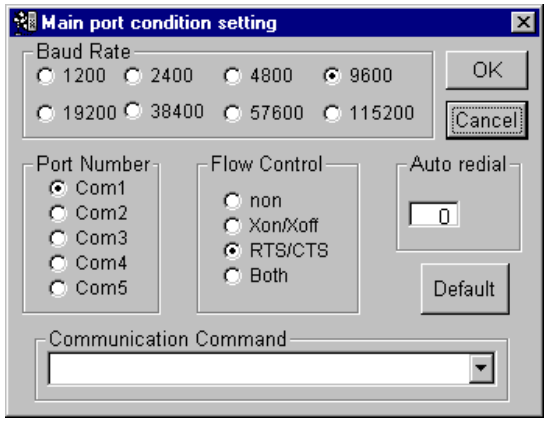
6. Start Windows.

7. Click the LAPCOM icon in Programs to start Lapcom Terminal.

8. Click Main Line Setting in the menu. Click Main Port Condition from the popup menu.

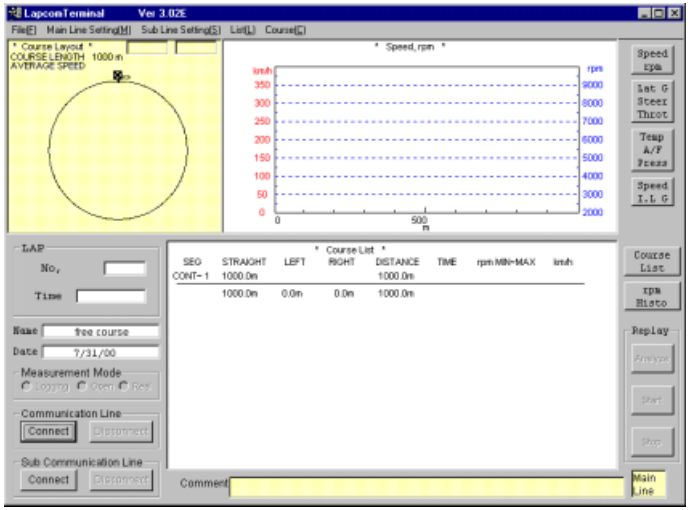


9. In the Main Port Condition Setting dialog box, select the port number (COM1 to COM5) the communication cable connects to. Leave the communication command box blank. Click OK.

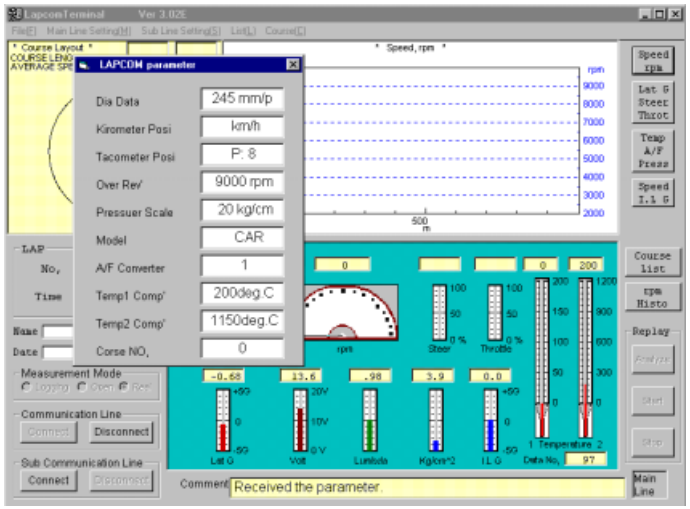


10. To transfer the data a PC has received from LAPCOM to another PC using a sub port, click Sub Sub Line Setting in the menu. Click Sub Port Condition from the popup menu. In the Sub Port Condition Setting dialog box set each condition.

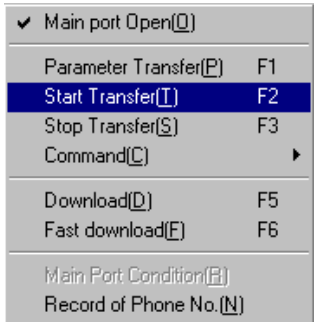
11. Click the Connect button in Communication Line. If also transferring the data to another PC, click the Connect button in Sub Communication Line.



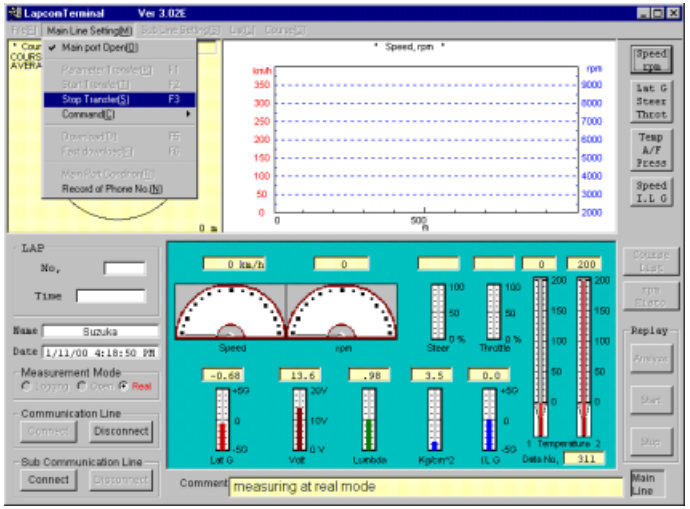
12. Click x to close the LAPCOM parameter window.



13. For the VX-2000 Hyper/Hyper Pro Plus, click Main Line Setting on the menu bar, and click Start Transfer from the popup menu to start sending real time telemetry data by LAPCOM.



14. Click Main Line Setting in the menu bar and click Stop Transfer to stop sending the data from LAPCOM.



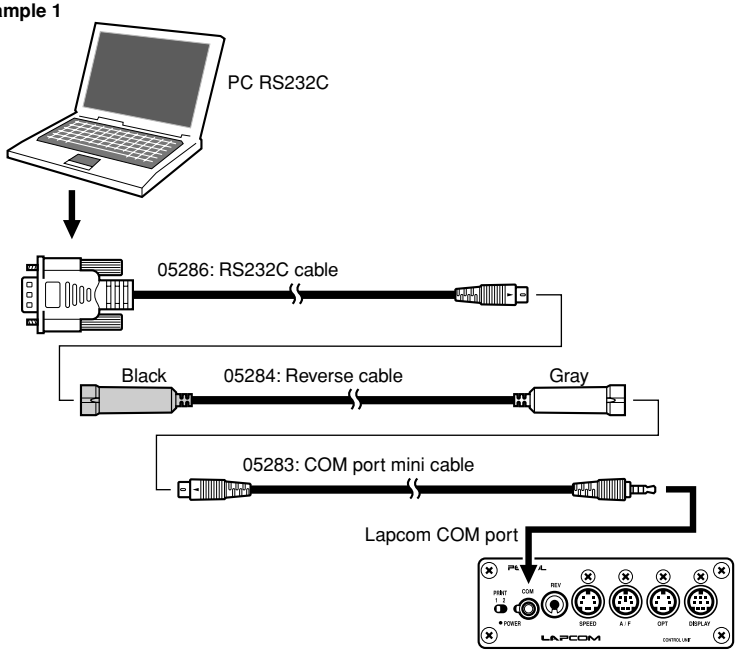
15. Click Disconnect to disconnect the line.

Note
If LAPCOM's internal battery is running low it may cause problems with data communication. If this is the case, charge the internal battery or run LAPCOM with the external battery.

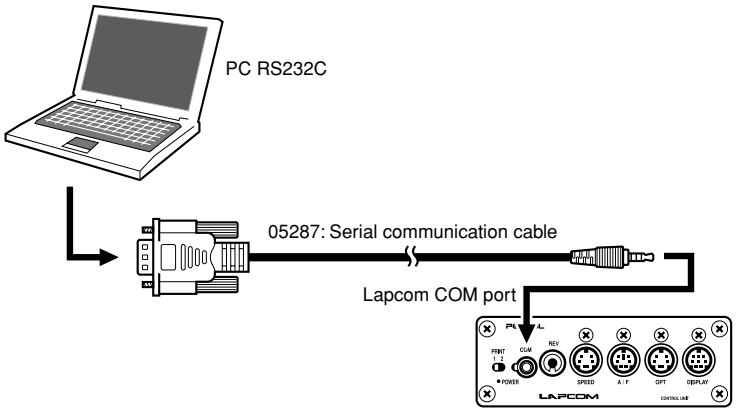
<Connecting to a PC by Cable>

By directly connecting a PC to the COM port of the control unit by cable, it is possible to establish communication for monitoring or download even from 15m (maximum) away.

Example 1



Example 2



Connecting to a PC by Radio Modem

1. Turn off the power to the control unit.

2. Connect the COM port printer cable to the COM port of the control unit.

3. Connect the other end of the COM port printer cable to the RS-232C connector of the radio modem.

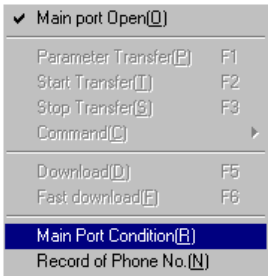
4. Connect the RS-232C ports of the PC and radio modem with a commercially available RS232C cable. Turn on the power to the modem and PC.

5. Turn on the power to the control unit.

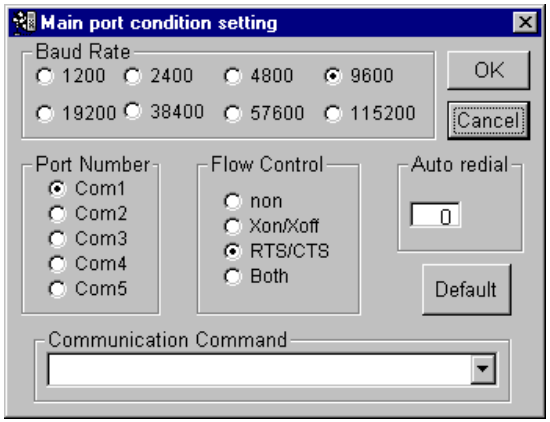
6. Start Windows.

7. Click the LAPCOM icon in Programs to start Lapcom Terminal.

8. Click Main Line Setting in the menu. Click Main Port Condition from the popup menu.

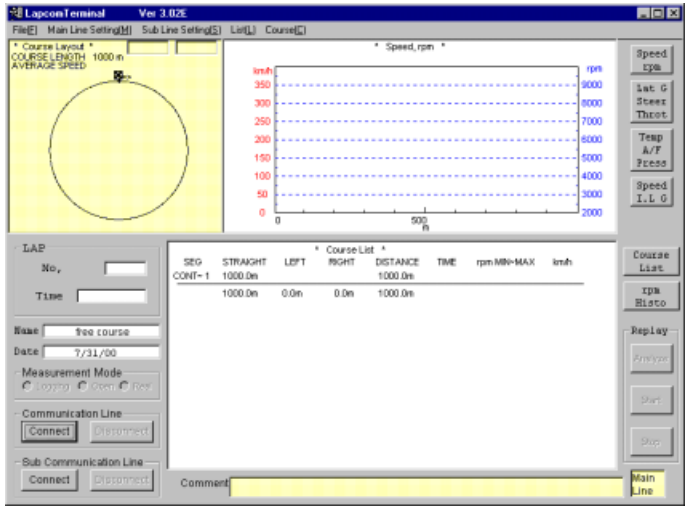


9. In the Main Port Condition Setting dialog box, select the port number (COM1 to COM5) the communication cable connects to. Set the communication command according to the modem protocol specification. Click OK.

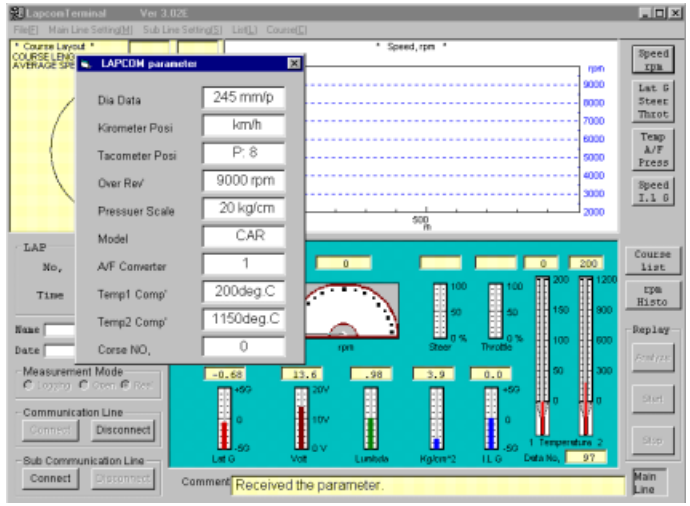


10. To transfer the data a PC has received from LAPCOM to another PC using a sub port, click Sub Line Setting in the menu. Click Sub Port Condition from the popup menu. In the Sub Port Condition Setting dialog box set each condition.

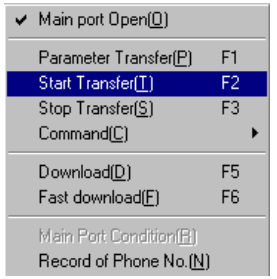
11. Click the Connect button in Communication Line. If also transferring the data to another PC, click the Connect button in Sub Communication Line.



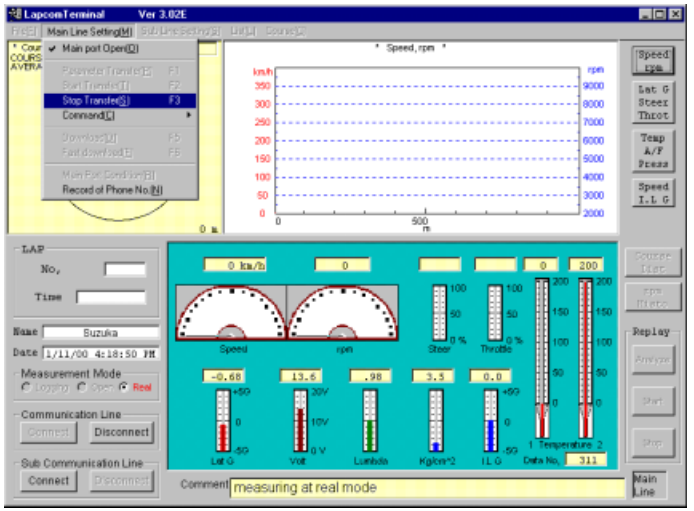
12. Click x to close the LAPCOM parameter window.



13. For the VX-2000 Hyper/Hyper Pro Plus, click Main Line Setting on the menu bar, and click Start Transfer from the popup menu to start sending real time telemetry data by LAPCOM.



14. Click Main Line Setting in the menu bar and click Stop Transfer to stop sending the data from LAPCOM.

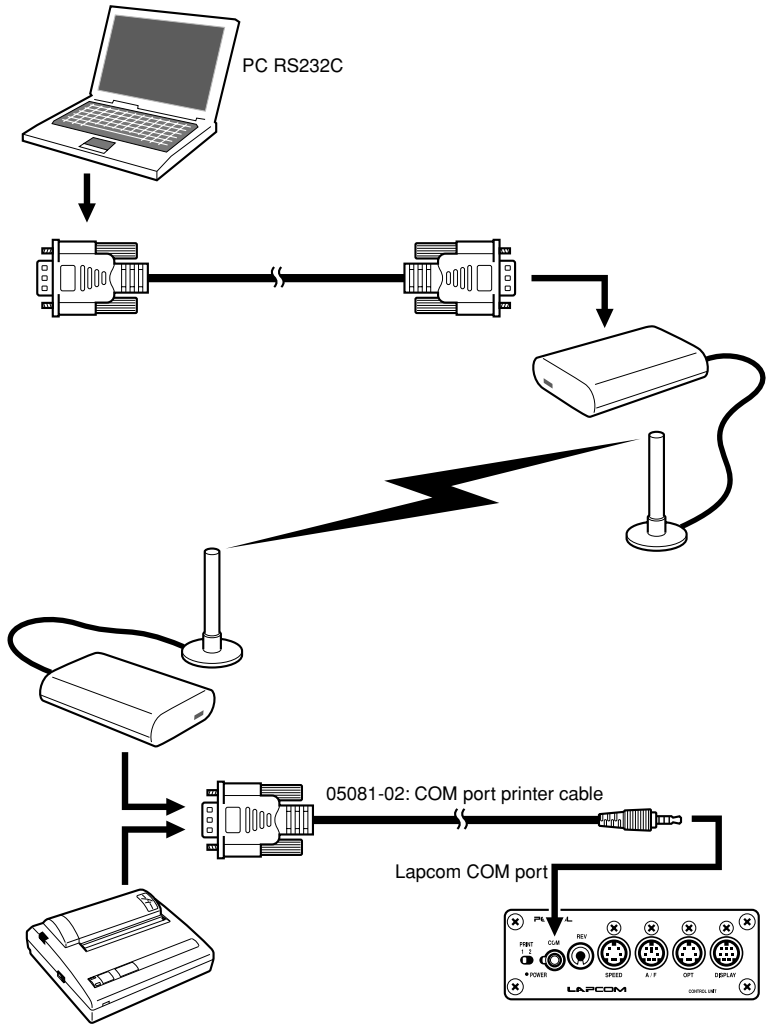


15. Click Disconnect to disconnect the line.

Note
If LAPCOM's internal battery is running low, it may cause problems with data communication. If this is the case, charge the internal battery or run LAPCOM with the external battery.

<Connecting to a PC by Radio Modem>

By connecting a PC to the COM port of the control unit by radio modem, it is possible to establish communication for telemetry or download according to the working range of the radio.



Connecting to a PC by a Mobile Communication Adapter/Modem such as a Cellular Phone

1. Turn off the power to the control unit.

2. Connect the COM port mini cable to the COM port of the control unit.

3. Connect the other end of the COM port mini cable to the RS-232C connector of the radio modem using a mobile conversion cable.

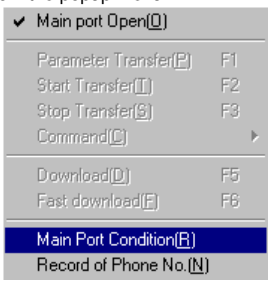
4. Connect the desired communications equipment such as a modem or adapter to the RS232C port of the PC.

5. Turn on the power to the control unit.

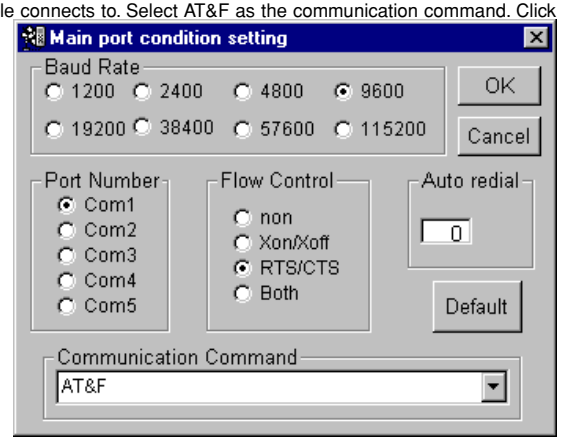
6. Start Windows.

7. Click the LAPCOM icon in Programs to start Lapcom Terminal.

8. Click Main Line Setting in the menu. Click Main Port Condition from the popup menu.

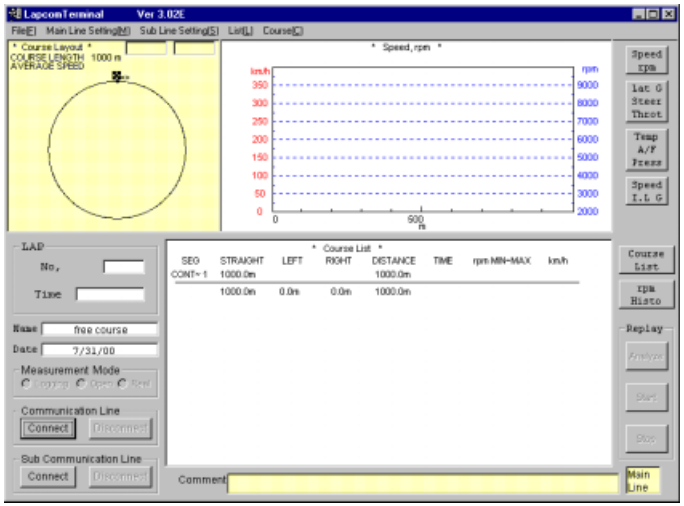


9. In the Main Port Communication Condition Setup dialog box select the port number (COM1 to COM5) the communication cable connects to. Select AT&F as the communication command. Click

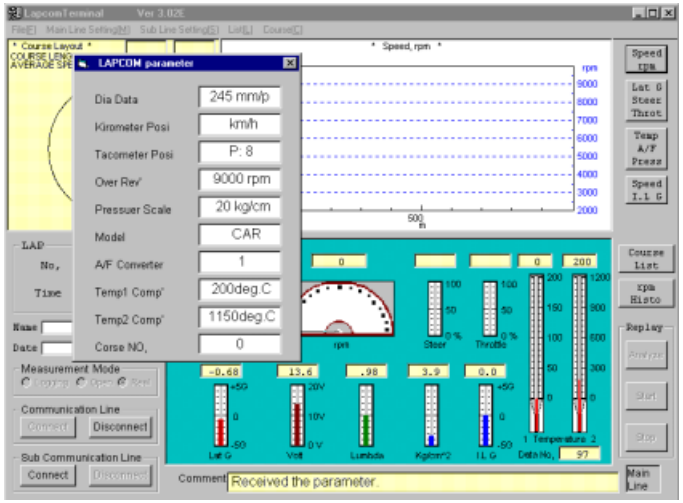


10. To transfer the data a PC has received from LAPCOM to another PC using a sub port, click Sub Line Setting in the menu. Click Sub Port Condition from the popup menu. In the Sub Port Condition Setting dialog box set each condition.

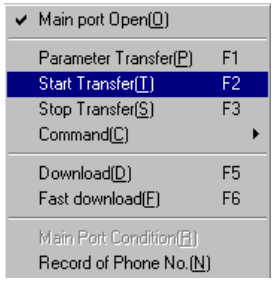
11. Click the Connect button in Communication Line. If also transferring the data to another PC, click the Connect button in Sub Communication Line.



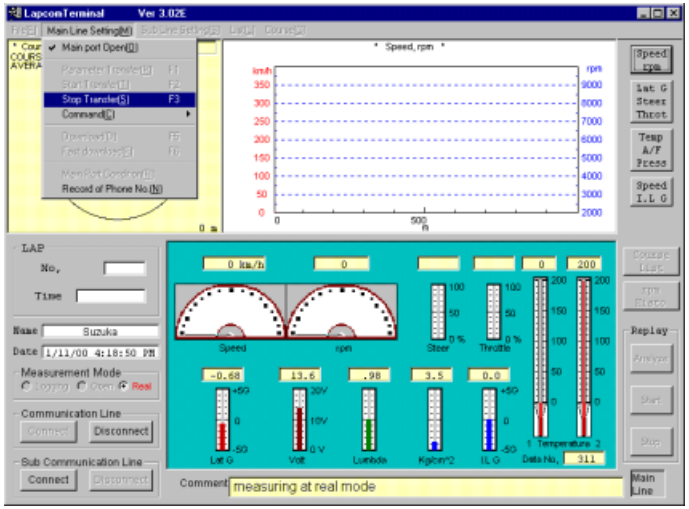
12. Click x to close the LAPCOM parameter window.



13. For the VX-2000 Hyper/Hyper Pro Plus, click Main Line Setting on the menu bar, and click Start Transfer from the popup menu to start sending real time telemetry data by LAPCOM.



14. Click Main Line Setting in the menu bar and click Stop Transfer to stop sending the data from LAPCOM.

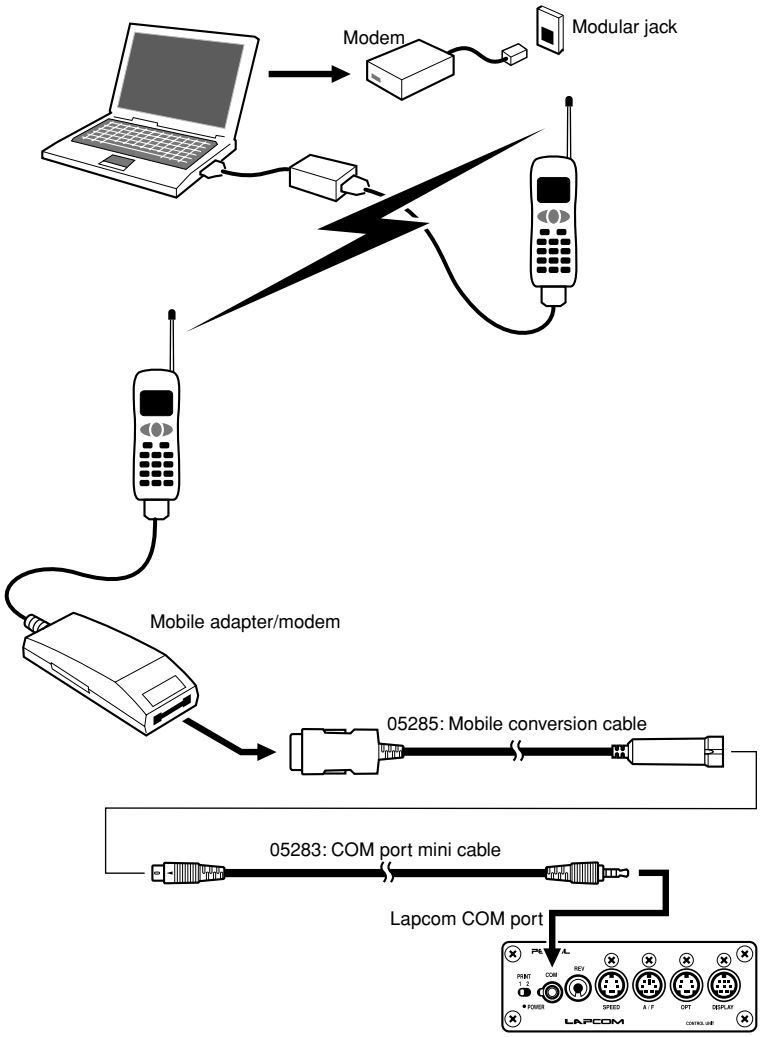


15. Click Disconnect to disconnect the line.

Note
If LAPCOM's internal battery is running low, it may cause problems with data communication. If this is the case, charge the internal battery or run LAPCOM with the external battery.

<Connecting to a PC by a Mobile Adapter/Modem such as a Cellular Phone>

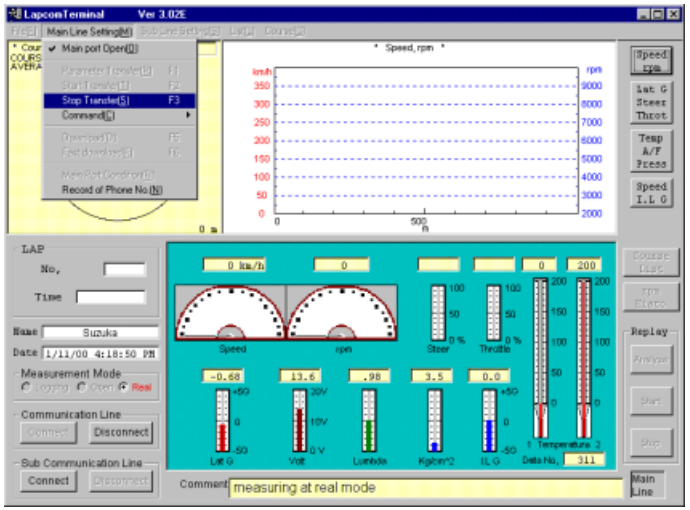
By connecting a PC to the COM port of the control unit via a phone line, it is possible to establish communication for telemetry or download.



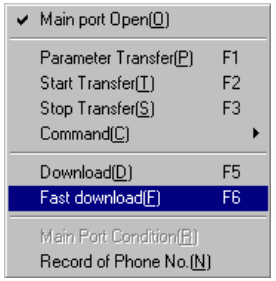
These instructions assume that the control unit is connected to Lapcom terminal. See "Data Communication" in this manual for how to connect.

How to Download Data
(Fast download is available by cable connection only)

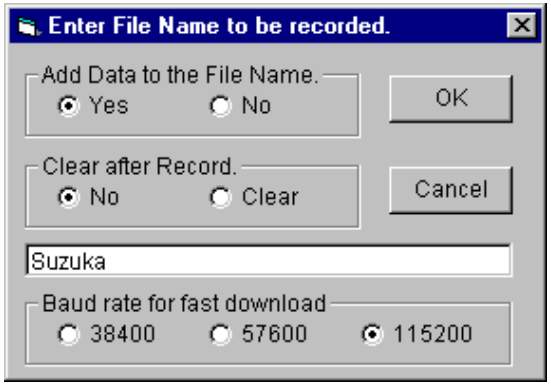
1. Click Main Line Setting on the menu bar to select Download or Fast download from the popup menu. If either cannot be selected, click Stop Transfer to stop the data transferring from the control unit, and then select again.



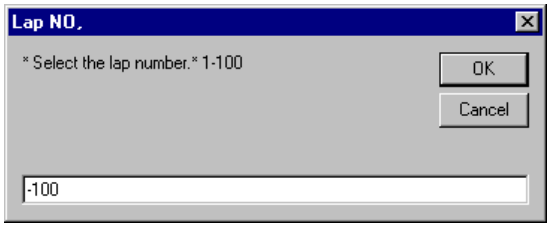
2. Click Main Line Setting on the menu bar, and click Download or Fast Download from the popup menu.



3. Select whether the date is to be included at the head of the file. Select whether the data in the control unit is to be deleted after recording the file. Enter a file name. Select a baud rate for data download. Click OK.



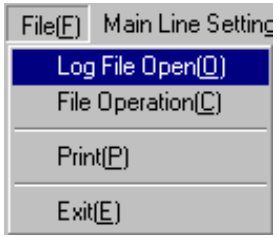
4. Enter the range of data to be downloaded from LAPCOM to the PC. Regardless of the number of stored laps, input "1-100" or "-100" to select all data.



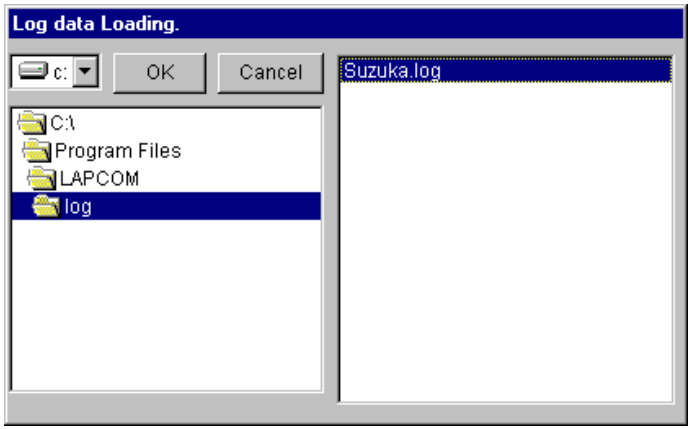
5. Click OK to start download.

How to Analyze the Data

1. Click File from the menu bar then click Log File Open from the popup menu.

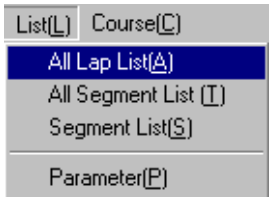


2. After selecting the file to be analyzed click OK.

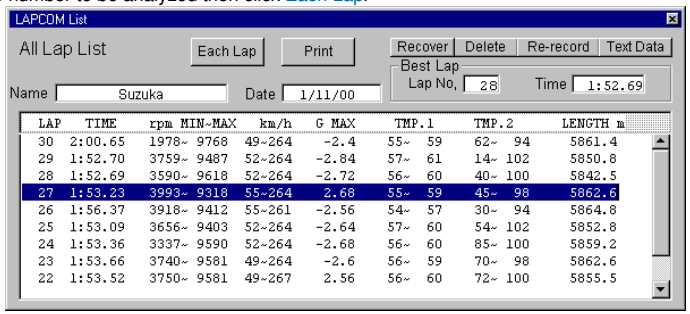


3. Click OK on the data loading end information dialog box.

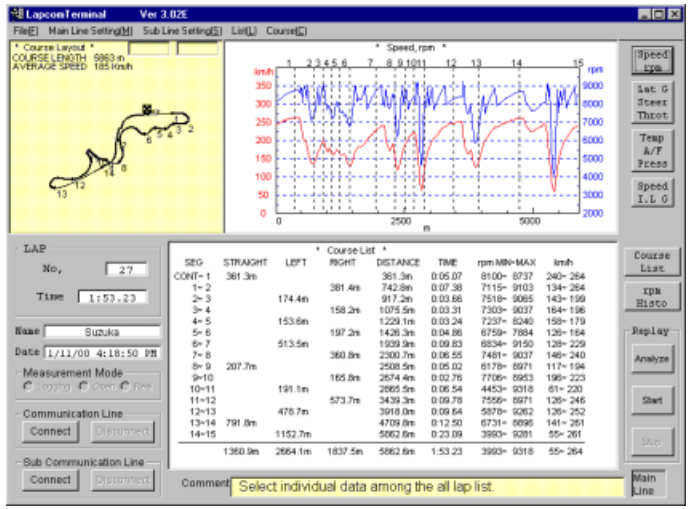
4. Click List from the menu bar then click All Lap List from the popup menu.



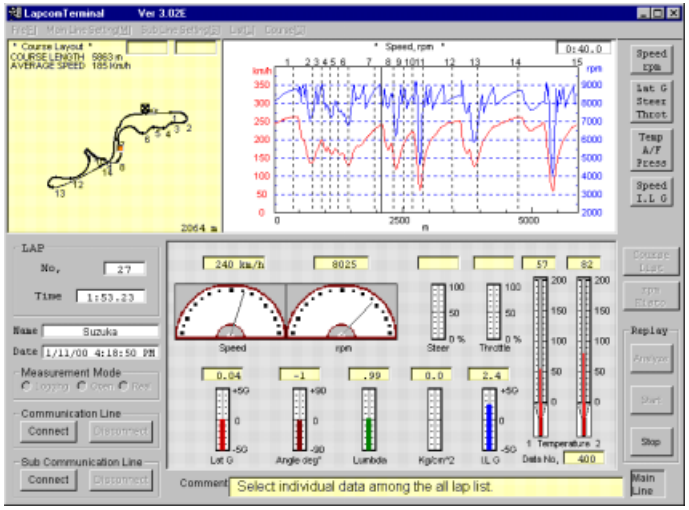
5. Select the lap number to be analyzed then click Each Lap.



6. To start simulation, click Start. To start analysis, place the cursor anywhere inside the graph. With the buttons on the upper right of the window, it is possible to display other graphs.



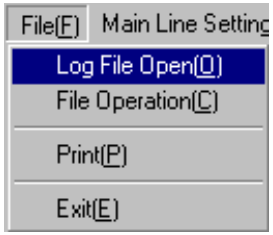
7. Place the cursor anywhere inside the graph. Using the cursor move the vertical axis laterally to the point to be analyzed.



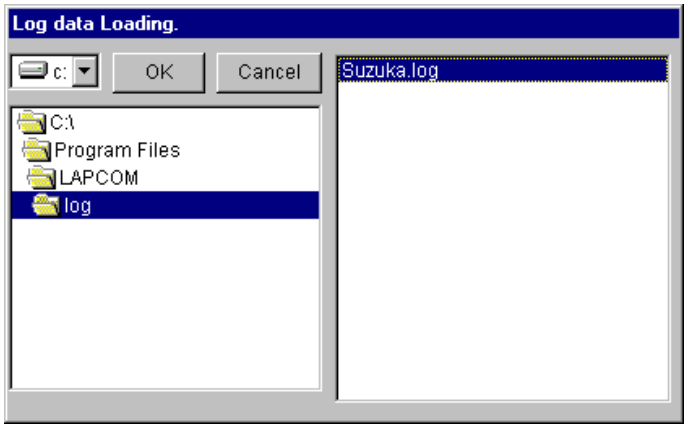
Lapcom Terminal can edit the course data obtained by the LAPCOM VX-2000 and deliver the course data to all models of LAPCOM. See "Data Communication" in this manual for how to connect.

How to Edit Course Data

1. Click File from the menu bar then click Log File Open from the popup menu.

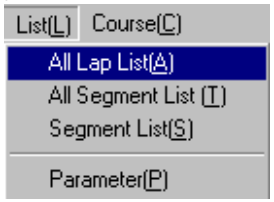


2. After selecting the file to be analyzed click OK.

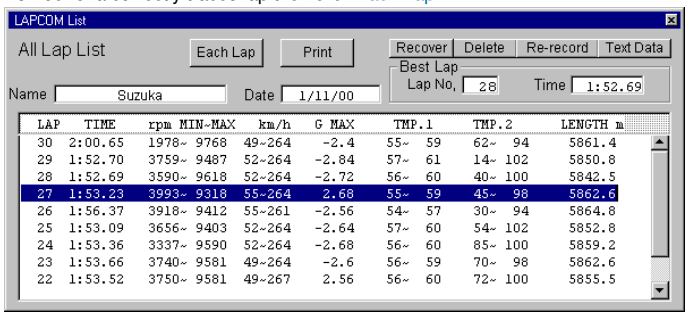


3. Click OK on the data loading end information dialog box.

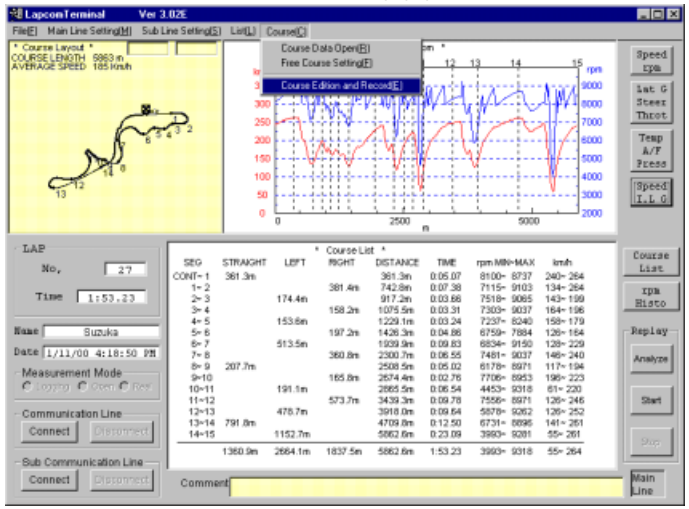
4. Click List from the menu bar then click All Lap List from the popup menu.



5. Select the lap number of a correctly traced lap then click Each Lap.



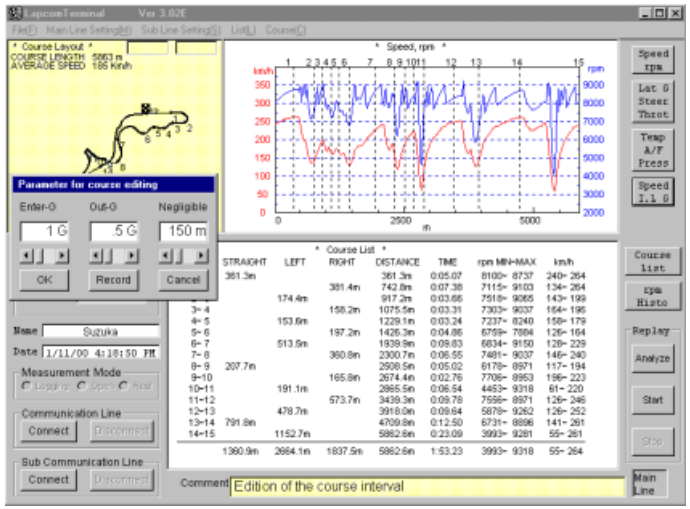
6. Click Course then click Course Edition and Record from the popup menu.



7. First, set the value for Enter-G in the parameter for courde editing box.
When the vehicle enters a corner from the straight, the point where the lateral g exceeds the set G is deemed to be the start of the corner.

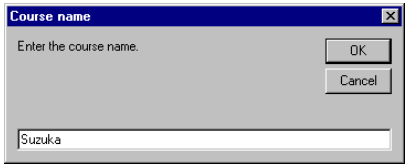
Set the value for Out-G.
When the vehicle exits the corner into the straight, the point where the lateral g falls below the set G is deemed to be the end of the corner.

Set the value of the distance to be disregarded.
This value is the distance from the start of the corner, and is for disregarding a momentary drop in G right after passing the start of the corner. Within that specified distance, even if the lateral g falls below the Out G value, it is not judged as the end of the corner.



8. Click OK to execute the edit. If re-editing, repeat from operation 7.
The maximum number of segments is 15.

9. After editing is completed, click Record. Enter a course name then click OK.

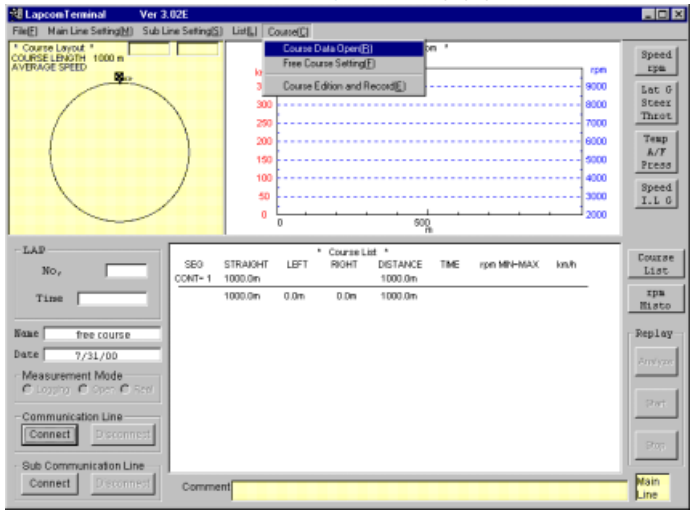


How to Record Course Data into LAPCOM

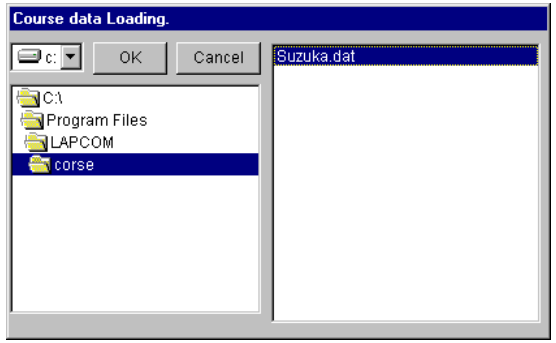
LAPCOM's internal memory (all models) can record data for a maximum of 10 courses.
Once the course number has been called up, it is possible to measure segment data for that course.
Because the course data edited by Lapcom Terminal can be transferred to all models of LAPCOM VX, it is possible to measure the data of all vehicles in the same team under the same conditions.
See page 46, "How to Measure Segment Data by Dividing a Course between Straights and Corners" for details.

1. To transfer the course data to LAPCOM, read through "Data Communication" and using Lapcom Terminal, connect LAPCOM to a PC with a cable or communication line.

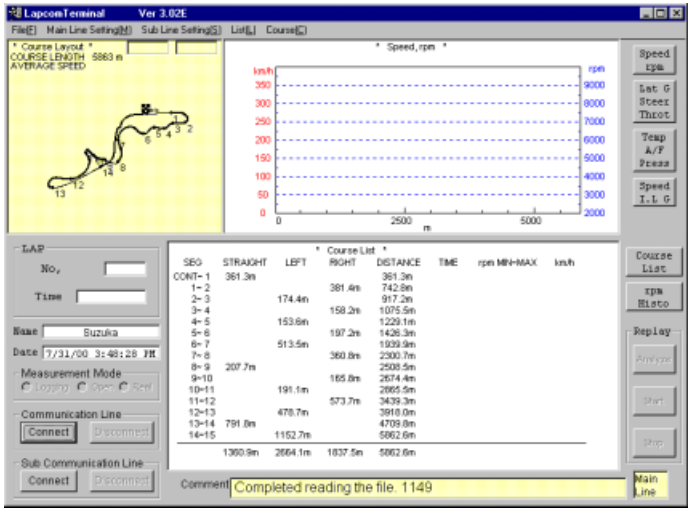
2. Click Course from the menu bar. Click Course Data Open from the popup menu.



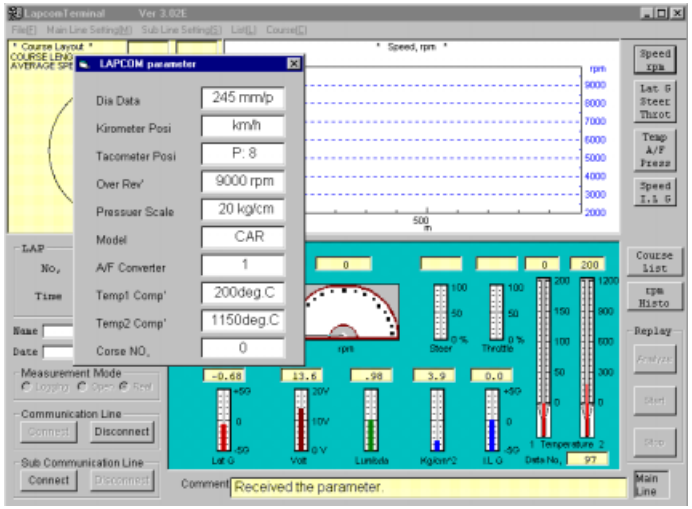
3. After selecting the desired course data, click OK.



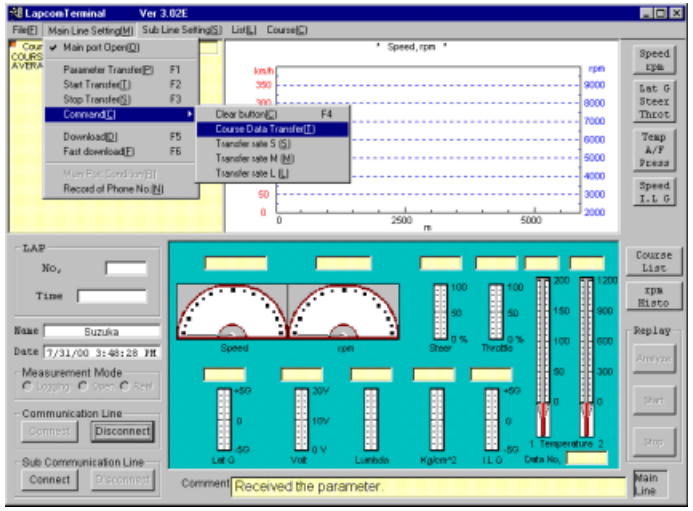
4. Click the Connect button in Communication Line.



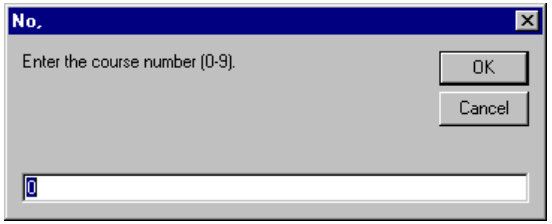
5. Click x to close the LAPCOM parameter window.



6. Click Main Line Setting from the menu bar then select Command from the popup menu. If it cannot be selected, press F3 or select Stop transfer from the popup menu.
Then click Course Data Transfer.

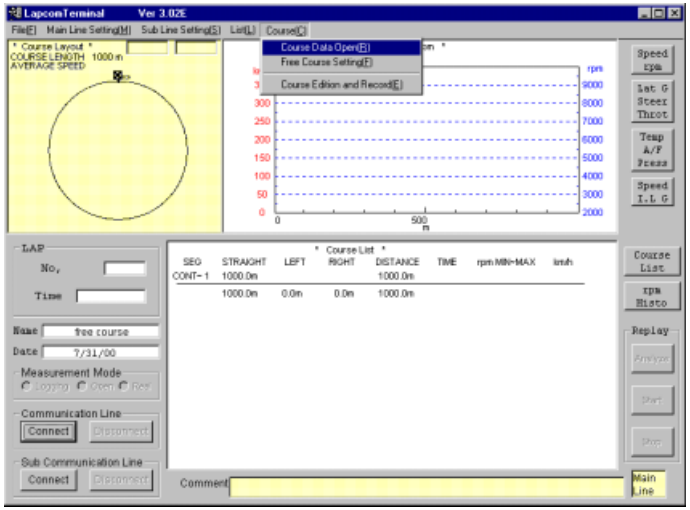


7. Enter the course number, 0 to 9, to be recorded in LAPCOM. If entering a previously recorded number delete the course data and update with the new data. Click OK to transfer the course data.

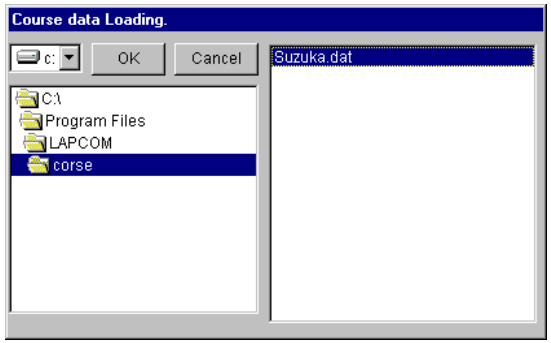


These instructions assume that LAPCOM VX-2000 Hyper Pro/Hyper Pro Plus is connected to Lapcom Terminal.

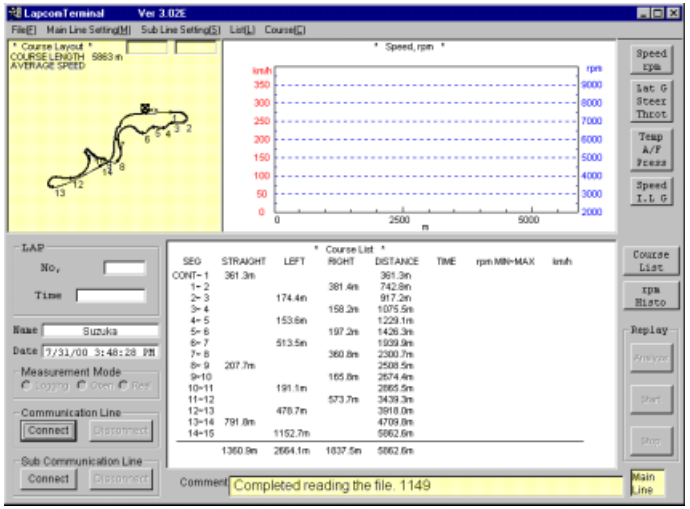
1. Click Course from the menu bar. Click Course Data Open from the popup menu.



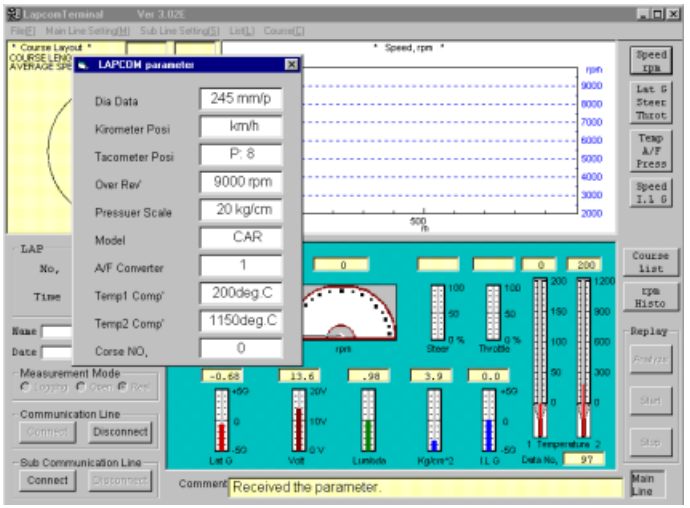
2. After selecting the desired course data, click OK.



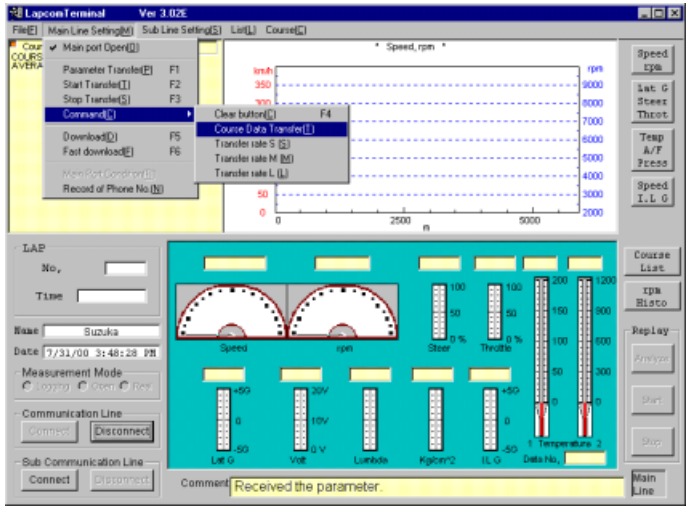
3. Click the Connect button in Communication Line.



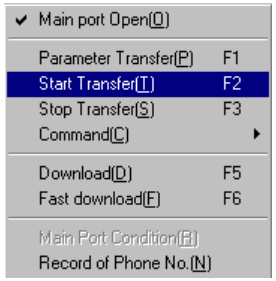
4. Click x to close the LAPCOM parameter window.



5. If the course data has not been transferred to LAPCOM, click Main Line Setting from the menu bar then select Command from the popup menu. If it cannot be selected, press F3 or select Stop Transfer from the popup menu. Then click Course Data Transfer.



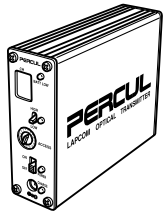
6. Click Main Line Setting on the menu bar then click Start Transfer from the popup menu to start sending data by LAPCOM. Click Stop Transfer to stop sending the data from LAPCOM.



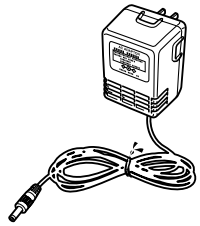
7. Click Disconnect to disconnect the line.

Products at a Glance

The following 2 items are included.



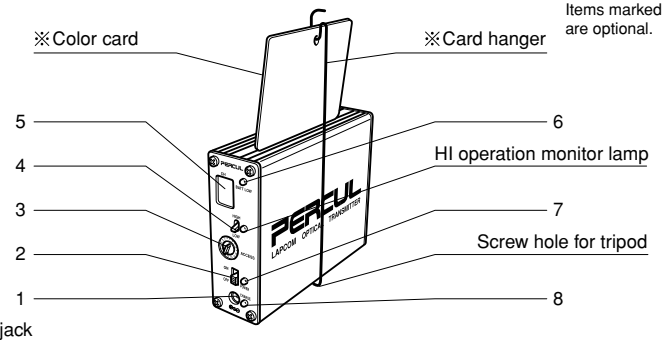
Transmitter



AC adapter

Parts

Items marked with ※ are optional.



1. Charging jack
   This jack is for connecting the AC adapter when charging the internal battery.

2. Power switch
   This switch is for turning on/off the power to the transmitter.

3. Address switch for ch selection
   This switch is for selecting the channel.

4. Hi-Lo switch
   This switch is for switching the signal coverage from the transmitter. Lo is about 20m and Hi is about 30m.

5. CH monitor
   The selected channel flashes on the monitor.

6. Battery low lamp
   This lamp lights up when the battery is running low.

7. Power lamp
   This lamp lights up when the power is on.

8. Charging monitor lamp
   This lamp lights up when charging the internal battery with the AC adapter.

Charging with the AC adapter

1. Confirm that power is OFF.

2. Insert the DC plug of the AC adapter into the charging jack of the transmitter.

3. Plug the AC adapter into a power outlet and leave for about 5 hours.

Caution
Observe the directions below to maintain battery quality.
· Do not charge the battery continuously for more than 5 hours.
· Charge the battery within the temperature range 5°C to 40°C.

A fully-charged battery is capable of running for approximately 12 hours in Lo mode and 8 hours in Hi mode.
When the battery starts to run low during operation, the battery low lamp lights up and the transmitter will soon stop functioning. When this occurs turn the power switch OFF before charging. If it is left ON, it causes the battery to quickly discharge thereby reducing its life.
Charge the battery before first using this device or if it has not been used for some time.

Selection of the Transmitting Code

1. Confirm the power switch is OFF.

2. To change channel, use the address switch. For measuring lap time, a transmitter is capable of sending infrared rays to any vehicle on the course equipped with a control unit that has the corresponding channel setting. If more than one transmitter with the same CH setting is on the same course, the transmitters will not measure lap time but segment time. Where several transmitters are used on a course, use different channels to identify teams or stop using multiple transmitters and use the channel setting for a single transmitter that has already been set for the course.

Caution
If several transmitters are used on the same course, it may cause confusion. To identify each team's channel, use of the color cards (optional) to distinguish channels, as shown below, is recommended.

CH	Color	CH	Color
0	white	A	light blue
1	gray	B	green
2	black	C	light green
3	dark brown	D	yellow
4	reddish brown	E	orange
5	tan	F	red
6	flesh colored		
7	pink		
8	purple		
9	blue		

Installing

1. To secure the transmitter, together with a card hanger (optional), on a tripod, use the screw holes on the bottom.

2. Use each color card according to the channel to be used.

3. LAPCOM is programmed to start when a sensor enters a receiving zone. Place the transmitter at 90˚ to the line of the course.

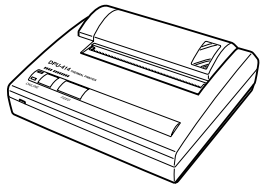
4. Infrared rays can reach as far as 20m in Lo mode and 30m in Hi mode.
Choose the desired mode according to the prevailing course setup.

5. If it is necessary to use this device in the rain, place it inside a plastic bag to prevent it getting wet.

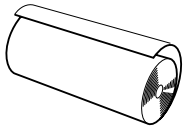
Caution
Although this device should not affect any automatic measuring device that may be used on the course, it is still recommended to place it at least 20 meters away from the control line.
When a transmitter is already being used, confirm its channel and place additional transmitters approximately 5 meters apart.
Place the transmitter at least several meters away from the line where vehicles pass. If it is placed too close to the line, measurement may fail.
If the transmitter is to be used to measure lap time, avoid placing it at the end of the straight. Locate it at a point where the vehicle can continue along the straight for more than one second after passing the transmitter.

Products at a Glance

· The following 2 items are included in the standard system.

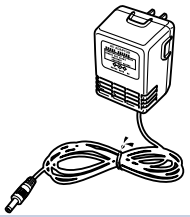


Printer

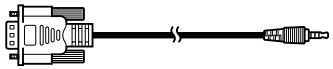


Paper roll

· Optional parts

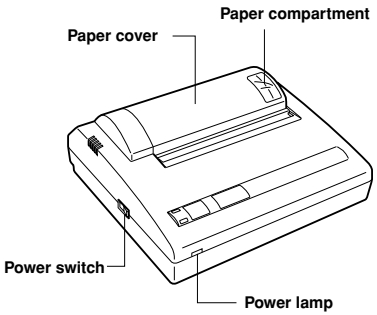


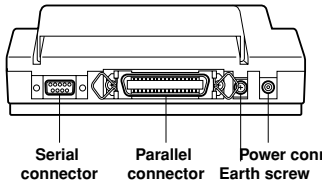
AC adapter
This is the same adapter that is included with the LAPCOM unit.



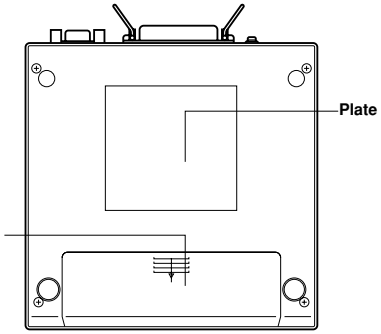
COM port printer cable

Parts



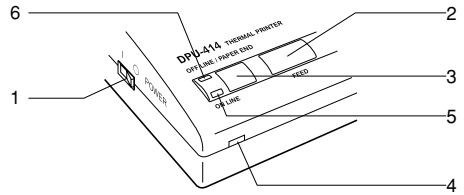


Back



Bottom

Operating Panel



1. Power switch
   Move this switch to ON to activate the power. Initial setting is on-line.

2. Paper feed switch
   Press this switch to feed the paper. It also operates when the printer is off-line.

3. On-line switch
   Press this switch to toggle between on-line and off-line.

4. Power lamp
   This lamp lights up when the power is on. It flashes once per second when the battery is charging. It flashes once every half second when the battery is running low.

5. On-line lamp
   This lamp lights when the printer is on-line. It flashes if data remains in buffer memory when off-line.

6. Off-line lamp
   This lamp lights up when the printer is off-line. It flashes when paper has not been correctly set or has run out. When an error occurs, both the on-line and off-line lamps light up.

Caution
When turning the power switch OFF, confirm that the printer head returns to the rest position on the extreme left. If it does not return to the rest position and remains that way

Note
On-line: Set on-line when printing by LAPCOM.
Off-line: Set off-line when feeding paper with the paper feed switch or to stop printing. It is not possible to enter data and function codes from LAPCOM when the printer is off-line.

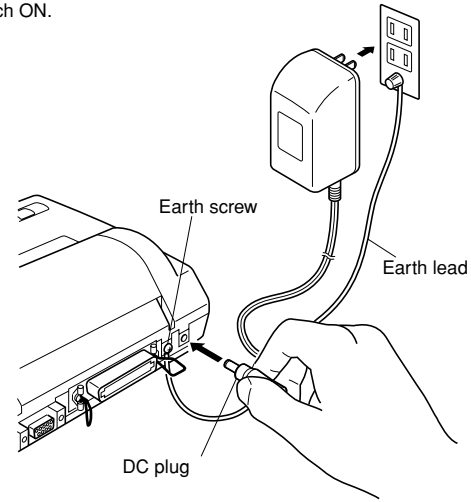
Connecting the AC adapter

1. Turn the power switch OFF.

2. Insert the DC plug of the AC adapter into the power connector of the printer.

3. Plug the AC adapter into a power outlet.

4. Turn the power switch ON.



Caution
Use only the AC adapter provided.
Connect the earth screw and the power outlet's earth jack with an earth lead.
Do not touch the tip of the DC plug or the power connector.
When unplugging the AC adapter, first turn the power switch OFF. Remove the AC adapter and then the DC plug.

Charging

1. Turn the power switch OFF.

2. Connect the AC adapter. The power lamp flashes every second and charging starts. In about 10 hours the power lamp will go out indicating that charging has finished.

3. When charging has finished remove the AC adapter.

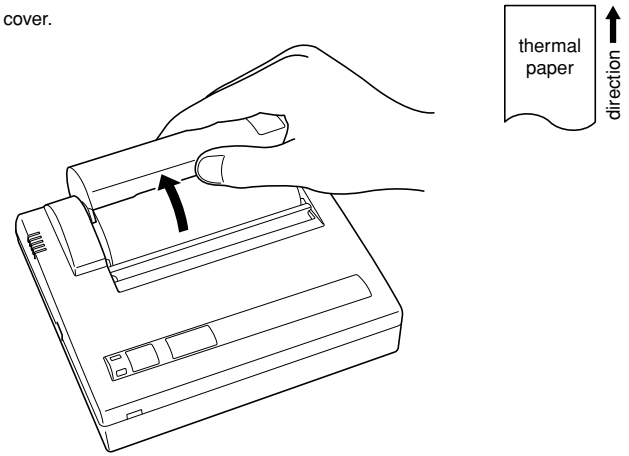
Caution
Charge the battery within the temperature range 5°C to 40°C. Charging outside this temperature range may cause a deterioration of battery quality.

How to Set the Paper

1. Turn the power switch ON.

2. Cut the leading edge of the paper straight.

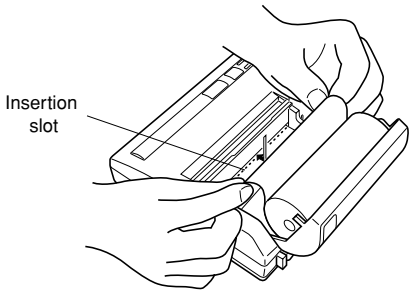
3. Open the paper cover.



4. Insert the leading edge into the paper insertion slot. The paper feeds automatically and will protrude from the outlet slot (about 10cm). (Auto-loading function.)

Caution
Avoid any place where the paper is in direct sunlight. Store it in the shade.

Note
Resting the paper roll on the inside of the paper cover makes setting of the paper easier.The outside part of the thermal paper is the printing surface. Insert the leading edge as illustrated below.



5. If the paper does not feed or exit correctly, continue pressing the paper feed switch until it feeds through smoothly in a straight line.

Note
When the paper is being set the off-line lamp stops flashing and lights up.
When the paper nears the end of the roll, red lines printed on both edges appear as a warning.

How to Set the Dip Switches

Dip switches (DIP SW) determine the printer's initial setup and input method. See the tables on the next page for the DIP SW settings.

1. Turn the power switch OFF.

2. To print the current settings hold down the on-line switch and turn the power switch ON. Release after printing starts.

3. When printing finishes, the following appears: "Continue?: Push 'On-line SW', Write?: Push 'Paper feed SW'". If changing the setting, push On-line SW (continue to operation 4). If not, push Paper feed SW (continue to operation 5).

4. If the On-line SW is pressed DIP SW-1, which indicates the function setting input state, prints out. Set DIP SW in order from switch number 1 to 8.

Caution
Set ON/OFF in order from switch number 1 to 8. Do not stop partway.
When setting ON, push On-line SW once. When setting OFF, push Paper feed SW once.
Every time On-line SW or Paper feed SW is pressed the setting that has been entered prints out, providing confirmation of the setting.
After setting SW number 8, return to operation 3.
Set DIP SW-2 and DIP SW-3 in the same way.

Note
When pushing On-line SW, the off-line lamp flashes once. When pushing Paper feed SW, the on-line lamp flashes once.

5. When the Paper feed SW is pushed the on-line and off-line lamps alternately flash to indicate the new settings are being written to the internal memory. "Dip SW setting complete!!" prints out and the printer enters on-line status.

Caution
If the Paper feed SW is pressed after printing the current function settings, the settings will not be changed.

6. After setting SW number 8 of Dip SW-3, push either On-line SW or Paper feed SW to complete setting.

Caution
While the setting is being written to memory, do not turn off the power.
Turn off the power after "Dip SW setting complete!!" prints out.

Setting for the LAPCOM VX-2000 series (9600bps)

	DIP SW-1
1	OFF
2	ON
3	ON
4	ON
5	ON
6	OFF
7	ON
8	ON

	DIP SW-2
1	OFF
2	ON
3	ON
4	ON
5	ON
6	ON
7	ON
8	ON

	DIP SW-3
1	ON
2	ON
3	ON
4	ON
5	OFF
6	ON
7	ON
8	ON (9600bps)

Caution
The settings above assume the baud rate for the LAPCOM VX-2000 is set to 9600bps (default).
By changing SW number 8 of DIP SW-3 from ON to OFF, it is possible to change the printer's baud rate to 19200bps (max). If making this change, use the printer after changing LAPCOM's baud rate to 19200bps.

Even though the baud rate has increased, the printing speed does not change.

PERCUL CO.,LTD.
2217, HIGASHIKATA,
MATSUYAMA,
EHIME, 791-1123 JAPAN
Phone:+81-89-963-3301
FAX: +81-89-963-1308
URL http://www.percul.co.jp