

# Drogger



## Hardware Manual v1.2.19

This manual is subject to change for better content.

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## Notes

Please follow the notes below for safe use and installation.

To install Drogger requires expert knowledge of the vehicle. Do not work if you do not have knowledge.



- *Turn off the main switch of the vehicle and stop the engine before installation.*
- *For vehicles with a battery, remove the battery terminal so that the battery voltage does not reach the vehicle.*
- *If the engine and muffler are hot, please work after cooling down to avoid burns.*
- *Turn off Drogger power supply (do not connect power cable) while installation.*
- *Make sure to connect and disconnect the connectors other than the power connector in the state that power is turned off.*
- *Drogger is only for racing. Please do not use in public roads.*
- *Be sure to fix the cables by tie wrap etc. and wire them avoiding sharp metal or high temperature things.*
- *Cover the unused connectors that main unit with the waterproof cap included.*
- *Although the connectors are waterproof, but waterproofness may be impaired by cable bending, oil, chemicals, aged deterioration, etc. Please check as necessary.*
- *We are not responsible for any damage or breakdown of vehicles or equipment caused by installation defects or mistakes of connection, accidents accompanying them, etc. You are responsible for them.*

## Prevent Ignition noise

Ignition noise causes malfunction not only in Drogger but also in ECUs, sub-computers, digital CDI, etc. In some cases even with analog CDI, it may affect the threshold and it may not operate as designed.

In general commercial vehicles, various noise countermeasures are taken to prevent malfunction of electrical components.

For racing vehicles, there is a tendency to be generous to electrical noise. However, it is indispensable for accurate operation, so please fully understand the following points and inspect and deal with it.

Ignition noise is rarely a problem if the following points are securely observed.

- Always use either a spark plug or a plug cap **with resistor**.
- Clean or replace the plug insulator if it is dirty or cracked.
- Replace plug cap and plug terminal, if there is wear or gap between them.
- Replace the plug cap, ignition cable, ignition coil which have cracks, deterioration, etc.

- Repair or replace the primary side wiring and the ignition coil if there is deterioration, cover breakage etc.
- Cover the primary side wiring and the ignition coil connection part with an insulating tube, a cap, or the like.
- Remove all unnecessary branch cables on the primary wiring.
- Connection and relay of the primary side wiring is performed surely by soldering or the like by connector. (It is not possible to just twist it by hand.)
- **Do not place other cables near the ignition cable.** (Including cables that can be energized such as throttle wire and clutch cable.)



*If there are other wires near the ignition cable, it becomes an antenna and radiates electromagnetic waves. This is not limited to Drogger cables. Please remove other cables from the ignition cable, if possible, by 10 cm or more.*

## Main unit revisions

The main unit has a production revision. Depending on the revision, there are things with different harnesses and adapters. The revisions are as follows.

| Revisions   | Ship date               | Bluetooth name | App display |
|-------------|-------------------------|----------------|-------------|
| <b>Rev1</b> | ~ 2017/11/30            | DROGGER-002    | Ver 6.32    |
| <b>Rev2</b> | 2017/12/20 ~ 2018/02/12 | DROGGER-003    | Ver 6.33    |
| <b>Rev3</b> | 2018/02/13 ~            | DROGGER-003    | Ver 6.34    |

If the Bluetooth name is different, there is a difference in the main circuit. Please note that harnesses and allowable voltages etc are different.

For different application display versions, the internal firmware (software) is different. There are sampling cycles and maximum capacity differ. Firmware can be updated at a fee. Please contact us if you wish.

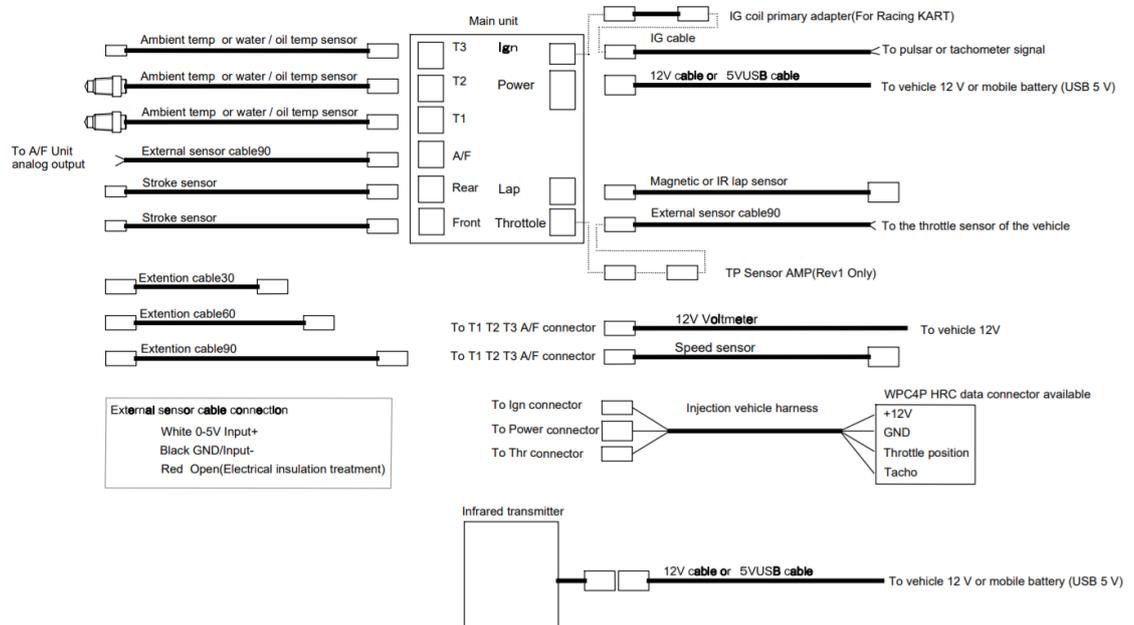
## Use of Injection vehicle harness or HRC data connector harness

Injection vehicle harness and HRC data connector harness is equipped with three connectors of power supply, Ign, throttle position.

For installation when using these harnesses, please see the section on the harness for injection car, not the individual connection method.

## Connection configuration

Drogger Connection configuration diagram



## Bluetooth pairing and Main unit

### Bluetooth pairing

Pair the Bluetooth before attaching the main unit.

- Connect the 5V USB cable to the power connector on the main unit.
- Connect the USB connector to the USB connector of a PC or USB mobile battery (mobile charger for smartphone).
- Make sure the blue LED on the main unit is blinking.
- Open Android's [Settings] - [Bluetooth] and tap [Find Device] or [Update].
- When **DROGGER-0xx** appears in [Available Devices], tap it to start pairing.
- When "Are you pairing DROGGER-0xx?" appears, tap [Pair setup].
- If **DROGGER-0xx** is displayed in the list of [Paired Devices], it is completed.



- *It is not possible to pair multiple Drogger with one android.*
- *If you replace the main unit, first remove the previous pairing and restart Bluetooth before new pairing.*
- *The first pairing may fail depending on the Android device and circumstances. In that case please tap **DROGGER-0xx** again and start pairing again.*

- *The above procedure is written in Android 6.0. In other versions the notation may be different.*

## Status LED

The main unit has a blue LED. The LED states and meanings are shown below:

| LED           | Status  |
|---------------|---|
| Off           | Power OFF   |
| Quickly blink | Power ON, Unit initializing (Only after power ON) |
| Slow blink    | Power ON, Bluetooth disconnected                  |
| Lighting up   | Power ON, Bluetooth connected                     |

## Mounting to the vehicle

Fix the main unit firmly to the back side of the meter panel etc. using double sided tape and tie wrap etc. Please attach the connector with facing down so that water will not accumulate in the connector.



*The main unit and Android communicate by Bluetooth. Since Bluetooth is a weak radio wave, it is possible to perform stable communication if it is as close as possible.*



*Make sure that the tie wrap does not press the connector.*

## Waterproof cap

Dummy connectors for waterproofing are inserted in connectors other than Power, Ign, and Lap. Remove it when attaching the sensor.

Be sure to insert this waterproof cap for unused connectors.



- *Please insert and remove the connector by hand. Using tools, may cause damage.*

## Injection vehicle harness

Injection vehicle harness and HRC data connector harness is equipped with three connectors of power supply, Ign, throttle position.

The number of pins is different from 2 pins 4 pins 3 pins. Connect 2 pin to Ign, 4 pin to Power, 3 pin to Thr and the corresponding connector of the main unit while confirming the pin number.



*If the signal from the ECU to the tachometer is not a 5 to 12 V pulse signal (eg CAN etc.), it is not possible to take a Tacho signal from the ECU. In case of such a vehicle, please do not use harness for injection vehicle harness please take Tacho signal from crankshaft position sensor using IG cable.*

*Connect to the power supply and the throttle position sensor individually using 12 V cable and external sensor cable 90 respectively.*

### Injection vehicle harness

Connect the WPC 4P connector of the harness to the DATA LOGGER connector of the vehicle. Please check with the vehicle service manual etc. which is the DATA LOGGER connector.

### HRC data connector harness

In advance, confirm the +12V · GND · Throttlole Position · Tacho signal line of the ECU input / output in the wiring diagram of the vehicle.

Please refer to the following blog on how to check ECU signal line.

<http://drogger.hatenadiary.jp/entry/SPIJC>

(You can access by reading the right QR code)



To each signal line, connect the corresponding line while looking at the label written on the harness.

In addition, when using these harnesses, power supply, Ign, throttle position are already connected. Please skip the individual connection explanation.



*Connection requires wiring knowledge and skill. We recommend that you ask the experts.*



- *The Tacho signal is limited to a pulse signal of 5 to 12 V from the ECU to the tachometer. Do not connect to the primary side signal to the ignition coil.*

## Power supply

Connect either 5V USB cable or 12V cable to the power connector.

### 5V power supply

When using a 5V USB cable, please connect to a power supply controlled accurately to DC 5.0V. (Ex: mobile battery for smartphone.)



- *Depending on the mobile battery, the output may stop after a few minutes because the power consumption of this unit is low. Please confirm whether you can continue to use before actually driving.*
- *USB side of 5V USB cable connector is not waterproof. Take waterproof measures together with your mobile battery.*
- *Please fix the mobile battery firmly to the vehicle. Fix the connected 5V USB cable with tie wrap etc. so as not to shake by vibration.*

### 12V power supply

The main unit has a built-in regulator corresponding to the voltage from 8V DC to 25V DC. If the vehicle has 12V power supply, you can use the 12V cable to power it. Connect 12V cable and the vehicle as follows.

| Cable color                           | Connect to  |
|---------------------------------------|-------------|
| Gray (white / black in some versions) | +12V        |
| Black                                 | Ground wire |



- *Max voltage of Rev1 is 14V. Do not connect to vehicles or batteries whose voltage exceeds 14V. The power supply circuit of the main unit may be damaged.*

## IG cable (engine pulse signal)

Connect the IG cable to Ign connector on the main unit.

The other side connects to the rotation signal of the engine, either a tachometer signal (12V) or a pickup signal. (It cannot be connected by winding on an ignition cable etc.)

Tachometer signals are limited to those whose voltage is 12V or higher. For 5 V - 12 V, please use Injection vehicle harness. (HRC genuine tachometer is 12V signal.)

Connect NSR / NSF 100 (for CDI without tachometer signal) to pickup signal (blue / yellow) line.

Known connections for each vehicle are released to the product site.

Please check if there is a corresponding vehicle.

<https://www.bizstation.jp/en/drogger/?tab=support>

(You can access by reading the right QR code)



Connect as follows:

| Cable color | Connect to |
|-------------|------------|
|-------------|------------|

|                                       |                           |
|---------------------------------------|---------------------------|
| Gray (white / black in some versions) | Plus side, Pulse signal + |
| Black                                 | Minus, Ground wire        |

The pickup signal (crankshaft position sensor CKP) has different number of pulses per revolution depending on the vehicle. The number of pulses is the number of protrusions of the object (rotor, etc.) of the sensor.

The maximum number that can be handled depends on the revision of the firmware. Please check the revisions that the target vehicle can handle. Firmware can be updated for a fee. Please contact us if you wish.

| Revision      | Maximum number of pulses per revolution |
|---------------|---|
| Rev1 Rev2     | 12                                      |
| Rev3 or later | 36                                      |



*When connecting to the primary side of the ignition coil, be sure to use the IG coil primary adapter. If not used, the voltage will be high and the circuit will be damaged. Do not connect to a special ignition device where the pickup signal voltage is extremely high. It may be damaged.*

## Magnetic LAP sensor

The magnetic LAP sensor measures LAP time by detecting that the vehicle has passed over the magnet embedded in the course.

Connect to Lap connector on the main unit.



*The sensor is molded with special resin. Never use solvents such as alcohol, gasoline, thinner, etc. for cleaning. The sensor may be damaged.*

## Mounting to the vehicle

In order to detect the magnet embedded in the course, please attach it as close as possible to the road surface. (About 20cm or less.)

Attach the sensor so that the surface marked with Drogger faces downward and is parallel to the road surface. At this time, make sure that the cable outlet is perpendicular to the traveling direction.

If the sensor and the main unit are separated and the cable does not reach, use an extension cable (30cm / 60cm / 90cm).



*Magnetic sensor is very sensitive. If there is a magnetized thing near the mounting part, malfunction may be caused. If possible, please install it in a position away from other magnetism things.*

*When installing it in the under cowl, in case of rain, remove the water drain cap of the cowl so that water drain in the cowl. If it submerges, the sensitivity adjustment terminal may short-circuit and be damaged.*

### Sensitivity adjustment

The sensitivity is adjusted to the proper value at the time of shipment. However, in order to respond to situations that we could not grasp in the test, you can adjust the sensitivity. For adjustment, a digital tester capable of accurately measuring millivolts and a precision minus driver (width 2mm) are required.

- Peel off the aluminum tape stuck on the opposite side of the Drogger mark of the magnetic LAP sensor. (Semi fixed volume will be adjustable.)
- Turn on the main unit and connect the magnetic LAP sensor to Lap connector.
- Measure the voltage of the two test electrodes of the magnetic LAP sensor. (Minus one closer to cable outlet.)
- Adjust by rotating the semi-fixed volume with a minus driver in the range of 20mV around the reference voltage 80mV. Increasing the voltage makes it insensitive, lower it makes it more sensitive.

Aluminum tapes are stuck to prevent contamination of semi-fixed volume and to indicate adjusted. We recommend that you stick the tape again after adjustment.



*Normally this adjustment is not necessary.*

## Water / oil temperature sensor, temperature sensor

The water / oil temperature sensor has 1/8PT adapter. There is no adapter in the temperature sensor.

Both of them are connected to one of T1, T2 or T3 connectors on the main unit. You can specify sensors type with Android app.

If you do not need water temperature on air cooling vehicle, you can install two temperature sensors instead.

If the sensor and the main unit are separated and the cable does not reach, use an extension cable (30cm / 60cm / 90cm).

### Mounting to the vehicle

Install the water / oil temperature sensor on 1/8 PT female screw. If there is no 1/8 PT internal threads on the vehicle side, please use commercially available mounting adapter etc.

Use such as seal tape to prevent leakage of water / oil.

Paste the temperature sensor with tapes to the part to measure.



*After installation, please make sure that there is no water or oil leak.*

*Also, please attention so that fragments of seal tape do not get mixed in the flow path.*

## Stroke sensor

The stroke sensor measures the movement of the suspension. Measure the distance that changes within the movement of the suspension, such as between the vehicle body and the top of the tire, the vehicle body and the top of the fender, with non-contact. In order to install, you need a bracket according to the vehicle.

The measurement range is from 90mm to 450mm.

Connect the stroke sensor to the Front or Rear connector on the main unit.

If the sensor and the main unit are separated and the cable does not reach, use an extension cable (30cm / 60cm / 90cm).

A protective film is affixed to the lens surface at the time of shipment. Please peel off this film and use it.



*Please be careful not to confuse connectors. Unlike other sensors, the stroke sensor operates at a low voltage of 3.3V. When connecting to a connector other than Front or Rear, 5V may be applied and the sensor may be damaged.*



*The sensor uses infrared rays. If the lens becomes dirty, clean it with a soft cloth etc. When rubbing strongly, the lens may be damaged. Measurement values during rainy may be disturbed by the influence of water droplet.*

## Mounting to the vehicle

- Place the suspension in the full stroke state.
- Look for a position that is nearest but 9cm or more away from the top of the tire or the top of the fender.
- Design the mounting bracket so that you can attach the sensor to that position. (The sensor makes the transparent window come to the center of the object. The sensor longitudinal direction is perpendicular to the direction of travel. The bracket and sensor are fixed with double sided tape and tie wrap.)
- Create and install the bracket.



*Installation examples are released on the product site. Please refer it.*

*<https://www.bizstation.jp/en/drogger/>*

*The accuracy is improved when the sensor is as close as possible. About 10cm in full*

*stroke is the best position.*

*The sensor uses reflection of light. The optical axis of the sensor should be perpendicular to the object. If it is diagonal, the reflectivity drops and the accuracy gets worse.*

*Also, when the object is a black and slurred surface such as a fender, it may not reflect well. In such cases it will be better to paste white tape etc. Generally the tire will reflect without problems.*

## Speed sensor

The speed sensor measures the rotation speed of the wheel by magnetic sensor. Vehicle speed is calculated by application from tire circumference length.

Attach three or more magnets at equal intervals to the wheel.

Connect the sensor to one of A/F, T1, T2, T3 connectors on the main unit.



*When more than 3 magnets are used, the measurement frequency improves, but the maximum measurable speed becomes lower. The maximum measurable speed can be calculated by the following formula when the number of magnets is  $n$ .*

*12 Inch tire: maximum speed =  $310 \times 3/n$*

*17 Inchtire: maximum speed =  $380 \times 3/n$*

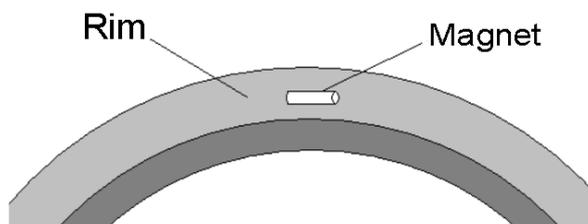
## Mounting to the vehicle

### Magnet polarity and spacing

Adhere the attached magnets to the rim of the wheel. Magnet has S pole N pole. There is no polarity with respect to the direction of rotation, but please install so that polarity is the same in all magnets. Different polarities can not be measured at the correct interval.

You can check if it is in the same direction as follows. Move another magnet closer and check with the same suction side.

Also, please install multiple magnets at even intervals.



### How to install magnets

Please install it securely so as not to come off by an epoxy adhesive or tape etc.

In the case of tape, please stick firmly so as to wrap the whole magnet with gum tape etc. so that

it can not be removed by centrifugal force. In advance, it is effective to make the wall with thick double-sided tape etc. so that the magnet does not shift to the outside of the wheel.



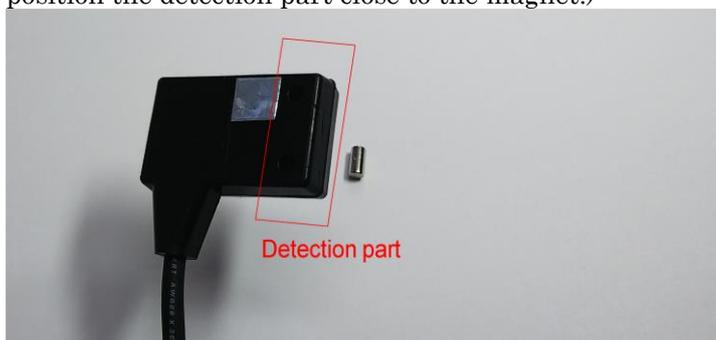
*It is extremely dangerous if the magnet scatters while running. Please do it firmly so that mounting does not come off.*

*Please do not let it adhere to the brake disk. When the magnet is exposed to high temperature, the magnetic force decreases and it does not adsorb.*

*We are not responsible for any damage or breakdown of vehicles or equipment due to installation failure etc., accidents accompanying it, etc. as the principal's responsibility..*

### Mounting the Sensor

Please attach the sensor to the vehicle using the attachment stay etc. in the orientation as shown below against the magnet. (Point the marking surface of Drogger to the magnet and position the detection part close to the magnet.)



The distance between the sensor and the magnet should be 25 mm or less.

### Infrared transmitter

You can measure LAP time using infrared transmitter and infrared sensor. It can be used in place of the magnetic LAP sensor, such as when the magnet is not embedded in the course or not enough.

Place the infrared transmitter carefully so that the infrared ray crosses the course at the side of the course.

Infrared light is emitted from the black lens part. The optical axis is the same direction as that of the blue LED. If possible, check the blue LED from where the vehicle will run. The point that looks the brightest and the line connecting the transmitter is the optical axis of infrared light.

A protective film is affixed to the lens surface at the time of shipment. Please peel off this film and use it.



*The maximum distance between the transmitter and the vehicle is 15 to 20m. (It is affected by the amount of infrared rays in the surroundings. When in fine weather,*

*the amount of infrared rays is large, the reachable distance becomes short.)  
Infrared has straight traveling properties like visible light. Please install it in a place where there is nothing to block the light between the vehicle.  
It is not necessary to become too nervous about the optical axis of infrared. Infrared light diffuses at an angle of about 15 °.*

## Mechanism and light pattern

The transmitter does not simply emit infrared light, but it repeats ON / OFF to emit a specific signal.

It distinguishes whether it is the signal of this unit according to the pattern of the signal, and only those specified by the setting of the android app are subject to LAP measurement.

The signal pattern varies depending on the manufacturer of the transmitter. This unit can transmit not only our signal pattern but also patterns similar to other company's products.

With the setting of the Android app, LAP measurement by the Drogger's infrared LAP sensor and another company's transmitter is also possible.

## Setting of light emission pattern

Four types of signal patterns can be emitted by changing the internal setting jumper on this unit.

| Setting name (pattern name) | Jumper JP101 | Jumper JP102 |
|-----------------------------|--------------|--------------|
| Drogger (Factory setting)   | 0            | 0            |
| Micron (AIM) *1             | 1            | 0            |
| ez-Lap *2                   | 0            | 1            |
| Always *3                   | 1            | 1            |

\*1 Micron is the product name of AIM.

\*2 ez-Lap is the product name of SED.

\*3 "Always" is a pattern that always lights ON at 38 kHz.

- Remove the four screws on the back side of the unit holding the top cover.
- Remove the top cover.
- Pull out the jumper plugged in JP101 / JP102 on the board.
- There are three JP101 pins and three JP102 pins. Insert the jumper between the center pin and the 0 or 1 pin according to the pattern you want to set shown in the above table.

## Installation notes

Please place the infrared transmitter at a distance of 10m or more away from other infrared transmitters regardless of this unit or other company's products. The light of the transmitter diffuses unlike laser light. When a sensor attached to the vehicle receives light from two or more transmitters, it is impossible to judge light patterns correctly by mixing.

A single transmitter can be shared by multiple vehicles. There is no need to put multiple transmitters. Also, by changing the settings of the Android app, you can substitute with transmitters made by other companies.

## Power supply

Connect either 5V USB cable or 12V cable to the power connector.

### 5V power supply

When using a 5V USB cable, please connect to a power supply controlled accurately to DC 5.0V.  
(Ex: mobile battery for smartphone.)



- *Depending on the mobile battery, the output may stop after a few minutes because the power consumption of this unit is low. Please confirm whether you can continue to use before actually driving.*
- *USB side of 5V USB cable connector is not waterproof. Take waterproof measures together with your mobile battery.*

### 12V power supply

The transmitter has a built-in regulator corresponding to the voltage from 8V DC to 14V DC. If the vehicle has 12V power supply, you can use the 12V cable to power it. Connect 12V cable and the vehicle as follows.

| Cable color                           | Connect to |
|---------------------------------------|------------|
| Gray (white / black in some versions) | +12V       |
| Black                                 | Minus      |



- *Do not connect to vehicles or batteries whose voltage exceeds 14V. The power supply circuit of the main unit may be damaged.*

## Status LED

The transmitter has a blue LED. The LED states and meanings are shown below:

| LED | Status    |
|-----|-----------|
| Off | Power OFF |
| On  | Power ON  |

## Infrared LAP sensor

The infrared LAP sensor measures the LAP time by receiving the signal of the infrared transmitter installed at the side of the course.

The infrared transmitter is not limited to the Drogger's transmitter. You can also measure LAP time with third-party transmitters listed in the android app.

### Mounting to the vehicle

Attach the sensor to the vehicle so that the light receiving surface is perpendicular to the transmitter. There is no up and down or left and right, if the hemispherical sensor faces the transmitter.

Connect to Lap connector on the main unit. (If you have already installed a magnetic LAP sensor in there, please remove it.)

Fix the sensor with double-sided tape or tie wrap so that it does not move.

If the sensor and the main unit are separated and the cable does not reach, use an extension cable (30cm / 60cm / 90cm).



- *Do not hide the sensor by the rider's motion.*
- *Installation on objects moving relative to the vehicle such as steering is not appropriate.*
- *Do not mount sensor away from direct sunlight. Since direct sunlight contains very strong infrared rays, it will not be able to correctly receive the signal of the transmitter.*

## 12V Voltmeter

The 12 V voltmeter is a DC voltmeter that can measure voltages up to 20 V at a resolution of 0.04 V.

## Connecting to the vehicle

Connect to one of the A/ F T1 T2 T3 connectors on the main unit. The connection on the opposite side is as follows.

| Cable color              | Vehicle side     |
|--------------------------|------------------|
| Black                    | Body Earth (GND) |
| Glau<br>(or White/Black) | +12V Power       |



- *Do not connect to voltage exceeding 20V or AC power supply. It may damage the main unit and the voltmeter.*

## Input of external equipment (A/F sensor, throttle position sensor)

An external 0 to 5V analog output can be input to A/F connector or Thr connector on the main unit.

For example, A/F sensor unit of each company such as HRC, PLX and INNOVATE\*4. These have 0 to 5V analog output in the unit.

The AF value varies depending on the voltage output for each unit, but values of these units can be converted and displayed on the application side. The throttle position sensor of HRC is the same mechanism.

If conversion is not built in the app, it can be logged as a simple 0 to 5V voltmeter.



- *Rev1 Only*  
*After connecting to the throttle position sensor, it may be necessary for the ECU to relearn the throttle position value again. Refer to ECU or vehicle manual for ECU re-learning. If re-learning is not possible, please connect via SE001 TP sensor amplifier.*  
*In Rev 2 and later, ECU relearning and SE001 TP sensor amplifier are not necessary.*

## Connect to external equipment

Use External-sensor-cable-90 to connect with external equipment.

Connect the cable to A/F connector or Thr connector on the main unit.

Connect the other side to the analog output of the external device as follows.

| Cable wiring color | External device side                                     |
|--------------------|--|
| White              | 0 to 5V, Analog + Output                                 |
| Red                | Not connect (Please insulate not to touch other things.) |
| Black              | Analog - (GND)   |



*The output of the external device should not exceed 5V. If exceeded, malfunction and the main unit may be damaged.*  
*If it exceeds 5V due to regulator of external device, it may be necessary to add protection circuit.*

\*4 HRC, PLX and INNOVATE are the company name, brand name or product name of each company.

## Warranty

The warranty on the main units is 6 months from purchase.\*5 However, sensors and cables are 3 months.

Every effort is made to the product, but if there are any defects in manufacturing, we will repair or replace it at our own risk without charge.

We cannot respond to any malfunction / defect other than the above. Moreover, please pardon the price of accidents, damages etc. due to defects.

3-1-5, Igawajo, Matsumoto-City, Nagano 390-0831, Japan

BizStation Corp.

<https://www.bizstation.jp/en/drogger/>

TEL +81-0263-87-4699 FAX +81-0263-28-2966

\*5 The purchase date certificate is required. If purchase date cannot be proved, 6 months from manufacture.

## Technical standard conformity certification

The Bluetooth module incorporated in SL001 main unit has received the following technical standard conformity certification.

Japan



Taiwan



Korea



USA

Contains Transmitter Module FCC ID: T9J-RN42  
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Europe

| Certification         | Standards                                 | Article  | Laboratory                                    | Report Number        | Date       |
|-----------------------|---|----------|---|----------------------|------------|
| Safety                | EN 60950-1:2006+A11:2009+A1:2010+A12:2011 | [3.1(a)] | Worldwide Testing Services (Taiwan) Co., Ltd. | W6M21402-13966-L     | 2014-03-24 |
| Health                | EN 62479:2010                             |          |   | W6M21402-13966-62479 | 2014-03-13 |
| EMC                   | EN 301 489-1 V1.9.2 (2011-09)             | [3.1(b)] |   | W6M21402-13966-E-16  | 2014-03-13 |
|                       | EN 301 489-17 V2.2.1 (2012-09)            |          |   |                      |            |
| Radio                 | EN 300 328 V1.8.1 (2012-06)               | (3.2)    |   | W6M21402-13966-T-45  | 2014-03-13 |
| Notified Body Opinion | <b>CE0681</b>                             | —        | Eurofins Product Service GmbH                 | U9M-1404-3736-C-V01  | 2014-04-15 |

## Specification

### SL001 Main unit

| Item                                       | Value  |
|--|--|
| Size (W × D × H) (Except connectors)       | 74 × 50 × 17.5mm   |
| Weight                                     | 79g  |
| Color                                      | Black  |
| Power supply                               | DC 8~25V or 5V USB power supply<br>(Rev1:DC 8~14V)   |
| Operating voltage                          | DC5V   |
| Consumption current                        | 130mA  |
| Protection circuit                         | Overcurrent<br>12V power supply reverse connect protection   |
| Analog input                               | 0~2V five channels (Front, Rear, T1, T2, T3)<br>0~5V two channels (A/F, Thr)   |
| Analog sampling period                     | 50Hz 0.02sec<br>(T1 T2 T3 are 10Hz 0.1msec)  |
| LAP sensor input                           | 1  |
| LAP resolution                             | 0.0001sec  |
| Engine pulse input                         | 10~100V  |
| Engine pulse / rotation                    | 0.5~36 (Rev1 Rev2 : 0.5~12)  |
| Engine maximum speed                       | 20000rpm   |
| Bluetooth                                  | Class2 Ver 2.1 + EDR/2.1/2.0/1.1<br>SPP communication<br>Technical standard conformity certifications<br>Japan: 201-125709<br>Taiwan: CCAF11LP1610T5<br>Korea: KCC-CRI-AEP-RN-42<br>USA: FCC ID T9J-RN-42<br>Europe: Radio EN 300 328 V1.8.1 (2012-06) |
| Firmware version upgrade                   | Possible by sending main unit  |
| Impact resistance / waterproof / dustproof | Corresponding<br>Except connection part of 5V USB cable.   |
| Warranty                                   | 6 months from purchase<br>3 months for sensors and cables  |

### ST001 Temperature sensor

| Item                   | Value         |
|------------------------|---------------|
| Temperature range      | 0~100℃        |
| Accuracy               | ±1℃           |
| Cable length           | 35cm          |
| Waterproof / dustproof | Corresponding |

**ST002 Water and oil temperature sensor**

| Item                   | Value         |
|------------------------|---------------|
| Temperature range      | -25~125°C     |
| Accuracy               | ±2°C          |
| Cable length           | 35cm          |
| Waterproof / dustproof | Corresponding |

**SM001 Magnetic LAP sensor**

| Item                   | Value  |
|------------------------|--|
| Sensitivity adjustment | Possible<br>Standard adjustment voltage 80mV |
| Mounting height        | 20cm or less from the road surface           |
| Cable length           | 100cm  |
| Waterproof / dustproof | Corresponding                                |

**SS002 Stroke sensor**

| Item                   | Value  |
|------------------------|--|
| Measurable range       | 90mm~450mm   |
| Measurement method     | Non-contact (infrared)   |
| Cable length           | 35cm   |
| Waterproof / dustproof | Corresponding (However, measured values at rainy weather may be disturbed by water drops etc.) |

**SMS01 Speed sensor**

| Item                   | Value                                  |
|------------------------|--|
| Measurement method     | Magnetic wheel speed measurement       |
| Range (3 magnets)      | 12Inch: 0~310Km/h<br>17Inch: 0~380Km/h |
| Number of magnets      | 3 ~ 6                                  |
| Resolution             | 0.3Km/h                                |
| Installation distance  | Within 25 mm from the magnet           |
| Cable length           | 60cm                                   |
| Waterproof / dustproof | Corresponding                          |

**SI001 Infrared LAP sensor**

| Item                   | Value                  |
|------------------------|------------------------|
| Light incident angle   | Recommended within 15° |
| Cable length           | 35cm                   |
| Waterproof / dustproof | Corresponding          |

**SR001 Infrared transmitter**

| Item                                 | Value          |
|--------------------------------------|----------------|
| Size (W × D × H) (Except connectors) | 52 × 65 × 27mm |

|                        |   |
|------------------------|---|
| Weight                 | 53g   |
| Color                  | White / Weather resistant ABS resin                       |
| Power supply           | DC 8~14V or 5V USB power supply                           |
| Operating voltage      | DC5V  |
| Consumption current    | 40mA  |
| Protection circuit     | 12V power supply reverse connect protection               |
| Waterproof / dustproof | Corresponding   |
| Warranty               | 6 months from purchase<br>3 months for sensors and cables |

### SV001 12V Voltmeter

| Item         | Value  |
|--------------|--------|
| Max voltage  | DC 25V |
| Resolution   | 0.05V  |
| Cable length | 70cm   |