

Handheld Digital Tachometer

HT-5500

Instruction Manual (Basic Operations)

Thank you for your selection of the HT-5500 Handheld Digital Tachometer.

To ensure the performance of the HT-5500, please read this manual thoroughly.

Warnings and Cautions

In this document precautions are classified into two categories: WARNING and CAUTION. This depends on the degree of danger or damage possible if the precaution is ignored and the product is used incorrectly.

	WARNING This symbol is used to indicate precautions where there is a risk of death or serious personal injury to the operator if the product is handled incorrectly.
	CAUTION This symbol is used to indicate precautions where there is a risk of some personal injury to the operator or only material damage to the product if the product is handled incorrectly.

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Omission of Issuance of Certificate

This product has been tested under strict inspections for correct operation before shipment. Please note that the issuance of certificate is omitted.

Warranty

- This product is covered by a warranty for a period of one year from the date of delivery.
- This warranty covers free-of-charge repair during the warranty period for defects occurred while the product is used under correct operating conditions according to descriptions in this manual and notices on the unit label.
- For free-of-charge repair during the warranty period, contact your dealer or your nearest Ono Sokki sales office nearby.
- Even during the warranty period, the following failures will be handled on a fee basis.
 - Failures or damages occurring through misuse, misoperation, modification, repairing without ONO SOKKI'S approval.
 - Failures or damages occurring through mishandling (dropping) during transportation after purchase.
 - Failures or damages occurring by an At of God (fires, earthquakes, flooding, and lightening), environmental disruption, or abnormal voltage.
 - Replenishment of expendable supplies, spare parts, and accessories.

This guarantee covers only the performance of the product itself only.
All inconvenience by the trouble of this product is not included.
*Outer appearance and specifications are subject to change without prior notice.
HOME PAGE: <http://www.onosokki.co.jp/English/english.htm>

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Observe the Following Points before Use

General Notes

- Be sure to read this Instruction Manual.
To ensure the excellent performance of this product and use it safely, be sure to read this Instruction Manual thoroughly.
- Avoid rapid temperature change.
Do not move the product rapidly from a hot place to a cold one or vice versa.
Condensation can form inside the unit and can cause trouble.
- Be careful not to get water, dust, or foreign materials inside the unit.
Do not use the product in places where you may get water or places which are humid or dusty.
- Do not drop the product or apply excessive shock to it.
Since this product incorporates high-precision electronic parts, be careful not to drop it or apply strong shock.
- Do not damage the lens of the light projector-receiver.
There is a risk of the deterioration of the performance.
- Wipe dirt off using a dry cloth or a cloth dampened with neutral detergent and squeezed firmly.
Do not use volatile oils (thinner or benzine) or alcohols.
- When you do not use the product for a prolonged period of time, remove the battery from the unit.
Leaving the product unused for a prolonged period of time or consumed battery may cause liquid leak.

- Do not apply external voltage to the analog and pulse output terminals.
- Do not use AC adapters other than our exclusive specified one (PB-7080).

WARNING

- In revolution measurement using a contact adapter, be sure to use the supplied contact tip or circumferential ring fully being careful of safety. In particular, pay the closest attention in measurement of revolution with 10,000 r/min or more. Also in measurement of the line speed using the circumferential ring, measure high-speed revolution fully being careful of safety.
- Be careful not to touch the body of revolution with hands.
- The contact tip (KS-300) and circumferential rings (KS-100, KS-200) are consumables. Use of a contact tip or circumferential ring with deformation or crack is very dangerous. Replace the deformed or cracked contact tip or circumferential ring with a new one.
- Use of a contact adapter with crack is dangerous. Replace the cracked contact adapter (HT-0502) with a new one.
- When using the AC adapter (PB-7080) and various output cables, be careful not to get them caught by the body of revolution. The condition where a cables is caught by the body of revolution is very dangerous.

Overview

1.Overview

The HT-5500 is a non-contact type handheld tachometer, with the reflective mark attached on the body of revolution, which measures revolution with the visible light reflection system.

The HT-5500 is a handheld type high-class model which is provided with various functions. When used together with the supplied contact adapter (HT-0502), it can be also used as a contact type tachometer.

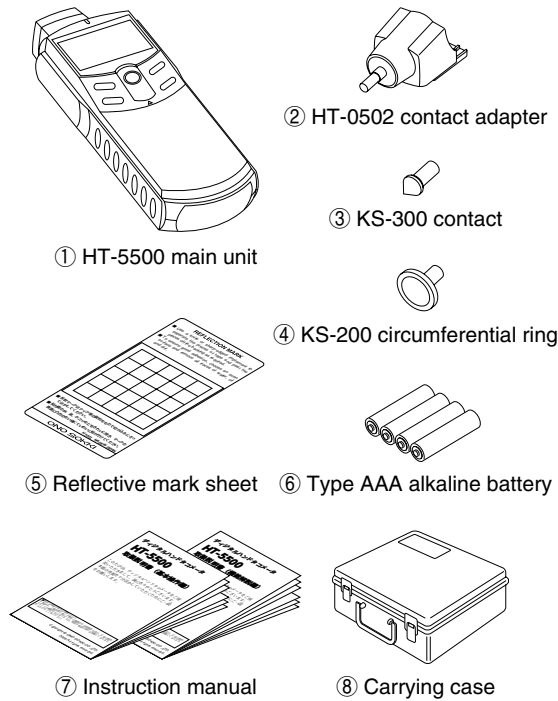
2.Features

- Wide measurement range from low-speed revolution (6 r/min) to high-speed revolution (99999 r/min by non-contact measurement)
- Measurement unit selectable from r/min, r/s, m/min, COUNT, and ms
- Direct-read measurement of the line speed
- MAX and MIN modes for displaying the maximum and the minimum values (except for COUNT)
- Convenient memory function (up to 20 datas can be memorized) for confirmation of measurement results
- Over alarm function for indicating that the measurement value exceeds the specified value
- Analog output and pulse output
- Can be used as a contact type tachometer with the use of the supplied contact adapter (HT-0502) and contact tip (KS-300).
- A tripod can be attached (only for non-contact measurement).
- Type AAA battery, AC adapter (PB-7080) commonly used
- Back light function which is convenient for use in dark places

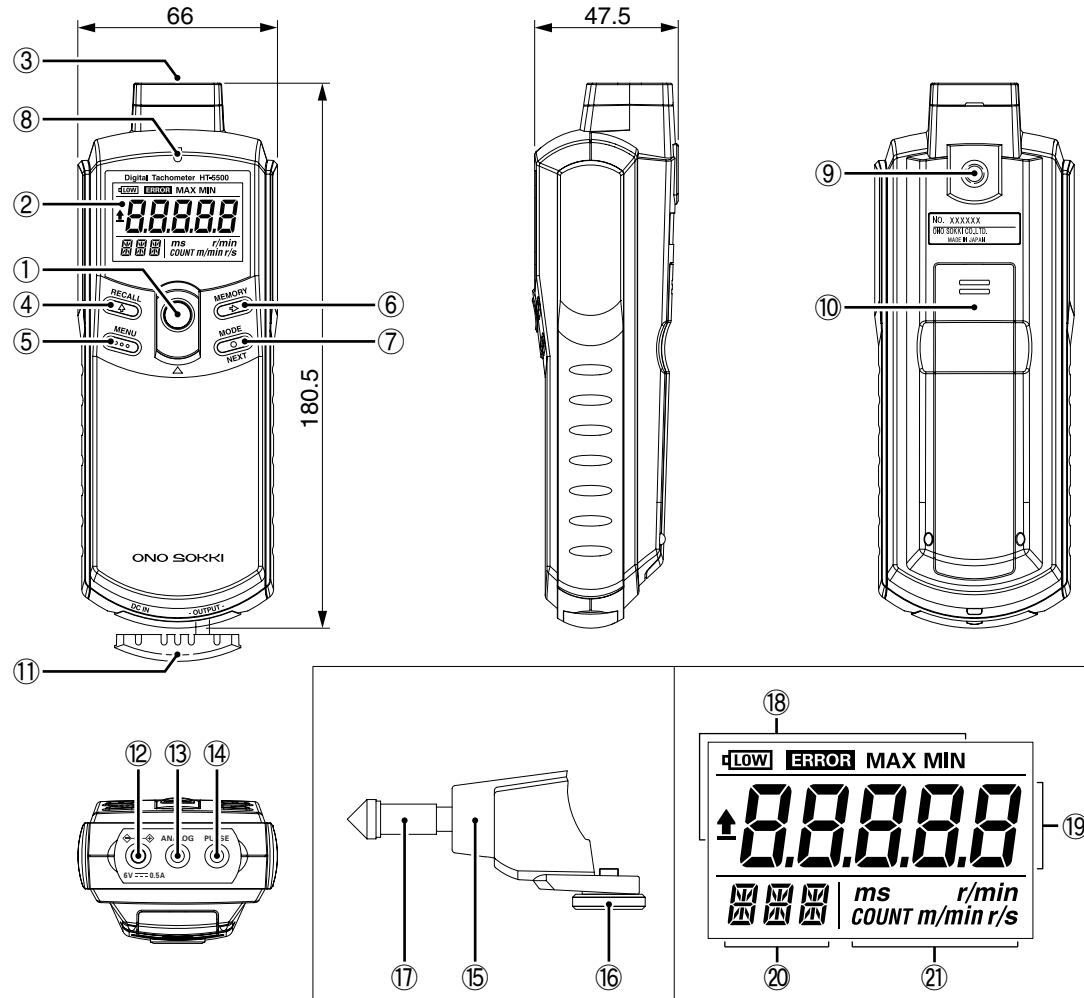
3.Unpacking

When you unpack the unit, make sure that you have all the following:

- Main unit (HT-5500) x1
- Contact adapter (HT-0502) x1
- Contact tip (KS-300) x1
- Circumferential ring (KS-200) x1
- Reflective mark sheet x1 (=25 pieces)
- Type AAA alkaline battery x4
- Instruction manual x2 (2 different manuals)
- Carrying case x1



Name and Function of Each Section



- Power switch**
Turns the power ON or OFF.
- Display**
Displays the measurement value and various settings.
- Detecting element**
Light projector-receiver for detecting the reflected light (rotational signal) from the reflective mark
- RECALL & ↑ switch**
Used for memory recall during measurement and numerical input in the setup mode.
- MENU switch**
Used to switch between the measurement mode and the parameter setup mode.
- MEMORY & → switch**
Used for memory storing during measurement and numerical digit shift in the setup mode.
- MODE & NEXT switch**
Used for mode change during measurement and item selection in the setup mode.
- Indicator (input signal indicator)**
When the detecting element detects the reflected light, this LED indicator lights up.
- Tripod mounting hole**
Used to mount a tripod.
Also used to attach the contact adapter to the main unit. (Cannot be used at the same time.)
- Battery cover**

- Connector cover**
Cover of the DC power input and analogue/pulse output connectors.
- DC power input**
Input connector for connecting the dedicated AC adapter
- Analog output**
Connector for connection with a recorder, etc. through the optional AX-501 cord
- Pulse output**
Connector for connection with an FFT analyzer, etc. through the optional AX-501 cable
- Contact adapter: HT-0502**
Attached to the HT-5500 main unit to select contact measurement.
- Tripod mounting screw**
Screw for attaching the contact adapter to the main unit. Tripod can be also attached for non-contact measurement separately.
- Detection shaft: Contact tip attachment condition**
The contact tip, circumferential ring, etc. are attached.
- CONDITION display**
Displays the measurement mode, LOW battery, and errors.
- MAIN display**
Displays the measurement value, selection, setting, etc.
- SUB display**
Displays the memory address, setting, etc.
- UNIT display**
Displays various measurement units.

Before Use

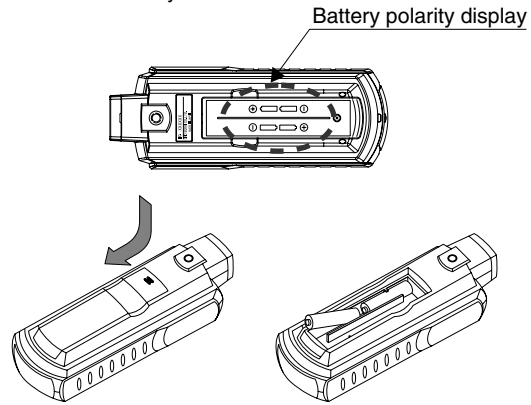
1.Power Supply

The HT-5500 operates on four Type AAA batteries or optional dedicated AC adapter (PB-7080).

If the batteries are consumed and the LOW mark “**LOW**” appears, replace them with new ones. Be sure to replace all the four batteries at the same time.

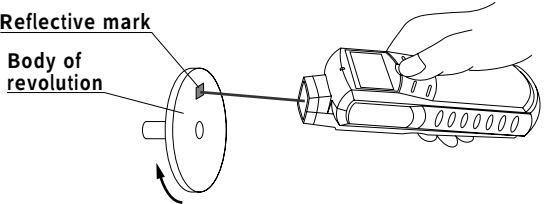
Battery replacement procedure

- ① While pushing lightly the two (anti-slip) slots of the battery cover with your finger, slide it to remove.
- ② Put the batteries properly in the battery compartment with the correct polarity (+/-).
- ③ Put the battery cover.



2.Preparing for Non-contact Measurement

- ① Stick a reflective mark to the body of revolution under measurement. (For how to stick the reflective mark, refer to the next section 3, “Notes on Non-contact Measurement.”)
 - a. Wipe off oil, water, dust, and other dirt from the surface to which the reflective mark is to be stuck, and then stick the reflective mark without irregularity.
 - b. If the surface to which the reflective mark is to be stuck is shiny because of plating, etc., perform measurement aslant with respect to the reflective surface or apply black paint before sticking the reflective mark.
- ② Turn ON the power switch. Align the light from the light projector with the position of the reflective mark, and make sure that the indicator lights up. (With high-speed revolution, it seems that the indicator is lit continuously.)
 - a. To obtain correct data, continue measurement for at least 3 seconds.
 - b. Keep a proper distance between the detecting element and the reflective surface.
(For the measurement distance, refer to subsection (4), “Is the Distance Appropriate ?” for Non-contact Measurement in “Troubleshooting” in the Instruction Manual (Function Reference).



3.Notes on Non-contact Measurement

(1) Measurement distance

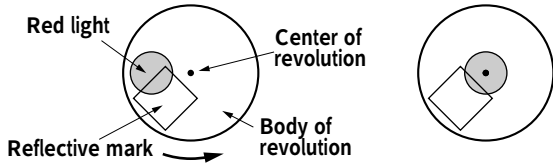
The 30cm maximum measurement distance of the specification is the measurement distance when a 12mm x 12mm reflective mark is used on the flat surface and then the light is applied perpendicularly to the reflective mark.

In the following cases, the measurement distance becomes short.

- ① When the reflective mark is stuck on the curved surface, for example, when the reflective mark is stuck on the shaft
- ② When the reflective mark is cut into pieces
- ③ When the light is applied aslant

(2) Applying light to the reflective mark

Since this product detects revolution based on the presence or absence of the reflected light, it cannot detect revolution if the light is constantly applied to the reflective mark. Apply red light to the reflective mark so that there are timing when the red light from the light projector hits the body and timing when it does not hit the body while the body of revolution rotates once. In particular, be careful when you stick the reflective mark near the center shaft of revolution.



(3) Sticking the reflective mark in high-speed revolution measurement

In order for the HT-5500 to detect the rotational signal, it is necessary to receive the reflected light from the reflective mark for about 0.2 ms or longer. With high-speed revolution, the light receive time becomes shorter than 0.2 ms disturbing measurement depending on the position for sticking the reflective mark. Therefore, be careful of the position for sticking the reflective mark.

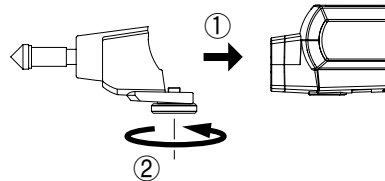
(4) If the reflective mark peels during high-speed revolution

If the reflective mark peels during high-speed revolution of 10,000 r/min, etc., use other adhesives together.

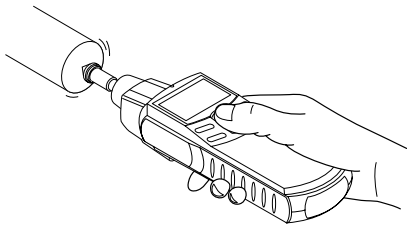
(5) If the reflective mark cannot be stuck

If the reflective mark cannot be stuck on the body of revolution for a certain reason, make a portion which reflects light and a portion which does not reflect it on the body of revolution. Note that the measurable distance and angle differ largely in comparison with the case when the reflective mark is stuck.

4.Preparing for Contact Measurement



- ① Align the contact adapter with the detecting element of the main unit and then fix it firmly to the tripod mounting screw at the bottom of the main unit using a knurling screw.
- ② Turn ON the power of the main unit. Rotate the detection shaft and make sure that the indicator lights up.
- ③ Attach the KS-300 contact tip and then select the measurement unit (r/min, ms, r/s, m/min, or COUNT). (For measurement unit setting, refer to the Instruction Manual (Function Reference).

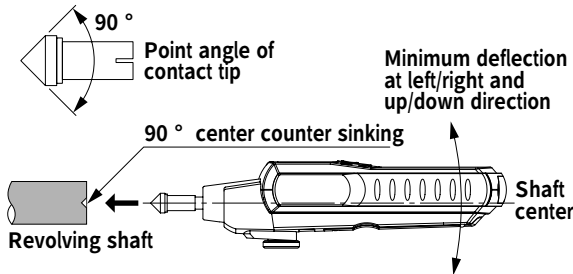


⚠ Be careful not to touch the body of revolution by hand.

- ④ Apply the contact tip to the shaft end center hole of the revolving shaft under measurement so that it may not slip. At this time, support the contact tip so that the shaft center of the revolving shaft under measurement is aligned with that of the detection shaft.

Do not perform measurement without using the contact tip or circumferential ring.

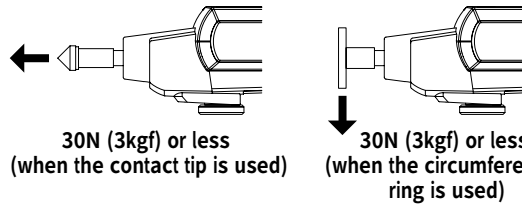
- a. Do not use bodies of revolution without a concave portion (center counter sinking).
- b. A measurement error may arise depending on the material of the body of revolution and how the contact adapter is applied.



5.Notes on Contact Measurement

■ Be sure to observe the following points to ensure safety. In contact measurement, since the HT-5500 is pressed directly to the body of revolution, danger arises. During measurement, observe the following precautions.

- ① When attaching the contact adapter to the main unit, insert the contact adapter properly to the detecting element and then fasten it securely using mounting screws. Use the instrument with the pressure shown below or less.



- ② During contact measurement, if the OVER alarm mark “**↑**” blinks, stop measurement immediately.
- ③ Apply correctly the contact tip to the concave portion of the center of the revolving shaft under measurement. Do not apply the contact tip aslant or do not apply excessive force to the contact adapter or revolving shaft.
- ④ During measurement of high-speed revolution of 5,000 r/min or more, be sure to support the main unit with both hands so that the contact tip does not shift from the center of the revolving shaft. If the contact tip shifts from the center, excessive force is applied to the main unit which is dangerous.
- ⑤ In measurement of high-speed revolution (10,000 r/min), deflection (inclination) between the revolving shaft and the shaft center is very dangerous when you apply the contact tip to the body of revolution. In particular, if the contact tip is deteriorated or applied in wrong way, there is a risk of flying which may cause injury. In measurement of high-speed revolution, we recommend non-contact measurement.

- ⑥ When operating switches even during measurement of revolution of 10,000 r/min or less, be sure to support the main unit with both hands and then press switches. Operate each switch before measurement. If possible, do not perform switch operation during measurement.

- ⑦ In measurement with the circumferential ring, the measurement specification range is 400 m/min (mm/s). Also from the viewpoint of safety, the line speed less than the above value is recommended.

Specifications

1.Measurement Section

Measurement system	: Non-contact method by visible light reflection and contact method using contact adapter
Calculation system	: Periodic calculation system
Measuring time	: 1s + Input signal 1 period time (In case of 60 r/min (=1Hz), up to twice the periodic time)
Measurement unit	: r/min, r/s (revolution) m/min (line speed) ms (period) COUNT (accumulated count)
Measuring range	:

Non-contact Measurement	Contact Measurement
6 to 99999 r/min (*1)	6 to 20000 r/min (*1)
0.10 to 999.99 r/s	0.10 to 400.00 r/s
0.6 to 9999.9 m/min	0.6 to 400.0 m/min
0.6 to 9999.9 ms	2.5 to 9999.9 ms
0 to 99999 COUNT	0 to 99999 COUNT

(*1) 6.0 to 600.0 r/min (displays to one decimal place) when the Lo range is selected

- Measurement accuracy : Display value* x (± 0.02%) ± 1 count*) The display value is the count value excluding the decimal point.*) However, the accuracy of the line speed depends on the accuracy of the revolution (r/min).
- Over range function : If the measurement value exceeds the display range, over range “**ERROR**” appears.
- Over alarm function : If the revolution exceeds the upper limit setting, the over alarm mark “**↑**” appears.

2.Detecting Element

Detection system	: Visible light photoelectric reflection
Detection distance	: 20 to 300 mm
Light source	: Red LED
Light-sensitive element	: Photo transistor
Detection mark	: 1 reflective mark/revolution

3.Display Section

Number of display digits	: 5 digits
Character height	: 10.2 mm
Display	: 7-segment LCD with back light
Refresh time	: 1 ± 0.2s

4.Measurement Mode

MAX (peak hold): Displays the maximum value during measurement.

MIN (peak hold): Displays the minimum value during measurement.

Others: Displays the present measurement value.

Memory function: Up to 20 measurement values can be memorized each time the Memory SW is pressed. Since these values are stored in non-volatile memory, they are retained even after you turn OFF the power.

Option

- ① Output cable: AX-501
- ② AC adapter: PB-7080 (IN: 100-240VAC, OUT: 6VDC)
- ③ Reflective mark sheet: HT-011 (10-sheet set) (12mmx12mm mark x 250)
- ④ Circumferential ring: KS-100 (mm/s)
- ⑤ KS-700: Extension shaft
- ⑥ HT-0521A: Stand jig
- ⑦ HT-0522: Magnet stand
- ⑧ LA-0203: Tripod
(HT-0521A and HT-0522 should be used in combination.)

Rapid deceleration following function: If the input signal decreases rapidly and then no input signal is supplied for one second or more, this function decreases the revolution automatically and then displays zero in about 11 seconds.

5. Analog Output Section

Output contents	: Output to the display value. (Full scale value can be set aebitrarily.)
Voltage range	: 0 to F.S./0 to 1V
Conversion system	: 10-bit D/A conversion system
Linearity	: ± 1% of F.S.
Output refresh time	: 50 ms + Input signal 1 period time or less
Temperature stability	: ± 0.05% of F.S./°C (ZERO & SPAN)
Setting error	: ± 0.5% of F.S. (adjustment setup error at the time of shipment, ZERO & SPAN)
Load resistance	: 100k Ω or more
Output connector	: Pin jack

6.Pulse Output Section

Non-contact measurement	: Outputs one pulse for each reception of reflected light.
Contact measurement	: Outputs one pulse per revolution.
Output voltage	: Hi level : 4.5V or higher Lo level: 0.5V or lower
Output logic	: Positive logic pulse
Load resistance	: 100k Ω or more
Output connector	: Pin jack

7.General Specifications

Power supply	: Type AAA battery x 4 or dedicated AC adapter (PB-7080: option)
Continuous operating time	: About 32 hours (with the back light turned OFF) About 8 hours (with the back light turned ON) (When alkali batteries are used at 20°C)
Battery LOW display	: 4.4V ± 0.45V or less
Operating temperature range	: 0°C to +40°C
Storage temperature range	: -10°C to +50°C
Operating humidity range	: +35 to +85%RH (without condensation)
Storage humidity range	: +35 to +85%RH (without condensation)
Mass	: About 220g (main unit only, batteries not included) About 282g (with the adapter, batteries not included)
Dimensions	: 180.5 x 66.0 x 47.5 mm (main unit only) 237.2 x 66.0 x 58.5 mm (with the adapter)

Storage

The storage temperature range of the HT-5500 is -10°C to +50°C. When you store it, avoid locations where the temperature is extremely high or low or the humidity is high. Store it in a place which is well-ventilated and not exposed to direct sunlight. If you do not use it for a prolonged period of time, be sure to remove the batteries to prevent accident caused by battery leakage, etc.