

# OPTICAL-d-TIMER User Manual

Thank you for purchasing this product.

The C15-1708 Recording Timer d (hereinafter referred to as "this product") is a distance measuring device designed for science experiments in school education. Please make sure to review the precautions before use.

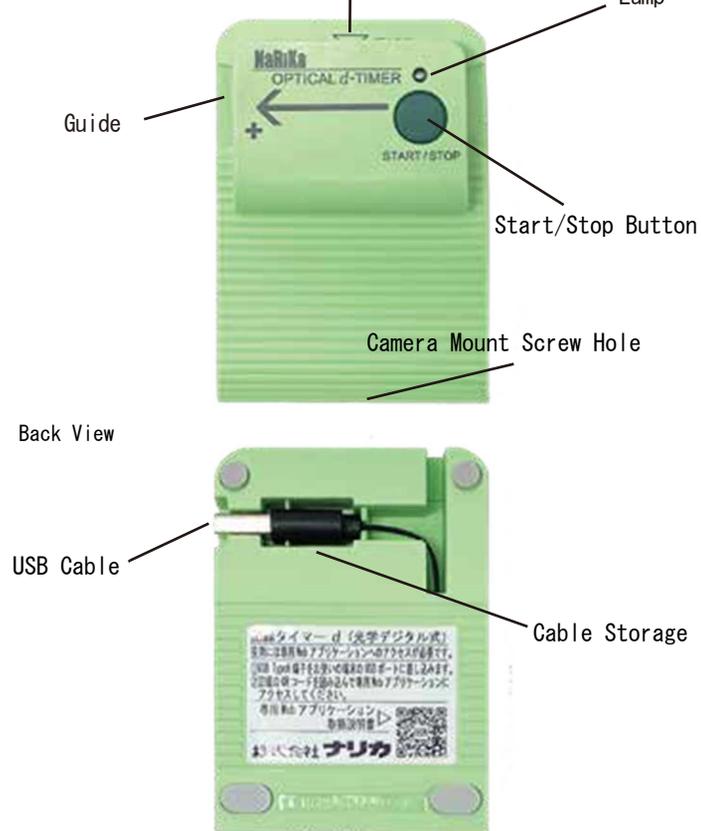
## Caution

- No Open Flames: This could cause significant damage to the device.
- No Disassembly: Disassembling the device may lead to malfunction or risk of injury, so please do not attempt to open it.
- No Water Exposure: Exposing the device to water can cause electric shock or malfunction, so do not get it wet.
- If you notice any unusual odor, excessive heat, discoloration, deformation, or other abnormalities during use or while storing, please discontinue use and contact us.
- Do not use or leave the device in high-temperature areas, such as places exposed to direct sunlight or inside a car on a hot day. This may cause deformation or malfunction.
- When conducting experiments, do not place the device on an unstable surface or on a slanted area.
- Do not apply strong impacts to the device or throw it.
- If the case is damaged or there is any damage to the cables, do not use the device.
- The USB terminal is for communication and power supply only, and cannot be used for charging.
- This product is designed for science experiment use. It is not intended for use outside of school science experiments.

## Specifications

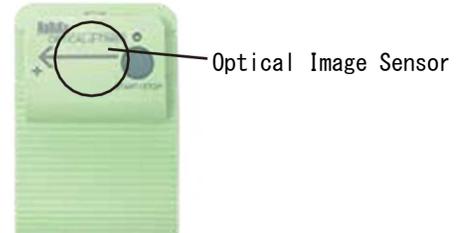
Size: 85 × 60 × 40 mm, Cable length: 1m (retractable into the main unit)  
 Weight: Approx. 100g  
 Measurement Method: Optical image sensor system  
 Measurement Distance: 0 to 50m (depends on the length of the recording tape)  
 Minimum Display Unit: 0.001m  
 Measurement Interval: 0.02 seconds  
 Measurement Items: Distance (m) / Time (s)  
 Displayable Items: Distance (m) / Speed (m/s) / Acceleration (m/s<sup>2</sup>)  
 Output: USB 2.0  
 Power Supply: USB-powered  
 Compatible OS: Windows 10/11, ChromeOS  
 Other Features: Measurement start/stop button, real-time display  
 Accessories: 1 roll of recording tape

## Names of Parts



## Measurement Principle

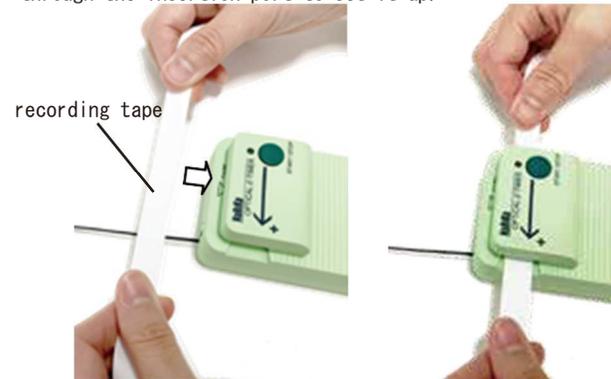
This device operates by shining light onto the recording tape inserted into the guide, allowing the optical image sensor to capture images of the tape's surface. The sensor continuously analyzes the captured images to determine the travel distance and direction, then outputs this data digitally via the USB cable.



By attaching the recording tape to a dynamics cart and moving it, the device measures the tape's displacement over time, enabling the analysis of the cart's motion. The high-speed processing of the optical image sensor allows measurement results to be displayed in real-time as graphs on a dedicated application, making this device highly efficient for motion analysis.

## Setting the Recording Tape

Cut the recording tape to the required length for the experiment (e.g., 50 cm). Insert the tape into the device through the insertion port to set it up.



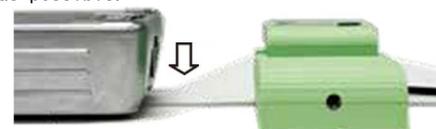
## Attaching the Recording Tape to a Dynamics Cart

Attach the recording tape to a dynamics cart or similar equipment.



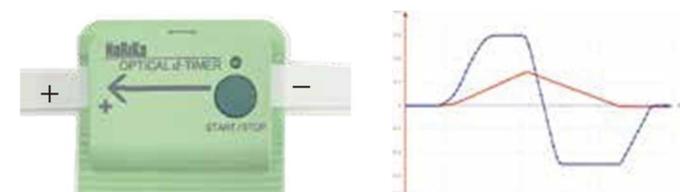
## Experiment Tip: Positioning the Recording Tape

To prevent the recording tape from sagging under its own weight, attach it as close to the experiment table (i.e., at a lower position) as possible.



## Other Experiment Example: Reciprocal Motion

Measure motion by defining the direction indicated by the arrow on the device as positive and the opposite direction as negative. By creating and using a custom thick paper tape, reciprocal motion can be measured.

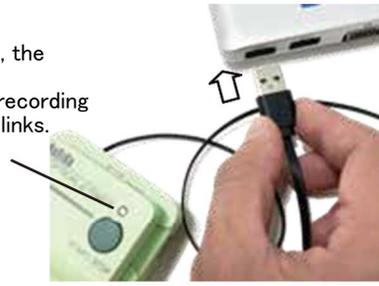


Right Diagram: A dynamics cart colliding with a wall via a rebound spring. The graph represents the distance and velocity of the dynamics cart's reciprocal motion.

### Connecting to a Device

Pull out the USB cable (Type-A) from the cable storage.  
Insert the USB cable into the USB port of your PC.

When the device is powered, the lamp lights up. Additionally, when the movement of the recording tape is detected, the lamp blinks.



### Launching the Dedicated Web Application

Open a web browser on your PC.  
Access the following website:  
Optical Digital Timer (OPTICAL-d-TIMER) Web Application

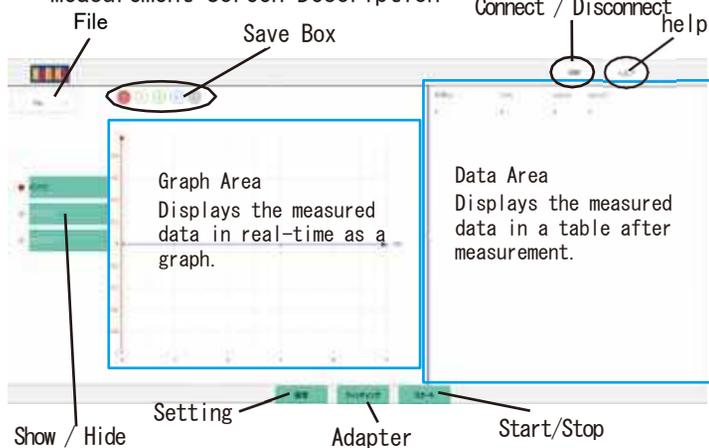
<https://www.rika.com/optical-d-timer-web>

### Device Connection

Click [Connect] at the top right of the web application screen. A popup window will display the devices connected to the USB port. Select [OPTICAL d-TIMER] and click [Connect]. You will then be redirected to the measurement screen below.



### Measurement Screen Description



**Start / Stop:** Starts or stops the measurement.  
**Adapter:** Adjusts the graph to display within 80% of the graph area by referencing the maximum and minimum measured values.  
**Settings:** Adjusts the timeline (horizontal axis), measurement range (vertical axis), and smoothing function (for smoother graph display).  
**Show / Hide:** Selects the items to be displayed on the graph.  
**File:Open File:** Opens a CSV file. **Save Data:** Saves data as a CSV file.  
**Save Box:** Temporarily stores the last five measurement results.  
**Connect / Disconnect:** Used to disconnect or reconnect the device.  
**Help:** Accesses the product's support webpage.

### Starting / Stopping Measurement

- ① Operating via the Device  
Press the button on the device.  
(This is the recommended method for easier operation.)
- ② Operating via the Web Application



Click [Start / Stop].

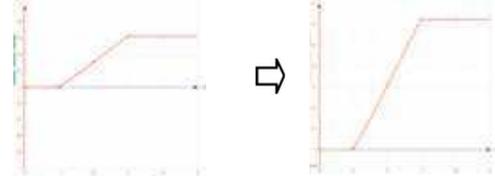
### Tips for Experiments: Initial Distance and Time

The device always starts measuring from [Distance: 0.000 m].  
The default measurement time is [5 seconds].  
You can change the measurement time in the Settings → Timeline section.

### Post-Measurement Operations

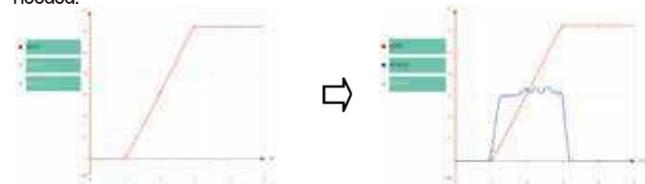
#### ① Adapter

By default, the vertical axis is set to  $\pm 1\text{m}$ . After measurement, clicking [Adapter] adjusts the graph by referencing the maximum and minimum measured values, ensuring that the data fits within the graph area.



#### ② Show / Hide

By default, only the Distance vs. Time (x-t) graph is displayed. You can enable additional graphs for Velocity and Acceleration as needed.



#### ③ Save Box

The last five measurement results are temporarily stored. You can retrieve saved measurement data by clicking on the box. When a sixth measurement is taken, the oldest data will be overwritten.



The currently displayed box will appear in a darker color.

#### ④ Saving and Opening Data in "File"

Measurement data can be saved as a CSV file. CSV files can be reopened in the web application for further analysis.



For more details about the web application, please refer to the following URL:

<https://www.rika.com/product/manual/c15-1708>

### Acknowledgments

We would like to express our gratitude to Professor Yoshiaki Murao for his guidance in the development of this product.

For Professor Murao's prior research, please refer to the following publication:

Yoshiaki Murao: "Recording Motion Using a Mouse – Part 2," *Physics Education Bulletin* 179 (2020), pp. 78–79.