Mitutoyo

Statistical Processing Printer for Quality Control Digimatic Mini-Processor

DP-1VA LOGGER

User's Manual

- Instructions for use -

Read this User's Manual thoroughly before operating the instrument. After reading, retain it close at hand for future reference.
This English language version of the User's Manual contains the original instructions.

No. 99MAM029A2
Date of publication: April 1, 2019 (1)

■ Correspondence of product names and model numbers

● Product names and model number

Product name	Model number
Digimatic Mini-Processor	DP-1VA LOGGER

■ Notice regarding this document

- Mitutoyo Corporation assumes no responsibilities for any damage to the instrument, caused by its use not conforming to the procedure described in this User's Manual.
- Upon loan or transfer of this instrument, be sure to attach this User's Manual to the instrument.
- In the event of loss or damage to this manual, please contact the agent where you purchased the product or Mitutoyo sales representative immediately.
- Before operation of the instrument, thoroughly read this manual to comprehend its contents.
- Particularly, for full understanding of information, carefully read "Safety Precautions" and "Precautions for Use" at the outset of this manual before using the instrument.
- The contents in this manual are based on the information current as of April, 2019.
- No part or whole of this manual may be transmitted or reproduced by any means without prior written permission of Mitutoyo Corporation.
- Some screen displays in this manual may be highlighted, simplified or partially omitted for convenience of explanation. In addition, some of them may differ from actual ones to the extent that no user will misunderstand the functions and operations.
- The corporation, organization and product names that appear in this manual are their trademarks or registered trademarks.

CONVENTIONS USED IN THIS USER'S MANUAL

Conventions used in Mitutoyo's User's Manual are roughly divided into three types (safety reminders, prohibited and mandatory actions, and referential information and locations). Moreover, these safety symbols include general warnings and specific warnings. Specific warning symbols are provided with concrete pictograms inside of them.

■ Safety reminder conventions and wording warning against potential hazards

General	**DANGER**	Indicates an immediately hazardous situation which, if not avoided, will result in serious injury or death.
	WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or death.
	CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor injury.
	NOTICE	Indicates a potentially hazardous situation which, if not avoided, may result in property damage.
Specific		Alerts the user to a specific hazardous situation that means "Caution, risk of ignition".

■ Conventions and wording indicating prohibited and mandatory actions

General		Indicates concrete information about prohibited actions.
		Indicates concrete information about mandatory actions.
Specific		Indicates that grounding needs to be implemented.

■ Conventions and wording indicating referential information or referential locations

Tips Indicates referential information such as that for when the operating methods and procedures which are printed in these sentences are to be applied to specific conditions.

Indicates referential locations if there is information that should be referred to in this guide or an extraneous manual.

E.g.:For functions of each part, refer to "1.3 Names and Main Functions of Each Part" on page 4.

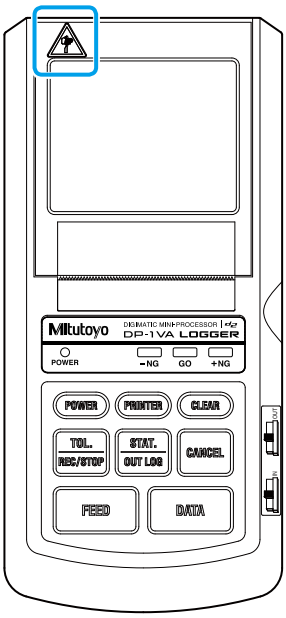
Product Safety Label

This product has been designed and manufactured with human safety taken as a major consideration.

In order to use it more safely, Product Safety Label has been applied to the product. This section describes where the label is applied and warning information.

Before operating this product, be sure to carefully read this section to use it safely for an extended period of service life.

■ Label location



■ Contents of the labels and precaution statement

Notice labels

Precautions

Be aware of cuts

Be aware so as to not cut your hand with the paper cutter when setting the printer paper.

Safety Precautions

Read the "Safety Precautions" thoroughly before operating to use the product properly.

As the precaution statements explained here address the contents to prevent the occurrence of safety hazards to others or damage to property, they are to be strictly observed.

⚠ DANGER

Do not use the product in areas where volatile gases may be generated.

There is a risk of igniting the gas.

⚠ WARNING

- The product is intended for use with general machinery (measuring instruments, machine tools, etc.).
  Do not use the product with a control instrument whose operation faults or accidents can cause direct bodily injury or death, such as medical equipment, aerospace equipment, trains, and atomic power plant equipment. Please consult us in advance before using.
- Observe the following, since there is a risk of an electric shock or fire.
  - If the product starts to emit smoke or strange odors, or if it otherwise fails to operate correctly, turn off the power switch immediately and disconnect the AC adapter from the electrical outlet, then contact Mitutoyo or the agent where you purchased the product for repair.
  - The product is not to be repaired or modified by the users.
  - Use with the designated AC adapter.
  - If the product is dropped or otherwise damaged, turn off the power switch and disconnect the AC adapter from the electrical outlet, then contact Mitutoyo or the agent where you purchased the product.
  - Be sure to use the options specified in this manual for the options to be used with this product.

⚠ CAUTION

Observe the following, since there is a risk of injury or fire.

- Use the designated batteries. Use of non-designated batteries may cause a fire or injury due to rupturing or liquid leakage.
- Pay attention to the batteries' polarities and set them in as per the instrument’s indications when setting them in the instrument. If they are mistakenly set in, that may cause rupturing or liquid leakage.

NOTICE

- Do not apply excessive external force to the product. It may cause a failure or breakage.
- If foreign matter enters the product, turn off the power switch and disconnect the AC adapter from the electrical outlet, then contact Mitutoyo or the agent where you purchased the product.

Precautions for Use

■ Use application and handling of the product

● The product is a precision instrument.

Take sufficient care when handling. Pay sufficient attention not to apply an excessive shock or force to any part when operating.

■ Operating environment

The product shall be used in the following environments.

- Places where the ambient temperature is 0 °C–45 °C (in case batteries are used, 10 °C–45 °C)
- Places with a small amount of dust and dirt
- Places with a small amount of vibration
- Places with low humidity

Avoid use in the following environments.

- Places directly affected by cutting oil or water
- Places with direct daylight, hot air or cold air
- Places where instruments generating electromagnetic noise, such as a welding machine or electric discharge machine, are used.

■ Daily maintenance

- Wipe dirt off the main body with a lint free cloth or paper moistened with neutral detergent. Do not use an organic solvent such as thinner.
- It is necessary to regularly clean the printer head and paper sensor of the printer portion.

  For further details on cleaning method, refer to 📖 "6.1 Maintenance" on page 65.

■ Power supply

- After use, please be sure to turn off the power.
- In case an AC adapter is used, connect to the different power supply from that where a large current flows (for machine tools or large scale of CNC controlled measuring machines).

Electromagnetic Compatibility (EMC)

This product complies with the EU EMC Directive. Note that, in environments where electromagnetic interference exceeds the EMC requirements defined in this directive, appropriate countermeasures are required to assure product performance.

This is an industrial product. It is not intended for use in a residential environment. Use of this product in a residential environment may cause electromagnetic interference with other instruments. In such a case, appropriate measures against electromagnetic interference are required.

Export Control Compliance

This product falls into the Catch-All-Controlled Goods and/or Catch-All-Controlled Technologies (including Programs) under Category 16 of Appended Table 1 of the Export Trade Control Order or under Category 16 of the Appended Table of Foreign Exchange Control Order, based on the Foreign Exchange and Foreign Trade Act of Japan.

If you intend re-export of the product from a country other than Japan, resale of the product in a country other than Japan, or re-provision of the technology (including program), you are obligated to observe the regulations of your country.

Also, if an option is added or modified to add a function to this product, this product may fall under the category of List-Control Goods and/or List-Control Technology (including Programs) under Category 1 - 15 of Appended Table 1 of the Export Trade Control Order or under Category 1 - 15 of the Appended Table of Foreign Exchange Control Order, based on Foreign Exchange and Foreign Trade Act of Japan. In that case, if you intend re-export of the product from a country other than Japan, resale of the product in a country other than Japan, or re-provision of the technology (including program), you are obligated to observe the regulations of your country. Please contact Mitutoyo in advance.

Notes on Export to EU Member Countries

When you intend export of this product to any of the EU member countries, you may be required to provide User's Manual(s) in English and EU Declaration of Conformity in English (under certain circumstances, User's Manual(s) in the destination country's official language and EU Declaration of Conformity in the destination country's official language). For detailed information, please contact Mitutoyo in advance.

Disposal of Old Electrical & Electronic Equipment under Waste Separation Processing system (in European countries)

This symbol on the product or on its packaging is based on the WEEE Directive (Directive on Waste Electrical and Electronic Equipment), which is a regulation in EU member countries, and this symbol indicates that the product shall not be treated as household waste.
To reduce the environmental impact and minimize the volume of landfills, please cooperate in reusing and recycling the product.
For how to dispose of the product, please contact the agent where you purchased the product or Mitutoyo sales representative.

China RoHS Compliance Information

This product meets China RoHS requirements. See the table below.

产品中有害物质的名称及含量

部件名称	有害物质					
	铅	汞	镉	六价铬	多溴联苯	多溴二苯醚
	(Pb)	(Hg)	(Cd)	(Cr(VI))	(PBB)	(PBDE)
本体	×	○	○	○	○	○
配件	○	○	○	○	○	○

本表格依据 SJ/T 11364 的规定编制。

○：表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。

×：表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。

环保使用期限标识，是根据电器电子产品有害物质限制使用管理办法以及，电子电气产品有害物质限制使用标识要求(SJ/T11364–2014)，制定的适用于中国境内销售电子电气产品的标识。

电子电气产品只要按照安全及使用说明内容，正常使用情况下，从生产月期算起，在此期限内，产品中含有的有毒有害物质不致发生外泄或突变，不致对环境造成严重污染或对其人身、财产造成严重损害。

产品正常使用后，要废弃在环保使用年限内或者刚到年限的产品时，请根据国家标准采取适当的方法进行处置。

另外，此期限不同于质量/功能的保证期限。

Warranty

This equipment has been manufactured under strict quality management, but should it develop problems within one year of the date of purchase in normal use, repair shall be performed free of charge. Please contact the agent where you purchased the product or Mitutoyo sales representative.

If this product fails or is damaged for any of the following reasons, it will be subject to a repair charge, even if it is still under warranty.

- Failure or damage owing to fair wear and tear
- Failure or damage owing to inappropriate handling, maintenance or repair, or to unauthorized modification
- Failure or damage due to transport, dropping, or relocation of the instrument after purchase.
- Failure or damage owing to fire, salt, gas, abnormal voltage, lightning surge, or natural disaster
- Failure or damage owing to use in combination with hardware or software other than those designated or permitted by Mitutoyo
- Failure or damage owing to use in ultra-hazardous activities

This warranty is effective only where the instrument is properly installed and operated in conformance with the instructions in this document within the original country of the installation.

EXCEPT AS SPECIFIED IN THIS WARRANTY, ALL EXPRESS OR IMPLIED CONDITIONS, REPRESENTATIONS, AND WARRANTIES OF ANY NATURE WHATSOEVER INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NONINFRINGEMENT OR WARRANTY ARISING FROM A COURSE OF DEALING, USAGE, OR TRADE PRACTICE, ARE HEREBY EXCLUDED TO THE MAXIMUM EXTENT ALLOWED BY APPLICABLE LAW.

You assume all responsibility for all results arising out of its selection of this product to achieve its intended results.

Disclaimer

IN NO EVENT WILL MITUTOYO, ITS AFFILIATED AND RELATED COMPANIES AND SUPPLIERS BE LIABLE FOR ANY LOST REVENUE, PROFIT, OR DATA, OR FOR SPECIAL, DIRECT, INDIRECT, CONSEQUENTIAL, INCIDENTAL, OR PUNITIVE DAMAGES HOWEVER CAUSED AND REGARDLESS OF THE THEORY OF LIABILITY ARISING OUT OF THE USE OF OR INABILITY TO USE THIS PRODUCT EVEN IF MITUTOYO OR ITS AFFILIATED AND RELATED COMPANIES AND/OR SUPPLIERS HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

If, notwithstanding the foregoing, Mitutoyo is found to be liable to you for any damage or loss which arises out of or is in any way connected with use of this product by you, in no event shall Mitutoyo's and/or its affiliated and related companies' and suppliers' liability to you, whether in contract, tort (including negligence), or otherwise, exceed the price paid by you for the product only.

The foregoing limitations shall apply even if the above-stated warranty fails in its essential purpose. BECAUSE SOME COUNTRIES, STATES OR JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR THE LIMITATION OF LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES, IN SUCH COUNTRIES, STATES OR JURISDICTIONS, MITUTOYO'S LIABILITY SHALL BE LIMITED TO THE EXTENT PERMITTED BY LAW.

This Document

■ The target audience and objectives of this document

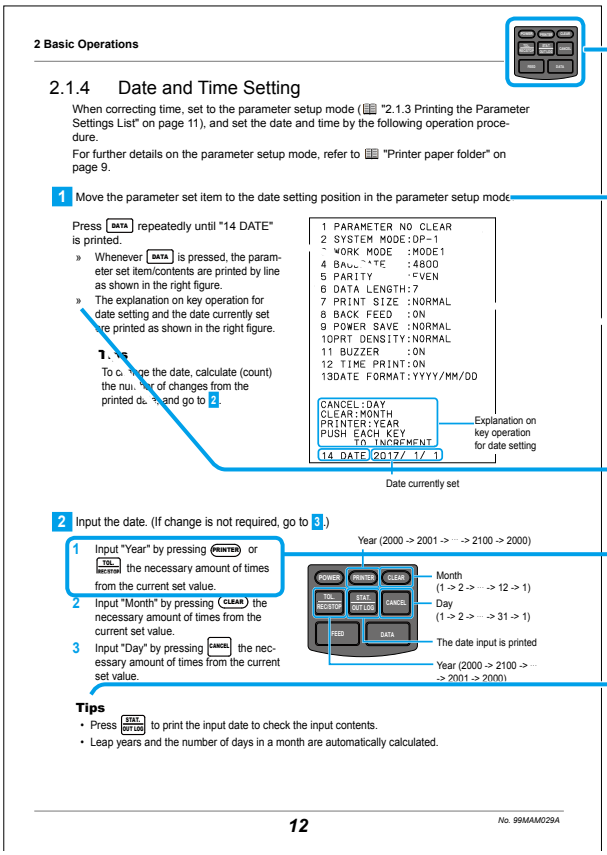
● Target audience

The target audience is first time users of Digimatic Mini-Processor DP-1VA LOGGER.

● Objectives

The objective of this document is to help you to understand the functional outline of the product, functions of each part, how to use and maintenance details.

■ Notes for reading this document



This indicates that the operation procedure which requires a key operation is explained.

The number and the text following are an overview which indicates the order and the contents of the work to be performed.

The sentence with ">>" mark at the head indicates the operation result.

The number and the text following are the details which indicate the order and the contents of the work to be performed.

This indicates the supplemental information.

■ As per the usage of this document

The contents in this document which are in particular quite frequently used are summarized on the back cover. Utilize them by making a copy of them or clipping them out.

■ Notation method of parentheses

The meaning of parentheses used in this documents will be explained.

( ): Round brackets	Used to explain the contents of previous items or add auxiliary explanation to it.
" ": Quotation marks	Used to emphasize the expression. Or, to indicate the referent in a referential sentence.
[ ]: Square brackets	Used to indicate the operation key.

Contents

MEMO

1 Outline

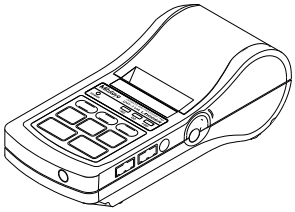
This chapter describes the overview of the product.

1.1 Packing Content Confirmation

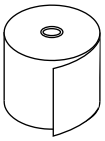
Make sure all items below are included.

Please contact the agent where you purchased the product or Mitutoyo sales representative if something is missing.

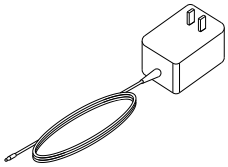
- Digimatic Mini-Processor DP-1VA LOGGER



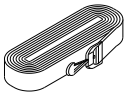
- Printer paper



- AC adapter



- Strap



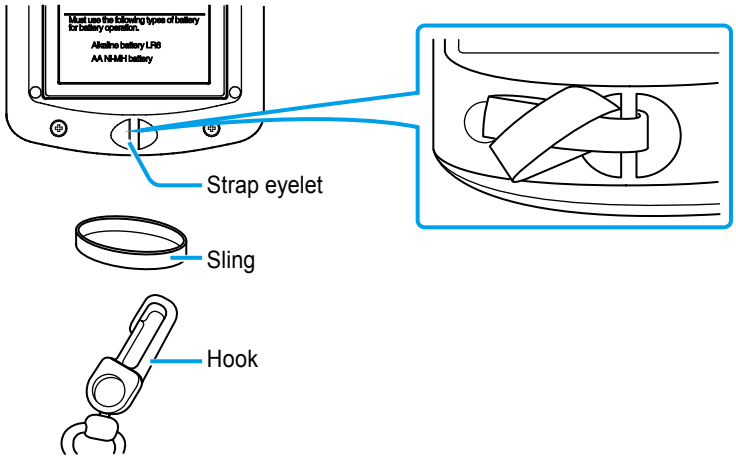
- User's Manual (This Document)
- Warranty card

Tips

- Note that dry batteries are not supplied. Please prepare them as needed.
  For further details on the required dry batteries, refer to "2.1.1 AC Adapter Connecting and Battery Cells Setting" on page 7.
- An optional dedicated cable is required to connect a measuring instrument with Digimatic output.
  For further details on the dedicated cable, refer to "7.4.1 Digimatic Connection Cable List" on page 79.

■ Attaching the strap

Attach the strap to the product for drop prevention as needed. Remove the sling from the hook and attach it to the strap eyelet.

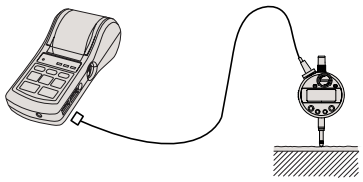


1.2 Functional Outline

The product is a data processing unit used to print out the measurement data by connecting with our measuring instrument with Digimatic output.

"2 Basic Operations" on page 7

The product supports the inputs from a Digimatic output and measuring instrument with Digimatic 2 output. This also can be used to automatically fetch the data from the measuring instrument at given intervals. ("3.6.1 Timer Input of the Measurement Data" on page 43)



```
TIME:       5   s
DATE 2017/ 6/21
TIME  9:34
      1        9.99     mm
      2        9.95     mm
      3       10.04     mm
      4       10.02     mm
      5       10.66     mm
```

Tips

This also supports an input of RS-232C output data by connecting an optional dedicated RS-232C output cable to the KA Counter.
For further details on the RS-232C input operation of the KA Counter, refer to "3.5 Inputting and Printing of the KA Counter Data with RS-232C" on page 39.

The product has additional functions below.

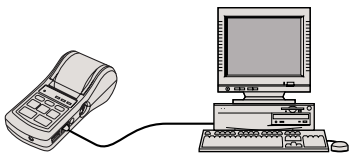
- **Data logging and USB output to PC**
  "3.4 Logging of Measurement Data and Printing/Output of Log Data" on page 35

  Up to a maximum of 1,000 entries of measurement data can be logged (stored) in the internal memory of the product. The log data stored can be printed or output to PC via USB collectively.

```
  * OUT LOG START *
  * LOG =    5
.....

DATE 2017/ 6/21

10:59: 9         9.99 mm
10:59:23        10.08 mm
10:59:31        10.07 mm
10:59:34        10.09 mm
10:59:38        10.07 mm

  * OUT LOG END *
```

- **Data output**
  "4 Output" on page 49

  Both the output of the measurement data to PC (USB, RS-232C: TTL level) and the output of the tolerance judgment result (+NG, GO, -NG) are possible.



Tips

Prior tolerance setting is required for the tolerance judgment result output.
For further details on the tolerance setting operation, refer to "2.3.1 Tolerance Settings" on page 19.

- **LED display and printing of the measurement data tolerance judgment result (A)**
  "2.3.2 Measurement and Display/Printing the Tolerance Judgment Results" on page 22

  This is the judgment function on whether the measurement data is within the setting tolerance or not and the judgment results can be indicated with the Tolerance Judgment LED or printed on the printer paper.

- **Abundant statistical processing (B)**
  "2.4 Printing the Statistical Calculation Value" on page 24

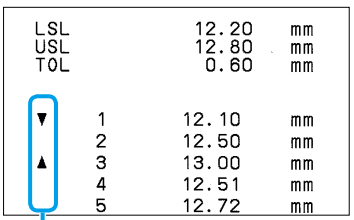
  Calculating number of data (N), Maximum value (MAX), Minimum value (MIN), Range (R), Average value ($\bar{X}$), Standard deviation (σn, σn-1), Number of defectives (±NG), Fraction defective (P) and Process capability index (Cp, Cpk), they can be printed on the printer paper.
- **Histogram generation (C)**
  "2.4 Printing the Statistical Calculation Value" on page 24

  The histogram shown in the charts below can be printed on the printer paper.
- **D chart (chart indicating temporal changes of measurement data) generation (D)**
  "3.2 D Chart (Chart Indicating Temporal Changes of Measurement Data) Printing (MODE2)" on page 29

  The measurement data in the D chart, which visually represents the change of displacement of measurement data, can be printed on the printer paper together with measurement data.
- **Calculation and printing of the various calculated values required for the $\bar{X}$-R control chart (E)**
  "3.3 Printing the Data for Xbar-R Control Chart (MODE3)" on page 31

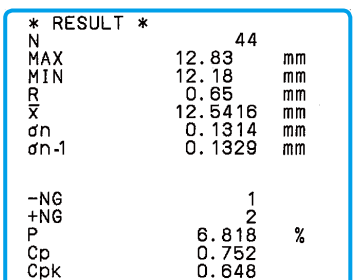
  Number of subgroups, Sample size, Subgroup average value ($\bar{X}$), Subgroup range (R), Center value ($\bar{\bar{X}}$), Upper control limit ($\bar{X}$-UCL), Center (R control) ($\bar{R}$), Upper control limit (R control) ($\bar{R}$-UCL), Lower control limit (R control) ($\bar{R}$-LCL) can be calculated and printed on the printer paper.

(A)



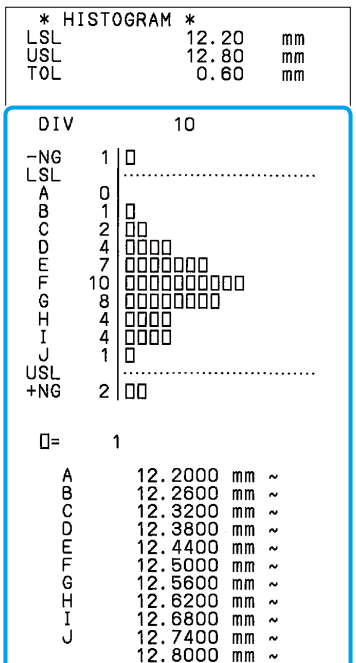
Tolerance judgment results

(B)



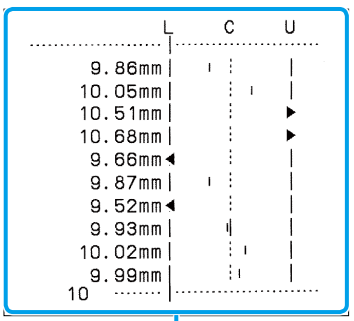
Statistical calculation value

(C)



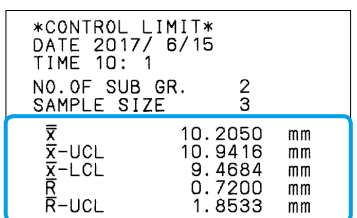
Histogram

(D)



D chart

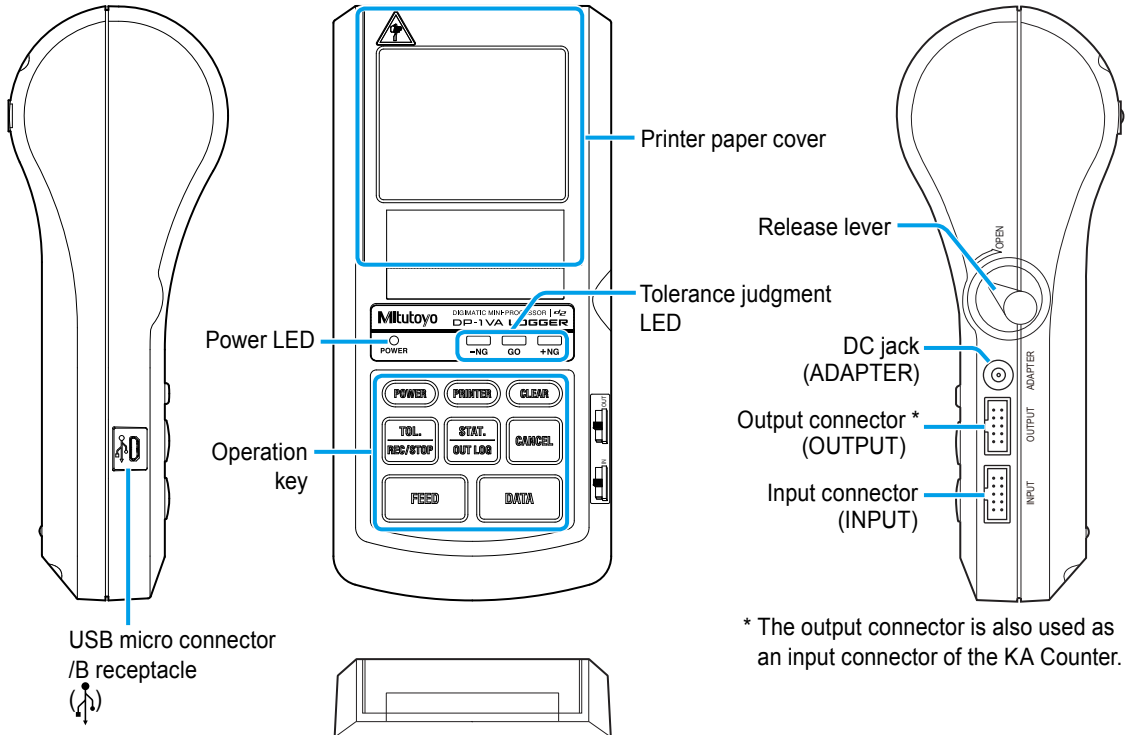
(E)



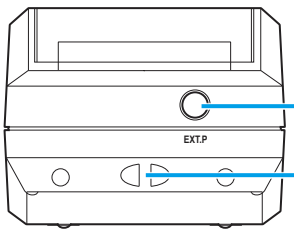
Various calculation values required for $\bar{X}$-R control charts

1.3 Names and Main Functions of Each Part

1.3.1 Names of Each Part



* The output connector is also used as an input connector of the KA Counter.

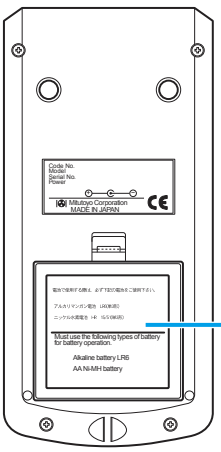


Foot switch connector (EXT.P)

Strap eyelet

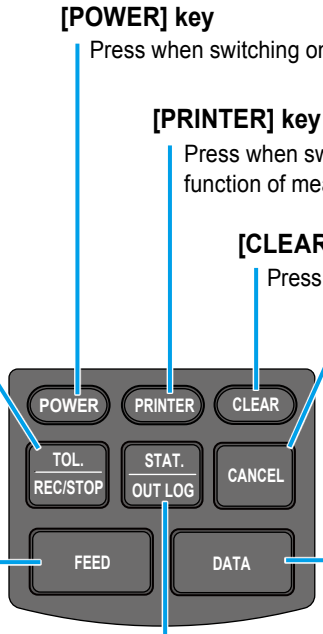
For further details on the attaching method of the strap, refer to "1.1 Packing Content Confirmation" on page 1.

Back Side



Battery box cover

1.3.2 Names and Functions of Operation Key



[POWER] key
Press when switching on/off the power.

[PRINTER] key
Press when switching on/off the printing function of measurement data and log data.

[CLEAR] key
Press when deleting all the measurement data.

[TOL. | REC/STOP] key
Press to enter or exit the setting mode for the limit data (upper/lower specification limit value).
Hold down to start/stop the data logging.

[CANCEL] key
Press to cancel the latest input measurement data.
Hold down for more than 10 seconds to delete the measurement data/log data and initialize the date and time by hardware reset.

[FEED] key
While being pressed the printer paper is fed.

[DATA] key
Press to input the data from the measuring instrument.

[STAT. | OUT LOG] key
Press to perform the statistical calculation based on all the input measurement data, print the calculation results and generate the histogram.
Hold down to print the log data and output it to USB.

● When two key operations are required

- Parameter Setup Mode: DATA + POWER (effective only when turning on the power)
  ("5.2 Various Parameter Settings and Setting Items" on page 63)
- Timer Input Mode: PRINTER + FEED
  ("3.6.1 Timer Input of the Measurement Data" on page 43)
- Print date and time: PRINTER + DATA

Tips

The operation will differ from the explanations above when the state falls under the items below.

- When entering in parameter setup mode
  For further details on the key operation in parameter setup mode, refer to "5.2 Various Parameter Settings and Setting Items" on page 63.
- When WORK MODE is selected to "MODE 3" in parameter setup mode
  For further details on the key operation with MODE3 setting, refer to "3.3 Printing the Data for Xbar-R Control Chart (MODE3)" on page 31.

MEMO

2 Basic Operations

The basic operation of the product will be explained as a series of the flow.

2.1 Setup

2.1.1 AC Adapter Connecting and Battery Cells Setting

A power supply through an AC adapter or batteries is required to power the product.

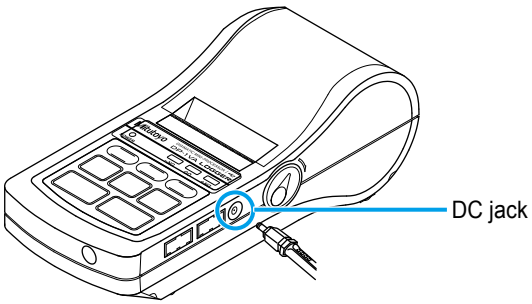
■ Connecting the AC adapter

Connect the power plug of the accessory AC adapter to an electrical outlet, and the DC plug to the DC jack (ADAPTER) on the right side of the product.

NOTICE

Use only one of the following of our specified AC adapters. Use of an AC adapter not included in the list below may result in poor print quality and shorten the printing life.

- Plug for Japan and North America (Parts No. 06AFZ950JA or 06AEG180JA)
- Plug for China (Parts No. 06AFZ950DC or 06AEG180DC)
- Plug for Europe (Parts No. 06AFZ950D or 06AEG180D)
- Plug for the UK (Parts No. 06AFZ950E or 06AEG180E)
- Plug for Korea (Parts No. 06AFZ950K)



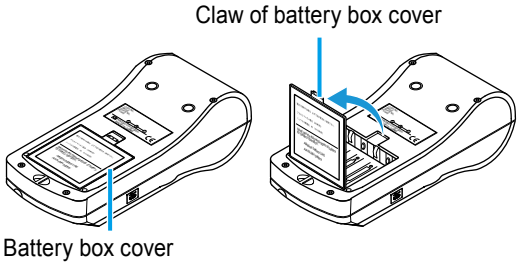
Tips

Insert the DC plug of the AC adapter securely all the way into the DC jack.

■ Setting the batteries

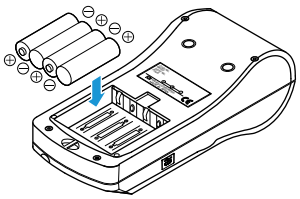
1 Detach the battery box cover.

Pressing down the claw portion of the battery box cover, pull out the cover toward this side.



2 Prepare the dry batteries and set them inside.

1. Prepare the batteries.
2. Insert the dry batteries in the battery box following the battery polarity indication inside the cover.



NOTICE

- Make sure that the coating of the battery terminals is not peeling or swelling before using. Any peeling or swelling of the coating on the battery terminals may cause a malfunction such as poor contact or short circuiting.
- If the product is not used for a long period of time, remove the batteries. If the batteries are left inside, battery liquid leakage may make the product unusable.

Tips

- AA alkaline batteries (LR6) or nickel-metal-hydride (Ni-MH Size AA) can be used. Do not use manganese batteries. When alkaline batteries are used, the print may become faint due to the characteristics of the batteries.
- Do not set different types of batteries together.
- Be sure to correctly set the polarity of batteries.

3 Press the battery box cover back.

Tips

- Press it back into place until it clicks.
- When using alkaline batteries or Ni-MH batteries, the printing speed may be slower compared to when the AC adapter is used.
- Batteries can be used as a power supply when the temperature is 10 °C or higher. In case the temperature is lower than 10 °C, a defect such as a faint printing may occur.
- The product does not have a charging function. Use a store-bought charger for charging.
- The battery life of the product is about 10,000 lines (in case printing in "LARGE" characters/5 seconds using 1,600 mAh Ni-MH batteries). The battery life may largely vary depending on the use method or environment.

2.1.2 Setting the Printer Paper and Power-on

Set the printer paper following the procedure below and turn on the power.

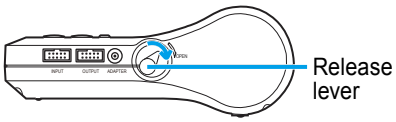
⚠CAUTION

- Be careful not to cut your hands with the paper cutter when setting the printer paper.
- The printer head is exposed when the printer paper cover is opened. The printer head becomes very hot immediately after printing and may cause burns if touched.

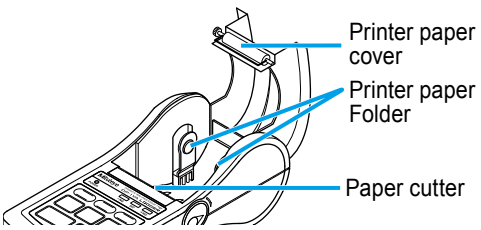
1 Connect the AC adapter (or set the batteries).

2 Press the release lever downward (to the direction of "OPEN").

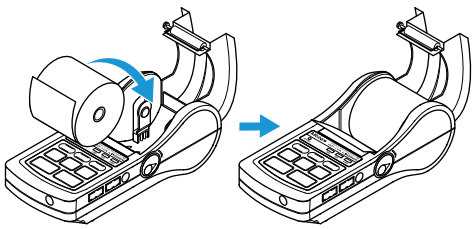
» The printer paper cover will be opened slightly.



3 Open the printer paper cover.

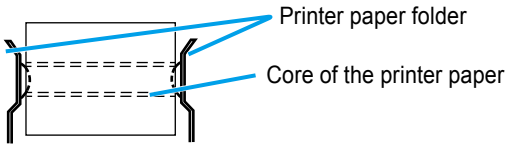


4 Set the printer paper into the printer paper folder.



Tips

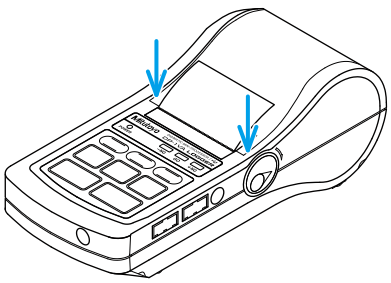
- Peel off the tape that holds the printer paper edge, set it pulling out the edge to the front side a little ahead of the paper cutter.
- Since a paper jam is likely to occur during printing, the printer paper core should be set securely into both salient points of the printer paper folder as in the below drawing.



Tips

Only our specified paper (Parts No. 09EAA082, 10 rolls/pack) shall be used. The printer paper for the product is a paper with excellent durability. Nevertheless, the print becomes faint over time due to the characteristics of thermal paper. In the case of extended storage (5 years or longer) or use for official documents, the use of photocopies is recommended. As the print disappears, discoloring or paper deterioration may occur if cutting fluid or other substances get on the printer paper, storing of the copies is recommended.

5 Close the printer paper cover pressing both ends of the cover top surface with the printer paper edge protruding a little from the paper cutter.



Tips

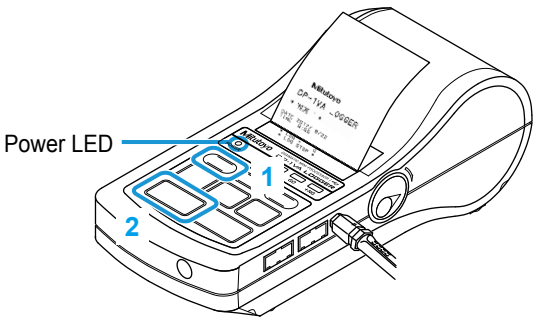
Close the cover paying attention so the printer paper does not hang over the right and left side edges of the cover.

6 Switch on the power and feed the printer paper forward.

1 Press (POWER), and then release a finger from the key.

» The power LED is lit, the printer paper is fed, and then "Mitutoyo", "DP-1VA LOGGER", the mode number, time/date, number of log data and log condition are printed.

2 Hold down [FEED] to feed the printer paper forward by approximately 100 mm.



Tips

- After the printer paper is set, it is necessary to feed it by pressing [FEED] without fail. Self-alignment function for the paper position to reduce the possibility of a paper jam is activated by pressing this button.
- When the power LED is not lit, check whether the batteries with sufficient charge remaining are firmly set or whether the AC adapter is connected properly.
- If the power LED blinks, change the batteries as promptly as possible. If continuing to use without changing, the malfunction where the power off switch does not work may occur.
- When holding down (POWER) again, the power turns off. On/Off operation of the power shall be performed at an interval of 5 seconds or more. On/Off operation of the power within a shorter time than the above may cause a malfunction. If it happens, load the batteries or AC adapter again and restart.

2.1.3 Printing the Parameter Settings List

The latest parameter settings list can be printed according to the following procedures.

1 Check whether the printer paper is set properly, the power LED is off and power is turned OFF.

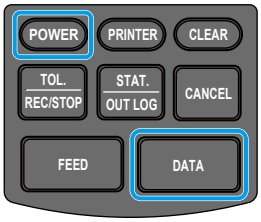
For further details on the printer paper setting method, refer to "2.1.2 Setting the Printer Paper and Power-on" on page 9.

2 Print the parameter settings list.

While pressing DATA press POWER, then just release POWER, when the printing starts, then release DATA.

» The power is turned on and enters the parameter setup mode.

» Parameter settings list is printed.



Tips

- The parameter setup mode is entered with the operations above.
  When DATA is pressed in this state, various parameters can be setup and changed.
  This mode will be released when the power is turned ON by holding down POWER after turning off the power in this state.
- If it is desired to complete parameter setup, press DATA repeatedly until parameter setup list is printed.
- These are explained on the assumption that WORK MODE is set at "MODE1" of the initial setting.
  For further details on WORK MODE, refer to "5.1 Various SYSTEM/WORK MODE and Print Contents/Output to PC" on page 61.

■ Print example of the parameter settings list

```
Mitutoyo

DP-1VA LOGGER
PARAMETER SETUP MODE

2 SYSTEM MODE:DP-1
3 WORK MODE   :MODE1
4 BAUDRATE    :4800
5 PARITY      :EVEN
6 DATA LENGTH:7
7 PRINT SIZE :NORMAL
8 BACK FEED   :ON
9 POWER SAVE :NORMAL
10PRT DENSITY:NORMAL
11 BUZZER     :ON
12 TIME PRINT:ON
13DATE FORMAT:YYYY/MM/DD
14 DATE 2017/ 1/ 1
15 TIME  0: 0
16 UNIT       :AUTO
17 LOG RESUME:1
18 OUT LOG    :1

PUSH DATA:DATA FIX & GO
PUSH STAT:DATA CHANGE

1 PARAMETER NO CLEAR
```

For further explanations on each item of the parameters, refer to "5.2 Various Parameter Settings and Setting Items" on page 63.

2.1.4 Date and Time Setting

When correcting time, set to the parameter setup mode ("2.1.3 Printing the Parameter Settings List" on page 11), and set the date and time by the following operation procedure.

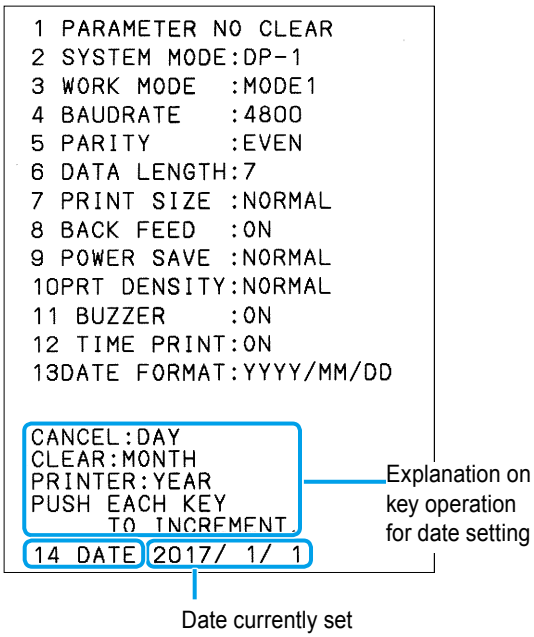
For further details on the parameter setup mode, refer to "5.2 Various Parameter Settings and Setting Items" on page 63.

1 Move the parameter set item to the date setting position in the parameter setup mode.

Press [DATA] repeatedly until "14 DATE" is printed.

» Whenever [DATA] is pressed, the parameter set item/contents are printed by line as shown in the right figure.

» The explanation on key operation for date setting and the date currently set are printed as shown in the right figure.



Tips

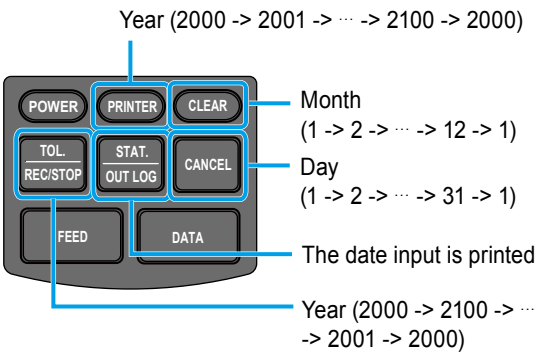
To change the date, calculate (count) the number of changes from the printed date, and go to **2**.

2 Input the date. (If change is not required, go to **3**.)

1 Input "Year" by pressing [PRINTER] or [TOL. REC/STOP] the necessary amount of times from the current set value.

2 Input "Month" by pressing [CLEAR] the necessary amount of times from the current set value.

3 Input "Day" by pressing [CANCEL] the necessary amount of times from the current set value.



Tips

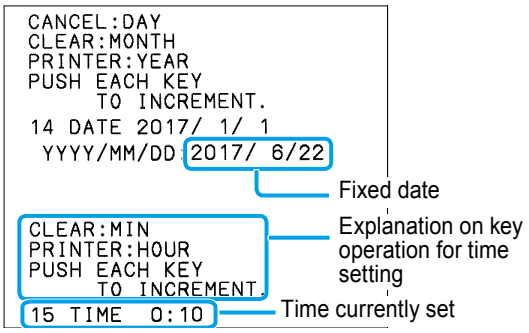
- Press [STAT. OUT LOG] to print the input date to check the input contents.
- Leap years and the number of days in a month are automatically calculated.

3 Fix the date.

Press DATA once.

» The fixed date is printed.

» The explanation on key operation for time setting, next settings "15 TIME" and the time currently set are printed as shown in the right figure.



Tips

If the desired date is not printed, enter the parameter setup mode again to re-enter it.

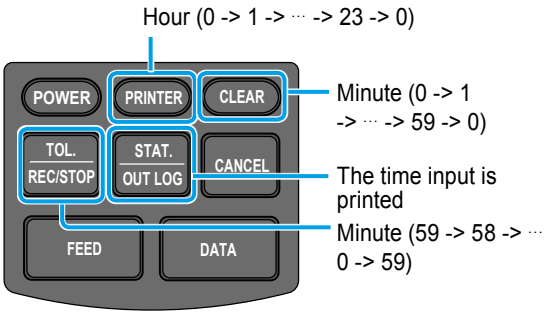
4 Input the time. (If change is not required, go to 5.)

1 Input "Hour" by pressing PRINTER the necessary amount of times from the current set value.

2 Input "Minute" by pressing CLEAR or TOL. REC/STOP the necessary amount of times from the current set value.

3 Check whether the printed time is the intended one by pressing STAT. OUT LOG.

4 When the desired time is not printed, change it with procedure 1 or 2.



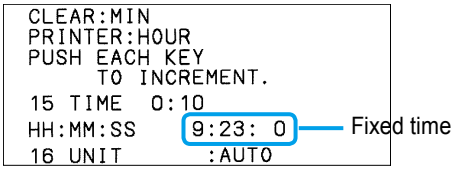
Tips

Set the time in the 24-hour system format.

5 Fix the time.

Press DATA once.

» The fixed time is printed.



Tips

- If the desired time is not printed by pressing DATA, enter the parameter setup mode again to re-enter it.
- Even if the power is turned off after this operation, the date and time set shall be maintained. However, when the parameters are cleared with "PARAMETER CLEAR" in the parameter, the date and time is set as "2017/1/1 0:0" and resetting is required..

The date and time have been set via the above.
If it is desired to complete parameter setup after the above, press DATA repeatedly until parameter setup list is printed.

2.1.5 Connection of a Measuring Instrument with Digimatic Output

Connect the Digimatic connection cable (option) to the product according to the following procedure.

1 Prepare.

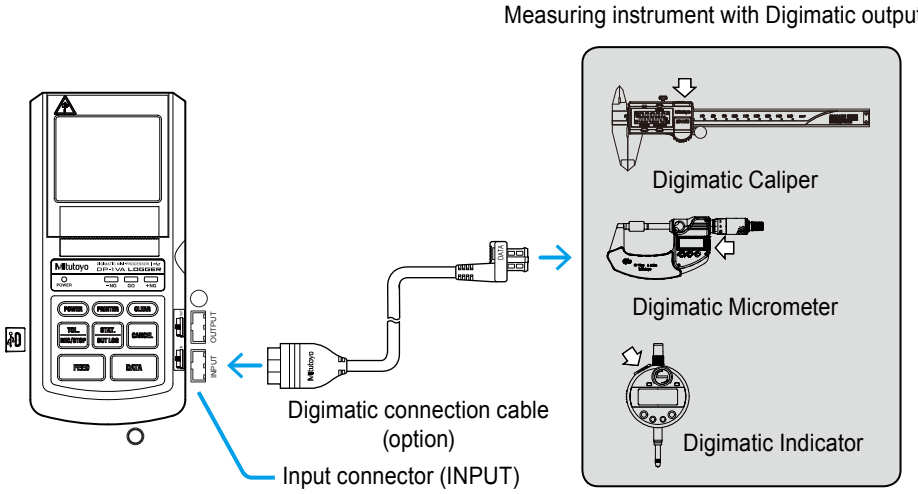
Prepare the measuring instrument with Digimatic output to connect and the Digimatic connection cable.
For further details on the Digimatic connection cable, refer to "7.4.1 Digimatic Connection Cable List" on page 79.

2 Check the power.

Check whether the power of the product is off.

3 Connect the Digimatic connection cable.

Connect one of the connectors of the Digimatic connection cable to the input connector (INPUT) on the right side of the product, and connect another one to the output connector of the measuring instrument with the Digimatic output side.



NOTICE

Do not use the product in a dusty place. If used in a dusty place, it may cause failure due to dust penetrating into the product.

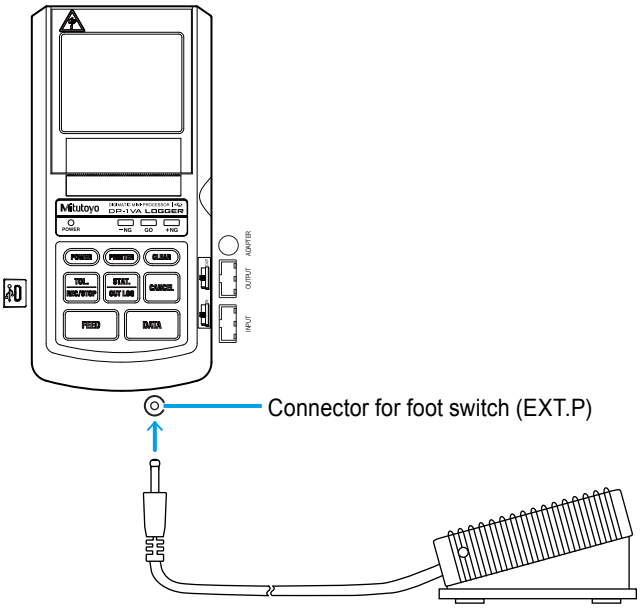
Tips

- Pay attention to the connector directions when inserting. DP-1VA LOGGER side of the connection cable shall be connected to ensure that the Mitutoyo logo mark on the connector is facing up.
- The connector shall be removed/inserted straight in the connector to avoid excessive burden to the product connector portion.

2.1.6 Connection of the Foot Switch (Option)

Data can be input without pressing DATA by using an optional foot switch (Parts No. 937179T, cable length: 2 m).

Connect the foot switch to the foot switch connector (EXT.P) on the lower side of the product.



Tips

The data can be input while using both hands for measurement when the foot switch is used.

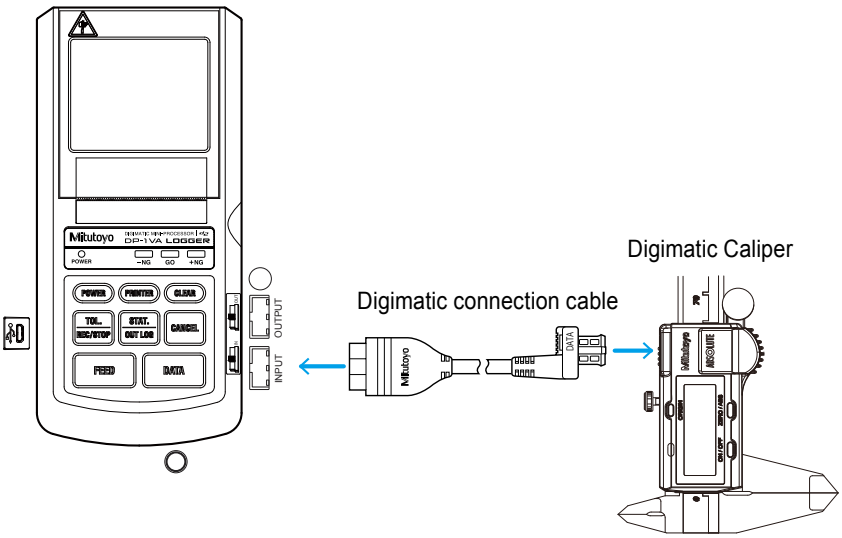
2.2 Measuring with a Measuring Instrument with Digimatic Output and Printing

The procedure to print the measurement data, after connecting to Digimatic Caliper, with MODE1 (initial setting at the time of purchase) in DP-1 mode is explained.

Tips

The various mode settings, other than the initial settings at the time of purchase, are explained in "5.1 Various SYSTEM/WORK MODE and Print Contents/Output to PC" on page 61.

1 Connect the Digimatic Caliper to the product via a Digimatic connection cable.

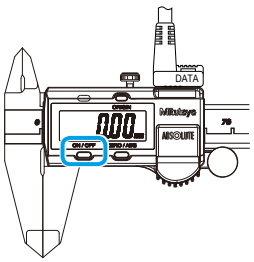


For further details on the connection method, refer to "2.1.5 Connection of a Measuring Instrument with Digimatic Output" on page 14.

2 Turn on the Digimatic Caliper power.

Press the [ON/OFF] button of the Digimatic Caliper.

» A numeric value is displayed on the LCD display portion of the Digimatic Caliper.



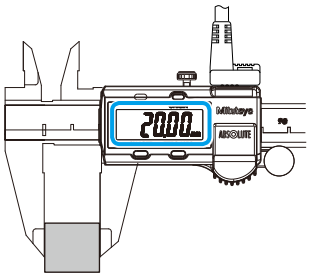
3 Turn on the power of the product.

Press (POWER), and then release a finger from the key.

» The power LED is lit and then the printer paper is fed.

4 Measure the workpiece with the Digimatic Caliper.

» A measurement value is displayed on the LCD display portion of the Digimatic Caliper.



5 Press DATA to input the measurement data.

» The measurement value is printed.

```
DATE 2017/ 6/22
TIME  9:55

  * LOG =    0
  * LOG STOP *
    1       20.00     mm
```

Tips

- The measurement data can be input by pressing the [DATA] button or with the foot switch (option) operation.
- When the measurement data cannot be input due to the reason that the power of the Digimatic Caliper is not turned on, the message "∗ NO GAGE ∗" is printed and a buzzer sounds and the "-NG" and "+NG" LEDs blink. To turn off the blinking LED, input normal measurement data.

6 Continuously, measure the workpiece with the Digimatic Caliper to input the measurement data.

1 Measure the workpiece with the Digimatic Caliper.

2 Press DATA.

» The measurement value is printed.

```
DATE 2017/ 6/22
TIME  9:55

  * LOG =    0
  * LOG STOP *
    1       20.00     mm
    2       19.98     mm
```

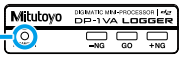
Tips

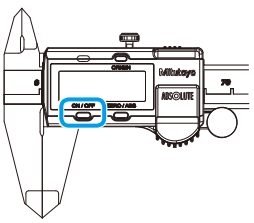
When you press CANCEL, the measurement data input immediately before is deleted. If you press CLEAR, all measured data will be deleted.

7 Completing measurement, turn off the product power.

1 Press POWER until the power LED is off.

Light is off





Tips

When the power is turned off, the measurement data is deleted..

2 Turn off the Digimatic Caliper power.

3 Detach the Digimatic connection cable from the product and the Digimatic Caliper.

Tips

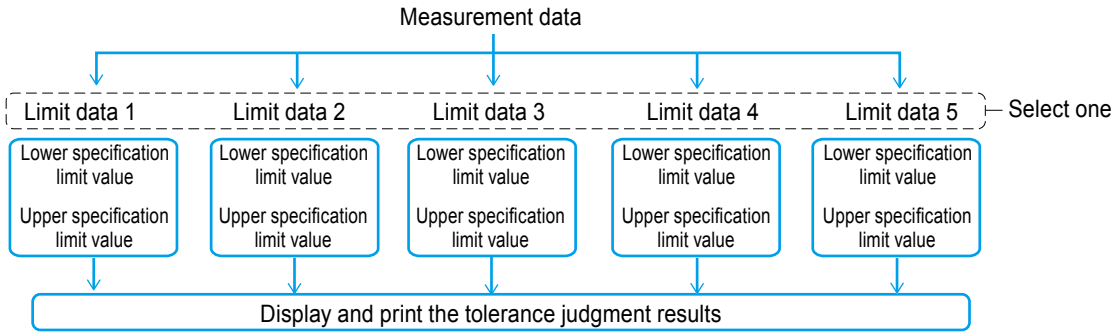
When printing the measurement value measured with the measuring instrument with Digimatic output other than the Digimatic Caliper, follow the basic procedure described below.

- Before the measurement
  1. Connect to the measuring instrument with Digimatic output via a Digimatic connection cable in the power off state.
  2. Turn on the power of the measuring instrument with Digimatic output.
  3. Turn on the product power.
- After the measurement
  1. Turn off the product power.
  2. Turn off the power of measuring instrument with Digimatic output.
  3. Detach the Digimatic connection cable from the product and the measuring instrument with Digimatic output.

2.3 Display and Printing the Tolerance Judgment Results

It is possible to make a tolerance judgment by comparing a set of upper/lower specification value (limit data) and measurement data.

The limit data can be set up to a maximum of five sets.



2.3.1 Tolerance Settings

Set the limit data for tolerance judgment following the operation below.

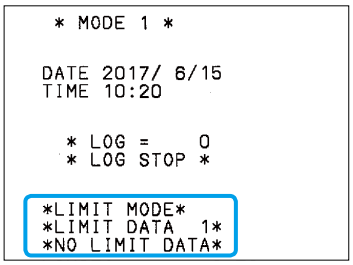
1 Connect a measuring instrument with Digimatic output to the product.

For further details on the connection method, refer to "2.1.5 Connection of a Measuring Instrument with Digimatic Output" on page 14.

2 Turn on the product power.

3 Turn on the power of the measuring instrument with Digimatic output.

4 Press TOL. REC/STOP to enter the limit input mode.



Tips

- To enter the limit input mode, the product must be in one of the following two states: <1> No input data immediately after power-on, or <2> all data is deleted with CLEAR operation.
- When in the "∗PRINTER OFF∗" state, the limit input mode cannot be entered into. Press PRINTER , after "∗ PRINTER ON ∗" prints, perform the aforementioned operations. Also, the printer will switch on due to the power being on.
- If TOL. REC/STOP is held down, the limit input mode will not be entered into, and the logging functions will start.

5 Display the value to be set as a lower specification limit or upper specification limit with the measuring instrument with Digimatic output.

Tips

Either the lower specification limit value or the upper specification limit value can be displayed first. When setting them, the lower value is set to the lower specification limit value and the higher value to the upper specification limit value.

6 Press [DATA] to input the data.

» First limit data is printed [LIMIT1].

```
*LIMIT MODE*
*LIMIT DATA  1*
*NO LIMIT DATA*
LIMIT1          9.70    mm
```

7 Display the value to be set as a lower specification limit or upper specification limit with the measuring instrument with Digimatic output.

8 Press [DATA] to input the data.

» Second limit data is printed [LIMIT2].

```
LIMIT1          9.70    mm

LIMIT2         10.20    mm
```

Tips

When redoing the previous data input, cancel it by pressing [CANCEL] and redo the input.

9 Press [TOL. REC/STOP] to exit the limit input mode.

» The set limit data is printed.

```
*NEW LIMIT DATA*
*LIMIT DATA  1*
DATE 2017/ 6/15
TIME 10:20

LSL             9.70    mm
USL            10.20    mm
TOL             0.50    mm
```

lower specification limit value
Upper specification limit value
Tolerance

■ When setting the limit data 2 continuously

1 Press [TOL. REC/STOP] to enter the limit input mode.

```
*LIMIT MODE*
*LIMIT DATA  1*
LSL             9.70    mm
USL            10.20    mm
TOL             0.50    mm
```

2 Press [STAT. OUT LOG] to enter the limit data 2 input mode.

```
*LIMIT DATA  2*
*NO LIMIT DATA*
```

3 Display the value to be set as a lower specification limit or upper specification limit with the measuring instrument with Digimatic output.

4 Press [DATA] to input the data.

» First limit data is printed.

```
*LIMIT DATA  2*
*NO LIMIT DATA*
LIMIT1        12.20   mm
```

5 Display the permissible value to be set as a lower specification limit or upper specification limit with the measuring instrument with Digimatic output.

6 Press [DATA] to input the data.

» Second limit data is printed.

```
LIMIT1        12.20   mm

LIMIT2        12.80   mm
```

Tips

When redoing the previous data input, cancel it by pressing [CANCEL] and redo the input.

7 Press [TOL. REC/STOP] to exit the limit input mode.

» The set limit data is printed.

```
*NEW LIMIT DATA*
*LIMIT DATA  2*
DATE 2017/ 6/15
TIME 10:21

LSL           12.20   mm
USL           12.80   mm
TOL            0.60   mm
```

When setting the limit data 3, 4 or 5 continuously, repeat the same operation as those done for limit data 2.

Tips

- After completing limit data 5 setting, it returns to limit data 1 setting again.
- The same value can not be set for LIMIT1 and LIMIT2. If the same values are input to LIMIT1 and LIMIT2, the tolerance setting is not completed and the buzzer sounds two beeps. Pressing [CANCEL] or [CLEAR], redo the input.
- When switching the limit data, press [STAT. OUT LOG] in the limit input mode.
- Limit data remains stored even after the power is turned off.
- Immediately after the power is turned on, the limit data used at the previous time of power off is selected.
- If no limit data is required (if limit tolerance judgment is not required), either select a limit number to which no limit data has been input, or delete the limit data (refer to "2.3.3 Deletion of Upper/ Lower Specification Limit Value (Limit Data)" on page 23)

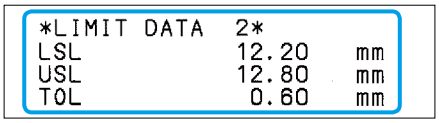
2.3.2 Measurement and Display/Printing the Tolerance Judgment Results

The tolerance judgment result of measurement data can be displayed with the tolerance judgment LED or printed by the limit data setting.

1 Connect a measuring instrument with Digimatic output to the product.

2 Press POWER and then release a finger from the key to turn on the product power.

» The limit data set is printed.



3 Select the limit data.

Tips

If the limit data desired to select is printed with the operation in procedure **2** already, this operation is not required. Proceed to procedure **4**.

1 Press TOL. REC/STOP.

» The limit input mode is entered.

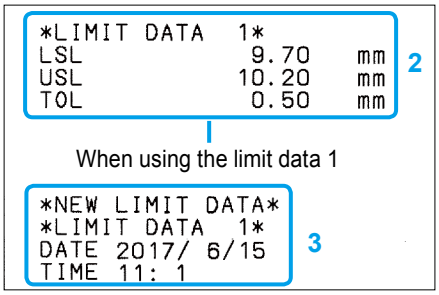
2 Press STAT. OUT LOG until the limit data you want to use is printed.

» The limit data is switched each time STAT. OUT LOG is pressed.

3 Press TOL. REC/STOP.

» Limit data to be used is determined.

» "∗ NEW LIMIT DATA ∗" and "∗ LIMIT DATA 1 ∗" are printed.



4 Turn on the power of the measuring instrument with Digimatic output.

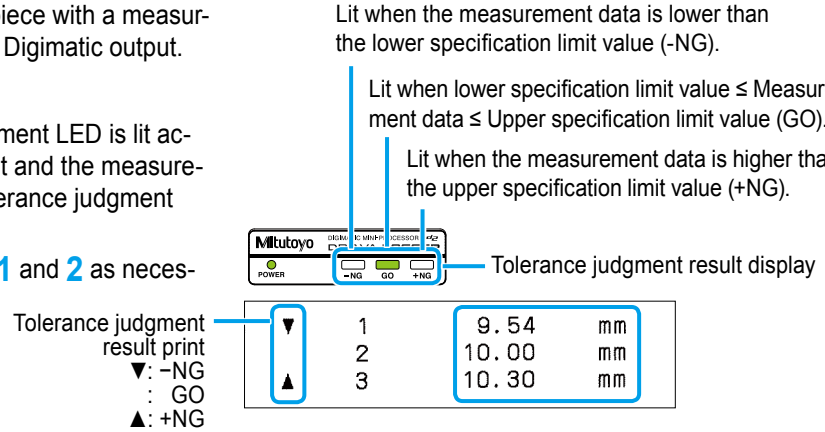
5 Measure with a measuring instrument with Digimatic output to input the measurement data.

1 Measure the workpiece with a measuring instrument with Digimatic output.

2 Press DATA.

» The tolerance judgment LED is lit according to the result and the measurement result and tolerance judgment result are printed.

3 Repeat procedure **1** and **2** as necessary.



Tips

- If measurement data is not input, limit data can be set by pressing TOL. REC/STOP even when the power is turned on.
- The tolerance judgment result can be output by connecting the GO±NG judgment cable (option) to the output connector.
  For further details on the tolerance judgment result output function, refer to "4.3 Tolerance Judgment Result Output" on page 58.

Based on the measurement data here, "2.4 Printing the Statistical Calculation Value" on page 24 is performed.

2.3.3 Deletion of Upper/Lower Specification Limit Value (Limit Data)

When deleting the upper/lower specification limit value (limit data), follow the procedure below.

1 Press TOL. REC/STOP to enter the limit input mode.

```
*LIMIT MODE*
*LIMIT DATA  1*
LSL          9.70   mm
USL         10.20   mm
TOL          0.50   mm
```

2 Select the limit data.

Tips

If the limit data desired to delete is printed with the operation in procedure **1**, this operation is not required. Proceed to procedure **3**.

Continue to press STAT. OUT LOG until the limit data desired to delete is printed.

```
*LIMIT DATA  2*
LSL         12.20   mm
USL         12.80   mm
TOL          0.60   mm
```

» The limit data is switched each time STAT. OUT LOG is pressed.

Tips

The old data is overwritten and disappears if the new limit data is input to it by selecting the limit data number already set.

3 Press CLEAR to delete the limit data.

```
*LIMIT CLEARED*
DATE 2017/ 6/15
TIME 11: 6

*LIMIT DATA  2*
*NO LIMIT DATA*
```

Tips

The measurement data can be immediately input following the operation above. However, the tolerance judgment cannot be performed as the limit data is deleted. To perform the tolerance judgment, enter the limit input mode again and measure after selecting the limit data set for the tolerance judgment.

2.4 Printing the Statistical Calculation Value

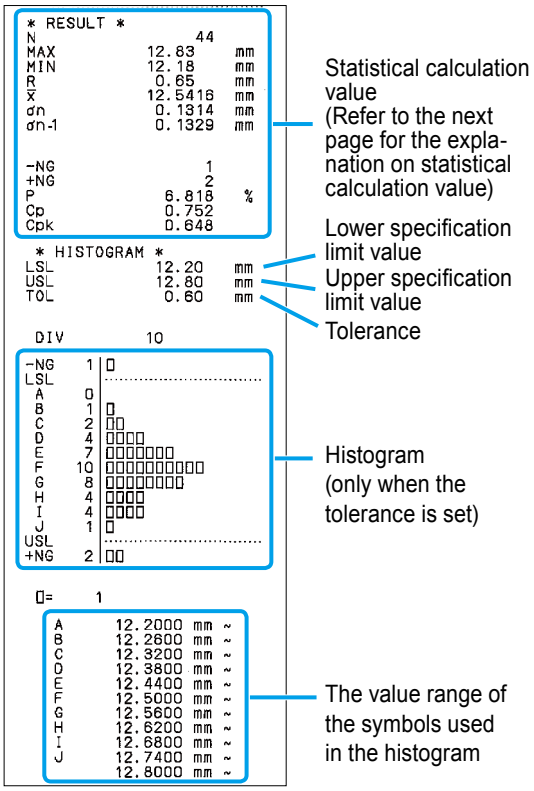
Following the operation explained in "2.3.2 Measurement and Display/Printing the Tolerance Judgment Results" on page 22, the operation to print the statistical calculation value and histogram based on the input data (a distribution chart of the measurement data) is explained here.

Tips

When the power is turned off, the measurement data is deleted. In case the power is turned off, the operation below shall be performed after performing the measurement value input operation again.

1 Press STAT. OUT LOG to print the statistical calculation result.

» The statistical calculation result is printed.



Tips

- The maximum number of data that can be handled with MODE1 is 9,999. Once 9,999 measurement data are input, the statistical calculation result is automatically printed.
- If "TIME PRINT" of the parameter is set to "OFF", the date and time are not printed.

2 Hold down POWER to turn off the power once the measurement value input and statistical calculation result printing are completed.

Tips

On/Off operation of the power shall be performed at an interval of 5 seconds or more.

■ Statistical calculation values

Printout	Meaning	Calculation formula
N	Number of data	
MAX	Maximum data value	
MIN	Minimum data value	
R	Data range	MAX−MIN
$\overline{X}$	Average data value	ΣXi/N
σn	Standard Deviation	$\sigma n = ((N \cdot \Sigma ESXi^2 - (\Sigma Xi)^2) / N2)^{1/2}$
σn-1	Sample Standard Deviation	$\sigma n - 1 = ((N \cdot \Sigma ESXi^2 - (\Sigma Xi)^2) / N \cdot E(N - 1))^{1/2}$
−NG	Number of data lower than the lower specification limit value	Number of data for which LSL > Xi
+NG	Number of data higher than the upper specification limit value	Number of data for which USL < Xi
P	Fraction defective	P = ((-NG) + (+NG))/N
Cp	Process capability index	Cp = TOL/(6σn − 1) TOL:USL − LSL
Cpk	When process capability index bias is considered	Cpk = Zmin/3 Zmin:The lower value of ZUSL and ZLSL ZUSL = (USL − $\overline{X}$)/σn−1, ZLSL = ($\overline{X}$ − LSL)/σn−1

MEMO

3 Advanced Operations and Useful Functions

Advanced operations and useful functions are explained.

3.1 Printing only Measurement Data and Tolerance Judgment Results (MODE0)

The printing contents can be limited to the measurement data and tolerance judgment result by setting WORK MODE to "MODE0" in the parameter setup mode.

The operation to measure in "MODE0" and print its result is explained here.

1 Set the WORK MODE to "MODE0".

1 While pressing [DATA] press (POWER), then just release (POWER), when the printing starts, then release [DATA].

» The power is turned on and enters the parameter setup mode.

```
Mitutoyo

DP-1VA LOGGER
PARAMETER SETUP MODE

2 SYSTEM MODE:DP-1
3 WORK MODE   :MODE1
4 BAUDRATE    :4800
```

2 Press [DATA] twice.

» The WORK MODE currently set is printed (MODE1, here).

3 Press [STAT. OUT LOG] repeatedly until "3 WORK MODE :MODE0" is printed.

4 Press [DATA].

» "MODE0" is determined.

```
PUSH DATA:DATA FIX & GO
PUSH STAT:DATA CHANGE

1 PARAMETER NO CLEAR
2 SYSTEM MODE:DP-1
3 WORK MODE   :MODE1   2
3 WORK MODE   :MODE2
3 WORK MODE   :MODE3
3 WORK MODE   :MODE0   3
```

5 Press [DATA] repeatedly until the parameter settings list is printed.

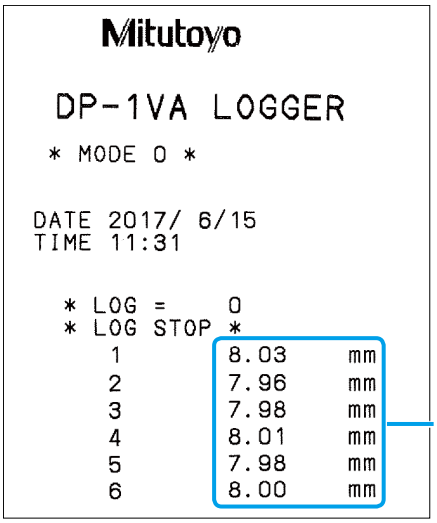
» Parameter setup mode is completed.

```
2 SYSTEM MODE:DP-1
3 WORK MODE   :MODE0
4 BAUDRATE    :4800
5 PARITY      :EVEN
6 DATA LENGTH:7
7 PRINT SIZE  :NORMAL
8 BACK FEED   :ON
9 POWER SAVE  :NORMAL
10PRT DENSITY:NORMAL
11 BUZZER     :ON
12 TIME PRINT:ON
13DATE FORMAT:YYYY/MM/DD
14 DATE 2017/ 6/15
15 TIME 11:24
16 UNIT       :mm
17 LOG RESUME:1
18 OUT LOG    :1
```

2 Input the measurement data.

Measure the workpiece, press DATA.

» The measurement data is printed each time DATA is pressed.

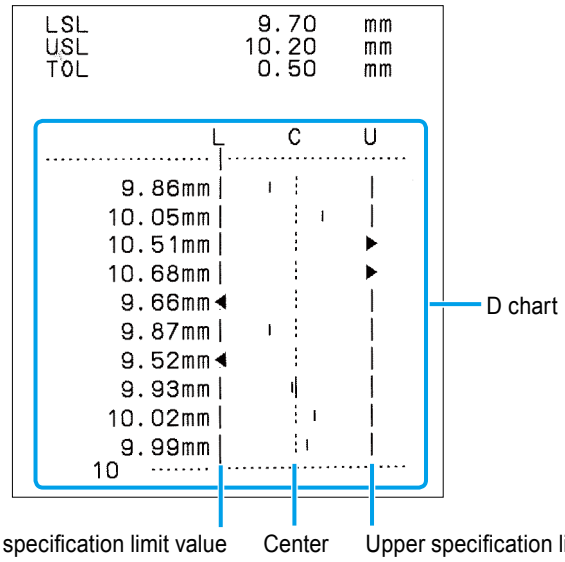


Tips

- The maximum number of data that can be handled with MODE0 is 100,000.
- Regardless of the SYSTEM MODE (DP-1, MP), only the measurement data and tolerance judgment result can be printed maximum 100,000 lines when the WORK MODE is set to "MODE0".
  - When printing the statistical calculation result or histogram:
    MODE1
  - When printing D chart:
    MODE2 (when DP-1 mode is set)
  - When printing calculation result for $\bar{X}$-R control chart:
    MODE3 (when DP-1 mode is set)
- The limit data shall be set before entering the measurement data to print the tolerance judgment result.
  For further details on the limit data setting method, refer to "2.3.1 Tolerance Settings" on page 19.

3.2 D Chart (Chart Indicating Temporal Changes of Measurement Data) Printing (MODE2)

Explain the operation to print the D chart which acquaints the distribution of measurement values visually when the SYSTEM MODE is "DP-1".



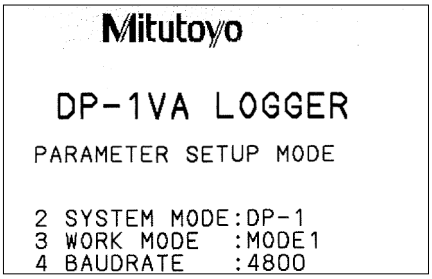
Tips

The D of the D chart stands for "Displacement", and the D chart is the chart that graphs the displacement.

1 Set the WORK MODE to "MODE2".

1 While pressing [DATA] press [POWER], then just release [POWER], when the printing starts, then release [DATA].

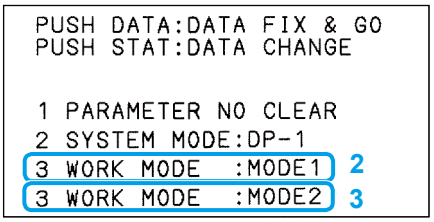
» The power is turned on and enters the parameter setup mode.



2 Press [DATA] twice.

» The WORK MODE currently set is printed.

3 Press [STAT. OUT LOG] repeatedly until "3 WORK MODE :MODE2" is printed.



4 Press [DATA].

» "MODE2" is fixed.

5 Press [DATA] repeatedly until the parameter settings list is printed.

» Parameter setup mode is completed.

```
2 SYSTEM MODE:DP-1
3 WORK MODE  :MODE2
4 BAUDRATE   :4800
5 PARITY     :EVEN
6 DATA LENGTH:7
7 PRINT SIZE :NORMAL
8 BACK FEED  :ON
9 POWER SAVE :NORMAL
10PRT DENSITY:NORMAL
11 BUZZER    :ON
12 TIME PRINT:ON
13DATE FORMAT:YYYY/MM/DD
14 DATE 2017/ 6/15
15 TIME   9:51
16 UNIT      :mm
17 LOG RESUME:1
18 OUT LOG   :1
```

2 Set the tolerance judgment.

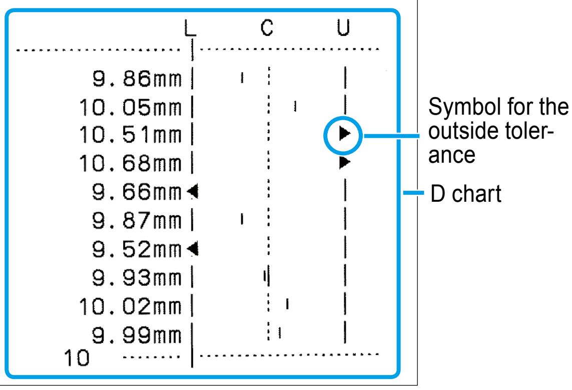
For further details on setting and selection method of the tolerance judgment, refer to "2.3.1 Tolerance Settings" on page 19.

```
*LIMIT DATA   1*
LSL            9.70   mm
USL           10.20   mm
TOL            0.50   mm
```

3 Press [DATA] to input the measurement data.

» The measurement data is printed in D chart format each time [DATA] is pressed.

```
LSL            9.70   mm
USL           10.20   mm
TOL            0.50   mm
```

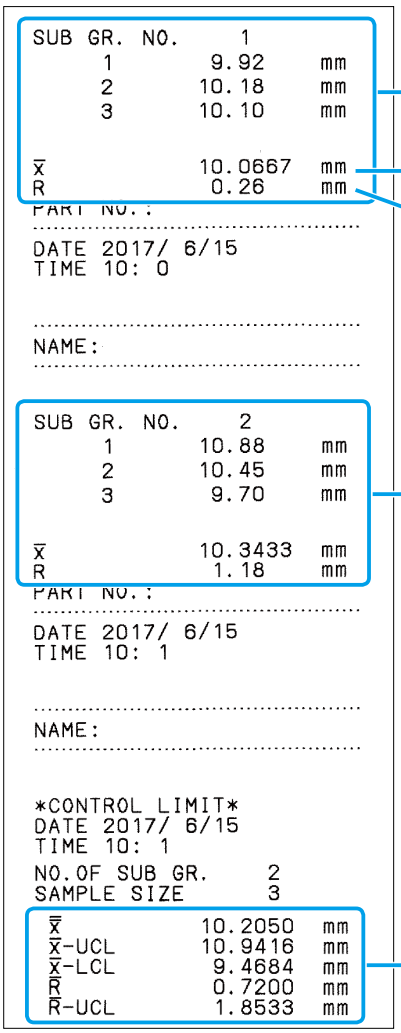


Tips

- Symbol ◀ ▶ in the D chart represents that the measurement data is out of the tolerance.
- The maximum number of measurement data that can be handled with MODE2 is 9,999.
- When pressing [STAT. OUT LOG] after inputting the measurement data, the statistical calculation value and histogram are printed as in the case of MODE1. Once 9,999 measurement data are input, the statistical calculation result is automatically printed.

3.3 Printing the Data for Xbar-R Control Chart (MODE3)

When the SYSTEM MODE is "DP-1", the calculation results for generating the $\overline{X}$-R control chart, which is one of representative control chart of sampling method of weighing data can be printed. The printing operation is explained here.



The measurement data and calculation result of subgroup 1

Average value

Range

The measurement data and calculation result of subgroup 2

The control limit's calculation result of all the subgroup measured before now

Tips

For further details on the formula, refer to "7.2.2 Formulas" on page 76.

1 Set the WORK MODE to "MODE3".

1 While pressing [DATA] press (POWER), then just release (POWER), when the printing starts, then release [DATA].

» The power is turned on and enters the parameter setup mode.

```
Mitutoyo

DP-1VA LOGGER

PARAMETER SETUP MODE

2 SYSTEM MODE:DP-1
3 WORK MODE   :MODE2
4 BAUDRATE    :4800
5 PARITY      :EVEN
```

2 Press [DATA] twice.

» The WORK MODE currently set is printed.

3 Press [STAT. OUT LOG] repeatedly until "3 WORK MODE :MODE3" is printed.

4 Press [DATA].

» "MODE3" is determined.

```
PUSH DATA:DATA FIX & GO
PUSH STAT:DATA CHANGE

1 PARAMETER NO CLEAR
2 SYSTEM MODE:DP-1
3 WORK MODE   :MODE2   2
3 WORK MODE   :MODE3   3
```

5 Press [DATA] repeatedly until the parameter settings list is printed.

» Parameter setup mode is completed.

```
2 SYSTEM MODE:DP-1
3 WORK MODE   :MODE3
4 BAUDRATE    :4800
5 PARITY      :EVEN
6 DATA LENGTH:7
7 PRINT SIZE  :NORMAL
8 BACK FEED   :ON
9 POWER SAVE  :NORMAL
10PRT DENSITY:NORMAL
11 BUZZER     :ON
12 TIME PRINT:ON
13DATE FORMAT:YYYY/MM/DD
14 DATE 2017/ 6/15
15 TIME  9:58
16 UNIT       :mm
17 LOG RESUME:1
18 OUT LOG    :1
```

This completes the parameter setting.

Next, move to the subgroup measurement.

When the WORK MODE is set to "MODE3", the key operation differs from usual as shown below.

Key	During subgroup measurement →	After completion of subgroup measurement
(CLEAR)	Re-input from the No.1 data.	Delete all the measurement data (setting contents will remain).
[CANCEL]	Cancel the previously inputted measurement data.	Deletes the subgroup for which input was previously completed.
[TOL. REC/STOP]	Stop measurement and release the measuring mode.	Move to the next subgroup measurement.
[STAT. OUT LOG]	Calculates $\bar{X}$ and R to print the result completing the subgroup measurement.	Calculates the control limits with all the subgroups' data input up to that point of time and prints the results.

2 Press [TOL. REC/STOP] to start the subgroup measurement.

» Subgroup number 1 is printed.

```
  * MODE 3 *

DATE 2017/ 6/15
TIME  9:59


  * LOG =    0
  * LOG STOP *

SUB GR. NO.     1
```

3 Press [DATA] to input the measurement data.

» The measurement data is printed each time [DATA] is pressed.

```
SUB GR. NO.     1
     1        9.92    mm
     2       10.18    mm
     3       10.10    mm
```

Measurement data

Tips

When canceling the previous measurement data, press [CANCEL] ("ÛCANCELÛ" is printed)

4 After measuring the necessary number of samples, press [STAT. OUT LOG] to print the calculation result of the subgroup's $\bar{X}$-R determining sample size.

» The number of samples is set to the subgroup sample size and the calculation result of $\bar{X}$-R is printed.

```
SUB GR. NO.     1
     1        9.92    mm
     2       10.18    mm
     3       10.10    mm

X̄              10.0667  mm
R               0.26    mm
PART NO.:
.....
DATE 2017/ 6/15
TIME 10: 0
```

$\bar{X}$-R calculation result

Tips

The maximum sample data number of the subgroup is 10.

5 Press [TOL. REC/STOP] to start the next subgroup measurement.

» Subgroup number is printed.

```
SUB GR. NO.     2
```

6 Press [DATA] to input the measurement data.

» The measurement data is printed each time [DATA] is pressed.

```
SUB GR. NO.     2
     1       10.88    mm
     2       10.45    mm
     3        9.70    mm
```

Measurement data

Tips

After the necessary number of samples are measured, further measurement data is not input even if [DATA] is pressed. Proceed to the next procedure.

7 After measuring the defined number of samples, press [STAT. OUT LOG] to print the calculation result of the subgroup's $\bar{X}$-R completing the subgroup measurement.

» The calculation result of $\bar{X}$-R is printed.

8 Repeat the sample measurement for the necessary number of subgroups (process **5** to **7**).

Tips

Up to 9,999 can be set for subgroups.

9 Press [STAT. OUT LOG] to print the control limit's calculation results of the subgroup measured before now.

» The control limit's calculated values of all measured subgroups are printed ($\bar{R}$-LCL is not printed when the number of samples is below six).

Number of subgroups measured

```
*CONTROL LIMIT*
DATE 2017/ 6/15
TIME 10: 1
NO.OF SUB GR.      2
SAMPLE SIZE        3
X=                10.2050  mm
X-UCL             10.9416  mm
X-LCL              9.4684  mm
R=                 0.7200  mm
R-UCL              1.8533  mm
```

The calculation result of control limit with all subgroups' data

Tips

- When canceling the previous subgroup data, press [CANCEL] immediately after the subgroup measurement completion ("CLEAR SUB GR." is printed).
- When deleting all the subgroup data, press [CLEAR] immediately after the subgroup measurement completion ("CLEAR ALL DATA" is printed).
- When force-quitting the subgroup measurement terminating it, press [TOL. REC/STOP] during measurement. When the subgroup measurement is terminated, "∗ EXIT SUB GR ∗" is printed.

3.4 Logging of Measurement Data and Printing/Output of Log Data

Operations to log the measurement data (to store in the internal memory as log data), to print the log data collectively and to output them to PC collectively using USB interface are explained.

Depending on the internal battery, the saved log data is retained even when the power is turned off.

3.4.1 Parameter Settings for Data Log Function

Set the items below in parameter settings.

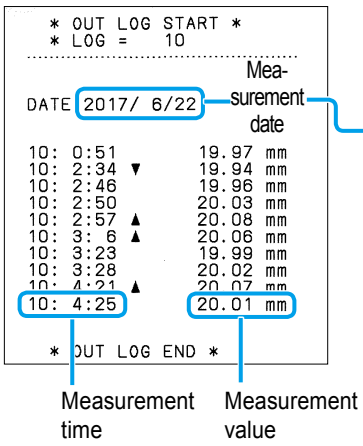
Setting items	Setting values	Setting contents	Initial setting values
LOG RESUME	1	Activate with the log halt state when power is turned on.	1
	2	Activate with the log start state when power is turned on.	
	3	Activate with the log state when the power was previously turned off when power is turned on.	
OUT LOG	1	Print contents: Time/Measurement value USB output data: Time/Measurement value	1 (Time/Measure-ment value)
	2	Print contents: Data number/Measurement value USB output data: Measurement value	
	3	Print contents: Data number/Date/Time/Measurement value USB output data: Date/Time/Measurement value	

For further details on USB output, refer to "4.1 USB Output of the Measurement Data" on page 49.

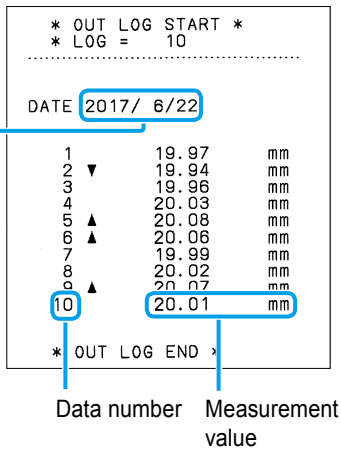
■ Log data collective print example

- In DP-1 mode

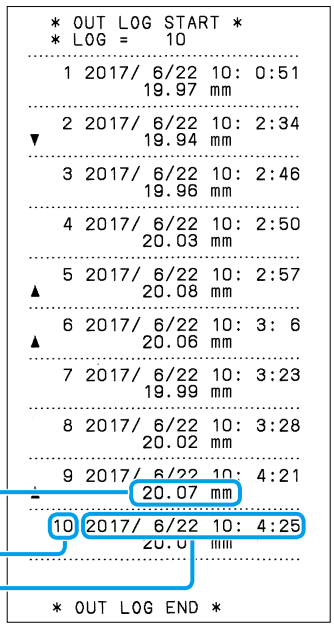
In case of OUT LOG setting value 1



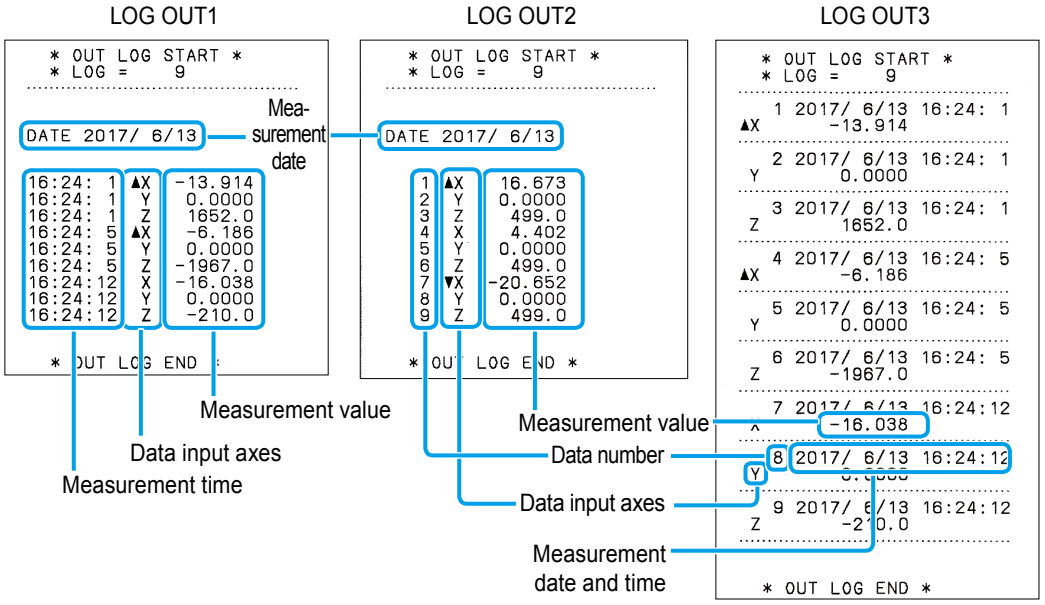
In case of OUT LOG setting value 2



In case of OUT LOG setting value 3



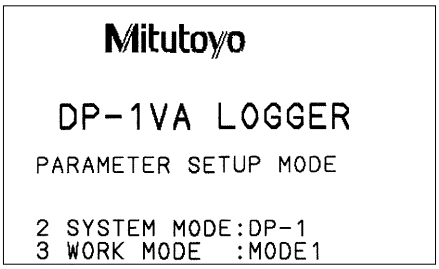
- In MP mode



1 Set "LOG RESUME" and "OUT LOG" of the parameters.

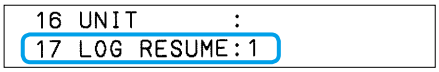
1 While pressing [DATA] press (POWER), then just release (POWER), when the printing starts, then release [DATA].

» The power is turned on and enters the parameter setup mode.

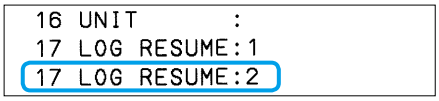


2 Press [DATA] repeatedly until "17 LOG RESUME" is printed.

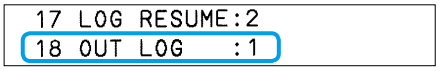
» "17 LOG RESUME : 1" is printed.



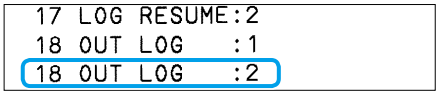
3 Press [STAT. OUT LOG] repeatedly until the desired number to set to LOG RESUME is printed.



4 Press [DATA].



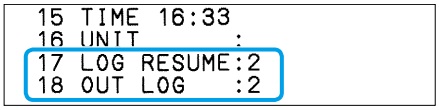
5 Press [STAT. OUT LOG] repeatedly until the desired number to set to "18 OUT LOG" is printed.



6 Press [DATA].

» The parameter settings list is printed.

» The parameter settings are completed.



3.4.2 Start/Stop of Logging, Collective Print/Deletion of Log Data

1 Turn on the power of the product connecting the measuring instrument with Digimatic output.

2 Start logging.

Hold down [TOL. REC/STOP], and then release a finger from the key.

» "∗ LOG START ∗" is printed.

» The logging function starts and waits for measurement data input.

```
∗ LOG =    0
∗ LOG STOP ∗

∗ LOG START ∗
```

Tips

If "∗ LOG START ∗" is printed when power is turned on, this operation is not required.

3 Press [DATA] to input the measurement data.

» The measurement data is printed each time [DATA] is pressed.

» At the same time, it is stored internally as log data.

```
∗ LOG START ∗
  1      8.93
  2      9.17
  3      9.15
  4      9.82
  5     10.41
```

Tips

- Input of the measurement data can be executed not only with [DATA] operation but also with the foot switch operation, the timer input or the request signal from a PC.
- When printing of the measurement data is not required, turn the printing off by pressing [PRINTER] before inputting the measurement data ("PRINTER ON" or "PRINTER OFF" is printed).
- When the number of log data exceeds 950, a dedicated buzzer sounds warning for each batch of 10 data from then on. Because up to 1,000 data can be logged, perform the output of the log data.
- When pressing [CANCEL] after measuring the data, one measurement datum is deleted and one log datum is deleted at the same time.

4 Stop logging.

Hold down [TOL. REC/STOP], and then release a finger from the key.

» "∗ LOG STOP ∗" is printed.

```
∗ LOG STOP ∗
```

Logging is now complete.

Next, output the stored log data.

5 Determine the output destination of the log data.

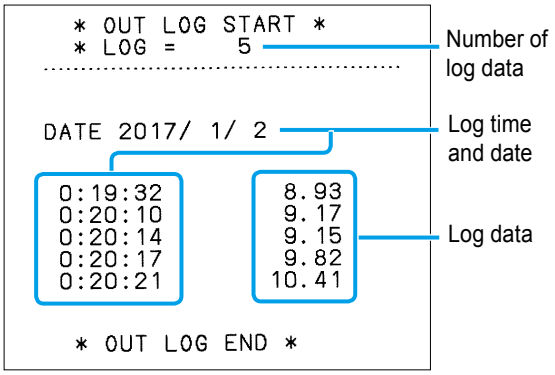
- In case printing them collectively, press [PRINTER] to check whether the printing function is on.
- If not, press [PRINTER] to turn off the printing function. (Buzzer sounds when measurement data input.)
- In case outputting them collectively to PC via USB, connect the product to a PC with a USB cable and activate the software such as Microsoft Excel.

6 Print (output to USB) log data collectively.

Hold down [STAT. OUT LOG], and then release a finger from the key.

» The log data is printed in the format set in OUT LOG of parameter.

» In case the product is connected to a PC with a USB cable, the log data is outputted to the PC.



Tips

- The collective output or print of log data is possible while logging without stopping logging.
- The log data remains stored without being deleted even if they are printed (output to USB). Or, they are not deleted even if the power is switched off. The deletion operation is required to delete the log data.
- Press [CANCEL] to interrupt the printing (USB outputting).
- The log data is printed all in the "NORMAL" size. Even if the "LARGE" size is set, they still shall be printed in the "NORMAL" size.
- The log data cannot be output to a PC connected with a RS-232C conversion cable.
- The data which are output to the PC are just the logged measuring values. The tolerance judgment results will not be output.
- The log data statistical calculation values cannot be printed.
- When the log data is going to be output to a USB, the output formats will be as per the following. E.g.: 2017 December 8 8:01.59 when the measuring value is 123.45 mm

USB output data	OUT LOG setting value		
	1	2	3
Date: year/month/day	Not output	Not output	20171208
Time: hours/minutes/seconds	080159	Not output	080159
Measurement value	123.45	123.45	123.45

7 Delete the log data.

1 Hold down (CLEAR) while pressing [TOL. REC/STOP].

2 Release [TOL. REC/STOP] first.

» "* ALL LOG CLEAR *" is printed.

Tips

Measured data will not be deleted even if the above operation is performed.

3.5 Inputting and Printing of the KA Counter Data with RS-232C

The operation procedure to print the display data of a KA Counter connecting a KA Counter with a RS-232C counter cable (option) is explained.

Tips

- The KA Counter is a counter for linear scale and also used as a counter for projectors such as PV-5110 and PH-3515F.
- Parameter setting or change in parameter setup mode is required beforehand. The display data of the KA Counter can be printed only when SYSTEM MODE is "MP mode" and WORK MODE is "MODE0" or "MODE1".

Initial setting of the parameters

```
2 SYSTEM MODE:DP-1
3 WORK MODE   :MODE1
4 BAUDRATE    :4800
5 PARITY      :EVEN
6 DATA LENGTH:7
7 PRINT SIZE  :NORMAL
8 BACK FEED   :ON
9 POWER SAVE  :NORMAL
10PRT DENSITY:NORMAL
11 BUZZER     :ON
12 TIME PRINT:ON
13DATE FORMAT:YYYY/MM/DD
14 DATE 2017/ 1/ 1
15 TIME  0: 0
16 UNIT       :AUTO
17 LOG RESUME:1
18 OUT LOG    :1
```

Change to MP mode

```
2 SYSTEM MODE:MP
3 WORK MODE   :MODE1
4 BAUDRATE    :4800
5 PARITY      :EVEN
6 DATA LENGTH:7
7 PRINT SIZE  :NORMAL
8 BACK FEED   :ON
9 POWER SAVE  :NORMAL
10PRT DENSITY:NORMAL
11 BUZZER     :ON
12 TIME PRINT:ON
13DATE FORMAT:YYYY/MM/DD
14 DATE 2017/ 1/ 1
15 TIME  0: 2
16 UNIT       :
17 LOG RESUME:1
18 OUT LOG    :1
19 INPUT AXIS:X Y Z
20 CUL    AXIS:X
```

Set the data input object axes (INPUT AXIS) and the calculation object axes (CUL) as needed.

1 Set the parameters.

1 While pressing [DATA] press (POWER), then just release (POWER), when the printing starts, then release [DATA].

» The power is turned on and enters the parameter setup mode.

```
Mitutoyo

DP-1VA LOGGER

PARAMETER SETUP MODE

2 SYSTEM MODE:DP-1
3 WORK MODE   :MODE1
4 BAUDRATE    :4800
5 PARITY      :EVEN
6 DATA LENGTH:7
7 PRINT SIZE  :NORMAL
8 BACK FEED   :ON
9 POWER SAVE  :NORMAL
```

Tips

The procedure to print the measurement data with "MODE1" of the initial setting is explained here. When printing only measurement data and tolerance judgment, change to "MODE0" ("3.1 Printing only Measurement Data and Tolerance Judgment Results (MODE0)" on page 27.)

2 Press DATA.

» "2 SYSTEM MODE : DP-1" is printed.

```
 1 PARAMETER NO CLEAR
 2 SYSTEM MODE:DP-1
```

3 Press STAT. OUT LOG.

» "2 SYSTEM MODE : MP" is printed.

```
 1 PARAMETER NO CLEAR
 2 SYSTEM MODE:DP-1
 2 SYSTEM MODE:MP
```

4 After pressing DATA until "19 INPUT AXIS" is printed, set the data input object axes.

» "19 INPUT AXIS : X Y Z" and setting methods are printed.

```
 16 UNIT      :
 17 LOG RESUME:1
 18 OUT LOG   :1
 19 INPUT AXIS:X Y Z

PUSH PRINTER  :X AXIS
PUSH CLEAR    :Y AXIS
PUSH CANCEL   :Z AXIS
PUSH DATA     :DATA FIX
```

Tips

To specify and release are possible for X axis with PRINTER, Y axis with CLEAR and Z axis with CANCEL and possible to set multiple axes.

5 After pressing DATA once, set the calculation object axes.

» "20 CUL AXIS : X" and setting methods are printed.

```
20 CUL   AXIS:X

PUSH PRINTER  :X AXIS
PUSH CLEAR    :Y AXIS
PUSH CANCEL   :Z AXIS
PUSH DATA     :DATA FIX
```

Tips

This setting is for the statistical calculation result printing. Only one axis can be calculated.

For further details on the statistical calculation printing, refer to "2.4 Printing the Statistical Calculation Value" on page 24.

6 Press DATA once.

» The parameter settings list is printed.

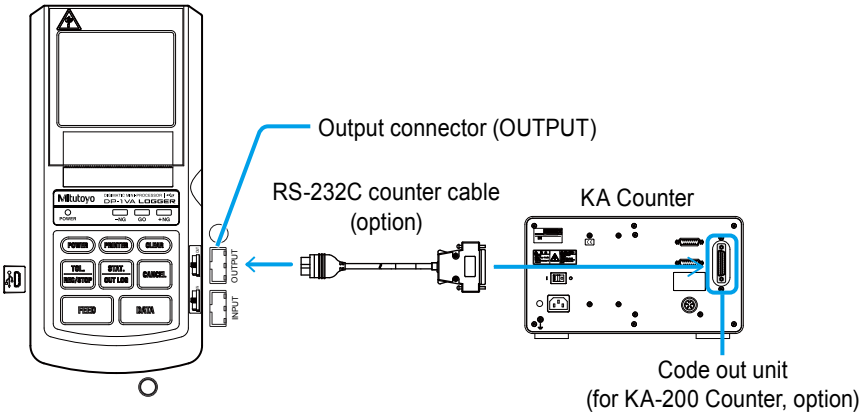
» The parameter settings are completed.

```
 2 SYSTEM MODE:MP
 3 WORK MODE   :MODE1
 4 BAUDRATE    :4800
 5 PARITY      :EVEN
 6 DATA LENGTH:7
 7 PRINT SIZE  :NORMAL
 8 BACK FEED   :ON
 9 POWER SAVE  :NORMAL
10PRT DENSITY:NORMAL
11 BUZZER     :ON
12 TIME PRINT:ON
13DATE FORMAT:YYYY/MM/DD
14 DATE 2017/ 1/ 1
15 TIME  0:46
16 UNIT      :
17 LOG RESUME:1
18 OUT LOG   :1
19 INPUT AXIS:X Y Z
20 CUL   AXIS:X
```

2 Turn off the product power.

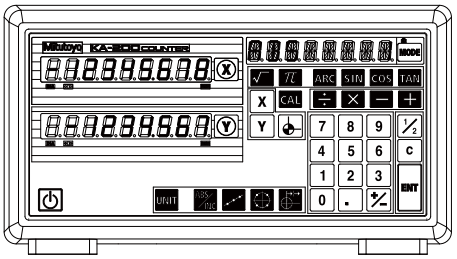
Press POWER until the power LED is off.

3 Connect the output connector of the product (OUTPUT) and the code out unit (for KA-200 Counter) of the KA Counter with a RS-232C counter cable (option).



4 Turn on the KA Counter power to start the counter display.

Refer to the instruction manual of KA Counter and turn on the power according to its operation method.



Tips

The value may not be displayed according to scale specifications. In this case, press [C] key.

5 Turn on the product power.

Press (POWER), release your finger from the key.

» The power LED is lit and the printer paper is fed.

6 Press [DATA] to input the displayed data.

» The printer paper is fed and the displayed data is printed.

```
* LOG =     0
* LOG STOP *
  1 X      1.717
    Y     0.0000
    Z      -83.0
  2 X     -2.974
    Y     0.0000
    Z       96.0
  3 X    -15.427
    Y     0.0000
    Z       96.0
```

7 Completing measurement, turn off the product power.

8 Turn off the KA Counter power.

9 Detach the connection cable.

Tips

- The setting is required in advance when the tolerance judgment of inputted data is performed. For further details on the necessary setting for tolerance judgment, refer to "2.3.1 Tolerance Settings" on page 19.
- When printing the statistical value of input data or the histogram, press STAT. OUT LOG.
  For further details on the statistical value or histogram print, refer to "2.4 Printing the Statistical Calculation Value" on page 24.
- When the power is turned off, the input data is deleted and the data number returns to 1.
- When deleting only previous data input, press CANCEL.
- When deleting all the input data, press CLEAR.

3.6 Other Functions

3.6.1 Timer Input of the Measurement Data

The measurement data can be automatically inputted at a regular interval. The interval time can be selected from the options below.

0.25 s, 1 s, 5 s, 30 s, 1 min, 30 min, 60 min

Tips

- The measurement data storing (N numbers) and log data storing are feasible for all timer settings.
- When setting at 0.25 s, only the output with RS-232C is possible but the measurement data cannot be printed. However, as the measurement data is internally stored, it is possible for them to become an object for statistical calculation.
- When setting at 1 s, only the output with USB or RS-232C is possible but the measurement data cannot be printed. However, as the measurement data is internally stored, it is possible for them to become an object for statistical calculation.

■ Timer input setting procedure for the measurement data

1 Connect the measuring instrument with Digimatic output or KA Counter to this product and turn on each power.

2 Enter the timer input mode.

Press FEED while pressing PRINTER .

» "∗ INTERVAL TIMER ∗" and the key name to set the timer input are printed.

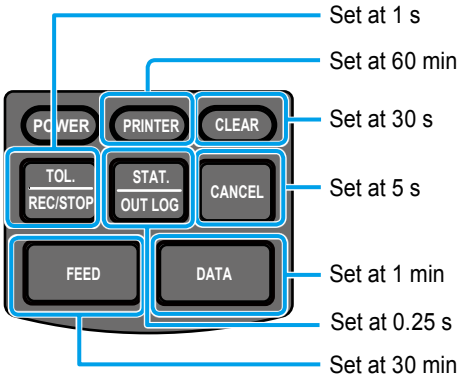
```
*INTERVAL TIMER*
STAT.:     0.25s
TOL.:         1   s
CANCEL:       5   s
CLEAR:       30   s
DATA:         1   m
FEED:        30   m
PRINTER:     60   m
```

3 Start the measurement data input selecting the interval time.

Press the key to set the interval time.

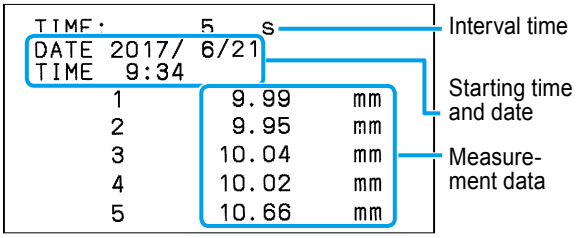
» The interval time set and the starting time/date are printed.

» Timer input starts.



Tips

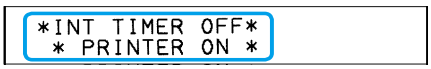
The buzzer sounds at the time of measurement data input but it does not when the interval time set at 0.25 s.



4 Completion of the timer input.

Press CLEAR while pressing PRINTER .

» "∗ INT TIMER OFF ∗" and "∗ PRINTER ON ∗" are printed.



Tips

- In case 0.25 s or 1 s is set to the interval time, do not press CANCEL , CLEAR or STAT. OUT LOG . It may cause a malfunction.
- If the data is already fetched when the timer input is completed, that data may be printed.
- The interval time shall not be changed while the timer input of measurement data is performed. The timer input shall be once terminated to change the interval time.

3.6.2 Deletion of the Measurement Data

Although (CLEAR) is pressed to delete the measurement data stored in the product internally, the deletion target may vary according to the WORK MODE as shown below.

MODE0, MODE1, MODE2	MODE3	
	During subgroup measurement	After completion of subgroup measurement
Only the measurement data is deleted. Press it before tolerance setting (limit data setting) without fail.	Re-input from the No.1 data.	Delete all the measurement data.

When deleting the log data, hold down (CLEAR) while pressing [TOL. REC/STOP].
For further details on the logging operation of measurement data, refer to "3.4.2 Start/Stop of Logging, Collective Print/Deletion of Log Data" on page 37.

Tips

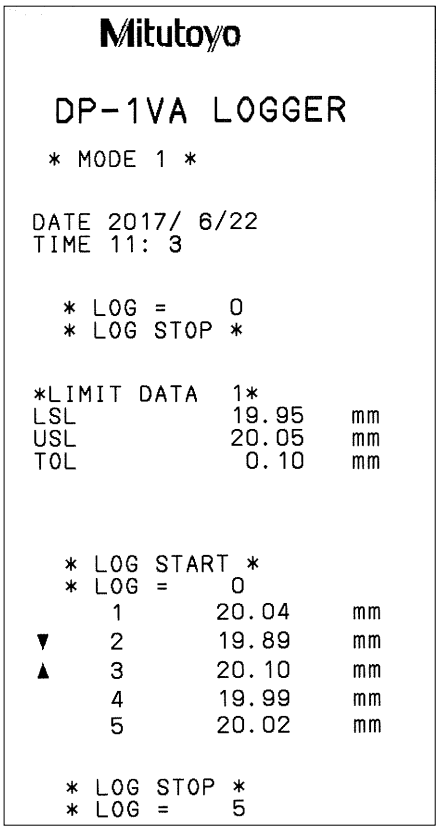
- The parameter setting is not changed even if (CLEAR) is pressed. When initializing the parameters, select "PARAMETER CLEAR" in "PARAMETER CLEAR" item of the parameter setting. For further details on the parameter setting, refer to "5.2 Various Parameter Settings and Setting Items" on page 63.
- When pressing [CANCEL], only the previously input data is deleted. When it is pressed after completion of the subgroup measurement in WORK MODE "MODE3", the previously input subgroup will be deleted.
  For further details on the operation in WORK MODE "MODE3", refer to "3.3 Printing the Data for Xbar-R Control Chart (MODE3)" on page 31.
- Be sure to delete the measurement data by pressing (CLEAR) before setting the limit data.

3.6.3 Change of a Print Character Font Size

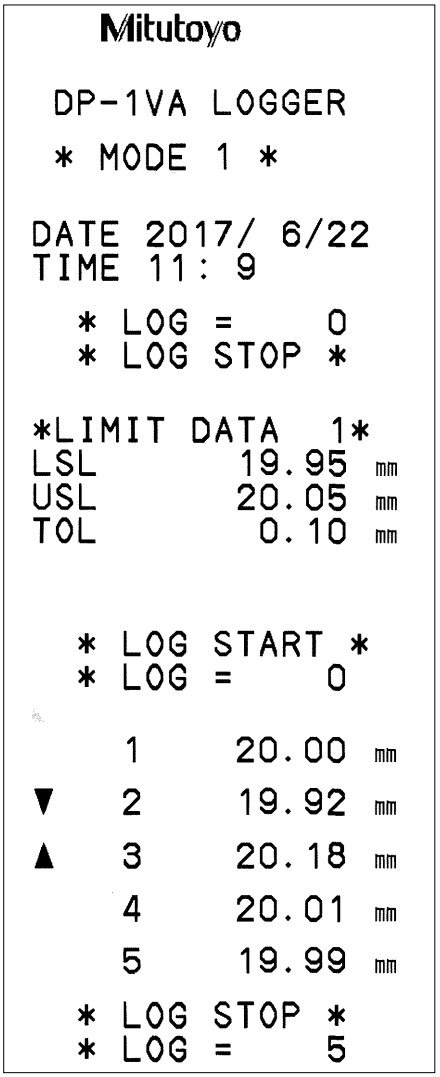
The print character font size can be selected from the two types, "NORMAL" (24 (H) x 16 (W) dots) or "LARGE" (36 (H) x 24 (W) dots).

Set by switching "7 PRINT SIZE" in the parameter setup mode.

NORMAL



LARGE



Tips

- 7,000 lines per printer paper with the LARGE font and 10,000 lines with the NORMAL font can be printed.
- The log data is always printed in the NORMAL font. Even if it is set to "LARGE", the print character font size is not changed. When using with "LARGE" setting, the normal measurement data is printed in LARGE font as set.
- The "Digimatic 2" format data is printed in NORMAL font. Even if it is set to "LARGE", it is automatically changed to the NORMAL font print. As the parameter setting remains the same, it returns to LARGE font by switching the power on again after switching it off.

■ Changing process of the print character font size

1 Set the "PRINT SIZE" of parameter.

1 While pressing [DATA] press (POWER), then just release (POWER), when the printing starts, then release [DATA].

» The power is turned on and enters the parameter setup mode.

```
Mitutoyo

DP-1VA LOGGER

PARAMETER SETUP MODE


2 SYSTEM MODE:DP-1
3 WORK MODE   :MODE1
4 BAUDRATE    :4800
5 PARITY      :EVEN
6 DATA LENGTH:7
7 PRINT SIZE  :NORMAL
8 BACK FEED   :ON
```

2 Press [DATA] repeatedly until "7 PRINT SIZE" is printed.

» "7 PRINT SIZE : LARGE" or "7 PRINT SIZE : NORMAL" currently set is printed.

```
 1 PARAMETER NO CLEAR
 2 SYSTEM MODE:DP-1
 3 WORK MODE   :MODE1
 4 BAUDRATE    :4800
 5 PARITY      :EVEN
 6 DATA LENGTH:7
 7 PRINT SIZE  :NORMAL
```

3 Press [STAT. OUT LOG].

» The switched "7 PRINT SIZE" is printed.

```
 6 DATA LENGTH:7
 7 PRINT SIZE  :NORMAL
 7 PRINT SIZE  :LARGE
```

4 Press [DATA] repeatedly until the parameter settings list is printed.

» The setting is completed.

```
 2 SYSTEM MODE:DP-1
 3 WORK MODE   :MODE1
 4 BAUDRATE    :4800
 5 PARITY      :EVEN
 6 DATA LENGTH:7
 7 PRINT SIZE  :LARGE
 9 POWER SAVE  :NORMAL
10PRT DENSITY:NORMAL
11 BUZZER     :ON
12 TIME PRINT:ON
13DATE FORMAT:YYYY/MM/DD
14 DATE 2017/ 6/22
15 TIME 11: 7
16 UNIT       :AUTO
17 LOG RESUME:1
18 OUT LOG    :3
```

3.6.4 Return to the Initial Settings

The parameter setting can be returned to the initial setting with the operations below.

1 Return the parameters to the initial setting.

1 While pressing [DATA] press [POWER], then just release [POWER], when the printing starts, then release [DATA].

» The power is turned on and enters the parameter setup mode.

» After printing the current parameter setting contents list, "1 PARAMETER NO CLEAR" is printed.

```
PARAMETER SETUP MODE

2 SYSTEM MODE:MP
3 WORK MODE   :MODE1
4 BAUDRATE    :4800
5 PARITY      :EVEN
6 DATA LENGTH:7
7 PRINT SIZE  :LARGE
9 POWER SAVE  :NORMAL
10PRT DENSITY:NORMAL
11 BUZZER     :ON
12 TIME PRINT:ON
13DATE FORMAT:YYYY/MM/DD
14 DATE 2017/ 6/22
15 TIME 12:47
16 UNIT       :
17 LOG RESUME:1
18 OUT LOG    :3
19 INPUT AXIS:X Y Z
20 CUL    AXIS:X

PUSH DATA:DATA FIX & GO
PUSH STAT:DATA CHANGE

1 PARAMETER NO CLEAR
```

Current parameter settings list

2 Press [STAT. OUT LOG].

» The buzzer sounds and "1 PARAMETER CLEAR" is printed.

```
1 PARAMETER NO CLEAR

1 PARAMETER CLEAR
```

3 Press [DATA] repeatedly until the parameter settings list is printed.

» The parameter settings list returned to the initial setting is printed.

```
2 SYSTEM MODE:DP-1
3 WORK MODE   :MODE1
4 BAUDRATE    :4800
5 PARITY      :EVEN
6 DATA LENGTH:7
7 PRINT SIZE  :NORMAL
8 BACK FEED   :ON
9 POWER SAVE  :NORMAL
10PRT DENSITY:NORMAL
11 BUZZER     :ON
12 TIME PRINT:ON
13DATE FORMAT:YYYY/MM/DD
14 DATE 2017/ 1/ 1
15 TIME  0: 0
16 UNIT       :AUTO
17 LOG RESUME:1
18 OUT LOG    :1
```

Parameter settings list returned to the initial setting

Tips

- The limit data of tolerance setting and the measurement data are deleted with the operation above.
- Under the power on state, the initialization of parameters and the deletion of limit data of tolerance settings are not performed with the hardware reset when [CANCEL] is pressed for 10 seconds or more. However, the date and time are initialized and the measurement data and log data are deleted.

4 Output

The operation to output the measurement data or tolerance judgment result from the product externally is explained.

4.1 USB Output of the Measurement Data

The operation to output the measurement data to a PC connecting USB cable to the product is explained.

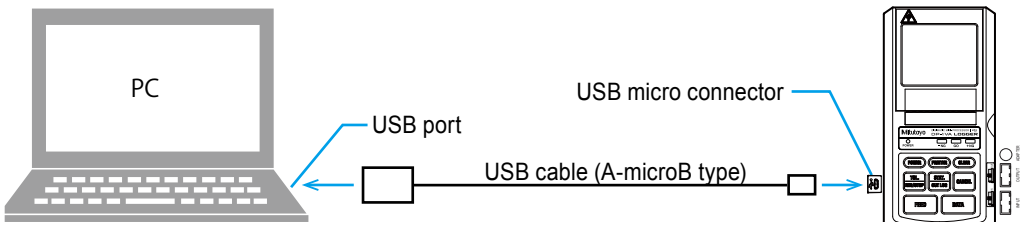
The product can be used with a PC in 2 ways: <1> used as an HID connecting one PC to one product; and <2> used as a VCP device capable of connecting multiple products to one PC. Each method is explained separately.

4.1.1 Connect to a PC Using a Store-Bought USB Cable

Connect the product to a PC using a store-bought USB cable (A-microB type) as shown in the figure below.

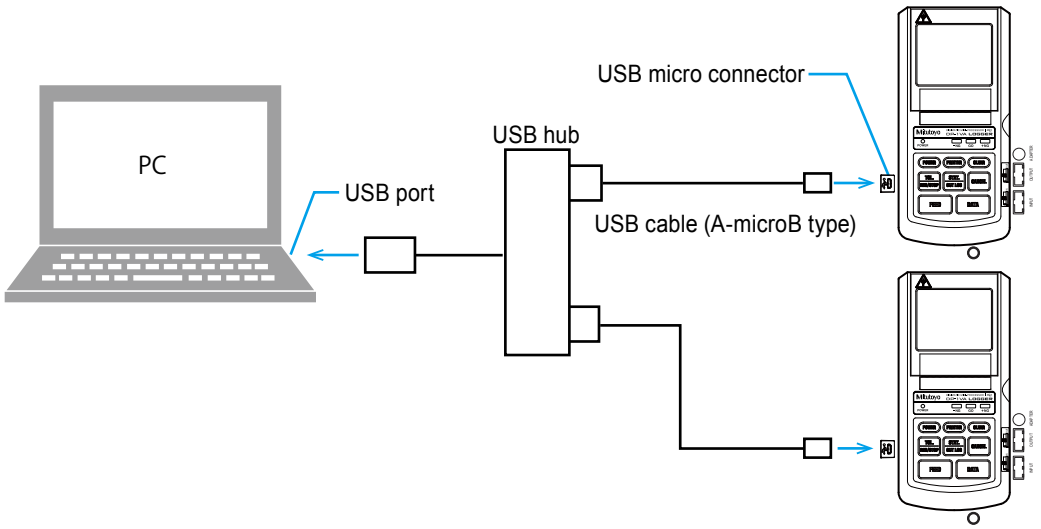
- In the case using as an HID (Human Interface Device)

  Connect one product to one PC.



- In the case of using as a VCP (Virtual COM Port) device

  Connect one or more of the products to one PC. If the PC does not have multiple USB ports, a USB hub (store-bought product) can be used.



■ Available PCs

PCs with a USB port and an OS listed below installed can be used.

- Windows 7
- Windows 8/8.1
- Windows 10

■ Software required on PC

● In the case using as an HID (Human Interface Device)

It can be used only by connecting to a USB port, no dedicated software or dedicated driver is required.
The product operates as if it was a keyboard connected to a PC. The data can be output to the text input software such as Microsoft Excel, Notepad or Wordpad.

- About HID driver installation
  It can be automatically installed when the USB connector is connected to a PC. No operation is required.
- Connection confirmation method
  The following operation shall be performed to check whether the product is properly connected.
  In case of Windows 7:

  1 Open [Control Panel].
  Pressing the Start button, open the [Control Panel] directly.
  2 Open [System] in the [Control Panel].
  3 Open [Device Manager] in [System].
  When an alarm of "User Account Control" is displayed, click [Yes] to proceed to process 4.
  4 Open [Human Interface Device].
  5 Check whether a [USB Human Interface Device] or a [USB Input Device] is added/removed by inserting/removing the USB connector.

  In case of Windows 8/8.1, Windows 10:

  1 By pressing the [X] key while pressing the Windows Logo key, open [Device Manager] by selecting [Device Manager] from the displayed menu.
  2 The processes 4 and 5 in "In case of Windows 7:" above shall be executed.

● In the case of using as a VCP (Virtual COM Port) device

A measurement data collection software "USB-ITPAK (V2.1 and higher)" (option) is required. It is possible to output the measurement data to an Excel sheet such as an inspection sheet form with "USB-ITPAK".
For further details on the use as a VCP device, refer to 📖 the user's manual of "USB-ITPAK (V2.1 and higher)".

■ USB communication specifications

- Power source: Use the PC's USB connector (Type A plug) as the +5 V power supply.
- Supported OS: Windows 7, Windows 8/8.1 Windows 10 (Windows 10 Mobile is not covered by warranty)
- Conformity Standards: USB standard
- USB 2.0 certification, communication speed: 12 Mbps (Full Speed)
- The product may temporarily deactivate the function due to electromagnetic interference caused by static electricity, but returns to the normal operation upon its elimination.
- If electromagnetic interference was generated into the AC or DC power supply lines to the PC, then normal measuring results might be unable to be obtained. In that case, measure again checking the state of the power line's surrounding area.

NOTICE

The product is compliant with the EU EMC directive. However, this does not guarantee the complete operation to all connections with PCs or USB hubs. In case noise interference occurs when connecting the product, there is the possibility to fix it with the measures against noise explained below.

- Attach a ferrite core to the USB cable (near the USB connector) of the product.
- Use a USB hub with a self-power supply (connected AC adapter).
- Ground the PC's frame ground.

4.1.2 USB Output Operation of the Measurement Data

1 Open Microsoft Excel or Windows software such as Notepad or Wordpad on the PC.

2 Connect a measuring instrument with Digimatic output to the product.

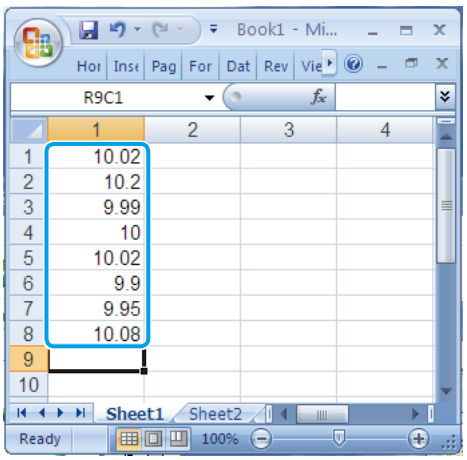
For further details on the connection method of measuring instrument with Digimatic output, refer to "2.2 Measuring with a Measuring Instrument with Digimatic Output and Printing" on page 16.

3 Press DATA to input the measurement data.

» Each time DATA is pressed, they are input to the product and output by USB to the PC.

» As shown in the right figure, it is imported and displayed by the software.

In case of Microsoft Excel



Tips

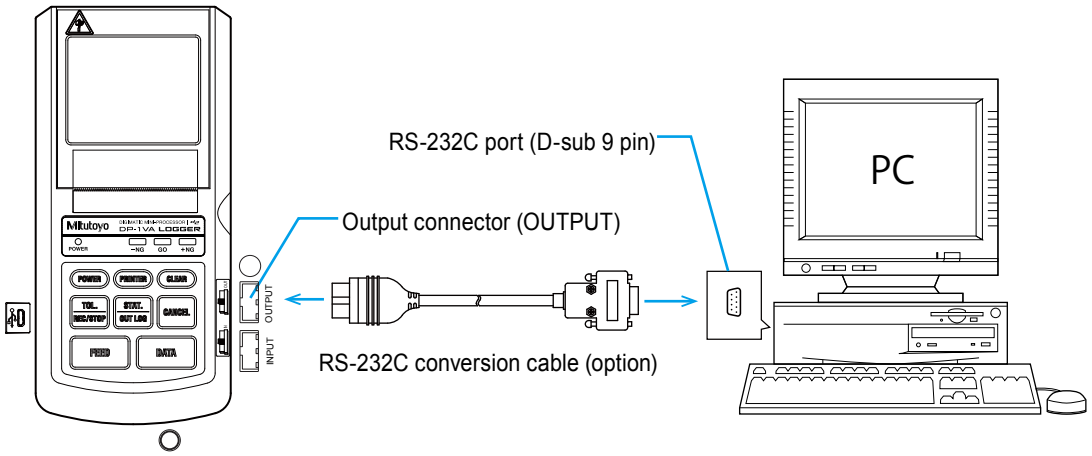
- The measurement data can be input by pressing the [DATA] button of a measuring instrument with Digimatic output or with the foot switch (option) operation.
- When the measurement data is input, they are printed at the same time they are transmitted to the PC. Press PRINTER to turn the printing off. "∗ PRINTER OFF ∗" is printed.
- In the case of using as an HID (Human Interface Device), the data input location on the software is the current cell or the cursor position.

4.2 RS-232C Output of Measurement Data

The operation to output the measurement data to a PC connecting RS-232C conversion cable (option) to the product is explained.

4.2.1 Connection of RS-232C Conversion Cable (Option)

Connect the output connector (OUTPUT) of the product and the PC with a RS-232C conversion cable (option, Parts No. 09EAA084, cable length: 1 m as shown in the figure below).



Removal/insertion of the cables shall be done while the power is turned off.

Tips

- The RS-232C conversion cable (option) and GO/±NG judgment cable cannot be used simultaneously.
- The RS-232C conversion cable (option) and RS-232C counter cable (Parts No. 09EAA094) cannot be used simultaneously.

■ Software required on PC

To fetch the measurement data to the PC, the software correspondent to the RS-232C communication as shown below are separately required.

Mitutoyo's optional software

- Data Collection/Analysis Software : MeasurLink Real-Time (functional three type)
  - Real-Time Standard
    Inexpensive standard version dedicated to measuring instruments
  - Real-Time Professional
    High-performance version connectable with measuring instruments and equipment products
  - Real-Time Professional 3D
    Full spec version corresponding to 3D display of workpiece

An example of store-bought software

- RS-232C communication software
- Microsoft Excel + Communication software
- Package software for quality control with communication function

■ RS-232C communication specifications

- Output signal level: TTL level
- Communication method: Half-duplex method
- Communication speed: 1,200/2,400/4,800/9,600/19,200
- Bit configuration; start bit: 1 bit, data length: 7/8 bits, parity: even/odd/none, stop bit: 2 bits
- Data format

<At the time of data output>

Number of bytes	1	2	3	4	5	6	7	8	9	10	11	12	13
Data	0	1	A	Sign	MSD							LSD	CR

Data division (floating decimal point)

Sign: + or -

Measuring Items

Channel No.

Code No.

According to the "Digimatic 2" output specification, it consists of 14 bytes and 5–13 is for the data division and 14 is for CR. Output is made in ASCII code.

<Format sample>

Measurement data: 0.123

Data output: 01A + 0000.123CR

<Error code>

Number of bytes	1	2	3	4
Data	9	1	Error code	CR

Error code
1: No data input
2: The imported data is in another format
9: System error, head temperature error, power-supply voltage error, over flow, printer head up or paper error

Channel No.

Error format

<Data request command>

Number of bytes	1	2
Data	1 or A	CR

- Connector specification: RS-232C conversion cable (option) D-sub 9 pins

Pin number	Signal name	Functions	IN/OUT
1	-	-	-
2	RD	Received data	Data output to PC
3	SD	Sent data	Data Input from PC
4	DSR	Data set ready (indicates that PC side is ready)	Data output to PC (fixed with H)
5	GND	-	-
6	DTR	Data terminal ready (indicates that PC side is ready)	Data Input from PC (not in use)
7	RTS	Request to send (asks whether PC can send the data to the product)	Data Input from PC (not in use)
8	CTS	Clear to send (tells the PC that the product can receive the data)	Data output to PC (fixed with H)
9	-	-	-

4.2.2 RS-232C Communication Settings

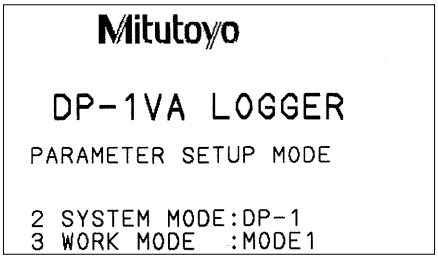
It is required to perform the RS-232C communication setting in parameter settings according to the usage environment to use RS-232C interface.

Setting order	Setting items	Setting contents	Print	Initial setting
4	BAUD RATE	RS-232C: communication speed	1200/2400/4800/ 9600/19200	4800
5	PARITY	Parity check method at the time of RS-232C communication	NON/EVEN/ODD	EVEN (even number)
6	DATA LENGTH	Data length at the time of RS-232C communication	7/8	7

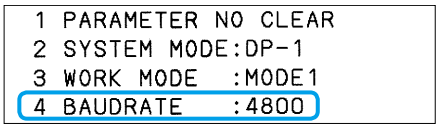
1 Set "BAUD RATE", "PARITY", "DATA LENGTH" of the parameters.

1 While pressing [DATA] press (POWER), then just release (POWER), when the printing starts, then release [DATA].

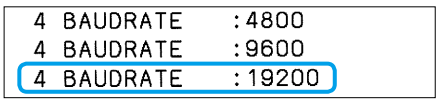
» The power is turned on and enters the parameter setup mode to print the list.



2 Press [DATA] repeatedly until "4 BAUD RATE" is printed.

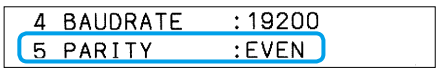


3 Press [STAT. OUT LOG] repeatedly until the desired communication speed to set to BAUD RATE is printed.

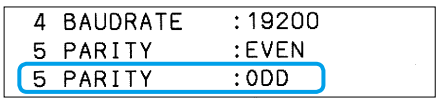


4 Press [DATA].

» The communication speed is determined.

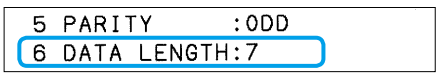


5 Press [STAT. OUT LOG] repeatedly until the desired parity check method to set to PARITY is printed.

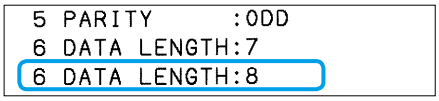


6 Press [DATA].

» The parity check is determined.

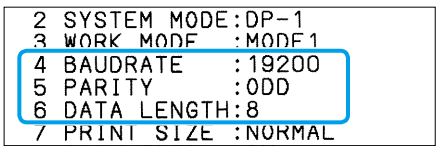


7 Press [STAT. OUT LOG] repeatedly until the desired data length to set to DATA LENGTH is printed.



8 Press [DATA] repeatedly until the parameter settings list is printed.

» The parameter setting is completed.



4.2.3 RS-232C Output Operation of Measurement Data

Explained with a PC used as an example.

1. Install the software correspondent to the RS-232C communication on the PC, and activate it.

2. Connect a measuring instrument with Digimatic output to the product.

3. Press [DATA] to input the measurement data.
   - » Each time [DATA] is pressed, the measurement data is input and the data is sent to the PC.

For further details on the connection of a measuring instrument with Digimatic output and the measurement data input, refer to "2.2 Measuring with a Measuring Instrument with Digimatic Output and Printing" on page 16.

Tips

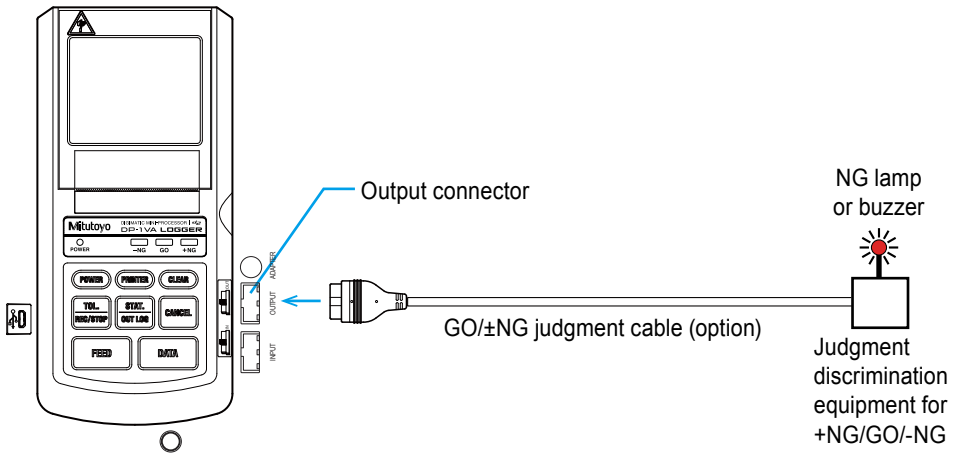
- The measurement data can be input by pressing the [DATA] button of a measuring instrument with Digimatic output or with the foot switch (option) operation.
- When the measurement data is input, they are printed at the same time they are transmitted to the PC. Press [PRINTER] to turn the printing off. "∗ PRINTER OFF ∗" is printed.
- The log data stored with logging cannot be output with RS-232C output.

4.3 Tolerance Judgment Result Output

The operation to output the tolerance judgment result connecting a GO/±NG judgment cable (option) to the product is explained.

4.3.1 Connection of a GO/±NG Judgment Cable (Option)

Connect the GO/±NG judgment cable (Parts No. 965516, digimatic 10 pin terminal - loose wires, cable length: 2 m) connected to the tolerance judgment discrimination equipment to the product (connector of OUTPUT) as shown in the figure below.



Removal/insertion of the cables shall be done while the power is turned off.

Tips

The GO/±NG judgment cable and RS-232C conversion cable (option) cannot be used simultaneously.

■ Tolerance judgment result output specification

When a GO/±NG judgment cable (option), is connected and the limit data are set in MODE0, MODE1 or MODE2, output is performed through an open drain.

$V_{DSS\ (max)}$ = 60 V

$I_{D\ (max)}$ = 250 mA

4.3.2 Tolerance Judgment Result Output Operation

1. Connect a measuring instrument with Digimatic output to the product.

2. Set the limit data.

   For further details on the limit data setting method, refer to "2.3.1 Tolerance Settings" on page 19.

3. Press [DATA] to input the measurement data.

   » Each time [DATA] is pressed, measurement data is input and the tolerance judgment result is output.

For further details on the connection of a measuring instrument with Digimatic output and the measurement data input, refer to "2.2 Measuring with a Measuring Instrument with Digimatic Output and Printing" on page 16.

Tips

The measurement data can be input by pressing the [DATA] button of a measuring instrument with Digimatic output or with the foot switch (option) operation.

MEMO

5 Function Settings

Function setting method for the product is explained.

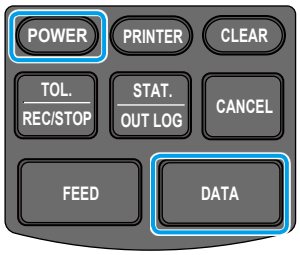
5.1 Various SYSTEM/WORK MODE and Print Contents/Output to PC

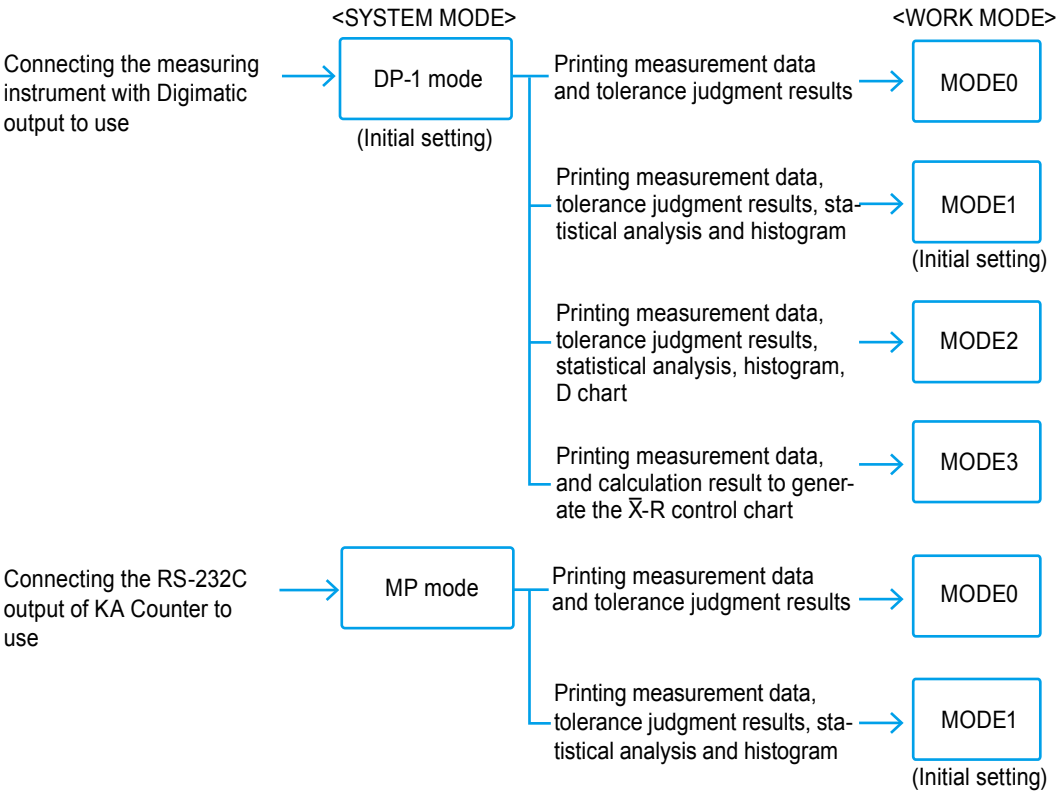
The product shall be used for switching the SYSTEM MODE and WORK MODE with parameter settings in accordance with objectives.

5.1.1 SYSTEM/WORK MODE Selection and Print Contents

Enter "PARAMETER SETUP MODE" by while pressing [DATA] press (POWER), and after releasing the (POWER) release [DATA] with the power turned off.

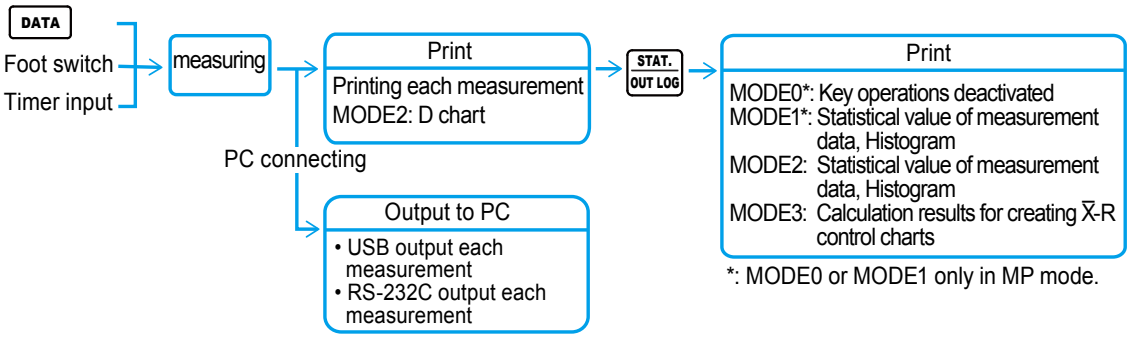
Switch SYSTEM MODE and WORK MODE in this mode.





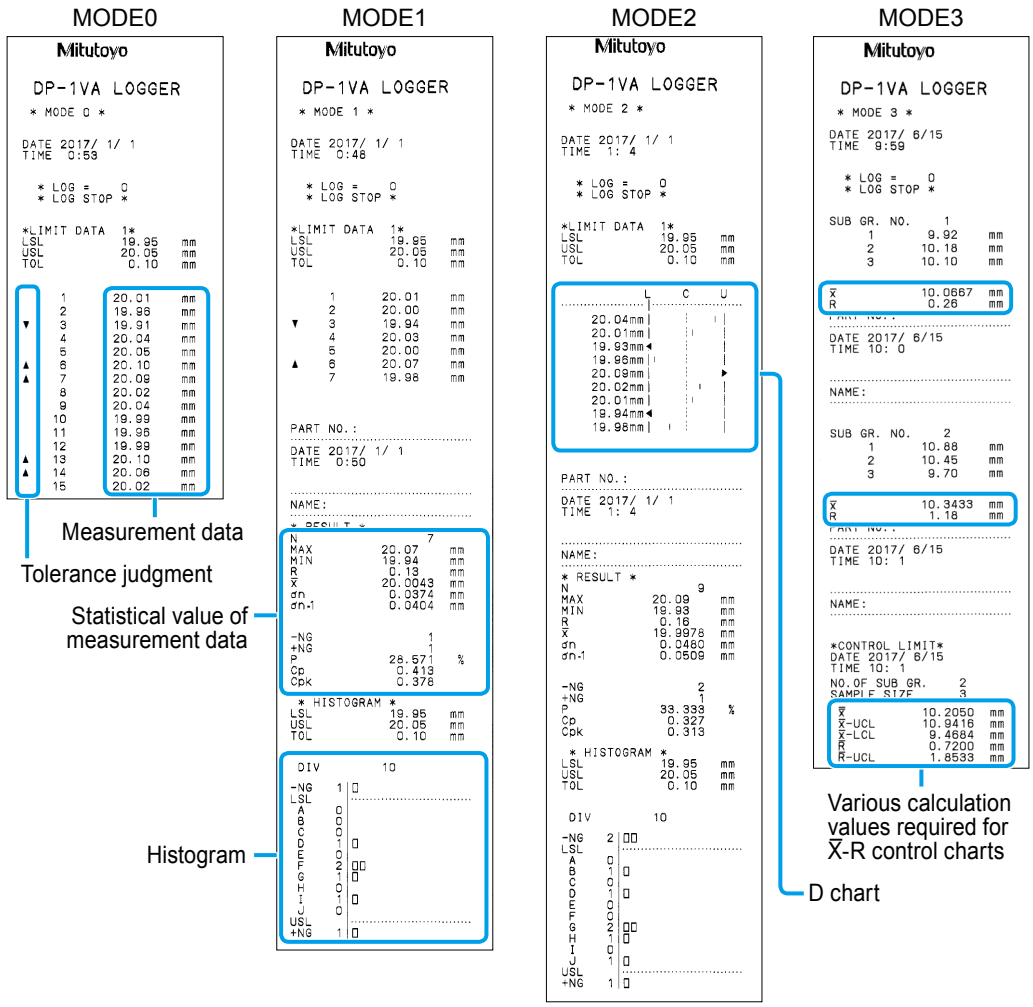
5.1.2 Measurement Data Collection and Output (Print and Output to PC)

The operations when STAT. OUT LOG is pressed may differ depending on the WORK MODE difference as shown in the chart below.



5.1.3 WORK MODE and Print Examples

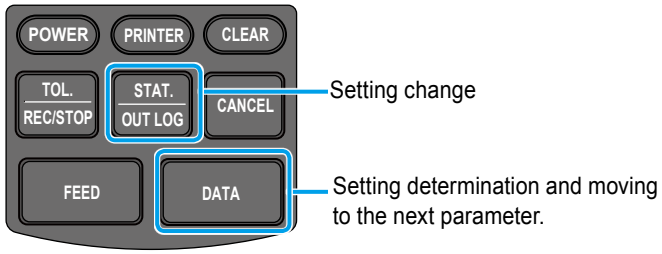
The print contents differ as shown in the chart below depending on the WORK MODE difference.



5.2 Various Parameter Settings and Setting Items

Parameter setting is the function to set and customize the operation of the product. They shall be set according to the purpose of use.

As explained in "5.1 Various SYSTEM/WORK MODE and Print Contents/Output to PC" on page 61, enter the "PARAMETER SETUP MODE" by pressing POWER while holding down DATA with the power turned off, then just release POWER, and when the printing starts, if DATA is released, the mode will be "PARAMETER SETUP MODE".



In the parameter setup mode, the parameters are fixed when all parameters are set changing them with the operation of DATA and STAT. OUT LOG. The changed contents are not saved if the power is turned off during operation.

Tips

- TThe key operations differ in parameter setting for DATE and TIME.
  For further details on the key operation for setting the date and time, refer to "2.1.4 Date and Time Setting" on page 12.
- For further details on the operation to return the parameters to the initial setting, refer to "3.6.4 Return to the Initial Settings" on page 48.

■ Parameters list

♦: Initial setting values

Setting order	Setting items	Setting/print contents
1	PARAMETER CLEAR	PARAMETER CLEAR: Clear the parameter, PARAMETER NO CLEAR: Not clear the parameter ♦
2	SYSTEM MODE	DP-1: DP-1 mode ♦, MP: MP mode
3	WORK MODE	MODE0, MODE1 ♦, MODE2, MODE3
4	BAUD RATE (RS-232C communication speed)	1,200, 2,400, 4,800 ♦, 9,600, 19,200
5	PARITY (RS-232C communication parity check method)	NON: no setting, EVEN: even number ♦, ODD: odd number
6	DATA LENGTH (data length of RS-232C communication)	7 ♦, 8
7	PRINT SIZE (print character font size)	NORMAL ♦, LARGE (only NORMAL in case MODE2 is selected)

Setting order	Setting items	Setting/print contents
8	BACK FEED	ON ♦, OFF (displayed only when NORMAL is selected in PRINT SIZE)
9	POWER SAVE	SAVE: Power save, NORMAL: Standard ♦
10	PRT DENSITY (Density of the print)	NORMAL ♦, DARK
11	BUZZER (Buzzer sound)	On: Sound ♦, Off: No sound
12	TIME PRINT (Clock function)	On: Use ♦, Off: Not use
13	DATE FORMAT (Print format of the date)	YYYY/MM/DD ♦, MM/DD/YYYY, DD/MM/YYYY
14	DATE	For January 2, 2018:2018/1/2, JAN/2/2018, 2/JAN/2018
15	TIME	For 14:25 pm: 14:25
16	UNIT	*** AUTO can be selected only in DP-1 mode** AUTO♦ (Only mm units can be accepted), mm: millimeter, inch: inch, no unit, g: gram, °C: temperature, t: ton, lb: pound, N: newton, Nm: newton-meter, µm: micrometer, µin: microinch
17	LOG RESUME (Log state setting at the time of activation)	1: Log stop ♦, 2: Log start, 3: Assume the log state when the power was turned off last time
18	OUT LOG (Log output setting)	Log print: 1: Time/Measurement value ♦, 2: N number/Measurement value, 3: N number/Date/Time/Measurement value Log USB output: 1: Time/Measurement value ♦, 2: Measurement value, 3: Date/Time/Measurement value
19	INPUT AXIS (Data input object axes setting)	*** Set only in MP mode** XYZ ♦, X, Y, Z (multiple settings are possible)
20	CUL AXIS (Calculation object axes setting)	*** Set only in MP mode** X ♦, Y, Z (only 1 axis can be set)

Tips

- When setting "PRINT SIZE" (print character font size) to "NORMAL", move to the "BACK FEED" setting subsequently. Normally, use with this setting "ON".
- When this is set to "AUTO" in the "UNIT" setting, length units other than mm cannot be accepted.
- If the setting other than "AUTO" is selected in the "UNIT" setting, the print is performed in the unit set with this parameter regardless of the input data unit. In this case, the input data unit information is ignored.
- If there is no data with the designated axis in the input data in "CUL AXIS" (Calculation object axes setting), the error message is printed (example: if the input data is for the X axis, "NO CUL AX" is printed). In this case, use with "WORK MODE" in Setting Order 3 set to "MODE0". The statistical calculation is not performed but the data can be printed.
- MP mode can be used only for RS-232C output of our KA Counter. The proper operation is not guaranteed if equipment other than the KA Counter is connected for use.

6 Maintenance and Trouble-shooting

The maintenance work, error display and troubleshooting method of the product are explained.

6.1 Maintenance

To prevent the product failure, the cleaning described below shall be regularly performed (about once every six months).

⚠ WARNING

Before cleaning, make sure that the power is turned off. There is a risk of electric shock.

⚠ CAUTION

- Be careful not to cut your hands with the paper cutter when cleaning.
- The printer head is exposed when the printer paper cover is opened. The printer head becomes very hot immediately after printing and may cause burns if touched. Do not touch it.
- For the cleaning of the printer head or sensors alcohol is used. Observe the following, since there is a risk of ignition.
  - Clean the printer head after it has cooled down.
  - Thoroughly dry off any alcohol remaining on the printer head.
  - Treat the alcohol with sufficient care.
  - Turn the power on after the alcohol is thoroughly dried up.

NOTICE

Observe the following, since these things may cause malfunctions.

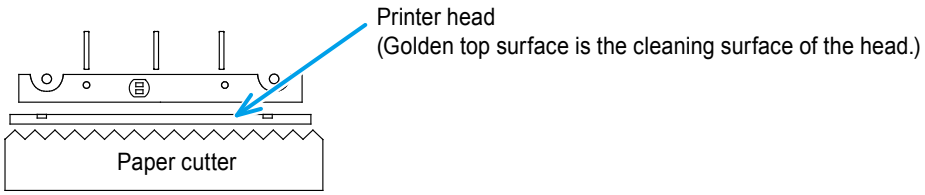
- Absolutely do not use volatile chemicals, such as thinners or benzene, except for alcohol.
- Make sure to not scratch the printer head with fingernails or hard things.
- Pay sufficient attention not to get the printer interior wet.

■ Printer head cleaning

Dirt and stain adhering to the printer head may result in poor printing quality or damage the printer head that makes printing impossible. Clean the printer head regularly.

● Cleaning method

1. Press the release lever downward (to the direction of "OPEN") to open the printer paper cover.
2. Wipe the printer head with a cotton swab moistened with a little alcohol.
3. Wipe off alcohol remaining on the printer head with a dry cotton swab to dry it off.
4. Close the printer paper cover.

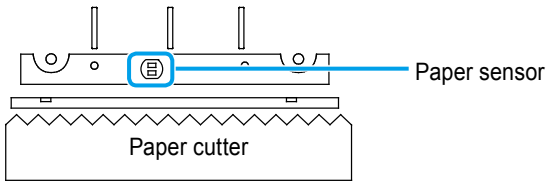


■ Paper sensor cleaning

The paper sensor is built in the printer which detects the presence/absence of the printer paper. A dirtied paper sensor part may render printer paper detection impossible and prevent normal operation. Clean the paper sensor portion regularly.

● Cleaning method

1. Press the release lever downward (to the direction of "OPEN") to open the printer paper cover.
2. Wipe the paper sensor with a cotton swab moistened with a little alcohol.
3. Wipe off alcohol remaining on the paper sensor with a dry cotton swab to dry it off.
4. Close the printer paper cover.



6.2 Error Displays

6.2.1 Error Displays with Power LED

When the power is turned on, the power LED is lit on when the product is in the normal state. If it is blinking, there may the errors shown below. Address it according to the error contents.

Power LED blinking pattern	State of the Product	Data input	Handling method
Repetition of blinking at 0.6 s on and 0.6 s off.	Abnormally high voltage	Not possible	Turn off the power and turn it on again.
Repetition of blinking at 1.5 s off, 0.3 s on, 0.3 s off and 0.3 on	Voltage drop alarm (when the voltage drops and the remaining battery level becomes low)	Possible	It is recovered when the voltage returns to the normal range. (Replace batteries)
Repetition of blinking at 0.6 s on and 0.6 s off.	Abnormally low voltage (when voltage drops and operation becomes impossible)	Not possible	Turn off the power and turn it on again.

Tips

- When the power of the product is turned off, all the measurement data automatically saved for the statistical calculation up to that point of time is deleted. Also, if the AC adapter is connected/ disconnected while the product is operating, all the measurement data automatically saved for the statistical calculation up to that point of time is lost, regardless of whether the product is powered with the AC adapter or not. Please handle with care.
- When operating the product with batteries, if the room temperature drops below 10 °C, the battery life becomes considerably shorter. Use an AC adapter when the room temperature is below 10 °C.
- When the batteries are consumed, the power LED may malfunction as the voltage becomes below the operating voltage. If the power LED starts blinking, change the batteries as promptly as possible or switch to the AC adapter..

6.2.2 Other Error Displays

There are other error displays (symptoms) below than the power LED blinking. Address them according to the error contents.

Error display (symptom)	Types of errors	Causes	Handling method
Immediately after the power on, all the LEDs start blinking.	System error	• A fatal error is occurring with the product • The service temperature is either too high or too low.	Turn off the power and turn it on again.
"∗ OVER FLOW ∗" is printed out.	Overflow	The calculable range is exceeded.	Delete the data by pressing CLEAR.
• The [-NG] and [+NG] LEDs are blinking. • A red line appears on the printer paper.	Out of printer paper.	No printer paper.	Replace the printer paper. "2.1.2 Setting the Printer Paper and Power-on" on page 9
The [-NG] and [+NG] LEDs are blinking.	Cover open (head up).	The printer paper cover is opened.	Close the printer paper cover.
"∗ NO GAGE ∗" is printed out, and the [-NG] and [+NG] LEDs are blinking.	No connected measuring instrument.	• No measuring instrument is connected. • The connection cable is broken. • The connection cable has a contact failure.	• Connect a measuring instrument. • Replace the connection cables. • Check the connector portion of the connection cable.
"∗ FORMAT ERROR ∗" is printed out, and the [-NG] and [+NG] LEDs are blinking.	Data format difference	The format of the input data is different.	• Delete all the data pressing CLEAR. There may be the possibility whereas the measurement data with digimatic specifications 1 and 2 are mixed in input. "5.1.1 SYSTEM/WORK MODE Selection and Print Contents" on page 61 • Replace the connection cables. • Check the connector portion of the connection cable.

Error display (symptom)	Types of errors	Causes	Handling method
"∗ UNIT ERROR ∗" is printed out, and the [-NG] and [+NG] LEDs are blinking.	Difference in units.	The units of the input data are different.	• This message is printed when the unit differs from that of the data input first. Input the data with the same unit as that of the data input first. • A unit that differs from that of the set limit data is input. Input the data with the same unit as that of the limit data. "5.2 Various Parameter Settings and Setting Items" on page 63
"∗ POINT ERROR ∗" is printed out, and the [-NG] and [+NG] LEDs are blinking.	Decimal point position error	The position of the decimal point of the input data are different.	• This message is printed when the position of the decimal point differs from that of the data input first. Input the data with the same decimal point position as that of the data input first. • A decimal point position that differs from that of the set limit data is input. Input the data with the same decimal point position as that of the limit data.
The buzzer sounds twice each time the data are input.	Overflow alarm	Overflow of the measurement data storage is about to happen.	Stop the measurement ahead of time to perform the statistical calculation. Then, delete the data pressing (CLEAR).
The buzzer sounds during logging.	Alarm for number of log data	The number of log data entries exceeds 950.	Up to 1,000 data entries can be logged. Perform the output of the log data. "3.4 Logging of Measurement Data and Printing/Output of Log Data" on page 35
"∗ BACKUP BATTERY LOW ∗" is printed.	Remaining level drop of backup batteries	Remaining level of the backup batteries has dropped.	The time for replacement of backup batteries mounted to the circuit board inside the product is approaching. Please contact Mitutoyo service representative. Noted that the battery life is about 10 years.

6.3 Troubleshooting

The troubleshooting for other problems than error display is explained here.

Tips

- If the problem cannot be solved even through troubleshooting, please contact Mitutoyo or the agent where you purchased the product (the contact number of our service network is listed at the back of this manual).
- The warranty of the product is good for a period of one year from the purchase date. However, some types of repairs may be available only at the customers' expense.

State of the product	Causes	Handling method
• The state of the product turns to that immediately after power-on during printing. • The print is faint.	• Manganese batteries are used.	• Use charged nickel-hydride batteries or AA-size alkaline batteries. "2.1.1 AC Adapter Connecting and Battery Cells Setting" on page 7
	• Battery electrode plane is peeling or swelling.	• Remove peeling or swelling from the battery electrode plane.
	• The designated AC adapter is not used.	• Use the designated AC adapter. "2.1.1 AC Adapter Connecting and Battery Cells Setting" on page 7
	• A measuring instrument which is powered by an external power source is connected.	• This product cannot supply power to an external instrument. Separately prepare a dedicated power source.
	• The AC adapter shares its power input with high-voltage, large-current use machines.	• Connect the AC adapter to a separate power supply line.
	• Printer head is dirty.	• Clean the printer head with a cotton swab, etc. "6.1 Maintenance" on page 65
Cannot print.	• Data printing function is off by the PRINTER operation. • A foreign object is inside the printer portion or a paper jam has occurred. • The timer input mode is set and the interval time is set to either 0.25 s or 1 s.	• Press PRINTER to turn the data printing function on. • Remove the foreign object or jammed paper with tweezers. • When the interval time is set to 0.25 s or 1 s, the data printing function is automatically switched off. "3.6.1 Timer Input of the Measurement Data" on page 43
Miscounting occurs at the measuring device side.	The AC adapter shares its power input with high-voltage, large-current use machines.	Connect the AC adapter to a separate power supply line.

State of the product	Causes	Handling method
The power cannot be switched on/off.	• The voltage drops abnormally when the batteries are used. • The on/off operation is performed at short intervals (below 5 s).	• Execute the hardware reset by holding CANCEL for 10 s or more. • Change the batteries and reboot the product. • Detach the batteries and AC adapter and set them again to reboot the product. "2.1.1 AC Adapter Connecting and Battery Cells Setting" on page 7
The data output cannot be performed properly even if connecting the product to a PC.	• Contact failure of USB cable. • Broken USB cable. • Abnormality of PC side connector.	• Detach the product from the PC, and reconnect it. • If the product does not perform properly after reconnection, contact the agent where you purchased the product or Mitutoyo sales representative.
The product is not recognized when the PC returns from the suspend mode (sleep mode or standby mode).	This may occur depending on the PC type or the BIOS when the product is connected via a USB hub or an expansion USB board.	Detach the unrecognized product from the PC, and reconnect it. If the product does not perform properly after reconnection, reboot the PC.

Tips

The product corresponds to the suspend function (sleep mode or standby mode) as the PC's power supply mode.

However, this does not guarantee the complete operation with all the PCs or USB hubs.

If there is any obstacle in the operation with the suspend function in your environment, set the PC power control not to be suspended during operation.

MEMO

7 Specifications

In this chapter, general specifications, calculation specifications, connection with various optional devices and options are explained.

7.1 General Specifications

Items	Description	Note
Code No.	264-505	
Data input	Digimatic, Digimatic 2, RS-232C input (for KA Counter only)	
Printing method	Thermal Line Printer	
Character specifications	Total dot number: 384 dots/line Dot size: 8 dots/mm NORMAL font: 24 (H) x 16 (W) dots LARGE font: 36 (H) x 24 (W) dots	
Print speed	0.8 s/line (6.5 mm/s)	When using AC adapter
Print line number	7,000 lines/roll (with LARGE font) 10,000 lines/roll (with NORMAL font)	
Printer paper to be used	High-durability thermal paper, width: 58 mm, roll length: 48 m	In the case of long-term storage or use for official documents, the use of photocopies is recommended.
Power supply	• 100-240 V 50/60 Hz AC adapter (6 V, 2 A) • AA alkaline batteries (LR6) or nickel-metal-hydride (Ni-MH Size AA) x 4	Two power source system Dry batteries are not included.
Battery life	About 10,000 lines (in case of use at 20 °C, with 1,600 mA Ni-MH and print 1 time/5 s)	Reference value (battery life greatly varies depending on the use conditions)
Data processing capacity	MODE0: 100,000 data entries MODE1, 2: 9,999 data entries MODE3: sample size 10 x subgroup 9,999 = Total number of data entries 99,990	
Tolerance judgment	Possible to set 5 pairs	
Logging of the measurement data (to store)	Max. 1,000 points	
Timer input	0.25 s, 1 s, 5 s, 30 s, 1 min, 30 min, 60 min	
Data Output	USB output RS-232C output at TTL level Tolerance judgment result output (-NG, GO, +NG)	
Clock precision	±2 min max./month	
Battery life of the backup batteries	About 10 years	Reference value

Items	Description	Note
Operating temperature range	When using the AC adapter: 0 °C–45 °C When using batteries: 10 °C–45 °C	
Storage temperature range	-10 °C–50 °C	In case of our specified packaging
Weight	390 g	Main unit only
External view and dimensions	94 mm (W) × 201 mm (D) × 75.2 mm (H)	
CE Marking	EMC Directive: EN61326-1 Immunity test requirements: Clause 6.2 Table 2 Emission limit: Class B RoHS Directive: EN50581	

■ Standard accessories

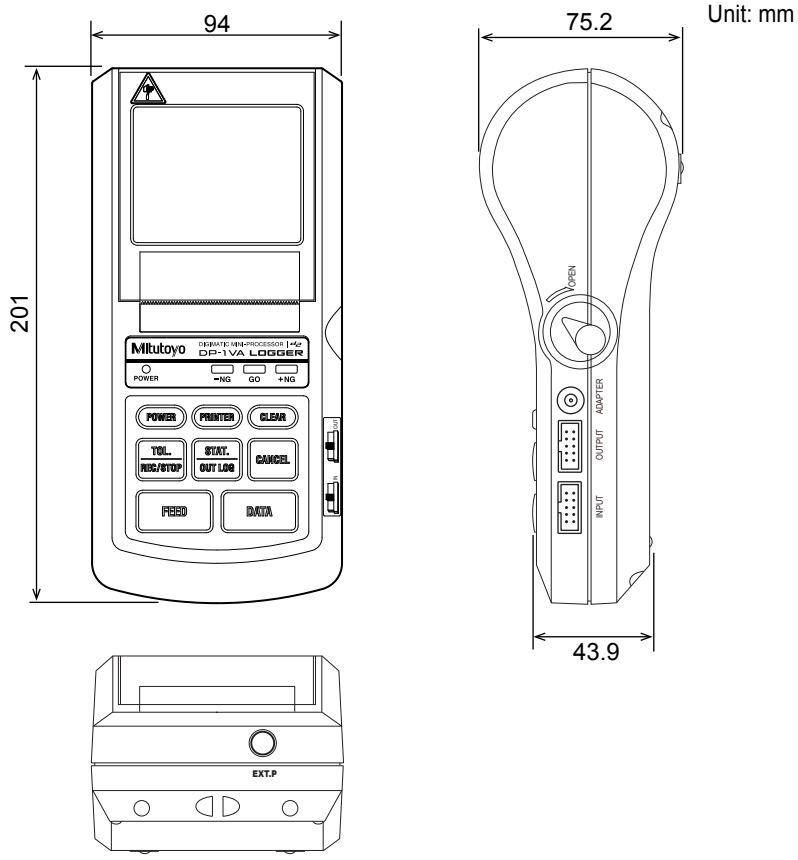
AC adapter: 1, Printer paper: 1 roll, Strap: 1 (Parts No. 09EAA079)

■ Consumables

Printer paper (10 rolls/pack) (Parts No. 09EAA082, width: 58 mm, roll length: 48 m)

■ External view and dimensions

Unit: mm



7.2 Calculation Specifications

7.2.1 Effective Digits

The essential figures for calculation are as follows.

Setting the effective digits (number of digits after the decimal point) of input data as A, the effective digits of each case are shown.

Symbol	Meaning	Displayed effective digits (after the decimal point)	Tolerance
Data	Input data	A	-
N	Number of data	-	-
MAX	Maximum value	A	-
MIN	Minimum value	A	-
R	Range	A	-
X	Average	A + 2	Lowermost digit ±1
σn	Standard deviation	A + 2	Lowermost digit ±1
σn-1	Sample standard deviation	A + 2	Lowermost digit ±1
P	Fraction defective (%)	3	Lowermost digit ±1
Cp	Process capability index	3	Lowermost digit ±1
Cpk	Process capability index	3	Lowermost digit ±1
LSL	Lower specification limit value	A	Lowermost digit ±1
USL	Upper specification limit value	A	Lowermost digit ±1
DIV	Number of divisions in histogram	Fixed to 10 divisions	-
	Histogram range display	A + 2	Lowermost digit ±1
$\overline{X}$	Center ($\overline{X}$ control)	A + 2	Lowermost digit ±1
$\overline{X}$-UCL	Upper control limit ($\overline{X}$ control)	A + 2	Lowermost digit ±1
$\overline{X}$-LCL	Lower control limit ($\overline{X}$ control)	A + 2	Lowermost digit ±1
$\overline{R}$	Center (R control)	A + 2	Lowermost digit ±1
$\overline{R}$-UCL	Upper control limit (R control)	A + 2	Lowermost digit ±1
$\overline{R}$-LCL	Lower control limit (R control)	A + 2	Lowermost digit ±1

7.2.2 Formulas

■ Calculation of MODE1 and MODE2

Print	Meaning	Calculation formula
N	Number of data	
MAX	Maximum data value	
MIN	Minimum data value	
R	Data range	MAX−MIN
$\overline{X}$	Average data value	ΣXi/N
σn	Standard deviation	$\sigma n = ((N \bullet \Sigma ESXi^2 - (\Sigma Xi)^2) / N2)^{1/2}$
σn-1	Sample standard deviation	$\sigma n - 1 = ((N \bullet \Sigma ESXi^2 - (\Sigma Xi)^2) / N \bullet E(N - 1))^{1/2}$
−NG	Number of data lower than the lower specification limit value	Number of data for which LSL > Xi
+NG	Number of data higher than the upper specification limit value	Number of data for which USL < Xi
P	Fraction defective	P = ((-NG) + (+NG))/N
Cp	Process capability index	Cp = TOL/(6σn-1) TOL: USL − LSL
Cpk	When process capability index bias is considered	Cpk = Zmin/3 Zmin: The lower value of Zusl and Zlsl Zusl = (USL − $\overline{X}$)/σn-1, Zlsl = ($\overline{X}$ − LSL)/σn-1

■ Calculation of MODE3

N: Number of sample data

MAX: Maximum data value

MIN: Minimum data value

n: Number of subgroups

A2: Refer to the conversion table below

D3: Refer to the conversion table below

D4: Refer to the conversion table below

* The maximum sample data number of the subgroup is 10.

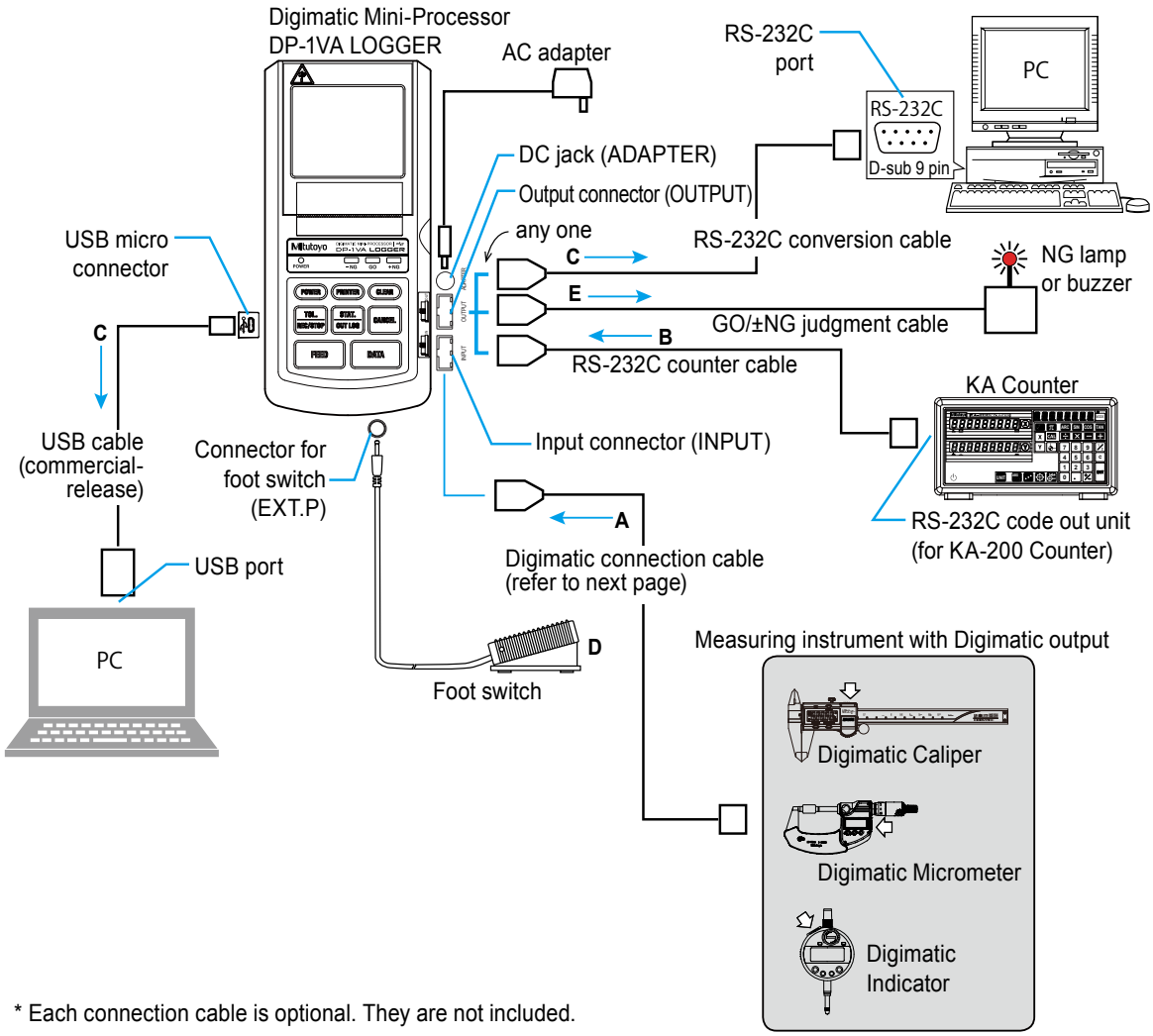
Variable Table

Sample size n	A2	D3	D4
2	1.880		3.267
3	1.023		2.574
4	0.729		2.282
5	0.577		2.114
6	0.483		2.004
7	0.419	0.076	1.924
8	0.373	0.136	1.864
9	0.337	0.184	1.816
10	0.308	0.223	1.777

Print	Meaning	Calculation formula
$\overline{X}$	Subgroup average value	$\overline{X} = \Sigma Xi/N$
R	Subgroup range	R = Xmax - Xmin
$\overline{\overline{X}}$	Center value	$\overline{\overline{X}} = \Sigma Xi/N$
$\overline{X}$-UCL	Upper control limit	$\overline{X}\text{-UCL} = \overline{\overline{X}} + A2 \cdot \overline{R}$
$\overline{X}$-LCL	Lower control limit	$\overline{X}\text{-LCL} = \overline{\overline{X}} + A2 \cdot \overline{R}$
$\overline{R}$	Center (R control)	$\overline{R} = \Sigma Ri/n$
$\overline{R}$-UCL	Upper control limit (R control)	$\overline{R}\text{-UCL} = D4 \cdot \overline{R}$
$\overline{R}$-LCL*1	Lower control limit (R control)	$\overline{R}\text{-LCL} = D3 \cdot \overline{R}$

*1 In case the number of samples is below 6, $\overline{R}$-LCL is not printed.

7.3 Connection Diagram with Various Optional Instruments



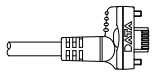
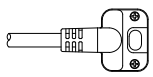
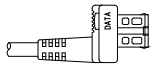
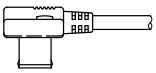
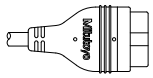
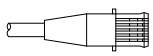
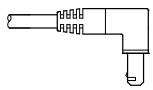
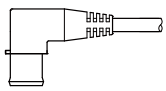
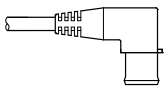
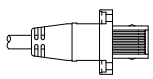
* Each connection cable is optional. They are not included.

A	**Measurement data input**	Connect a measuring instrument with Digimatic output and the input connector (INPUT) with the Digimatic connection cable.
B	**Measurement data input of KA Counter**	Connect the RS-232C port of the KA Counter and the output connector (OUTPUT) with an optional dedicated RS-232C counter cable (Parts No. 09EAA094).
C	**Measurement data output**	• Connect the PC USB port and USB micro connector with a store-bought USB cable. • Connect the PC RS-232C connector and the output connector with the RS-232C conversion cable (Parts No. 09EAA084).
D	**Input measurement data with foot switch operation**	Connect the foot switch (Parts No. 937179T) cable to the foot switch connector (EXT.P).
E	**Tolerance judgment result output**	Connect the output connector (OUTPUT) and the tolerance judgment discrimination equipment etc. with a GO/±NG judgment cable (Parts No. 965516).

7.4 Options

7.4.1 Digimatic Connection Cable List

Main Digimatic connection cables are shown below. For further details on the measuring instruments specifications, refer to our General Catalog.

Connector type	Measuring instrument side connector shapes	Part No.		Main corresponding measuring instruments
		1 m	2 m	
Waterproof type with output button		05CZA624	05CZA625	ABS Coolant Proof Caliper CD-P_M/-30PMX Length Measuring Unit SD-G
Waterproof type with output button		05CZA662	05CZA663	Digimatic Micrometer MDC-MX/MDH-25M QuantuMike MDE-MX Digimatic Holtest HTD-R
Straight type with output button		959149	959150	ABS Digimatic Caliper CD-AX/CD-C Length Measuring Unit SD-AX/SD-D/SDV-D
L type with output switch (cable outlet is right)		04AZB512	04AZB513	Digimatic Micrometer MDC-MB/OMC-MB/PMU300-MB
Flat 10-pin type		936937	965014	Digimatic Indicator ID-H/-F Height Gauge QM-Height QMH Digital MU-Checker M-561 Laser Scan Micrometer LSM-9506 Linear Gauge Counter EC-101D/EB/EH Litematic VL-B/S-B Portable Surface Roughness Tester SJ-210/310/410 Hardness Testing Machine HM-210/220
Round 6-pin type		937387	965013	Digimatic Micrometer MDQ-M/CLM1-QM/PDM-QM Portable Hardness Gauge HH-411
Flat straight type		905338	905409	ABS Digimatic Indicator ID-CX/ID-CAX/ID-CGX/ID-CRX/ID-SX/ID-SS/ID-U Digimatic Height Gauge HDM-AX/HD-AX/HDS-HC/HDS-C ABS Boremetic SBM-CX Digimatic Cylinder Gauge CG-D Length Measuring Unit SD-E/SDV-E/SD-F/SDV-F Hardness Testing Machine H-300
Flat L-shape (cable outlet is back)		905689	905690	
Flat L-shape (cable outlet is right)		905691	905692	
Flat L-shape (cable outlet is left)		905693	905694	
Flat straight water-proof type		21EAA194	21EAA190	ABS Digimatic Indicator ID-N/-B

Tips

The designs and specifications of Digimatic connection cables are subject to partial change without prior notice for product improvement. We appreciate your understanding.

7.4.2 Other Options

Part No.	Product name	Note
09EAA084	RS-232C conversion cable	To output the measurement data to the RS-232C port. Cable length 1 m, D-sub 9 pins
965516	GO/±NG judgment cable	To output the tolerance judgment result. Cable length 2 m, 10 pins terminal - loose wires
937179T	Foot switch	This switch enables the measurement data input with foot operation.
09EAA094	RS-232C counter cable	Use to connect with a KA Counter. Cable length 1 m, D-sub 9 pins
06AET993	Code Out Unit (for KA-200 Counter)	This unit enables RS-232C output from a KA Counter.
06AFM386	Measurement Data Collection Software USB-ITPAK (corresponding to V2.1 and higher)	This software enables the measurement data of the measuring instrument with Digimatic output connected to the product to be fetched into a Microsoft Excel sheet prepared by the customer by sending it to a PC via a USB cable. As the cursor movement can be automatized by registering the fetching process to Microsoft Excel, this displays its full power in the operational efficiency improvement of inspection operation for the mass-produced products which have a lot of repetitive works.
06AFZ050	USB cable (A-microB)	This USB cable is used to output measurement data to the PC. Commercially available products can be used. Cable length 1 m, USB Type A-to-Micro-USB Type B

Index

Symbol

A

B

C

D

E

F

G

H

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K

L

M

N

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P

R

S

T

U

W

X

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*As of January 2019

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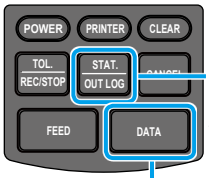
MEMO

Revision History

Date of publication	Revision status	Details of revision
August 1, 2017	First edition	Publication
July 1, 2018	Revised first edition	Revised in accordance with changes to modification of product specification and manual production guidelines
April 1, 2019	Revised second edition	Corresponds to other partial changes in product operation explanations

DP-1VA LOGGER parameters list

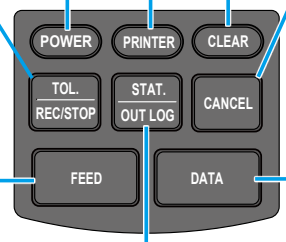
- With the power off, press POWER while holding down DATA, then just release POWER, and when the printing starts, if DATA is released, the mode will be "PARAMETER SETUP MODE".
- Set and change the parameters by DATA and STAT. OUT LOG operations.



♦: Initial setting values

Setting order	Setting items	Setting/print contents
1	PARAMETER CLEAR	PARAMETER CLEAR: Clear the parameter, PARAMETER NO CLEAR: Not clear the parameter ♦
2	SYSTEM MODE	DP-1: DP-1 mode ♦, MP: MP mode
3	WORK MODE	MODE0, MODE1 ♦, MODE2, MODE3
4	BAUD RATE (RS-232C communication speed)	1,200, 2,400, 4,800 ♦, 9,600, 19,200
5	PARITY (RS-232C communication parity check method)	NON: no setting, EVEN: even number ♦, ODD: odd number
6	DATA LENGTH (data length of RS-232C communication)	7 ♦, 8
7	PRINT SIZE (print character font size)	NORMAL ♦, LARGE (only NORMAL in case MODE2 is selected)
8	BACK FEED	ON ♦, OFF (displayed only when NORMAL is selected in PRINT SIZE)
9	POWER SAVE	SAVE: Power save, NORMAL: Standard ♦
10	PRT DENSITY (Density of the print)	NORMAL ♦, DARK
11	BUZZER (Buzzer sound)	On: Sound ♦, Off: No sound
12	TIME PRINT (Clock function)	On: Use ♦, Off: Not use
13	DATE FORMAT (Print format of the date)	YYYY/MM/DD ♦, MM/DD/YYYY, DD/MM/YYYY
14	DATE	For January 2, 2018:2018/1/2, JAN/2/2018, 2/JAN/2018
15	TIME	For 14:25 pm: 14:25
16	UNIT	*** AUTO can be selected only in DP-1 mode** AUTO♦ (Only mm units can be accepted), mm: millimeter, inch: inch, no unit, g: gram, °C: temperature, t: ton, lb: pound, N: newton, Nm: newton-meter, µm: micrometer, µin: microinch
17	LOG RESUME (Log state setting at the time of activation)	1: Log stop ♦, 2: Log start, 3: Assume the log state when the power was turned off last time
18	OUT LOG (Log output setting)	Log print: 1: Time/Measurement value ♦, 2: N number/Measurement value, 3: N number/Date/Time/Measurement value Log USB output: 1: Time/Measurement value ♦, 2: Measurement value, 3: Date/Time/Measurement value
19	INPUT AXIS (Data input object axes setting)	*** Set only in MP mode** XYZ ♦, X, Y, Z (multiple settings are possible)
20	CUL AXIS (Calculation object axes setting)	*** Set only in MP mode** X ♦, Y, Z (only 1 axis can be set)

■ Names and functions of operation key



[POWER] key
Press when switching on/off the power.

[PRINTER] key
Press when switching on/off the printing function of measurement data and log data.

[CLEAR] key
Press when deleting all the measurement data.

[TOL. | REC/STOP] key
Press to enter or exit the setting mode for the limit data (upper/lower specification limit value).
Hold down to start/stop the data logging.

[CANCEL] key
Press to cancel the latest input measurement data.
Hold down for more than 10 seconds to delete the measurement data/log data and initialize the date and time by hardware reset.

[FEED] key
While being pressed the printer paper is fed.

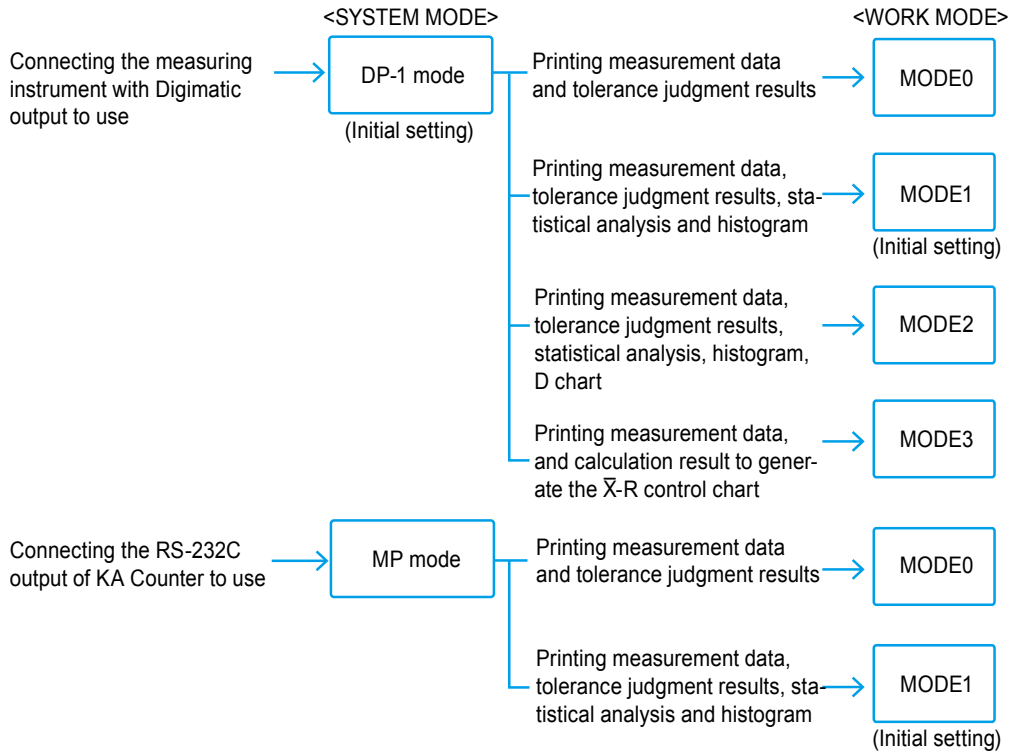
[DATA] key
Press to input the data from the measuring instrument.

[STAT. | OUT LOG] key
Press to perform the statistical calculation based on all the input measurement data, print the calculation results and generate the histogram.
Hold down to print the log data and output it to USB.

● When two key operations are required

- Parameter Setup Mode: DATA + POWER (effective only when turning on the power)
  ("5.2 Various Parameter Settings and Setting Items" on page 63)
- Timer Input Mode: PRINTER + FEED
  ("3.6.1 Timer Input of the Measurement Data" on page 43)
- Print date and time: PRINTER + DATA

■ SYSTEM/WORK MODE selection and print contents



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