

# Measurement Data Wireless Communication System U-WAVE®

Bulletin No. 1954



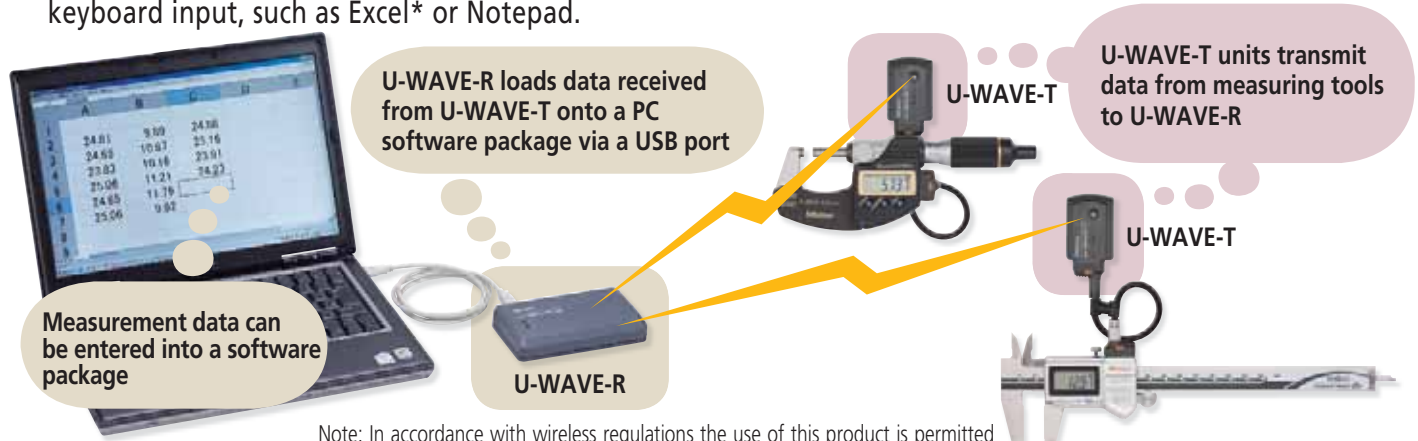
New wireless system improves efficiency by eliminating the need for data cables when sending measurements to a PC

**Mitutoyo**

# Measurement Data Wireless Communication System

## U-WAVE®

The **U-WAVE** system enables easy wireless data communication from a measuring tool to a PC using the Digimatic protocol. Measurement efficiency is improved by eliminating the long and cumbersome data cables. The user-friendly interface allows data to be loaded into any software product that accepts keyboard input, such as Excel\* or Notepad.

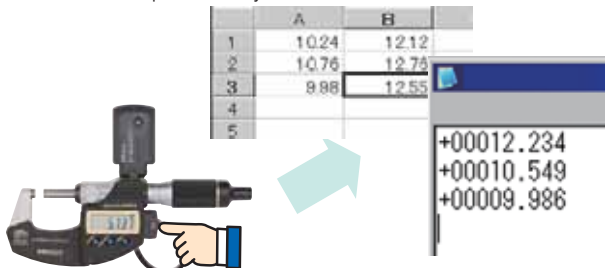


\*Excel is a registered trademark of Microsoft Corporation.

Note: In accordance with wireless regulations the use of this product is permitted in Japan, Europe (a total of 32 countries including 27 EU members, 4 EFTA members and Turkey), U.S.A. and Canada. This product must not be used in other countries or areas.

### Easy loading in Excel format

The **U-WAVEPAK**, **U-WAVE-R** standard package features a keyboard interface function. This allows measurement data to be easily entered into in Excel, Notepad or other format that accepts numeric value input via a keyboard.



In addition, a virtual COM driver allows measurement data to be input to a program that supports **RS-232C** serial communication. The communication speed (baud rate) is fixed to 57,600 bps.

### Approximately 400,000 Data Transmissions

One commercially available CR2032 lithium battery will support about 400,000 data transmissions.

Assuming that the device is used twenty days a month, sending data 2,000 times a day, one battery will last for about ten months.

### Dustproof and water resistant IP67 model

**IP67**-type **U-WAVE-T** (No.02AZD730C) has an **IP67**-level dust/water-proof function. This model can be used in combination with, devices such as a coolant-proof caliper, micrometer or indicator.

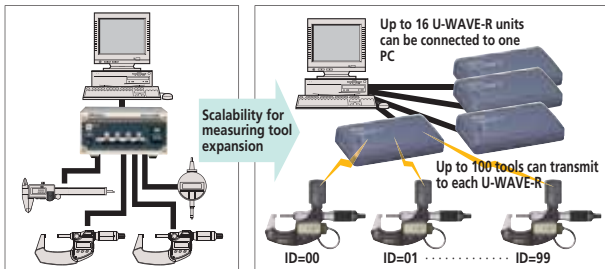


**IP67**

# U-WAVE®

## Up to 100 measuring tools can be connected to one U-WAVE-R unit

Up to 100 **U-WAVE-T** units can be registered with one **U-WAVE-R** unit, and up to 16 **U-WAVE-R** units can be connected via a commercially available USB hub.



**MUX-10F**  
(up to 4 wired channels)

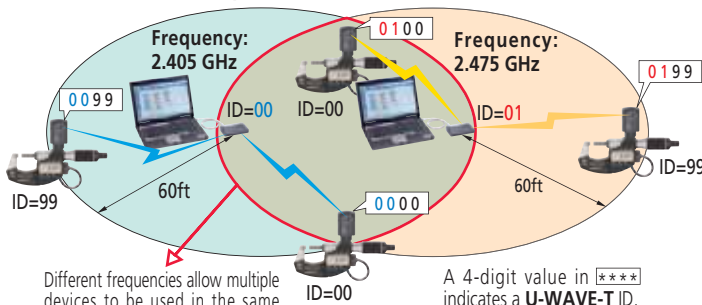
**U-WAVE**  
(up to 100 wireless channels)

## Data communication range up to 60ft possible

The maximum reliable communication range is approximately 60ft\*. Even when multiple **U-WAVE-R** units are used within the range of 60ft, interference does not occur since an ID (00 to 99) is assigned to each unit. Radio interference between **U-WAVE-R** units can also be avoided by setting different frequencies (selected from 15 bands).

\*Actual range depends on the local radio transmission characteristics.

### Different frequencies ensure no radio interference



Different frequencies allow multiple devices to be used in the same communication range.

A 4-digit value in \*\*\*\* indicates a **U-WAVE-T** ID.

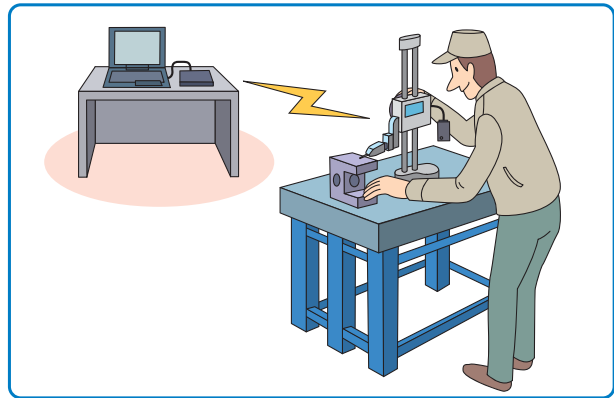
## Lower price than existing Mu-WAVE models

Design enhancements offer a variety of functional improvements and a price lower than existing Mu-WAVE models.

## Cordless operation improves efficiency in measurement data recording

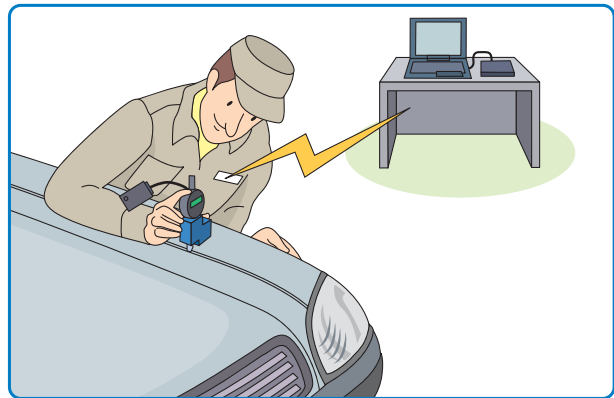
### Measurement on surface plate

With a cordless device, the surface plate and PC desk no longer need to be adjacent, allowing flexible layout in the inspection room.



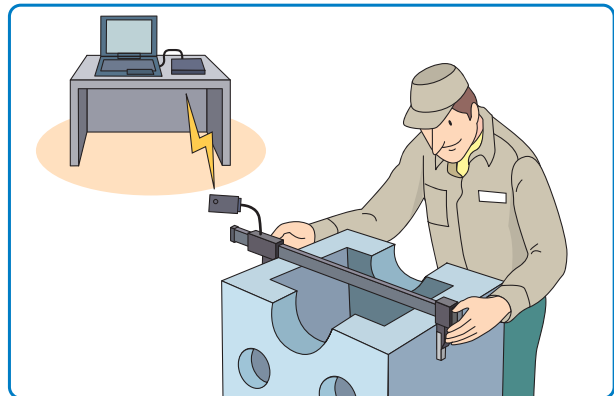
### Measurement of large workpieces

With **U-WAVE**, operators can perform measurement freely around the workpiece with no cable constraints.



### Measurement using long measuring tools

**U-WAVE** eliminates cable constraints, making the use of hard-to-handle, long measuring tools easier.



# Just press a button to send measurements to

Purchase the following four products ( 1 to 4 ) to send data to your PC.

## 3 U-WAVE-T/tool connection

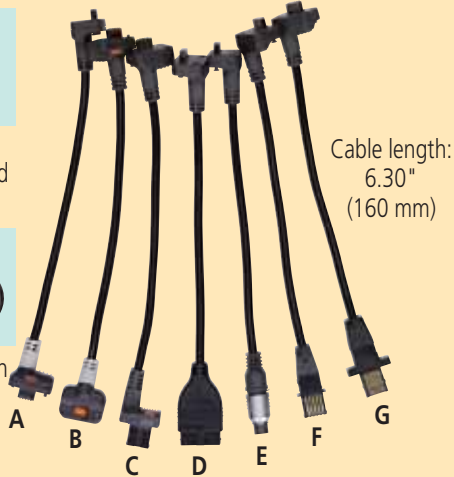
A short cable is used to connect a measuring tool to its **U-WAVE-T** unit. Select the appropriate cable from **A** to **G** below (7 types) to suit the measuring tool. Detailed information on cable suitability is given on page 7.



Fastening clip included with cable



Cable with clip



	Type	Order No.
<b>A</b>	Water-proof model with output button	<b>02AZD790A</b>
<b>B</b>	Water-proof model with output button	<b>02AZD790B</b>
<b>C</b>	With data-out button type	<b>02AZD790C</b>
<b>D</b>	10-pin plain type	<b>02AZD790D</b>
<b>E</b>	6-pin round	<b>02AZD790E</b>
<b>F</b>	Plain type straight	<b>02AZD790F</b>
<b>G</b>	Plain type straight water-proof model	<b>02AZD790G</b>

## 2 U-WAVE-T · Registered Design (Japan)

Inch/(Metric)

**U-WAVE-T** sends measurement data to **U-WAVE-R**.

Actual size



Major specifications of **U-WAVE-T**

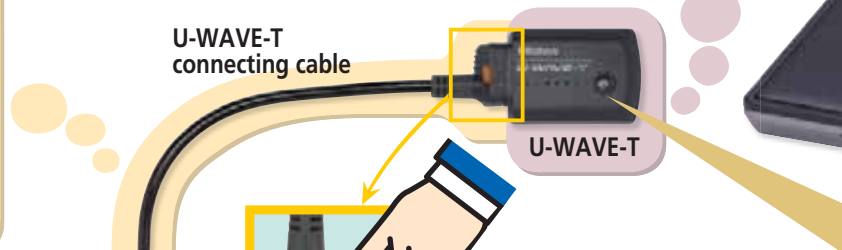
Model	<b>U-WAVE-T</b> (IP67 model)
Order No.	<b>02AZD730C*</b>
Protection Rating	IP67
Data reception indication	LEDs
Power supply	Lithium battery CR2032 x 1
Battery life	Approx. 400,000 transmissions
External dimensions	1.73" x 1.17" x .73" (44 x 29.6 x 18.5 mm)
Mass	.05 lbs (23g)

\*Detailed information on conformity standards of wireless communication specification is given on page 6.

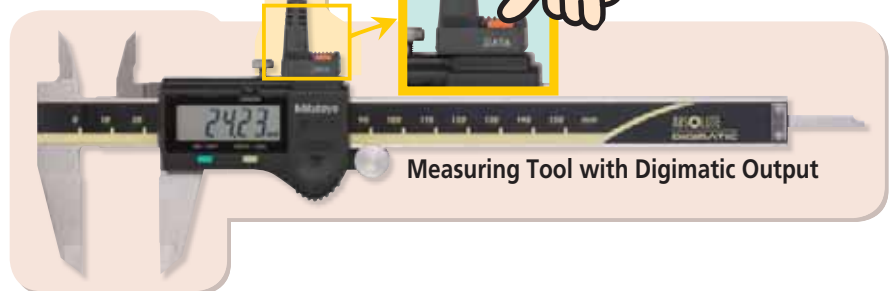


Standard accessory: driver

**U-WAVE-T** connecting cable



**U-WAVE-T**



Measuring Tool with Digimatic Output

## 4 Mitutoyo Measuring Tool with Digimatic Output

This product can be connected to a measuring tool that provides Digimatic data output. Digimatic output is Mitutoyo's proprietary output format. The Digimatic specifications remain unchanged since the first Digimatic measuring tool was released. Therefore, any tool having a Digimatic port can be used, regardless of age. Connectors on some older instruments are not compatible with connectors used on the above-listed cables. See cable list on page 7.

Example Digimatic measuring tools pictured with connecting cables. Instrument models/cable product numbers are listed below.



**Super Caliper**  
CD67-S15PM  
No.02AZD790A



**QuantuMike**  
MDE-25MJ  
No.02AZD790B

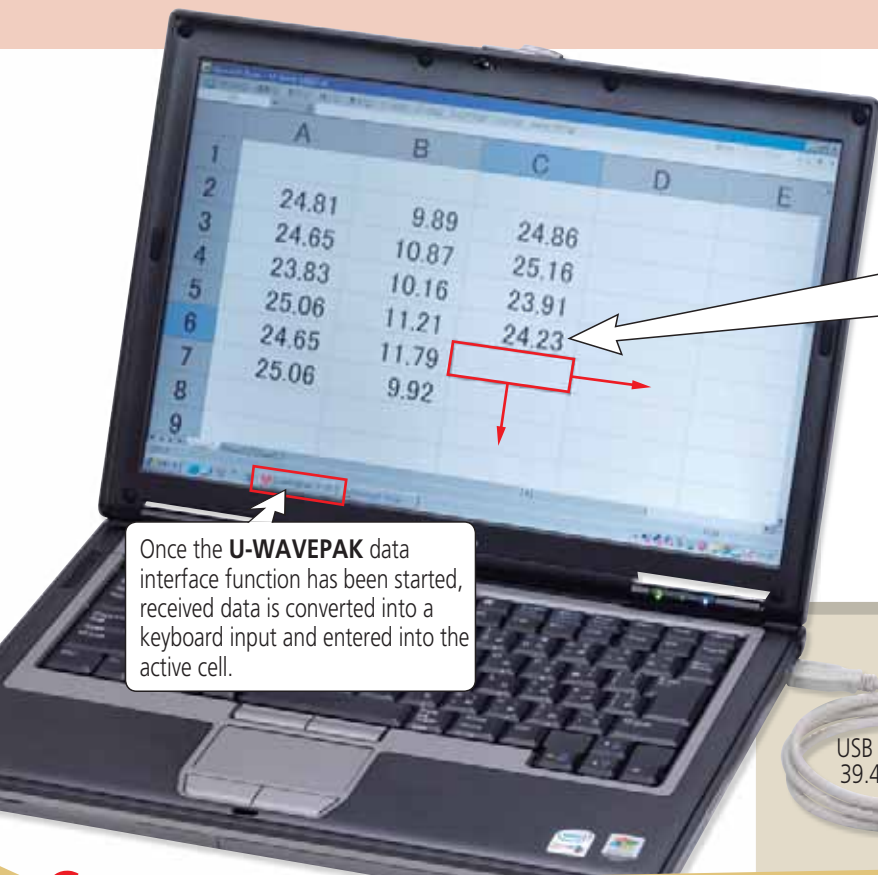


**ABS Digimatic Caliper**  
CD-15CX  
No.02AZD790C



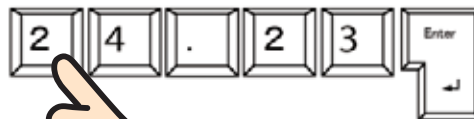
**Digimatic Indicator**  
ID-H0530  
No.02AZD790D

# U-WAVE® a PC through wireless communication.



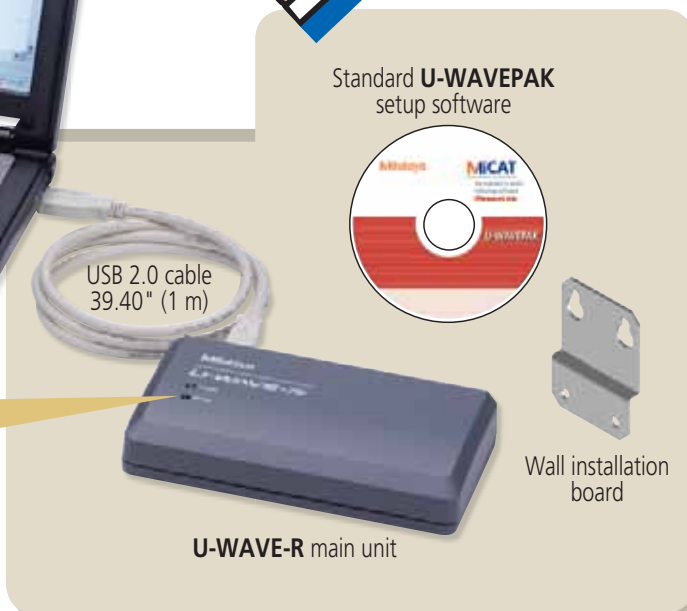
Once the **U-WAVEPAK** data interface function has been started, received data is converted into a keyboard input and entered into the active cell.

When the data input button is pressed, the value displayed on the measuring tool is entered into the active cell of Excel followed by "Enter" key input. The cursor movement direction after input (up, down, left or right) can be set in Excel.



**Communication distance of approximately 60ft  
(in a good transmission/reception location)**

*\*Refer to page 6 for wireless communication specification*



## 1 U-WAVE-R · Registered Design (Japan)

Inch/(Metric)

### Major Specifications of U-WAVE-R

Model	U-WAVE-R
Order No.	<b>02AZD810C*</b>
Power supply	USB bus power system
Number of <b>U-WAVE-R</b> units that can be connected to one PC	Up to 16
Number of <b>U-WAVE-T</b> units that can be connected	Up to 100
External dimensions	5.51" x 3.15" x 1.24" (140 x 80 x 31.6mm)
Mass	.29 lbs (130g)



\*Detailed information on conformity standards of wireless communication specification is given on page 6.

\*Refer to page 6 for specification of **U-WAVEPAK** (setup software)



**Quick Micro  
MDQ-30M  
No.02AZD790E**



**Digimatic  
Height Gauge  
HD-30AX  
No.02AZD790F**



**ABS Digimatic  
Indicator  
ID-N112  
No.02AZD790G**

## Specifications of wireless communication

Conformity standards	<ul style="list-style-type: none"> <li>European conformity standards*                             <ul style="list-style-type: none"> <li>EN 50371:2002</li> <li>EN 300 440-1 V1.3.1</li> <li>EN 300 440-2 V1.1.2</li> <li>EN 301 489-01 V1.6.1</li> <li>EN 301 489-03 V1.4.1</li> </ul> </li> <li>U.S.A. conformity standards                             <ul style="list-style-type: none"> <li>47 CFR Part 15.247:(Subpart :C)</li> <li>47 CFR Part 15,(Subpart :B)</li> </ul> </li> <li>Canada conformity standards                             <ul style="list-style-type: none"> <li>RSS-210 (Issue 7)</li> <li>RSS-Gen (Issue 2)</li> <li>ICES 003 (Issue 4)</li> </ul> </li> </ul>	Wireless standards	Conform to IEEE802.15.4
	Wireless communication distance	Approx. 60ft (within visible range)	
Wireless communication speed	250 kbps		
Transmission output	1 mW (0 dBm) or less		
Modulation method	DS-SS (direct sequence spread spectrum) Resistant to interfering signal or noise.		
Communication frequency	2.4 GHz band (ISM band: universal frequency)		
Used band	15 channels (2.405 to 2.475GHz at intervals of 5MHz) The noise search function can avoid interference with other communication devices.		

Note: In accordance with wireless regulations the use of this product is permitted in Japan, Europe (a total of 32 countries including 27 EU members, 4 EFTA members and Turkey), U.S.A. and Canada. This product must not be used in other countries or areas.

· This product is not compatible with the conventional Mu-WAVE, for which communication specifications are different.

\* Japan conformity standards: ARIB STD-T66

## U-WAVE-R

### Receives data from U-WAVE-T and sends it to a PC via a USB connection

#### <Specifications of U-WAVEPAK (setup software)>

Before using **U-WAVEPAK** for the first time, IDs, frequencies, and other software setup must occur. The data interface function allows measurement data to be sent to a PC into Excel, Notepad or other software that accepts keyboard input.

Data can also be sent to a program that supports **RS-232C** serial communication using the virtual COM driver.

#### 1) Operating environment

Supported OS: Windows 2000 Professional (SP4 or higher)  
Windows XP Home Edition (SP2 or higher)  
Windows XP Professional (SP2 or higher)  
Windows Vista

Other information: USB port needed

#### 2) Initial setup procedure

- (1) Install **U-WAVEPAK** (setup software).
- (2) Connect the **U-WAVE-R** main unit to the PC with a USB 2.0 cable.
- (3) Install the dedicated USB driver and virtual COM driver.
- (4) Set IDs and frequencies for **U-WAVE-R** and **U-WAVE-T** with **U-WAVEPAK**.
- (5) Press the DATA button of **U-WAVE-T** once to write settings into **U-WAVE-T** main unit memory.

#### 3) Data interface function

Data is entered into an Excel or Notepad file as keyboard-input data.

(1) Control key (terminal code)

Codes to be suffixed to measurement data can be switched.

· ENTER (default), TAB, up, down, left, right

(2) Data send mode

Two data formats are available.

· Measurement data only (default) Example +00000012.34

· All data Example DT1 01 02 +00000012.34 M

Header: measurement data | Measurement data |

**U-WAVE-R** ID: 00 to 99 | Unit M: millimeter  
**U-WAVE-T** ID: 00 to 99 | I: inch

(3) Use of status code

Select the state of **U-WAVE** or whether to output control command or other data.

· Ignore (default), load

Status code: low battery voltage (00), no response from measuring tool (01), measurement data missing (03), data cancellation (99), etc.

Example data cancellation ST1 01 02 09999999073 99

Header: status | Device ID\*

**U-WAVE-R** ID: 00 to 99 | Status code

**U-WAVE-T** ID: 00 to 99 | 99: data cancellation

\*Unique number assigned to **U-WAVE-T** and **WAVE-R** at shipment

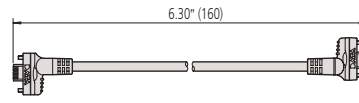
# U-WAVE®

## List of U-WAVE-T Connecting Cables

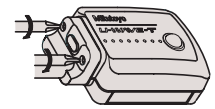
Select one from cables **A** to **G**, referring to the part number of connecting cable for wired connection in your measuring tool catalog or manual. If you are unsure which cable is appropriate, check the cable connectors, the shapes of terminal on the measuring tool side, or the codes of compatible measuring tool for cables **A** to **G** below. It is not possible to connect to EF and EH counters.

From seven types of cables (**A** to **G**), select one compatible with your measuring tool.

### Measuring tool



### U-WAVE-T



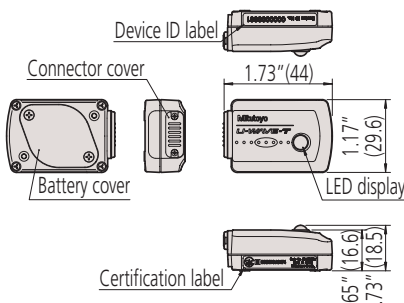
Fasten the connector to **U-WAVE-T** with two screws.

Cable type	<b>A</b> water-proof model with output button	<b>B</b> water-proof model with output button	<b>C</b> With data-out button type	<b>D</b> 10-pin plain type	<b>E</b> 6-pin round	<b>F</b> Plain type straight	<b>G</b> Plain type straight water-proof model
Order No.	02AZD790A	02AZD790B	02AZD790C	02AZD790D	02AZD790E	02AZD790F	02AZD790G
Connector shape on the measuring tool side	Light gray	Light gray					
Socket shape on the measuring tool							
Codes of major compatible measuring tools and instruments	[Digimatic Caliper] CD67-S_PM CD-PMX CD-PM/GM CDC-P_PMX CDN-P_PMX CFC-G/GL/GC/GU [Digimatic Caliper] NTD-PMX [Digimatic Depth Gage] VDS-PMX [Digital Scale and DRO Systems] SD-G	[Digimatic Micrometer] MDE-MJ MDC-MJ/MJT [Digimatic Micrometer] The code suffix is -MJ. BLM-M OMV-M OMP-M PDM-M IMP-M VM-M [Digimatic Micrometer Heads] MHN-M/MJ/MJN [Digimatic Holtest] HTD-R [Digimatic Depth Gage] DMC-M	[Digimatic Caliper] CD-CX/-C CD-S_C CDC-CX/C CDN-CX/C [Digimatic Caliper] NTD-CX/C [Digimatic Depth Gage] VDS-DCX [Digital Scale and DRO Systems] SD-D, SDV-D	[Digimatic Indicator] ID-H/F [Linear Height] QMH-S [Linear Gage/Counter] EB,EC-D [μ-checker] Digital μ-checker [Laser Scan Micrometer] LSM-9506 [Reference Gage] HDM-C [Coating Thickness Gage] DGE-745/755 [Form Measurement] SJ-201/301/401	[Digimatic Micrometer] MDQ-M MDC-M CLM1-QM/DK PDM-QM PMU-DM BD-M [Digimatic Holtest] HTD [Reference Gage] HDM-DM [Hardness Testing Machines] HM-100/200 HV-100 HR-500 HH-411	[Digimatic Caliper] CD, CFC-P/-L/-C/-U [Digimatic Height Gages] HD-AX, HDM-AX HDS-H_C/-C HDM-A HDF-N [Digimatic Indicator] ID-C/_RB/_A/_GB ID-S/U [Digimatic Depth Gage] Digimatic model (ID-C) [Digital Scale and DRO Systems] SD-E, SDV-E SD-F, SDV-F [Portable Hardness Testing Instruments] HH-300	[Digimatic Indicator] ID-N ID-B
Reference Order No. of connecting cable	1m 05CZA624 2m 05CZA625	05CZA662 05CZA663	959149 959150	936937 965014	937387 965013	905338 905409	21EAA194 21EAA190

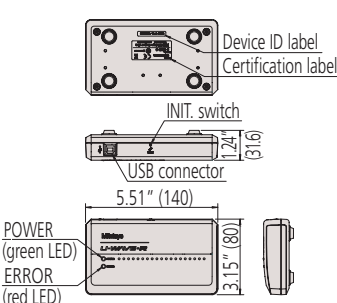
## Name and Dimensions of Each Part

Unit: Inch/(mm)

### U-WAVE-T



### U-WAVE-R



## Note on Wireless Communication Environment

Although the communication range for **U-WAVE** is approximately 60ft line-of-sight, performance may be affected by obstacles or environmental factors.

### Items that may cause communication errors

Item	Contents
Concrete wall	Communication is not possible into a room completely enclosed.
Metal partition	Communication speed may drop or communication may be interrupted.
Wireless LAN, communication device such as ZigBee Bluetooth, and microwave oven	Communication speed may drop or communication may be interrupted. Maintain the set frequency and installation distance if at all possible.
Medical instrument	Do not use this product near a medical instrument such as a laser knife or electronic scale.

## Cautions · Safety Caution:

- Do not use this device near medical equipment that might malfunction due to radio interference.
- Caution on radio law:** This device is certified as a 2.4 GHz band wide-band low-power data communication system based on the Radio Regulations in Japan, Europe, U.S.A. and Canada. It is prohibited by law to disassemble or modify this device or peel off the certification label from it.

# MeasurLink® V6.1

Combining the U-WAVE system with commercially available data measurement software allows the user to perform SPC and data analysis. New functions have been added to MeasurLink including **U-WAVE** ID identification and data cancellation.

## Measurement Data Network System — MeasurLink® V6.1 Real-Time PLUS

When data is input, **MeasurLink** displays a variety of statistical processing results including GO/NG judgment, process capability, Xbar-R control chart and histogram on the screen in real time. For details, refer to **Bulletin No. 1717**.

### Other Highlights

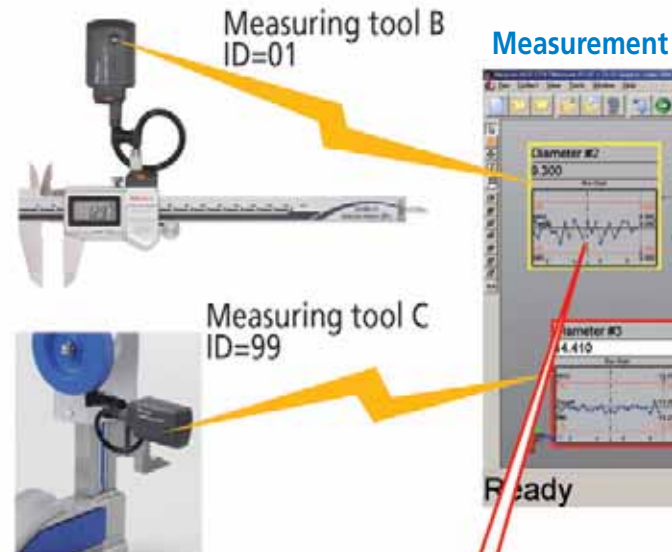
- Alarm function: tolerance judgment, control limit value, series, tendency, etc.
- Report output: statistical calculation result, chart, measured value, etc.
- Comment addition and per-layer function: It is possible to add history information (such as inspector, machine tool, lot number, serial number, and cause of failure) to data as comment so that it can be checked when a problem occurs or used as a keyword to search for or narrow down data.
- File import function: Text, PocketML or other file
- File output: Excel, text or other format

### Association between U-WAVE-T ID and the Measured Item

When there is a one-to-one relationship between the measuring tool and the measured item, data randomly measured by the operator can be automatically input into the associated measured item. When a single measuring tool measures multiple items, determine the measurement order in advance since a single ID cannot identify measured items.

### V6.0 or earlier version

It is necessary to upgrade to V6.1 to support data cancellation and other new functions of the **U-WAVE**. The V6.1 upgrade for V6.0 users is at no cost. A service pack can be downloaded from the Support section of the MeasurLink website. [www.measurlink.com](http://www.measurlink.com)



### Standing details can be freely selected.

**Character information (item information and calculation result)**  
Item name, measured value, upper/lower limits, Cp, Cpk, Pp, Ppk, standard deviation, average, maximum value, minimum value, defect rate, etc. (All selectable)

**Chart display (control charts, etc.)**  
Xbar-R control chart, Xbar-S control chart, X-Rs control chart, histogram, tier chart, run chart, pre-control chart, statistics, etc. (All selectable)

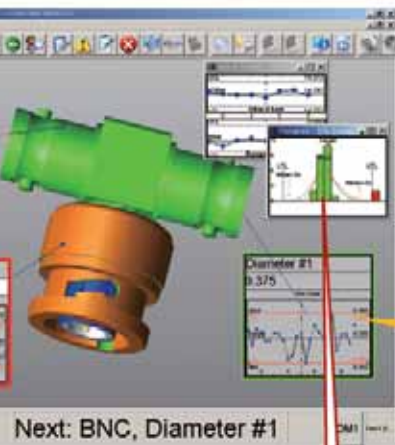
**Color-coding of judgment of GO/NG results**  
The color of the outer frame of the call-out corresponds to the GO/NG result.

Green	Yellow	Red
OK	Close to out-of-tolerance	Out-of-tolerance

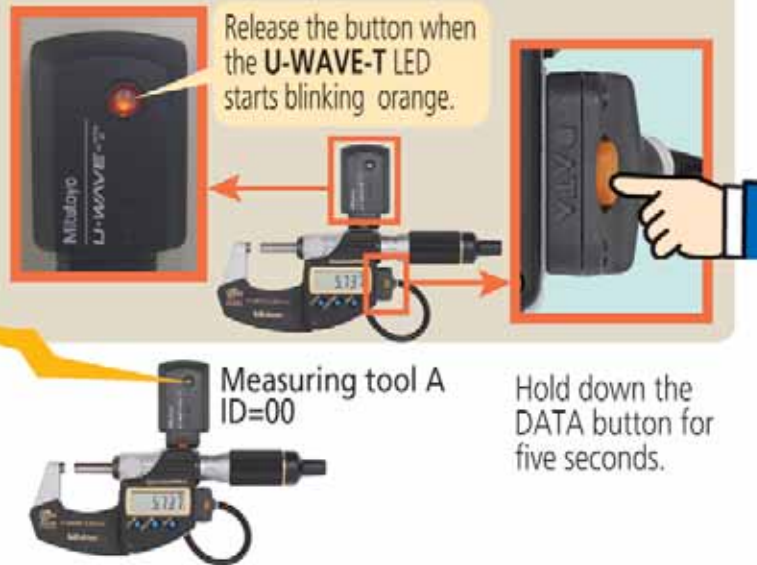


# U-WAVE®

## Data Input Screen



## U-WAVE's New Function (Common): Data Cancellation Function Activated by Holding Down the Button



## Detailed statistical charts can be arbitrarily displayed.

### <Individual item chart>

- Xbar-R control chart (a)
- Xbar-S control chart
- X- Rs control chart
- EWMA control chart
- Histogram (b)
- Run chart
- Pre-control chart (c)
- Tier chart

### < All item chart >

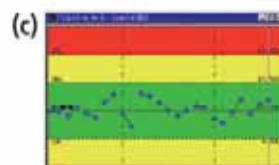
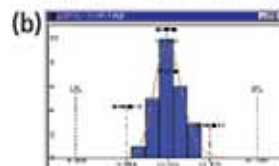
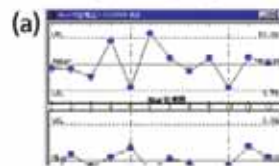
- Multivariate control chart
- Column indicator
- All item Cpk sheet
- Multivariate defect ratio (bar graph)
- Manager display (4 columns x 3 rows)  
(Histogram, meter, box and whisker plot, Cpk)

### <Measured value>

- Measured value data sheet
- Parts data sheet

### <Statistics>

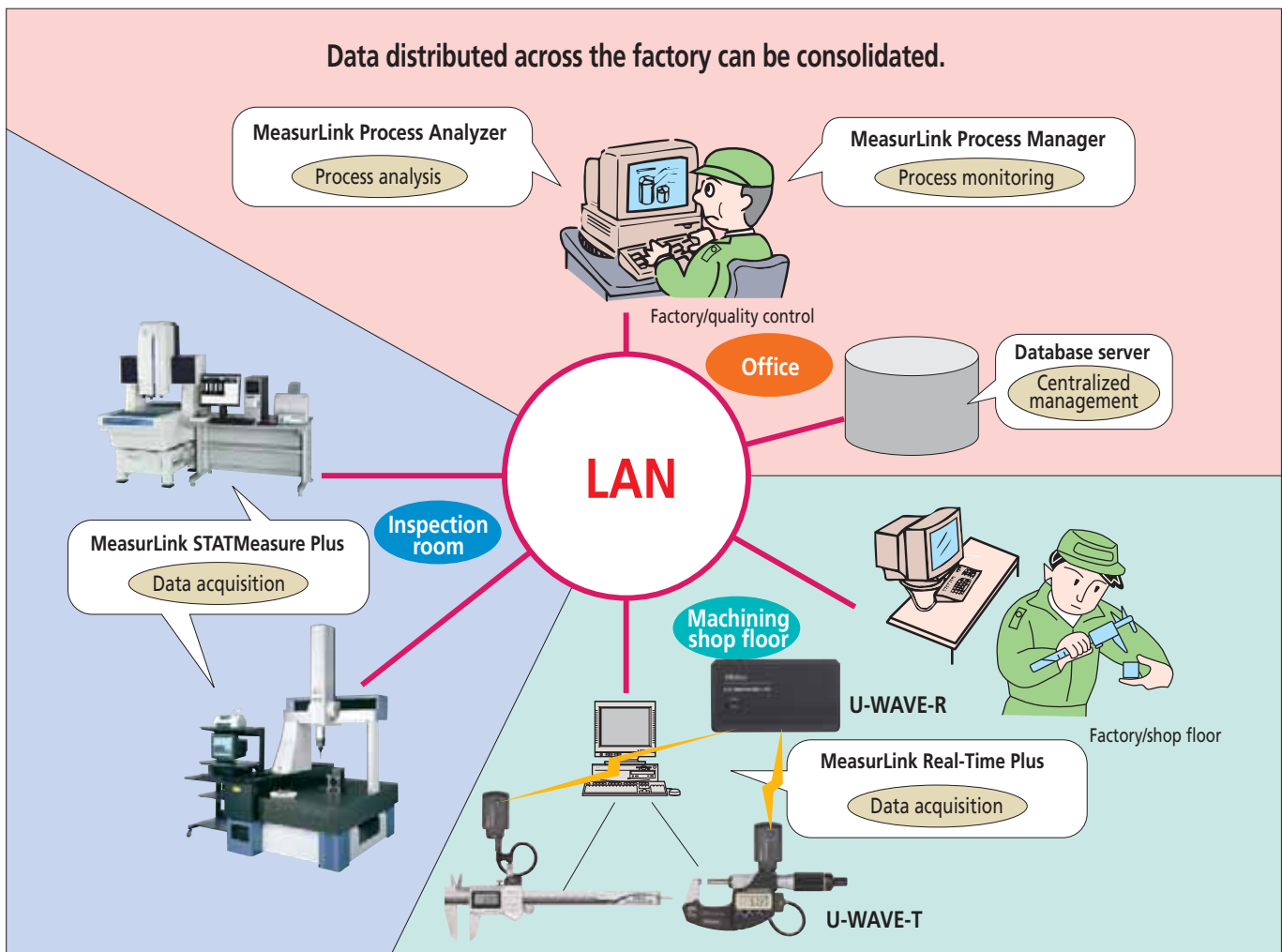
- Maximum value
- Minimum value
- Average
- Standard deviation
- Process capability
- Defect ratio
- Average  $\pm 3\sigma/4\sigma/6\sigma$  etc





## Central Management of Quality Information through Construction of Measurement Data Network System

**MeasurLink** can be expanded to a network system of server and clients. This software consolidates and centrally manages measurement data generated across the factory (handheld measuring tools to CMMs) to support quality information sharing.



### Operating Environment (Recommended)

#### <MeasurLink V6.1 Real-Time PLUS>

OS: Windows 2000/XP Vista

CPU: Pentium IV 1GHz

Memory: 1 GB or more

Hard disk: 2 GB or more free space

I/O: USB port (required for **U-WAVE-R** connection)

Media drive: CD-ROM (required at installation)

# PDA Navi

## U-WAVE®

Remotely view data input into MeasurLink Real-Time Plus (sold separately)

### Measurement Navigation Program — PDA Navi

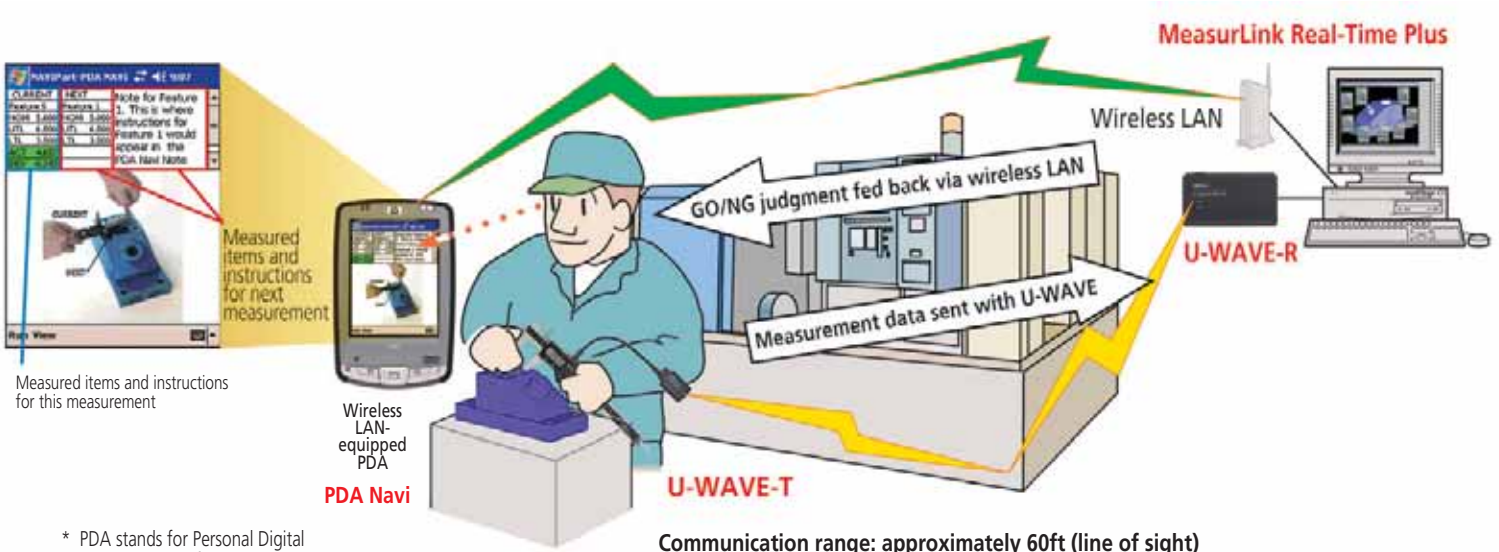
**PDA Navi** is a measurement navigation program that allows data input to **MeasurLink Real-Time Plus** on a PC to be viewed using a commercially available PDA\* via a wireless LAN. This means that even when you make measurements at a station remote from your PC the measurement data can still be sent to the PC with **U-WAVE**, loaded into **MeasurLink** and the results fed back to **PDA Navi** for viewing at your remote station. GO/NG judgment results, statistical processing results, next point to be measured and other data can all be verified.

### Operating Environment for PDA Navi

Supported OS	Microsoft Windows Mobile 5.0 for Pocket PC
Supported PDA	PDA equipped with above OS and wireless LAN Recommended memory: ROM: 192 MB or more, RAM: 64 MB or more Certified model: "iPAQ hx 2490b2" (from HP)
Supported MeasurLink	Real-Time Plus or STAT-Measure Plus V6.1 or higher (required when using PDA Navi)

Order No. 64AASPDAN\*\*

### PDA Navi Measurement Screen Example



\* PDA stands for Personal Digital Assistant and refers to a personal mobile information terminal.

\*\*PDA device not included

### Major Specifications of PDA Navi

- Inspection lot: New, Open, Close, Switch
- Measurement display: Starts measurement using the graphic screen.
- Measurement result display: GO/NG judgment result is displayed color-coded.
- Specification of next measured item
- Chart display: control chart, histogram, run chart, etc.
- Data collection: key input of data, data cancellation, key input of serial number



**Note:** All information regarding our products, and in particular the illustrations, drawings, dimensional and performance data contained in this printed matter as well as other technical data are to be regarded as approximate average values. We therefore reserve the right to make changes to the corresponding designs. The stated standards, similar technical regulations, descriptions and illustrations of the products were valid at the time of printing. In addition, the latest applicable version of our General Trading Conditions will apply. Only quotations submitted by ourselves may be regarded as definitive.

Mitutoyo products are subject to US Export Administration Regulations (EAR). Re-export or relocation of Mitutoyo products may require prior approval by an appropriate governing authority.

**Trademarks and Registrations**

Designations used by companies to distinguish their products are often claimed as trademarks. In all instances where Mitutoyo America Corporation is aware of a claim, the product names appear in initial capital or all capital letters. The appropriate companies should be contacted for more complete trademark and registration information.

We reserve the right to change specifications and prices without notice.

- Coordinate Measuring Machines
- Vision Measuring Systems
- Form Measurement
- Optical Measuring
- Sensor Systems
- Testing Equipment and Seismometer
- Digital Scale and DRO Systems
- Small Tool Instruments and Data Management

**Mitutoyo America Corporation**

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