OLYMPUS

Magna-Mike 8600
Hall-Effect Thickness Gage
User's Manual

DMTA-10026-01EN — Rev. D
January 2015

This instruction manual contains essential information on how to use this Olympus product safely and effectively. Before using this product, thoroughly review this instruction manual. Use the product as instructed.

Keep this instruction manual in a safe, accessible location.

Olympus Scientific Solutions Americas, 48 Woerd Avenue, Waltham, MA 02453, USA

This document was prepared with particular attention to usage to ensure the accuracy of the information contained therein, and corresponds to the version of the product manufactured prior to the date appearing on the title page. There could, however, be some differences between the manual and the product if the product was modified thereafter.

The information contained in this document is subject to change without notice.

Part number: DMTA-10026-01EN
Rev. D
January 2015

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Table of Contents

List of Abbreviations

2D	two-dimensional
AC	alternating current
ASCII	American standard code for information interchange
CSV	comma separated values
DC	direct current
DIFF	differential
EFUP	environment-friendly use period
GB	gigabyte
ID	identifier
IP	ingress protection
LED	light-emitting diode
Li-ion	lithium-ion
MAX	maximum
MIL	military
MIN	minimum
NiMH	nickel-metal hydride
NIST	National Institute of Standards and Technology
P/N	part number
PLC	programmable logic controller
SPC	statistical process control
USB	universal serial bus
VAC	volts alternating current
VGA	video graphics array

Labels and Symbols

Safety-related labels and symbols are attached to the instrument at the locations shown in Figure i-1 on page 1. If any or all of the labels or symbols are missing or illegible, please contact Olympus.

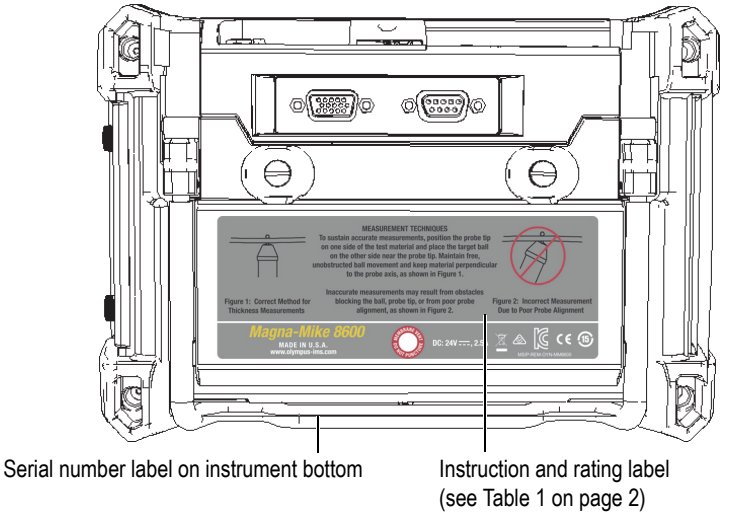
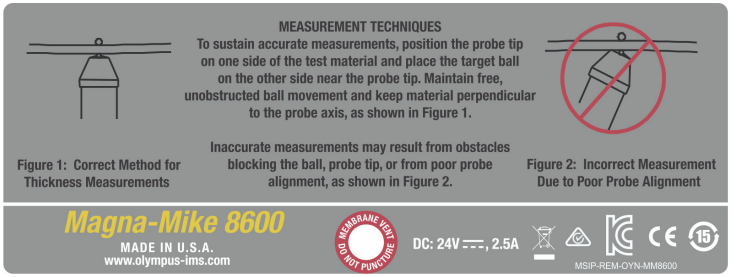


Figure i-1 Labels attached to the instrument

Table 1 Content of the instruction, rating, and serial labels



Content	
	This symbol indicates the location of the membrane vent.
	The direct current symbol.
	The WEEE symbol indicates that the product must not be disposed of as unsorted municipal waste, but should be collected separately.
	The regulatory compliance mark (RCM) label indicates that the product complies with all applicable standards, and has been registered with the Australian Communications and Media Authority (ACMA) for placement on the Australian market.

Table 1 Content of the instruction, rating, and serial labels *(continued)*

	Seller and user shall be noticed that this equipment is suitable for electromagnetic equipment for office work (class A) and it can be used outside home. The MSIP code for the Magna-Mike 8600 is the following: MSIP-REM-OYN-MM8600
	The CE marking is a declaration that this product conforms to all the applicable directives of the European Community. See the *Declaration of Conformity* for details. Contact your Olympus representative for more information.
	The China RoHS mark indicates the product's Environment-Friendly Use Period (EFUP). The EFUP is defined as the number of years for which listed controlled substances will not leak or chemically deteriorate while in the product. The EFUP for the Magna-Mike 8600 has been determined to be 15 years. **Note**: The Environment-Friendly Use Period (EFUP) is not meant to be interpreted as the period assuring functionality and product performance.
SERIAL	The serial number is a nine (9) digit number in the following format: **yynnnnnmm** where: **yy** Production year **nnnnn** Unit number manufactured that month **mm** Production month For example, the 100000504 serial number indicates that the fifth unit (00005) was produced on the April 2010.

CAUTION

To avoid the risk of electric shock, do not touch the conductors of the PROBE and/or FOOT SWITCH connector. The warning symbol between the connectors shown in Figure i-2 on page 4 warns of this electric shock risk.

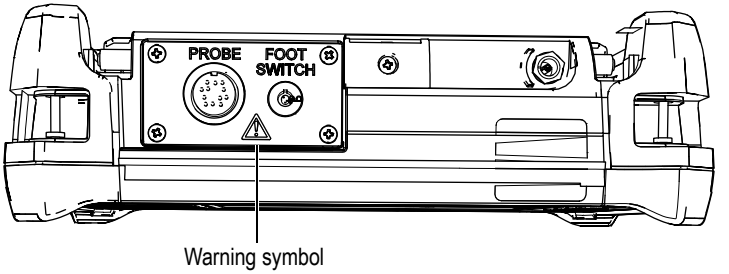


Figure i-2 The location of the warning symbol on the top of the instrument

Important Information — Please Read Before Use

Intended Use

The Magna-Mike 8600 is designed to perform nondestructive inspections of industrial and commercial materials.

WARNING

Do not use the Magna-Mike 8600 for any purpose other than its intended use. It must never be used to inspect or examine human or animal body parts.

Instruction Manual

This instruction manual contains essential information on how to use this Olympus product safely and effectively. Before using this product, thoroughly review this instruction manual. Use the product as instructed.

Keep this instruction manual in a safe, accessible location.

IMPORTANT

Some of the details of components illustrated in this manual may differ from the components installed on your instrument. However, the operating principles remain the same.

Instrument Compatibility

Only use the Magna-Mike 8600 instrument with the following ancillary equipment:

- Rechargeable lithium-ion (Li-ion) battery pack (Olympus P/N: 600-BAT-L-3 [U8051431])
- Optional stand-alone external battery charger (Olympus P/N: 201-167 [U8909100]).
- Charger/adaptor (Olympus P/N: EP-MCA-X), where "X" denotes the power cord type (see Table 24 on page 151).

CAUTION

Always use equipment and accessories that meet Olympus specifications. Using incompatible equipment could cause equipment malfunction and/or damage, or human injury.

Repair and Modification

Except for the batteries, the Magna-Mike 8600 does not contain any user-serviceable parts. Opening the instrument might void the warranty.

CAUTION

In order to prevent human injury and/or equipment damage, do not disassemble, modify, or attempt to repair the instrument.

Safety Symbols

The following safety symbols might appear on the instrument and in the instruction manual:

General warning symbol

This symbol is used to alert the user to potential hazards. All safety messages that follow this symbol shall be obeyed to avoid possible harm or material damage.

High voltage warning symbol

This symbol is used to alert the user to potential electric shock hazards greater than 1000 volts. All safety messages that follow this symbol shall be obeyed to avoid possible harm.

Safety Signal Words

The following safety symbols might appear in the documentation of the instrument:

DANGER

The DANGER signal word indicates an imminently hazardous situation. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, will result in death or serious personal injury. Do not proceed beyond a DANGER signal word until the indicated conditions are fully understood and met.

WARNING

The WARNING signal word indicates a potentially hazardous situation. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in death or serious personal injury. Do not proceed beyond a WARNING signal word until the indicated conditions are fully understood and met.

CAUTION

The CAUTION signal word indicates a potentially hazardous situation. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, may result in minor or moderate personal injury, material damage, particularly to the product, destruction of part or all of the product, or loss of data. Do not proceed beyond a CAUTION signal word until the indicated conditions are fully understood and met.

Note Signal Words

The following safety symbols could appear in the documentation of the instrument:

IMPORTANT

The IMPORTANT signal word calls attention to a note that provides important information, or information essential to the completion of a task.

NOTE

The NOTE signal word calls attention to an operating procedure, practice, or the like, which requires special attention. A note also denotes related parenthetical information that is useful, but not imperative.

TIP

The TIP signal word calls attention to a type of note that helps you apply the techniques and procedures described in the manual to your specific needs, or provides hints on how to effectively use the capabilities of the product.

Safety

Before turning on the instrument, verify that the correct safety precautions have been taken (see the following warnings). In addition, note the external markings on the instrument, which are described under “Safety Symbols.”

Warnings

WARNING

General Warnings

- Carefully read the instructions contained in this instruction manual prior to turning on the instrument.
- Keep this instruction manual in a safe place for further reference.
- Follow the installation and operation procedures.
- It is imperative to respect the safety warnings on the instrument and in this instruction manual.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment could be impaired.
- Do not install substitute parts or perform any unauthorized modification to the instrument.
- Service instructions, when applicable, are for trained service personnel. To avoid the risk of electric shock, do not perform any work on the instrument unless qualified to do so. For any problem or question regarding this instrument, contact Olympus or an authorized Olympus representative.
- Do not touch the connectors directly by hand. Otherwise, a malfunction or electric shock may result.
- Do not allow metallic or foreign objects to enter the device through its connectors or any other openings. Otherwise, a malfunction or electric shock may result.

WARNING

Electrical Warning

The instrument must only be connected to a power source corresponding to the type indicated on the rating label.

CAUTION

If an unauthorized power supply cord not dedicated to Olympus products is used to power the instrument, Olympus cannot guarantee the electrical safety of the equipment.

Precautions with Magnets

WARNING

- Do not bring a magnet near a person who has a pacemaker or electrical medical device, or near any other electrical medical devices. It is extremely dangerous and can cause the device to malfunction.
- Never swallow or place a magnet in body orifices, including but not limited to ears, nose, mouth. Magnets can cause serious damage — up to and including death — if swallowed. Seek immediate medical attention if magnets enter the body.
- Do not place a magnet within the reach of children or mentally impaired adults.
- Do not burn rare earth magnets as toxic fumes can result.

CAUTION

Do not place magnets near floppy disks, magnetic cards (such as credit cards), magnetic tape, prepaid cards, tickets. Files may be erased if magnets are placed near magnetic storage devices.
Do not place magnets near electronic devices, such as cell phones, television tubes,

and PLCs. This could cause an accident by affecting instruments and control circuits. People who are allergy sensitive to metals may develop rough skin or a rash if they touch a magnet. Do not handle magnets if these symptoms occur.

Battery Precautions

CAUTION

- Before disposing of a battery, check your local laws, rules, and regulations, and follow them accordingly.
- When using the optional lithium-ion battery (Olympus P/N: 600-BAT-L-3 [U8051431]) or if the user chooses to insert AA-size lithium metal batteries into the optional alkaline battery holder (Olympus P/N: 600-BAT-AA [U8780295]), the user must be aware that transportation of lithium-ion batteries is regulated by the United Nations under the United Nations Recommendations on the Transport of Dangerous Goods. It is expected that governments, intergovernmental organizations, and other international organizations shall conform to the principles laid down in these regulations, thus contributing to worldwide harmonization in this field. These international organizations include the International Civil Aviation organization (ICAO), the International Air Transport Association (IATA), the International Maritime Organization (IMO), the US Department of Transportation (USDOT), Transport Canada (TC), and others. Please contact the transporter and confirm current regulations before transportation of lithium-ion batteries or lithium metal batteries. Please note that Olympus does not supply lithium metal batteries.
- If the user chooses to use the Magna-Mike 8600 with a rechargeable battery, only use Olympus P/N: 600-BAT-L-3 [U8051431]. Do not use this battery with other products.
- Do not open, crush, or perforate batteries; doing so could cause injury.
- Do not incinerate batteries. Keep batteries away from fire and other sources of extreme heat. Exposing batteries to extreme heat (over 80 °C) could result in an explosion or personal injury.
- Do not drop, hit, or otherwise abuse a battery, as doing so could expose the cell contents, which are corrosive and explosive.
- Do not short-circuit the battery terminals. A short circuit could cause injury and severe damage to a battery making it unusable.

- Do not expose a battery to moisture or rain; doing so could cause an electric shock.
- Only use the Magna-Mike 8600 unit or an external charger approved by Olympus to charge the batteries.
- Only use batteries supplied by Olympus.
- Do not store batteries that have less than 40 % remaining charge. Recharge batteries to between 40 % and 80 % capacity before storing them.
- During storage, keep the battery charge between 40 % and 80 %.
- Do not leave batteries in the Magna-Mike 8600 unit during instrument storage.

Equipment Disposal

Before disposing of the Magna-Mike 8600, check your local laws, rules, and regulations, and follow them accordingly.

CE (European Community)

CE

This device complies with the requirements of both directive 2004/108/EC concerning electromagnetic compatibility and directive 2006/95/EC concerning low voltage. The CE marking indicates compliance with the above directives.

WEEE Directive

In accordance with European Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE), this symbol indicates that the product must not be disposed of as unsorted municipal waste, but should be collected separately. Refer to your local Olympus distributor for return and/or collection systems available in your country.

China RoHS

China RoHS is the term used by industry generally to describe legislation implemented by the Ministry of Information Industry (MII) in the People's Republic of China for the control of pollution by electronic information products (EIP).

The China RoHS mark indicates the product's Environment-Friendly Use Period (EFUP). The EFUP is defined as the number of years for which listed controlled substances will not leak or chemically deteriorate while in the product. The EFUP for the Magna-Mike 8600 has been determined to be 15 years.

Note: The Environment-Friendly Use Period (EFUP) is not meant to be interpreted as the period assuring functionality and product performance.

Korea Communications Commission (KCC)

A 급 기기 (업무용 방송통신기자재)

이 기기는 업무용 (A 급) 전자파적합기기로서 판 매자 또는 사용자는 이 점을주의하시기 바라 며 , 가정외의 지역에서 사용하는 것을 목적으로 합니다 .

EMC Directive Compliance

This equipment generates and uses radio-frequency energy and, if not installed and used properly (that is, in strict accordance with the manufacturer's instructions), may cause interference. The Magna-Mike 8600 has been tested and found to comply with the limits for an industrial device in accordance with the specifications of the EMC directive.

FCC (USA) Compliance

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.

2. This device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, might cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case you will be required to correct the interference at your own expense.

ICES-001 (Canada) Compliance

This Class A digital apparatus complies with Canadian ICES-001.

Cet appareil numérique de la classe A est conforme à la norme NMB-001 du Canada.

Information Screens

The Magna-Mike 8600 contains an **ABOUT** menu that provides access to information screens with important information about the Magna-Mike 8600:

STATUS screen

Displays information about the software version of the instrument, the date of manufacture, total hours of operation, and total number of power-on cycles.

TEMP/BATT STATUS screen

Displays information about the instrument's internal temperature, and battery-charge level information.

REGULATORY screen

Displays all required regulatory markings.

LICENCES screen

Displays information about licences associated with the Magna-Mike 8600.

LEGAL INFO screen

Displays a list of patents associated with the Magna-Mike 8600.

To access and view information screens

1. In the measurement screen, press **[SET UP]**, and then select **ABOUT**.
2. In the **ABOUT** submenu, select the desired information screen (**STATUS**, **TEMP/BATT STATUS**, **REGULATORY**, **LICENSES**, or **LEGAL INFO**), and then press **[ENTER]**.
3. Press **[MEAS]** or **[SET UP]** to exit the submenu information screen.

Warranty Information

Olympus guarantees your Olympus product to be free from defects in materials and workmanship for a specific period, and in accordance with conditions specified in the *Olympus Scientific Solutions Americas Inc. Terms and Conditions* available at http://www.olympus-ims.com/en/terms/.

The Olympus warranty only covers equipment that has been used in a proper manner, as described in this instruction manual, and that has not been subjected to excessive abuse, attempted unauthorized repair, or modification.

Inspect materials thoroughly on receipt for evidence of external or internal damage that might have occurred during shipment. Immediately notify the carrier making the delivery of any damage, because the carrier is normally liable for damage during shipment. Retain packing materials, waybills, and other shipping documentation needed in order to file a damage claim. After notifying the carrier, contact Olympus for assistance with the damage claim and equipment replacement, if necessary.

This instruction manual explains the proper operation of your Olympus product. The information contained herein is intended solely as a teaching aid, and shall not be used in any particular application without independent testing and/or verification by the operator or the supervisor. Such independent verification of procedures becomes increasingly important as the criticality of the application increases. For this reason, Olympus makes no warranty, expressed or implied, that the techniques, examples, or procedures described herein are consistent with industry standards, nor that they meet the requirements of any particular application.

Olympus reserves the right to modify any product without incurring the responsibility for modifying previously manufactured products.

Technical Support

Olympus is firmly committed to providing the highest level of customer service and product support. If you experience any difficulties when using our product, or if it fails to operate as described in the documentation, first consult the user's manual, and then, if you are still in need of assistance, contact our After-Sales Service. To locate the nearest service center, visit the Service Centers page at: http://www.olympus-ims.com.

Introduction

This user's manual provides operating instructions for the Olympus Magna-Mike 8600 thickness gage, which makes measurements on nonferrous materials. The information in this manual is organized to explain the technology, safety details, hardware, and software. Practical examples are provided to help you become familiar with the instrument's capabilities.

Figure i-3 The Magna-Mike 8600 thickness gage

1. Instrument Overview

This chapter provides a brief overview of all common operational requirements of the Magna-Mike 8600 instrument.

1.1 Operating Principle

The Olympus Magna-Mike 8600 is a small, lightweight thickness gage designed to make fast, accurate, and repeatable measurements of nonmagnetic materials such as plastics, glass, composites, aluminum, and titanium. It is based on the Hall Effect principle. Wall thickness is measured by placing a small steel target (ball, disk, or wire) on one side of the test piece and the magnetic probe on the opposite side. The Magna-Mike 8600 precisely measures the distance between the probe tip and the target, which corresponds to the thickness of the wall.

The probe contains a strong magnet and an electronic semiconductor device known as a Hall Effect sensor, which responds to changes in a magnetic field by varying a voltage that the instrument tracks. A target such as a small steel ball bends the magnetic field generated by the probe magnet, with the effect increasing as it comes closer. As the test piece thickness and thus the distance between the target and the probe tip changes, the voltage through the Hall Effect sensor also varies in a predictable way. Once the instrument has been calibrated for a particular probe and target, these voltage changes can be converted to thickness readings through a software algorithm that utilizes the established calibration curve. Measurements are accurate up to ± 1 % of thickness (depending on probe and target type) when the Magna-Mike 8600 is used according to the instructions in this manual.

1.2 Package Contents

The Magna-Mike 8600 instrument (see Figure 1-1 on page 21) comes with several key accessories:

- One standard calibration kit (Olympus P/N: 86ACC-KIT [U8771068])

  OR

  One extended range calibration kit (Olympus P/N: 86ACC-ER-KIT [U8771069]) shown in Figure 1-2 on page 21

  OR

  One low-profile probe calibration kit (P/N: 86ACC-PR3-KIT [Q7800005])
- Charger/adaptor (Olympus P/N: EP-MCA-X), where "X" denotes the AC power cord type (see Table 25 on page 159).
- AC power cord
- Instrument transport case (Olympus P/N: 600-TC [U8780294])
- Magna-Mike 8600 *Getting Started Guide* (Olympus P/N: DMTA-10028-01EN [U8778545])
- Magna-Mike 8600 *User's Manual* on CD-ROM (Olympus P/N: 8600-MAN-CD [U8778535])
- Interface program on CD-ROM (Olympus P/N: WINXL [U8774010])
- Probe and cable (see Table 26 on page 161)

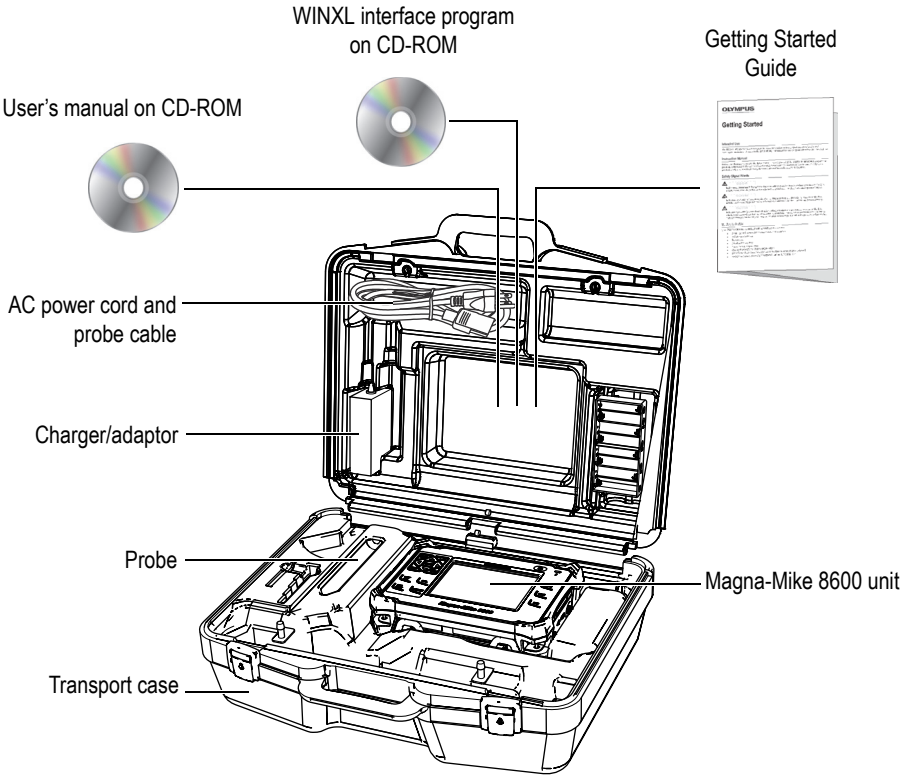


Figure 1-1 Transport case contents

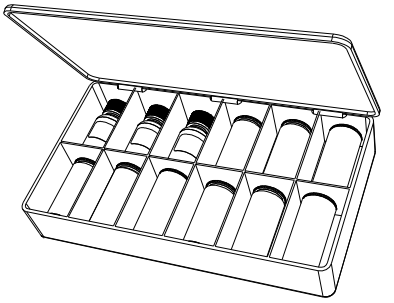


Figure 1-2 The standard or extended range calibration kit

For a list of optional accessories, please refer to “Accessories and Replacement Parts” on page 159.

1.3 Connectors

Figure 1-3 on page 22 illustrates the connections of the Magna-Mike 8600 with the charger/adaptor, the microSD card, and a PC.

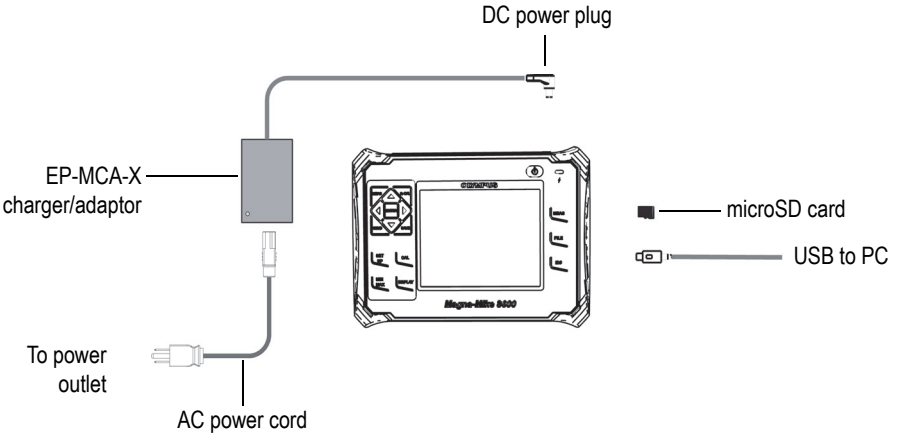


Figure 1-3 The Magna-Mike 8600 connections

CAUTION

To avoid the risk of injury or equipment damage, use only the AC power cord supplied with the Magna-Mike 8600. Do not use this power cord with other products.

The DC power, PROBE, and FOOT SWITCH connectors are located on the top end of the Magna-Mike 8600 (see Figure 1-4 on page 23).

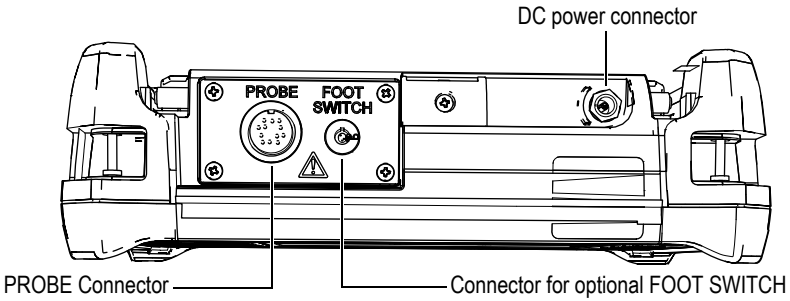


Figure 1-4 The top end connectors

The USB port and the removable microSD memory card slot are located on the right-hand side of the instrument, hidden behind the I/O door (see Figure 1-5 on page 23).

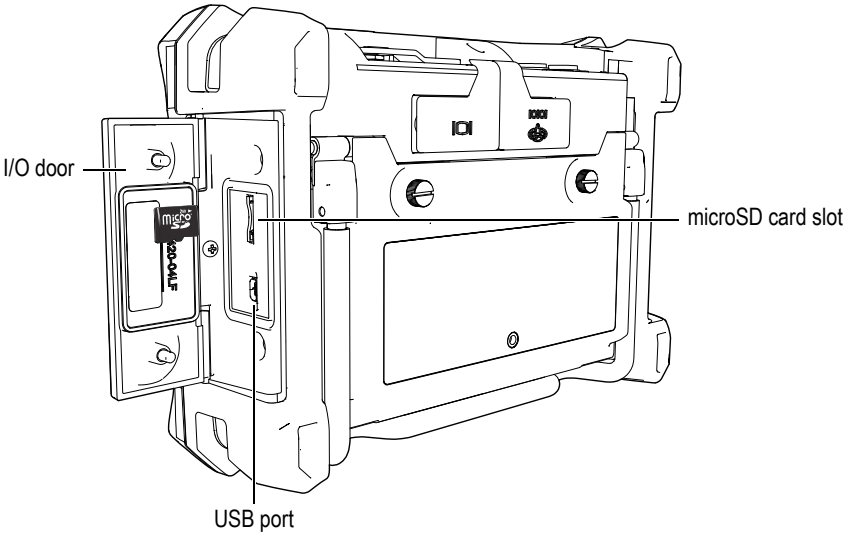


Figure 1-5 The connectors behind the I/O door

The RS-232 and the VGA Out connectors are located at the back of the instrument, in the upper section (see Figure 1-6 on page 24). A rubber cover protects each connector.

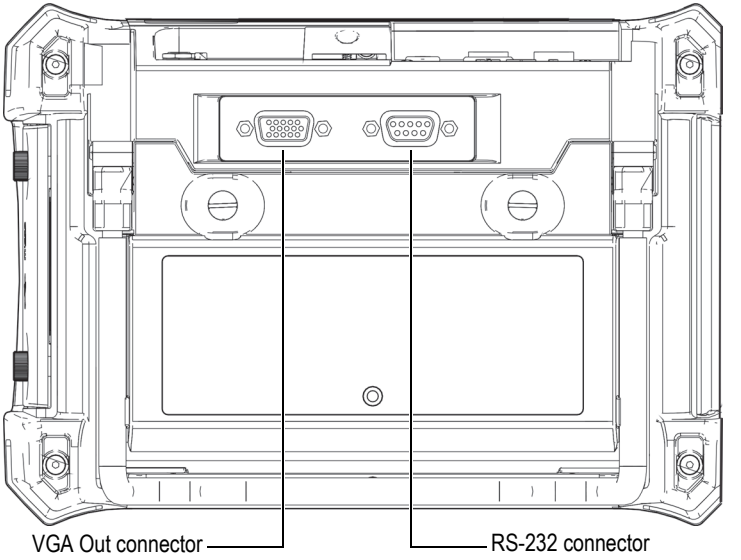


Figure 1-6 The RS-232 and VGA Out connectors

1.4 Power Requirements

The Magna-Mike 8600 is designed to operate using three power supply methods:

- Directly from the Magna-Mike 8600 charger/adaptor
- Optional internal lithium-ion battery
- Optional internal alkaline battery holder

Press  to turn on the Magna-Mike 8600 (see Figure 1-7 on page 25). Pressing this key once causes an initial beep, followed by the instrument startup screen and a second beep approximately five seconds later.

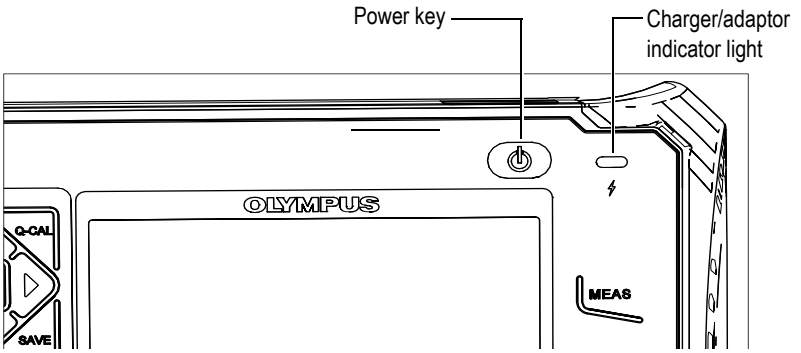


Figure 1-7 Location of the Magna-Mike 8600 power key and indicator light

1.4.1 Charger/Adaptor

The Magna-Mike 8600 charger/adaptor is provided with every instrument. The charger/adaptor is the primary method for powering the Magna-Mike 8600 with or without a battery installed. It is also used to charge the optional lithium-ion rechargeable battery when installed in the instrument. A charger/adaptor indicator light on the front panel of the unit displays the current status of the charger/adaptor.

To connect the charger/adaptor

1. Connect the AC power cord to the charger/adaptor and to an appropriate power outlet (see Figure 1-8 on page 26).

CAUTION

To avoid the risk of injury or equipment damage, use only the AC power cord supplied with the Magna-Mike 8600. Do not use this AC power cord with other products.

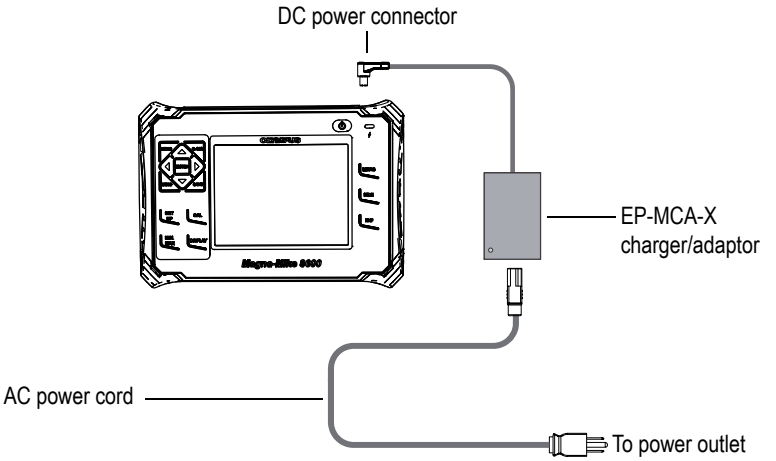


Figure 1-8 Connecting the charger/adaptor

2. Lift the rubber seal that covers the DC connector on top of the Magna-Mike 8600 instrument.
3. Connect the DC output power cable from the charger/adaptor to the DC power connector on top of the Magna-Mike 8600 (see Figure 1-9 on page 26).

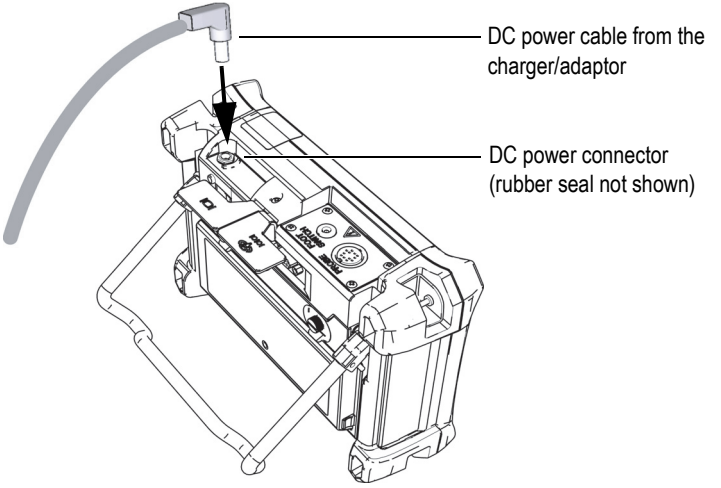


Figure 1-9 Connecting the DC power plug

The power status of the charger/adaptor and the battery charge condition are both indicated on the front panel of the Magna-Mike 8600, as well as in the user interface (see Table 2 on page 27).

Table 2 Charger/adaptor and battery indicators

Charger/adaptor indicator light	AC line power connected	Indicator meaning	Battery indicator (located at bottom right of display)
Red	Yes	Internal battery is charging.	
Off	No	Charger/adaptor is not connected.	
Green	Yes	Internal battery is fully charged. OR Charger/adaptor is connected, but no battery is installed.	

1.4.2 Optional Lithium-Ion Battery

The Magna-Mike 8600 is normally used as a bench-top instrument and continuously powered from the charger/adaptor supplied with the instrument. The lithium-ion (Li-ion) battery is an optional method for powering the Magna-Mike 8600. When properly maintained, and when the instrument is operated under typical inspection conditions, the lithium-ion battery should provide between 15 and 16 hours of continuous operation.

To install or replace the lithium-ion battery

1. Unfold the instrument stand.
2. At the back of the instrument, loosen the two thumb screws securing the battery compartment cover (see Figure 1-10 on page 28).
3. Remove the battery compartment cover (see Figure 1-10 on page 28).
4. Remove the battery and/or install the battery in the battery compartment.
5. Ensure that the gasket of the battery compartment cover is clean and in good condition.

6. Install the battery compartment cover at the back of the instrument, and then tighten the two thumb screws to complete the installation.

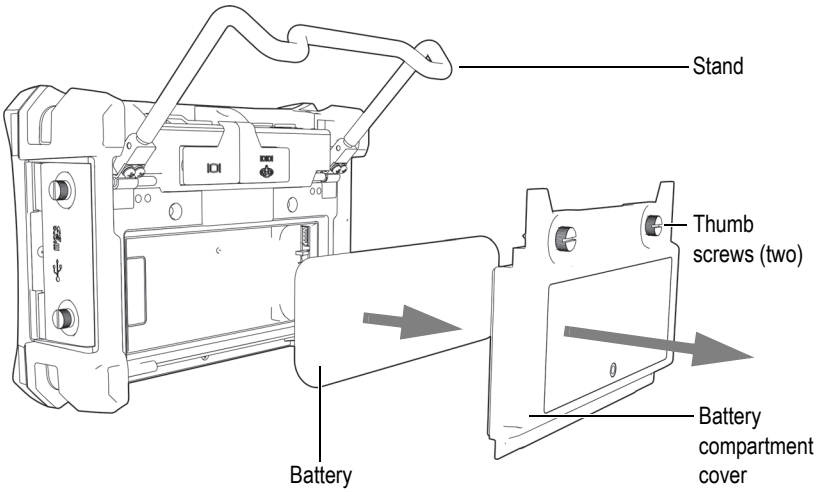


Figure 1-10 Removing the lithium-ion battery

1.4.3 Alkaline Batteries

The Magna-Mike 8600 has an optional battery holder (Olympus P/N: 600-BAT-AA [U8780295]). This holder accommodates eight AA-size alkaline batteries in situations where an AC power source is not available and the internal Li-ion battery is discharged. When operated under typical inspection conditions, the alkaline batteries will provide a minimum of three hours of continuous operation.

To install the alkaline battery holder

1. Unfold the instrument stand.
2. Loosen the two thumb screws securing the battery compartment cover at the back of the instrument, and then remove the battery compartment cover.
3. Remove the lithium-ion battery, if installed (see Figure 1-11 on page 29).

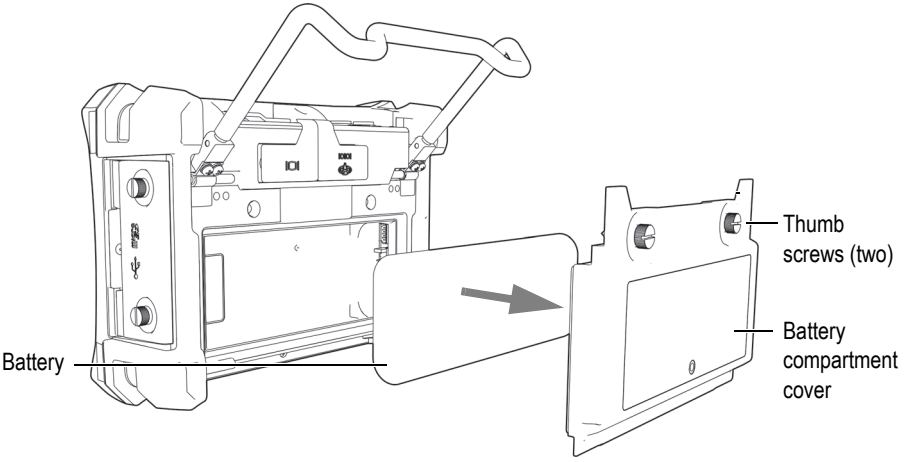


Figure 1-11 Removing the battery compartment cover and the lithium-ion battery

4. Install eight AA-size alkaline batteries into the optional alkaline battery holder.
5. Connect the alkaline battery holder connector to the instrument.
6. Position the alkaline battery holder in the battery compartment (see Figure 1-12 on page 29).

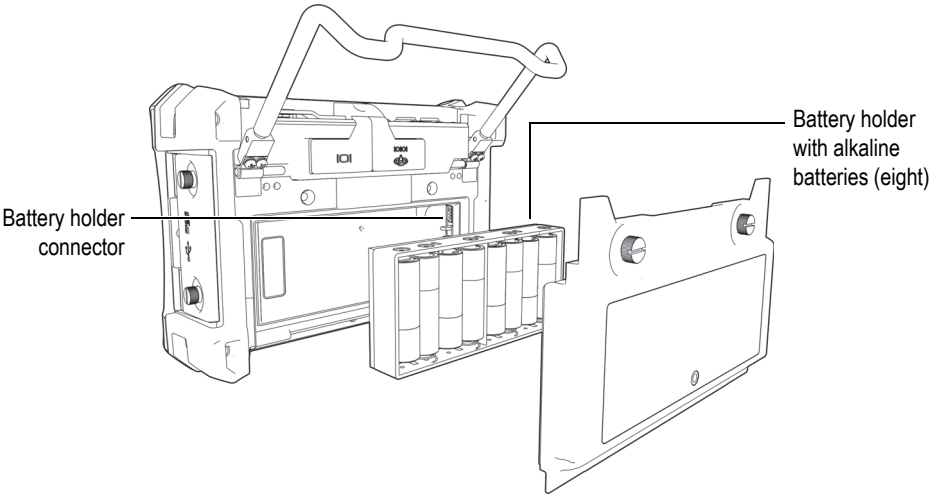


Figure 1-12 The alkaline battery holder

7. Install the battery compartment cover at the back of the instrument, and then tighten the two thumb screws.

NOTE

When alkaline batteries are installed in the instrument, the battery indicator in the user interface displays **ALK**. The charger/adaptor does not recharge the batteries installed in the alkaline battery holder.

1.5 Optional microSD Card

A 2-GB microSD card (Olympus P/N: MICROSD-ADP-2GB [U8779307]) can be installed in the Magna-Mike 8600.

To install the microSD removable memory card

1. Remove the card from its packaging.
2. Loosen the two thumb screws, and then open the Magna-Mike 8600 I/O door (see Figure 1-13 on page 30).

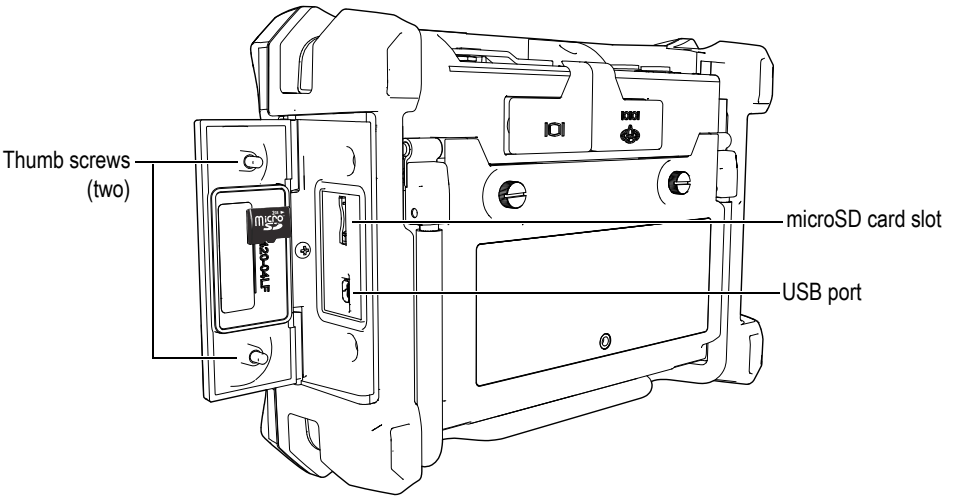


Figure 1-13 Installing the microSD card

3. Hold the card so that the microSD label faces toward the rear of the instrument.
4. Carefully slide the card into the microSD slot until it clicks.

NOTE

To remove the microSD card, carefully push the card into the instrument and release. A spring mechanism will partially eject the card, and then you can grasp the card, and then remove it from the instrument.

1.6 Magna-Mike 8600 Hardware Features

The Magna-Mike 8600 has many physical features that are either completely new or improved compared to previous Magna-Mike instruments. It is important to become familiar with the use and maintenance of these items.

This section covers the following topics:

1.6.1 Hardware Overview

Figure 1-14 on page 32 and Figure 1-15 on page 32 show the Magna-Mike 8600 instrument and identifies its main components.

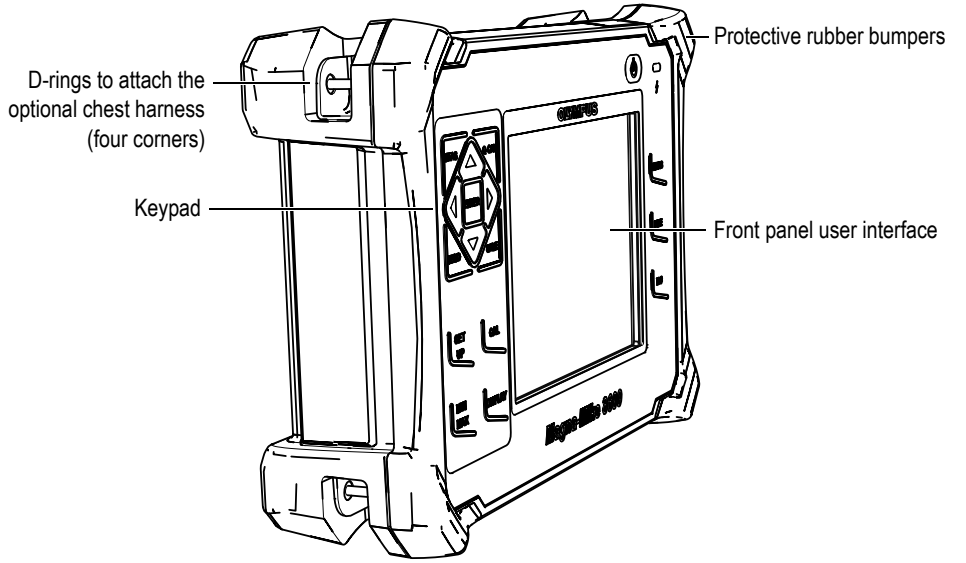


Figure 1-14 Overview of the Magna-Mike 8600 hardware — Front view

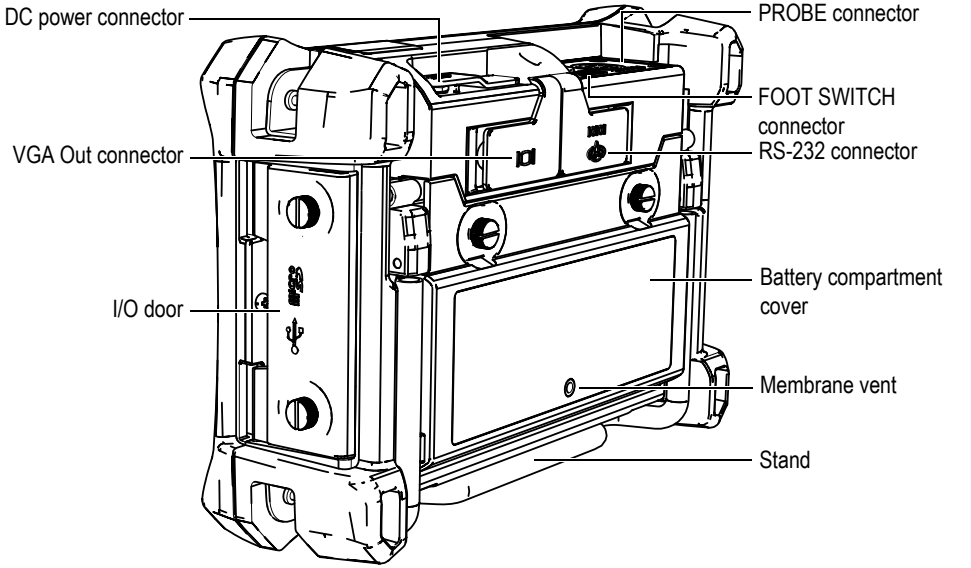


Figure 1-15 Overview of the Magna-Mike 8600 hardware — Back view

1.6.1.1 Keypad Configuration

The navigation pad is a hallmark feature of the Magna-Mike 8600 thickness gage. The up **[▲]**, down **[▼]**, right **[▶]**, and left **[◀]** arrows on the navigation pad are used to navigate, select menus, and also to move to different parameters within a menu.

The Magna-Mike 8600 instrument provides a charger/adaptor indicator light (Figure 1-16 on page 33) located on the front panel above the display window.

Figure 1-16 The charger/adaptor indicator light on the front panel

The Magna-Mike 8600 front panel is available in several language configurations, as shown in Figure 1-17 on page 34. The keypad features a combination of direct-access keys and navigation arrows. The layout of the front panel also provides direct access to common parameters, and easy adjustment of values.

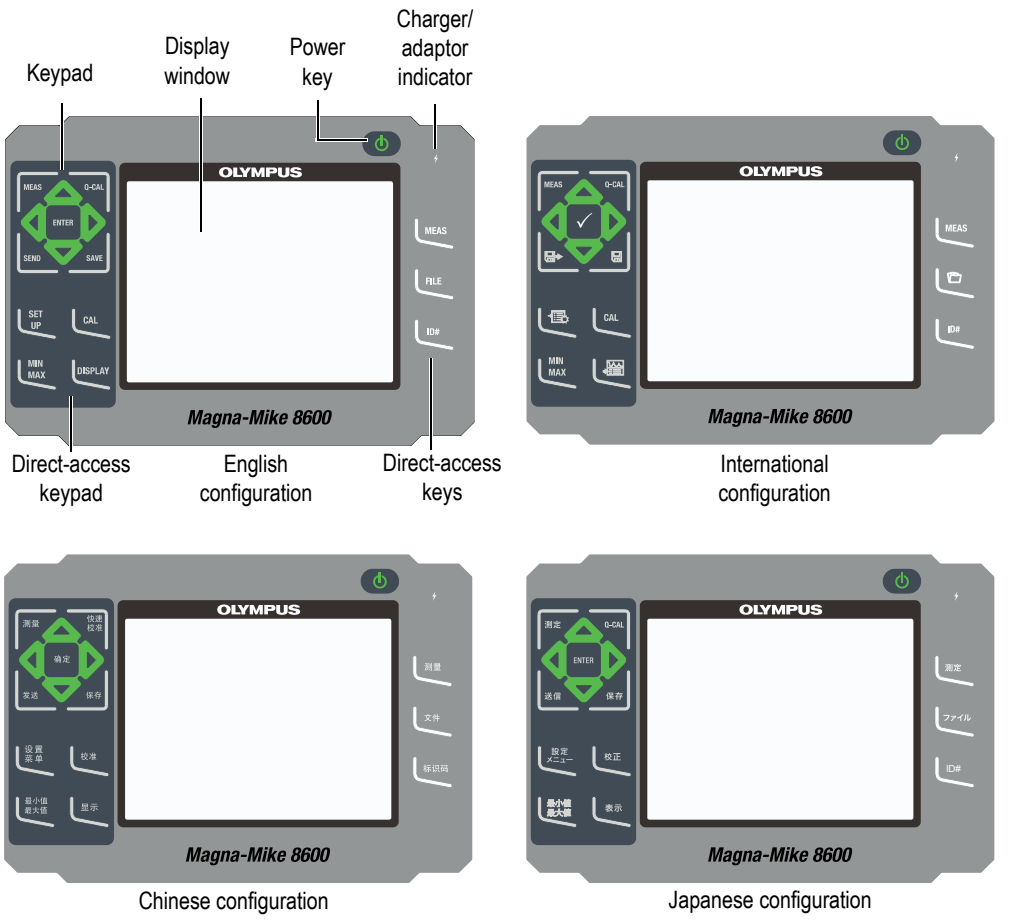


Figure 1-17 The English, international, Chinese, and Japanese keypads

1.6.1.2 Keypad Functions

The Magna-Mike 8600 keypad functions are the same for the English, international, Chinese, and Japanese keypads (see Figure 1-17 on page 34). On the international keypad, the text labels on many keys are replaced by pictograms. In this document, keypad keys are referred to using the English label in bold and within brackets.

Each key indicates its function. The **[▲]**, **[▼]**, **[▶]**, and **[◀]** keys, together with **[ENTER]**, are used to select menu items or screen parameters and to change parameter values. Press **[MEAS]** at any time to return to the measurement screen. Table 3 on page 35 lists the key functions available from the Magna-Mike 8600 keypad.

Table 3 Keypad functions

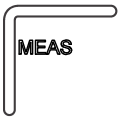
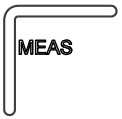
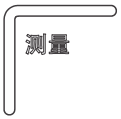
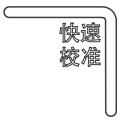
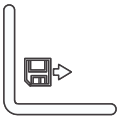
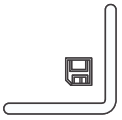
English	International	Chinese	Japanese	Function
				**MEAS** (measurement) — Completes the current operation and returns to the measurement screen.
				**Q-CAL** — Compensates for drifts caused by moderate changes in temperature or ambient magnetic fields.
				**SEND** — Sends the active measurement out via the RS-232 or USB connection to an external device.
				**SAVE** — Stores a measurement in the datalogger at the current ID number.
				**ENTER** — Selects an highlighted item or accepts an entered value.
				Up arrow — In a screen or a list, moves to the previous element. — For some parameters, a numerical entry increases the value.

Table 3 Keypad functions *(continued)*

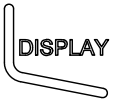
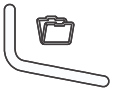
English	Inter-national	Chinese	Japanese	Function
				Down arrow — In a screen or a list, moves to the next element. — For some parameters, a numerical entry decreases the value.
				Left arrow — Selects the previous available value for the selected parameter. — In text edit mode, moves the cursor one character position to the left.
				Right arrow — Selects the next available value for the selected parameter. — In text edit mode, moves the cursor one character position to the right.
				**SET UP** — Provides access to the instrument parameters (Measurement, System, Alarm, Differential, Communication, Strip Chart View, Reset, Clock, Password Set, Instrument Lock, and Diagnostics).
				**CAL** — Initiates the instrument calibration functions.
				**MIN/MAX** — Opens the Min/Max setup menu.
				**DISPLAY** — Opens the display control menu.

Table 3 Keypad functions *(continued)*

English	Inter-national	Chinese	Japanese	Function
				**MEAS** (measurement) — Completes the current operation and returns to the measurement screen. This key has the same function as the **MEAS** key located on the top left-hand corner of the keypad.
				**FILE** — Provides access to the file menus (Open, Review, Create, Cal Recall, Copy, Delete, Send, Edit/Rename, and Reports).
				**ID#** (identification number) — Accesses several functions related to the ID numbers for the thickness measurement location.
				On/Off — Turns the instrument power on or off.

1.6.2 Connectors

The Magna-Mike 8600 instrument provides numerous connections. The following sections describe these connections.

1.6.2.1 Probe and Foot Switch Connectors

The Magna-Mike 8600 instrument is supplied with a 12-pin probe connector. A 2-pin foot switch connector can be used with an optional foot switch (Olympus P/N: 85FSW [U8780127]).

The PROBE and FOOT SWITCH connectors are located at the top of the instrument, on the left-hand side. The two connectors are easily accessible from the front of the instrument (see Figure 1-18 on page 38).

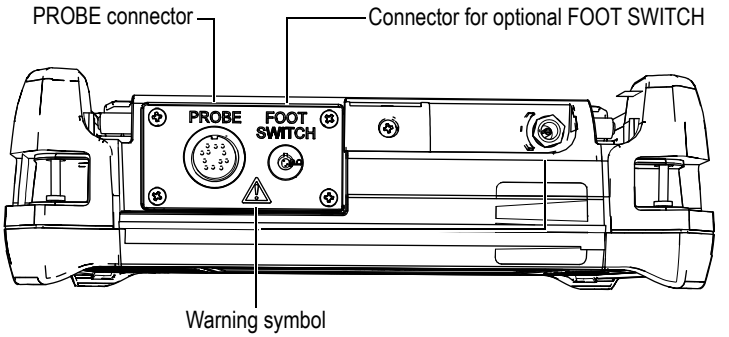


Figure 1-18 Location of the PROBE and FOOT SWITCH connectors

CAUTION

To avoid the risk of electric shock, do not touch the conductors of the PROBE and FOOT SWITCH connectors. The warning symbol between the connectors shown in Figure 1-18 on page 38 warns of this electric shock risk.

1.6.2.2 RS-232 and VGA Out Connectors

The RS-232 and the VGA Out connectors are located at the back of the instrument, in the upper section (see Figure 1-19 on page 39). A rubber cover protects each connector.

Along with the USB port (see "microSD and USB Port" on page 39), the Magna-Mike 8600 allows the user to connect the instrument to a PC via a standard RS-232 port. PC communication requires the interface program (Olympus P/N: WinXL [U8774010]) provided with the instrument for file transfers. The Magna-Mike 8600 can also communicate directly with other SPC programs.

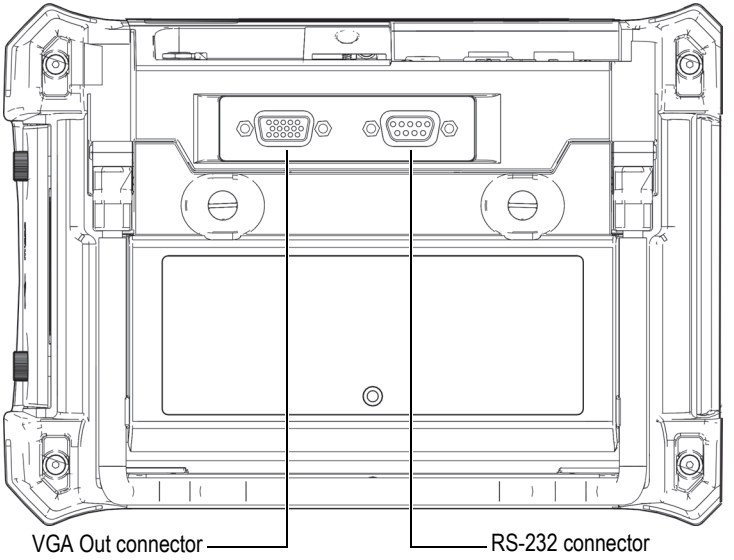


Figure 1-19 The RS-232 and VGA Out connectors

The VGA Out connector allows the user to connect the instrument to a standard analog computer monitor.

CAUTION

Do not expose the instrument to harsh and wet environments while the RS-232 or the VGA Out connectors are not protected by their rubber covers. To prevent connector corrosion and damage to the instrument, keep the rubber protective covers on the connectors when no cable is connected.

1.6.2.3 microSD and USB Port

On the right-hand side of the Magna-Mike 8600, a door covers the microSD slot and the USB port (see Figure 1-20 on page 40). The I/O door closes against an integral membrane seal to keep liquids away from the unsealed connectors behind the door.

The Magna-Mike 8600 utilizes 2 GB microSD memory cards for both onboard and removable memory. The onboard 2 GB microSD card is mounted to the PC board inside the instrument, and is responsible for all onboard data storage. In the event the instrument is damaged beyond repair, this microSD card can be removed at an authorized service center, allowing you to recover critical data from the damaged instrument.

Along with the RS-232 port (see "RS-232 and VGA Out Connectors" on page 38), the Magna-Mike 8600 allows the user to connect the instrument to a PC via the USB port. PC communication requires the interface program (Olympus P/N: WinXL [U8774010]) provided with the instrument for file transfers.

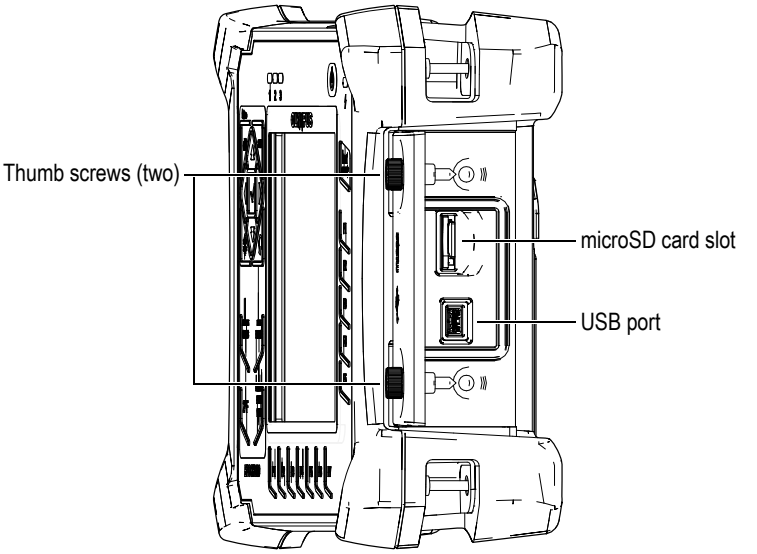


Figure 1-20 The microSD slot and USB port

The I/O door is kept closed by two thumb screws. You can also use a coin or a screwdriver to manipulate these thumb screws as needed.

CAUTION

Do not expose the instrument to harsh and wet environments while the I/O door is opened to access the computer connection compartment. To prevent connector corrosion and damage to the instrument, keep the I/O door closed and sealed when no cable is connected.

1.6.3 Various Hardware Features

The following sections describe various hardware features.

1.6.3.1 Battery Compartment

The Magna-Mike 8600 battery compartment cover allows you to quickly access the optional battery (or AA batteries in optional battery holder) without the need for tools. Two thumb screws on the battery compartment cover secure it to the instrument case and ensure the compartment is sealed.

The battery compartment cover also has a small hole in the bottom center area that is covered on the inside by an environmentally sealed membrane vent. This vent is a safety feature that is required in the event that the instrument battery fails and emits gas. This vent must not be punctured.

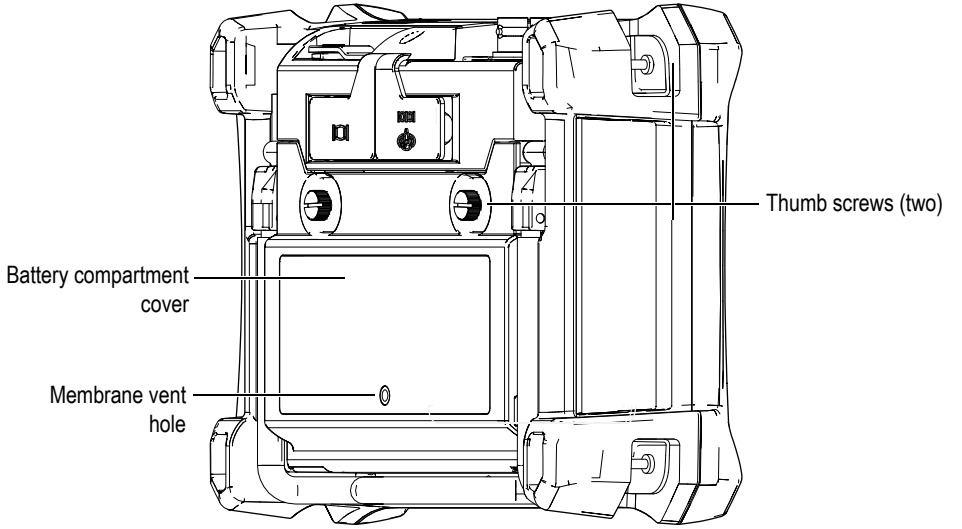


Figure 1-21 The battery compartment

The Magna-Mike 8600 accepts one rechargeable lithium-ion battery pack (Olympus P/N: 600-BAT-L-3 [U8051431]) that can be recharged inside the instrument or on the optional external charging base (Olympus P/N: 201-167 [U8909100]). You can also use the Magna-Mike 8600 with eight standard AA-size alkaline batteries installed in an optional battery holder (Olympus P/N: 600-BAT-AA [U8780295]) for extended portable use.

1.6.3.2 Instrument Stand

The Magna-Mike 8600 features an articulating stand for variable viewing angles (see Figure 1-22 on page 43). The stand is attached on the back of the instrument with two hard pivot blocks, and has been dipped into a high friction coating for resistance to sliding during use. The stand is bent in the center to easily accommodate being placed on a curved surface.

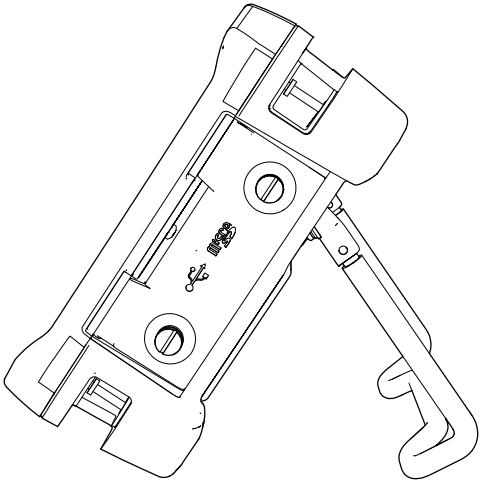


Figure 1-22 Instrument stand

1.6.3.3 O-Ring Gasket and Membrane Seals

The Magna-Mike 8600 contains seals that are used to protect the instrument internal hardware from the environment. These include:

- Battery compartment cover seal
- I/O door seal
- Membrane vent

These seals must be properly maintained to assure environmental durability. Instrument seals are evaluated and replaced as needed during the instrument annual calibration. This should be performed at an authorized Olympus service center.

1.6.3.4 Display Protection

The Magna-Mike 8600 includes a clear-plastic sheet protecting the instrument display window. Olympus strongly recommend to leave this protection sheet in place. Replacements are available in packages of ten sheets (Olympus P/N: 600-DP [U8780297]).

CAUTION

The display window is permanently bonded to the instrument case to fully seal the instrument. If the display window becomes damaged, the front part of the case must be replaced, along with the instrument's direct-access keypad.

1.6.4 Environmental Ratings

The Magna-Mike 8600 is an extremely rugged and durable instrument that can be used in harsh environments. To classify the instrument's durability in wet or damp environments, Olympus has adopted the IP (ingress protection) system to rate how well the instrument is sealed.

The Magna-Mike 8600 has been tested to the requirements of IP67. The instrument is designed and manufactured to meet this level of ingress protection when it leaves the factory. To maintain this level of protection, you are responsible for the proper care of all routinely exposed membrane seals. Additionally, you are responsible for returning the instrument to an authorized Olympus service center each year to ensure that the instrument seals are properly maintained. Olympus cannot guarantee any level of ingress protection performance once the instrument seals have been manipulated. You must use sound judgment and take proper precautions before exposing the instrument to harsh environments.

The Magna-Mike 8600 adheres to the environmental standards listed in Table 20 on page 156.

2. Software User Interface Elements

The following sections describe the main elements of the Magna-Mike 8600 software screens and menus.

2.1 Measurement Screen

The Magna-Mike 8600 starts with the measurement screen displaying the measured thickness value (see Figure 2-1 on page 45). The measurement screen is the main screen of the Magna-Mike 8600 software. From anywhere in the Magna-Mike 8600 software, simply press **[MEAS]** to return to the measurement screen. The battery power indicator is always present at the bottom of the Magna-Mike 8600 screen (see Table 2 on page 27 for details).

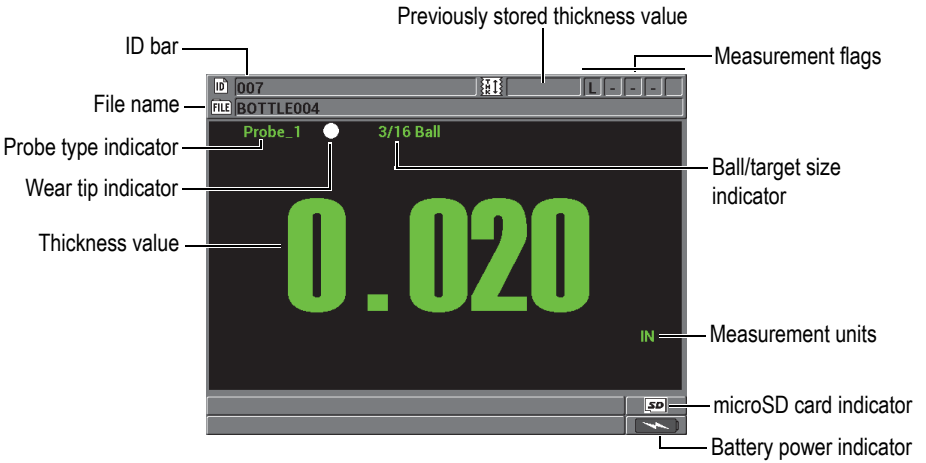


Figure 2-1 The main elements of the measurement screen

The ID and file bar, located at the top of the measurement screen, contains the identifier for the actual thickness measurement location, the previously stored value, the file name, and the measurement flags.

The probe type indicator shows which probe has been connected: **Probe 1**, **Probe 2**, or **Probe 3**. It will also indicate **No probe**, if no probe is connected or if the probe cable is broken. The ball/target size indicator shows for which ball/target size the instrument is currently calibrated.

The Magna-Mike 8600 also displays a wear tip indicator: a white dot or a white triangle. A white dot indicates that the user has selected a standard wear tip. A white triangle indicates that the chisel wear tip has been selected.

The microSD indicator appears in the bottom right-hand corner of the screen when a removable microSD memory card is inserted in its slot. This slot is located behind the I/O door on the right-hand side of the instrument (see Figure 1-20 on page 40).

Depending on the context and on the available functions and options, various indicators and numeric values appear around the display and around the main measurement value (see Figure 2-2 on page 46).

A help text bar, at the bottom of the screen, indicates the keys that you can use to navigate and make a selection in the menu structure.

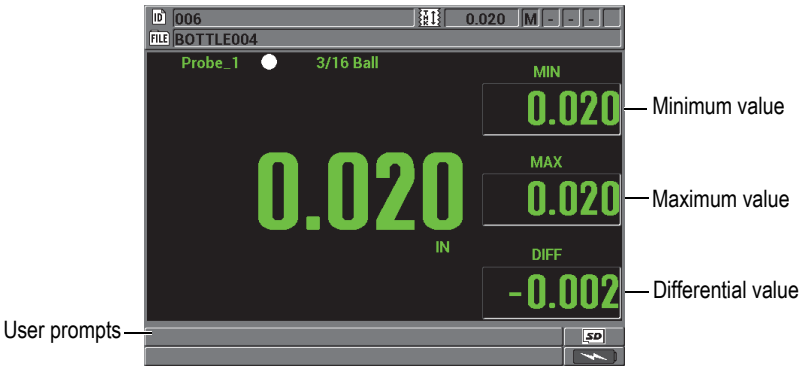


Figure 2-2 Example of other elements appearing on the measurement screen

2.2 Menus and Submenus

The Magna-Mike 8600 displays menus and submenus when you press some of the front panel keys. The menu appears at the top left-hand corner of the screen (see Figure 2-3 on page 47). If applicable, a submenu also appears, conveniently showing the parameters available for the highlighted menu command.

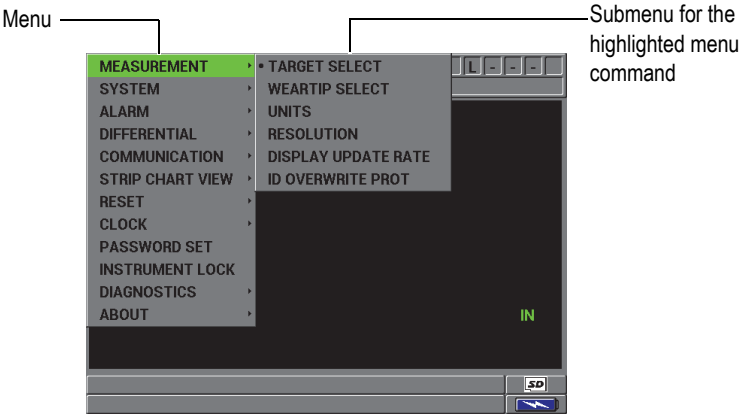


Figure 2-3 Menu and submenu example

To select a menu or a submenu command

1. Press **[SET UP]**, **[MIN/MAX]**, **[DISPLAY]**, or **[FILE]** on the instrument keypad to display a menu.
2. Press **[▲]** and **[▼]** to highlight the desired menu command.
3. If applicable and needed, press **[▶]** to move the highlight to the submenu, and then press **[▲]** and **[▼]** to highlight the desired submenu command.
4. Press **[ENTER]** to select the highlighted menu, or submenu command.

NOTE

In the remainder of this document, the above procedure is summarized by simply stating to select a specific menu or submenu command. For example: "In the menu, select **MEASUREMENT**."

2.3 Parameter Screens

The Magna-Mike 8600 parameters are logically grouped in parameter screens that you access using front panel keys or menu commands. Figure 2-4 on page 48 shows the **MEASUREMENT SETUP** screen as an example.

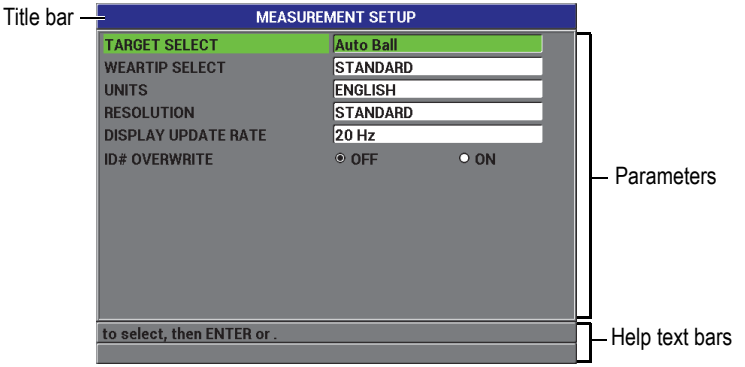


Figure 2-4 The MEASUREMENT SETUP screen

The title bar, located at the top of the parameter screen, indicates the parameter subject. One or two help text bars, appearing at the bottom of the screen, indicate the keys to use to select a parameter and edit its value.

To select a parameter and edit its value

1. Press **[▲]** and **[▼]** to highlight the desired parameter.
2. For parameters with predefined values, press **[▶]** and **[◀]** to select the desired value.
   OR
   For parameters in a list, press **[▲]** and **[▼]** to highlight the desired list item.
   OR
   For alphanumeric parameters, press **[▲]**, **[▼]**, **[▶]**, and **[◀]** to highlight the desired character, and then press **[ENTER]** to select the character (see "Editing Text Parameters Using the Virtual Keyboard" on page 49 for details).
3. Highlight **DONE**, **PREVIOUS**, or **NEXT**, and then press **[ENTER]** to leave a list or an alphanumeric parameter, and respectively go to the previous or next screen element.
4. Press **[MEAS]** to exit the parameter screen and return to the measurement screen.

NOTE

In the remainder of this document, the above procedure is summarized by simply stating to select a specific parameter or list, and its value. For example, "In the **MEASUREMENT** screen, set **RESOLUTION** to **STANDARD**."

2.4 Editing Text Parameters Using the Virtual Keyboard

When the text edit mode is displayed, the virtual keyboard appears when you select an alphanumeric parameter (see Figure 2-5 on page 49).

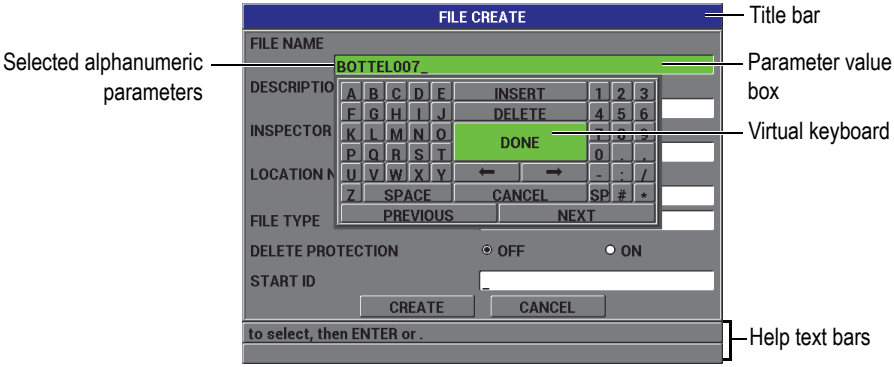


Figure 2-5 The virtual keyboard

To edit an alphanumeric parameter value using the virtual keyboard

1. Select an alphanumeric parameter.
   The virtual keyboard appears.
2. Press **[▲]**, **[▼]**, **[▶]**, and **[◀]** to highlight the character that you wish to enter, and then press **[ENTER]**.
   The selected character appears in the parameter value text box and the cursor moves to the next character position.
3. Repeat the previous step to enter other characters.

4. If you need to move the position of the cursor in the value text box, highlight either ⬅ or ➡ on the virtual keyboard, and then press **[ENTER]**. The cursor moves by one character position.
5. When you need to delete a character:
   a) Move the cursor to the character that you wish to delete.
   b) On the virtual keyboard, highlight **DELETE**, and then press **[ENTER]**.
6. When you need to insert a character:
   a) Move the cursor to the character in front of which you wish to insert a character.
   b) On the virtual keyboard, highlight **INSERT**, and then press **[ENTER]**.
   c) Enter the desired character in the inserted space.
7. If you want to cancel the editing operation and return to the original parameter value, on the virtual keyboard, highlight **CANCEL**, and then press **[ENTER]**.
8. To complete the editing of the parameter value, on the virtual keyboard, highlight **DONE**, and then press **[ENTER]**.

NOTE

When editing a multiple line parameter value, highlighting **DONE** and pressing **[ENTER]** moves the cursor to the next line. You can also highlight **NEXT** and press **[ENTER]** to jump to the next field, or highlight **PREVIOUS** and press **[ENTER]** to jump to the previous field.

---

3. Initial Setup

The following sections describe basic system configurations.

3.1 Setting the User Interface Language and Other System Options

You can configure the Magna-Mike 8600 to present the user interface in the following languages: English, French, Spanish, German, Japanese, Chinese, Russian, Swedish, Italian, Portuguese, Norwegian, Hungarian, Polish, Dutch, and Czech. You can also set the character delimiting the radix of a number.

The Magna-Mike 8600 includes a beep tone generator to confirm when a key is pressed and to notify you of an alarm condition. You can set the beeper on or off.

To save battery while you do not use the instrument, you can enable the inactive time function so that the instrument automatically turns off when no key has been pressed and no measurement has been made within about six minutes.

To change the user interface language and other system options

1. In the measurement screen, press **[SET UP]**, and then highlight **SYSTEM**.
2. In the **SYSTEM** submenu, select the desired parameter: **BEEPER**, **INACTIVE TIME**, **LANGUAGE**, **RADIX**, **PROBE BUTTON**, **FOOT SWITCH**, or **UPGRADE**.

NOTE

For the software **UPGRADE** mode, refer to"Activating the Software Upgrade Mode" on page 106.

3. In the **SYSTEM SETUP** screen (see Figure 3-1 on page 52):
   a) Set the **BEEPER** to **ON** or **OFF**.
   b) Set the **INACTIVE TIME** to **ON** or **OFF**.
   c) Set the **LANGUAGE** to the desired language.
   d) Set the **RADIX** to the desired character to be used to separate the integer and the decimal digits: **PERIOD (.)** or **COMMA (,)**.
   e) Assign the **PROBE BUTTON** to a specific function: **Q-CAL**, **SAVE**, **SEND**, or **MEAS**.
   f) Assign the **FOOT SWITCH** to a specific function: **Q-CAL**, **SAVE**, **SEND**, or **MEAS**.

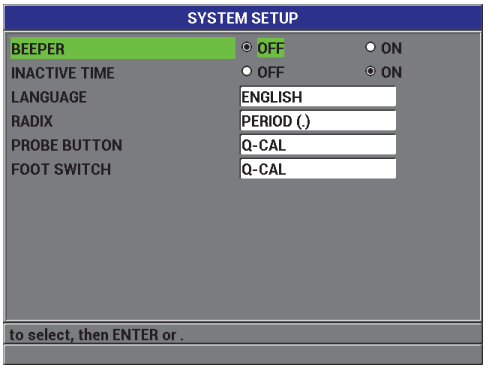


Figure 3-1 The SYSTEM SETUP screen

4. Press **[MEAS]** to return to the measurement screen.

3.2 Selecting the Measurement Units

You can set the Magna-Mike 8600 to show thickness measurements in inches or millimeters.

To set the measurement units

1. In the measurement screen, press **[SET UP]**, and then highlight **MEASUREMENT**.
2. In the **MEASUREMENT** submenu, select **UNITS**.

3. In the **MEASUREMENT SETUP** screen (see Figure 3-2 on page 53), set **UNITS** to **ENGLISH** or **METRIC**.
4. Press **[MEAS]** to return to the measurement screen.

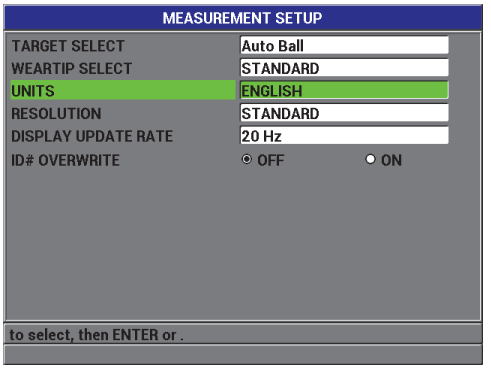


Figure 3-2 The MEASUREMENT SETUP screen — UNITS

3.3 Setting the Clock

The Magna-Mike 8600 has a built-in date and time clock. You can set the date and the time, and select their respective format. The Magna-Mike 8600 saves all measurements value with their acquisition date.

To set the clock

1. In the measurement screen, press **[SET UP]**, and then highlight **CLOCK**.
2. In the **CLOCK** submenu, select the desired parameter: **MONTH**, **DAY**, **YEAR**, **DATE MODE**, **HOUR**, **MINUTE**, or **HOUR MODE**.
3. In the **CLOCK SETUP** screen (see Figure 3-3 on page 54):
   a) Set the date parameters to the current date: **MONTH**, **DAY**, and **YEAR**.
   b) Set the **DATE MODE** to the desired format: **MM/DD/YYYY** or **DD/MM/YYYY**.
   c) Set the time parameters to the current time: **HOUR** and **MINUTE**.
   d) Set the **HOUR MODE** to the desired format: **12 HOUR** or **24 HOUR**.

e) Select **SET** to accept the changes.
OR
Select **CANCEL** to discard the changes.

4. Press **[MEAS]** to return to the measurement screen.

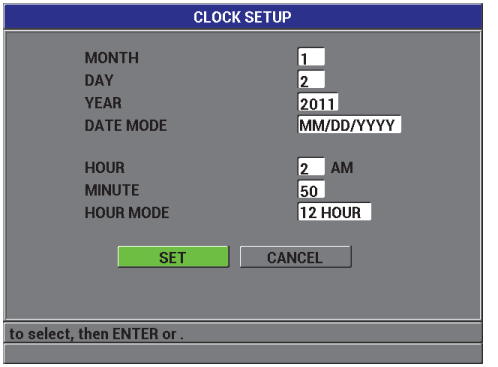


Figure 3-3 The CLOCK SETUP screen

3.4 Changing Display Settings

You can change the appearance of some display elements such as colors and brightness.

To change the display setting

1. In the measurement screen, press **[DISPLAY]**.
2. In the **DISPLAY** screen (see Figure 3-4 on page 55), select the desired parameter and value for the following parameters:
   - Set **COLOR SCHEME** to either select the **INDOORS** or **OUTDOORS** for optimized visibility (see "Color Schemes" on page 55 for details).
   - Set **BRIGHTNESS** to one of the predefined brightness levels: 0 %, 25 %, 50 %, 75 %, or 100 % (see "Display Brightness" on page 56 for details).
   - Set **VGA OUTPUT** to **ON** or **OFF**.
   - **LARGE FONT** to select which of the following measurements is displayed on the screen in large font: **LIVE** (active measurement), **MIN** (minimum), **MAX** (maximum), or **DIFF** (differential) value.

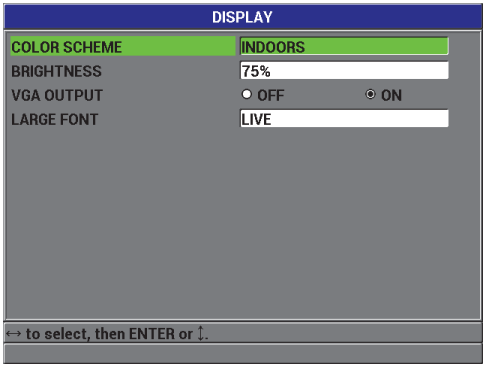


Figure 3-4 The DISPLAY screen

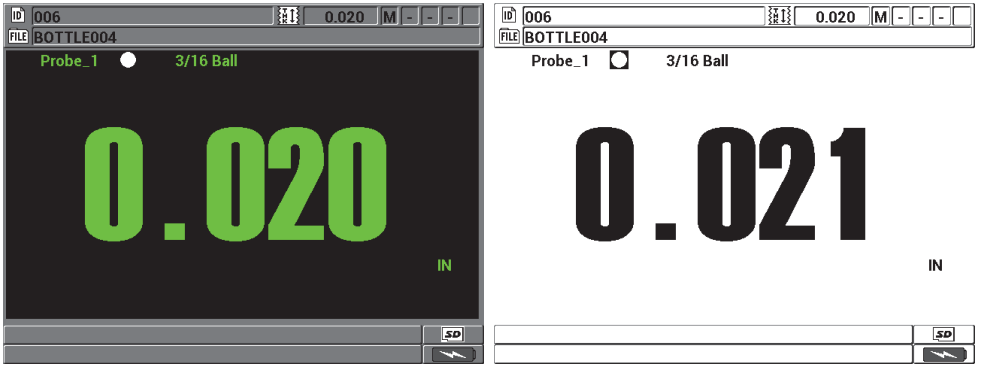
3. Press **[MEAS]** to return to the measurement screen.

3.4.1 Color Schemes

The Magna-Mike 8600 offers two standard color schemes designed to provide best display visibility in indoors or outdoors lighting conditions (see Figure 3-5 on page 56).

To select the color scheme

1. In the measurement screen, press **[DISPLAY]**, and then highlight **COLOR SCHEME**.
2. Select either **INDOORS** or **OUTDOORS**.
3. Press **[MEAS]** to return to the measurement screen**.**



INDOORS color scheme OUTDOORS color scheme

Figure 3-5 Example of the INDOORS and the OUTDOORS color schemes

The INDOORS color scheme gives the best visibility when you use the instrument indoors or in low lighting conditions. The INDOORS color scheme presents green characters on a black background.

The OUTDOORS color scheme scheme gives best visibility when you use the instrument in direct sunlight. The OUTDOORS color scheme presents black characters on a white background. For best readability, in this document, most screen captures are shown with the INDOORS color scheme.

NOTE

Colored measurement values corresponding to specific alarm conditions only appear when the INDOORS color scheme is selected.

3.4.2 Display Brightness

You can adjust the Magna-Mike 8600 display brightness by selecting the backlight intensity. The display brightness can be set at 0 %, 25 %, 50 %, 75 %, and 100 %. Choosing a high percentage increases the brightness of the display. By default, the display brightness is set to 50 %.

1. In the measurement screen, press **[DISPLAY]**, and then highlight **BRIGHTNESS**.

2. Select the desired **BRIGHTNESS** percentage: **0 %**, **25 %**, **50 %**, **75 %**, or **100 %**.
3. Press **[MEAS]** to return to the measurement screen**.**

The Magna-Mike 8600 uses a transflective color display that reflects ambient light and becomes brighter in direct light. With brighter ambient conditions, you can set the display BRIGHTNESS to a lower percentage.

NOTE

Reducing the display BRIGHTNESS percentage increases the battery life. Battery life specifications are based on backlight BRIGHTNESS set to 50 %.

3.5 Adjusting the Display Update Rate

You can select a predefined measurement update rate (4 Hz, 8 Hz, 16 Hz, or 20 Hz).

NOTE

The Magna-Mike 8600 makes measurement at 60 Hz, but will only update the display at the update rate selected by the user. Note that when the Magna-Mike 8600 is in MIN or MAX mode, the MIN and MAX values are captured at the 60 Hz measurement rate.

To adjust the display update rate

1. In the measurement screen, press **[SET UP]**, and then highlight **MEASUREMENT**.
2. In the **MEASUREMENT** submenu, select the **DISPLAY UPDATE RATE**.
3. In the **MEASUREMENT SETUP** screen (see Figure 3-2 on page 53), set the **DISPLAY UPDATE RATE** to the desired value: **4 Hz**, **8 Hz**, **16 Hz**, or **20 Hz**.
4. Press **[MEAS]** to return to the measurement screen.

3.6 Changing the Thickness Resolution

The resolution of the Magna-Mike 8600 is set by default to AUTO, where the number of decimal places shown on the display varies, depending on the thickness being measured.

While in automatic resolution, the measurements between 0.000 mm (0.000 in.) and 4.06 mm (0.160 in.) are displayed at high resolution (0.001 mm or 0.0001 in.). Measurements above 4.06 mm (0.160 in.) are displayed in standard resolution (0.01 mm or 0.001 in.).

NOTE

For the 1.59 mm (1/16 in.) target ball, the automatic resolution changes from HIGH to STANDARD at 2.03 mm (0.080 in.).

You can change the thickness measurement resolution, meaning the number of digits shown to the right of the decimal point. The resolution selection affects all displays and data output of values with thickness units. This includes the measured thickness, the differential reference value, and the alarm set points. The highest thickness resolution is 0.001 mm (0.0001 in.).

You can reduce the resolution in some applications where the extra precision of the last digit is not required, or where rough outside or inside surfaces make the last thickness display digit unreliable.

To change the thickness measurement resolution

1. In the measurement screen, press **[SET UP]**, and then highlight **MEASUREMENT**.
2. In the **MEASUREMENT** submenu, select **RESOLUTION**.
3. In the **MEASUREMENT SETUP** screen (see Figure 3-2 on page 53), set the **RESOLUTION** to the desired option:
   - **AUTO** (default): Automatically changes between **STANDARD** and **HIGH** resolution based on the thickness being measured. Thicknesses below 4.06 mm (0.160 in.) are displayed at **HIGH** resolution, while thicknesses above 4.06 mm (0.160 in.) are displayed in **STANDARD** resolution
   - **STANDARD**: 0.01 mm or 0.001 in.

- **LOW**: 0.1 mm or 0.01 in.
- **HIGH**: 0.001 mm or 0.0001 in.

4. Press **[MEAS]** to return to the measurement screen.

4. Basic and Multipoint Calibration

Olympus recommends regular calibration (with regular verification) of the Magna-Mike 8600 to ensure consistency and accuracy of thickness readings. This chapter outlines how to choose probes, target balls, target disks, wire targets, when to calibrate, and how to calibrate.

4.1 Probe Types

The Magna-Mike 8600 can be used with three different probes:

- Standard straight probe (Olympus P/N: 86PR-1 [U8470020])
- Right angle probe (Olympus P/N: 86PR-2 [U8470028])
- Low-profile articulating probe (Olympus P/N: 86PR-3 [Q7800004])

The 86PR-1 and 86PR-2 probes have the same measurement and maximum thickness capabilities, but the 86PR-2 is shorter, has a handle, and is easier to use when the probe is being used outside of the probe stand. The 86PR-2 probe (see Figure 4-2 on page 62) is useful for special application where the longer 86PR-1 probe (see Figure 4-1 on page 62) may be too large to fit into the measurement location.

The third probe (86PR-3) is a special low-profile probe designed to be as small as possible for applications with very limited access space at the measurement location (see Figure 4-3 on page 63). However, this probe has a more limited thickness range. The head of the probe can be adjusted and locked at different angles. The 86PR-3 probe's maximum measurable thickness is up to 4.06 mm (0.160 in.), depending on the target being used.

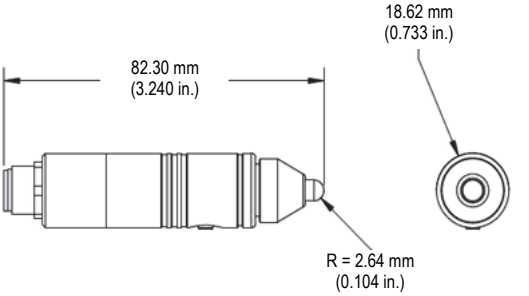


Figure 4-1 Standard straight probe model 86PR-1

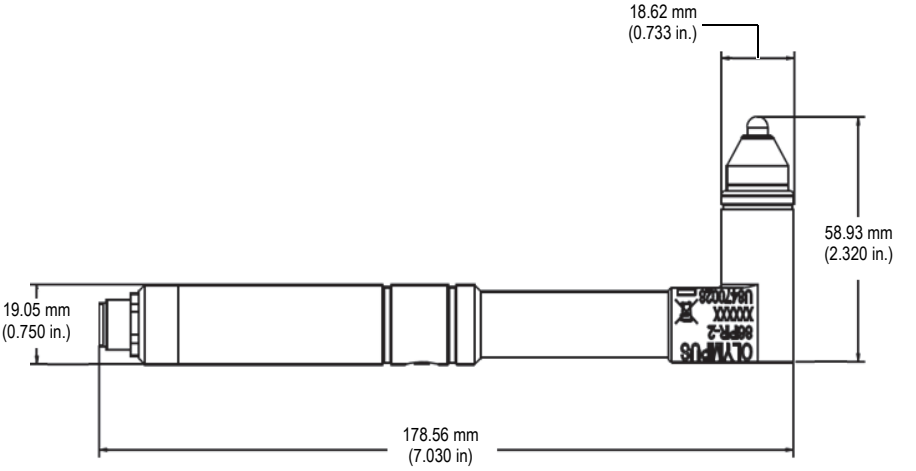


Figure 4-2 Right-angle head probe model 86PR-2

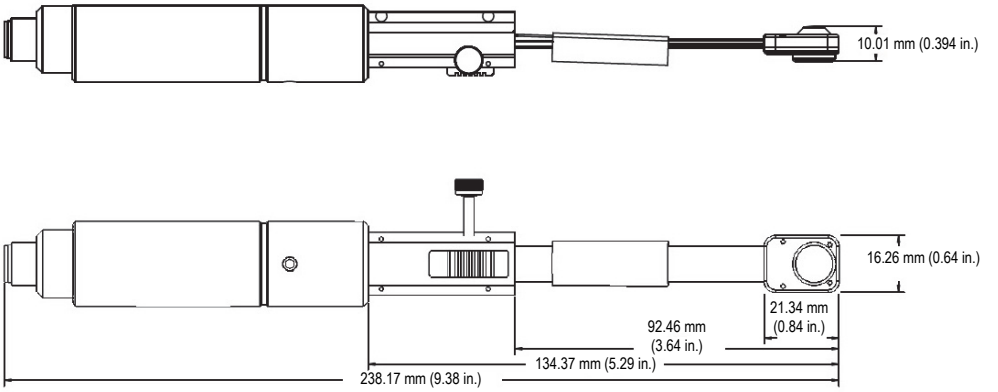


Figure 4-3 Low-profile articulating probe model 86PR-3

WARNING

To avoid the risk of injury, or death, do not bring a magnet near a person who has a pacemaker or electrical medical device, or near any other electrical medical devices. It is extremely dangerous and can cause the device to malfunction.
Never swallow or place a magnet in body orifices, including but not limited to ears, nose, and mouth. Magnets can cause serious damage — up to and including death — if swallowed. Seek immediate medical attention if magnets enter the body.
Do not place a magnet within the reach of children or mentally impaired adults.
Do not burn rare earth magnets as toxic fumes can result.

IMPORTANT

Do not place magnets near floppy disks, magnetic cards (such as credit cards), magnetic tape, pre-paid cards or tickets. Files may be erased if magnets are placed near magnetic storage devices.
Do not place magnets near electronic devices (for example, cell phone, television tube, programmable logic controller). This could cause an accident by affecting instruments

and control circuits.
People who are allergy-sensitive to metals may develop rough skin or a rash if they touch a magnet. Do not handle magnets if these symptoms appear.

4.2 Probe Cable Connections

There are two probe cables available for the Magna-Mike 8600: the standard cable (Olympus P/N: 86PC [U8801410]) and the extended-length coiled cable (Olympus P/N: 86PCC [U8780323]). The standard 86PC cable is appropriate for most applications where the probe is being used in the probe stand. The 86PCC is a 3.04 meter (10 foot) coiled cable and is often used when the probe is being used hand held or when using the 86PR-2 right angle probe for measuring larger objects.

Table 4 Probe cables

Part number	Description
86PC (U8801410)	Standard length probe cable, 0.91 m (3 ft)
86PCC (U8780323)	Extended-length coiled probe cable, 3.04 m (10 ft)
86PC-6 (Q7800016)	Standard probe cable, 1.83 m (6 ft)

4.2.1 Connection to the Magna-Mike 8600

The 86PC and 86PCC cables have two different connectors, one at each end. The larger connector on the 86PC or 86PCC connects into the connector labeled PROBE at the top left-hand side of the Magna-Mike 8600.

Insert the cable connector into the PROBE connector by aligning the positioning key on the connector. When properly aligned, the connector should engage easily. Once engaged, simply hand tighten in a clockwise direction until snug.

4.2.2 Connection to the 86PR-1, 86PR-2, and 86PR-3 Probes

The smaller connector on the 86PC or 86PCC cable connects to the probe. Insert the cable connector into the probe connector by aligning the positioning key on the connector. When properly aligned, the connector should engage easily. Once engaged, simply hand tighten in a clockwise direction until snug.

NOTE

The Magna-Mike 8600 should be turned off when changing probes. If the Magna-Mike 8600's power remains on while a probe is disconnected and reconnected, it must first be turned off, and then turned back on to correctly recognize the probe. After a probe is connected, you must also perform a Q-CAL to clear any previous probe recognition parameters from memory.

CAUTION

Do not use tools to tighten the probe cable. Doing so can cause damage to the probe cable connector, the Magna-Mike 8600, or the probe.

4.3 Replaceable Wear Tips for 86PR-1 and 86PR-2 Probes

The standard straight probe (Olympus P/N: 86PR-1 [U8470020]), the right-angle head probe (Olympus P/N: 86PR-2 [U8470028]), and the low-profile articulating probe (Olympus P/N: 86PR-3 [Q7800004]) for the Magna-Mike 8600 have different replaceable wear tips. This allows the user to replace the wear surface of the probe without replacing the entire probe. This is very useful for applications where the material being measured has a hard or rough surface. The Magna-Mike 8600 will do a check for probe wear during calibration and prompt the user, if the probe wear tip has worn below the recommended limits. The user can also access the diagnostic menu for the Magna-Mike 8600 and select the probe test where the instrument will indicate the wear of the tip.

NOTE

Wear of the probe tip can affect accuracy of the thickness measurements. Therefore, the wear tip should be replaced if it shows areas of damage, denting, or abrasion.

There are three wear tip models available:

- Standard wear tip, Olympus P/N: 86PR1-WC (U8780324)
- Chisel wear tip, Olympus P/N: 86PR1-CWC (U8780326). This wear tip is used for applications where the probe tip needs to fit into a slotted or recessed contoured area, and where the standard tip will not fit.
- Extended wear tip, Olympus P/N: 86PR1-EWC [U8780344]. This wear tip has a hard ceramic insert for greater wear resistance when the probe is contacting hard materials like metal or glass.

Table 5 Wear tips

Part number	Description
86PR1-WC (U8780324)	Standard wear tip
86PR1-CWC (U8780326)	Chisel wear tip
86PR1-EWC (U8780344)	Extended wear tip

4.4 Wear Tip Replacement

To replace the wear tip, simply unscrew, counterclockwise, the knurled section of the probe tip and replace it with the appropriate replacement wear tip and hand tighten it in a clockwise direction. The Magna-Mike 8600 must be recalibrated once the wear tip has been removed or replaced. It is also recommended that the unit be recalibrated if the wear tip has been tightened or loosened.

The user must select the type of wear tip to be used. The standard wear tip and the extended wear tip both use the STANDARD wear tip setting in the MEASUREMENT SETUP screen. By default, the Magna-Mike 8600 is set to the standard wear tip,

indicated by a white dot at the top of the screen. The user needs to select the CHISEL tip in the MEASUREMENT SETUP screen (see Figure 4-4 on page 67) when using the chisel wear tip, indicated by a white triangle at the top of the screen.

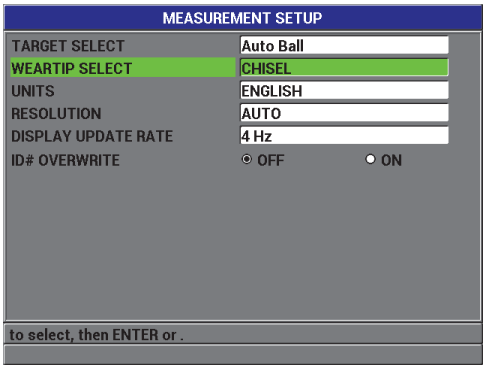


Figure 4-4 The MEASUREMENT SETUP screen

CAUTION

The wear tip should only be hand tightened. Using tools to tighten the wear tip can permanently damage the probe.
Do not use the Magna-Mike 8600 probe without a wear tip. Doing so will cause inaccurate measurements and may cause permanent damage to the probe.

4.5 Proper Target Selection

The Magna-Mike 8600 can be used with a variety of target balls of different sizes, target disks, and a target wire. Choosing the proper ball will greatly improve the accuracy of the measurements. Use only Olympus target balls, disks and wires with the Magna-Mike 8600, as other seemingly identical targets may cause inaccurate measurements.

4.5.1 Standard Target Balls

Standard target balls are used for most general purpose applications. Selecting which size of target ball to use greatly depends on the application geometry and the maximum thickness to be measured. In general, you should try to use the largest diameter target ball that will roll freely for the application. The ball must be able to make contact with the inside surface in a cornered or contoured area.

Consider the following criteria when choosing a ball:

- Minimum curvature of the material
- Maximum thickness measurement
- Accuracy needed for measurement
- Compressibility of the material (larger or magnetic balls will compress the material more than smaller or non-magnetic target balls)
- Surface hardness: Magnetic target balls will slide along the surface unlike the non-magnetic target balls that roll. The user should uses caution when using magnetic balls to ensure that the surface of the material will not be scratched by a magnetic target ball.

1.59 mm (1/16 in.) diameter target ball (Olympus P/N: 80TB1 [U8771030]): Useful for applications that involve intricate contours. While the small size is efficient for measuring difficult shapes, it is less accurate than the 3.18 mm (1/8 in.) ball and has a restricted thickness range up to 2.03 mm (0.080 in.) with the standard wear tip.

3.18 mm (1/8 in.) diameter target ball (Olympus P/N: 80TB2 [U8771031]): Serves all standard applications, such as plastic blow molding, simple shapes, and wall thicknesses up to 6.10 mm (0.240 in.) with the standard wear tip.

4.76 mm (3/16 in.) diameter target ball (Olympus P/N: 80TB3 [U8771032]): Useful for applications that require better accuracy, or where the material is thicker than the range offered by 3.18 mm (1/8 in.) ball. The maximum thickness range is up to 9.14 mm (0.360 in.) with the standard wear tip. However, the ability to measure intricate corners is limited, and soft materials are more likely to be compressed using this target ball.

6.35 mm (1/4 in.) diameter target ball (Olympus P/N: 80TB4 [U8771033]): Useful for applications that require a larger thickness range and where the contour of the material will allow a 6.35 mm (1/4 in.) diameter ball to roll smoothly. The maximum wall thickness that can be measured with the 6.35 mm (1/4 in.) target ball is 9.14 mm (0.360 in.) with the standard wear tip. However, the ability to measure intricate corners is limited, and soft materials are more likely to be compressed using this target ball.

4.5.2 Magnetic Target Balls

Magnetic target balls are used to achieve the maximum thickness measurement range possible. Using a magnetic target ball can also allow the instrument to measure thicker materials while using a smaller diameter ball for applications that have both thicker geometry and contours constraints. The Magna-Mike 8600 can use two magnetic target balls of different sizes. Selecting which size magnetic target ball to use greatly depends on the application geometry and the maximum thickness to be measured. In general, you should try to use the largest diameter target ball that will roll or move freely for the application. The ball must be able to make contact with the inside surface in cornered or contoured areas. Also keep in mind that magnetic balls will tend to compress soft materials and the smallest target ball that meets the maximum thickness capability should be used to limit the compressing of soft materials.

Magnetic 4.76 mm (3/16 in.) diameter target ball (Olympus P/N: 86TBM3 [U8771039]): Useful for applications that require a greater maximum thickness than the standard 4.76 mm (3/16 in.) target ball and where the 6.35 mm (1/4 in.) diameter ball will not roll freely in the contours of the application. The maximum thickness range of the 4.76 mm (3/16 in.) magnetic target ball is 19.05 mm (0.750 in.) with the standard wear tip.

Magnetic 6.35 mm (1/4 in.) diameter target ball (Olympus P/N: 86TBM4 [U8771040]): Useful for applications that require the largest thickness possible and application where a 6.35 mm (1/4 in.) diameter ball will roll smoothly in any corners or contoured areas. The maximum wall thickness that can be measured with the 6.35 mm (1/4 in.) Magnetic target ball is 25.4 mm (1.00 in.) with the standard wear tip. However, the ability to measure intricate corners is limited, and soft materials are more likely to be compressed or scratched using this target ball.

WARNING

To avoid the risk of injury or death, observe the following safety precautions:

- DO NOT swallow or place magnetic target balls in body.
- DO NOT place magnetic target balls near electronic equipment.
- DO NOT place magnetic target balls near people with pacemakers.
- DO seek medical attention if magnets enter the body.

4.5.3 Target Disks

Target disks are used for special applications where the wall thickness needs to be measured in a thin channel and where a target ball will not move freely in the contour. The most common application where target disks are used is in automobile tear seam thickness measurements applications. There are two different target disks: a flat disk (Olympus P/N: 80TD1 [U8771034]) and a V-edge (Olympus P/N: 80TD2 [U8771035]). The target disks can be used with a standard probe with STANDARD wear tips or with the CHISEL wear tip for applications where a thin channel may be on both sides of the material.

The flat 12.70 mm (0.500 in.) diameter disk (Olympus P/N: 80TD1 [U8771034]): Useful for applications where a wall thickness needs to be made in a thin channel. The maximum thickness range with the 80TD1 flat disk is 9.14 mm (0.360 in.) with the standard wear tip.

The V-edge 6.35 mm (0.250 in.) diameter disk (Olympus P/N: 80TD2 [U8771035]): Useful for applications where a wall thickness needs to be made in a thin channel and the 80TD1 disk is too large to move freely in the contours of the material. The maximum thickness range with the 80TD2 V-edge disk is 6.10 mm (0.240 in.) with the standard wear tip.

4.5.4 Target Wires

Wire targets are used for special applications where the wall thickness needs to be made from an outside surface to the inside diameter of a hole. In these applications, a wire target can be inserted in the hole and the probe will be in contact with the outside surface. The most common application is for measuring the wall thickness of a cooling hole in a turbine blade. The 86TW1 (U8771041) is a 1.14 mm (0.045 in.) diameter wire target and the maximum thickness range is 12.70 mm (0.500 in.) with the standard wear tip.

Table 6 Magna-Mike 8600 targets

Olympus part number	Description	Application	Maximum thickness (with standard wear tip)	Maximum thickness (with chisel wear tip)	Maximum thickness (with low-profile probe 86PR-3)
80TB1 (U8771030)	1.59 mm (1/16 in.) target ball	Thin or compressible material with intricate geometry.	2.03 mm (0.080 in.)	2.03 mm (0.080 in.)	2.03 mm (0.080 in.)
80TB2 (U8771031)	3.18 mm (1/8 in.) target ball	General applications for plastic bottles.	6.10 mm (0.240 in.)	4.06 mm (0.160 in.)	4.06 mm (0.160 in.)
80TB3 (U8771032)	4.76 mm (3/16 in.) target ball	Thicker material where a 4.76 mm (3/16 in.) ball will roll freely.	9.14 mm (0.360 in.)	6.10 mm (0.240 in.)	Not available
80TB4 (U8771033)	6.35 mm (1/4 in.) target ball	Thicker noncompressible material where a 6.35 mm (1/4 in.) ball will move freely.	12.70 mm (0.500 in.)	9.14 mm (0.360 in.)	Not available
86TBM3 (U8771039)	Magnetic 4.76 mm (3/16 in.) target ball	Thicker material where a smaller target ball is needed due to contours.	19.05 mm (0.750 in.)	19.05 mm (0.750 in.)	Not available
86TBM4 (U8771040)	Magnetic 6.35 mm (1/4 in.) target ball	Noncompressible material where maximum thickness capability is needed.	25.40 mm (1.00 in.)	25.40 mm (1.00 in.)	Not available
80TD1 (U8771034)	Flat disk 12.70 mm (0.500 in.)	Thin channels where a standard target ball will not roll freely.	9.14 mm (0.360 in.)	9.14 mm (0.360 in.)	Not available

Table 6 Magna-Mike 8600 targets *(continued)*

Olympus part number	Description	Application	Maximum thickness (with standard wear tip)	Maximum thickness (with chisel wear tip)	Maximum thickness (with low-profile probe 86PR-3)
80TD2 (U8771035)	Knife edge (V) disk 6.35 mm (1/4 in.)	Small channels where the 80TD1 disk will not roll freely.	6.10 mm (0.240 in.)	6.10 mm (0.240 in.)	Not available
86TW1 (U8771041)	Wire target 1.14 mm (0.045 in.)	Wall thicknesses in holes or small diameter openings.	12.70 mm (0.500 in.)	12.70 mm (0.500 in.)	Not available
86TW2 (U8779858)	Wire target 0.66 mm (0.026 in.)	Wall thicknesses in holes or small diameter openings.	6.10 mm (0.240 in.)	6.10 mm (0.240 in.)	0.160 in. (4.06 mm)

4.5.5 Calibration Accessory Kits

The Magna-Mike 8600 has six different calibration kits available, depending on the type of target ball, disk, wire, and the maximum thickness of your application.

- Standard kit for most applications (Olympus P/N: 86ACC-KIT)
- Extended range calibration kit (Olympus P/N: 86ACC-ER-KIT)
- Target disk calibration kit (Olympus P/N: 86ACC-D-KIT)
- Wire target calibration kit (Olympus P/N: 86ACC-W-KIT)
- Low-profile probe calibration kit (Olympus P/N: 86ACC-PR3-KIT)
- Set of six NIST traceable standards (Olympus P/N: 80CAL-NIS)

Table 7 Calibration kits

Part number	Description	Targets included in kit	Items included in kit
86ACC-KIT (U8771068)	Standard calibration kit for most applications where thicknesses are up to 7.62 mm (0.300 in.).	1.59 mm (1/16 in.), 3.18 mm (1/8 in.), and 4.76 mm (3/16 in.) steel target balls	80CAL-TB1, 80CAL-TB2, 80CAL-TB3, 80TB1, 80TB2, 80TB3, 80CAL-010, 80CAL-020, 80CAL-040, 80CAL-080, 80CAL-160, 80CAL-240, and 80CAL-300 in a plastic case.
86ACC-ER-KIT (U8771069)	Extended range calibration kit for applications where thicknesses are between 1.02 mm (0.040 in.) in to 25.40 mm (1.00 in.).	6.35 mm (1/4 in.) steel balls, 4.76 mm (3/16 in.) magnetic balls, and 6.35 mm (1/4 in.) magnetic balls	80CAL-TB3, 80CAL-TB4, 86TBM3, 80TB4, 86TBM4, 80CAL-040, 80CAL-160, 80CAL-240, 80CAL-360, 86CAL-500, 86CAL-750, 86CAL-875, and 86CAL-1000 in a plastic case.
86ACC-D-KIT (U8771071)	Disk calibration kit for applications requiring target disks	12.70 mm (0.500 in.) diameter flat disk and 6.35 mm (0.250 in.) diameter V-Edge disk	86PR1-CWC, 86CAL-TD, 80TD1, 80TD2, 86DCAL-010, 86DCAL-020, 86DCAL-040, 86DCAL-080, 86DCAL-160, 86DCAL-240, and 86DCAL-360 in a plastic case.

Table 7 Calibration kits *(continued)*

Part number	Description	Targets included in kit	Items included in kit
86ACC-PR3-KIT [Q7800005]	Low-profile probe calibration kit	1.59 mm (1/16 in.), 3.18 mm (1/8 in.), and 0.66 mm (0.026 in.) diameter target wire	86CAL-PR3-TB1, 86CAL-PR3-TB2, 86CAL-PR3-TW2, 80TB1, 80TB2, 86TW2, 86CAL-PR3-010, 86CAL-PR3-020, 86CAL-PR3-040, 86CAL-PR3-080, 86CAL-PR3-120, and 86CAL-PR3-160 in a plastic case.
86ACC-W-KIT (U8771070)	Wire target calibration kit for applications requiring a wire target max range up to 12.70 mm (0.500 in.)	1.14 mm (0.045 in.) and 0.66 mm (0.026 in.) diameter target wire	86CAL-TW1, 86TW1, 86TW2, 86WCAL-010, 86WCAL-020, 86WCAL-040, 86WCAL-080, 86WCAL-160, 86WCAL-240, 86WCAL-360, and 86WCAL-500 in a plastic case.
80CAL-NIS (U8771011)	NIST calibration Standards	Kit does not include any balls, disks, or wire targets.	A complete set of six Magna-Mike calibration standards traceable to NIST for applications where thicknesses are up to 6.10 mm (0.240 in.). The certificate of calibration is also included.

4.6 Calibration Frequency

You should perform a calibration:

- Daily or at the start of a work session
- When changing to a different target ball size

- When replacing wear tips or probes
- If the probe tip is worn from abrasive material
- If the probe is replaced, dropped, or contacts highly-magnetic material

NOTE

If the Magna-Mike 8600 has just been turned on, or if a probe has just been connected, allow the gage to warm up for at least five minutes with the probe connected before performing a calibration.

4.7 Calibration

The user can choose to perform a either a basic calibration or a multipoint calibration. The basic calibration uses four points; BALL OFF, BALL ON, THIN SHIM, and THICK SHIM. The multipoint calibration adds up to eight additional points to these basic calibration points. The accuracy of the measurements will depend on the type of calibration performed and the target being used. In general, a multipoint calibration (a basic calibration with additional points) will improve the accuracy. The accuracy for each target and calibration type is listed in Table 8 on page 75 and Table 9 on page 76.

Table 8 Calibration accuracy for 86PR-1 and 86PR-2 probes

Target name	Description	Basic calibration accuracy	Multipoint calibration accuracy
80TB1 (U8771030)	Target steel ball, 1.59 mm (1/16 in.)	4 %	3 %
80TB2 (U8771031)	Target steel ball, 3.18 mm (1/8 in.)	4 %	2 %
80TB3 (U8771032)	Target steel ball, 4.76 mm (3/16 in.)	3 %	1 %
80TB4 (U8771033)	Target steel ball, 6.35 mm (1/4 in.)	3 %	1 %

Table 8 Calibration accuracy for 86PR-1 and 86PR-2 probes *(continued)*

Target name	Description	Basic calibration accuracy	Multipoint calibration accuracy
86TBM3 (U8771039)	Magnetic target steel ball, 4.76 mm (3/16 in.)	3 %	1 %
86TBM4 (U8771040)	Magnetic target steel ball, 6.35 mm (1/4 in.)	3 %	1 %
80TD1 (U8771034)	Flat disk, 12.70 mm (0.500 in.)	3 %	2 %
80TD2 (U8771035)	Knife edge (V) disk, 6.35 mm (0.250 in.)	3 %	2 %
86TW1 (U8771041)	Wire target, 1.14 mm (0.045 in.)	3 %	2 %
86TW2 (U8779858)	Wire target, 0.66 mm (0.026 in.)	3 %	2 %
Tolerance for metric values: ± [(accuracy × thickness) + 0.003 mm] Tolerance for English values: ± [(accuracy × thickness) + 0.0001 in.]			

Table 9 Calibration accuracy for the 86PR-3 probe

Target name	Description	Basic calibration accuracy	Multipoint calibration accuracy
80TB1 (U8771030)	Target steel ball, 1.59 mm (1/16 in.)	4 %	3 %
80TB2 (U8771031)	Target steel ball, 3.18 mm (1/8 in.)	4 %	2 %
86TW2 (U8779858)	Wire target, 0.66 mm (0.026 in.)	3 %	2 %
Tolerance for metric values: ± [(accuracy × thickness) + 0.025 mm] Tolerance for English values: ± [(accuracy × thickness) + 0.001 in.]			

In order to make accurate measurements with the Magna-Mike 8600, the user must perform a four-point basic or multipoint (additional points) calibration for the target ball, disk, or wire that is being used. The points used in the calibration will be a "BALL OFF" point, a "BALL ON" point (thickness equal to zero), a "THIN SHIM" point, and a "THICK SHIM" point. The values for the "THIN SHIM" and "THICK SHIM" calibration points will vary depending on the wear tip used, target ball, disk, or wire selected. The user may also choose to add up to eight additional calibration points in order to fine-tune the calibration curve and improve accuracy in the thickness range where measurements will be made.

4.7.1 Selecting a Target and Wear Tip

When using the standard target balls and the standard wear tip, the Magna-Mike 8600 can normally automatically recognize the proper ball during the calibration for the 86PR-1 and 86PR-2 probes. The Magna-Mike 8600 will display the recognized target on the calibration screen. When using the 86PR-3 probe (and sometimes with the other two probes as well), the instrument cannot recognize the correct target ball size and the user will have to manually choose the target ball in the TARGET SELECT field. When using the target disk, the target wire, or the chisel wear tip, the user must also manually select the proper target and wear tip in the MEASUREMENT SETUP screen.

To manually select the proper target and wear tip

1. In the measurement screen, press **[SET UP]**, and then highlight **MEASUREMENT.**
2. In the **MEASUREMENT** submenu, select **TARGET SELECT**, and then press **[ENTER]**.
3. In the **MEASUREMENT SETUP** screen (see Figure 4-5 on page 78), proceed as follows:
   - When using the 86PR-1 or 86PR-2 and one of the target balls, select **Auto Ball**.

     OR

     When using the 86PR-3 or one of the target disks or wires, select **1/16 BALL**, **1/8 BALL**, **0.5 DISK**, **V DISK**, **0.045 WIRE**, or **0.026 WIRE**.

     Note that the targets available to select are probe dependent.
4. Highlight **WEARTIP SELECT**, and then choose **STANDARD** or **CHISEL**.

   Note that only the **STANDARD** wear tip setting is available for the 86PR-3 probe.
5. Press **[MEAS]** to return to the measurement screen.

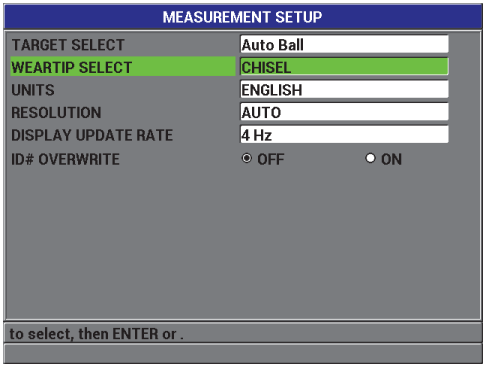


Figure 4-5 The MEASUREMENT SETUP screen

4.7.2 Calibrating

The calibration matches each target ball being used to an internal lookup table from the instrument's memory. The calibration also measures the two extremes of the ball's possible locations (BALL OFF and BALL ON) and assigns these endpoints to the lookup table. If no table exists for the ball, then the unit automatically creates a default table from which subsequent measurements are displayed. The table is preserved in the instrument's memory, even if powered off, until overwritten by a new calibration or deliberately erased by a MEASUREMENT RESET or a MASTER RESET.

To calibrate

1. **BALL OFF**: With the probe sitting in the probe stand, press **[CAL]**. The gage display instructions will read **BALL OFF**.
2. Remove any target ball close to the probe tip, and then press **[CAL]**. The display will read "**Processing... Please Wait**" while the gage measures the field strength at the probe tip. The gage display instructions will read **BALL ON**.
3. **BALL ON**: Select the target ball that you will be using in subsequent measurements, along with the BALL ON FIXTURE for that ball size. The fixture centers the target ball on the probe tip. Place the ball on top of the fixture. Place the fixture over the tip of the probe and slide it down until it stops, as shown in Figure 4-6 on page 79.

NOTE

Place the target ball into the BALL ON FIXTURE before placing the fixture onto the probe. Dropping the ball repeatedly into the fixture as it rests on the probe may pit the end of the wear tip, causing small measurement inaccuracies.

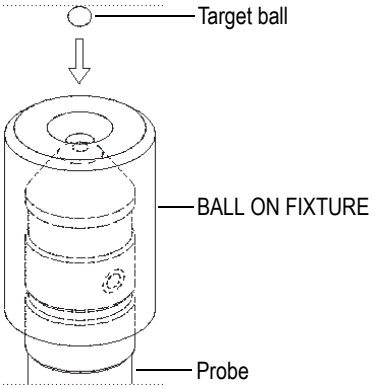


Figure 4-6 Alignment of target ball in fixture on probe

IMPORTANT

When using the target disk and the chisel wear tip, make sure that the disk is aligned perpendicularly to the chisel edge (see Figure 4-7 on page 80).

Figure 4-7 Aligning disk to chisel edge

4. Once the ball is centered on the probe tip, press **[CAL]**. A "**Processing... Please Wait**" message will appear while the gage measures the field strength again.
5. THIN SHIM point: The instrument will prompt the user to place a specific thin calibration shim and target onto the probe tip. The thickness of this thin calibration point will vary depending on which target ball, disk, or target wire is selected. The approximate thickness of the shim will be displayed in the lower measurement box. Press **[CAL]** to transfer the measurement to the text box, use the arrows keys to enter the known thickness of the calibration shim, and then press **[CAL]** (see Figure 4-8 on page 80).

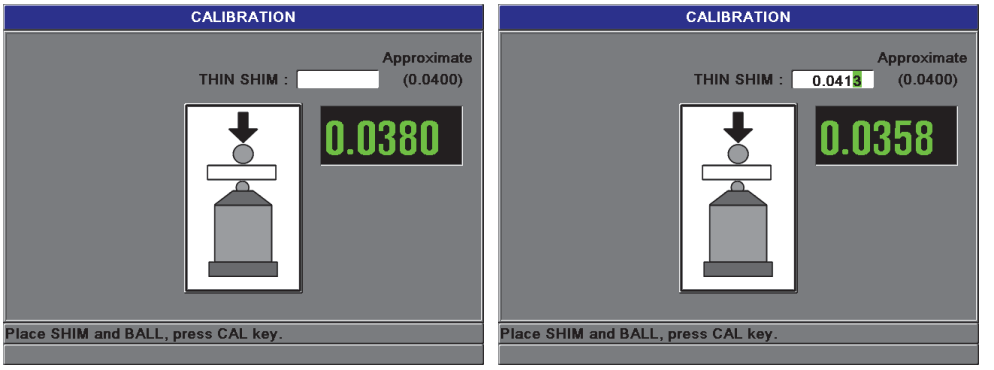


Figure 4-8 THIN SHIM calibration point

6. THICK SHIM point: The instrument will prompt you to place a specific thick calibration shim and target onto the probe tip. The thickness of this thick calibration point will vary depending on which target ball, disk, or target wire is selected. The approximate thickness of the shim will be displayed in the lower measurement box. Press **[CAL]** to transfer the measurement to the text box, use the arrows keys to enter the known thickness of the calibration shim, and then press **[CAL]** (see Figure 4-9 on page 81).

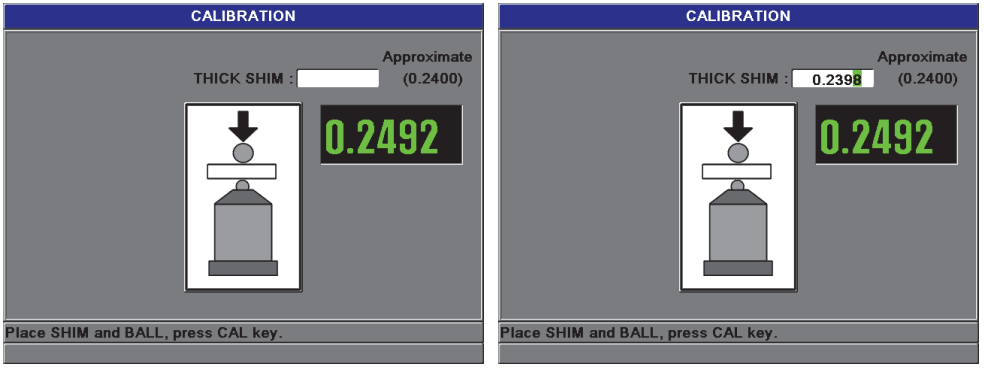


Figure 4-9 THICK SHIM calibration point

7. Additional (multipoint) calibration points: The instrument will ask if you would like to add additional calibration points (see Figure 4-10 on page 82). Selecting **NO** will complete the standard (basic) calibration, while selecting **YES** (multipoint) will allow the user to add up to eight additional calibration points.

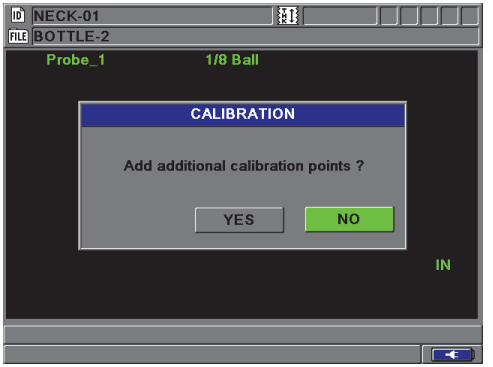


Figure 4-10 Adding additional calibration points

8. Up to eight additional calibration points will be listed on the left side of the display (see Figure 4-11 on page 82) as follows:
   a) Place a specific calibration shim and target onto the probe tip.
   b) Press **[CAL]** to transfer the measurement to the text box.
   c) Use the arrows keys to enter the known thickness of the calibration shim, and then press **[CAL]**.
   d) Press **[CAL]** again to enter the next calibration point.
   OR
   Press **[MEAS]** to complete the calibration process.

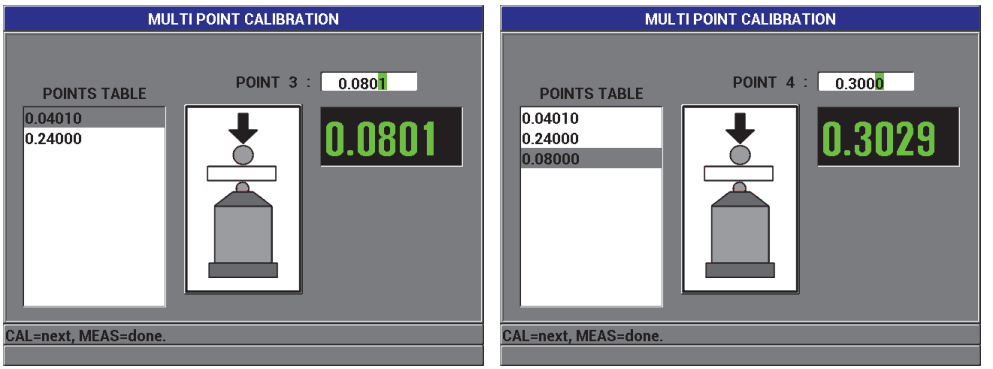


Figure 4-11 The MULTIPOINT CALIBRATION screen

4.7.3 Saving and Recalling a Calibration File

The Magna-Mike 8600 automatically saves the last calibration that was performed for each target ball, disk, or wire. The calibration file is automatically named, based on the target that was used, as shown in Table 10 on page 83.

Table 10 Calibration file names

Calibration File name	Description
1/16 BALL	1.59 mm (1/16 in.) steel target ball
1/8 BALL	3.18 mm (1/8 in.) steel target ball
3/16 BALL	4.76 mm (3/16 in.) steel target ball
1/4 BALL	6.35 mm (1/4 in.) steel target ball
3/16 MAGBALL	4.76 mm (3/16 in.) magnetic target ball
1/4 MAGBALL	6.35 mm (1/4 in.) magnetic target ball
0.50 DISK	12.70 mm (0.500 in.) diameter flat disk
V-DISK	6.35 mm (0.250 in.) diameter V-edge disk
0.045 WIRE	1.14 mm (0.045 in.) diameter wire target
0.026 WIRE	0.66 mm (0.026 in.) diameter wire target

TIP

Each time a new calibration is performed, the Magna-Mike 8600 will automatically replace the previous calibration file in the instrument memory. This allows the user to quickly change between the last calibrations performed with different target sizes. If the probe is changed or if the wear tip is replaced, the user should perform a new calibration.

To recall a calibration file

1. Press **[FILE]**, and then select **CAL RECALL**.

2. Use the up and down arrow keys to highlight the calibration file to open, and then press **[ENTER]**.
3. Highlight **RECALL**, and then press **[ENTER]** to recall the calibration file. Perform a Q-CAL by removing the target from the probe tip, and then press **[Q-CAL]**. The Magna-Mike 8600 is now ready to make measurements using the target corresponding to the calibration file that was recalled.
   OR
   Highlight **CANCEL**, and then press **[ENTER]** to cancel the recall of the calibration file.

IMPORTANT

The user should verify that the instrument is making accurate thickness measurements after a calibration file is recalled. Recalled calibration files may have been performed when the instrument was in a different location, or there may have been changes in the ambient magnetic field or temperature since the calibration file was saved.

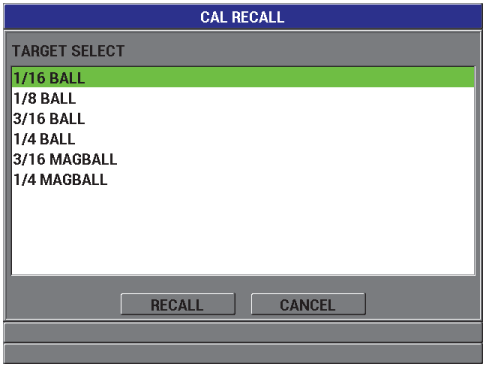


Figure 4-12 Recalling a calibration file

4.8 Measurements

Thickness measurements can be made once the Magna-Mike 8600 is calibrated for a particular target: ball, disk, or wire. To measure a test piece, simply place the probe tip on one side of the material, and place the target on the other side near the probe tip.

The target will be attracted to the probe tip by a magnetic field. Once the target is within range, the Magna-Mike 8600 will begin to display thickness values providing the probe tip and target are both in contact with the material. The target must be able to move freely (target disks must be standing on their edges) and the material kept perpendicular to the probe axis, as shown in Figure 4-13 on page 85. Inaccurate measurements may result from target or probe tip obstructions, or poor probe alignment, as shown in Figure 4-14 on page 86, Figure 4-15 on page 86, Figure 4-16 on page 86 and Figure 4-17 on page 87.

To optimize the gage's accuracy, be careful to

- Utilize proper measurement techniques
- Measure non-magnetic material
- Maintain gage calibration

Using the probe in the stand is the best method to measure material. This method allows gravity and probe attraction to work together to ensure good alignment of the target with the probe tip.

IMPORTANT

Avoid contact with magnetic metals (excluding the 4.76 mm [3/16 in.] and 6.35 mm [1/4 in.] magnetic target balls) or alloys (iron, steel, etc.) to ensure accurate operation of the Magna-Mike 8600.

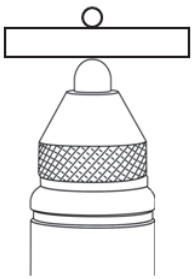


Figure 4-13 Correct method for thickness measurements

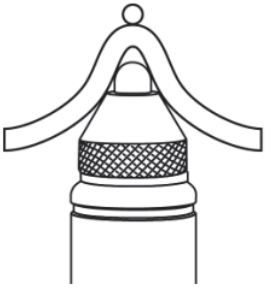


Figure 4-14 Inaccurate measurement due to obstruction of probe tip

Figure 4-15 Inaccurate measurement due to obstruction of target ball

Figure 4-16 Inaccurate measurement due to surface curvature

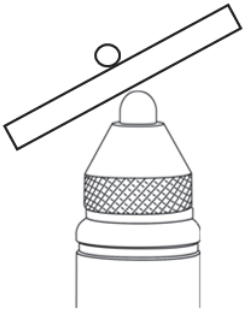


Figure 4-17 Inaccurate measurement due to bad probe alignment

4.8.1 Other Factors Affecting Accuracy

Nearby magnetic objects and magnetic fields

The probe should never be used on or near ferromagnetic materials such as carbon steel benches, shelves, brackets, supports, watches or jewelry, or near electric motors or similar sources of electromagnetic interference. It should be kept at least eight inches (20 cm) from computers. All of these objects can influence the probe's magnetic field and cause inaccurate measurements. This is especially important when measuring near the maximum specified thickness for each target type.

Probe orientation

Because the Magna-Mike 8600 measures thicknesses by monitoring small changes in a magnetic field, its calibration process includes an automatic compensation for the effects of the earth's magnetic field. Most commonly, the probe is held at a constant orientation, vertically in a stand. However in cases where the probe is used at a different orientation (such as being held horizontally), or when the orientation is changing as in scanning the outside of a curved part, the Q-CAL function must be used to make a correction. This is especially important when measuring near the maximum specified thickness for each target type. Simply remove the target and press **[Q-CAL]** while the probe is held at the desired orientation.

Rough or vertical test surfaces

Surface roughness or grooves can cause target balls to momentarily hang up as the probe is scanned, increasing the apparent thickness. When measuring vertical surfaces with the probe in a horizontal orientation, gravity can cause the target

ball to fall away from the center line of the probe. In these cases, the MIN capture mode should be used to insure measurements of true minimum thicknesses.

Wire targets

When using the wire target, the probe must be positioned at least 25 mm (1 in.) from the end of the wire. The wire must be pressed securely against the test piece at the point of measurement, since as with any other target, the Magna-Mike 8600 is actually measuring the distance to the target, not the wall thickness directly. The angular alignment between the probe tip and the wire (typically perpendicular) must be maintained, since wire tilt can affect readings. The wire target should not be kinked or bent.

4.8.2 Maintaining Accuracy

Once the Magna-Mike 8600 is calibrated and processing thickness measurements, it is important to maintain the gage's accuracy in order to produce consistent, reliable readings. Users are encouraged to perform maintenance procedures to obtain the best accuracy and productivity available from the gage (see "Periodic Verification" on page 89).

4.8.3 Q-CAL

The Magna-Mike 8600 incorporates a "quick calibration" or Q-CAL feature. Q-CAL compensates for drifts caused by moderate changes in temperature or ambient magnetic fields. Q-CAL works best when the probe is stationary and positioned upright in the stand.

NOTE

To ensure that the Magna-Mike 8600 operates properly, begin each new measurement session or day by performing a standard calibration or recall a stored calibration, and then verify the accuracy using the calibration fixtures.

If the probe is moved, has a different orientation between measurements, or is exposed to wide variations in temperature, the user will need to perform a Q-CAL.

To perform a manual Q-CAL, simply remove the target ball from the probe tip and press the Q-CAL button located on the instrument keypad or by pressing the button on the side of the probe, if the probe button is set to Q-CAL. The user may resume

measurements immediately. A manual Q-CAL may be performed as often as desired. If the test material is very thick, or requires great accuracy, the operator can choose to perform a manual Q-CAL prior to each new measurement.

When the Magna-Mike 8600 probe is being used hand-held to scan large objects, and not in the probe stand, it will be necessary to perform a manual Q-CAL when the orientation of the probe changes. This will compensate for changes in the ambient magnetic field around the probe due to probe orientation. For best results, perform the calibration while the probe is in the probe stand, and then press the Q-CAL button once the probe is pointing in the same orientation as the measurements will be made. For best measurement results, perform Q-CAL as often as the orientation of the probe changes.

NOTE

For best results, keep the probe in the same position during the Q-CAL as it will remain during subsequent measurements.

4.8.4 Periodic Verification

The Magna-Mike 8600 is classified as an operator-calibrated instrument. Olympus recommends establishing periodic checks to verify that acceptable accuracy is being maintained while the gage is in use.

Use care when handling the thickness standards provided by Olympus. The probe tip and steel target balls are significantly harder than the brass and aluminum disks that are located inside the fixtures. Excessive force will dent the disk's surface. These dents may induce errors in thickness values during calibration. To obtain replacement disks, contact Olympus. Other operator-supplied thickness standards may be used, but care must be taken that these are independently and accurately measured.

4.8.5 Traceability

Due to the operator-calibrated status of the Magna-Mike 8600, traceability to the National Institute of Standards and Technology (N.I.S.T.) may be conferred on the gage by using documented and certified standards from an appropriate metrology laboratory.

Use a set of traceable standards to periodically verify thickness measurements. Record the displayed thickness readings to verify that the Magna-Mike 8600 is operating at its expected accuracy (see Table 8 on page 75). Verifications may be made on a monthly or annual basis depending upon the user's judgment.

Olympus offers sets of traceable standards (Olympus P/N: 80CAL-NIS [U8771011]). These sets are measured by a traceable metrology laboratory, engraved and labeled with their true thickness, and delivered with appropriate certificates. The set may be periodically recertified by any qualified metrology laboratory providing they (1) use a ball or rounded anvil-style caliper, and (2) measure within 1.59 mm (1/16 in.) of the disk center.

As with all thickness standards, gentle use is essential to avoid dents, which may cause inaccurate measurements. If damage occurs to the traceable disks by use, Olympus suggests replacing them.

5. Using Special Functions

This chapter describes how to use special Magna-Mike 8600 functions and modes. The Magna-Mike 8600 has many thickness measurement features. Although the features outlined in this section are not required for basic thickness operation, they can make the gage a more versatile instrument.

5.1 Activating and Configuring a Differential Mode

The Magna-Mike 8600 includes differential modes to easily compare the actual measurement with a reference value that you enter. The actual thickness measurement appears on the thickness display and the differential value appears in the differential display area (see Figure 5-1 on page 91).

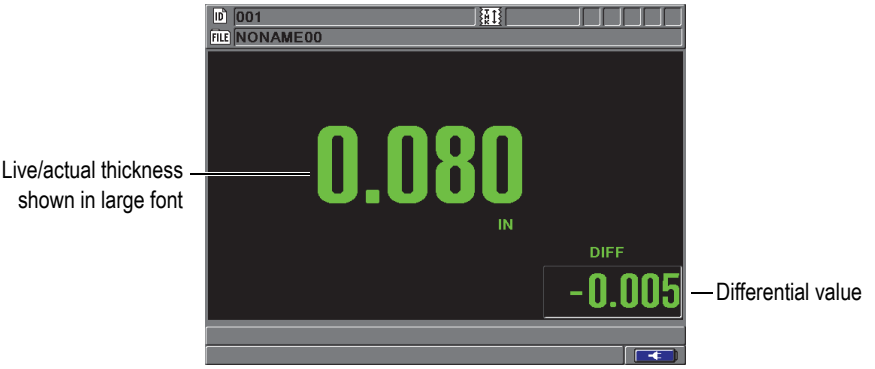


Figure 5-1 Normal differential mode

The units and resolution of the differential thickness are the same as those selected for the thickness measurement.

When you press **[SAVE]** while in differential modes, the Magna-Mike 8600 saves both the live and differential measurement values. The user can select to display the differential value or the live thickness measurement in large font. This is selected in the **DISPLAY** menu.

To activate and configure a differential mode

1. In the measurement screen, press **[SET UP]**, and then highlight **DIFFERENTIAL**.
2. In the **DIFFERENTIAL** submenu, select **ENABLE**.
3. In the **DIFFERENTIAL SETUP** screen (see Figure 5-2 on page 93):
   a) Set **ENABLE** to **ON** to activate the differential function.
   b) In **DIFF TYPE**, select one of the two differential types:
   - **NORMAL**: Shows the actual thickness along with the difference between the actual thickness measurement and the **REF VALUE** that you entered.

$$\text{Differential}_{Normal} = \text{Current thickness} - \text{Reference value}$$

   - **PERCENT**: Shows the actual thickness along with the percent difference from the **REF VALUE** that you entered.

$$\text{Differential}_{\%\ \text{Ratio}} = \frac{\text{Current thickness} - \text{Reference value}}{\text{Reference value}} \times 100$$

   c) In **REF VALUE** field, set the desired reference value.

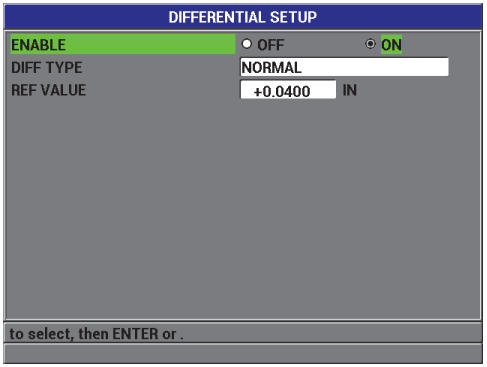


Figure 5-2 The DIFFERENTIAL SETUP screen

4. Press **[MEAS]** to return to the measurement screen with the displayed differential value.

5.2 Using the Minimum/Maximum Thickness Mode

The Minimum thickness mode of the Magna-Mike 8600 is often used for scanning for the minimum thickness. While scanning, a false thickness reading can be displayed if the probe is not properly aligned with the surface. Using the Minimum mode greatly reduces false readings because, when the probe is properly aligned, it will always display the minimum thickness.

You can activate the Minimum/Maximum (**MIN/MAX)** thickness mode to also display retained minimum and/or maximum thickness values. The **MIN** and/or **MAX** values appear on the right-hand side of the main thickness reading (see Figure 5-3 on page 94). The user can select which measurement is shown in large font (Live, Minimum or Maximum).

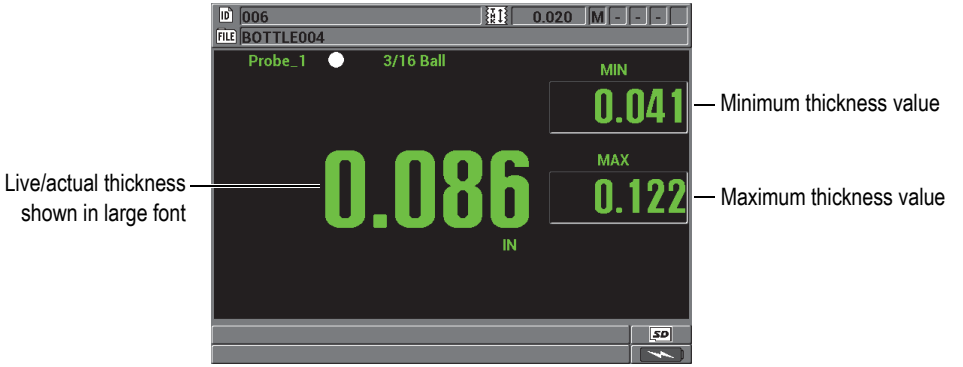


Figure 5-3 Displaying the minimum and maximum thicknesses

NOTE

The display update rate is independent of the Minimum capture rate. The user can choose to update the measurements at 4 Hz, 8 Hz, 16 Hz, or 20 Hz. The measurement capture rate is 60 Hz, and all **MIN** and **MAX** thickness values are captured using the 60 Hz capture rate.

The minimum and maximum thickness modes respectively display the smallest and largest thickness measured value from the time you activate the minimum mode or from the time you reset it. The modes are useful when it is important to determine the thinnest/thickest reading obtained while making a series of readings on a test piece.

To activate the minimum, maximum, or min/max mode

1. In the measurement screen, press **[MIN/MAX]**.
2. In the **MIN/MAX** screen (see Figure 5-4 on page 95):
   a) Set **ENABLE MIN** to **ON** or **OFF**.
   b) Set **ENABLE MAX** to **ON** or **OFF**.
3. Press **[MEAS]** to return to the measurement screen.
4. In the measurement screen, press **[MEAS]** again to reset the held minimum, maximum, or min/max values.

   The thickness display will blank indicating that the old **MIN/MAX** value is reset. Saving or sending a **MIN/MAX** reading also resets the value.

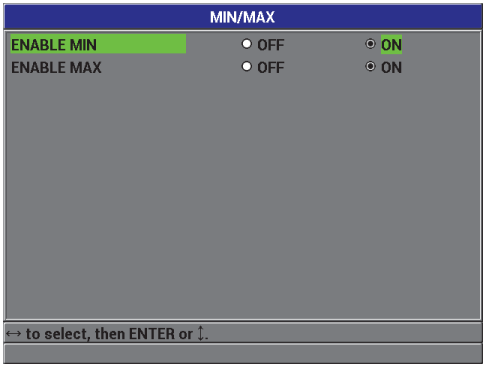


Figure 5-4 The MIN/MAX screen

5.3 Using Alarms

You can activate one of the Magna-Mike 8600 alarm modes to help you identify when the actual thickness measurement is above or below editable reference values.

When an alarm condition occurs, the Magna-Mike 8600 warns you as follows:

- The **HI** or **LOW** alarm indicator flashes in the top right-hand corner of the measurement screen (see Figure 5-5 on page 96).
- The thickness value also appears in red during an alarm condition.
- When the beeper is active (see "Setting the User Interface Language and Other System Options" on page 51), the Magna-Mike 8600 emits an alarm beep.

NOTE

The thickness value and alarm indicator appear in color only when the indoors color scheme is active (see "Color Schemes" on page 55 to change the color scheme).

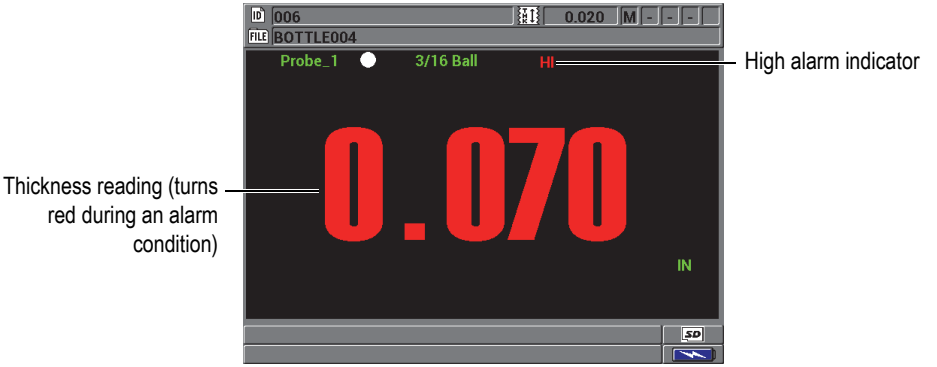


Figure 5-5 Example of a HIGH alarm indicator

The datalogger records an alarm condition in the second status box for all stored measurements. An **A** indicates the alarm mode, an **L** indicates a low alarm condition, and an **H** indicates a high alarm condition.

To set the alarm

1. In the measurement screen, press **[SET UP]**, and then highlight **ALARM**.
2. In the **ALARM** submenu, select **ENABLE**, **LOW ALARM SET POINT**, or **HIGH ALARM SET POINT**.
3. In the **ALARM SETUP** screen (see Figure 5-6 on page 97):
   a) Set **ENABLE** to **ON** to activate the alarm function.
   b) Set the **LOW ALARM SET POINT**, and then press **[ENTER]**.
   c) Set the **HIGH ALARM SET POINT**.
   d) Press **[MEAS]** to return to the measurement screen.

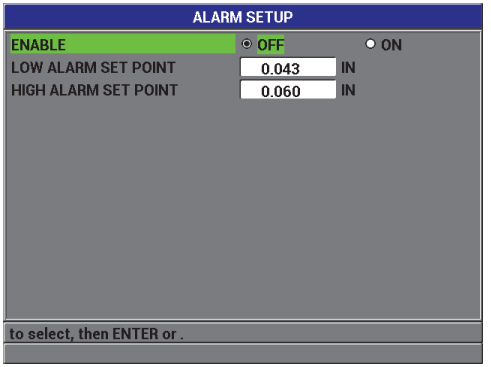


Figure 5-6 The ALARM SETUP screen

NOTE

Alarm reference values that were entered in one unit system are displayed as the equivalent value when the alternate units are selected.

5.4 Using a Strip Chart View

The Magna-Mike 8600 offers a strip chart view (see Figure 5-7 on page 98) to help trend the thickness as the user scans over an area to be measured. The strip chart measurements are updated at the 60 Hz measurement rate. This function is only a visual aid to show how the thickness changes from location to location and does not produce any type of printout. Strip charts cannot be saved or recalled in the internal data logger. The upper and lower limits of the strip chart can be set, and high and low alarm set points can be added. The user can choose to view live statistics, and display or hide their values (minimum value (**MIN**), maximum value (**MAX**), and **AVERAGE** value).

Strip chart with statistics

Strip chart without statistics

Figure 5-7 Strip chart view with and without statistics

To set the strip chart view

1. In the measurement screen, press **[SET UP]**, and then highlight **STRIP CHART VIEW**.
2. In the **STRIP CHART VIEW** submenu, select **ENABLE**, **MAX RANGE**, **MIN RANGE**, or **LIVE STATS**.
3. In the **STRIP CHART VIEW** screen (see Figure 5-8 on page 99):
   a) Set **ENABLE** to **ON** to activate the strip chart function.
   b) Set the desired value in the **MAX RANGE** field to define the upper limit of the strip chart.
   c) Set the desired value in the **MIN RANGE** field to define the lower limit of the strip chart.
   d) Set **LIVE STATS** to **ON** to view the live statistics for the strip chart view: minimum (**MIN**), maximum (**MAX**), and **AVERAGE** values.
   e) Press **[MEAS]** to return to the measurement screen.

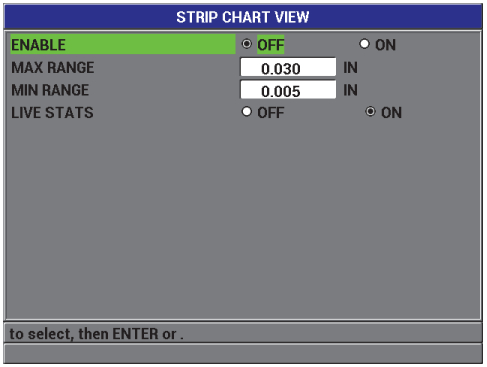


Figure 5-8 The STRIP CHART VIEW screen

5.5 Locking the Instrument

The Magna-Mike 8600 offers an instrument lock allowing a supervisor to restrict access to selected functions. The supervisor can also enter a password to prevent other users from unlocking the functions. Once a password has been set, you must reenter the password before you can lock or unlock any function.

You can lock the following functions:

- Calibration (except Q-CAL and calibration recall)
- Setup menus accessed with **[SET UP]**
- File menu (except **[SAVE]**, **[SEND]** and calibration recall)

Locking the calibration prevents changes to calibration values so that no parameters can affect the value of the measurement.

Anytime a user attempts to use a locked function, a message appears in the help bar to indicate that the function is locked (see Figure 5-9 on page 100).

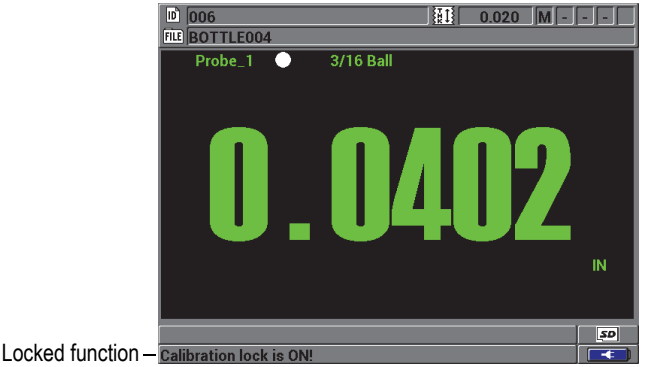


Figure 5-9 Example of a locked function message in the help bar

To set the password

1. In the measurement screen, press **[SET UP]**, and then select **PASSWORD SET**.
2. In the **PASSWORD SETUP** screen (Figure 5-10 on page 100), using up to eight alphanumeric characters, enter your password in the **INSTRUMENT PASSWORD** field.

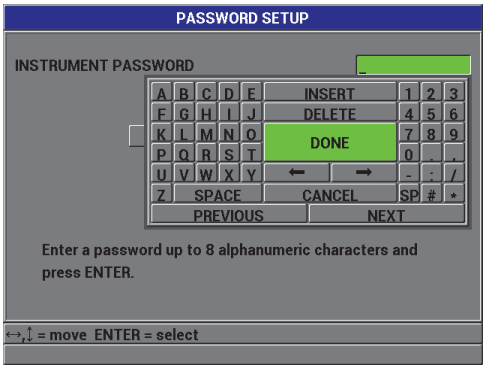


Figure 5-10 The PASSWORD SETUP screen

IMPORTANT

If you forget the password, you can unlock the instrument and deactivate the password by entering the master password "OLY8600".
When you want to change the password, you must first use the master password to deactivate the password, and then set a new password.

3. Select **SET** to set the password and return to the measurement screen.

To lock and unlock instrument functions

1. In the measurement screen, press **[SET UP]**, and then select **INSTRUMENT LOCK**.
2. In the **INSTRUMENT LOCK SETUP** screen (see Figure 5-11 on page 101), enter the password in the **PASSWORD** field (if a password was set), and then lock or unlock as follows:
   a) Set **CALIBRATION** to **ON** or **OFF** in order to lock or unlock this function.
   b) Set **SETUP MENU** to **ON** or **OFF** in order to lock or unlock this menu.
   c) Set **FILE MENU** to **ON** or **OFF** in order to lock or unlock this menu.
   d) Select **SET** to activate or deactivate the instrument locks and return to the measurement screen.
   OR
   Select **CANCEL** to discard the changes.

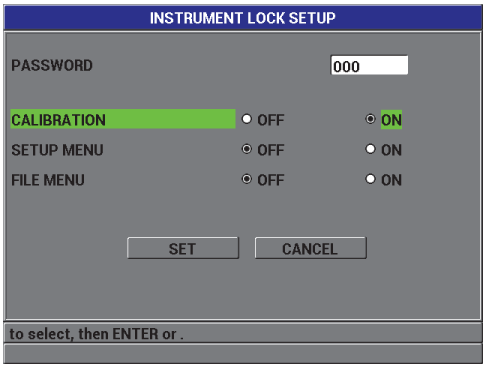


Figure 5-11 The INSTRUMENT LOCK SETUP screen

6. Configuring the Instrument

This chapter describes how to configure instrument parameters for measurement, system setup, and communications.

6.1 Configuring Measurement Parameters

The **MEAS** setup is the most commonly used setup menu screen where you access global parameters concerning the instrument measurement features.

To configure measurement parameters

1. In the measurement screen, press **[SET UP]**, and then select **MEASUREMENT** to display the **MEASUREMENT SETUP** screen (see Figure 6-1 on page 103).

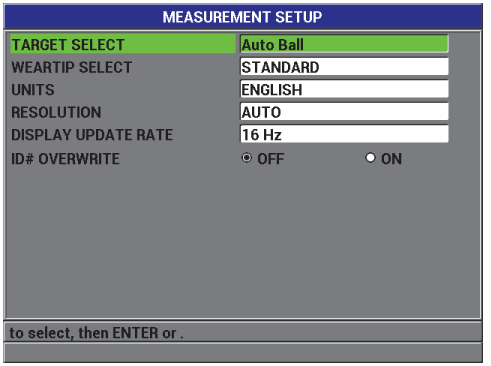


Figure 6-1 The MEASUREMENT SETUP screen

2. In **TARGET SELECT**, when using 86PR-1 and 86PR-2 probes, set to **Auto Ball** for the standard target diameter balls:
   - 1.59 mm (1/16 in.), Olympus P/N: 80TB1
   - 3.18 mm (1/8 in.), Olympus P/N: 80TB2
   - 4.76 mm (3/16 in.), Olympus P/N: 80TB3
   - 6.35 mm (1/4 in.), Olympus P/N: 80TB4
   - 4.76 mm (3/16 in.) magnetic, Olympus P/N: 86TBM3
   - 6.35 mm (1/4 in.) magnetic, Olympus P/N: 86TBM4

   When using the 86PR-3 probe, the Magna-Mike 8600 is unable to automatically recognize targets, so for this type of probe you must manually select the 1.59 mm (1/16 in.) ball, 3.18 mm (1/8 in.) ball, 0.66 mm (0.026 in.) wire, or target disk in **TARGET SELECT**.

IMPORTANT

The Magna-Mike 8600 is unable to automatically recognize a target disk or wire. You need to manually select the following targets:
.5 Disk for 12.70 mm (0.500 in.) diameter disk, Olympus P/N: 80TD1,
V Disk for 6.35 mm (1/4 in.) diameter V disk, Olympus P/N: 80TD2,
0.026 Wire for 0.66 mm (0.026 in.) diameter target wire, Olympus P/N: 86TW2,
0.045 Wire for 1.14 mm (0.045 in.) diameter target wire, Olympus P/N: 86TW1.

---

3. In **WEARTIP SELECT**, select the type of wear tip that is being used. Most commonly and by default, this will be set to **STANDARD** (for the standard wear tip and the extended wear tip). The user must manually select **CHISEL** when a chisel wear tip is being used. The measurement screen of the Magna-Mike 8600 shows an icon that indicates what the current wear tip selection is:
   - A white dot next to the probe type indicates that the standard wear tip is selected.
   - A white triangle next to the probe type indicates that the chisel wear tip is selected.
4. In **UNITS**, select between the **ENGLISH** (inches) or **METRIC** (millimeters) units.
5. In **RESOLUTION**, select one of the following resolutions:
   AUTO (default): Automatically uses **HIGH** resolution for measurements below 4.06 mm (0.160 in.) and **STANDARD** resolution for measurements above 4.06 mm (0.160 in.). For the 1.59 mm (1/16 in.) ball, the change occurs at 2.03 mm (0.080 in.) instead of 4.06 mm (0.160 in.).
   STANDARD (0.01 mm [0.001 in.])

LOW (0.1 mm [0.01 in.])
HIGH (0.001 mm [0.0001 in.])

6. In **DISPLAY UPDATE RATE**, adjust the number of thickness updates of the display per second to one of the following rates: 4 Hz, 8 Hz, 16 Hz, or 20 Hz.

NOTE

The **DISPLAY UPDATE RATE** only controls the rate at which the thickness displays are updated. The instrument internal measurement rate is 60 Hz. This ensures that the minimum and maximum thickness readings are being captured at the 60 Hz measurement rate (see "Adjusting the Display Update Rate" on page 57).

---

7. Set **ID OVERWRITE PROT** to **ON** if you want to see a confirmation message in the help bar when attempting to save a measurement reading in an ID that already contains a value (see "Setting the ID Overwrite Protection" on page 129 for details).
8. Press **[MEAS]** to return to the measurement screen.

6.2 Configuring System Parameters

The **SYSTEM** screen allows you to configure many Magna-Mike 8600 system parameters.

To configure system parameters

1. In the measurement screen, press **[SET UP]**, and then select **SYSTEM** to display the **SYSTEM SETUP** screen (see Figure 6-2 on page 106).
2. Set **BEEPER** to **ON** or **OFF** (see "Setting the User Interface Language and Other System Options" on page 51 for details).
3. Set **INACTIVE TIME** to **ON** or **OFF** (see "Setting the User Interface Language and Other System Options" on page 51 for details).
4. In **LANGUAGE**, select the desired user interface language (see "Setting the User Interface Language and Other System Options" on page 51 for details).
5. Set **RADIX** to the desired character to be used to separate the integer and the decimal numbers: **PERIOD (.)** or **COMMA(,)**.
6. Set the **PROBE BUTTON** to assign the button to a specific function: **Q-CAL**, **SAVE**, **SEND**, or **MEAS.**

7. Set the **FOOT SWITCH** to assign the button to a specific function: **Q-CAL**, **SAVE**, **SEND**, or **MEAS.**
8. Press **[MEAS]** to return to the measurement screen.

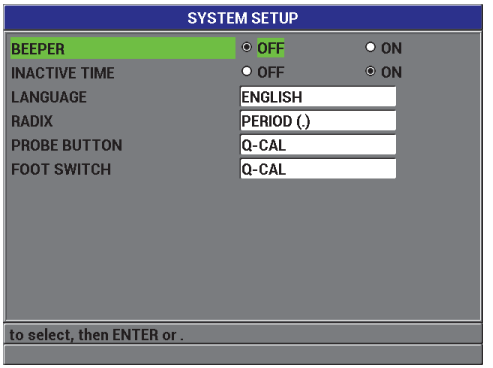


Figure 6-2 The SYSTEM SETUP screen

6.3 Activating the Software Upgrade Mode

If the internal operating software of the Magna-Mike 8600 needs to be upgraded, the user must put the instrument into the software upgrade mode prior to upgrading the software. Software upgrade can be done using the interface program (Olympus P/N: WINXL [U8774010]) that is included with the Magna-Mike 8600 or by using Upgrade2010. Contact Olympus for more details concerning upgrading the software for the Magna-Mike 8600.

To activate the Magna-Mike 8600 software upgrade mode

1. In the measurement screen, press **[SET UP]**, and then highlight **SYSTEM**.
2. In the **SYSTEM** submenu, select **UPGRADE**, and then press **[ENTER]**.
3. Once the instrument is in the **UPGRADE** mode, use a program on the PC, such as WINXL or Upgrade2010, to upgrade the software on the Magna-Mike 8600.

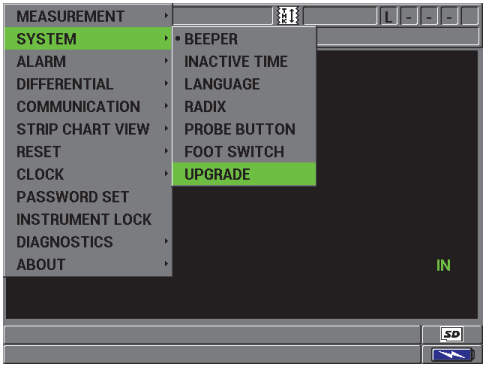


Figure 6-3 The UPGRADE screen

6.4 Configuring Communications

The Magna-Mike 8600 features a RS-232 and a USB port allowing you to connect the instrument to a computer. When connected to a computer, the Magna-Mike 8600 can send and receive data, or can be remotely controlled by the computer. A FTP (file transfer protocol) document and a remote command document are available upon request.

The instrument is set to use USB communication by default. You can select which type of communication you wish to use along with other communication parameters.

To configure the communication parameters

1. In the measurement screen, press **[SET UP]**, and then select **COMMUNICATION** to display the **COMMUNICATIONS SETUP** screen (see Figure 6-4 on page 108).

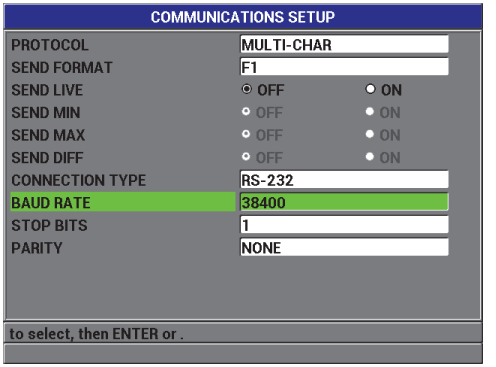


Figure 6-4 The COMMUNICATIONS SETUP screen — RS-232

2. In **PROTOCOL**, select which remote command set the instrument uses for communication:
   - **MULTI-CHAR**: Multi-character commands used for communication with a computer using the Magna-Mike 8600 multi-character commands.
   - **SINGLE CHAR**: Single-character command normally used when an external program is controlling the instrument by remotely sending commands to mimic keystroke.
3. In **SEND FORMAT**, select the format of the data being output (**F1**, **F2**, **F3**,...**F10**).

NOTE

Contact Olympus for more information on the following communication parameters:
— Multi-character and single-character remote commands.
— Send formats (F1, F2, F3, F4, F5, F6, F7, F8, F9, and F10).

---

4. Set the **SEND** selections in order to select which information is sent out of the instrument when **[SEND]** is pressed, as follows:
   a) Set **SEND LIVE** to **ON** in order to send the live reading.
   b) Set **SEND MIN** to **ON** in order to send the minimum held reading.
   c) Set **SEND MAX** to **ON** in order to send the maximum held reading.
   d) Set **SEND DIFF** to **ON** in order to send the differential reading.
5. In **CONNECTION TYPE**, select the communication format to be used:

- **USB**: Universal serial bus used to communicate with a computer running the WINXL interface program (default) [see "Setting Up USB Communication" on page 138].
- **RS-232**: Used for communication with serial port printers, digital calipers, bar code readers, and other RS-232 communication devices.

NOTE

The WINXL interface program can use either the USB or the RS-232 port to communicate with the Magna-Mike 8600.

6. When the **CONNECTION TYPE** is set to **RS-232**, select the communication parameters to match the device with which the Magna-Mike 8600 communicates:
   a) Set the **BAUD RATE** to match the data transfer rate of the device (example: **38400**).
   b) Set the **STOP BITS**: **1** or **2**.
   c) Set the **PARITY**: **NONE**, **EVEN**, or **ODD**.
   d) The word length is fixed at 8.
7. Press **[MEAS]** to return to the measurement screen.

7. Using the Datalogger

This chapter describes how to use the Magna-Mike 8600 internal datalogger to organize your data.

7.1 Datalogger Functions

The Magna-Mike 8600 datalogger is a file-based system where one file is opened at a time. The active file stores a measurement at a thickness measurement ID# location. Each time you press **[SAVE]**, the displayed value is saved to the active file at the current ID#. The ID# is automatically incremented for the next measurement. The name of the active file and the current ID# location appears in the header bar above the measurement screen.

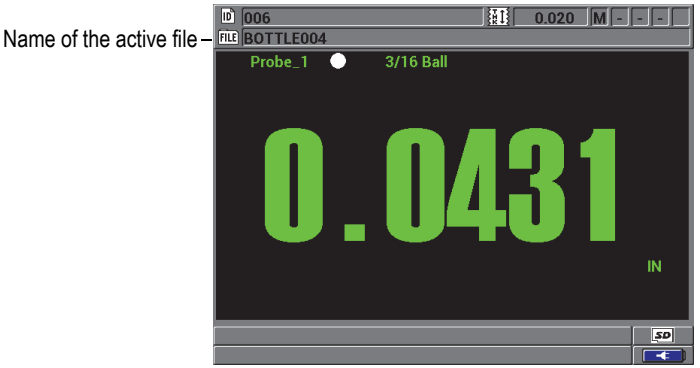


Figure 7-1 The active file name appearing in the header bar

A file also contains header parameters that you can define to better describe the content of the file. Table 11 on page 112 summarizes the contents of a file and indicates where you can find more information.

Table 11 File contents summary

Contents	Description	See section
Header	Extra parameters to describe the contents and the context of the data	"Creating a Data File" on page 113
Measurement data	Organized by predefined IDs arranged by file types	"Data File Types" on page 114

You can identify the datalogger parameters in the ID bar at the top of the measurement screen.

With each measurement, the Magna-Mike 8600 also stores a complete description of the measurement conditions. Table 12 on page 112 describes the additional data stored with each thickness measurement.

Table 12 Additional information stored with the data

For a measurement
File name File header data Identifier Units (in. or mm) LOS (loss-of-signal) Differential mode Differential reference value Alarm mode Alarm status Alarm set points Minimum or maximum mode Minimum or Maximum Reading Resolution

You can store approximately 475000 thickness values. You can double the storage capacity by using an optional removable microSD memory card. The maximum size of the removable microSD card that can be used on the Magna-Mike 8600 is 2 GB.

With the datalogger, you can easily create a data file (see "Creating a Data File" on page 113), perform a number of file operations (see "Performing File Operations" on page 122), and perform data operations (see "Setting the ID Overwrite Protection" on page 129).

7.2 Creating a Data File

The following procedure describes how to create a data file in the Magna-Mike 8600.

To create a data file

1. In the measurement screen, press **[FILE]**, and then select **CREATE**.
2. In the **FILE CREATE** screen (see Figure 7-2 on page 114):
   a) In the **FILE NAME** parameter, using up to 32 characters, enter the desired file name.
   b) In the **DESCRIPTION** parameter, optionally enter a description of the contents of the file.
   c) In the **INSPECTOR ID**, optionally enter an identification of the inspector.
   d) In the **LOCATION NOTE** parameter, optionally enter an identification of where the measurements are performed.
3. Select the desired **FILE TYPE**: **INCREMENTAL**, **SEQUENTIAL**, **SEQUENTIAL + CUSTOM**, or **2D**.

INCREMENTAL	see "Incremental Data File Type" on page 114
SEQUENTIAL	see "Sequential Data File Type" on page 117
SEQUENTIAL + CUSTOM	see "Sequential Data File Type with Custom Points" on page 118
2D	see "2D Grid Data File Type" on page 120

4. Set the **DELETE PROTECTION** mode **ON** or **OFF**.
   DELETE PROTECTION locks the file so it cannot be deleted. You can unlock the file for deletion using the file edit function.

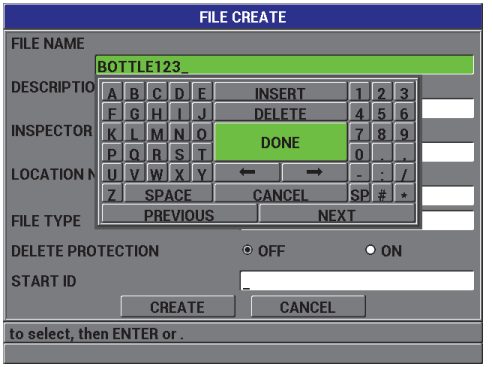


Figure 7-2 The FILE CREATE screen

5. Select **CREATE** to return to the measurement screen.

TIP

At any time, you can highlight **NEXT** or **PREVIOUS** and then press **[ENTER]** to jump to the next or previous parameters on the screen.

7.2.1 Data File Types

You can create a data file using one of the following four data file types:

- Incremental
- Sequential
- Sequential with Custom Points
- 2D Matrix Grid

7.2.2 Incremental Data File Type

The incremental data file type uses the alphanumeric start ID value (up to 20 characters) and automatically increments to the subsequent ID value using the following incrementing rules:

- Increments only digits and letters, not punctuation or other special characters.

- Begins incrementing with the right-most character.
- Extends leftward until reaching the first punctuation or special character, or the left-most character, whichever comes first.
- Increments digits from 0, 1, 2,..., 9. Makes the 9 to 0 transition only after incrementing the character to the left.
- Increments letters from A, B, C,..., Z. Makes the Z to A transition only after incrementing the character to the left.
- When an ID cannot be incremented after saving a reading, the **Cannot increment ID!** message momentarily appears in the help text bar. Subsequent saves overwrite the reading of the last possible ID until you change the ID value range.

NOTE

To make the gage increment through a range of numbers several digits wide while beginning with a single digit ID number, the maximum number of digit positions must be entered initially using leading zeroes (see examples in Table 13 on page 115).

Table 13 Resulting ID examples for the INCREMENTAL file type

START ID	Resulting IDs	
1	1, 2, 3,..., 9	
0001	0001 0002 0003 ... 0009	0010 ... 9999
ABC	ABC ABD ABE ... ABZ	ACA ACB ACC ... ZZZ
1A	1A 1B 1C 1Z	2A 2B ... 9Z

Table 13 Resulting ID examples for the INCREMENTAL file type *(continued)*

START ID	Resulting IDs
ABC*12*34	ABC*12*34 ABC*12*35 ABC*12*36 ... ABC*12*99

To create an incremental data file

1. In the measurement screen, press **[FILE]**, and then select **CREATE**.
2. In the **FILE CREATE** screen (see Figure 7-2 on page 114):
   a) In the **FILE NAME** parameter, using up to 32 characters, enter the desired file name.
   b) In the **DESCRIPTION** parameter, optionally enter a description of the contents of the file.
   c) In the **INSPECTOR ID**, optionally enter an identification of the inspector.
   d) In the **LOCATION NOTE** parameter, optionally enter an identification of where the measurements are performed.
3. Select **INCREMENTAL** in the **FILE TYPE field**, and then enter the **START ID** value (see Figure 7-3 on page 116).
4. Set the **DELETE PROTECTION** mode **ON** or **OFF**.
5. Select **CREATE** to return to the measurement screen.

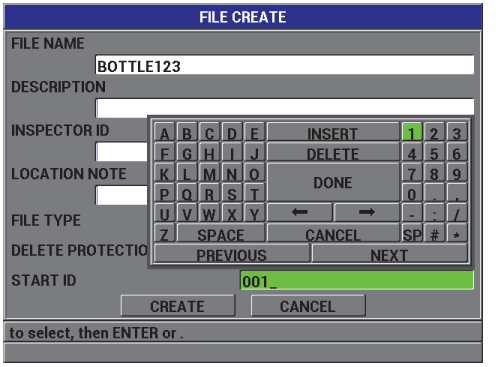


Figure 7-3 The FILE CREATE screen for the incremental data file type

7.2.3 Sequential Data File Type

The sequential data file type is similar to the incremental type but you can define both a starting and ending ID numbers. The resulting file is inclusive of the starting and ending points and all incremental points in between (see examples in Table 14 on page 117).

Table 14 Resulting ID examples for the SEQUENTIAL file type

START ID	END ID	Resulting IDs
ABC123	ABC135	ABC123 ABC124 ABC125 ... ABC135
XY-GY	XY-IB	XY-GY XY-GZ XY-HA ... XY-IB

To create a sequential data file

1. In the measurement screen, press **[FILE]**, and then select **CREATE**.
2. In the **FILE CREATE** screen (see Figure 7-2 on page 114):
   a) In the **FILE NAME** parameter, using up to 32 characters, enter the desired file name.
   b) In the **DESCRIPTION** parameter, optionally enter a description of the contents of the file.
   c) In the **INSPECTOR ID**, optionally enter an identification of the inspector.
   d) In the **LOCATION NOTE** parameter, optionally enter an identification of where the measurements are performed.
3. In the **FILE TYPE** field, select **SEQUENTIAL**.
4. Set the **DELETE PROTECTION** mode **ON** or **OFF**.
5. At the bottom of the **FILE CREATE** screen, select **CONTINUE**.
6. In the second page of the **FILE CREATE** screen (see Figure 7-4 on page 118), enter the **START ID** and **END ID** values.
7. Select **CREATE** to return to the measurement screen.

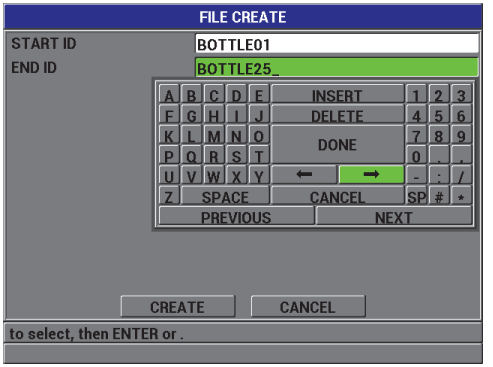


Figure 7-4 Selecting the ID range for the sequential file type

7.2.4 Sequential Data File Type with Custom Points

The sequential data file type with custom points (**SEQUENTIAL + CUSTOM**) is defined by a starting and an ending ID number plus a series of custom points. The resulting file is inclusive of the start and end points and all points in between. In addition, multiple thickness readings per ID number location are assigned using the assigned custom points.

Use the sequential data file type with custom points for example when you want to measure along a pipe or tube, where at each ID number location, you can take measurements at the top, bottom, left, and right of the pipe (see an example in Table 15 on page 118).

Table 15 Resulting ID example for the SEQUENTIAL + CUSTOM file type

START ID	END ID	Custom points	Resulting IDs
XYZ1267	XYZ1393	TOP BOTTOM LEFT RIGHT	XYZ1267TOP XYZ1267BOTTOM XYZ1267LEFT XYZ1267RIGHT XYZ1268TOP XYZ1268BOTTOM XYZ1268LEFT ... XYZ1393RIGHT

The allowable number of characters for each custom point depends on the ID number of characters defined in the start and end ID values. The total number of characters of the ID value plus the custom points cannot exceed 20 characters. For example, when the start and end ID values are seven characters long, as in the example in Table 15 on page 118, the maximum allowable length for each custom point is 13 (20 − 7 = 13).

To create a sequential data file with custom points

1. In the measurement screen, press **[FILE]**, and then select **CREATE**.
2. In the **FILE CREATE** screen (see Figure 7-2 on page 114):
   a) In the **FILE NAME** parameter, using up to 32 characters, enter the desired file name.
   b) In the **DESCRIPTION** parameter, optionally enter a description of the contents of the file.
   c) In the **INSPECTOR ID**, optionally enter an identification of the inspector.
   d) In the **LOCATION NOTE** parameter, optionally enter an identification of where the measurements are performed.
3. In the **FILE TYPE** field, select **SEQUENTIAL + CUSTOM**.
4. Set the **DELETE PROTECTION** mode **ON** or **OFF**.
5. At the bottom of the **FILE CREATE** screen, select **CONTINUE**.
6. In the second page of the **CREATE** screen (see Figure 7-5 on page 120):
   a) Enter the **START ID** and **END ID** values.
   b) Enter two or more **CUSTOM POINTS** values.
7. Once all CUSTOM POINTS are entered, select **DONE** (without entering a custom point) to exit the entry list.
8. Select **CREATE** to return to the measurement screen.

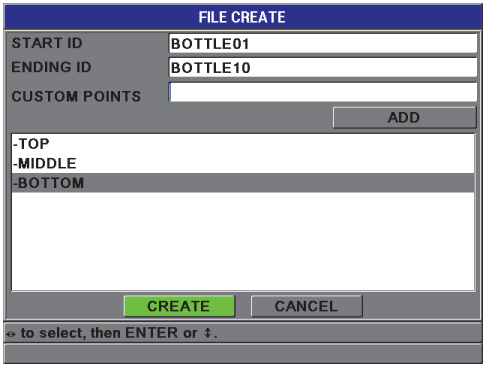


Figure 7-5 Configuring the ID range for a sequential file with custom points

7.2.5 2D Grid Data File Type

A grid is a sequence of ID numbers arranged to describe a two-dimensional path. Each part of the ID number corresponds to a particular matrix dimension.

A 2D (two-dimensional) sequence begins with the ID number that refers to the first column and the first row (see Figure 7-6 on page 121). Then the column (or row) increments one value at a time until the sequence reaches the last column (or row) value while the other dimension value stays constant. At this point, the other dimension increments from its first to its last value. This continues until the ID number that refers to the last column and the last row is reached. You can select to first increment either the columns or the rows.

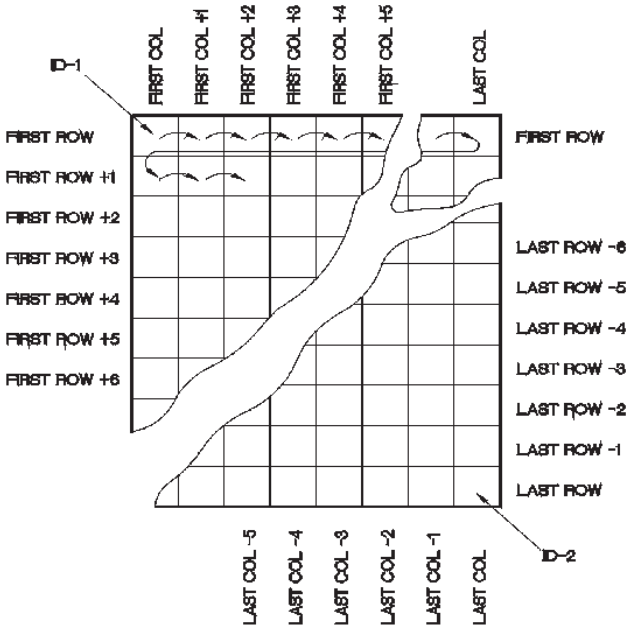


Figure 7-6 General 2D grid example

To create a 2D grid data file

1. In the measurement screen, press **[FILE]**, and then select **CREATE**.
2. In the **FILE CREATE** screen (see Figure 7-2 on page 114):
   a) In the **FILE NAME** parameter, using up to 32 characters, enter the desired file name.
   b) In the **DESCRIPTION** parameter, optionally enter a description of the contents of the file.
   c) In the **INSPECTOR ID**, optionally enter an identification of the inspector.
   d) In the **LOCATION NOTE** parameter, optionally enter an identification of where the measurements are performed.
3. In the **FILE TYPE** field, select **2D**.
4. Set the **DELETE PROTECTION** mode **ON** or **OFF**.
5. At the bottom of the **FILE CREATE** screen, select **CONTINUE**.
6. In the second page of the **CREATE** screen (see Figure 7-7 on page 122):

a) Enter the **START COLUMN**, **END COLUMN**, **START ROW**, and **END ROW** values.

b) In the **INC 1ST BY** field, select which parameter increments first: **ROW** or **COLUMN**.

7. Select **CREATE** to return to the measurement screen.

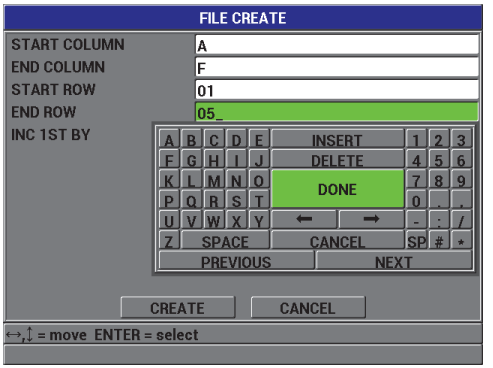


Figure 7-7 Configuring the ID range for a 2D grid data file type

7.3 Performing File Operations

Pressing **[FILE]** opens a menu from which you can perform numerous file operations (see Figure 7-8 on page 123). The following sections describe how to perform the operations. Datalogger files are stored in the internal microSD memory card. You can import/export files from/to a removable microSD memory card.

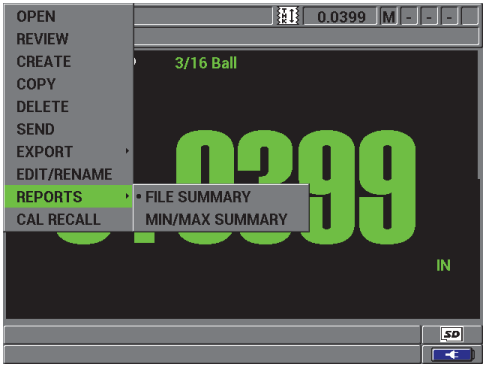


Figure 7-8 The FILE menu and REPORTS submenu

7.3.1 Opening a File

You can open an existing file to make it the active file to which new measurements will be saved.

To open a file

1. Press **[FILE]**, and then select **OPEN**.
2. In the **FILE OPEN** screen (see Figure 7-9 on page 124), select the file in the list that you wish to open, and then press **[ENTER]**.
   The descriptive header for the highlighted file name appears on the lower section of the display.
3. Select **OPEN** to return to the measurement screen with the selected file as the active file and the ID number set to the first ID number in the file.

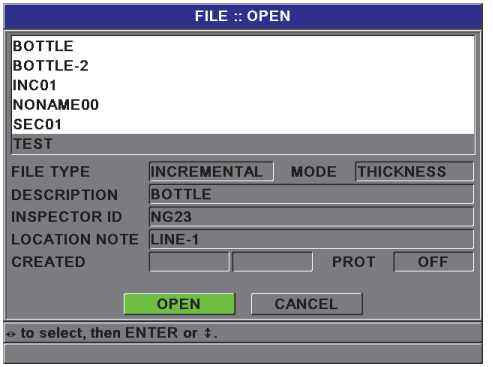


Figure 7-9 Opening a file

7.3.2 Copying a File

You can duplicate a file that already exists in the datalogger. The file copy function is useful when you need to create a new file with the exact same ID number structure as a previously created file. You can also choose to copy the thickness data.

The file copy only allows you to copy an existing file within the internal memory. Use the file **EXPORT** function to copy data between the internal memory and the removable microSD card.

To copy a file

1. In the measurement screen, press **[FILE]**, and then select **COPY**.
2. In the **FILE COPY** screen (see Figure 7-10 on page 125), highlight the desired source file in the list, and then press **[ENTER]**.
   a) In the **COPY NAME** field, enter the name of the destination file.
   b) Set **COPY THICKNESS DATA?** to **YES** when you want to also copy the thickness readings from the original file into the new file.
3. Select **COPY** to return to the measurement screen.

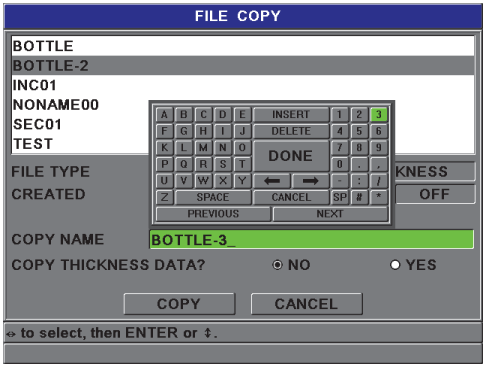


Figure 7-10 Copying a file

4. Open the newly created file when you want to make it the active file (see "Opening a File" on page 123).

7.3.3 Editing a File

Once a file is created, you can use the edit function to change the following file parameters:

- File name
- File description
- Inspector ID
- Location note
- Delete protection (on/off)

The edit function does not let you edit the file type and can not be used to edit individual measurement identifiers (ID) or actual thickness readings.

To edit an existing file

1. In the measurement screen, press **[FILE]**, and then select **EDIT/RENAME**.
2. In the **FILE EDIT** screen (see Figure 7-11 on page 126), select the desired file in the list.

NOTE

When scrolling through the file names, a descriptive header for the highlighted file name appears on the lower section of the display. This information can assist in selecting the proper file if you are uncertain of the exact file name.

a) To rename the file, edit the **NAME** value.

b) Edit the file description (**DESCRIPTION**), the inspector identification (**INSPECTOR ID**), and the location note (**LOCATION NOTE**) values as needed.

c) To change the file lock state, set **DELETE PROTECTION** to **ON** or **OFF**.

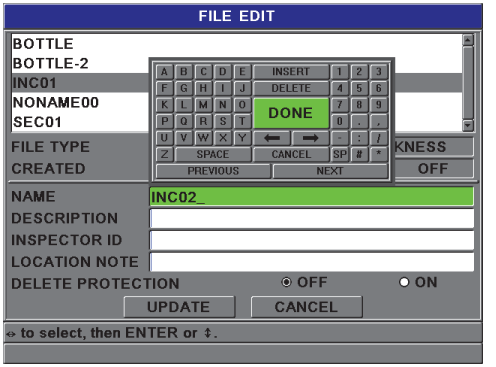


Figure 7-11 Entering new file information

3. Select **UPDATE** to return to the measurement screen.

7.3.4 Deleting a File or Its Contents

You can use the file delete function to completely erase the file from the datalogger memory or to erase the contents of a file. Files that are delete-protected cannot be deleted until the delete protection is disabled (see “Editing a File” on page 125).

CAUTION

Once you delete a file, you cannot recover any information that was once contained in that file.

To delete a file stored in the Magna-Mike 8600

1. In the measurement screen, press **[FILE]**, and then select **DELETE**.
2. In the **FILE DELETE** screen (see Figure 7-12 on page 127), select the file to be deleted in the list.
3. Set the **DELETE MODE** to **DATA** to only delete the contents of the file.
   OR
   Set the **DELETE MODE** to **FILE** to completely erase the file from the memory.
4. Select **DELETE** to perform the operation and return to the measurement screen.

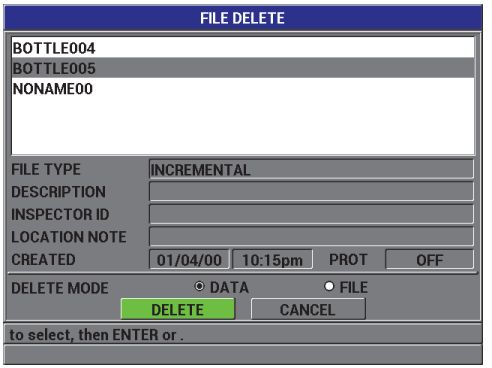


Figure 7-12 The FILE DELETE screen

NOTE

When you select to delete files that are delete-protected, the Magna-Mike 8600 will display the following message: "**File delete protection is ON!**".

7.3.5 Deleting All Data Files

You can use the reset function to quickly erase all the files stored in the Magna-Mike 8600.

CAUTION

Using the **DATABASE RESET** or **MASTER RESET** will erase all files and data contained in those files. The deleted files and the data they contain cannot be recovered. The datalogger will be completely empty after this procedure.

To delete all files

1. Press **[SET UP]**, and then highlight **RESET**.
2. In the **RESET** submenu, select **DATABASE** to display the **DATABASE RESET** warning message (see Figure 7-13 on page 128).
3. Select **RESET** to delete all the files.
   OR
   Select **CANCEL** or press **[MEAS]** to abort the operation.

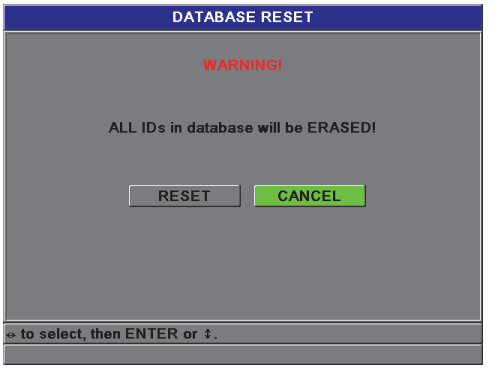


Figure 7-13 DATABASE RESET — Warning message

7.4 Setting the ID Overwrite Protection

You can activate the ID overwrite protection to warn you every time that you attempt to overwrite an existing measurement in a file. You can enable this function at any time.

When the ID overwrite protection is enabled, a message (see Figure 7-14 on page 129) appears when you attempt to save data over existing thickness readings. Select **YES** to replace the previous reading with the new one, or select **NO** to keep the original value.

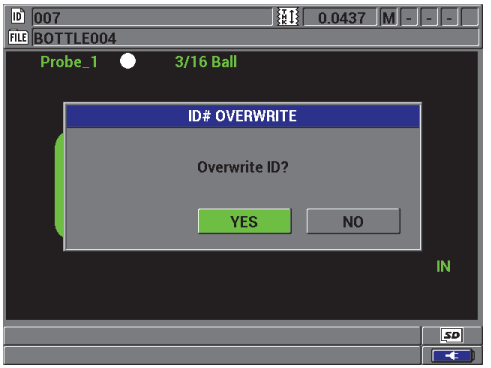


Figure 7-14 The ID# OVERWRITE protection message

To set the ID overwrite protection

1. In the measurement screen, press **[SET UP]**, and then highlight **MEASUREMENT**.
2. In the **MEASUREMENT** submenu, select **ID OVERWRITE PROT**.
3. Set the **ID OVERWRITE PROT** to **ON** or **OFF**.
4. Press **[MEAS]** to return to the measurement screen.

7.5 ID Review Screen

You can review the data stored in the active file using the ID review screen. You toggle the state of the ID review screen by pressing **[ID#]**. The ID review screen shows the data for the active ID.

Figure 7-15 on page 130 shows an example of ID review screen and describes its contents. The flags are the same single letter abbreviations for status words that are transmitted by the gage using the send commands.

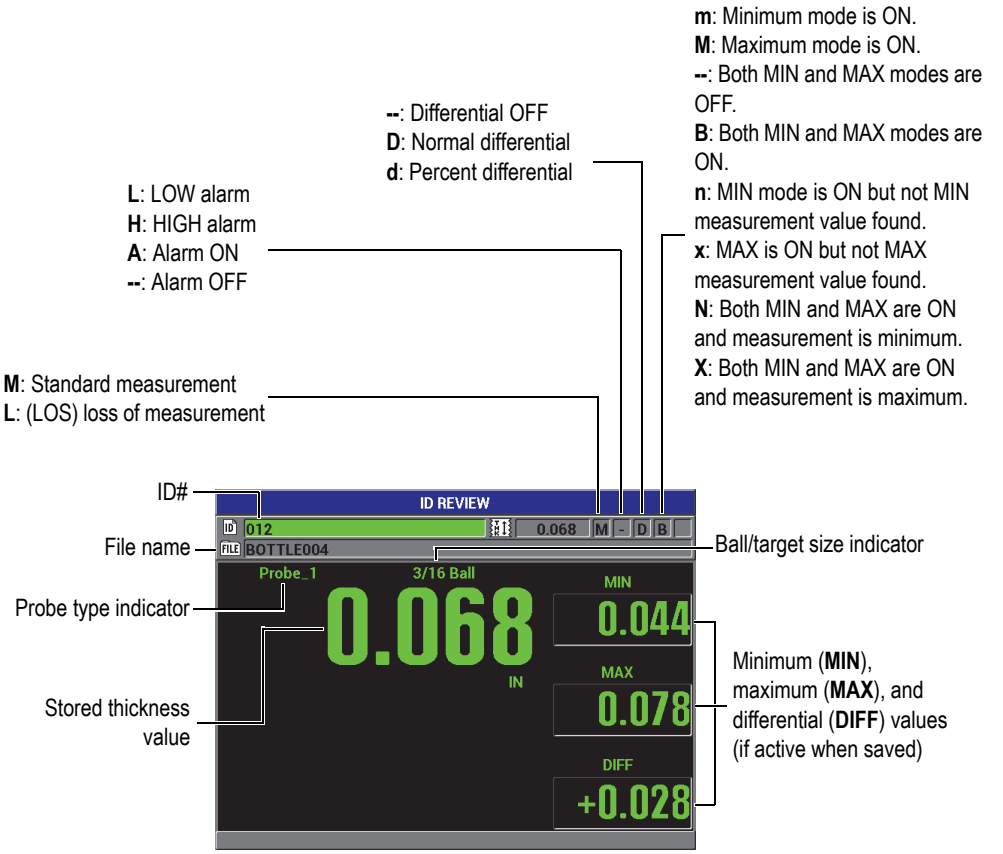


Figure 7-15 The ID REVIEW screen

The ID review screen has three purposes:

- Review datalogger contents by scanning through stored ID locations in the active file.
- Move within the data file and change the current ID location to any location that already exists in the data file.

- Change the current ID location to any location that already exists in the data file for the purposes of editing that ID location.

7.5.1 Reviewing Stored Data and Changing the Active ID

You use the ID review screen to review the data in the active file.

To review stored data and change the active ID

1. Open the file that you wish to review (see "Opening a File" on page 123).
2. In the measurement screen, press **[ID#]**, to open the **ID REVIEW** screen (see Figure 7-15 on page 130):
   a) Review the status flags, and measured values for the active ID.
   b) Press **[▲]** to display the data for the next ID in the file.
   c) Press **[▼]** to display the data for the previous ID in the file.
   d) Press **[ENTER]**, and then press **[▼]** to jump to the first ID in the file.
   e) Press **[ENTER]**, and then press **[▲]** to jump to the last ID in the file.
   f) Press **[ID#]** to edit the ID (see "Editing the ID" on page 131).
3. Press **[MEAS]** to return to the measurement screen with the new active ID.

7.5.2 Editing the ID

You can edit the ID for changing the active ID to quickly jump to an existing ID. This is useful when you are using a large database and it would take too long to locate the desired ID using the arrow keys.

NOTE

No stored data is shown while editing the ID.

To use the ID edit mode

1. Open the file in which you wish to edit an ID (see "Opening a File" on page 123).
2. In the measurement screen, press **[ID#]**.
3. Select the ID you wish to edit (see "Reviewing Stored Data and Changing the Active ID" on page 131).

4. Press **[ID#]** again, and edit the ID value (see Figure 7-16 on page 132).

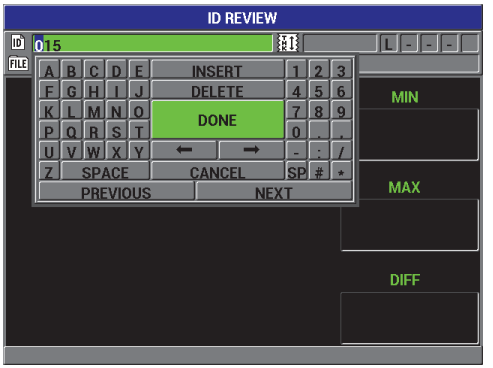


Figure 7-16 Editing the ID number

5. Press **[MEAS]** to return to the measurement screen with the new active ID.

TIP

To replace a thickness reading, it is easier to save a new measurement at the desired ID in the measurement screen. If you do not want to save a measurement at a specific ID, press **[SAVE]** in the measurement screen when you are not taking a measurement. This stores an **LOS** condition and -.--- at the specific ID number.

7.6 Generating Reports

The Magna-Mike 8600 can generate data reports without having to connect to a computer. The following reports are available:

File summary

Shows basic statistics for the file (minimum thickness, maximum thickness, high and low alarm conditions along with the mean, median, and standard deviation).

Minimum/Maximum summary

Shows a list of ID number location that have the minimum and maximum thickness in a file.

To generate a report

1. In the measurement screen, press **[FILE]**, and then highlight **REPORTS**.
2. In the **REPORTS** submenu, select the desired type of report.
3. If you select **FILE SUMMARY**, go to step 4.
   OR
   If you select **MIN/MAX SUMMARY**, go to step 5.
4. In the **FILE SUMMARY** screen (see Figure 7-17 on page 133):
   a) Select the file for which you want to create the report.
   b) Select **REPORT** to display the **FILE SUMMARY** report result screen (see Figure 7-18 on page 134).

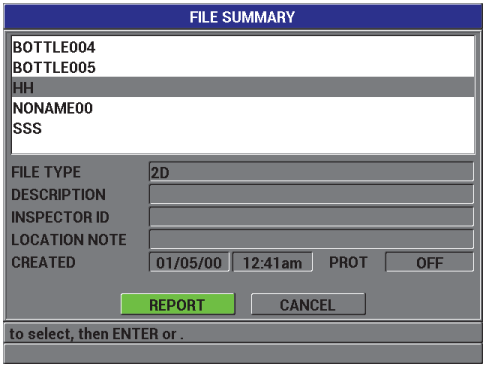


Figure 7-17 The FILE SUMMARY screen

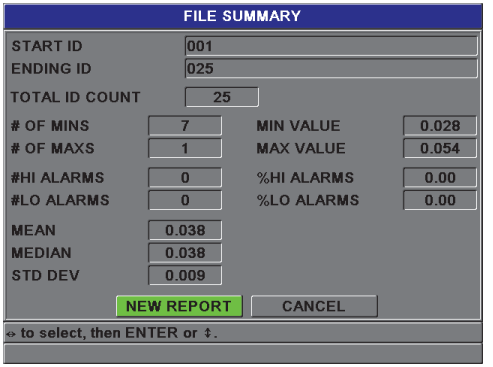


Figure 7-18 The FILE SUMMARY report screen

c) Select **CANCEL** to return to the **FILE** menu.
OR
Select **NEW REPORT** to select a different file and generate another report.

5. In the **MIN/MAX SUMMARY** screen (see Figure 7-19 on page 134):
   a) Select the file for which you want to create the report.
   b) Select **REPORT** to display the **MIN/MAX SUMMARY** report screen with the first MIN ID# highlighted (see Figure 7-20 on page 135).

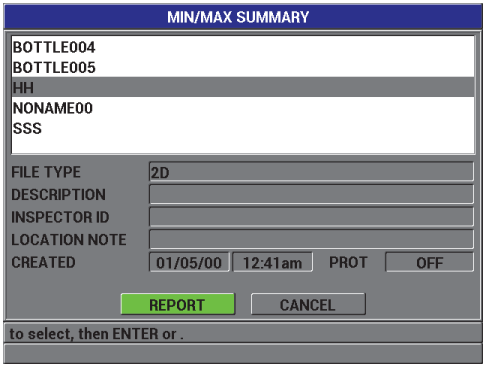


Figure 7-19 The MIN/MAX SUMMARY screen

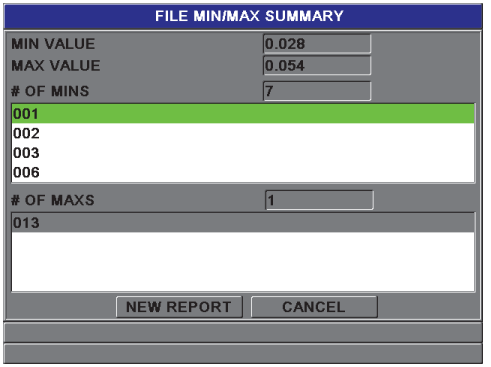


Figure 7-20 The FILE MIN/MAX SUMMARY report screen

c) Select **CANCEL** to return to the **FILE** menu.
OR
Select **NEW REPORT** to select a different file and generate another report.

8. Managing Communications and Data Transfer

This section describes how the Magna-Mike 8600 can communicate with a computer to export files. The Magna-Mike 8600 has two communication ports: USB and RS-232.

The Magna-Mike 8600 comes standard with either a USB cable for communicating using the USB 2.0 protocol or an RS-232 cable (see Table 16 on page 140) to use RS-232 communication. The Magna-Mike 8600 can send data to any device capable of receiving ASCII-formatted data using the RS-232C protocol. This includes personal computers and dataloggers. The data cable must be compatible with the Magna-Mike 8600 output connector and the serial input connector of the receiving device.

8.1 About WINXL

WINXL is the Olympus interface program designed to communicate with the Magna-Mike 8600. WINXL allows the user to single send or send thickness data files from the Magna-Mike 8600 directly to a Microsoft Excel spreadsheet. WINXL can also be used to upgrade the internal operating software of the Magna-Mike 8600.

NOTE

Microsoft Excel must be installed on the PC prior to installing WINXL.

WINXL is compatible with Windows XP, Vista, and Windows 7.

8.2 Setting Up USB Communication

The default communication protocol for the Magna-Mike 8600 is USB 2.0. The Magna-Mike 8600 can also be set to use RS-232 serial communication (see "Setting Up RS-232 Serial Communication" on page 139).

To set up the USB communication

1. Ensure that the Magna-Mike 8600 driver is installed on the computer. This driver is installed when you install the WINXL interface program.
2. Once WINXL has been installed, turn on the Magna-Mike 8600.
3. In the measurement screen, press **[SET UP]**, and then highlight **COMMUNICATION**.
4. In the **COMMUNICATION** submenu, select **CONNECTION TYPE**.
5. In **COMMUNICATIONS SETUP** screen, set the **CONNECTION TYPE** to **USB** (see Figure 8-1 on page 138).

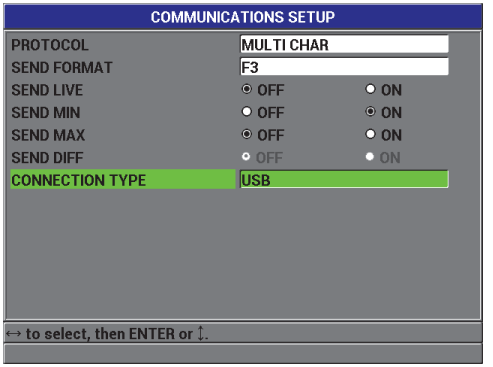


Figure 8-1 The COMMUNICATIONS SETUP screen — USB

6. Press **[MEAS]** to return to the measurement screen.
7. Connect one end of a USB cable to the USB client connector behind the I/O door of the Magna-Mike 8600, and the other end to a USB port of the computer (see Figure 8-2 on page 139).

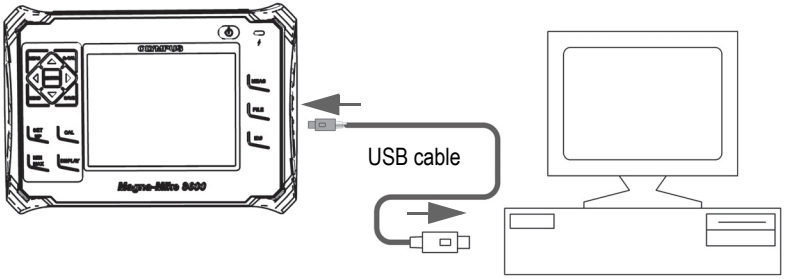


Figure 8-2 Connecting the Magna-Mike 8600 to a computer

The first time that you connect the Magna-Mike 8600 to this computer, the computer prompts you that a new hardware device has been detected and asks if you would like to install the driver.

The driver loads, and then you can start to use a program such as WINXL to communicate with the Magna-Mike 8600.

TIP

If you experience problem to establish the communication between the Magna-Mike 8600 and a remote device, consider using the Magna-Mike 8600 communication reset function to return all communication parameters to the default values (see "Resetting the Communication Parameters" on page 148), and then reconfigure only needed communication parameters.

8.3 Setting Up RS-232 Serial Communication

The Magna-Mike 8600 can transmit stored data and displayed readings over its input/output (I/O) RS-232 cable to other devices with a RS-232 serial interface. The Magna-Mike 8600 can also receive and execute commands sent from other devices with a serial interface, such as personal computers. A remote command document is available upon request.

The RS-232 cable available for the Magna-Mike 8600 is a 9-pin male connector. To connect to other RS-232 devices that do not have a 9-pin female connector, a commercially available adaptor may be required. The RS-232 cable is an option, which you can specify at the time of order (see Table 16 on page 140).

Table 16 Optional RS-232 cable

I/O cable part number	Computer serial port connector	Cable length	Typical device
600-C-RS232-5 (U8780299)	"D" Type, 9-pin male	6 ft. (2 m)	Windows computer

The serial communication parameter configuration must be the same in both the Magna-Mike 8600 and the other device. In the Magna-Mike 8600, the baud rate is selectable (1200, 2400, 4800, 9600, 19200, 38400):

- Word length: fixed at 8 characters
- Stop Bits selectable: 1 or 2
- Parity selectable: None, even, or odd

To set up the RS-232 serial communication

1. Refer to the receiving device hardware and software documentation, and set the receiving device serial communication parameters to values supported by the Magna-Mike 8600:
   a) Set the baud rate to 1200, 2400, 4800, 9600, 19200, or 38400.
   b) Set the stop bits to 1 or 2.
   c) Set the parity to none, even, or odd.
2. On the Magna-Mike 8600, in the measurement screen, press **[SET UP]**, and then highlight **COMMUNICATION.**
3. In the **COMMUNICATION** submenu, select **CONNECTION TYPE**.
4. In the **COMMUNICATIONS SETUP** screen (see Figure 8-3 on page 141), set **CONNECTION TYPE** to **RS-232** in order to display the RS-232 parameters.
   a) Set the **BAUD RATE** to the same value as selected in step 1.*a* above.
   b) Set the **STOP BITS** to the same value as selected in step 1.*b* above.
   c) Set the **PARITY** to the same value as selected in step 1.*c* above.

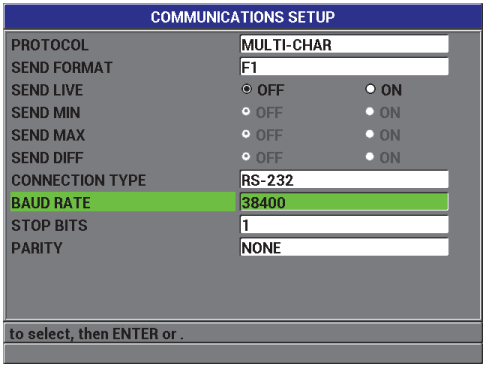


Figure 8-3 The COMMUNICATIONS SETUP screen — RS-232

5. Using the appropriate RS-232 cable (see Table 16 on page 140), connect the Magna-Mike 8600 to the remote serial communication device.
6. If needed, on the remote serial communication device, start the serial communication program.
7. Press **[MEAS]** to return to the measurement screen.

TIP

If you experience problem to establish the communication between the Magna-Mike 8600 and a remote device, consider using the Magna-Mike 8600 communication reset function to return all communication parameters to the default values (see "Resetting the Communication Parameters" on page 148) and reconfigure only needed communication parameters.

8.4 Exchanging Data with a Remote Device

You can exchange Magna-Mike 8600 data with a remote device such as a computer.

8.4.1 Sending Entire Files (RS-232)

You can send a single or all files from the Magna-Mike 8600 to a computer or other device. The data that is transmitted includes the file name, the file header, ID numbers, thickness data, flags, and calibration setups.

To send entire files from the Magna-Mike 8600 to a computer

1. Ensure that the RS-232 communication parameters are configured correctly (see "Setting Up RS-232 Serial Communication" on page 139).
2. In the measurement screen, press **[FILE]**, and then select **SEND**.
3. In the **FILE SEND** screen (see Figure 8-4 on page 142):
   - Choose **SELECTED** to send a single file.

     OR

     Choose **ALL** to send all files.
4. If you chose **SELECTED**, highlight the desired file in the list, and then press **[ENTER]** to select the file.

   OR

   If you chose **ALL**, just press **[ENTER]**.
5. Select **SEND** at the bottom of the screen.

   The following message may appear on the help text bar while the data is transferred: "**Processing. Please wait**".

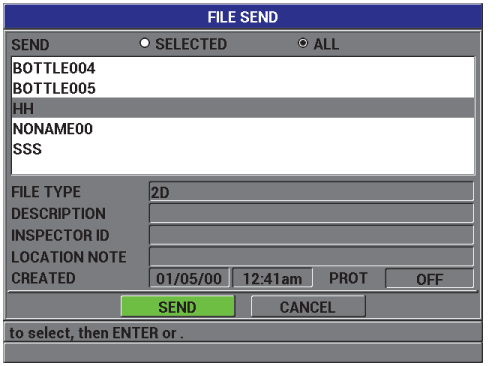


Figure 8-4 The FILE SEND screen

8.4.2 Sending the Currently Displayed Measurement

You can transmit the current displayed measurement data only. This function is useful when the Magna-Mike 8600 is continuously connected to an external device (data collector or computer) and you need to collect only data on command.

To perform a single send

1. Setup the desired measurement screen on the Magna-Mike 8600.
2. Make a thickness reading.
3. Press **[SEND]**.

   The displayed measurement data with its appropriate setup flags is transmitted and the instrument returns to the original measurement screen.

NOTE

The specific data transmitted depends on the datalogger output format. Pressing **[SEND]** while the thickness display is blank sends "—.—-" and the displayed flags.

NOTE

When a displayed reading is sent, the reading held in memory becomes blank, and the minimum or maximum function is reset.

8.4.3 Exporting a File to the Removable Memory Card

The Magna-Mike 8600 has the ability to export files from the internal memory to the removable microSD memory card. You can export the files in CSV (comma separated values) or text (space delimited). Using a microSD card reader, you can then open these files directly on your computer in Microsoft Excel or many other programs.

To export files to the removable memory card

1. Ensure that a microSD memory card is inserted in its slot under the I/O door on the right side of the Magna-Mike 8600 (see Figure 8-5 on page 144).

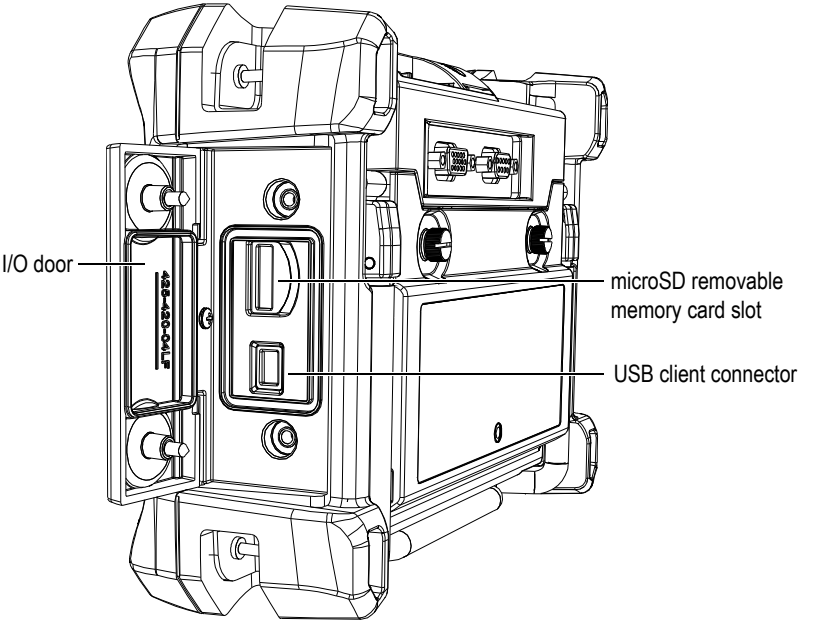


Figure 8-5 The connectors behind the I/O door

2. In the measurement screen, press **[FILE]**, and then highlight **EXPORT**.
3. In the **EXPORT** submenu, select one of the following file formats:

   EXCEL CSV: For files to be opened in Microsoft Excel.
   OR
   TEXT FILE: For files to be opened in many Windows-based programs.
4. In the **FILE EXPORT** screen (see Figure 8-6 on page 145), select either:

   SELECTED: to allow the user to highlight a file in the file list to be exported.
   OR
   ALL: will export all files.
5. Select **EXPORT** to export the highlighted file, if **SELECTED** was chosen, or all the files, if **ALL** was chosen. The file(s) are created in the following folder on the removable microSD memory card: *Export*.
   OR
   Select **CANCEL**.
   The instrument automatically returns to the measurement screen.

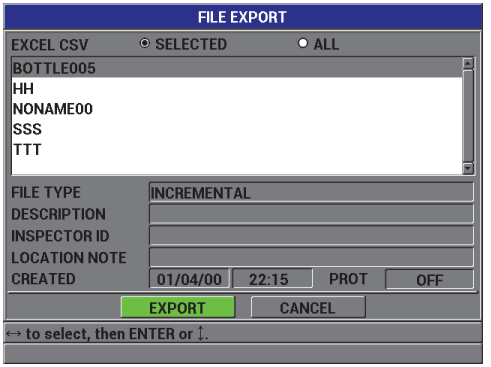


Figure 8-6 The FILE EXPORT screen

8.5 Capturing Magna-Mike 8600 Screen Images

You can save a snapshot of the full Magna-Mike 8600 screen contents to an image file. This function is useful when you need an exact replica of the display for reporting or documentation purposes. You can do this by sending a Screen Capture to the removable microSD card.

The Magna-Mike 8600 has the ability to copy the contents of the current screen to the removable microSD card. The screen shot is saved as a bitmap (.bmp) file. You can then connect the microSD card to a computer and open the file in any program that can view bitmap (.bmp) files.

To send a screen capture to the removable microSD card

1. Ensure that a microSD memory card is inserted in its slot under the I/O door on the right side of the Magna-Mike 8600 (see Figure 8-5 on page 144).
2. Select the screen that you wish to capture.
3. Hold **[SEND]**, and then press **[ID#]**.
   The screen freezes for about 20 seconds as the file is being sent to the removable memory card.

   The screen shots are automatically named BMP*n*.bmp where *n* starts at 0 and is incremented by one each time a new screen shot is added.
4. To transfer the image file:
   a) Remove the microSD memory card from its slot in the Magna-Mike 8600.

b) Using a microSD card reader, connect the memory card to a computer.

c) Copy the file from the microSD card to the desired folder on the computer.

8.6 RS-232 Serial Data Output Formats

The Magna-Mike 8600 supports ten output formats for RS-232 transmitted data. Table 17 on page 146 describe the contents of each format.

NOTE

For USB communications, the output format is normally set to F1.

Table 17 Serial data output format for Magna-Mike 8500 and Magna-Mike 8600

Format	File header File name length	Thickness table	MIN, MAX, DIFF	Setup table	Statistics
F1		✓		✓	
F2		✓			
F3	✓	✓	✓	✓	✓
F4		✓	✓		
F5		✓			
F6	✓	✓		✓	
F7	✓	✓			
F8		✓		✓	
F9		✓		✓	✓
F10		✓	✓ [a]		

a. Minimum value if MIN is turned on; actual value if MIN is turned off.

NOTE

Formats F1, F2, F5, F6, F7, F8, and F9 are Magna-Mike 8500 compatible formats that have an 8-character file name and a 16-character ID number.
Formats F3 and F4 are Magna-Mike 8600 compatible formats that have a 32-character file name and a 20-character ID number.

To view or change the current output file format

1. In the measurement screen, press **[SET UP]**, and then highlight **COMMUNICATION**.
2. In the **COMMUNICATION** submenu, select **SEND FORMAT**.
3. In the **COMMUNICATIONS SETUP** screen, view or change the **SEND FORMAT** value (see Table 17 on page 146 for a description of the formats).

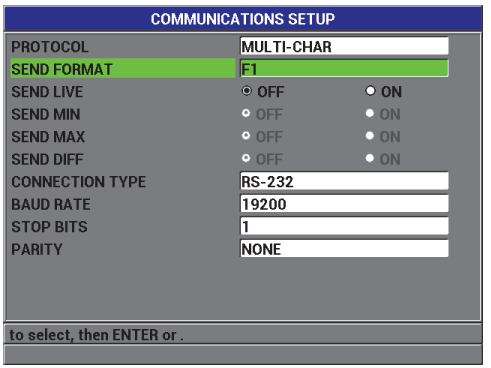


Figure 8-7 The COMMUNICATIONS SETUP screen — SEND FORMAT

4. Press **[MEAS]** to return to the measurement screen.

8.7 Resetting the Communication Parameters

The communication reset function quickly returns communication parameters to the factory default values. This function may be useful when you experience difficulties to establish the communication with a remote device. Table 18 on page 148 gives the default values for the communication parameters.

Table 18 Default communication parameter values

Parameter	Value
PROTOCOL	MULTI CHAR
OUTPUT FORMAT	F1
CONNECTION TYPE	USB

To reset the communication parameters

1. Press **[SET UP]**, and then highlight **RESET** (see Figure 8-8 on page 148):
2. In the **RESET** submenu, select **COMMUNICATION** to display the **COMMUNICATION RESET** screen (see Figure 8-9 on page 149).
3. Select **RESET** to reset the communication parameters.
   OR
   Select **CANCEL** or press **[MEAS]** to abort the operation.

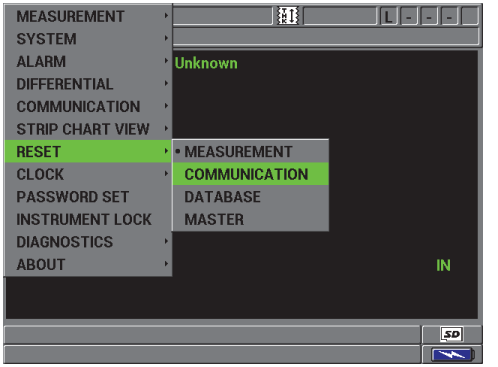


Figure 8-8 The COMMUNICATION RESET screen

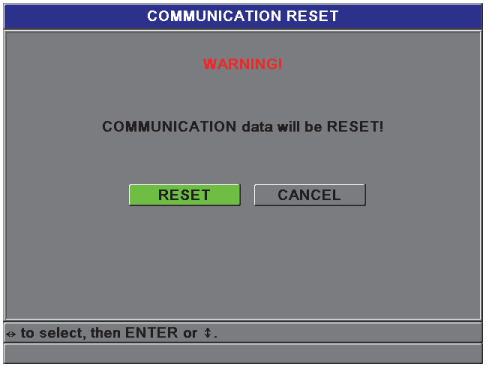


Figure 8-9 The COMMUNICATION RESET screen — Warning message

9. Maintenance and Troubleshooting

The Magna-Mike 8600 is an industrial quality electronic instrument that requires very little maintenance. Most troubleshooting and maintenance procedures may be done by the user. However if problems persist, please contact Olympus for technical assistance.

9.1 Probe

If an unknown target error message occurs during calibration, it means that the gage is unable to identify the target or target ball. The Magna-Mike 8600 can only auto-detect the target balls when 86PR-1 and 86PR-2 probes are used. You must manually select the target when using the 86PR-3 probe or when using a target disk or wire. This could also be due to probe failure, or that the target ball is not resting centered on top of the probe tip. Verify that the ball is in the alignment fixture; the fixture moves freely and is seated correctly on the probe; and the ball is sitting on the probe tip. (If the alignment or reference fixtures do not slide onto the probe freely, the target ball may be at an incorrect distance away from the tip.)

9.2 Battery (Optional Lithium-Ion)

Under normal operating conditions, the gage can operate for at least 15 hours to 16 hours between charges. The percentage of remaining battery charge constantly appears at the lower-right corner of the display, indicating the remaining battery life. When the battery charge becomes insufficient, the gage automatically turns off to prevent damage to the battery. Recharge the battery using the charger and line cord supplied with the unit.

Charging the Battery

The charger/adaptor indicator light (battery charge LED) is red while the battery is charging, and turns green when the battery is fully charged (approximate recharge time: two hours to three hours).

Replacing the Battery

Rechargeable batteries lose their ability to hold a full charge after several hundred recharges.

9.3 Error Messages

Listed below are the most commonly seen error messages and problems. Follow the diagnostic recommendations listed. If the problem persists, please contact Olympus or your local sales and service representative for technical assistance.

"Do Calibration" during Quick Calibration (Q-CAL)

This is not an error message, but a warning. If the target ball has been removed from the tip, and this message appears, it indicates that the BALL OFF probe signal has drifted farther than what is typical between Q-CAL calibrations. This may be due to a large change in temperature, probe orientation, or ambient magnetic field. Be certain to remove any target ball or magnetic material, orient the probe as it will be used, and press **[Q-CAL]** again. If this message persists, it will be necessary to perform a new calibration.

"No Probe"

When a probe is connected to the Magna-Mike 8600 and this message appears, a failure in the identification circuit for the probe occurred. This problem is typically caused by a connection failure in the probe cable. Verify that the cable is connected to both the gage and the probe, and that the cable is not damaged. Replace the cable, if a substitute is available, turn the instrument off, and then turn it back on.

"Host is Off Line…"

The gage is configured to send thickness data through the RS-232 port, but the gage fails to receive the correct "ready" (DSR) signal from the external Datalogger. Verify the following:

- External device is powered on.
- External device is set to "serial" or "RS-232" mode and is not malfunctioning.

- Appropriate data logging software is running (if the receiving device is a PC).
- Interface cable is securely fastened at both ends.
- Cable is compatible with equipment and not damaged.

NOTE

The serial communication parameters MUST match those of the external device.

No Data or Garbled Data Received by External Datalogger/Host

If the gage is configured for serial RS-232 mode, verify that the Comport parameters under the Communication menu of the gage and external Datalogger agree. Often, an incorrect Baud Rate is the problem.

The Foot Switch does not Work

If the Foot Switch is not functioning correctly confirm that the configuration is set properly on the Magna-Mike 8600 under the Communication menu. Also, make sure the Foot Switch is fully plugged into the jack on the top panel of the gage.

"Do Calibration"

This message indicates that the active lookup table is either missing, or is not valid for the type of probe connected to the gage. If you know that the inactive table does match the probe, perform a ball calibration to bring the inactive table forward. This message will always appear when returning to Measure mode immediately after a Measurement or Master Reset.

9.4 Diagnostics

The probe is reliable and durable when the following care is taken:

- Do not drop the probe on hard surfaces
- Do not hit the probe with any objects

The user may perform a Keypad, Video Display, or Hardware Diagnostic test from the keypad to aid in localizing a suspected gage problem or simply to check functionality.

Appendix A: Specifications

This appendix contains the general, environmental, and input/output specifications for the Magna-Mike 8600.

A.1 General and Environmental Specifications

Table 19 General specifications

Parameter	Value
Overall dimensions (W × H × D)	236 mm × 167 mm × 70 mm (9.3 in. × 6.57 in. × 2.76 in.)
Weight	1.68 kg (3.7 lb), including lithium-ion battery
Keypad	English, international, Japanese, Chinese
Languages	English, Spanish, French, German, Italian, Japanese, Chinese, Russian, Portuguese, Polish, Dutch, Korean, Czech, Hungarian, and Finnish
Probe connector	Binder, 12 pins
Data storage	Onboard up to 95000 IDs with thickness readings
Battery type	Optional single lithium-ion rechargeable battery or optional standard AA-size alkaline battery holder
Battery life	15 hours to 16 hours for the lithium-ion rechargeable battery
Power requirements	AC Mains: 100 VAC to 120 VAC, 200 VAC to 240 VAC, 50 Hz to 60 Hz
Display type	Full VGA (640 × 480 pixels) color transflective LCD (liquid crystal display)

Table 19 General specifications *(continued)*

Parameter	Value
Display dimensions (W × H, Diagonal)	117.4 mm × 88.7 mm, 146.3 mm (4.62 in. × 3.49 in., 5.76 in.)
Warranty	Two-year limited

Table 20 Environmental ratings specifications

Parameter	Value
IP rating	Designed to meet requirements of IP67
Drop tested	MIL-STD-810G, Method 516.6, Procedure IV
Shock tested	MIL-STD-810G, Method 516.6, Procedure I
Vibration tested	MIL-STD-810G, Method 514.6, Procedure I
Operating temperature	−10 °C to 50 °C
Battery storage temperature	0 °C to 50 °C

A.2 Input/Output Specifications

Table 21 on page 156 provides the specifications for the input output signals.

Table 21 Input/output specifications

Parameter	Value
USB ports	One USB 2.0 peripheral port
Video output	One standard VGA analog output port
RS-232	One RS-232 Port: selectable baud rate, stop bits, and parity fixed word length (eight data bits), and fixed flow control (none)

Table 22 on page 157 describes all the connections available on the RS-232 9-pin D-sub connector. Table 23 on page 157 describes all the connections available on the VGA Out 15-pin connector.

Table 22 Magna-Mike 8600 RS-232 9-pin port output

Pin	Signal	Description
1	+5 V	+5 V voltage
2	TXD	Transmit data (serial)
3	RXD	Receive data (serial)
4	DSR	Data set ready (serial)
5	GND	Ground
6	DTR	Data terminal ready (serial)
7	NC	Not connected
8	NC	Not connected
9	NC	Not connected

Table 23 Magna-Mike 8600 VGA 15-pin port output[a]

Pin	Signal	Description
1	VGA_RED	VGA red output
2	VGA_GREEN	VGA green output
3	VGA_BLUE	VGA blue output
4	NC	Not connected
5	GND	Ground
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	NC	Not connected
10	GND	Ground
11	NC	Not connected
12	NC	Not connected
13	LCD_HSYNC	Horizontal sync.
14	LCD_VSYNC	Vertical sync.
15	NC	Not connected

a. Standard VGA output configuration

Appendix B: Accessories and Replacement Parts

Table 24 Accessories and replacement parts

Description	Part number
Carrying case	600-TC [U8780294]
Gage stand	600-STAND [U8780296]
Magna-Mike 8600 User's Manual (on CD only)	8600-MAN-CD [U8778535]
WINXL interface program CD-ROM (standard)	WINXL [U8774010]
Batteries (optional) Rechargeable lithium-ion battery Optional external charging base AA-size battery holder for alkaline and NiMH batteries	 600-BAT-L-3 [U8051431] 201-167 [U8909100] 600-BAT-AA [U8780295]
Remote save/send foot switch	85FSW [U8780127]
Display protection sheets (package of 10)	600-DP [U8780297]

Table 25 Interface cables and power accessories

Description	Part number
RS-232 cable, 1.83 m (6 ft), 9-pin female, "D" connector	600-C-RS232-5 [U8780299]
1.83 m (6 ft) USB cable (connects behind I/O door)	EPLTC-C-USB-A-6 [U8840031]
VGA output cable 1.83 m (6 ft)	600-C-VGA-5 [U8780298]
2 GB removable microSD memory card	MICROSD-ADP-2GB [U8779307]

Table 25 Interface cables and power accessories *(continued)*

Description	Part number
Universal charger/AC adaptor	EP-MCA-X where X denotes power cord type: U for North America [U8050397] A for Australia [U8767330] K for United Kingdom [U8767287] I for Italy [U8767289] D for Denmark [U8767290] P for Pakistan, India, South Africa, and Hong Kong [U8767291] E for Europe [U8767288] J for Japan [U8767369] B for Brazil [U8767377] C for China [U8767378] S for Korea [U8767379]
AC/adaptor power cord for: North America, and South America	2111 [U8840015]
AC/adaptor power cord for: European—Austria, Belgium, Finland, France, Germany, Netherlands, Sweden, Norway, Israel, and Greece	1514 [U8840003]
AC/adaptor power cord for Australia	1515 [U8840005]
AC/adaptor power cord for United Kingdom	1516 [U8840007]
AC/adaptor power cord for Italy	1517 [U8840009]
AC/adaptor power cord for Denmark	1518 [U8840011]
AC/adaptor power cord for India, Pakistan, South Africa, and Hong-Kong	1519 [U8840013]
AC/adaptor power cord for Japan	PWRC-10001-JPWR [U8767383]
AC/adaptor power cord for Brazil	PWRC-10002-BPWR [U8769007]
AC/adaptor power cord for China	PWRC-10007-CPWR [U8769008]
AC/adaptor power cord for Korea	PWRC-10006-KPWR [U8769009]

Table 26 Probes, probe cables and wear tips

Description	Part number
Standard probe	86PR-1 [U8470020]
Right-angle probe with handle	86PR-2 [U8470028]
Low-profile articulating probe	86PR-3 [Q7800004]
Probe cable,1.5 meter (5 feet)	86PC [U8801410]
Coiled probe cable, 3.04 meter (10 feet)	86PCC [U8780323]
Standard probe cable, 1.83 m (6 ft)	86PC-6 (Q7800016)
Replaceable wear tip	86PR1-WC [U8780324]
Extended wear tip	86PR1-EWC [U8780344]
Chisel wear tip	86PR1-CWC [U8780326]
Probe stand for 86PR-1	86PRS1 [U8771043]
Probe stand for 86PR-2	86PRS2 [U8771044]
Probe stand for 86PR-3	86PRS3 [Q7800006]

Table 27 Targets balls, disks, and wires

Description	Part number
Target balls, 1.59 mm (1/16 in.), 200 in package	80TB1 [U8771030]
Target balls, 3.18 mm (1/8 in.), 300 in package	80TB2 [U8771031]
Target balls, 4.76 mm (3/16 in.), 75 in package	80TB3 [U8771032]
Target balls, 6.35 mm (1/4 in.), 40 in package	80TB4 [U8771033]
Target disk, Flat Edge, 0.79 mm (1/32 in.) thick, 12.70 mm (1/2 in.) diameter, 1 in package	80TD1 [U8771034]
Target disk, V-Edge, 6.35 mm (0.25 in.) diameter	80TD2 [U8771035]
Magnetic target balls, 4.76 mm (3/16 in.), gold color, 30 in package	86TBM3 [U8771039]
Magnetic target balls, 6.35 mm (1/4 in.), gold color, 20 in package	86TBM4 [U8771040]
Wire target, 1.14 mm (0.045 in.) diameter, 254 mm (10 in.) long, 10 in package	86TW1 [U8771041]
Wire target, 0.66 mm (0.026 in.) diameter, 254 mm (10 in.) long, 20 in package	86TW2 [U8779858]

Table 28 Balls, disks, and wires on fixtures

Description	Part number
Calibration fixture, ball 1.59 mm (1/16 in.), 86PR-1, and 86PR-2 probes	80CAL-TB1 [U8771019]
Calibration fixture, ball 3.18 mm (1/8 in.), 86PR-1, and 86PR-2 probes	80CAL-TB2 [U8771020]
Calibration fixture, ball 4.76 mm (3/16 in.), 86PR-1, and 86PR-2 probes	80CAL-TB3 [U8771021]
Calibration fixture, ball 6.35 mm (1/4 in.), 86PR-1, and 86PR-2 probes	80CAL-TB4 [U8771022]
Wire on fixture for 86TW1 and 86TW2 targets and 86PR-1 and 86PR-2 probes	86CAL-TW1 [U8771048]
Disk on fixture for 80TD1 and 80TD2	86CAL-TD [U8771042]
Calibration fixture for 1.59 mm (1/16 in.) ball and 86PR-3 probe	86CAL-PR3-TB1
Calibration fixture for 3.18 mm (1/8 in.) ball and 86PR-3 probe	86CAL-PR3-TB2
Calibration fixture for 0.66 mm (0.026 in.) wire and 86PR-3 probe	86CAL-PR3-TW2

Table 29 Calibration fixtures for 86PR-1 and 86PR-2 probes

Description	Part number
Calibration fixture 0.25 mm (0.010 in.)	80CAL-010 [U8771003]
Calibration fixture 0.51 mm (0.020 in.)	80CAL-020 [U8771004]
Calibration fixture 1.02 mm (0.040 in.)	80CAL-040 [U8771005]
Calibration fixture 2.03 mm (0.080 in.)	80CAL-080 [U8771006]
Calibration fixture 4.06 mm (0.160 in.)	80CAL-160 [U8771007]
Calibration fixture 6.10 mm (0.240 in.)	80CAL-240 [U8771008]
Calibration fixture 7.62 mm (0.300 in.)	80CAL-300 [U8771009]
Calibration fixture 9.14 mm (0.360 in.)	80CAL-360 [U8771010]
Calibration fixture 12.70 mm (0.500 in.)	86CAL-500 [U8771049]
Calibration fixture 15.88 mm (0.625 in.)	86CAL-625 [U8771050]
Calibration fixture 19.05 mm (0.750 in.)	86CAL-750 [U8771051]
Calibration fixture 22.23 mm (0.875 in.)	86CAL-875 [U8771052]
Calibration fixture 25.40 mm (1.00 in.)	86CAL-1000 [U8771053]
Calibration fixture for target disk 0.25 mm (0.010 in.)	86DCAL-010 [U8771061]

Table 29 Calibration fixtures for 86PR-1 and 86PR-2 probes *(continued)*

Description	Part number
Calibration fixture for target disk 0.51 mm (0.020 in.)	86DCAL-020 [U8771062]
Calibration fixture for target disk 1.02 mm (0.040 in.)	86DCAL-040 [U8771063]
Calibration fixture for target disk 2.03 mm (0.080 in.)	86DCAL-080 [U8771064]
Calibration fixture for target disk 4.06 mm (0.160 in.)	86DCAL-160 [U8771065]
Calibration fixture for target disk 6.10 mm (0.240 in.)	86DCAL-240 [U8771066]
Calibration fixture for target disk 9.14 mm (0.360 in.)	86DCAL-360 [U8771067]
Calibration fixture for wire targets 0.25 mm (0.010 in.)	86WCAL-010 [U8771055]
Calibration fixture for wire targets 0.51 mm (0.020 in.)	86WCAL-020 [U8771056]
Calibration fixture for wire targets 1.02 mm (0.040 in.)	86WCAL-040 [U8771057]
Calibration fixture for wire targets 2.03 mm (0.080 in.)	86WCAL-080 [U8771058]
Calibration fixture for wire targets 4.06 mm (0.160 in.)	86WCAL-160 [U8771059]
Calibration fixture for wire targets 6.10 mm (0.240 in.)	86WCAL-240 [U8771060]
Calibration fixture for wire targets 9.14 mm (0.360 in.)	86WCAL-360 [U8771072]
Calibration fixture for wire targets 12.70 mm (0.500 in.)	86WCAL-500 [U8771073]

Table 30 Calibration fixtures for 86PR-3 probe

Description	Part number
Calibration fixture 0.25 mm (0.010 in.)	86CAL-PR3-010 [Q7800007]
Calibration fixture 0.51 mm (0.020 in.)	86CAL-PR3-020 [Q7800008]
Calibration fixture 1.02 mm (0.040 in.)	86CAL-PR3-040 [Q7800009]
Calibration fixture 2.03 mm (0.080 in.)	86CAL-PR3-080 [Q7800010]
Calibration fixture 4.06 mm (0.120 in.)	86CAL-PR3-120 [Q7800011]
Calibration fixture 4.06 mm (0.160 in.)	86CAL- PR3-160 [Q7800012]

Table 31 Calibration kits

Description	Part number
8600 Standard Calibration kit. Includes the plastic case, 80CAL-TB1, 80CAL-TB2, 80CAL-TB3, 80TB1, 80TB2, 80TB3, 80CAL-010, 80CAL-020, 80CAL-040, 80CAL-080, 80CAL-160, 80CAL-240, and 80CAL-300.	86ACC-KIT [U8771068]

Table 31 Calibration kits *(continued)*

Description	Part number
8600 Extended Range Calibration kit. Includes the plastic case, 80CAL-TB3, 80CAL-TB4, 80TB4, 86TBM3, 86TBM4, 80CAL-040, 80CAL-160, 80CAL-240, 80CAL-360, 80CAL-500, 86CAL-750, 86CAL-875, and 86CAL-1000.	86ACC-ER-KIT [U8771069]
8600 Wire target Calibration kit. Includes the plastic case, 86CAL-TW1, 86TW1, 86TW2, 86WCAL-010, 86WCAL-020, 86WCAL-040, 86WCAL-080, 86WCAL-160, 86WCAL-240, 86WCAL-360 and 86WCAL-500.	86ACC-W-KIT [U8771070]
86PR-3 calibration kit. Includes plastic accessory case, 80CAL-TB1, 80CAL-TB2, 86TW2, 86CAL-PR3-TB1, 86CAL-PR3-TB2, 86CAL-PR3-TW2, 86CAL-PR3-010, 86CAL-PR3-020, 86CAL-PR3-040 86CAL-PR3-080, 86CAL-PR3-120, and 86CAL-PR3-160.	86ACC-PR3-KIT [Q7800005]
8600 Disk target calibration kit. Included the plastic case, 86PR1-CWC, 86CAL-TD, 80TD1, 80TD2, 86DCAL-010, 86DCAL-020, 86DCAL-040, 86DCAL-080, 86DCAL-160, 86DCAL-240, and 86DCAL-360.	86ACC-D-KIT [U8771071]
A complete set of six Magna-Mike calibration standards traceable to NIST. Also includes the certificate of calibration. Thickness from 0.254 mm (0.010 in.) to 6.096 mm (0.240 in.)	80CAL-NIS [U8771011]

List of Figures

List of Tables

Index

D

E

T

U

V

W