USER'S MANUAL

MAGNA-MIKE 8500

Hall Effect Thickness Gage

Part No. 910-198E

PANAMETRICS-NDT™

Nondestructive Testing Products

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Printed in the United States of America.

WARRANTY

Olympus NDT™ guarantees the Model 8500 to be free from defects in materials and workmanship for a period of two years from date of shipment. The warranty only covers equipment that has been used in a proper manner as described in this instruction manual and has not been subjected to excessive abuse, attempted unauthorized repair, or modification. DURING THIS WARRANTY PERIOD, Olympus NDT' LIABILITY IS STRICLTY LIMITED TO REPAIR OR REPLACEMENT OF A DEFECTIVE UNIT AT ITS DISCRETION. Olympus NDT does not warrant the Model 8500 to be suitable for intended use, and assumes no responsibility for unsuitability for intended use. Olympus NDT accepts no liability for consequential or incidental damages including damage to property and/or personal injury.

Olympus NDT warranties the probe, probe cable, and battery for a period of 90 days. This warranty applies only to defects in workmanship that render the probe inoperative. Normal wear and tear on the probe tip or any defects caused by misapplication or abuse is not covered. Olympus NDT reserves the right to judge whether the probe shall be covered under warranty.

The customer will pay shipping expense to the Olympus NDT plant for warranty repair; Olympus NDT will pay for the return of the repaired equipment. (For instruments not under warranty, the customer will pay shipping expenses both ways.)

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1 GENERAL INFORMATION

Panametrics-NDT™' Magna-Mike 8500 is a small, lightweight thickness gage designed to make measurements of nonferrous materials such as plastics, glass, composites, aluminum, and titanium. Accuracy is generally not affected by material shape or internal properties.

The Magna-Mike 8500 is based on the Hall Effect Principle. Wall thickness is measured by placing a small steel target ball on one side of test material and the magnetic probe on the opposite side. The probe's Hall Effect sensor measures the distance between the probe tip and the ball, instantly displaying a thickness reading.

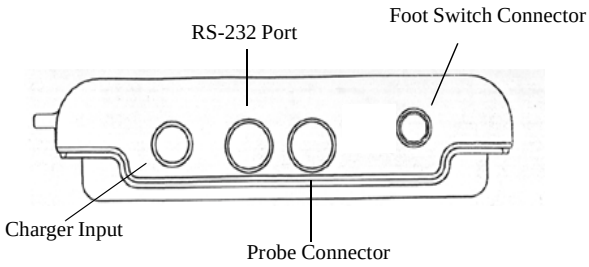
As the sample thickness changes, the field strength in the probe tip also changes from a minimum when the ball is far away, to a maximum when the ball rests, centered on the tip. These field strengths however, are different for each size target ball and vary from probe to probe. The control unit, therefore, employs a numerical look-up table to translate these changes in field strength into thickness values.

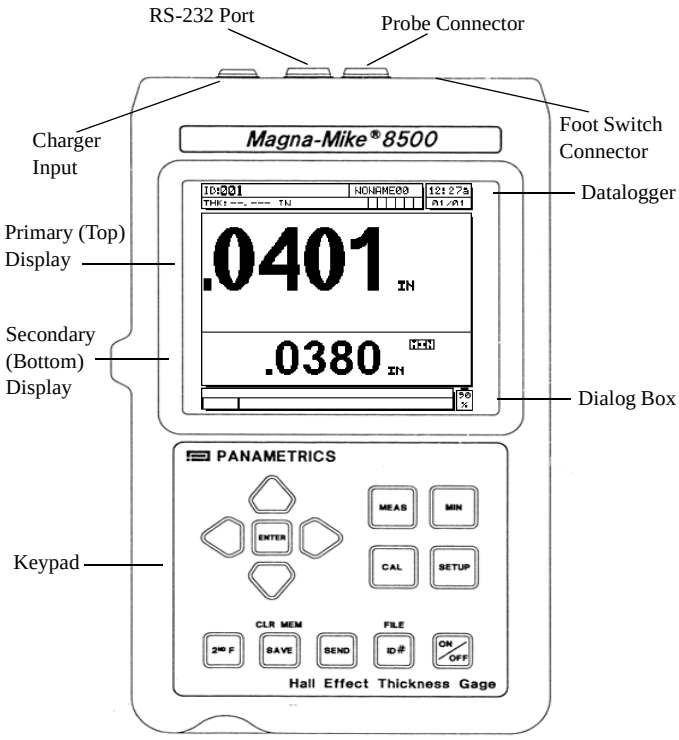
Only after the calibration procedure is performed, and only if the calibrated state of the instrument is maintained as directed in Section 2 of this manual, will the thickness values obtained from the Magna-Mike 8500 be accurate and meaningful.

Note: The probe contains a strong magnet. Damage to the probe can change its magnetic properties. To ensure accurate operation of the Magna-Mike 8500, **DO NOT:** (1) drop the probe as it may cause damage; (2) use the probe near iron or steel as it may cause false readings; (3) apply force to the tip—the most fragile part of the probe (damage to the tip is not repairable); or (4) bring the probe near diskettes or tape cassettes as it may cause data loss in these items.
For best results, store the probe upright in the stand, away from large steel objects.

The contents of your new Magna-Mike 8500 package include the following items in addition to this manual:

- Magna-Mike 8500
- WIN8500 Interface Program #85IP-EX
- Charger/Adapter with Power Cord
- Magnetic Probe
- Probe Cable
- Probe Stand
- Gage Stand #85GS
- Quick Reference Card
- Foot Switch (optional)
- Data Output Cable 8509F or 8525F (9 or 25-pin RS-232)
- Accessory Container with:
  - Three (3) Containers of Target Balls
  - Three (3) Calibration Reference Fixtures (blue labels)
  - Three (3) Target Ball Alignment Fixtures (red labels)


Foot Switch Connector
RS-232 Port
Charger Input
Probe Connector



This manual is designed to help users get started by placing the essential operating information in the first few sections; where as the Datalogger, maintenance, and troubleshooting information are found in the latter sections. At first, it may be helpful to use this manual in conjunction with the Magna-Mike 8500.

Refer to the illustrations above to identify the different gage features, especially the Primary and Secondary Display.

- The top portion of the display shows Datalogger information including filenames, ID numbers, and stored thickness values for your reference while making measurements.
- The middle portion of the screen is split into two (2) sections. The Primary display, located in the main area of the screen, shows current thickness measurements. The Secondary Display is located beneath the Primary Display and shows minimum, maximum, and differential measurements.
- The bottom portion of the screen displays the dialog box that contains helpful information for calibrating, operating, and diagnosing the gage. Instructions, status conditions, and error messages are also displayed in the dialogue box. The far right section of this portion continuously shows flags that describe the battery condition and operating mode.

2 CALIBRATION

Olympus NDT™ recommends monthly calibration (with regular verification) of the Magna-Mike 8500 to ensure consistency and accuracy of thickness readings. This chapter outlines how to choose a target ball, when to calibrate, and how to calibrate.

2.1 Choosing a Ball

The Magna-Mike 8500 comes with three (3) different sized target balls. In general, use the largest target ball that will move freely in the concave areas that need to be measured. Consider the following criteria when choosing a ball:

- Minimum curvature of the material
- Maximum thickness measurement
- Accuracy needed for measurement

Once the criteria have been established, review the descriptions below and Table 2-1 to choose an appropriate target ball.

Target Ball Descriptions

3/16" (4.76mm) diameter target ball
Useful for applications that require high accuracy, or where material is thicker than the range offered by other target balls. However, the ability to measure intricate corners is limited, and soft materials are more likely to be compressed using this target ball.

1/8" (3.2mm) diameter target ball
Serves all standard applications, such as plastic blow molding, simple shapes, and wall thicknesses up to 0.180" (4.6mm).

1/16" (1.6mm) diameter target ball
Useful for applications that involve intricate contours. While the small size is efficient for measuring difficult shapes, it is less accurate than the 1/8" ball and has a restricted thickness range.

Table 2-1: Target Ball Measurements and Accuracy

Target Ball Diameter	Maximum Thickness Range	Measurement Accuracy*	Minimum Surface Radius
3/16" (4.76mm)	0.250" (6.35mm)	1%	3/32" (2.38mm)
1/8" (3.18mm)	0.180" (4.57mm)	2%	1/16" (1.59mm)
1/16" (1.59mm)	0.090" (2.29mm)	3%	1/32" (0.79mm)

Note: * Reflects accuracy after Multi-Point Calibration.

Use only Panametrics-NDT' target balls with the Magna-Mike 8500 as other seemingly identical balls may cause inaccurate measurements.

2.2 When to Calibrate

Perform a **Ball Calibration**:

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

Perform a **Multi-Point Calibration**:

- At least once per month
- If superior accuracy is desired
- If the probe is replaced, dropped, or contacts strong magnetic material
- If the probe tip is worn from abrasive material

Note: If the unit has just been turned on, or the probe just connected, allow the gage to warm-up for at least five (5) minutes with the probe connected before performing either a Ball Calibration or Multi-Point Calibration.

2.3 Ball Calibration

Ball Calibration matches each target ball being used to an internal lookup table from the unit's memory. Ball calibration also measures the two extremes of the ball's possible locations (Ball On and Ball Off) 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 unit's memory, even if powered off, until overwritten by a new calibration or deliberately erased by a Measurement or Master Reset.

1. With the probe sitting in the probe stand, press the **[CAL]** key. The gage display instructions will read "Ball Off".
2. Remove any target ball from proximity to the probe tip by lifting the ball straight up, and press **[CAL]**. The display will read "Wait" while the gage measures the field strength at the probe tip, and will then change to "Ball On".

3. Select the target ball that you will be using in subsequent measurements, along with the *Red Labelled Alignment 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 2-1.

Note: Place the target ball into the *red labelled fixture* before placing the fixture onto the probe. Dropping the ball repeatedly into the fixture as it rests on the probe may pit the tip of the probe causing small measurement inaccuracies.

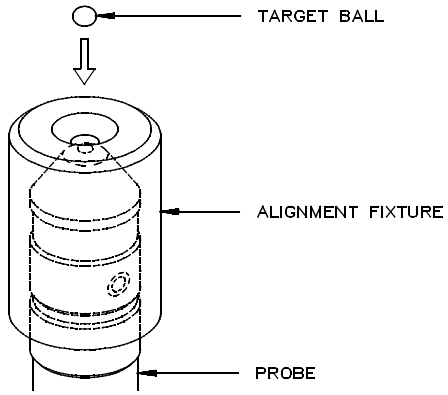


Figure 2-1: Alignment of Target Ball in Fixture on Probe

4. Once the ball is centered on the probe tip, press **[MEAS]**. A brief "Wait" message will appear while the gage measures the field strength again, and then automatically returns to Measure Mode with a zero thickness reading. The unit will now display thickness values according to the most recently created table for that ball.

2.4 Multi-Point Calibration

Multi-Point Calibration produces customized lookup tables to obtain superior accuracy. To activate the Multi-Point Calibration feature, turn on the Multi-Point Cal option located in the Calibration Setup Menu.

1. Press **[SETUP]** to enter the Setup Menu screen.
2. Use the **[↑]** and **[↓]** keys to select Calibration. Press **[ENTER]**.
3. Use the **[↑]** and **[↓]** keys to select Multi-Point Cal.
4. Use the **[←]** or **[→]** key to turn Multi-Point Cal "ON".
5. Press the **[MEAS]** key to return to the Measure screen.

To begin Multi-Point Calibration:

1. Press **[CAL]**. The gage display will read "Ball Off".
2. Remove any ball from the probe.
3. Press **[CAL]**. The display will read "Wait", then "Ball On".
4. Place the target ball into the *Red Labelled Alignment Fixture*, and position fixture onto the probe.
5. Press **[CAL]**. "Wait" and then "Point #1" will appear on the gage display.

Note: To terminate the calibration process at any stage, press the **[2nd] [MEAS]** keys.

6. Place the target ball into a *Blue Labeled Reference Thickness Fixture*, and position the fixture onto the probe. The Primary (Top) Display on the screen will show the thickness reading according to the gage's default table.

   (If no value appears on the thickness display, then the disk thickness of the fixture is beyond the measurement range for the target ball. Repeat this step using a thinner disk.)

7. Press **[ENTER]** or **[CAL]** and the default thickness value will appear on the Secondary (Bottom) Display.

8. Use the **[↑], [↓]**, **[←]**, and **[→]** keys to adjust the thickness value in the Secondary Display to match the thickness value printed on the *blue labelled fixture*.

9. Press **[ENTER]** or **[CAL].** The gage display will change to "Point #2" prompting the user to enter another reference point.

10. Repeat steps 6-9 to continue entering reference thickness points. Up to eight (8) reference points may be entered.

11. Press **[MEAS]** when done. The gage will display the message "Please Wait, Creating Table...".

12. To protect the customized table from being overwritten accidentally, disable the Multi-Point Cal option as follows. Press **[SETUP]**. Return to the Calibration Menu and press **[ENTER]**. Use the **[↑]** and **[↓]** keys to scroll to the Multi-Point Cal feature, and set Multi-Point Cal to OFF by using the **[←]** and **[→]** keys. Press **[MEAS]** to return to the Measurement screen.

Note: Once a Multi-Point Calibration is done for a specific size target ball, the customized table becomes the table used for all subsequent measurements employing that size target ball. If a Ball Calibration is performed (see Section 2.3) after a Multi-Point Calibration, it only adjusts the table's endpoints and does not erase the table's custom points.

3 MEASUREMENTS

Thickness measurements can be made once the Magna-Mike 8500 is calibrated for a particular target ball size. To measure a test piece, simply place the probe tip on one side of the material, and place the target ball on the other side near the probe tip. The ball will be attracted to the probe tip by a magnetic field. Once the ball is within range, the Magna-Mike 8500 will begin to display thickness values providing the tip and ball are both in contact with the material. The ball must be able to move freely and the material kept perpendicular to the probe axis, as shown in Figure 3-1. Inaccurate measurements may result from ball or probe tip obstructions, or poor probe alignment, as shown in Figures 3-2 to 3-5.

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 ball with the probe tip.

Caution: Avoid contact with magnetic metals or alloys (iron, steel, etc...) to ensure accurate operation of the Magna-Mike 8500.

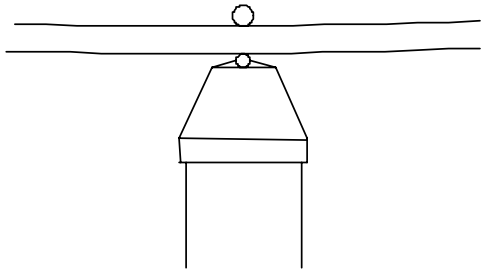


Figure 3-1: Correct Method for Thickness Measurements

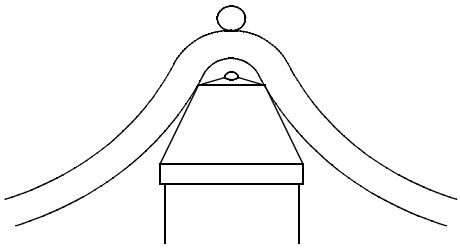


Figure 3-2: Inaccurate Measurement Due
to Obstruction of Probe Tip

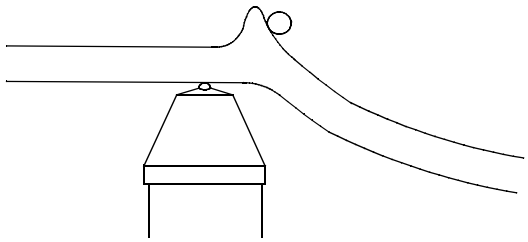


Figure 3-3: Inaccurate Measurement Due to Obstruction of Target Ball

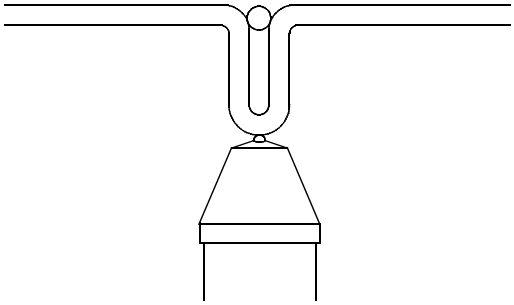


Figure 3-4: Inaccurate Measurement Due to Surface Curvature

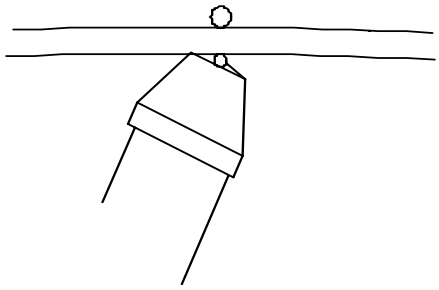


Figure 3-5: Inaccurate Measurement Due to Bad Probe Alignment

3.1 Maintaining Accuracy

Once the Magna-Mike 8500 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 3.3–Periodic Verification.)

3.2 QCAL

The Magna-Mike 8500 incorporates an automatic "quick calibration" or QCAL feature. Following a Ball Calibration or Multi-Point Calibration, Auto QCAL monitors the probe for inactivity when a target ball is removed from the probe tip. When a ball is removed from the probe for a set amount of time (i.e. five (5) seconds, five (5) minutes, or 15 minutes) the unit compensates for drifts caused by moderate changes in temperature or ambient magnetic fields. Auto QCAL works best when the probe is stationary and positioned upright in the stand.

The default time interval between Auto QCAL activity is five (5) minutes. This time interval may be changed by following the steps below:

1. Press **[SETUP]**.
2. Use the **[↑]** and **[↓]** keys to select Calibration and press **[ENTER]**.
3. Use the **[↑]** and **[↓]** keys to select QCAL Interval.
4. Use the **[←]** or **[→]** key to select 5 sec., 5 min., or 15 min.

Note: To ensure that AUTO QCAL operates properly, begin each new measurement session or day by performing a Ball Calibration.

If the probe is moved between measurements, or is exposed to wide variations in temperature, the user will need to supplement the AUTO QCAL feature by periodically performing a manual QCAL (at least once every half hour).

To perform a manual QCAL, simply remove the target ball from the probe tip and press the QCAL button located on the side of the probe. The user may resume measurements immediately. A manual QCAL 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 QCAL prior to each new measurement.

Note: For best results, keep the probe in the same position during the manual QCAL as it will remain during subsequent measurements.

In order to suppress the Auto QCAL feature, which by default remains ON, and rely only on the manual QCAL, follow the steps below:

1. Press **[SETUP]**.
2. Use the **[↑]** and **[↓]** keys to select Calibration and press **[ENTER]**.
3. Use the **[↑]** and **[↓]** keys to select Auto QCAL.
4. Use the **[←]** or **[→]** key to turn the function OFF.

Note: Performing a manual QCAL is always an option, even when the Auto QCAL feature is active.

3.3 Periodic Verification

The Magna-Mike 8500 is classified as an **operator-calibrated** instrument. Panametrics-NDT 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 (*Blue Labeled Reference Thickness Fixture*) provided by Panametrics-NDT. The steel probe tip and steel target balls are significantly harder than the brass and aluminum disks that are located inside the *blue labeled fixtures*. Excessive force will dent the disk's surface. These dents may induce errors in thickness values during calibration. To obtain replacement disks, contact Panametrics-NDT. Other operator-supplied thickness standards may be used, but care must be taken that these are independently and accurately measured.

3.4 Traceability

Due to the operator-calibrated status of the Magna-Mike 8500, 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 8500 is operating at its expected accuracy (see Appendix IV). Verifications may be made on a monthly or annual basis depending upon the user's judgment.

Panametrics-NDT offers sets of traceable standards **(part#: 80CAL-NIS)**. 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 re-certified by any qualified metrology laboratory providing they (1) use a ball or rounded-anvil style caliper, and (2) measure within 1/16" 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, Panametrics-NDT suggests replacing them.

4 MIN MEASUREMENTS

The MIN feature on the Magna-Mike 8500 is one of the most frequently used and important functions. When the MIN Measure mode is ON a minimum thickness reading appears on the screen in addition to the active thickness reading. This mode allows the user to scan a particular area, such as a corner of a container, and record the minimum reading in a short period of time with very good reliability. Repeatability and reproducibility are also improved with this feature.

After capturing a minimum value it is easily cleared by pressing the **[SEND]**, **[SAVE]**, or **[MEAS]** key, allowing the operator to capture a new minimum reading.

To Activate the MIN Mode:

1. Press the **[MIN]** key on the gage's keypad. Notice that the word "MIN" is now highlighted on the screen. By default, the Min reading will appear on the Secondary (Bottom) Display. The thickness reading on the Primary (Top) Display operates normally. The gage compares each new measurement reading to the value on the Secondary Display, which is where the lesser of these two values will be held.
2. Press the **[MIN]** key again to exit the MIN mode. The gage will return to the standard Measure mode.

Note: When MIN mode is NOT ON, only the active thickness reading appears on the screen.

The user may decide to change the MIN thickness reading location from the Secondary Display to the Primary Display.

To Change the MIN Reading Location to the Primary Display:

1. Press **[SETUP].**
2. Use the **[↑]** and **[↓]** keys to select Measurement. Press **[ENTER].**
3. Use the **[↑]** and **[↓]** keys to select Primary Data.
4. Use the **[←]** or **[→]** key to select Bottom. Press **[MEAS].**

Please note: after following the instructions above, the active thickness reading will now be shown on the Secondary Display and the MIN value will be shown on the Primary Display. By default the Primary Display is set to “Top”. Therefore, performing a Master Reset or Measurement Reset will change this parameter back to the default. For more information, see Section 5.1.5–Primary Data.

Note: To ensure capturing the true minimum thickness of a scanned area when the MIN function is turned ON, the display rate will automatically change to 16Hz. This value may be changed via the Setup/Measurement menu while in MIN mode, however 16Hz is recommended for best results. When MIN mode is turned OFF, the gage will automatically return to its original display rate.

4.1 Save/Send Parameters

The operator may choose to Save thickness values to the Datalogger or Send data to an external device. However, Saving and Sending values depend where each value (MIN, MAX, or DIFF) appears on the screen.

For example, in order to Save or Send a MIN value that is located on the Secondary Display, the Save/Send parameter must be set to "Secondary". By default, when the user turns on the MIN, DIFF, or MAX mode, the Send function will automatically be set to "Secondary". After the parameter is set, simply press the **[SAVE]** or **[SEND]** key.

To Change the Save/Send Parameters to Secondary:

1. Press **[SETUP].**
2. Use the **[↑]** and **[↓]** keys to select Communication. Press **[ENTER].**
3. Use the **[↑]** and **[↓]** keys to select Save/Send.
4. Use the **[←]** or **[→]** key to select Secondary. Press **[MEAS].**

In order to Save or Send a MIN value located on the Primary Display, the Save/Send parameter must be set to "Primary". After the parameter is set, simply press the **[SAVE]** or **[SEND]** key.

To Change the Save/Send Parameters to Primary:

1. Press **[SETUP].**
2. Use the **[↑]** and **[↓]** keys to select Communication. Press **[ENTER].**

3. Use the **[↑]** and **[↓]** keys to select Save/Send.

4. Use the **[←]** or **[→]** key to select Primary. Press **[MEAS].**

Note: When there is no information in the Secondary Display, the Send function will automatically be set to “Primary”.

Please be aware, if a Foot Switch is connected to the Magna-Mike 8500, then the Save/Send function will be directed by the Foot Switch rather than the gage’s menu parameters. See Section 5.3 for more detail.

5 SETUP

The [SETUP] key on the Magna-Mike's keypad allows access to secondary setup menus. These menus hold many functions and parameters that are used less often than those found on the gage's keypad. The Setup Menu contains the following submenus:

- Measurement
- General
- Communication
- Calibration
- Diagnostics
- Resets
- Clock
- Diff
- Alarm

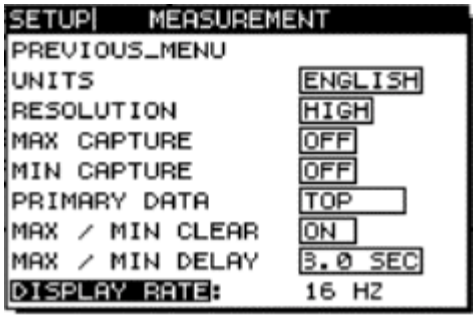
Press the [SETUP] key to enter the Setup Menu. The gage displays the following menu:

Use the [▲] and [▼] keys to scroll through the options and press [ENTER] to select a submenu.

5.1 Measurement

The Measurement setup contains the Magna-Mike's measurement parameters. To access the Measurement Setup menu, press [SETUP].

Use the [▲] and [▼] keys to highlight the Measurement option and press [ENTER]. The gage displays the Measurement Setup menu:



Use the **[↑]** and **[↓]** keys to highlight the desired parameter and then use the **[←]** or **[→]** key to select a setting.

5.1.1 Units

The Magna-Mike 8500 can display thickness measurements in either English units (In) or Metric (mm) units.

5.1.2 Resolution

The Magna-Mike 8500 can display thickness measurements in either Low Resolution (0.001", 0.01 mm) or High Resolution (0.0001", 0.001 mm). When Auto is selected, the gage determines which resolution to use per measurement range.

- Inches (In): Readings less than or equal to 0.1289" will read out to four decimal places.
- Auto Res: Readings greater than or equal to 0.129" will read out

to three decimal places.

- Metric (mm): Readings less than or equal to 3.22 mm will read out to three decimal places; readings greater than 3.22 will read out to two decimal places.

5.1.3 Max Capture

Max Capture allows the gage to display the active and maximum thickness readings while in Measure mode. Turn Max Capture ON and return to Measure mode to enable this function. By default, Max Capture is turned OFF and will be reset to OFF after performing a Measurement or Master Reset.

Note: Max Capture is prone to significant operator error due to target ball movement. It is common for the target ball to drift off center or to bounce away from the test piece, thereby creating false maximum readings.

5.1.4 Min Capture

Min Capture allows the gage to display the active and minimum thickness readings while in Measure mode.Turn Min Capture ON and return to Measure mode to enable this function, or press [MIN] on the keypad while in Measure mode. By default, the MIN function is turned OFF and will be reset to OFF after performing a Measurement or Master Reset.

Min Capture and Max Capture work together in the following four combinations to display both Minimum and Maximum thickness values while scanning:

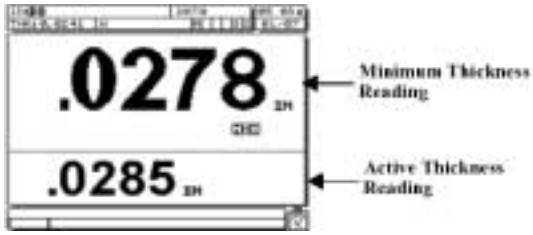
Table 1: Min and Max Capture Combinations

Combination	Result
1: Max Capture ON and Min Capture OFF	The gage displays the active reading and the maximum thickness reading in Measure mode.
2: Max Capture ON and Min Capture ON	The gage displays the active reading and the minimum thickness reading in Measure mode. The maximum thickness reading is captured, but not displayed unless the user presses [2ndF], [MIN] from the Measure mode. The maximum thickness value will be displayed briefly, and then the gage will return to displaying the active reading and minimum reading.
3: Max Capture OFF and Min Capture ON	The gage displays the active reading and the minimum thickness reading in Measure mode.
4: Max Capture OFF and Min Capture OFF	The gage displays the active reading only in Measure mode. Remember that the user can turn on the Min function at any time by using the [MIN] key from the Measurement mode.

5.1.5 Primary Data

The Primary Data function determines where the active, Min, or Max thickness reading will be displayed on the measurement screen. This function can be set to either Top or Bottom. If Primary Data is set to Top, the active thickness reading will be displayed on the Primary (Top) display, and the Min, Max, and Diff values will be displayed on the Secondary (Bottom) Display.

Primary Data Set to Top



Primary Data Set to Bottom

5.1.6 Max/Min Clear

The Max/Min Clear function can be set to either ON or OFF. When Max/Min Clear is turned ON and the MIN or MAX mode is also enabled, the operator may press the [MEAS], [SEND], or [SAVE] key to clear the Minimum or Maximum Value on the screen until the next measurement is taken. By default, the Max/Min Clear function is turned ON and will be set to ON after performing a Measurement or Master Reset.

5.1.7 Max/Min Delay

The Max/Min Delay works in conjunction with the Max/Min Clear function to set a time delay once a Max/Min has been set or cleared. This delay prevents the gage from updating a Min reading while the operator re-positions the target ball to a new measurement location. Max/Min Delay can be set to 0.0, 0.5, 1.0, 1.5, 2.0, 2.5, or 3 seconds. By default, this function is set to 0.0 and will be reset to 0.0 after performing a Measurement or Master Reset.

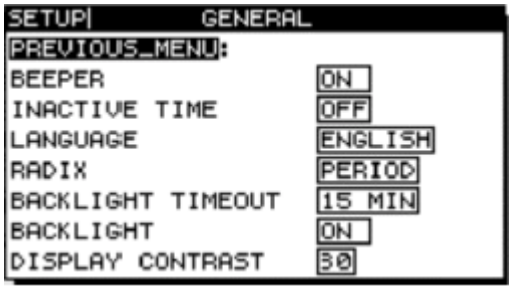
Note: The Max/Min Delay function is applicable only if the Max/Min Clear function is turned ON.

5.1.8 Display Rate

The Display Rate specifies how often measurements are updated on the screen. The rate is adjustable to 4, 8, and 16 Hz (measurements per second). The default rate, 4 Hz, should be the optimum choice for most applications and the easiest to view. When the Min or Max functions are ON, the Display Rate will automatically change to a fast scanning rate that has a default value of 16 Hz. This rate is adjustable to 4 or 8 Hz.

5.2 General Setup

The General Setup menu contains many global gage settings. Press the [SETUP] key to enter the Setup menu. Use the [▲] and [▼] keys to highlight General and press the [ENTER] key. The General Setup menu is displayed:



Use the [▲] and [▼] keys to highlight a desired parameter, and the **[◄]** or **[►]** key to choose a setting.

5.2.1 Beeper

The Beeper function controls the audible beep of the gage. When this function is turned ON, the gage will beep after the operator presses an inactive key. Additionally, the beeper acts as a warning during any High or Low Alarm condition. The Beeper can be turned ON or OFF. By default, the beeper is turned ON, and it will be active after performing a Measurement or Master reset.

5.2.2 Inactive Time

The Inactive Time function controls the Auto Power Off feature of the gage. If the Inactive Time is set to OFF, the gage's Auto Power Off function is disabled. The gage will shut off only when turned off manually.

If the Inactive Time is turned ON, the gage will turn itself off after the gage has been dormant for six (6) minutes.

By default, Inactive Time is OFF and will be turned OFF after performing a Measurement or Master reset.

5.2.3 Language

The Magna-Mike 8500 is capable of communicating in the following languages:

- English
- Spanish
- German
- French

Use the **[◄–]** or **[–►]** key to select a desired language and then press the [MEAS] key to return to Measure mode. Messages in the User Help box located at the bottom of the main measurement screen display the currently active language. Note that some messages remain displayed in English even though a different parameter is set. The default language is English, and the gage is set to English after performing a Measurement or Master Reset.

5.2.4 Radix

The user can select which symbol the gage uses for radix. Radix can be set to Period (for example, 0.00”) or Comma (for example, 0,00”) depending on units and resolution chosen. The radix point chosen will be used for all active thickness measurement displays, measurements stored in the Datalogger, and output thickness values. By default, the

radix is set to Period, and will be set to Period after performing a Measurement or Master Reset.

5.2.5 Backlight Timeout

The Backlight Timeout sets the amount of time that the gage must remain dormant (the period between the time that the last key was pressed or a new measurement was updated to the display and the time that the backlight timed out) before the backlight turns itself off. This function is designed to conserve battery life and the overall life of the Backlight. The user can select from 1, 5, 15, 30, or 60 minutes. If the Backlight turns itself off, the user can turn the Backlight back on by moving the target ball and updating a new measurement or by pressing any key. By default, the Backlight Timeout is set to 15 minutes and will reset to 15 minutes after performing a Measurement or Master Reset.

5.2.6 Backlight

The Backlight function can be turned ON or OFF. When the Backlight is ON, gage display and overall visibility improves. When the Backlight is OFF, the function is disabled. By default, the Backlight is turned ON and will be turned ON after performing a Measurement or Master Reset.

5.2.7 Display Contrast

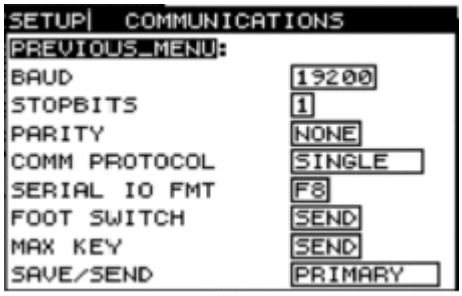
The gage displays black text on a gray background. The user can control the contrast of the display by adjusting the Contrast between 10 and 62, where 10 is very bright and 62 is very dark. The user should adjust the contrast to suit the lighting conditions in which the gage will be used.

By default, the Display Contrast is set to 30. This value will be restored after performing a Measurement or Master Reset.

5.3 Communication Setup

The Communication Setup menu contains the communications parameters for the gage. To enter the Setup menu, press the [SETUP] key. Use the **[↑]** and **[↓]** keys to select Communications and press [ENTER] to display the Communications Setup menu.

When communicating with an external device, it is important to make sure that the communications parameters match the computer or device with which the gage would communicate. Use the **[↑]** and **[↓]** keys to highlight the parameter and the **[←]** or **[→]** key to select a setting.



The Communication Menu default parameters include:

Table 2: Communications Menu Default Parameters

Baud Rate	19200
Stop Bits	1
Parity	None
Comm. Protocol	Single
Serial I/O Fmt	F1
Foot Switch	Send
Max Key	Send
Save/Send	Primary

Note: Refer to Section 7, Appendix I, and Appendix II for more information regarding Communications, RS-232 Data Transfers, and I/O Formats.

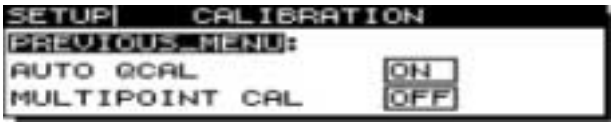
The Foot Switch is an optional item that connects to the gage, allowing the operator to use both hands when taking measurements. The Foot Switch is programmed to function identically to the [SEND] key on the front panel of the gage. However, the Foot Switch can also be set to function as the [SAVE] or [MEAS] key. When operating as a [MEAS] key, the Foot Switch can reset the Min thickness reading on the display. To change the Foot Switch function, access the Communication menu via the [SETUP] key.

The two button probe is also an optional item. By default, the Max button on a two-button probe is programmed to function as the send command; however, this functionality may be altered to the Meas or Save function. To view or change the Max button configuration, press [SETUP] and go to the Communications menu.Use the **[↑]** and **[↓]** keys to highlight Max Key and the **[←]** or **[→]** key to choose either Save, Send, or Meas.

The Save/Send function in the Communication Setup menu can be set to Primary or Secondary. For more information on these parameters, see Section 4.1, Saving and Sending Values.

5.4 Calibration Setup

The Calibration Setup menu contains the calibration setup parameters for the gage. To enter the Setup menu, press [SETUP]. Use the **[↑]** and **[↓]** keys to select Calibration and press [ENTER]. The gage displays the Calibration Setup menu:



Use the **[↑]** and **[↓]** keys to highlight the parameter and the **[←]** or **[→]** key to select a setting:

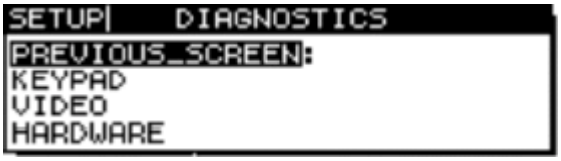
Auto QCAL - The Auto QCAL function is responsible for the automatic, internal calibration that compensates for probe temperature fluctuations. When this function is turned ON, it will allow the gage to

perform an Auto Quick Calibration. The Auto QCAL will be performed automatically at five second intervals when the gage is not otherwise making a measurement and the target ball is not in contact with the probe. The user can also press the [QCAL] button on the probe during non-measurement conditions at any time to manually perform this quick calibration. By default, Auto QCAL is turned ON and will be set to ON after performing a Measurement or Master Reset.

Multi-Point CAL - The Multi-Point Calibration (Multi-Point CAL) feature allows the user to create a customized lookup table for the probe and target ball currently in use. The user should perform a Multi-Point CAL when switching from one target ball size to another or when the highest degree of accuracy is required. For most applications, a single point ball calibration is adequate. By default, Multi-Point CAL is turned OFF and will be reset to OFF after performing a Measurement or Master Reset.

5.5 Diagnostics Setup

The Diagnostics Setup contains self test modes for the gage. Press [SETUP]. Use the **[↑]** and **[↓]** keys to select the Diagnostics Setup submenu and press [ENTER]. The gage displays the Diagnostics Setup menu:



Use the **[↑]** and **[↓]** keys to highlight the desired self test mode and press [ENTER] to access the test options. Refer to the subsections below for further details.

5.5.1 Keypad Test

The Keypad Test allows the user to test the gage's keypad to make sure that all keys are functioning properly. The keypad test is a graphical representation of the Magna-Mike keypad and other remote switches. To begin testing, press any key on the keypad. The corresponding key on the display should be highlighted to demonstrate that the key is functioning properly. If the Beeper parameter is set to ON, then the gage will beep each time a key is pressed. Pressing [ENTER] will exit the keypad test. Pressing [ON/OFF] will turn the unit OFF.

The four graphic keys on the left of the test display correspond to:

- **QCAL**: Test indicator for the [QCAL] button on the probe.
- **MAX**: Test indicator for the [MAX] button on the optional two-button probe.
- **FOOT**: Test indicator for the optional foot switch.
- **AUX**: Test indicator for any installed auxiliary switch.

5.5.2 Video Test

The Video Test allows the user to test individual pixels from the display. On entering the Video Test, the display will alternate turning on and off each pixel on the screen so that any pixel or set of pixels that

are not functioning properly can be easily identified. To exit the test, press [ENTER].

5.5.3 Hardware Test

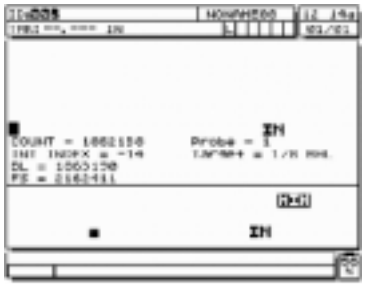
The Hardware Test has two purposes. First, basic information, such as software and probe type, is displayed. This information appears on the top of the display:

Second, there is a debugging option located on the top area of the display. If this option is turned ON, a new screen appears on the Measurement display supplying hardware data information. The following definitions refer to each field in the graphic below:

- **Count**: Analog/Digital converter number
- **INT Index**: Numerical location on the look-up table
- **BL**: Base Line (ball OFF position) A/D number
- **FS**: Full Scale (ball ON position) A/D number

- **Probe**: Probe type
- **Target**: Size of target ball

The information above is especially useful to test the amplitude of the test signal. Refer to Section 9.1 for steps on implementing the debugging option.



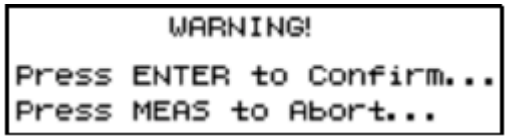
5.6 Resets

The Magna-Mike 8500 has four Resets designed to quickly restore the gage to the default setup parameters: Measurement, Communications, Dbase, and Master Reset. These settings are useful to new operators who are becoming familiar with the advanced feature setups described earlier in this section. The resets are also useful to experienced operators as efficient shortcuts to known configurations.

Caution: Dbase Reset and Master Reset PERMANENTLY DELETE all stored thickness readings in the Datalogger.

Press [SETUP] to enter the Setup menu. Use the **[▲]** and **[▼]** keys to select Resets and press [ENTER]. The Reset Setup menu is displayed:

Use the **[▲]** and **[▼]** keys to highlight a function and press [ENTER]. Regardless of which option is selected, the gage will respond with the following prompt:



Press [ENTER] to confirm the Reset or press [MEAS] to terminate the Reset and return to the Measure mode. Each Reset function is described below.

5.6.1 Measurement Reset

The Measurement Reset changes the measurement parameters to the factory default values listed below:

- Measure mode with Differential, Min, Max, and Alarms turned OFF
- All previous calibrations are voided
- Differential Reference Value = 0.0”
- Low Alarm Reference Value = 0.0”
- High Alarm Reference Value = 0.393”
- Multi-Point Cal is turned OFF
- Display Update Rate = 4 Hz (per second)
- Foot Switch configured to Send
- Low Resolution - 0.001” or 0.01 mm
- Backlight is turned ON
- Backlight Timeout is set to 15 seconds
- Two button probe - Max button configured to Send

5.6.2 Communication Reset

The Communication Reset changes the communications parameters to the factory default values listed below:

- Baud Rate - 19200
- Stop Bits - 1

- Parity - None
- Comm Protocol - Multiple
- Serial I/O Fmt - F1

5.6.3 Dbase Reset

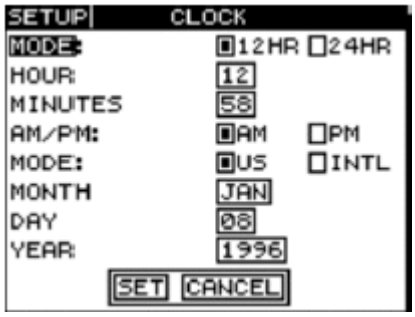
The Dbase Reset deletes all stored data in the Datalogger.

5.6.4 Master Reset

The Master Reset performs all Magna-Mike resets simultaneously. Therefore, the Measurement, Communications, and Dbase parameters are reset to default values.

5.7 Clock

The Clock setting feature allows the user to set the internal clock. The user has the choice of U.S. Standard and International time, as well as a 12 or 24 hour mode. To enter the Clock Set mode, press the [SETUP] key. Use the [↑] and [↓] keys to select Clock and press [ENTER]. The gage displays the Clock Setup screen:



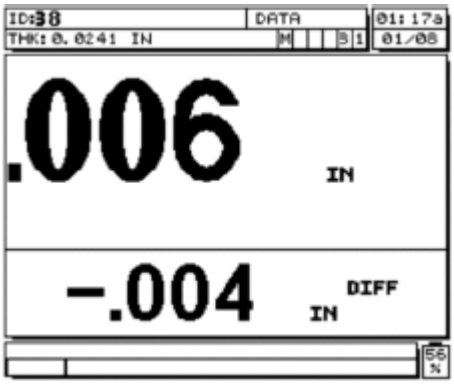
Use the [↑] and [↓] keys to highlight a parameter and use the **[←]** or **[→]** key to change the parameter. After settings have been made, select SET and press [ENTER] to confirm the changes.

5.8 Differential

The Differential function shows the actual thickness along with the difference between the actual thickness and a user-set reference value. The differential thickness can be used in conjunction with the Min Mode as well as with the Alarm Mode.

To enter the Differential Setup screen, press [SETUP]. Use the [↑] and [↓] keys to select Differential and press [ENTER]. The gage displays the Differential Setup screen:

Use the **[←]** or **[→]** key to enable or disable the Differential Mode and press [ENTER]. Use the **[↑], [↓], [←],** and **[→]** keys to enter the Differential referential value and press [MEAS] to return to the Measurement screen with the Differential active.



The gage displays the active thickness reading on the Primary Display and the Differential value on the Secondary Display.

Note: The step above will be reversed if the Primary Display is set to Bottom.

5.9 Alarm

The Alarm feature allows the user to view and change the Low and High Alarm Reference values (thickness set points that include current gage units and resolution) via the Setup menu. When this feature is enabled, the Alarm sounds when any displayed reading (actual, minimum, or maximum) is either less than or equal to the Low Alarm Reference Value or greater than or equal to the High Alarm Reference Value.

A flashing Alarm flag, located in the thickness display area, indicates the alarm condition and repeats an audible beep. The Alarm is recorded in the Datalogger second status box for all stored measurements. An “A” indicates the Alarm Mode, an “L” indicates the Low Alarm condition, and an “H” indicates the High Alarm condition.

To enter the Alarm Setup screen, press [SETUP]. Use the **[▲]** and **[▼]** keys to select Alarm and press [ENTER]. The gage displays the Alarm Setup screen:

Use the **[←]** or **[→]** key to enable or disable the Alarm Mode and press [ENTER]. Use the **[↑], [↓], [←],** and **[→]** keys to enter the Low Alarm Reference Value and press [ENTER]. Use the **[↑], [↓], [←],** and **[→]** keys to enter the High Alarm Reference Value. Press [MEAS] to return to the Measurement screen with the Alarm active. The displays below show High Alarm and Low Alarm conditions:

5.10 Optional Items

In addition to the standard items included with the gage, several optional items may be purchased separately. These include:

WIN8500 Interface Program - This Windows-based software application imports, collects, and saves thickness measurement data from the gage directly into a Microsoft® Excel spreadsheet. When transferring data to WIN8500, the user may choose to send just one active thickness reading, an entire file, or a range of measurements. The program is compatible with Windows 95®, Windows 98®, and Windows NT®.

Foot Switch - The gage can use a foot switch (part # 85FSW) to simulate the Send, Save, or Meas function from the gage. See Section 5.3 for details.

Two Button Probe Configuration - All 802PR type probes are equipped with both the standard QCAL button and a second MAX button. The function associated with the MAX button may be programmed as described in Section 5.3.

6 DATALOGGER

The Magna-Mike 8500 Datalogger has a built-in file and data management system. Each thickness reading can be stored and tagged with an alpha-numeric ID and filename corresponding to the location of each measurement point in the actual application. The measurement type and setup parameters are stored with each reading. The operator may recall and print data, or send data to a computer.

6.1 Creating Data Files

There are three (3) types of data files that the user may create from the Magna-Mike 8500 Datalogger or PC:

- Incremental
- Sequential
- Sequential + Custom Points

Incremental File Types
An Incremental file starts at a specified ID number and then automatically increments to the next ID number thereafter. A maximum of 16 alpha-numeric characters may be used.

Example of **Incremental File Types:**

1. initial	1
	2
	3
	.
	.
	.
limit	9

2. initial	ABC
	ABD
	ABE
	.
	.
	.
	ABZ
	ACA
	ACB
	.
	.
	.
limit	ZZZ

3. initial	ABC*12*34
	ABC*12*35
	ABC*12*36
	.
	.
	.
limit	ABC*12*99

4. initial	0001
	0002
	0003
	.
	.
	.
	0009
	0010
	.
	.
	.
limit	9999

5. initial	1A
	1B
	1C
	.
	.
	.
	1Z
	2A
	2B
	.
	.
	.
limit	9Z

Sequential
A Sequential file contains a starting and ending ID number. The resulting file includes both starting and ending values, and all incremental points in between.

Example of **Sequential File Types:**

Example 1: Start ID# = ABC123
End ID # = ABC135

Resulting file would contain the following list of ID#'s:

ABC123
ABC124
ABC125
.
.
.
ABC135

Example 2: Start ID# = XY-GY
End ID# = XY-IB

Resulting file would contain the following list of ID#'s:

XY-GY
XY-GZ
XY-HA
.
.
.
XY-IB

Sequential + Custom Point
A Sequential + Custom Point file includes a starting and ending ID number, plus up to 20 Custom Points that the user defines. In addition to the sequential values, each multiple thickness reading is assigned an ID number location.

Example of a **Sequential with Custom Point File**:

(Start - Finish ID#: mold cavity numbers such as 1, 2, 3, 4.)
(Custom Points: areas on a bottle or part such as top, bottom, left, right.)

Starting ID# = 1
Ending ID# = 4
Custom Points = Top
Bottom
Left
Right

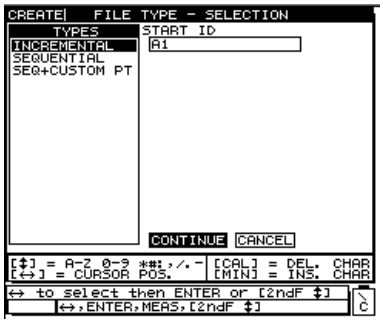
The resulting file would contain the following list of ID numbers:

1 Top
1 Bottom
1 Left
1 Right
2 Top
2 Bottom
2 Left
2 Right
.
.
.
4 Right

To create a file:

1. Press **[2nd F]** followed by the **[ID#]** key.
2. Use the [▲] and [▼] keys to select Create, and press **[ENTER]**.

3. Use the [▲] and [▼] keys to choose one of the three (3) file types (described above), and press **[ENTER]**.
4. Enter any alpha-numeric character in the Start ID or End ID fields by pressing the [▲] and [▼] keys.

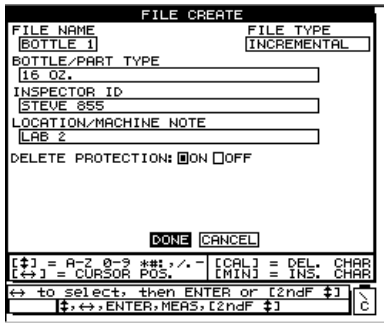


5. Use the **[←]** or **[→]** key to move the cursor position.
6. To insert a character, press the **[MIN]** key at the cursor position.

7. To delete a character, press the **[CAL]** key at the cursor position.
8. Press **[ENTER]** when entry(ies) are complete.
9. Press **[ENTER]** to select the Continue or Cancel button located on the bottom portion of the display.

Note: At any time press **[2nd F]**, **[↑]** or **[2nd F]**, **[↓]** to tab between fields.

After a file type is created, the File Create screen will appear below:



In a file, there are four (4) main parts to the file name header:

- File Name
- Bottle/Part Type
- Inspector ID
- Location/Machine Note

In the first field of the header section, the user must assign a File Name—up to eight (8) alpha-numeric characters—the following three (3) fields are optional. Please note, the ID number will not accept a space as either the first or last character of the field.

The File Create screen also includes a function called Delete Protection that may be turned ON or OFF per file. Delete Protection acts as a safeguard against accidental file deletion by displaying a warning message to notify the user. The Delete Protection must be turned OFF in order to delete a file. Use the Edit Rename function to turn the Delete position ON or OFF.

6.2 Saving Data

Saving Data allows the operator to review data or send stored data to a computer or printer. Thickness values, including calibration and setup parameters, may be stored in the Datalogger.

Note: If a measurement is already stored at the current ID number location, pressing the **[SAVE]** key will overwrite the old thickness reading.

To save data:

1. Press **[SAVE**] while a thickness value appears on the screen. When the gage beeps (only if the Beeper is set to ON) the reading is saved.

2. The displayed thickness value and setup information will be stored at the current ID number location. If the thickness display is blank when **[SAVE]** is pressed, then "_ _._ _ _" will be saved in place of a value.

The ID number, located on the top left portion of the Primary Display, automatically updates to the next available ID number. If the ID number cannot update sequentially, then a long beep will sound (only if the Beeper is set to ON), and a message will appear stating why the ID was unable to update.

6.3 File Options Menu

All File Options are listed by pressing **[2nd F]**, **[ID#]**. Below are brief descriptions of the following available options:

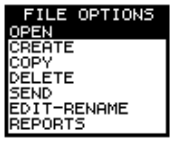
- Open
- Create
- Copy
- Delete
- Send
- Edit-Rename
- Reports

6.3.1 Open

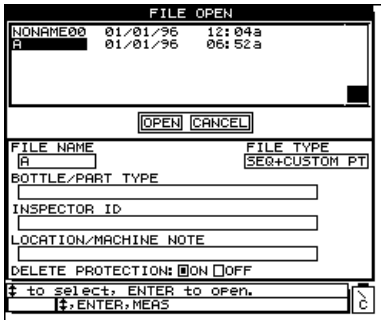
Use File Open to recall files stored in the Datalogger. Scroll through file names and a descriptive header for the highlighted file will appear on the lower portion of the display. This information is helpful in selecting the proper file, especially if the user is uncertain of the exact file name. The file that is opened then becomes the active file in the Magna-Mike 8500 Measure Mode.

1. Press **[2nd F]**, **[ID#]** and the File Options menu will appear.

2. Use the [▲] and [▼] keys to select Open from the list, and press **[ENTER]**.



3. Use the [▲] and [▼] keys to select a file to open, and press **[ENTER]**.



4. Use the **[←]** or **[→]** key to highlight the Open or Cancel button. Press **[ENTER]**.

6.3.2 Create

(Refer to Section 6.1 for details.)

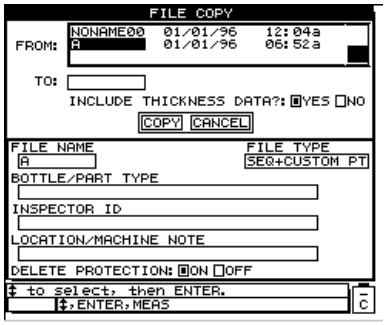
6.3.3 Copy

File Copy creates a duplicate file of any file that already exists in the Datalogger. The copy command copies the entire file including stored thickness data, or copies the file ID number structure only. The File Copy feature is useful when a new file needs to be created with the exact structure as a previous stored file.

1. Press **[2nd F]**, **[ID#]** and the File Options menu will appear.

2. Use the [▲] and [▼] keys to select Copy from the list, and press **[ENTER]**.

3. Use the [▲] and [▼] keys to select a file to copy, and press **[ENTER]**.



4. Use the [▲], [▼], **[◄–]**, and **[–►]** keys to enter the new file name for the copied file and press **[ENTER].**
5. Use the **[◄–]** or **[–►]** key to choose the Yes or No option to include thickness data. Press **[ENTER].**
6. Use the **[◄–]** or **[–►]** key to highlight the Copy or Cancel button. Press **[ENTER]**.

Note: If an error occurs, a long beep will sound and the gage will prompt the user to begin at step 3 from above.

6.3.4 Delete

See Section 6.6.

6.3.5 Send

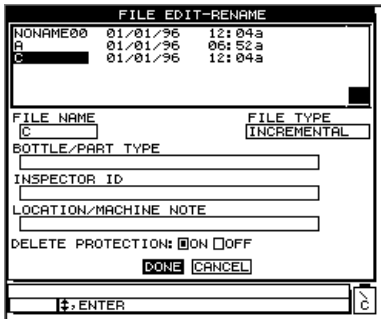
Data may be transferred to an external device, such as a printer or computer. See Section 7.2 for more information.

6.3.6 File Edit-Rename

The File Edit-Rename function allows changes to be made on one or all of the fields in a given file header. This feature does not allow editing the File Type and is not used for editing individual measurement identifiers or actual thickness readings.

1. Press **[2nd F]**, **[ID#]** and the File Options menu will appear.
2. Use the [▲] and [▼] keys to select Edit-Rename from the list, and press **[ENTER]**.

3. Use the [▲] and [▼] keys to select a file to edit or rename, and press **[ENTER]**.



4. Use the [▲], [▼], **[◄–]**, and **[–►]** keys to enter new information in the designated fields. Press **[ENTER]** to move to the next header line.

5. Use the **[◄–]** or **[–►]** key to turn Delete Protection ON or OFF. Press **[ENTER].**

6. Use the **[◄–]** or **[–►]** key to highlight the Done or Cancel button. Press **[ENTER]**.

6.3.7 Reports (On Screen)

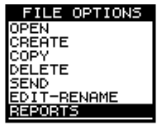
The Magna-Mike 8500 is capable of generating reports from inspection data without having to connect to a PC or printer. Three (3) types of reports are available:

- File Summary with Statistics Report
- Min/Max Summary
- File Comparison Report

To view a screen report:

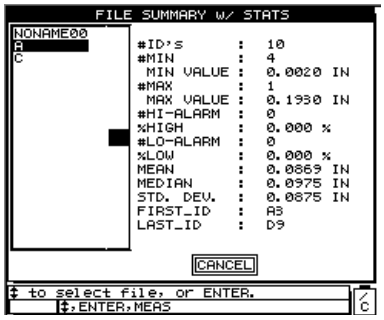
1. Press **[2nd F]**, **[ID#]** and the File Options menu will appear.

2. Use the [▲] and [▼] keys to select Reports from the list, and press **[ENTER]**.

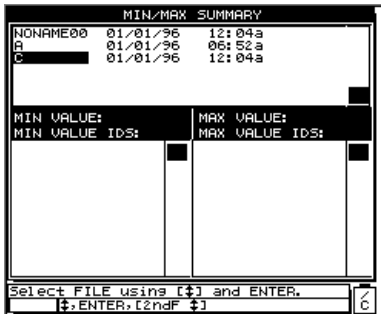


3. Use the [▲] and [▼] keys to select a desired report, and press **[ENTER]**.

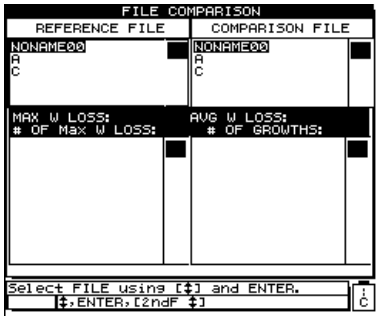
    a. If ***File Summary w/ Stats*** is chosen, use the [▲] and [▼] keys to highlight the desired file name, then press **[ENTER]** to view the statistics. Press **[ENTER]** again to exit.



b. If ***Min/Max Summary*** is chosen, use the [▲] and [▼] keys to highlight the desired file, and press **[ENTER]**. The minimum and maximum thickness location will be displayed. Use the [▲] and [▼] keys to scroll through the minimum thickness locations. Press **[ENTER]** to move to the list of maximum ID Locations. Use **[2nd F]**, **[▲]** and **[2nd F]**, **[▼]** to move between File Select, Min Thickness, and Max Thickness. Press **[MEAS]** to exit.



c. If ***File Comparison*** is chosen, use the [▲] and [▼] keys to select the Reference file (original file) in the left column, and press **[ENTER]**. Use the [▲] and [▼] keys to select the Comparison file (latest file) in the right column, and press **[ENTER].** Use the [▲] and [▼] keys to scroll through the maximum Wall Loss ID# Locations. Press **[ENTER]** and use the [▲] and [▼] keys to scroll through the Growth ID Locations. Press **[MEAS]** to exit.



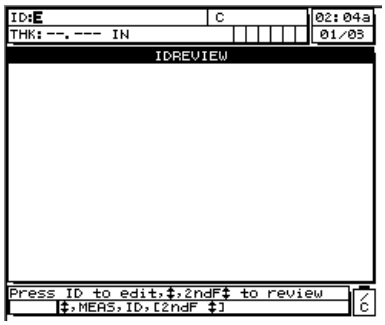
6.4 ID# Review/Edit

The ID Review mode is used to view an ID location and information stored within that file, such as:

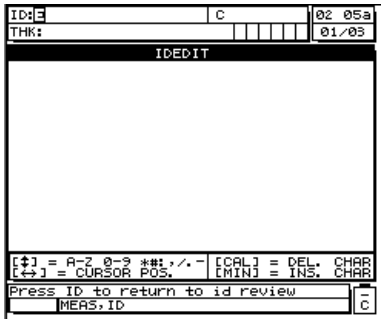
- Current ID Location
- Thickness Value
- Measurement Flags

To edit or review ID# locations:

1. Press the **[ID#]** key to review stored data and the ID# review screen will be shown.



2. Use the **[▲], [▼]** keys to slew through the stored ID# locations.
3. Press **[2nd F]**, **[▲]** to jump directly to the last ID# location in the file, or **[2nd F]**, **[▼]** to jump directly to the first ID# location in the file.
4. Press the **[ID#]** key a second time to enter the ID# Edit screen, and access any ID# file location. A cursor will be displayed in the ID# field located on the top left portion of the display.



5. Use the **[↑], [↓]**, **[←]**, and **[→]** keys to enter an exact ID# location.

6. Press the **[ID#]** key after editing, and the contents of the specified ID# location will be displayed.

7. Use the **[↑]** and **[↓]** keys to slew through the file at the new ID# location on the ID# Review screen.

6.5 Inserting or Appending ID# Locations into a File

The user may wish to insert or append ID# locations into a file. Inserting and appending data into a file will vary slightly depending on the file type.

6.5.1 Inserting or Appending ID# Locations into Incremental Files

Incremental files are organized in alpha-numeric order. Any ID# that is inserted or appended will be automatically placed in alpha-numeric order.

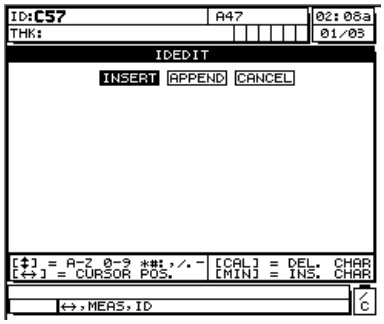
1. In the Measure mode, press the **[ID#]** key to enter the ID# review screen.
2. Press the **[ID#]** key a second time to enter the ID# Edit screen. The editing cursor will be displayed in the ID# field located on the top left portion of the display.
3. Use the **[↑], [↓], [←]**, and **[→]** keys to enter the new ID#.
4. Press the **[MEAS]** key to return to the Measure mode with the new ID# as the current location. The user must press the **[SAVE]** key so that the ID# location will be added to the File.

Note: The ID# will be automatically sorted in alpha-numeric order in Incremental File types.

6.5.2 Inserting or Appending ID# Location into Sequential or Sequential with Custom Point Files

Sequential or Sequential + Custom Point Files are organized in a repetitive fixed pattern. ID#s that are added to these file types need to specify the location were the ID# will be placed. The user will be prompted to Insert data after the current location, or Append data to the end of the file.

1. In the Measure mode, press the **[ID#]** key to enter the ID# review screen.
2. Press the **[ID#]** key a second time to enter the ID# Edit screen and the editing cursor will be displayed.
3. Use the **[↑], [↓]**, **[←]**, and **[→]** keys to enter the new ID#.
4. Press the **[MEAS]** key if the edited ID# is not part of the active file, and the gage will prompt the user to "Insert", "Append" or "Cancel".



5. Use the **[←]** or **[→]** key to select "Insert", "Append" or "Cancel". The user must press the **[SAVE]** key so that the ID# location will be added to the File.
6. Press **[ID#]** to return to the ID Review Screen.

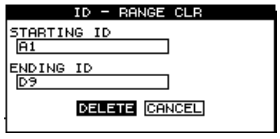
6.6 Erasing Data

Caution: Data erased by the following techniques CANNOT be recovered.

Note: In order to erase or delete a file or any portion of a file, the Delete Protection for the file MUST be turned OFF. If Delete Protection is turned ON, then the user will be prompted by the message "Delete Protection is ON" when attempting to delete a protected file. Use the file Edit-Rename function to turn OFF Delete Protection and then restart the erase sequence.

Erasing a Range of ID# Locations:

1. From the Measurement Mode, press **[2nd F], [Clr Mem]**.
2. The ID-Range CLR dialog box will appear on the screen displaying the first and last ID# in the active file.



3. Use the [▲], [▼], **[◄–]**, or **[–►]** key to edit the starting ID# to the ID# that defines the beginning of the range that the user wishes to erase.
4. Press **[ENTER]**.

5. Use the [▲], [▼], **[◄–]**, or **[–►]** key to edit the ending ID# to the ID# that defines the end of the range that the user wishes to erase.
6. Press **[ENTER]**.
7. Use the **[◄–]** or **[–►]** key to highlight the **[DELETE]** or **[CANCEL]** button, and press **[ENTER]** to return to the Measure mode with the ID# range from the file erased.

Erasing a Single ID# Location

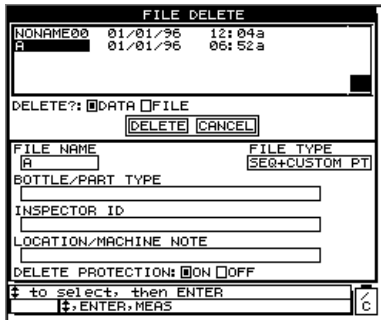
A single ID# location can be deleted using the Range Delete. Simply define the starting ID# and ending ID# to be the same ID# location. If you wish to overwrite a stored ID# with a new thickness it is easier to edit to the ID# location and save over the existing thickness value.

File Delete

The Delete feature erases files from the Datalogger's memory permanently. Only use this feature if data is no longer necessary.

1. Press **[2nd F]**, **[ID#]** and the File Options menu will appear.
2. Use the [▲] and [▼] keys to select Delete from the list, and press **[ENTER]**.

3. Use the [▲] and [▼] keys to select a file to delete, and press **[ENTER]**.



4. Use the **[←]** or **[→]** key to choose whether the Data or File will be deleted. Press **[ENTER].**

5. Use the **[←]** or **[→]** key to highlight the Delete or Cancel button. Press **[ENTER]**.

   If the file is Delete Protected, a message will appear on the bottom of the display. The user must Cancel the File Delete screen and use the Edit-Rename function to turn Delete Protection OFF for the file you wish to delete.

   a. Press **[2nd F] [ID#]**, (file).

   b. Use the [↑] and [↓] keys to select Edit-Rename from the File menu, and press **[ENTER]**.

   c. Use the [↑] and [↓] keys to select the appropriate file to edit, and press **[ENTER]**.

   d. Press **[ENTER]** until Delete Protection is highlighted.

   e. Use the **[←]** or **[→]** key to choose OFF. Press **[ENTER].**

f. Use the **[←]** or **[→]** key to highlight the Done button. Press **[ENTER]**.

g. Begin again at Step 1.

Erasing the Entire Database

This function will erase all files and the data contained in those files. The Datalogger will be completely empty after this procedure, and deleted information is **NOT** retrievable.

1. Press **[SETUP]**.
2. Use the [↑] and [↓] keys to highlight “Resets”, then press **[ENTER]**.
3. Use the [↑] and [↓] keys to select “DBASE Reset”. Press **[ENTER]**.
4. A warning dialog box will appear. Press **[ENTER]** to confirm deleting the entire Database, or **[MEAS]** to exit and return to the Measure mode.

7 COMMUNICATIONS, RS-232 DATA TRANSFER

Data is easily transferable by directly sending individual files from the gage to a PC. Once data is transmitted from the Magna-Mike 8500 it remains in memory for later use, or until cleared out by the operator. Therefore, if any errors occur while transmitting data, the information may be transmitted again.

1. Confirm that the receiving device is connected and configured properly. See Appendix I for the receiving device and software usage.
2. Confirm that the communications parameters on the Magna-Mike 8500 are identical to those on the computer or other device (see Section 5-3).

Note: The Magna-Mike 8500 can send data to any device capable of receiving ASCII formatted data using the RS-232 C/D protocol including personal computers, minicomputers, Dataloggers, and printers. The data cable must be compatible with the Magna-Mike 8500 output connector and the serial input connector of the receiving device. Panametrics-NDT supplies cables for IBM compatible PC's and serial printers. When communicating directly to a printer the Magna-Mike 8500 only works with serial printers.

7.1 Single Send Data Transfer

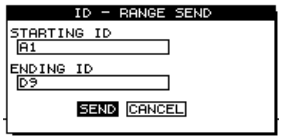
If the gage is connected to an external device (printer, data collector, or computer), and if the only data that needs to be collected on command is the active displayed measurement, follow the steps below. Please note that the current ID number will not be transmitted and only the appropriate setup flags will be transferred.

1. Set up the desired Measure mode on the Magna-Mike 8500.
2. Make a thickness reading.
3. Press **[SEND]** quickly (release in less than one second) or use the optional footswitch.
4. Only the displayed measurement data with its appropriate setup flags will be transmitted, and the gage will return to the original Measure mode. The specific data transmitted depends on the Datalogger output format (see Appendix II). If the thickness display is blank when **[SEND]** is pressed, then "--.---" will be sent in place of a value.

7.2 Range Data Transfer

When only a portion of a file needs to be transmitted to a computer or printer, follow the steps below:

1. Open the file that contains the range to be transferred (see Section 6.3). From the Measure Mode, press and hold **[SEND]** until the ID-Range Send dialog box is displayed.



2. Use the [▲] and [▼] keys to set the starting ID of the desired ID number range. Press **[ENTER]**.

3. Use the [▲] and [▼] keys to set the ending ID of the desired ID number range. Press **[ENTER]**.

4. Use the **[◄]** or **[►]** key to highlight the Send button. Press **[ENTER]** and the specified data range will begin transmission. Choose the Cancel button to exit this function.

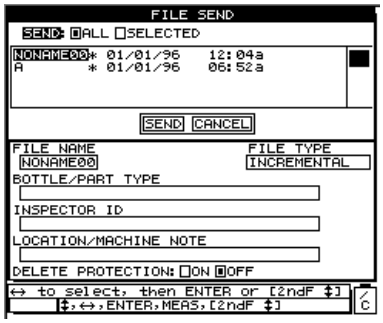
7.3 File Data Transfer

Data may be sent one file at a time or several files at a time to a computer or printer. The data includes the Filename, File Header, ID Number, Thickness Data, Flags, and Comments. To perform a data transfer, follow the instructions below:

1. Press **[2nd F]**, **[ID#]** and the File Options menu will appear.

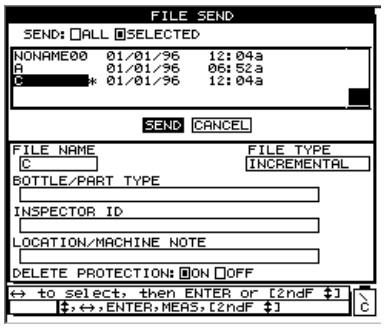
2. Use the [▲] and [▼] keys to select Send from the list, and press **[ENTER]**.

3. Use the **[◄–]** or **[–►]** key to choose to send “All” or “Selected” files in the gage to the connected device. Press **[ENTER]**.



a. If ***All*** is chosen, then an asterisk will appear next to all of the file names. The Send function will be highlighted. Press **[ENTER]** to confirm the transmission, and the gage will begin sending all files in the database. Use the **[◄–]** or **[–►]** key to highlight the Cancel button to exit the Send function.

b. If ***Selected*** is chosen, then an asterisk will only appear next to the file names selected by the operator. Select a file by using the [▲] and [▼] keys, and press **[ENTER]** to tag a file for sending. Pressing **[ENTER]** again will un-tag the file. Use the **[▲]** and **[▼]** keys to continue scrolling through the file list until all desired files are tagged.



4. When finished, press **[2nd F]**, **[▼]** to highlight the Send button. Press **[ENTER]**.

7.4 Serial Communication Setup

The Magna-Mike 8500 can transmit stored data and displayed readings over its I/O (Input/Output) RS-232 cable to any device with an RS-232 serial interface connector. The gage can also receive and execute commands sent from any device with a serial interface including personal computers and printers. (See Appendix I and III for a detailed list of remote commands and cable pin numbers.)

In order to enable communication between the Magna-Mike 8500 and other devices, the correct cable must be used and both communication parameters must be set to match the configuration of the computer. To verify compatibility proceed as follows:

1. Press the **[SETUP]** key.

2. Use the [▲] and [▼] keys to select Communication, and press **[ENTER]**.

   The current communication parameters will be displayed. Use the [▲] and [▼] keys to select a parameter, and the **[←]** or **[→]** key to change the parameter. The settings options for each parameter is as follows:

Baud Rate:	(1200, 2400, 4800, 9600, or 19200)
Number of Stop Bits:	(1 or 2)
Parity Bit:	(None, Odd, or Even)
Comm Protocol:	(Single or Multiple)
Serial I/O Format:	(F1, F2, F5, F6, F7,or F8)
Foot Switch:	(Send, Save, and Measure)
Max Key:	(Send, Save, and Measure)
Save/Send:	(Primary and Secondary)

Note: Make sure the settings in the receiving device match that of the Magna-Mike 8500:

Baud Rate: (1200, 2400, 4800, 9600, or 19200)
Number of Stop Bits: (1 or 2)
Parity Bit: (None, Odd, or Even)

3. Press **[MEAS]** to exit and return to Measure mode with the new parameters.

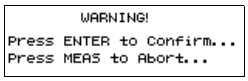
7.5 Data Output Formats

There are six (6) formats for transmitting data: F1, F2, F5, F6, F7, and F8. Please refer to Appendix II for a general description about these I/O formats for both Single-Send and Batch-Send transmissions.

7.6 Database Reset

The Dbase Reset function will erase all data files in the Magna-Mike 8500 Datalogger. Only use this reset when there is no future need for any of the stored data in the Datalogger. **There is no way to recover data once this reset is performed.**

1. Press **[SETUP]**.
2. Use the [▲] and [▼] keys to select Resets. Press **[ENTER]**.
3. Use the [▲] and [▼] keys to select Dbase Reset. Press **[ENTER]**.
4. A warning message will appear prompting the user to press **[ENTER]** to confirm the reset, or **[MEAS]** to terminate the reset.



5. Once the reset is complete, the gage will return to the Setup menu.
6. Press **[MEAS]** to return to the Measure mode.

Note: If **[MEAS]** is pressed at any time before pressing **[ENTER]** in Step 3, the gage will return to the Measure Mode without performing the reset.

8 TECHNICAL SPECIFICATIONS

PACKAGING

Case Material:	High impact Lexan, splash proof
Size:	9.375H x 5.45W x 1.5T inch 238H x 138W x 38T mm
Weight:	2.1 lbs

DISPLAY

Display Type:	Graphics super twisted nematic LCD
Color:	Black on grey, electroluminescent backlight
Module Size:	114mm (W) x 100mm (H) x 14mm (T)
Viewing Area:	102mm (W) x 86mm (H)
Dots:	240W x 200H
Dot Size:	0.36mm x 0.36mm

KEYPAD

14 Keys, sealed, tactile fell, beep for active key function

INTERNAL DATALOGGER

- 95,000 thickness storage capacity
- ID# Location can be up to 16 alpha-numeric characters
- Full setup and measurement information stored with each reading
- ID numbers may be organized into two dimensional arrays of X columns by Y rows. X represents different measurement points, and Y represents products to be measured (see Section 6.1–Creating Data Files).

RS-232 OUTPUT

- 6-pin Lemo connector on top panel
- Full duplex transmit & receive capability
- Selectable communication parameters:

  Baud Rate: 1200, 2400, 4800, 9600, or 19200
  Word Length:8
  Stop Bits: 1 or 2
  Parity: Even, Odd, or None
- XON/XOFF and DSR/DTR flow control

BATTERY TYPE

6 Volts, 1800M MAH, Internal rechargable NiCad battery pack

BATTERY OPERATION

Duty cycle–8 to 16 hours (depending on display backlight usage), recharge time–2 hrs

POWER REQUIREMENTS OF 36CAP CHARGER/ADAPTER

100-240 VAC, 50/60Hz

LINE CORDS, PLUGS

- NEMA 15-5P (US, Canada, Japan)
- CEE 7/7 (Europe)
- BS1363 (UK)

AMBIENT TEMPERATURE

0°C to 50°C (32°F to 125°F) if measurement taken within 15°C of calibration temperature.

OPERATING ENVIRONMENT

Designed to operate in a controlled electroomagnetic environment.

STANDARD PROBE

- Approximately 0.85" dia. x 6.0" long
- Tip radius 0.062"
- Quick disconnect cable, Hirose connector
- Integral Quick-Calibration button

Table 1: Accuracy for Probes 801PR and 802PR

Target Ball Size		1/16" (1.6mm)	1.8" (3.2mm)	3/16" (4.8mm)
Number of Decimal Digits	Low Res.	0.xxx" x.xxmm	0.xxx" x.xxmm	0.xxx" x.xxmm
	High Res.	0.xxxx" x.xxxmm	0.xxxx" x.xxxmm	0.xxxx" x.xxxmm
Range	--	0.090" 2.29mm	0.180" 4.57mm	0.250" 6.35mm
* Basic Accuracy	Low Res.	5% + .001" 5% + .025mm	4% + .001" 4% + .025mm	3% + .001" 3% + .025mm
	High Res.	5% + .0001" 5% + .003mm	4% + .0001" 4% + .003mm	3% + .0001" 3% + .003 mm
Multi-Point Accuracy	Low Res.	3% + .001" 3% + .025mm	2% + .001" 2% + .025mm	1% + .001" 1% + .025mm
	High Res.	3% + .0001" 3% + .003mm	2% + .0001" 2% + .003mm	1% + .0001" 1% + .003mm

Note: * Basic accuracy is assured for new probes only. Multi-Point Calibration is recommended to ensure accuracy of measurements.

DEFINITIONS

Measurable Materials:	Any nonferrous (not magnetically permeable) or composite material that is hard enough to withstand deformation by the probe or target ball. The material must have a minimum outside concave radius of 0.062" (1.59mm) at the point of measurement and a minimum inside concave radius no less than: 0.031" (0.79mm) with a 1/16" ball 0.062" (1.59mm) with 1/8" ball 0.94" (2.38mm) with a 3/16" ball
Basic Accuracy:	The difference between the actual thickness and display thickness shall be less than the specified basic accuracy amount if calibrated (see Section 2.3–Ball Calibration). Basic Accuracy is expressed as a percent of reading plus a fixed amount.
Multi-Point Accuracy:	The difference between the actual thickness and display thickness shall be less than the specified Multi-Point accuracy if calibrated (see Section 2.4–Multi-Point Calibration). Multi-Point Accuracy is expressed as a percent of reading plus a fixed amount.
Effective Resolution:	The actual attainable measurement resolution may be limited to an amount greater than a least significant display digit.

Measurement Rate:	4 measurements/second standard. Rate can be programmed to 4, 8, or 16Hz.
Min Measurement:	A selectable display mode that shows the lowest thickness measured since being reset.
High/Low Alarms:	A selectable feature that produces an audible beep and displays a visual flag when the measured thickness extends beyond the set parameters.

9 MAINTENANCE AND TROUBLESHOOTING

The Magna-Mike 8500 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 call Panametrics-NDT™ for technical assistance (refer to Section 9.6).

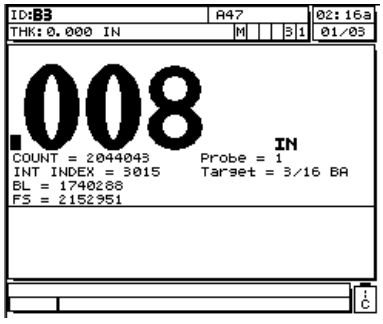
9.1 Probe

If an unknown target error message occurs during calibration, it means that the gage is unable to identify the target ball. This could 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.)

To test the amplitude of the probe signal, follow the steps below:

1. Press **[SETUP].**
2. Use the **[↑]** and **[↓]** keys to select Diagnostics. Press **[ENTER].**
3. Use the **[↑]** and **[↓]** keys to select Hardware. Press **[ENTER].**
4. Use the **[↑]** and **[↓]** keys to select Debug.
5. Use the **[←]** or **[→]** key to turn the Debug function ON. Press **[MEAS].**

The hardware data information will appear on the Measure mode display.



If the user presses directly on the probe tip with a nonmagnetic object, such as plastic, the INT Index number should not change by more than two counts. Large changes that occur may indicate that the tip is damaged and unable to provide reliable signals to the gage. If the problem continues, try changing the probe and probe cable. To clear the hardware data from the screen, go back to the Diagnostics Setup menu and turn Debug to OFF.

9.2 Battery

The gage operates for at least eight (8) hours between charges under normal conditions. A battery percentage is continuously shown in the lower right corner of the display to represent the remaining battery life. When the battery charge is insufficient, the gage automatically turns-off to prevent damage to the battery. Recharge the battery using the charger and line cord provided with the unit.

Charging the Battery
The battery charge indicator will show a rotating bar when the charger is plugged in. The gage will display a “C” indicating that the battery is charging, and an “S” when the charging is complete (approximately 2 hours).

Replacing the Battery
The NiCad battery looses the ability to hold a full charge after several hundred recharges. To replace an old battery pack, follow the steps below:

1. Open the battery panel on the back of the gage case by loosening the four (4) captive screws.
2. Once the case is open, extract the battery by gently pulling the black strap at the right end of the battery.
3. Carefully remove the plug that connects the wire from the battery pack to the circuit board of the gage.
4. Connect the new battery pack with the label side facing out.
5. Replace the battery panel and tighten the screws.

The internal memory will be maintained for over an hour when the battery is removed. If a new battery is installed in less than an hour, no calibration or thickness data will be lost.

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 Panametrics-NDT or your local sales and service representative for technical assistance.

"Do Calibration" during Quick Calibration (QCAL)
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 QCALs. 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 QCAL again. If this message persists, it will be necessary to perform a new calibration.

"No Probe, Please Connect Probe"
When a probe is connected to the Magna-Mike 8500 and this error 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.

Thickness Readings Drifting Beyond Accuracy Specifications
Verify that a QCAL is being performed at least every half hour. If QCAL is used excessively to preserve accuracy (i.e. between each reading), then there may be an electrical problem in the probe or probe cable. Please note that drift due to temperature and probe orientation is substantially worse near the upper limit of any target ball's range.

“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 datalogging 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 or 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 8500 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
- Do not allow the probe to contact metal objects
- Do not rub the probe tip over abrasive surfaces, such as ceramics

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. For more detail about performing these Diagnostics, see Section 5.5–5.5.3.

9.5 ROM Upgrades

The operation of the Magna-Mike 8500 is controlled in large part by a program that is stored in a type of memory called Flash ROM. The user can easily change the operating program by connecting the gage to a personal computer, which allows Panametrics-NDT to offer operating program revisions and upgrades on diskettes, or via e-mail or FTP download.

9.6 Repair and Technical Assistance

You may contact a Panametrics-NDT' service representative by phone or e-mail. Please have the following information available: your company name, address, and telephone number; the model and serial number of your unit; and a description of the problem or request.

Phone within the U.S.: (800)225-8330
Phone outside the U.S.: (781)899-2719
Telefax: (781)899-1552 - Telex 6817337
E-mail: gepanametrics-ndt@ps.ge.com

Outside the United States, please contact your local sales representative or Panametrics-NDT office.

If you need to return equipment, you will be given an **RA (Return Authorization) number** to attach to you packing slip. This number allows prompt handling and tracking of your equipment during repair. Additionally, if your unit requires repair or replacement parts that the warranty does not cover, please also have your purchase order number ready. Ship Magna-Mike 8500 units requiring service to:

Panametrics
223 Crescent Street
Waltham, MA 02453
USA
Attn: NDT Repair/RA#

Remember to use you RA Number.

APPENDIX I - RS-232 INTERFACE

The RS-232 Input-Output (I/O) connector is located on the top-center of the Magna-Mike 8500. It is a 6 position circular LEMO style receptacle. Insert the mating connector with the red dot upward, and push straight in until the connector snaps into place. Withdraw the connector by pulling straight out. Panametrics provides complete cables to connect the Magna-Mike 8500 directly to devices with standard DB-25 male and female connectors, as well as the IBM PC-AT 9 male pin serial I/O connector.

Use the information below to verify compatibility with particular equipment, and assist in constructing a custom cable if necessary.

Magna-Mike 8500 I/O PIN #	**Wire Name**	**Signal Name**	**IBM PC 9 Pin Conn. PIN #**	**STD DB25 25 Pin Conn. PIN #**
1	Foil/tinned copper	Ground	5	7
2	Red	Data from Gage	2	3
3	Orange	Data to Gage	3	2
4	Yellow	Do not connect	-	-
5	Green	DTR from Gage	6	6
6	Blue	DSR to Gage	4	20

Electrical Definition

Data is transmitted on one line (Data Out of Gage) and received on another line (Data Into Gage). Data transfer, consisting of ASCII-coded character strings, is a synchronous serial. Baud rate, word length, stop bits and parity are selectable from the keyboard.

Data Format

Listed below are the electrical specifications for data transmittal:

Signal levels are RS-232 C/D compatible
Mark is less than -2.5 Volts
Space is greater than +2.5V
The maximum output signal range is ± 5.50 Volts
The maximum input signal range is ± 20 Volts

The following two hardware handshake lines are included:

DTR: The gage sets DTR (Data Terminal Ready) low (<-2.5V) when it is not able to receive data. DTR will be high (>+2.5V) at all times.

DSR: A high (>+2.5V) supplied by the external DSR (Data Set Ready) device (or by being connected to the DTR line) will enable the gage to transmit data. A low (<-2.5V) supplied by the external device (or by being connected to the RTS line) will prevent the gage from transmitting data.

Note: If the external device does not provide the proper DSR signal, then DTR must be connected to DSR (jump pin 6 to pin 20 in the 25 position cable connector or in the 25-pin connector on the attached equipment.

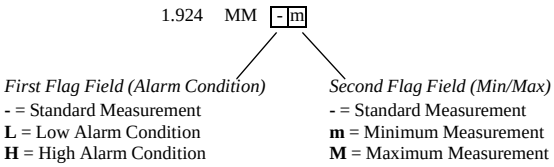
APPENDIX II - I/O FORMATS

The Magna-Mike 8500 is able to transmit data to any device through the RS-232 I/O connector. I/O formats are applicable in both single-send and batch-send transmissions. In order to view the current Serial I/O format or change it, press **[SETUP]** and go to the Communications Menu.

Single-Send Transmission

F1, F2: **Thickness data, measurement units, and 2 flag fields will be transmitted.**

For example, if a minimum thickness of 1.924mm is transmitted, the transmission will appear as:



F5: **Only the numerical, signed (+ or -) thickness data is sent:**

+1.924

F6, F7, F8: **Data is sent in the same format as when multiple readings are retrieved from the gage memory.**

Each reading will have an ID number such as “001” (as shown below). The string will contain the reading, units, and flags. Note: the fifth and sixth flag field will be represented by a single digit: 1, 2, or 3 for the fifth flag; and 1, 3, or 6 for the sixth flag depending on the probe type.

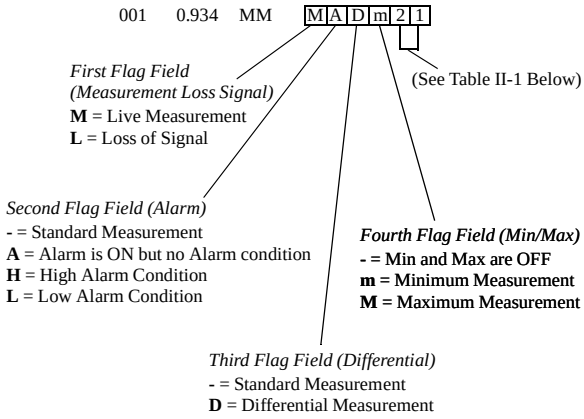


Table II-1: Fifth and Sixth Flag Field Value Definitions			
Fifth Flag Value (Target Type)	*Sixth Flag Value (Probe Type)*		
	Probe Type: 1 (801PR, 802PR, 802PR-111, 802PR-112)	**Probe Type: 3** (802PR-105)	**Probe Type: 6** (802PR-109, 802PR-110)
1	1/16" Ball	1/16" Ball	1/8" Ball
2	1/8" Ball	3/16" Ball	3/16" Ball
3	3/16" Ball	1/2" Disk	1/4" Ball

Batch-Send Transmission

F1: ID number, Thickness Reading, Setup Table and Comment

ID#	THICKNESS	UNITS	FLAGS	SU#
AA	-.---	IN	--	1
AB	-.---	IN	--	1
BA	-.---	IN	--	1
BB	-.---	IN	--	1

OK

SU#	LO-ALM	HI-ALM	UNITS	PID	BID
1	0.000	20.000	IN	11	4

OK

F2: ID number, Thickness Reading and Comment

ID#	THICKNESS	UNITS	FLAGS	SU#
AA	-.---	IN	--	1
AB	-.---	IN	--	1
BA	-.---	IN	--	1
BB	-.---	IN	--	1

OK

F5: Thickness Reading Only

+-.---
+-.---
+-.---
+-.---

F6: File Header, Thickness Reading Setup Table, and Comment

FILE NAME: B
FILE TYPE: SEQ+CUSTOM PT
FILE DESCRIPTION:
INSPECTOR ID:
LOCATION NOTE:
FILE DELETE PROTECTION: OFF
OK

ID	THICKNESS	UNITS	FLAGS	SU #
AA	--.---	IN	L-----	1
AB	--.---	IN	L-----	1
BA	--.---	IN	L-----	1
BB	--.---	IN	L-----	1

OK

SU #	LO-ALM	HI-ALM	DIFF	UNITS	PID	BID
1	0.000	20.000	0.000	IN	11	4

OK

F7: File Header, Thickness Reading, and Comment

FILE NAME: B
FILE TYPE: SEQ+CUSTOM PT
FILE DESCRIPTION:
INSPECTOR ID:
LOCATION NOTE:
FILE DELETE PROTECTION: OFF
OK

ID	THICKNESS	UNITS	FLAGS	SU #
AA	--.---	IN	L-----	1
AB	--.---	IN	L-----	1
BA	--.---	IN	L-----	1
BB	--.---	IN	L-----	1

OK

F8: ID number, Thickness Reading, Setup Table, and Comment

ID	THICKNESS	UNITS	FLAGS	SU #
AA	--.---	IN	L-----	1
AB	--.---	IN	L-----	1
BA	--.---	IN	L-----	1
BB	--.---	IN	L-----	1

OK

SU #	LO-ALM	HI-ALM	DIFF	UNITS	PID	BID
1	0.000	20.000	0.000	IN	11	4

OK

F9: ID number, Thickness Reading, Setup Table and Statistics

ID	THICKNESS	UNITS	FLAGS	SU #
AA	0.032	IN	--	2
AB	0.021	IN	--	2
BA	0.016	IN	--	2

BB 0.048 IN -- 2
OK

SU #	LO-ALM	HI-ALM	UNITS	PID	BID
2	0.000	0.393	IN	1	2

OK

STATISTICS

OF THK: 4
MEAN: 0.0293 IN
MEDIAN: 0.0265 IN
STD. DEVIATION: 0.0142 IN
OF HIGH ALARMS: 0
% OF HIGH ALARMS: 0.00%
# OF LOW ALARMS: 0
% OF LOW ALARMS: 0.00%
# OF MINS: 1
MIN. VALUE: 0.0160
OF MAXS: 1
MAX. VALUE: 0.0480
OK

APPENDIX III - REMOTE COMMANDS VIA RS-232

The Magna-Mike 8500 can be controlled from an external computer or programmable controller using the serial RS-232 cable. Most functions, which can be performed by pressing keys on the Magna-Mike 8500, may be done by transmitting commands to the gage via the serial cable. These functions include setup, calibration, and data storage and retrieval.

For example, this feature allows the user to input the setup and calibration parameters into the gage from a computer, thus relieving the operator of setting up and calibrating the gage manually.

There are two sets of command formats: **Multiple-Character** and **Single-Character** commands. Multiple-Character commands consisting of two or more characters, and may be followed by a terminator. Single-Character commands imitate gage keystrokes by using a single character and no terminator.

To change the command formats:

1. Press **[SETUP]**.
2. Use the [▲] and [▼] keys to select the Communication menu, and press **[ENTER]**.
3. Use the [▲] and [▼] keys to select Comm Protocol.
4. Using the **[←]** and **[→]** keys to toggle between Multiple and Single character command formats.
5. Press **[MEAS]** to return to Measure mode.

Multiple-Character Commands

Multiple-Character commands are case sensitive, and if appropriate, terminated with a carriage-return line-feed pair i.e., (\r\n). The commands listed below instruct the gage to send the host, (the sender of the command) either a file directory or file read from the gage.

Send a File Directory:

Command FORMAT: FILEDIR?\r\n
\r is an escape sequence for carriage return.
\n is an escape sequence for line-feed.

Send a File Read:

Command FORMAT: FILEREAD?\2\r\n
FREAD info block\3

Note: \2 is an escape sequence referring to the ASCII data 2 hex, 2 decimal, or the STX character.

\3 is an escape sequence referring to the ASCII data 3 hex, 3 decimal, or the ETX character.

Single Character Commands				
Command Name	**ASCII Character**	**Decimal**	**Hex**	**Key Command**
Range Send	-	-	-	Hold [SEND]
Measure	m	109	6D	[MEAS]
Calibrate	c	99	63	[CAL]
ID	i	105	69	[ID#]
Minimum	n	110	6E	[MIN]
Save	s	115	73	[SAVE]
Send	t	116	74	[SEND]
Setup	)	41	29	[SETUP]
Slew Up	u	85	55	[↑]
Slew Down	D	68	44	[↓]
Slew Left	L	76	4C	[←]
Slew Right	R	82	52	[→]
Enter	p	112	70	[ENTER]
File	I	73	49	[2nd F] [ID#]
Clear Memory	S	83	53	[2nd F] [SAVE]
Print Screen	T	84	54	[2nd F] [SEND]

APPENDIX IV - CALIBRATION VERIFICATION FORM

This document is intended to assist the customer with calibration verification of the Magna-Mike 8500 in conjunction with the calibration instructions in Section 2. The Magna-Mike 8500 is a user-calibrated instrument and is subject to potential changes in accuracy caused by usage and environment. There are no electronic adjustments to make within the gage itself. It is the responsibility of the user to periodically verify system calibration as outlined in Section 3.3–Periodic Verification, and will be aided by the purchase and maintenance of 80CAL-NIS.

Customer: _____

Gage Model: Magna-Mike 8500

Gage S/N :_____

Probe Model (circle one): 801 PR or 802 PR and 1/8" ball

Probe S/N:_____

This documents that calibration of the above thickness gaging system has been verified within the tolerance and measurement range indicated in the table below, using standards with measured thickness traceable to the National Institute of Standards and Technology (N.I.S.T.).

Note: Use the Basic Ball Calibration described in Section 2.3–Ball Calibration.

Magna-Mike 8500 System Data Using Basic Ball Calibration with 1/8" Target Ball and 801PR, 802PR, 802PR-102, or 802PR-111					
Nominal Thickness	Certif. Thickness	Meas. Thickness	Deviation	Tolerance	Within Tolerance?
0.010 inches	inches	inches	inches	±0.0005 inches	
0.020 inches	inches	inches	inches	±0.0009 inches	
0.040 inches	inches	inches	inches	±0.0017 inches	
0.080 inches	inches	inches	inches	±0.0033 inches	
0.160 inches	inches	inches	inches	±0.0065 inches	

Note: The measurement accuracy of any gaging system is dependent on the performance and proper usage of both the gage and probe. This document identifies the part number and serial number of the probe used to make the recorded measurements. System performance with other probes may differ. The user assumes responsibility for verifying system accuracy because the Magna-Mike 8500 is a user-calibrated device.

Signature: _____
Name/Title: _____
Calibration Set S/N: _____Date:_____

APPENDIX V - PROBES, FIXTURES, AND TARGETS FOR SPECIAL APPLICATIONS

The standard 801 probe is useful for the majority of blow-molded plastic bottle applications, however several additional probes have been designed for measuring special applications. A brief description is provided in this section for each special probe. New probes may have been designed since the publication of this manual, and Panametrics will evaluate requests for special modifications. Please contact Panametrics for more complete information regarding applications, price, and delivery.

802 style probes have a second button labeled **[MAX]**, which is located next to the **[QCAL]** button. The **[MAX]** button can change its functionality to perform either the **[MEAS]**, **[SEND]**, or **[SAVE]** key functions via the Communications menu. This versatile feature is beneficial when access to the front panel or footswitch is inconvenient. The connector at the base of 802 probes is different from that on 801 probes, so probe cables 852PC or 852CC must be employed with 802 probes.

Probes with special tips are designated by a three digit suffix (for example, 802PR-102). The Magna-Mike 8500 utilizes all of the probes listed below. The gage automatically identifies these probes by type, and thus knows which targets and look-up tables to assign.

- The ***-102 probe*** is a standard probe with a standard 1/16" (1.6mm) radius tip. The tip, however, has been chemically hardened to help resist tip wear from abrasive materials. This probe is employed with the three (3) standard target balls.

- The ***-105 probe*** has a tip modified to fit into the groove of an automotive air-bag tear seam or similarly tight areas. The targets for these probes are 1/16" (1.6mm) diameter ball, a 3/16" (4.8mm) diameter disk with a sharp edge, and a 1/2" (12.7mm) diameter disk with a square 1/32" (0.79mm) wide edge. The disks are used exactly the same way as target balls, but align with the shape of the tip.
- The ***-109 probe*** has a 1/4" (6.4mm) radius tip, and is used for measurements up to 0.400" (10mm). The targets employed with this probe are a 1/8" (3.2mm) diameter ball, a 3/16" (4.8mm) diameter ball and a 1/4" (6.4mm) diameter ball. The -109 is a type 6 probe.
- The ***-110 probe*** is the same as -109, except that the connector is mounted on the side, 90-degrees from its normal location.
- The ***-111 probe*** is a standard probe with a super-wear resistant material added to the tip. This probe uses standard targets.
- The ***-112 probe*** is the same as -111, except that the connector is mounted on the side, 90-degrees from its normal location.

The 80FXV, V-standard plastic fixture, fits over any probe tip, and helps to align some items over the probe axis, such as tubing.

The accuracy specification for the -109 and -110 extended range probes should be quoted for all target balls (1/8”, 3/16”, and 1/4”) as follows:

Basic Accuracy: + or -3%, + or - (a resolution error)
Reference Accuracy: + or - 1%, + or - (a resolution error)

The “resolution error” is described as the greater of the following values:

Fundamental resolution error:
High resolution mode: 0.0001; Low resolution mode: 0.001

As the thickness increases however, the following resolution error values will supersede the fundamental error if greater than the fundamental:

At 0.1200 inches or above, 0.0005
At 0.2000 inches or above, 0.0010
At 0.3000 inches or above, 0.0020

For example, at a thickness or 0.1600, the Basic Accuracy is + or - (0.0048 + 0.0005) or 0.0053. A 0.1600" reference could, therefore, read as low as 0.1547 and as high as 0.1653.

Please note that the Basic Accuracy is only guaranteed in a probe that is in good or new condition. Tip distortion due to abrasive materials or magnetic shock may cause the probe, during its lifetime, to not meet Basic Accuracy specifications. Unless this distortion becomes extreme however, inaccuracies can be corrected and Multi-Point Accuracy can still be achieved by employing the Multi-Point Calibration procedure described in Section 2 of this manual.