Operating Instructions MA 40

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WARRANTY

This warranty is extended to the original purchaser of the MA 40 Portable Diagnostic Audiometer by Maico, through the authorized Special Instrument Distributor from whom it was purchased. This warranty covers defects in material and workmanship for a period of one year from date of delivery of the MA 40.

Should the Maico MA 40 require service due to a defect in material or workmanship, Maico, at its option, will repair or replace the instrument at no charge except for transportation to and from the point of service. It is the purchaser's responsibility to return the MA 40 to the Maico Special Instrument Distributor from whom it was purchased or directly to Maico after receiving a return authorization.

This warranty does not cover breakage or failure caused by tampering, misuse, carelessness, accident or modification. The warranty is void if the instrument is serviced by other than an authorized Maico Special Instrument Service Center.

NOTE:

Specifications in this manual are in effect at the time of printing. Maico reserves the right to modify or change specifications or design at any time without notice or incurring obligation.

WARNING

The Maico MA 40 is designed to be used with a hospital grade outlet. Injury to personnel or damage to equipment can result when a three-prong to two-prong adapter is connected between the power plug and an AC outlet or extension cord.

1.0 SPECIFICATIONS

Test signals: Pure tone, pulsed, warble; narrow band masking noise

Frequency accuracy: To within ±1% maximum of indicated frequency

Frequency and HL ranges:

Frequency	Air conduction HL range
125 Hz	-10 to +80 dB_{HL}
250 HZ	-10 to +100 dB_{HL}
500 Hz	-10 to +110 dB_{HL}
750 Hz	-10 to +110 dB_{HL}
1000 Hz	-10 to +110 dB_{HL}
1500 Hz	-10 to +110 dB_{HL}
2000 Hz	-10 to +110 dB_{HL}
3000 Hz	-10 to +110 dB_{HL}
4000 Hz	-10 to +110 dB_{HL}
6000 Hz*	-10 to +110 dB_{HL}
8000 Hz*	-10 to +100 dB_{HL}

*Maximum level for insert phones is 10 dB_{HL} lower at 6000 Hz and 8000 Hz.

Attenuator Linearity: ± .5 dB per 5 dB step, ± 3 dB overall

Distortion: .5% typical, 2% maximum

Sound pressure level calibration accuracy: ± 3 dB

Pulsed stimulus: 2.5 pulses/second, 50% duty cycle

Rise/Fall time: 35 msec. typical

Freq. mod. rate: ±5% triangle wave modulation at 5 Hz modulating rate

Dimensions: 12.5" W x 6.25" H x 15.5" D
32cm W x 16cm H x 40cm D

Weight: 16.5 lb/7.5 kg

Case: Structural foam

Voltage requirements: 117/234 volts AC, switchable

Narrow band noise and bone specifications:

Frequency	Narrow band HL range	Bone conduction HL range
125 Hz	-10 to +60 dB_{HL}	-----
250 Hz	-10 to +80 dB_{HL}	-10 to +40 dB_{HL}
500 Hz	-10 to +100 dB_{HL}	-10 to +70 dB_{HL}
750 Hz	-10 to +100 dB_{HL}	-10 to +70 dB_{HL}
1000 Hz	-10 to +100 dB_{HL}	-10 to +70 dB_{HL}
1500 Hz	-10 to +100 dB_{HL}	-10 to +70 dB_{HL}
2000 Hz	-10 to +100 dB_{HL}	-10 to +70 dB_{HL}
3000 Hz	-10 to +100 dB_{HL}	-10 to +70 dB_{HL}
4000 Hz	-10 to +100 dB_{HL}	-10 to +70 dB_{HL}
6000 Hz	-10 to +100 dB_{HL}	-10 to +60 dB_{HL}
8000 Hz	-10 to +80 dB_{HL}	-----

Roll-off is 12 dB per octave minimum; narrow band calibration is for effective masking.

Masking level attenuation: Variable intensity with a 5 dB step detent

Outputs: Air, bone, insert phone

Calibrated to ANSI S3.6 1996.

2.0 INTRODUCTION

2.1 Instrument Description

The MA 40 is a portable, one and a half-channel audiometer, offering pure tone audiometric testing.

It performs tests using TDH 39 headphones, a B-71 bone conduction receiver or optional insert phones. Built-in test signals include pure tone, pulse tone, warble tone, narrow band noise. Outputs have separate jacks for TDH 39s, optional insert phones and bone conduction.

The MA 40 offers air conduction frequencies from 125 Hz to 8 kHz, with intensity levels from -10 dB_{HL} to 110 dB_{HL}. Bone conduction test frequencies are 250 Hz to 6 kHz with intensity levels of -10 dB_{HL} to 70 dB_{HL}.

The MA 40 has a built-in RS 232 interface. Calibration is performed via the front panel and thus simplifies annual service calibrations.

3.0 UNPACKING AND INSPECTION

3.1 External Inspection

Your MA 40 was carefully inspected and packed for shipping. However, it is good practice to thoroughly inspect the outside of the shipping container for signs of damage. If any damage is noted, please notify the carrier immediately.

3.2 Unpacking

Remove the upper layer of packing material from the top of the instrument. Carefully lift the instrument from the shipping carton and remove the plastic bag. Inspect the case for sign of any damage. Notify the carrier immediately if any signs of mechanical or physical damage are noted. This will ensure that a proper claim is made. Save all packing material so that the claim adjuster can inspect it as well. When the adjuster has completed the inspection, notify the Maico Special Instrument Distributor you purchased this unit from.

Save all the original packing material and the shipping carton so the instrument can be properly packaged if it needs to be returned for service or calibration.

3.3 Accessories Supplied

Standard accessories are packaged and shipped inside the MA 40 storage compartment. Open the compartment by unsnapping the side latches and folding the cover up and back. Please check that all accessories listed below are received in good condition. If any accessories are missing or damaged, notify your Maico Special Instrument Distributor immediately.

Standard Accessories	**Part**
TDH 39 headset	4687
B71 Bone Vibrator	1034-105
Bone Cord	2068
Bone headband	1037-37
Audiogram pad	1162-417
Operator's Manual	1162-0002

Optional Accessories:	
Patch cords	1025-352
Audiocup™ headset	4695
Insert phones	4790
Patient Response Switch	2169

4.0 FRONT AND REAR PANEL CONTROLS AND DESCRIPTIONS

4.1 Front Panel Controls

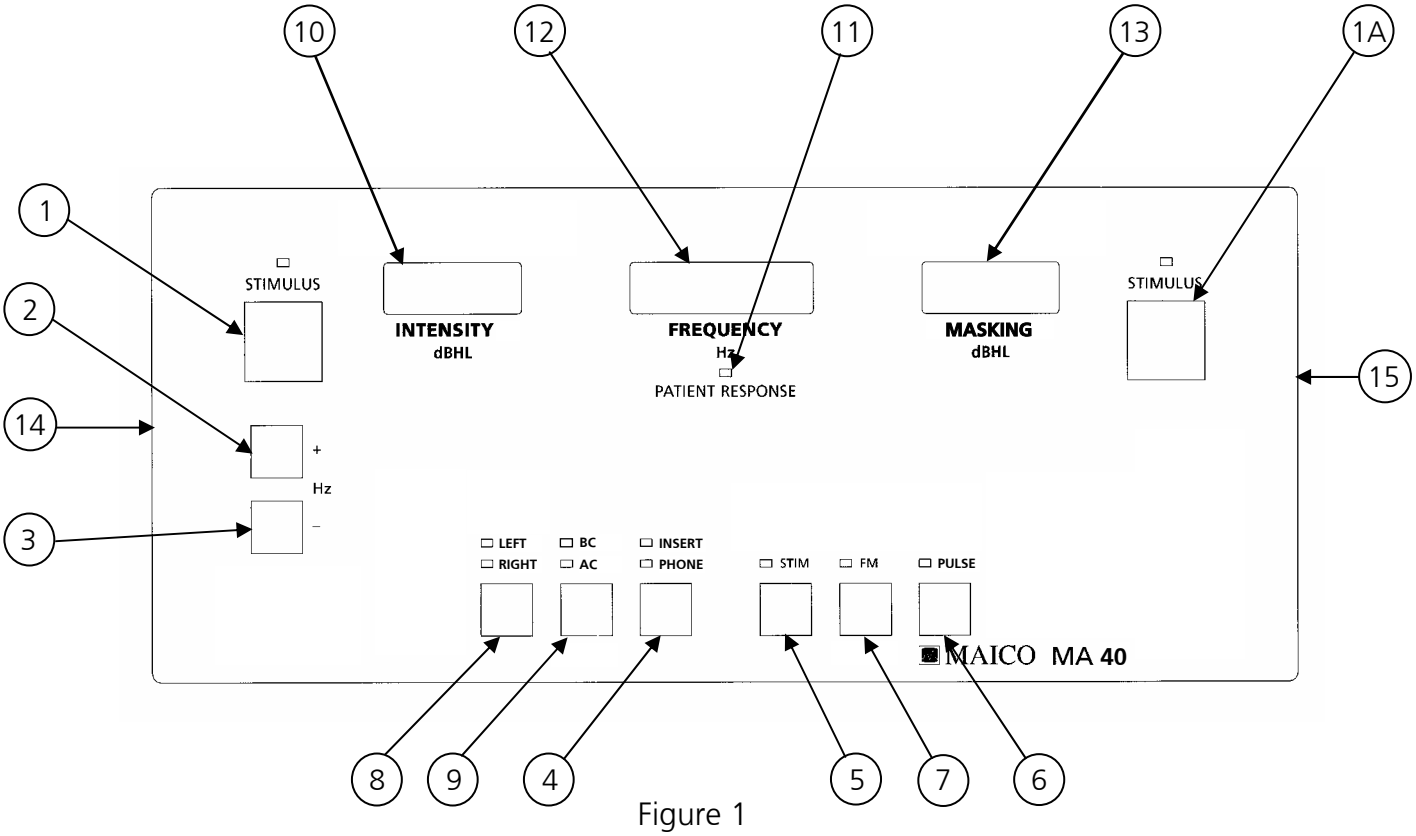

Figure 1

1. STIMULUS - stimulus present/interrupt switch. Stimulus is present when the LED above the switch is lit.

1A. Masking ON/OFF

2. + Hz - Frequency select increase key.

3. - Hz - Frequency select decrease key.

4. PHONE / INSERT – Selects TDH 39 or optional insert phones

5. STIM - Press to enable this option:
   STIM LED on = Reverses function of (1) STIMULUS key to act as an INTERRUPT key, i.e. stimulus always on unless the STIMULUS key is depressed.

6. PULSE - PULSE LED on = Pure tone stimulus will be pulsed.

7. FM - FM LED on = Pure tone stimulus will warble.

8. LEFT / RIGHT SELECT – Selects LEFT or RIGHT for test tone. Masking is automatically routed to the opposite side.

9. BC / AC – Selects either bone conduction or air conduction mode.
10. INTENSITY - Displays intensity level of the test tone in the selected ear.
11. PATIENT RESPONSE - LED lights when patient response switch is pressed.
12. FREQUENCY - Displays the frequency test setting.
13. MASKING – Displays the intensity level of the masking signal.
14. INTENSITY CONTROL DIAL - Adjusts the intensity for the test tone.
15. INTENSITY CONTROL DIAL - Adjusts the intensity for the masking signal.

4.2 Rear Panel Controls

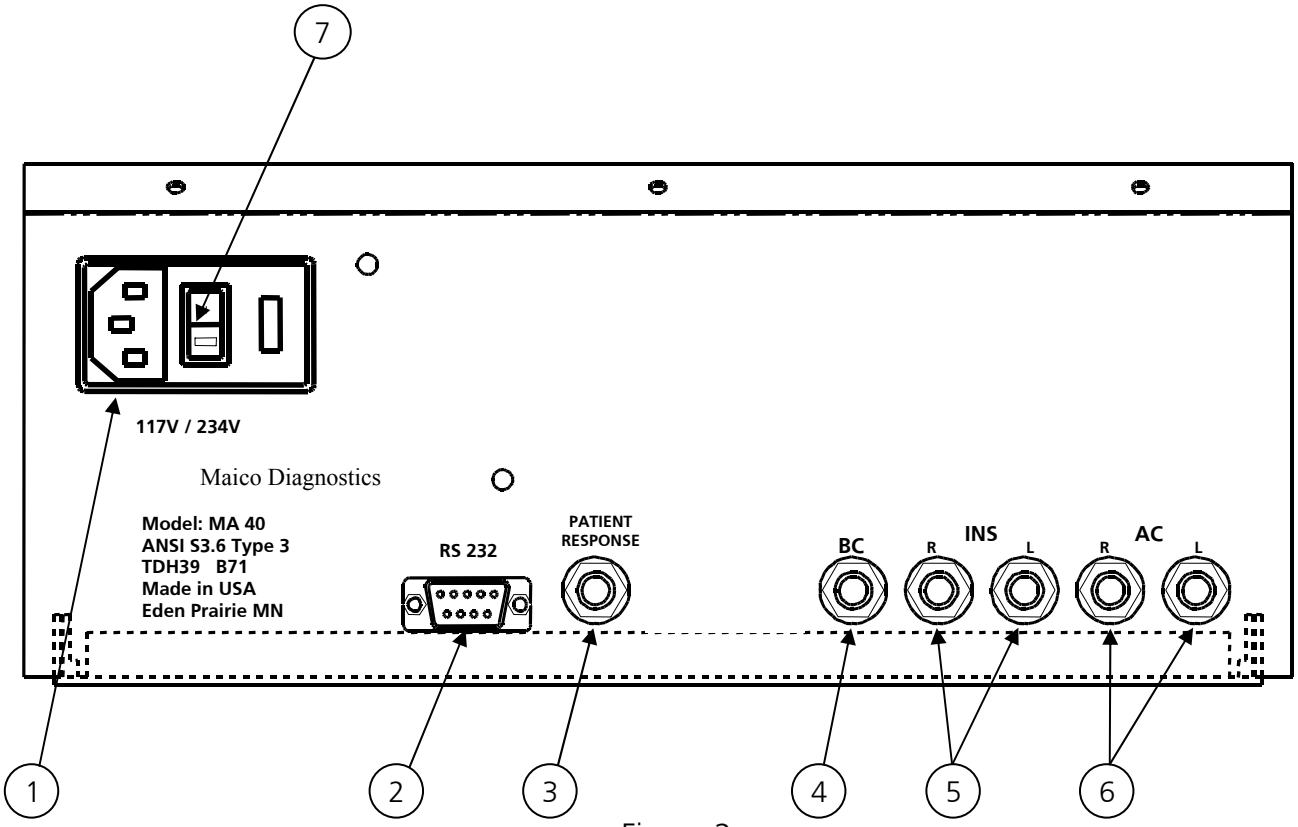

Figure 2

1. AC INPUT - Power input.
2. RS 232 PORT - 9-pin RS 232 port.
3. PATIENT RESPONSE - Input for the optional patient response switch.
4. BC - Bone conduction output jack.
5. INS - Right and left jacks for optional insert phones.
6. AC - Right and left jacks for air conduction TDH 39 earphones.
7. ON/OFF - On/Off power switch.

5.0 INSTALLATION AND SETUP

5.1 Headset/Insert Phones

Place the MA 40 on a stable counter or table. Flip open the side latches and fold the lid back. Fold the lid back one more time to reveal the accessories that are packaged within the rear storage compartment. If you haven't already done so, unpack and inspect the accessories.

The TDH 39 headphones are serialized and should match the serial number on the instrument. Check to see that the numbers match, as this will confirm that the headphones and MA 40 were calibrated together. The optional insert phones do not have a serial number, but if they were ordered at the same time as the MA 40, they were calibrated to that particular instrument and should not be used on another without calibration.

Turn the MA 40 around so that you can view the rear jacks. Insert the RED (right) plug of the TDH 39 headset into the right air conduction earphone jack labeled **R**, under **AC** (**A**ir **C**onduction). Insert the BLUE (left) plug into the left **AC** earphone jack labeled **L**.

The insert phones are installed in the same manner. Insert the RED (right) plug of the insert phone cord into the insert phone jack labeled **R**, under **INS** (**INS**ert phones). The BLUE (left) plug is inserted into the jack labeled **L**.

5.2 Bone Conduction Transducer

Insert the bone conduction plug into the port labeled BC (**B**one **C**onduction).

5.3 Patient Response Switch - Optional

Locate the **PATIENT RESPONSE** jack on the rear panel and insert the plug end of the optional switch.

5.4 Sound Room Patch Cords - Optional

When using the MA 40 in a sound room, connect the patch cords from the sound room to the proper right and left earphone/insert phone jacks, patient response jack, and bone conduction jack.

5.5 Power Up

Insert the power plug into the rear socket, then into a three-conductor electrical outlet (or the appropriate outlet for your country).

WARNING

This Maico instrument has been designed to meet the most exacting electrical safety requirements for patient care equipment.

The hospital grade, 117 volt alternating current, three-prong plug should be inserted into a mating three-prong hospital grade receptacle that is properly grounded. This will ensure reliable and safe operation of this precision instrument. The use of a three-prong to two-prong adapter should be avoided. If you have any questions, check with your Maico Special Instrument Distributor.

NOTICE

This Maico product is equipped with a universal power interlock to change the power/mains input voltage from 115 VAC to 230 VAC.

To change the power/mains voltage input:

1. **Unplug the power/mains cord from the unit (Figure 3).**
2. **Using the flat edge of a small screwdriver, pry open the cover and remove the voltage selector**
3. **Replace fuses with enclosed .25 amp.**
4. **Replace voltage selector switch with <u>230V</u> label displayed in window.**
5. **Apply .25A label to the back panel.**

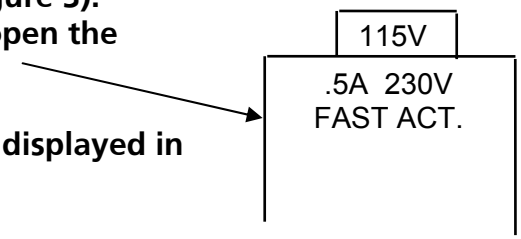

Figure 3

Place the power switch to the "ON" position (Figure 2). To ensure accuracy, let the instrument warm up 5-10 minutes before running tests.

6.0 OPERATION - PURE TONE AUDIOMETRY

6.1 Air Conduction Testing

Air conduction testing is used to measure the patient's hearing threshold levels. The test is usually started on the ear with better hearing.

1. Turn the MA 40 on and let it warm up for 10 minutes before using. Upon power up the initial setting will be in audiometric testing mode, left ear on air conduction, 1 kHz, 30 dB intensity, right ear on noise, 0 dB.
2. Seat the patient so that he/she is facing away from the instrument at a 90° angle and cannot see what the operator is doing. Give a brief description of what the patient can expect to hear. Using a consistent explanation will help provide more reliable results. Instructions may be expressed as follows: "I am going to place these headphones on your ears. You will hear a tone or beeping sound, which may be loud or soft. Whenever you hear, or think you hear one of these tones, raise your hand. Lower it when you no longer hear the tone. Listen carefully because some tones are very soft."
3. Eliminate any obstructions that could interfere with placement of the earphone cushion on the ear (i.e. hair, earring, eyeglasses, hearing aids, etc.). Adjust the headband so that the earphone cushions are centered over the ears (RED on the right ear, BLUE on the left) and the receivers line up with the ear canals. The headband should rest firmly over the center of the head and place firm pressure on both ears.
4. Set the OUTPUT SELECT to AC. Choose PULSE and/or FM if you wish. Set the INTENSITY and FREQUENCY to the desired level.
5. Press STIMULUS to present the test tone. The STIM LED should light. If the patient hears the tone he/she will raise their hand or press the patient response switch, indicated by the patient response LED.

The most commonly used hearing threshold procedure is called a modified Hughson-Westlake procedure.

1. Start at 1000 Hz with a level of 0 dB and present a signal for at least 1 second. If no response, increase in 10 dB steps until the patient responds.
2. Increase another 10 dB for a confirmation and orientation. If the patient responds again, decrease the presentations in 10dB steps until the patient no longer responds.
3. Increase in 5 dB steps until the patient responds. Once the patient responds, descend 10 dB until there is no response. Increase again in 5 dB steps.
4. Repeat until you have 2 out of 3 ascending responses at the same level. Change the frequency and repeat above procedure until you have thresholds for the number of frequencies that you wish to test.

The hearing threshold is defined as the lowest hearing level at which the patient responds to *two out of three ascending stimuli at the same level.*

6.2 Bone Conduction Testing

Bone conduction is the transmission of sound waves through the skull directly to the inner ear. This test conveys useful information about the function of the inner ear and whether there is neural hearing loss. Threshold differences between air conduction and bone conduction are a good indicator of middle ear disease or external ear canal obstruction.

1. Place the bone conduction receiver so that the flat, circular side of the transducer is seated on the mastoid, right on the ledge of the cranial bone behind the auricle. The other side of the headband is placed in front of the opposite ear.
2. Set the OUTPUT SELECT to BC (bone conduction). Perform the test in the same manner as for air conduction testing (see section 6.1). Record all measurements and results.

6.3 Masking

To ensure that the patient does not experience crossover (sound transmitted through bone conduction over to the opposite ear) you must mask the opposite ear. Masking is performed with a noise signal in the headphone. A narrowband noise is used in pure tone audiometry. The noise automatically changes its center frequency following the frequency of the test signal.

1. The masking noise is continuously presented for effective masking. You may interrupt the masking signal by pressing the STIMULUS key.
2. To mask while performing bone conduction tests, place the headphone on the non-test ear so that the receiver is directly in line with the ear canal. Adjusting the headband, place the other headphone so that it sits directly on the cheekbone.
3. Adjust the masking intensity level whenever you change the test signal level.

7.0 MAINTENANCE

7.1 Preventive Maintenance

To maximize the service life of your audiometer and accessory equipment, we suggest the following:

1. Turn off the instrument overnight.

2. Wipe the headset cords, ear cushions and casing occasionally with a cloth dampened (not dripping wet) with warm water. Dry with a soft cloth.

3. Leave the accessories such as the headset, bone vibrator and monitor phone permanently connected to the audiometer to minimize strain on the connections. It is not necessary to disconnect accessories not in use while performing other tests. Should it be necessary to disconnect cords, always grasp the barrel of the plug — never pull the cords. Never drop or snap the headphones together. Mechanical shock may change the earphone's electrical and operational characteristics and require calibration of the MA 40.

4. Close the audiometer cover at the end of each day to minimize dust collection.

5. Avoid sharply bending or twisting any of the cords. Although they are designed to be highly flexible, rough treatment may cause damage. Broken or defective cords can cause crackling noise and intermittent or weak operation in the headset, microphone and bone vibrator. Headset, bone vibrator and microphone cords may be replaced without calibrating the audiometer.

7.2 Cleaning the MA 40

First, disconnect the power cord **before** cleaning. Clean the instrument, headphones, bone conduction receiver, loudspeakers and other accessories with a soft cloth dampened with a little warm, soapy water. Do not use alcohol to clean.

The ear cushions of the headphones can be detached for cleaning. To remove, gently pull the cushion away from the headphone. To re-assemble, press it back onto the headphone. Make sure that the sound outlet hole sits exactly in the middle of the earphone.

7.3 Calibration

The optimum length of time between re-calibrations for audiometers varies, depending upon the treatment given the instrument and the headphones. It is recommended that the instrument have a laboratory calibration at least once every year. Since rough handling, such as dropping the headphones, can easily cause calibration errors it is advisable to establish a biological calibration check as soon as you receive the instrument.

Should you feel at a later date that the audiometer's calibration might be in error, perform a biological check on a known ear. If all re-tests show major changes calibration is probably in error.

All repair and calibration should be done at an authorized Maico Special Instruments Distributor service center. This assures the use of quality materials by trained and experienced technicians using the proper, accurate equipment.

Maico Special Instruments Distributors are located in major cities throughout the world. To minimize costs and time delays, contact the Distributor that you purchased the instrument from. If you don't know who that is, or need to find the Distributor closest to you, contact the factory at:

Maico Diagnostics
7625 Golden Triangle Drive
Eden Prairie, MN 55344
Toll free 888-941-4201
Phone 952-941-4200
Fax 952-903-4200

Customers outside of North America and South America may contact:

Maico Diagnostic GmbH
Salzufer 13/14
10587 Berlin, Germany
phone ++030 70 71 46 50
fax ++030 70 71 46 99

7.4 Shipping Instructions for Calibration and Repair

In the event it becomes necessary to return the instrument for calibration or repair, please follow these instructions:

1. Place the instrument in the original shipping carton, using the packaging provided. Be sure to include all accessories, as they are required for proper calibration.

2. Enclose an explanatory letter describing the service you require, carefully detailing any operational problems. Be sure to include your name, phone number, the serial number and your full return address for return shipping.

3. Ship, prepaid, to your Maico Special Instrument service center.

NOTE: Warranty service is provided by your authorized Maico Special Instruments Distributor.

DO NOT ATTEMPT TO REMOVE THE INSTRUMENT CASE YOURSELF. THIS SHOULD BE DONE ONLY BY AN AUTHORIZED MAICO SERVICE TECHNICIAN.