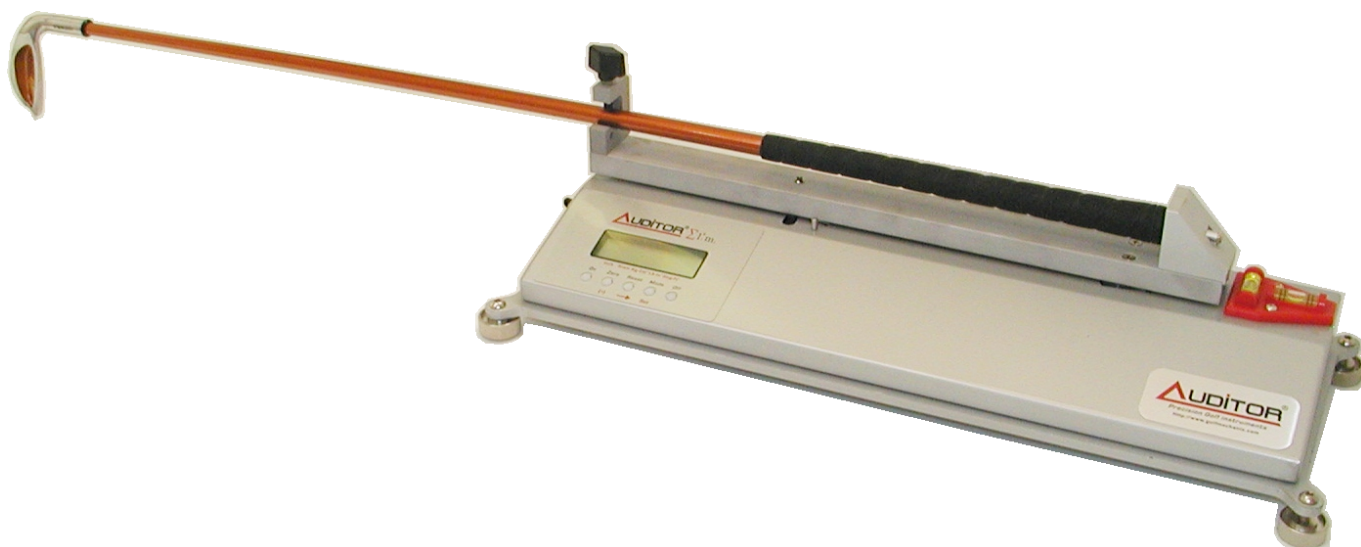




MOI SPEED MATCH



***GOLF CLUB MOMENT OF INERTIA MEASURING
INSTRUMENT & MOI MATCHING SYSTEM***

OPERATION MANUAL 070200

Technorama Co.Ltd 781, Fong Lin Road Sec 4, Ta-liao, Kaohsiung Taiwan R.O.C
Tel:886 7643 6516 Fax: 886 7643 6529 E-mail: Sales@Golfmechanix.com
[Http://www.golfmechanix.com](http://www.golfmechanix.com)

PART-1 SETUP AND INSTALLATION



KEYBOARD FUNCTIONS

ZERO Tares the display back to zero, This subtract one measurement from another to produce a net inertia measurement. Such as a gripped versus a grip-less MOI measurement.

RESET Clears the current measurement and starts the next measurement cycle.

MODE Unit selector and converter

(+) Changes selected value incrementally. Used to input calibration values, club weight and balance point when in Moi matching mode

→ Move and select on digit at a time from left to right.

Set Save input values to memory.

▼ Unit and Function indicator

Specifications

Max weight load	750 grams
Maximum moment load Factor*	6
Maximum radius of gyration**	40 inches
Minimum radius of gyration**	25 Inches
Resolution	1/1000
Maximum measurable MOI	5000 Kg.Cm ²
Minimum measurable MOI***	0.005 % TI*
Accuracy	+/- 0.5%
Operating Temperature range	-20~60 C°
AC/DC adapter	9V 500Ma

* Club balance point divided by the club total weight. (Inches and ounces or grams and mm)

** Club balance point must be between 40 and 25 inches measured from the end of the grip cap.

*** given as a percentage of the tare inertia of the system

First time operation:

Upon unpacking the Auditor MOI Speed Match its box, it is preferable not to operate the machine straight away.

1) The machine should be installed first on a wobble free, flat and level surface. The machine should be placed away from ventilation vents, direct exposure to sun light and other sources of heat and draft.

2) Even though the Auditor CGM is EMI shielded, the machine should be placed away from potential sources of electromagnetic interference such as bench grinders, micro wave ovens etc...

3) Level the machine as accurately as possible using the built in bubble level or a carpenter spirit level for greater accuracy. If the Auditor MOI Speed match is not properly leveled, inertia measurements will be inaccurate and the message bad run "B Run" will be shown on the display.

4) The Auditor MOI Speed Match is a spring Damped instrument and the accuracy depends very much on the spring linearity. To prevent damaging the damping spring the following precautions should be taken:

* Do Not overload the beam by placing on it other then conventional golf clubs of standard weight and length not exceeding 48 inches.

* Do not override the side stops that restrict the beam amplitude. Greater Angles will merely stress the spring and result in premature failure.

* When loading a club in the measuring fixture avoid excessive force to prevent twisting the beam.

5) An MOI calibration stick is provided with the machine to ensure the instrument is functioning correctly.

* Do not disassemble the calibration stick end weight
* Always tighten the two rods correctly to maintain the correct length for the stick.

*Do not drop the calibration stick. If the end weight is marred, the MOI calibration value will be affected as a result of the change in geometry of the end weight.

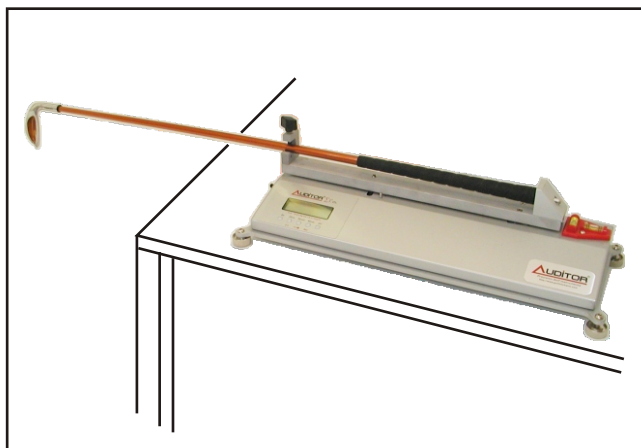
* Do not bend the calibration stick and Store properly.

* Do not use the calibration stick for calibrating frequency analyzers, swing weight scales or similar devices.

Calibration stick

Individually calibrated. Refer to value on stick before calibrating the Auditor MSM.

PART-2 INSTRUMENT & CALIBRATION CHECK



Locate the Auditor MSM on a work surface near the edge to facilitate the mounting and un-mounting of golf clubs. Enough clearance should be provided for the longer clubs.

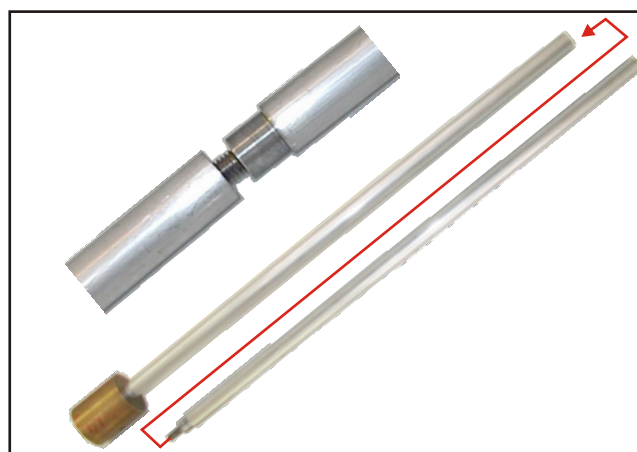


MOI
● ON

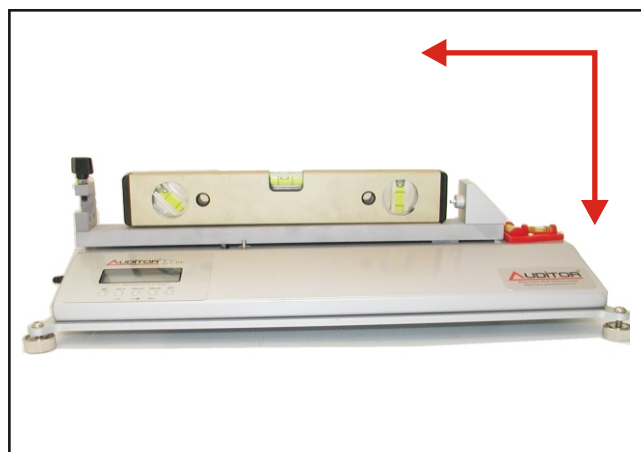
Plug in the power supply and turn the instrument to ON. The Caption MOI will show on the Display.



Level the Auditor MSM as accurately as possible using the built in bubble level. Leveling the instrument is done by dialing the leveling feet.



Assemble the calibration stick and tighten the two rod sections together. The Calibration value is inscribed on it for easy reference.

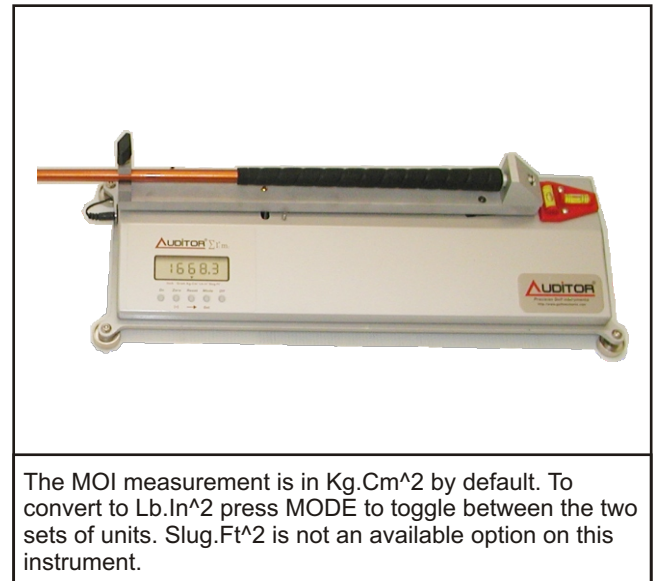
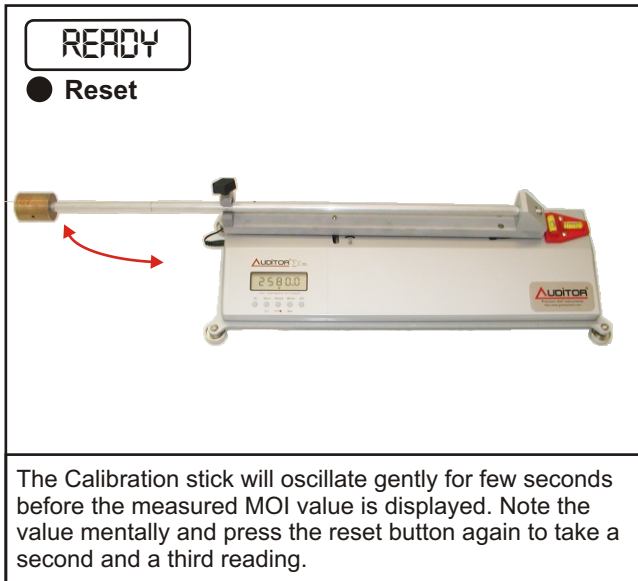


To improve the instrument accuracy, the use of a precision spirit level is recommended. Leveling must be carried out. Along the beam and across.



Mount the calibration stick on the Auditor MSM, and gently pull the beam until it contacts the side stop. Release the beam and press the reset button

PART-2.1 INSTRUMENT & CALIBRATION CHECK



Example

1) Mount the calibration stick on the instrument and initiate the count cycle.

RESET	2.580.0
RESET	2.580.5
RESET	2.581.5

The difference between the three consecutive readings Maxima and minima is less then 0.05% of the calibration value. When all three readings are within 1% of the calibration value the instrument is setup correctly and does not require calibration.

Important Note:

The oscillations imparted to the beam decays over time due to gravity and air friction. This introduces small errors into the measured inertia values. A maximum of three counts taken at the beginning of the cycle and at short interval are sufficient.



When placing a club on the beam it is not necessary to tsecure the club with the thumb screw, as long as the club points toe towards the ground and does not wobble during an oscillation cycle.

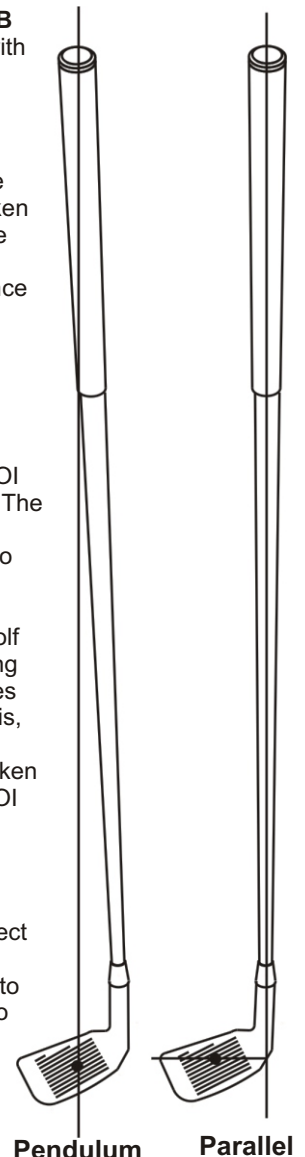
POSITIONING THE GOLF CLUB

For those club-makers familiar with MOI measurements using the pendulum method, the golf club lays on a plane controlled by The club head center of gravity. This in fact shortens the effective pendulum length which is not taken into account when calculating the inertia of the golf club using the standard pendulum equation, since the balance point of the club is measured parallel to the shaft centerline and not parallel to the pendulum plane.

This small error in the effective pendulum length results in an MOI slightly larger then the true MOI. The effective pendulum length and experimental errors can add up to 2~3% of the effective MOI.

When measuring the MOI of a golf club using the direct method using the Auditor MSM, the golf club lies parallel to the principal inertia axis, with the club head balance point parallel to it. This fact must be taken into account when comparing MOI results gathered using the two methods.

It must be noted that when measuring the MOI using the direct method on the Auditor MSM, the reduction in golf club length due to shaft bending under load will also result in small experimental errors.



PART-3 COMPARING THE MOI OF 2 CLUBS



Mount the first club on the beam and take an MOI reading. Press **ZERO** to clear the display and remove the club. Mount the 2nd club on the instrument and take a measurement. The reading is the MOI difference.

Example

1) Mount the 1st club on the instrument and initiate the count cycle.

RESET **2.300.0** **ZERO**

2) Remove the 1st club and mount the 2nd club on the instrument and initiate the count cycle.

RESET **0056.0**

The MOI difference between the two clubs

3) To analyze more clubs repeat step 2.

4) To exit the ZERO mode simply turn the instrument to off then back to on again.

OFF **ON** **MOI** **RESET** **00000**

Mount the second club and take a measurement. The MOI difference between the 1st club and the 2nd club is shown. If the MOI of the 2nd club is larger, the MOI difference is positive. If smaller the difference is negative.

ERR DU

This error message is displayed when the instrument cannot compute the MOI difference between two clubs when:

1) The MOI difference between the two clubs is very small and thus exceeds the resolution of the instrument

2) The MOI value of one of the clubs that is being compared is very close or equal to the calibration MOI, which is equal the value of the calibration stick provided with the instrument.

It must be noted that the tare value MOI (ZERO) cannot equal the calibration MOI. This causes a divide by zero error and the solution cannot be resolved. When the error occurs the instrument must be re-started. To clear the tare value.

PART-3.1 MOI MATCHING OF A SET OF CLUBS

Step-1

MODE **On** **MOI M**

Do not release the Mode button until the function is initiated

Step-2

MODE **F MOI** **MODE** **00000**

Step-3

Mount the favorite club on the Auditor MSM. When done pull the beam against the side stop and release the beam gently. Press **RESET** to start the count cycle.

1639.5

Step-4

MODE **MOI 2** **MODE** **00000**

Mount the club that needs MOI matching on the instrument. And initiate a count cycle.

RESET **00000** **1638.1** **MODE**

MOI LOC **MODE** **00.00**

Inch

Use the **ZERO** and the **RESET** key to enter the Distance in inches from the grip end to where additional weight can be added or removed from the club head. For this example additional weight can be located 32 inches from the grip down the shaft.

32.00 **MODE** **0.40**

Gram

In this example an MOI match between the favorite club and the club that needs matching requires that 0.40 grams be added 32 inches from the grip end.

Step-5

To match additional clubs to the favorite club MOI repeat **step-4**. If you wish to terminate the MOI matching mode turn the instrument to **OFF**

PLEASE NOTE:

1) The Standard units for when in MOI matching mode are Kg.Cm², Grams and inches. It is not possible to convert to Lb.In² or ounces.

2) The **reset** key can be used any time during a measuring cycle to Interrupt the cycle or to re-take a 2nd measurement for verification purposes. Pressing the mode key will automatically save the last measurement to memory for further computations.

MATCH

When one of the clubs to be MOI matched has the same Moi as the favorite golf club the caption "Match" will appear on the display. Press **MODE** to resume MOI matching another club in the set.

ENTERING THE MASS LOCATION (Inches only)

To input the distance from the grip end to where additional **can be added or removed from the club head use the ZERO** and the **RESET** key as follows:

ZERO (+) Each press will increment the active digit by one from 1-9

RESET--> Each press will activate the next digit to the right.

PART-4 AUDITOR MSM CALIBRATION

The Auditor MSM requires calibration at regular intervals. The procedure assumes that the instrument is properly leveled. Prior to calibration you must ensure that the instrument is still, since outside factors such as wind draft may interfere with the calibration. The calibration stick should be inspected and the calibration value known before initiating the procedure. For reasons of clarity the captions indicate the action to be taken and the resulting display.

Step-1

ZERO **RESET** **MODE** **On** **CAL P1**

Step-2

MODE **00000**

Step-3

Pull beam against side stop and release gently

Step-4

RESET	00000	0.2660
RESET	00000	0.2660
RESET	00000	0.2660

All three readings should yield the same result +/- 1
If the results do not agree. Repeat step 3 through 4
If the results agree proceed to next step.

Step-4

MODE **CAL P2**

Step-5

Place the calibration stick on the beam and secure

Step-6

MODE **00000**

Step-7

Pull beam against side stop and release gently

RESET	00000	1.3037
RESET	00000	1.3038
RESET	00000	1.3040

All three readings should yield the same result +/- 3
If the results do not agree. Repeat step 7
If the results agree proceed to next step.

Step-8

MODE **2580.0**

This is the calibration stick Moi value as calibrated before shipment. Check the calibration value on the stick. If the values match

MODE **MOI**

The instrument will shut down and restart automatically

Step-8-1

If the Instrument MOI calibration value and the calibration stick value do not match proceed as follows:

ZERO (+)	Each press will increment the active digit by one from 1-9
RESET-->	Each press will activate the next digit to the right.

Finish entering the MOI calibration stick value, as directed. To finish

MODE **MOI**

The instrument will shut down and restart automatically

Step-9

With the calibration stick still on the beam.
Pull the beam gently against the side stop and release.

RESET	00000	2579.5
RESET	00000	2580.0
RESET	00000	2580.5

All three readings should yield the same result within 1%. The Auditor MSM is now calibrated.

GOLF CLUB MOMENT OF INERTIA "MOI"

