Golfsmith®
THE ULTIMATE GOLF COMPANY

STOCK NO. 236821

Reference Frequency Analyzer

Golfsmith®

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GOLFSMITH REFERENCE ANALYZER ADVANCED FEATURES SETUP

Your Golfsmith Reference Frequency Analyzer has a host of advanced functions specifically engineered to make the most out of shaft frequency measurement, frequency matching, zone profiling as well as detecting shaft asymmetry.

Since you may already have a working knowledge of shaft frequency measurement or would like to use your frequency analyzer straight away; the advanced setup options and operation will be described first.

Before getting started!

1) Plug the AC/DC power adapter into a wall outlet.

2) Connect the power to the Frequency analyzer.

3) Press on the **ON** button to turn the unit on.

4) Wait for about 4 seconds until the message "**Ready**" appears on the LCD display.

5) Turn the unit **Off**.

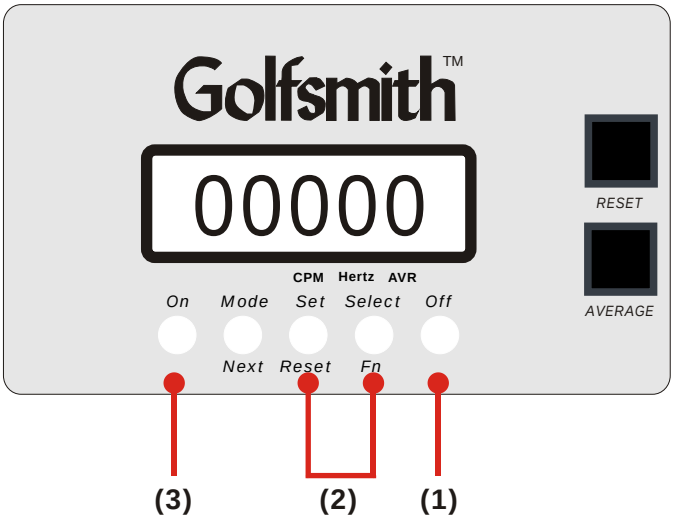
6)Press both the **Reset** & **Fn** button simultaneously Do not release the buttons just yet.
7) Press the **On** button and hold. Do not release the button just yet.

8) Wait till the machines reset itself which will be indicated by the LCD showing **00000**.

9) You may now release all the buttons. After about 4 seconds the "**Ready**" status is displayed on the LCD.

The machine is now re-booted. You can turn the unit off at any time.

Please note:
The "re-booting" procedure described above should be initiated whenever the machine has been off power for very long periods of time.



If you activated the Advanced Function and want to restore the original factory setting

Your Golfsmith Frequency Analyzer can be restored to the original factory settings. **"Normal frequency analyzer mode"** will allow your machine to operate just like a normal frequency analyzer but without the customized options. The procedure described below can come in handy if you are not familiar with the advanced setup options or that you suspect your machine to be "faulty".

1) Turn the analyzer **Off** by pressing the **Off** button.

2)Press both the **Reset** & **Fn** button simultaneously and hold. Do not release the buttons just yet.

3) Press the **On** button and hold.

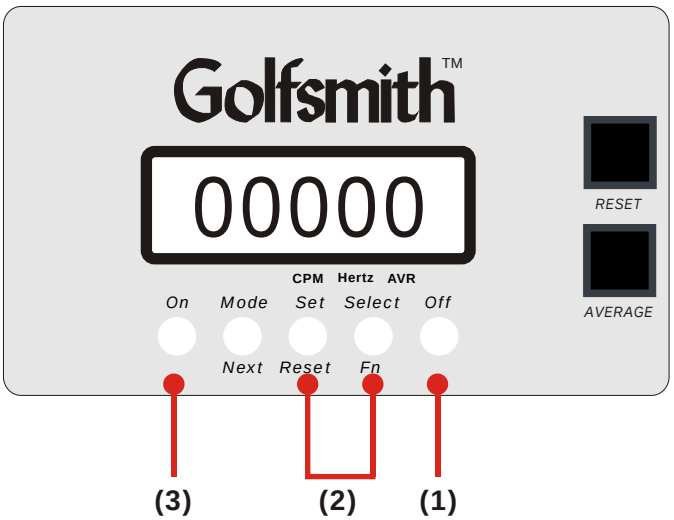
4) Wait until the machine resets itself which will be indicated by the LCD showing **00000**. Release the buttons. After 4 seconds the "**Ready** status" message will be displayed.

The Analyzer is now set to **"Normal"** mode.

Please note:
When the frequency analyzer is restarted in normal mode all advanced option settings will be cleared and reset to factory standard values

Units = CPM
Count = 4-4
Average = 5
Decimals = OFF

Key combination to re-start the analyzer in standard mode



SLEEP MODE

Your frequency analyzer has an **auto off** function that is activated whenever the analyzer is idle for more than 2 minutes.To reactivate the analyzer press **On** to re-start

ERROR CODE
Your Golfsmith Reference Frequency Analyzer has several built in error detection algorithms that are displayed whenever a "condition" is detected either as a result of hardware malfunction, operator error or shaft anomaly.

B-run : "Bad run"
The analyzer detected a bad twang either due to excessive pull on the shaft tip or because of a poorly timed release. Press **Reset** to catch the next measurement. For accurate readings it is best to:

1) Twang the shaft first
2) Press **Reset** to take a measurement.
3) Pressing the **Reset** button again will take the next measurement while the shaft is still oscillating.

Please note:
Your frequency analyzer automatically detects a shaft oscillating along an irregular path "wobble". If the measurement coincides with a change in the oscillation pattern, the count will be rejected and the error message **B-Run is** displayed.

Important notice:
Your Golfsmith frequency analyzer is a precision measuring instrument which has been optimized for measuring resonant frequencies as low as 1Hz up to 20 Hz. Therefore you should consider the following points prior to installing your analyzer:

1) Install the analyzer on a sturdy, wobble free bench. Rocking and thumping may cause the analyzer to malfunction.

2) Do not install the analyzer near a bench grinder, drill press or similar device as these may cause the analyzer to malfunction.

ready *"Ready status"*
The "**ready**" message is displayed after 4 seconds of inactivity. Press **Reset** to clear the display, or twang the shaft again to take a frequency count.

OVER: *"Amplitude decay rate too high"*
Your Golfsmith Reference Analyzer is able to measure frequency up to 1000 CPM. If the oscillation decay rate is too fast with the amplitude nearing zero the analyzer will not be able to measure the underlying shaft frequency.

LO **"Low Amplitude signal"**
The analyzer is unable to measure the base frequency of the shaft because it is below the minimum detectable range of 1Hz (60 CPM)

To extend the frequency range you can:
- Use a heavier frequency tip weight (above 20Hz)
- Use a lighter frequency tip weight (below 1Hz)
- Increase / decrease the shaft testing span.
- Use the analogue I/OPort with a PC equipped with a good quality sound card and a wave spectrum analysis software such as **Spectro Pro** from:
http://www.soundtechnology.com.

On:
Turns the unit to On
Off
Turns the unit Off

Mode /Next:
Press this button to page the advanced functions listed under the menu. These functions include:

Units: For units conversion from **CPM** to **Hertz**

Count: For tracking shaft oscillations during a measurement cycle.

Average: Sets the numbers of readings to be taken before the average value is computed.

Decimal: Sets the decimal function **On** or **Off**
When pressing consecutively on the mode key, the **next** function is automatically displayed.

Set / Reset:
This function key clears the active display.
If the mode function has been activated first the setting for the function selected is displayed.
Pressing on the **Set** button again will recall the next function in line and its settings.

Select / Fn:
When pressed this function key will display the CPM/Hertz average for the shaft being tested. If the average memory buffer is empty the "CLR" for "clear" will be shown on the display.

When the advanced setup mode is selected, the Select button is used to change the parameters for the function currently active.

Master RESET (1)
Clears the active display and takes the next CPM measurement while the shaft is still oscillating.

AVERAGE (2)
Display the CPM / Hertz average stored in memory. When the Average button is pressed for more than 3 seconds the memory buffer is flushed out and the **"CLR"** message appears on the display.

Advanced Setup Function Description.

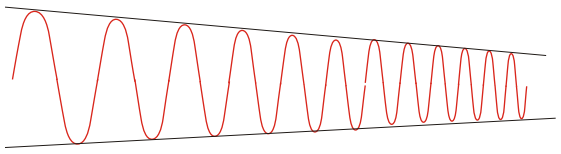
Unit "Unit**"**
This function alternates reading between CPM and Hertz Unit. Please note that when the analyzer is run in Hertz Mode, the shaft frequency dispersion / accuracy is improved to 1/10th of cycle. CPM are Hertz multiplied by 60. A 0.1 Hertz error, leads to a 6 CPM error count.

The Hertz Mode is best used when shaft spinning since the difference between shaft planes are easier to detect 360 degrees around.

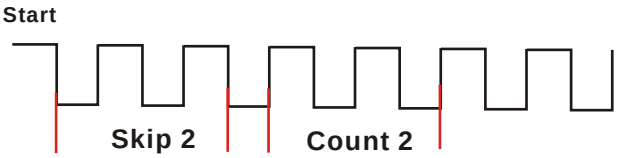
Count "count"
Selects the shaft frequency count mode. This function is used to optimize the frequency measurement of shafts especially when doing zone frequency matching where higher CPM readings are prevalent because of shorter shaft testing span.

This function basically instructs the frequency analyzer when and how many oscillations it should measure to accommodate the rate of decay of the shaft's oscillations which is dependant on the shaft's stiffness, testing span, tip weight, etc.

Shaft oscillation decay



Example of the 2-2 count



2-2: Skips the first 2 cycles and counts the next 2 cycles. This mode is best used with very short shafts spans.

2-4 Count: Skips the first 2 cycles and counts the next 4 cycles. Best used with very stiff shafts.

2-6 and 2-8 count: For stiff shafts with an irregular oscillation pattern.

4-2 Count: Skips the first 4 cycles and counts the next 2 cycles. Suited for all shafts that need to be frequency matched to tight tolerances.

4-4 Count: Industry standard default for CPM count. The first 4 cycles are skipped and the next 4 cycles are measured.

4-6 and 4-8 Count: The longer counting cycle is best suited for frequency matching clubs during the assembly process.

Average "AVG":
This function instructs the analyzer how many CPM / Hertz counts should be stored in memory for each shaft before the average CPM / Hertz value is computed. Average CPM can be computed from 1-5 counts. The default is 5.

Decimal:"DCML":
Enables or disables the fractional CPM count. 300.10 Versus 300 CPM. or 5Hz Versus 5.1Hz.

Changing the advanced setup option
The advanced settings on your Golfsmith Reference Analyzer can be changed anytime and the selected settings are permanently stored in non- volatile memory. The settings are not lost when the analyzer is turned off or stored for long periods.

Changing units Hertz or CPM
press **Mode**. "Units" is displayed.
Press **Set**. "CPM" is displayed.
Press **Fn** to page "hertz" or "CPM". When the desired unit is displayed. Press **Set** to save.
Press **Off** to exit.
Press **On** to restart with the selected unit setting

Changing Count by mode:
Press **Mode**. "Count" is displayed
Press **Set** until "4-6" is displayed.
Press **Fn** to page the count by modes available.
When the desired Count is displayed press **Set** to save the settings.
Press **Off** to exit.
Press **On** to restart the analyzer with the new count.

Changing Average mode:
Press **Mode**. "AVG" is displayed
Press **Set** until "5" is displayed
Press **Fn** to page the AVG modes from 1-5.
When the desired averaging value is displayed press **Set** to save.
Press **Off** to exit.
Press On" to restart with the new AVG setting.

Changing to Decimal mode
Press **Mode**."dcnL" is displayed
Press **Set** until "ON" is displayed
Press **Fn** to page "ON" or "OFF". Select On or Off.
Press **Set** to save.
Press **Off** to exit
Press "**On**" to restart the analyzer with the new decimal setting.

Set up at a glance

1 Mode	2 Set	3 Select	4 Set	5 Off	6 On
Unit	CPM	CPM	o	Exit	Re-start
		Hertz	o		
Count	4-4	4-4	o	Exit	Re-start
		4-6	o		
		4-8	o		
		2-2	o		
		2-4	o		
		2-6	o		
		2-8	o		
		4-2	o		
AVG	5	1	o	Exit	Re-start
		2	o		
		3	o		
		4	o		
		5	o		
Dcml	Off	Off	o	Exit	Re-start
		On	o		

Frequency analyzer Do's and Don'ts

Secure analyzer to a work bench or stable surface, making sure that no wobble is induced to the work surface when the analyzer is in use.

Never overload the shaft clamp by placing heavy objects on top. Avoid sudden shock / impact as this may damage the load cell.

Do not replace the torque limiting knob screw on the shaft clamp except with an identical part set at 1Lb/ft of torque. Higher torque settings may damage graphite shafts.

Before you call your service representative!

1) Read and understand the instruction manual.

2) Follow the start up procedure especially if the unit has not been used for extended periods.

3) Set up the analyzer for standard mode operation to clear any anomaly that may be causing the problem.

If your analyzer is not working satisfactorily please return it in its original packaging including all the accessories.

Power Supply & battery pack
The machine is supplied with a regulated AC/DC adapter (110-115 volts AC, 9 volts 600MA) which must be plugged into a normal 110-115 volt wall outlet.

Connect the single pole connector to the back of the machine and then plug the AC/DC adapter into the power outlet. After plugging the unit in press the **ON** button and wait for the **Ready** Status. If the machine has been off service for a long time reboot the analyzer before using it.

Keeping the shaft Reference Analyzer constantly plugged in will result in the premature aging and ultimate failure of the AC/DC adapter.

Your frequency analyzer can be used with a standard battery pack as is used for small portable electronic devices with an AMP rating not exceeding **700 mA**

Do not use car or motorcycle batteries and do not use cell phone batteries as this may damage the analyzer.

AC/DC adapter and Battery Pack Pin Polarity

Shaft Clamp:
Do not raise the clamping bar to the top of the V-clamp. Dialing the pressure control knob when the clamping bar is fully raised will cause the slip clutch to bind and cause unnecessary wear and tear in the slip mechanism.

Tampering with the pressure control knobs slip mechanism will necessitate re-calibration.

TOUR VANS
If you are using or planning to use your frequency analyzer in a tour van:

1) Protect unit from shock and vibration while on the road by placing the analyzer in a protective box. To eliminate rattles and shakes you can place a 5 inch shaft butt section into the shaft clamp and tighten the clamp down. This will protect the sensing elements on the load cell and minimize wear and tear.

2) If the analyzer is bolted onto a bench a 5 inch butt section clamped down in the into the shaft clamp is a must otherwise the load cell will be damaged beyond repair.

3) Do not plug the analyzer into a generator power source as this may damage both the AC/DC adapter and the circuit board. Plug the analyzer to the main power outlet or use a 12 Volt battery pack instead.

Golfsmith Reference Analyzer Stock #236821

Introduction
The Golfsmith Reference Frequency Analyzer is designed to measure the resonant frequency of any shaft. For clubmakers, this instrument offers access to advanced golf shaft analysis technology at an affordable price.

With so many shafts being made with different specifications an accurate shaft frequency analyzer has become a necessity for all clubmakers.

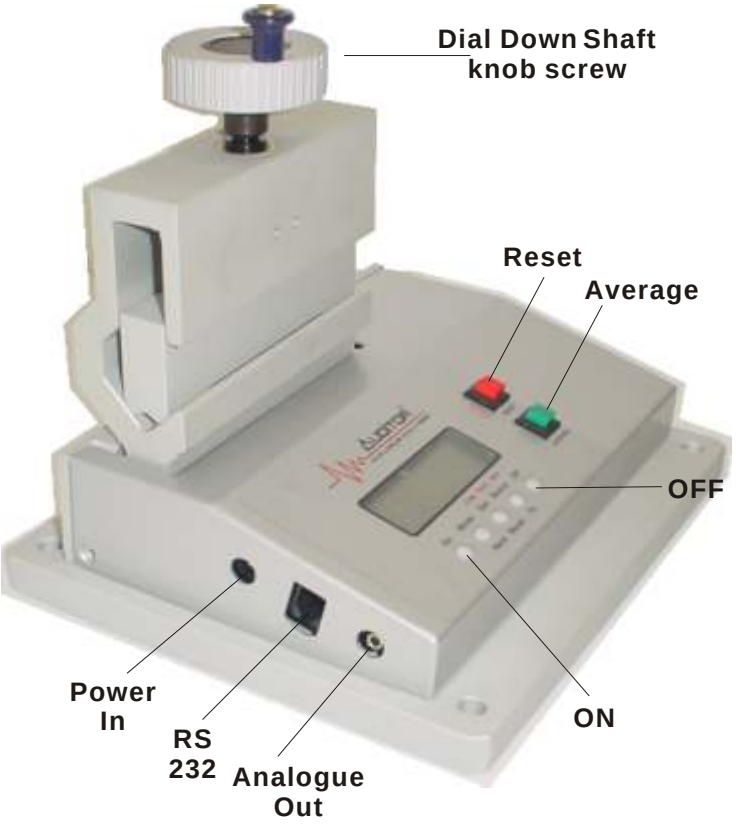
The Golfsmith Reference Analyzer does not rely on optical methods or "beam" technology. Instead it is designed to measure the frequency of any shaft by sensing resonant frequencies / oscillations through a highly sensitive vibration pick load cell such as is used for analyzing the stiffness of machine tools beds, CNC mills, turbines, etc... where by excessive vibrations can cause tear and wear and reduce machine performance over time.

On the Golfsmith frequency analyzer vibrations are measured at the grip end of the shaft with the load cell positioned under the clamping unit. The load cell features two vibration sensing elements positioned 90 degrees apart so that erratic oscillations can be accurately measured whether the shaft is oscillating up and down, side ways or both. This overcomes some of the difficulties encountered by conventional optical frequency analyzers which cannot accurately sens irregular oscillation patens.

The unit counts the number of oscillations and computes those oscillations by their CPM (Cycles Per Minute). The number of units for a specified shaft length will increase as shaft stiffness increases, and decrease likewise.

With the Golfsmith Reference Analyzer you will be able to make your own accurate comparison of shaft stiffness. Because each shaft company has always been free to determine its own methods and parameters for measuring stiffness, it has been difficult for clubmakers to accurately compare the flex designations of one shaft company to the same flex designations of a different shaft manufacturer. Hence, frequency stands as a viable way to rank the actual level of stiffness of any shaft or group of shafts.

In addition, the Golfsmith analyzer is designed to allow you to build frequency matched sets of golf clubs. In a golf equipment industry in which custom shaft fitting and component accuracy have become more and more important to properly match the golfer with the right set of clubs, the Golfsmith analyzer will enable clubmakers to build sets of woods and irons with which the club-to-club progression of stiffness not only can be kept consistent, but can be customized to any desired progression of stiffness as well.



Installing the Golfsmith Reference Analyzer

***Work Bench Installation*:**
Place the analyzer on one corner of a work bench, close to a wall power outlet. The work bench must be heavy, well built and wobble free, as this may affect measurements.

The Reference Analyzer should be bolted down with two 5/16" bolts. Backing washers should be used to prevent marring and sinking. (Lag screws are not recommended as these will pull through over time.)

In order to avoid condensation that may damage the electronic components inside, avoid exposing the Reference Analyzer to direct sunlight, heat source or dampness.

Provide enough clearance around the Golfsmith Reference Analyzer to allow easy clamping of golf shafts and swing clearance of golf clubs.

***Wall Mount Installation*:**
Secure the Reference Analyzer about 50" from the ground with the LED display facing the operator and on the right side of the unit. Use 5/16" concrete bolts. Care must be taken to secure the Reference Analyzer perfectly perpendicular to the ground using a plumb line.

Using the Shaft Reference Analyzer

The accuracy of a measure can only be as goods as the methodology used during the measuring process. The repeatability of a measure over time is the key to accurate and reliable measurements..

Your frequency analyzer is capable of measure golf shaft frequency up to 1000cpm (Cycles Per Minute) and is accurate to 0.01HZ or about +-1cpm. The key to achieving a high level of measuring accuracy is the repeatability of the measure you are performing. Therefore, it is essential that golf clubmakers develop golf club and shaft testing methods that best suit their accuracy requirements.

1) Develop a consistent shaft clamping procedure that will ensure that the shaft is accurately positioned in the clamp fixture to a predetermined length of 5.00" for RSSR (Recommended Shaft Speed Rating) calculations and 5.00" for the purpose of reporting shaft frequency as established in the ASTM guideline.

2) Develop a consistent shaft/head orientation procedure. For woods and irons, it's best to position the golf club with the toe of the clubhead pointed towards the ground. Golf shafts are best positioned with the shaft logo facing upwards and parallel to the ground. When testing golf shafts it is necessary to use a tip weight that weights 205 grams and conforms to the ASTM guideline. ASTM conforming tip weights can be purchased separately from Golfsmith (Frequency Tip Weight #8245)

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3) The clamping fixture on the frequency analyzer features a single clamping knob that ensures a disbursed and even clamping pressure. This is a self-limiting torque knob. Stop dialing the knob when the slip mode is engaged. Dialing the knob several turns after the slip mode is engaged will wear out the slip mechanism and could cause the knob to lock, in which case disassembly of the clamp bolts must be disengaged in order to release the shaft from the clamping fixture.

4) When oscillating golf clubs or raw shaft, try to develop a consistent and even pull. Pulling down the golf club or shaft 1-2 inches is more than enough for the frequency analyzer to count the oscillations. Pulling the golf club or shaft by more than the prescribed amount can seriously damage the load cell.

Pulling the golf club or shaft by more than the recommended amount will usually result in inaccurate and inconsistent frequency readings and can result in damage to the shaft.

5) The most accurate frequency readings are usually obtained when the oscillations of the golf club or shaft begin to decay, indicating that the shaft or golf club is entering its resonance phase, or natural frequency, and is no longer influenced by the pulling forces applied at the beginning of the oscillation.

6) Refer to the Golfsmith Reference Analyzer procedure making sure that the unit is correctly installed and properly secured.

7) The greater the frequency reading in CPMs the more stiff a shaft is considered to be. As a guideline, the following is a list of what my be considered reliable average frequencies for the golf industry's steel and graphite driver and 5-iron shafts. You may use this chart as a way to compare your frequency measurements of different shafts to average for each flex.

DRIVERS			**5-Irons**	
Steel	Graphite	Flex	Steel	Graphite
235	242	L	285	289
240	250	A	290	290
250	255	R	300	295
260	270	S	310	305
270	285	X	320	315

Measuring The Frequency of a Shaft

1) Plug the AC/DC adapter in to a wall socket and connect the power to the analyzer. Turn the unit on and wait for the **ready** status message.

2) Insert the grip end of the club/shaft into the clamp Dial the control knob counter clockwise to open the butt clamp mechanism so that the shaft will fit within the clamp.

3) Position the end of the club at the desired distance from the front edge of the clamping unit to establish your standard for frequency measurement.

4) Dial the knob down until the slip mode is engaged. The distance from the right front edge of the clamping unit to the tip end of the shaft or club is called the beam length.

For your information, the frequency measurements used for calculating the RSSR for each shaft in the Golfsmith catalog were performed using a clamping length of 5.00" from the edge of the grip cap (end of the shaft) to the front of the clamp.

If the shaft is installed into a clubhead, it is not necessary to position the head in any particular position. However most clubmakers prefer to clamp the shaft with the toe of the clubhead pointing towards the ground. Once the grip end of the club is set in the clamp to the desire clamping length, dial the pressure control knob clockwise to lower the clamping bar on top of the shaft until the knob slips in response to having reach its designed clamping pressure

5) Oscillate the shaft to obtain the frequency reading. The analyzer is built to measure frequency in an up and down direction (vertical) or back and forth direction (horizontal). The customary direction for shaft testing is vertical with the analyzer bolted to the workbench. Because the unit is very sensitive all that is required for an accurate reading to the pull the head or shaft tip down by approximately 1-2 inches and release, thus causing the shaft to oscillate up and down.

For testing in the horizontal mode, pull the head or tip of the shaft straight back and release..The frequency of the shaft will appear in the LCD window.

The frequency measurement displayed is expressed in CPMs. You may press the RESET button at any time during the movement of the shaft and the machine will start a new count automatically.

If the frequency analyzer is not used for more than two minutes, the unit will go into sleep mode. Press the ON button to" wake" the unit back up.

Using the Average Function
The Golfsmith Reference Analyzer is one of the few machines on the market today that features a frequency averaging function. The purpose of this function is to assist golf clubmakers in obtaining accurate frequency measurements at a glance. This also eliminates the need for excessive data logging and manipulation.

Pull the club or shaft 1-2 inches, as previously recommended, and release. Wait for the first frequency reading to appear in the LCD window. While the club or shaft is still oscillating, press the **RESET** button for the next count and wait for the second frequency count to appear Repeat this step up to 5 times.

Stop the golf club or shaft from oscillating and press on the **AVERAGE** button. The count displayed is the average of the five readings already taken.

Pressing the **Average** button for 3 seconds will flush the averaged reading from memory. "**CLR**" will appear on the LCD to indicate that the memory is cleared.

IMPORTANT!
When measuring the frequency count for a set of shaft or golf clubs, it is necessary to flush the average frequency count from memory for the preceding golf club shaft, otherwise the average frequency count for the club or shaft at hand will not be accurate.

Press and hold the **Average** button for 3 seconds unitll the "**CLR**" appears on the LCD to indicate that the memory is cleared.

Shaft clamping Pressure
The repeatability and accuracy of a shaft's frequency quite often depends on the shaft clamping pressure. That's why the slip clutch on your analyzer has been factory calibrated at 1Lb/foot of torque.

To maintain adequate clamping pressure for the life of your analyzer, you can make a calibration shaft to use as a reference for when your analyzer requires adjustment.

Making a calibration shaft:
1)Take an untrimmed wood or iron steel shaft

2)Clamp the shaft in the analyzer and load the shaft with a standard 205 gram tip weight.

3)Take a frequency measurement. You can take the average of 5 measurements if necessary.

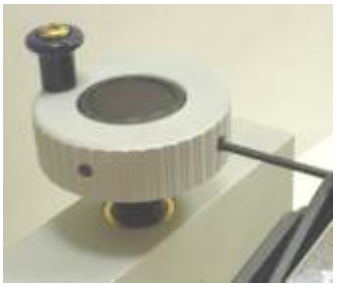
4) Record the value on a sticky on label.

5)Do not remove the shaft from the analyzer just yet. Stick the label as close as possible to the shaft clamp with the label facing up. This will reference the shaft orientation in the clamp to counter act any spine the shaft may have.

6) You can now remove the shaft and test it again if necessary. You should get the same frequency measurement as you did before.

7) Store the shaft in a convenient place so you can have it close at hand for whenever you need to re-calibrate your machine.

Re-Calibrating the Knob Screw



1) Remove the dial knob to expose the knob with the slip clutch mechanism.

2) Locate the access hole from where to access the slip clutch pressure spring.

3) Insert the small allen key located into the hole and locate the screw head. Adjust as required.

4) Assuming that the calibration shaft is already clamped; un-clamp and re-clamp the shaft to reset the slip clutch.

5) Twang the shaft and take a frequency count. Adjust the spring pressure again or until you achieve the same frequency reading.

6) When done re-install the aluminum knob screw.

Golfsmith Reference analyzer Computer interface

RS-232
Your Golfsmith Frequency analyzer is already equipped with an RS-232 port which will allow you to transfer frequency readings directly into a data collection program for analysis.

The RS-232 supported mode, transfers frequency reading as displayed on the LCD directly to the data collection program. Extra functionality such as data parsing, labels printing etc. are supported within the data collection program not the analyzer.

Since the extra functionality provided by the RS-232 connection depends on individual user's level of experience as well as operating system and PC configurations. Golfsmith International does not support the RS-232 and I/O functions provided with this product.

RS-232 configuration:
Baud rate 9600
1Start bit
1 Stop bit
8 data bit

RS-232 Requirements:
- PC with Windows or MAC OS
- RS-232 / RJ-11 connector and adapter
- 4 Wire flat type phone extension cord.
-RS-232 program or SPC data collection program.

Analogue Signal OUT
Your Golfsmith Reference Frequency analyzer has an analogue signal out port which will allow you to analyze the frequency of the shaft in real time on a computer screen.

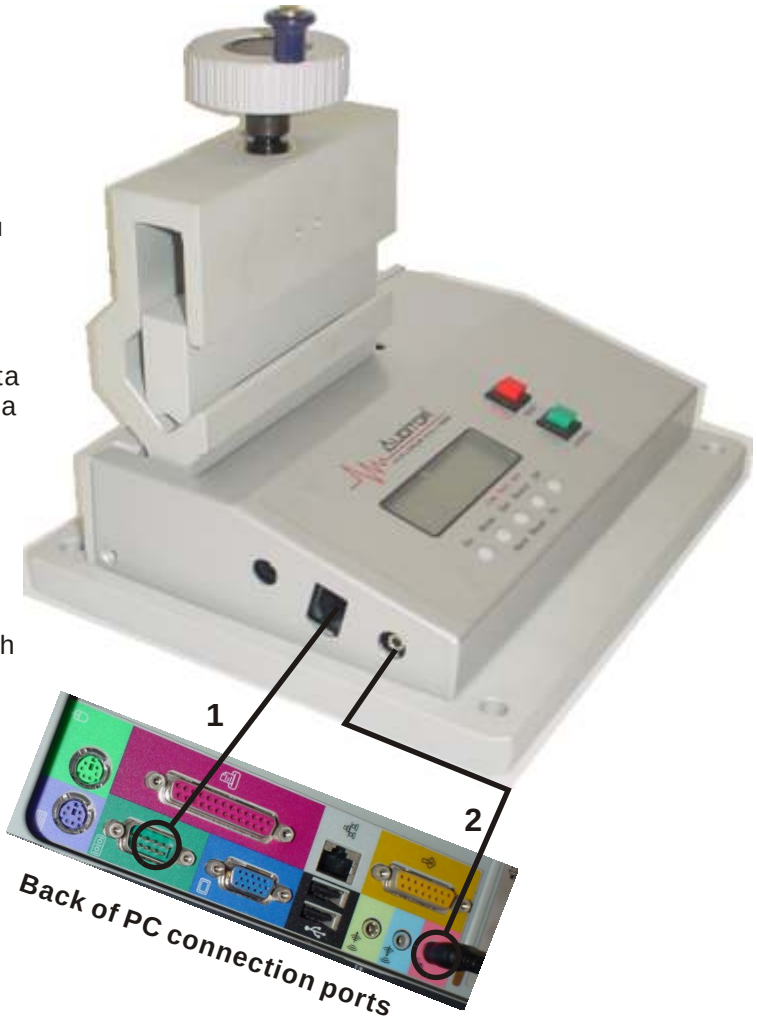
The extra functionality provided by the Analogue I/O allows you extend the capability of the analyzer for frequency measurements and other parameters such as decay rate, amplitude, etc. at very little cost

Analogue I/O requirements:
-PC Windows or MAC OS
-Sound card (8 bit minimum)
-Mono Oral connector cable.
-Sound wave / Vibration analysis software.

Please note:
Analyzer to PC connection and Software are not supplied with your Golfsmith Analyzer.

Disclaimer:
Your Golfsmith Frequency analyzer is shipped with the RS-232 and Analogue out ports blanked out. By breaking the tabs you signify your intent to use the extra features as is and at your own risk.

Golfsmith international will not accept any liability for personal injury, damaged computers, hardware and or software associated with the use of this product.



1) RS-232 to PC RS-232Port
2) Analogue Out To Analogue in or Microphone in

RS-232/ RJ 11 converter

Mono Oral Audio cable

WARNING!

1)TURN THE PC OFF BEFORE CONNECTING ANY CABLES TO IT.

2) TO PREVENT STATIC ELECTRICITY DISCHARGING INTO THE ANALYZER. ALWAYS CONNECT CABLES & CONNECTORS TO THE PC FIRST.

3) ALWAYS DISCONNECT THE ANALYZER OFF THE MAIN WALL SOCKET OUTLET BEFORE COMPLETING THE CABLE CONNECTION.