

# HARMONIZER

## A 2-port Adventure Vacuum Tool

*Thank you for choosing the Harmonizer. You made a good choice. Fast. Accurate. Portable. Versatile. Foolproof.*

The Harmonizer is a small, portable, battery-powered, Vacuum Multi-Tool intended to aid power-sports engine tuning and diagnostics. It may be used to help tune motorcycles, watercraft, snow machines, ultralight aircraft and more. It works for both carbureted and fuel injected motors. In addition to vacuum and RPM measurements in both differential manometer (balancer) mode and single-port gauge modes, a few utility/camping/touring features have been included.

### Features-

- Two calibrated vacuum measurement modes with tachometer functions.
- Reliable, all electronic design, with digital signal processing and no moving parts.
- Large, easy to read, LCD display. No bouncing needle or parallax errors.
- Rugged housing with a clear Lexan top.
- Vacuum hoses are removable. They attach to the unit with twist-on (finger tight), Luer type connectors.
- Swivel-hook on top for hanging/attachment. Will operate in any orientation.
- Auto Range.
- Auto Zero on power-up.
- Auto shutoff after 5 minutes of inactivity (except beacon and timed lantern modes).
- Internal voltage regulation and Battery Voltage Indicator.
- Automatic display backlight.
- Bright White LED included for convenience and utility. The LED is bright enough to illuminate a timing hole in daylight.
- Input button is recessed to prevent inadvertent activation and breakage.

### Human Interface-

Simple one-button interface. Press/release button and wait for Auto-Zero calibration. The unit is now ready in balancer mode. To access other modes and menu options, hold button pressed until desired function appears. Then release button.

### Modes and menu selections

Zero, Power Off, Toggle LED, Balancer Mode, Gauge Mode, Timed Lantern, Beacon, Info (displays version and internal sensor voltage).

### Vacuum Measurement and Tachometer Functions-

The Harmonizer has two vacuum measurement modes that both include tachometer functions. **Balancer mode** and **Gauge mode**. In both modes, the Harmonizer measures the timing of the vacuum pulses to calculate and display RPM.

**Balancer mode** (differential manometer mode) displays the difference in vacuum at the two ports. There is a center-zero representation similar to an analog meter, and a numeric representation in the range of +/- 999mbar. A smiley appears if the vacuum difference is 0 +/- 25mbar. The "needle" sensitivity auto-ranges. If you exceed the limits of the display, the sensitivity of the "needle" is cut in half. The numeric display always resolves to 1 mbar. In **Balancer mode** the tachometer is calibrated for 4-stroke motors with one cylinder per intake. In **Balancer Mode**, for 2-strokes or motors with 2 cylinders per intake, you must divide the tachometer reading in half.

**Gauge mode** is a digitally damped vacuum gauge, intended to measure vacuum on intakes that support one or two cylinders. Only one Harmonizer port is used. The other is left unconnected. A left-zero meter representation is displayed along with a numeric representation in the range of 0.00-29.00 inHg. **Gauge mode** can be used to adjust idle speed with the tachometer function and mixture (carburetor) with the tachometer and/or gauge function. **Gauge mode** can also be a powerful diagnostic tool.

In **Gauge mode**, if you use the yellow port, the tachometer is calibrated for 4-stroke motors, 1 cylinder per intake. In **Gauge mode**, if you use the red port, the tachometer is calibrated for 4-stroke motors, 2 cylinders per intake (or two-stroke motors, 1 cylinder per intake). Gauge readings are affected by altitude and weather (barometric pressure). By definition, gauge readings are with reference to atmospheric pressure.

### LED modes-

**Toggle LED on/off** through menu or by a double press of the button for a quick flashlight function.

**Timed Lantern Mode** illuminates the LED for 15 minutes then power-off. During **timed lantern mode** a single button press resets the timer to 15 minutes.

**Beacon Mode** flashes the LED in a randomly selected, 5-flash, repeating sequence. Potentially useful as an emergency flasher or locating beacon. **Beacon mode does not time-out**. It will persist until the mode is changed or the battery is depleted.

## Specifications –

**Storage temperature:** -20C to 70C

**Operating temperature:** -10C to 50C

**Vacuum Hose size/length/temp:** 4mm (5/32) ID x 122cm (48 inches) SAE J1037 -40C to 125C (-40F to 257F)

Battery type: 9V Alkaline battery (included) recommended

**Current Consumption and Battery Life** - (based on fresh Alkaline battery 500mA/hr 23C) (Typical).

basic functions backlight off 11mA 45 hours

basic functions backlight on 16mA 31 hours

beacon mode (backlight on) 25mA 20 hours

LED on (backlight on) 34mA 15 hours

### **Displayed Range and (Resolution)-**

Balancer Vacuum: +/-999mbar (1mbar)

Gauge Vacuum: 0.00inHg - 29.00inHg (0.01inHg)

Tachometer: 0-9990 RPM (<1500RPM 10 RPM steps, >1500RPM 50RPM steps)

**Tachometer and internal timing accuracy:** +/- 0.5% @ 23C (+/- 2% over full operating temperature)

**RoHS compliant, CE compliant**

## **IMPORTANT Notes on Use-**

Follow all safety procedures. Ensure your motor is adequately cooled during tuning and/or diagnosis. Do not leave a running motor unattended. The Harmonizer is NOT waterproof. It should not be submerged or used in the rain.

Use on turbocharged motors in boost is not recommended.

The supplied vacuum hose is rated from -40F to +257F. It will melt if it contacts exhaust headers, exhaust manifolds, or catalytic converters. **There are restrictor tubes installed inside the hoses** approximately 4 inches from the motor end. They work in conjunction with the hose volume to "snub" peak pressure impulses. They protect the Harmonizer sensor from backfire, racing motors with large valve overlap, motors with damaged intake valves, and motors that have large vacuum orifices (> 1.5mm). These restrictors should remain in place and the hoses should not be shortened.

The gauge function can be used on motors with 3 or more cylinders/intake (like a car) but the tach function may not work reliably and may not work at all (due to diminished vacuum pulse amplitude attenuated in the plenum) and the gauge is much more heavily damped than it needs to be for such motors.

The Harmonizer is extremely sensitive. Large temperature changes during use can affect the "zero" point (offset). If the "needle" doesn't return close to zero after switching the motor off, re-zero the unit and repeat the measurement. Avoiding direct sun and a changing temperature environment minimizes the need to re-zero.

The clear polycarbonate cover is very durable. But it can scratch, and it can be discolored or melted by a few aggressive solvents or extreme heat.

The battery voltage indicator icon displays only battery voltage. It is not always a precise indicator of how much energy the battery has left. Sometimes battery voltage can recover a bit after a period of rest.

Warranty: One year parts and labor or replacement.

Designed and manufactured in the USA

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