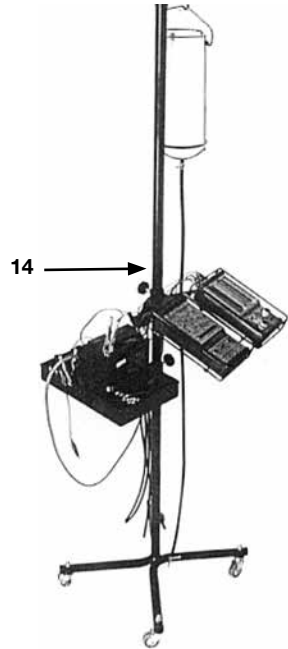


VacuumMATE

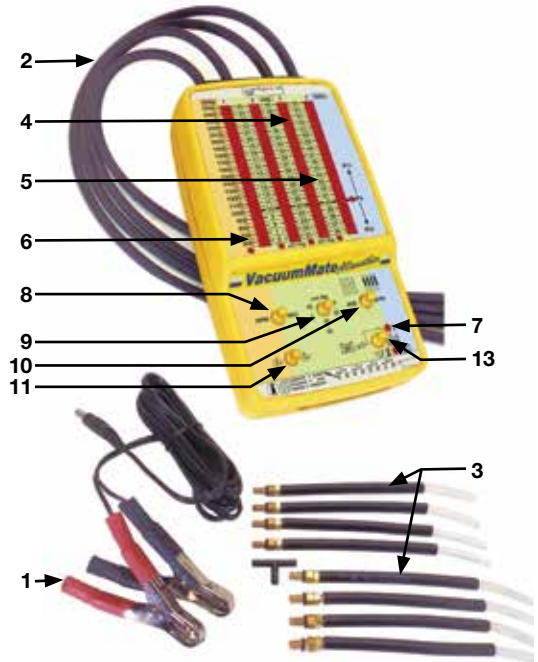


TecMate North America
www.tecmate.com



Legend :

1	External battery connection cord-set.
2	Flexible (replaceable) santoprene hoses.
3	2 sets flexi-rigid adapters.
4	4 LED-array displays.
5	3 graduated "AVE" mode scales.
6	RPM scale.



VacuumMate Allweather

The complete Intake Vacuum Synchroniser with Dynamic Engine Check & RPM

Read the whole of this manual before starting to use the VacuumMate

1. OVERVIEW

VacuumMate's 3-in-1 functions are all essential for rapid, precise and reliable intake synchronising.

Use the **RPM** mode for the essential adjustment of the engine speed to the correct value as stipulated by the constructor, prior to and after synchronising. (No need for a separate tachometer instrument or the need to rely on vehicle tachometers, usually imprecise at low-end engine speeds).

Then accurately synchronise in the "**AVE**" mode to the constructor-specified value(s). If synchronising seems difficult to achieve, flick the selector switch over to the "DYN" mode for an immediate visual check that the cylinder seals and valves are functioning correctly. A valve leak or other sealing defect affecting the manifold pressure will thwart any attempt at a correct synchronisation of the relevant cylinder's intake.

More details of these three functions are given in the following sections of this manual.

The purpose of "synchronising" throttle valves is to bring the average vacuum settings in the various intake channels as close to their specified values as possible. Their specified values are (usually) equal, but for some engines one or more cylinders may need a slightly different value from the others for specific reasons such as differential heat expansion in control linkages of differing lengths. **It is therefore essential to consult the service manual.** Precise adjustments are essential to ensure a stable engine idle speed and a good engine response.

VacuumMate has four highly visible LED bar-graph displays for monitoring up to 4 channels (or 4 cylinders). These fast, precise & frictionless columnar displays replace outdated toxic mercury columns.

VacuumMate's compact size & weight allows use anywhere, whether in the workshop or at the track – the ideal tool for the professional mechanic, for power sports vehicles, 4-stroke outboard motors and multi-carburettor classic sports cars. The bright protective holder and custom storage and travel case lend added protection to the robust water- and shock-resistant construction.

The VacuumMate **VMR6ME** model has an internal rechargeable 7.2V NiMH battery, ideal for outdoor use, for example on outboard motors on board boats. The battery can be recharged simply by connecting to an external charged 12V vehicle or storage battery.

In addition to its protective holder and custom travel case the **VacuumMate** kit includes the external battery cord-set, a fuel-line Tee-connector and 2 sets (of 4) unique "flexi-rigid" connection adapters with M5 & M6 threads for easy connections to all types of engines. Additional connection adapters are readily available to order, (order references M5ADPFR & M6ADPFR respectively).

2. UNITS OF MEASUREMENT OF VACUUM & THEIR EQUIVALENTS .

For our purposes, vacuum is negative pressure, or pressure which is below atmospheric pressure at sea level which is equal to the pressure exerted by a column of mercury (Symbol : Hg) with a height of about 76 cm. Atmospheric (or “barometric”) pressure can be expressed in various different units :-

1 atmosphere = 76 cm Hg= 1,013 bar= 1013 mb (millibar)= 101,3 kPa (kiloPascals)= 14.7 psi (lb/in²)

1 psi = 5,17 cm Hg= 68,95 mb = 6,895 kPa. **1 cm Hg** = 1,333 kPa = 13,33 mb = 0,193 psi

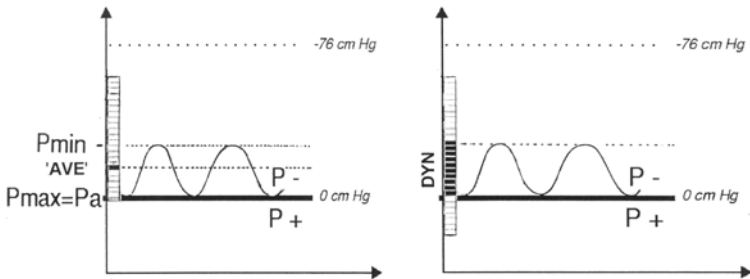
Examples : 10 cm Hg = 133 mb. 20 cm Hg = 3,86 psi. 200 mb = 15,0 cm Hg. 5 psi = 25,85 cm Hg.

Most service manuals today give the vacuum settings in cm Hg so this is the unit used on the VacuumMate’s synchronising scale displays. So when the displayed vacuum value is 20 cm Hg, this means the intake pressure = atmospheric pressure at the place you are working, *less 20 cm Hg*.

3. AVERAGE (“AVE”) & DYNAMIC (“DYN”) VACUUM MEASUREMENT MODES.

The pressure in the intake system of an engine is not constant, as it is caused by piston movement which causes the vacuum to oscillate between a minimum and maximum level in the form of a wave, called the vacuum waveform. Mechanical (& some other electronic) vacuum gauges display only the AVERAGE value (“AVE”) of the vacuum waveform. This is the parameter used for the synchronisation of throttle valves on carburetors or injection systems. However such instruments lack the speed & precision needed to follow DYNAMICALLY the very fast fluctuations of the vacuum waveforms themselves so as to monitor the heights and relative positions of the crests and troughs of the waveforms of each cylinder. And it is only by monitoring and displaying these DYNAMIC characteristics that one can reveal the existence and nature of engine seal defects which will distort & thwart attempts at synchronisation.

The **VacuumMate’s** electronics & LED bar-graph displays react extremely fast, fast enough to show in DYNAMIC (“DYN”) mode the vacuum waveform heights and relative positions for each connected channel. This is displayed as a column of light on each LED display channel, extending between the crests and troughs of the waveforms. By comparing the relative heights and positions of the columns of light for each channel one can detect various problems which would normally require disassembly and detailed investigation of engine components such as valves & pistons. See § 8. **DIAGNOSTICS** below.



AVERAGE (“AVE”) & DYNAMIC (“DYN”) VACUUM DISPLAY MODES COMPARED

Use the **AVE/ DYN** selector switch (#10, illustration, inside front cover) to select **AVE** or **DYN** mode as required. In AVE mode the VacuumMate measures average vacuum in 3 ranges: 5-25 / 20-40 / 35-55 cm Hg, selected by the 3-position selector switch (#9, illustration, inside front cover). The overlapping scale ranges help to avoid “losing sight” of the display on one or other channel if the measured values are somewhat out of synchronisation and close to the end of the scale range. Resolution is a precise 0,5 cm Hg on all scales.

Use the DYN mode to check for and analyse defective engine seals in case of apparent difficulty in arriving at a satisfactory synchronisation, even after several attempts and probably associated with an irregular engine rhythm. The function of the DYN mode is to compare the waveform heights of each connected channel (cylinder) and the relative positions of their crests & troughs, which should be similar for each channel. The precise values themselves are not relevant to this purpose. For more details on using the “DYN” mode, refer to page 7, section **§8. DIAGNOSTICS**.

4. ENGINE SPEED, RPM (Revolutions Per Minute).

In RPM mode the **VacuumMate** monitors the waveform pulses from the pneumatic engine connections, so no other pick-up or probe is required. As the waveform pulses are not subject to interference or other HT parasitic stray signals they provide a much easier and more reliable signal input than other methods. The RPM function receives it's signal input from the waveform pulses from the #1 channel hose connection, so it is important to connect this hose in cases where not all four hose connections are made.

The RPM function is selected by the RPMNAC selector switch (#8, illustration, inside front cover).

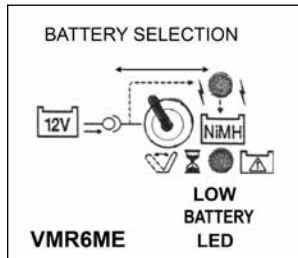
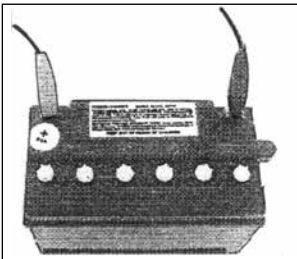
For many Japanese motorcycles and some other engines, adjustment of the engine speed to within about 50 RPM of the correct value (as stipulated by the constructor) is essential for precise intake synchronisation. Vehicle tachometers are usually imprecise at low-end engine speeds and should not be used for setting or monitoring engine speed for synchronising purposes. This is therefore a vital feature of the VacuumMate. The engine speed should be re-adjusted accurately to the correct idling speed on completion of the synchronising task.

The **RPM** mode displays engine speeds from 500 to 2500 rpm, with 50 rpm resolution. The 2-stroke / 4-stroke selector switch (#11, illustration, inside front cover) allows correctly displayed values for both types of engine. Incorrect selection will display either double the true RPM (4-stroke selected for 2- stroke) or half of it (2-stroke selected for 4-stroke).

5. POWERING THE VACUUMMATE

The **VacuumMate** (standard model, ref **VMR6WS**) requires a 12Vdc external power source such as a charged 12V battery with a capacity of at least 4Ah. To connect to this, a cord-set with alligator clips is included in the VacuumMate kit. (Replace this immediately in case of damage or wear, see **§ 9. SERVICE**). Alternatively, use a well-regulated DC power supply with a power rating of at least 20W and delivering between 11Vdc & 15Vdc. **NOTE** : Use only a DC power supply which you have ensured is correctly rectified, filtered and regulated. To do otherwise may damage the VacuumMate circuitry & invalidate the warranty. If using a 12 Volt vehicle battery make sure it is in good condition. A battery in poor condition or a bad connection can give rise to unstable power conditions such as voltage spikes that may damage the VacuumMate.

The **VMR6ME** model has internal rechargeable 7,2V NiMH batteries. These can be recharged when necessary by connecting an external well charged 12V battery or regulated 12Vdc power supply using the connection cable set supplied. The external source can also be used to power the VMR6ME, but NOT, for safety reasons, when used on boats. On shore, whenever an external battery or 12Vdc power source is to be connected to power the VMR6ME or for recharging the internal batteries, place the selection switch in 12V position before connecting and leave it so until the task or recharging completed, then disconnect.



A well charged external 12V battery or power supply can be left connected to the model VMR6ME when not in use to ensure that the internal batteries are -always charged up. To connect the external battery, (for VMR6ME, first place the battery selection switch in the 12V battery position), connect the red alligator clip to the positive terminal and then the black clip to the negative terminal of a charged 12V battery. Then plug the cable set into the VacuumMate (between the rubber hoses). If the input voltage is below 9Vdc or above 15Vdc or if the connections are incorrect {inverted}, the VacuumMate will not function. The Low Battery warning LED (see panel at the bottom of the previous page), will indicate if the battery or power supply voltage drops below 7V and the LED bars of the display will go into “dimmed” mode until the voltage level is again satisfactory. Note that when powered up, the LED bars of the display will go automatically into “dimmed” mode in periods of inactivity to conserve energy, automatically reverting to “bright mode” immediately on resumption of active measurements. When working on internal battery power, the model **VMR6ME** will automatically switch itself off after 5 minutes of inactivity to conserve the battery. To re-start, move the switch to the left, then right again.

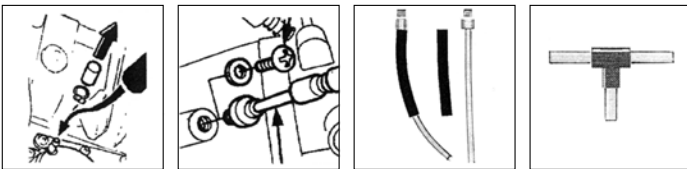
CAUTION! Connection to an alternating current (AC) input will damage the VacuumMate and may even cause electric shocks! Connect **ONLY** to a 12V battery or suitable regulated power supply.

6. PNEUMATIC CONNECTIONS

To function correctly and give true readings all of the VacuumMate 's hoses & connections must be absolutely **air-tight**, including the connections to the adapters and at the connection points on the engine. Protect the hoses and connection elements from physical damage & stress and before synchronising conduct visual & pneumatic checks to ensure there are no defects such as holes or cuts in the hoses.

For ease of replacement the hoses are fitted to external nipples protruding from the enclosure. The VacuumMate hoses are oil & fuel resistant and any replacement hoses should be of a similar specification. You are advised to replace hoses only with original VacuumMate replacement hoses, available individually, order reference VMHOSE (see § 9. **SERVICE**).

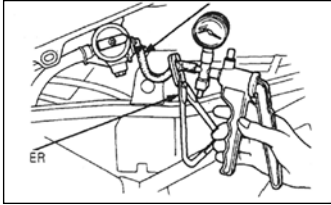
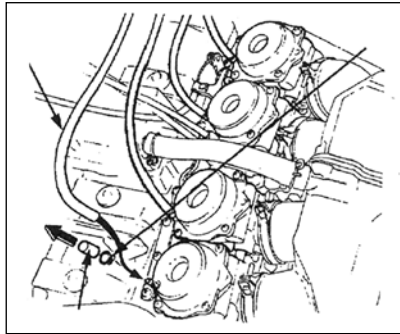
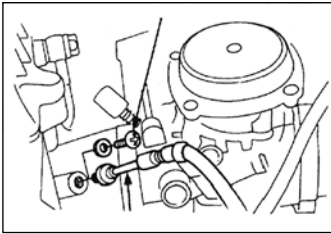
The SERVICE MANUAL of the engine manufacturer should indicate where to make the necessary hose connections on the engine to measure the intake vacuum. In some cases, the rubber hoses can be fitted directly onto the vacuum connection ports (or nipples) at the manifold once the clips and rubber sealing plugs are removed. Most engines, however, have vacuum connections plugged with screws. Connect a rubber tube directly to each 'male' vacuum port (after removing the rubber plug) or use the VacuumMate 's threaded adapters in case of a threaded vacuum port, after removing the sealing screws. Connection of the channel 1 hose is essential for correct functioning of the displays.



The **VacuumMate** comes with unique and versatile connection adapters. The “flexi-rigid” guide tubes can be bent slightly. They act as a guide for the plastic tubes within them, which can be rotated for tightening the thread. This helps to make connections even where the points are hard to reach*. Reverse thread construction at the junction of the plastic tubes & their threaded metal end pieces allow the unscrewing of the adapters from hot engines without the risk of the metal pieces sticking in the threaded ports. There are 4 adapters with MS thread (Honda & Suzuki) & 4 with MS thread (Kawasaki & Yamaha). When the adapters are in place, insert the plastic adapter pipe(s) firmly into the rubber hose(s) of the **VacuumMate**. Some silicone oil (not engine oil) may help if this seems difficult.

•*A useful accessory kit is available, comprising a set of connection aids which are fixed permanently to the threaded female points on the intake manifold, and terminate in readily accessible metal nipples sealed off with rubber caps which (on removal) allow the VacuumMate's rubber hoses to

be pushed directly onto the nipples. These kits are available with MS & M6 threads with 40 cm of rubber hose (rspective order references VMLFIXADP5 & VMLFIXADP6) or in short configuration without hose, (order reference VMSFIXADP5 or VMSFIXADP6).

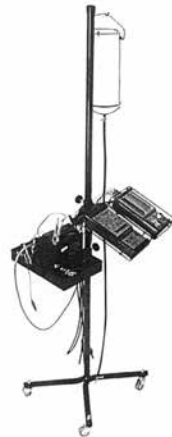


When the fuel is supplied through an automatic fuel valve, it is usually connected to one of the vacuum ports. By using the Tee-piece (illustrated above) & it's short piece of hose, included with the **VacuumMate**, the fuel valve can remain connected, so that fuel can flow while synchronising.

Another possibility is to use a vacuum hand pump to keep fuel flowing (illustrated above, the **MityVac #4000**, available from VacuumMate distributors).

For cases when it is necessary to remove the fuel tank in order to access the hose connection points at the manifold. an auxilliary suspended fuel bottle is a useful accessory. Such a fuel bottle complete with hose and tap is available together with special mobile stand or gantry, the **StandMate**, designed specially for use with the **VacuumMate** & the **IgnitionMate** ignition troubleshooting peak voltage analyser. The **StandMate** has twin angled height – adjustable holders for these two tools as well as an adjustable tray for small parts, adapters, clips & screws; and a suspension point for the auxilliary suspended fuel bottle. The **StandMate** allows secure & convenient positioning of the two tools right next to or above the vehicle so that the service technician has both hands free for his work.

Order references: StandMate: IMSTAND, Fuel bottle kit: IMSTATANK.



7.HOW TO PROCEED

To start.

Make the necessary pneumatic connections. It is best to connect the channel 1 hose first. Start the engine and let it warm up. Connect the **VMR6WS** to a suitable battery or dc electrical input. If using the **VMR6ME** model: move the battery selector switch lever from left to right to reset it to "ON", as it has an auto-switch-off feature which switches off the VacuumMate when there has been no "activity" for 5 minutes to protect it's rechargeable internal batteries.

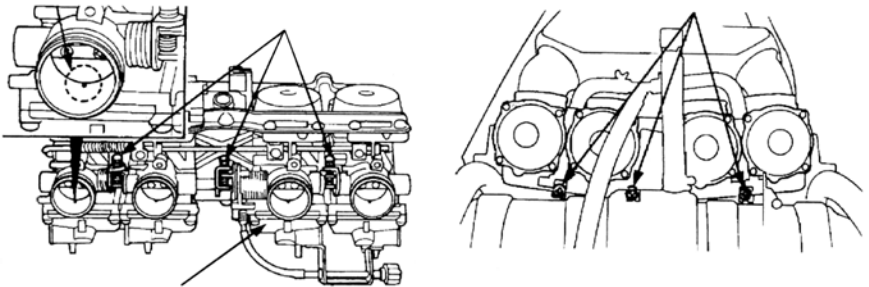
Adjust the engine speed

Select AVE mode with the AVE/DYN selector switch. Put the RPM/NAC switch in the RPM position. RPM selection is indicated by the LED below the RPM scale markings. Position the 2-stroke/4-stroke selector according to engine type. The left scale (“CHANNEL 1”) can now be used to monitor engine speed from 500-2500 rpm with a scale resolution of 50 rpm per individual LED segment.

Adjust the engine speed to the rpm specified by the engine manufacturer for intake synchronisation. Re-adjust to maintain the specified rpm if necessary during the synchronisation procedure. When the synchronising task has been satisfactorily completed, return to the RPM mode to reset the engine speed if necessary to the correct specified idling speed.

Synchronising

One of the carburettors is called the “**base**” or “**fixed**” carburettor, sometimes the reference carburettor. This is the carb actuated directly by the throttle mechanism (cable or rod). It is best to connect the rubber hose of channel 1 to this “fixed”, carb for convenience in synchronising the others to it. The other throttle valves are linked to the fixed carb. Study the linkage to understand in which sequence synchronisation is possible without influencing previously set carburettors. See illustration below left. There is one adjusting screw for each carburettor to be synchronised. See illustration below right.



Usually you should start adjusting the carburettor next to the fixed one. The object is to achieve the same reading on each of the channels during idling unless the values specified for a particular engine are slightly different for specific cylinder-manifolds. (Some examples of such engines : 4-stroke Mercury and Yamaha outboard motorsi Honda’s VFR800 motorcycle engine). Start with the scale range switch in the position 5-25 cm Hg. If necessary shift to the 20-40 cm Hg scale. The upper scale range 35-55 cm Hg is only required for a very few motorcycle models. The scale selection is indicated by the LED below the respective scale markings.

For some engines synchronisation to within 0,5 cm Hg i.s required, but for many engines, a synchronisation to within 1 cm Hg is adequate, so always consult the .service manual to check the required degree of precision of the synchronisation before struggling to achieve a more precise result. Flick over to the RPM display periodically while synchronising to check that the engine RPM has not wandered off the setting, in which case readjust to the correct RPM before continuing.

In case of apparent difficulty in arriving at a satisfactory synchronisation even after several attempts, for example if the LED displays indicate a synchronised engine but the engine sounds irregular, select the **DYN** mode to check for and analyse defective engine seals. DYN mode selection is indicated by the LED next to the 1’Pa” to the right side of channel 4 display. See § **8. DIAGNOSTICS** below. Refer also to the VacuumMate “3-in-1” wall poster for a quick reminder.

Finishing the job

Once a satisfactory synchronisation has been achieved, switch over once again to the RPM function and reset the engine idling speed as required. Switch off the engine, disconnect the VacuumMate's electrical input from the source and from the enclosure, and disconnect the pneumatic engine connections taking care not to burn your fingers! The connection adapters and other accessories are best kept for safe-keeping together with the VacuumMate itself either in the custom travel case or, if you have a StandMate (see page 5), in the compartmentalised steel tray and instrument holder.

8. DIAGNOSTICS : HOW TO USE THE "DYN" DYNAMIC MODE

IMPORTANT: If you have not yet read section 3. "AVE & DYN VACUUM MEASUREMENT MODES", please do so before reading the following section.

By monitoring and displaying the DYNAMIC intake vacuum waveform characteristics one can reveal the existence and nature of engine seal defects which distort & thwart attempts at synchronisation. In case of difficulty in arriving at a satisfactory synchronisation, even after several attempts, (in which case you may also have noticed an irregular engine rhythm), select the DYN mode (but only after trying as best you can to synchronise in AVE mode).

Some engine seal defects quickly diagnosed in DYN mode are

- ◆ Leaking intake or exhaust valves
- ◆ 'False' air entering the intake system
- ◆ Compression loss....

Background information

The diagrams below show some more realistic examples of pressure waveforms which can occur in the intake manifold of a 4-stroke engine. Compare with the drawings on page 2.

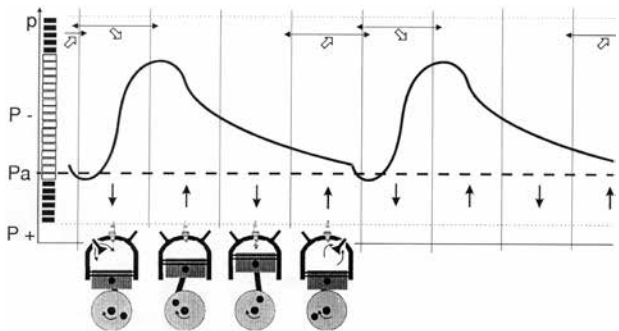
The pressure scale orientation has been deliberately inverted so as to rather show vacuum scale so as to correlate with the LED displays of the VacuumMate.

The display appears as a shimmering column of light. In reality a single LED on each connected display channel follows the wave-form curve (from left to right) at great speed rather like a very fast roller-coaster car, tracing the vacuum wave-form between troughs and crests. Because the speed of observation of the human eye cannot match that of the running engine's vacuum wave-form your eye sees the resulting display as a column of light of height and position equating to the troughs and crests.

NORMAL INTAKE VACUUM WAVE-FORM - ENGINE SEALS O.K.

The LED-column display illustrated with a typical intake pressure wave-form.

During the intake stroke the intake valve is open and the piston moves down, increasing the vacuum until the crest of the vacuum wave-form (inverted pressure wave form) is attained.

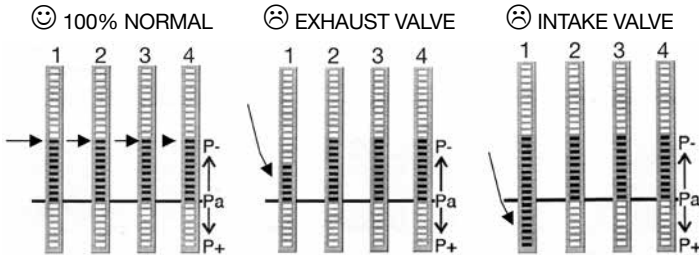


When the intake valve closes, suction ceases and the mixture coming through the throttle valve fills up the vacuum, so that the vacuum is "released" to atmospheric pressure (Pa mark) at the trough of the vacuum wave-form. The slight apparent "over-shooting" of the Pa mark datum can be thought of as due to "shock" effect.

In **DYN** mode the waveform **heights** of each connected channel (cylinder) and the **relative positions of their crests & troughs** are displayed side by side for direct comparison.

When all carburetors have been correctly synchronized and everything works normally, the bands should all have the same height and position. (See illustration below left and comment** below).

*** Note that this statement is not precisely true of certain engines for example that of the Honda VFR800 motorcycle and certain Mercury, Mariner & Yamaha 4-stroke outboard motors on which certain cylinders have slightly different “**AVE**” intake vacuum setting values by design.*



The **VacuumMate** has an auto-ranging feature in **DYN** mode. The range is automatically adjusted to achieve optimal resolution for the comparison of the connected channels. The channel with the highest waveform crest governs the auto-ranging adjustment. The bases of the displayed columns of light for engines without defective seals should normally be almost exactly opposite the “**Pa**” mark (Pa = Atmospheric pressure) on the right hand side of the LED displays (see above left). Other than the **Pa** mark there are no scale markings for the **DYN** mode as the purpose is not to measure but rather to **compare** the connected channels. A light column extending downwards into the **P+** zone (below the Pa level) means **POSITIVE** pressure (higher than atmospheric), upwards into the **P-** zone means vacuum.

Some abnormal display patterns are shown above, centre and right. The nature of the waveform anomaly reveals the nature of the engine sealing defect because various different defects give rise to different patterns of waveform anomaly. The most common anomalous wave-forms are shown on the next page.

EXAMPLE 1:

EXHAUST VALVE NOT CLOSING

When one of the exhaust valves is not closing completely, a part of the exhaust gas will be “sucked back” into the combustion chamber during the intake stroke. This is evident from the “**DYN**” mode LED column displayed for that cylinder, whose highest point (crest of the vacuum wave-form) will be lower than on the other (normal) channels.

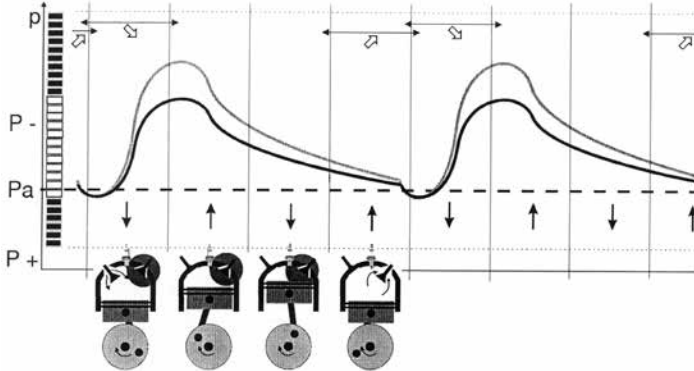
FALSE AIR INTAKE

‘False air’ is air which is sucked into the cylinder after the throttle valve. For example in case of a leak in the intake manifold. The display in **DYN** mode looks very similar to that of a leaking exhaust valve. The highest point of the LED column displayed for that cylinder will also be lower than on the other channels.

A typical anomalous wave-form for these defects is illustrated on the next page.

EXAMPLE 1: LEAK THROUGH EXHAUST VALVE OR INTAKE MANIFOLD

The normal wave-form is shown in paler tone for comparison with the darker abnormal wave-form.



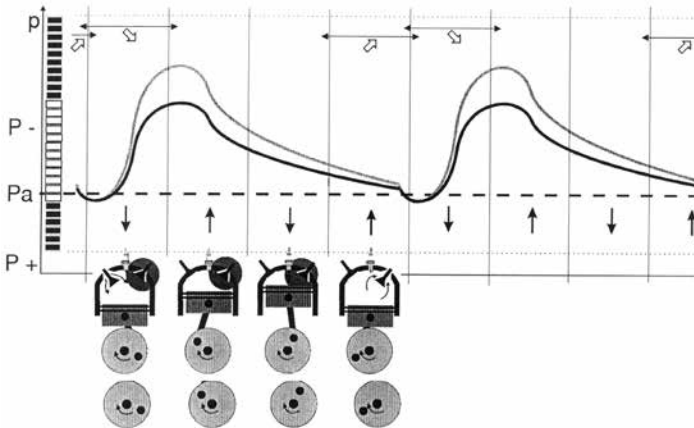
EXAMPLE 2 :

INTAKE VALVE NOT CLOSING

If one of the intake valves is not closing completely, it means that the combustion chamber is continuously connected with the intake system. During the combustion cycle, a high pressure wave will 'blow back' to the carburettor creating positive pressure in the intake manifold. The trough of the vacuum wave-form (the low point of the displayed dynamic band of that cylinder), will move under the P_a line towards the $P+$ side, reflecting this positive pressure.

EXAMPLE 2: LEAKING INTAKE VALVE

The normal wave-form is shown in paler tone for comparison with the darker abnormal wave-form.



9. SERVICE

Accidental immersion

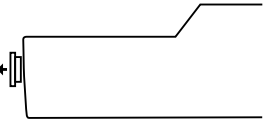
In case of accidental immersion in water retrieve the VacuumMate immediately and disconnect from any electrical input. Dry off the **VacuumMate** and blow out the DC power inlet using a hair dryer. Carefully remove the soft rubber sealing plug covering the calibration trimmers at the lower end of the **VacuumMate** and blow out the calibration cavity with a hair dryer.

If there is evidence of water inside the unit, shake out as much water as possible through the calibration aperture, then dry -

thoroughly using a hair dryer, then place against a vertical surface with calibration cover at the top and allow to dry out completely. Replace the calibration cover only when you are sure all humidity has been removed, taking care that it is well seated as this is essential to minimise damage in case of a future accidental immersion. **Entry of water, especially salt water, will cause damage unless completely and immediately removed. Connect again to electrical power only once you are absolutely sure there is no water inside the unit or in or around the DC power inlet.**

In case of malfunction following immersion please return to your distributor for checking and repair.

Damage to plug
may impair water
resistance



Calibration

This instrument has been carefully checked and calibrated at the factory, and in normal use calibrates itself automatically against day to day changes in barometric pressure. However, after a time, gradual "drift" of the pressure sensor calibrations, together with the accumulated effects of handling knocks, wear and tear and severe temperature changes, will require correction of the calibration.

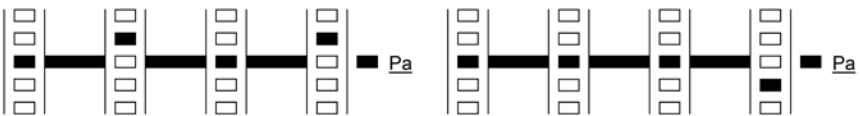
WHEN TO CALIBRATE?

Connect the instrument to power and allow it to warm up for at least 5 minutes. Then check the position of the 4 LEDs in **DYN** mode with the rubber hoses open to the air (i.e. not connected to the engine). All the LEDs should be aligned with the **Pa** line for perfect calibration. However, if the LEDs are within one graduation up or down from the **Pa** line and within one graduation of each other, calibration is not essential. Otherwise, calibration is necessary. Proceed as follows below.

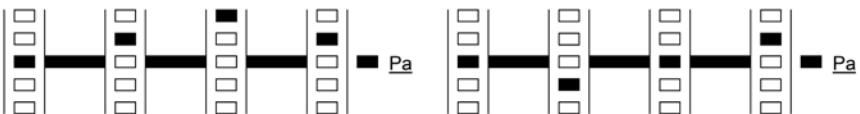
Perfect calibration : do not recalibrate



Examples of display when calibration is not essential



Examples of display when calibration is necessary



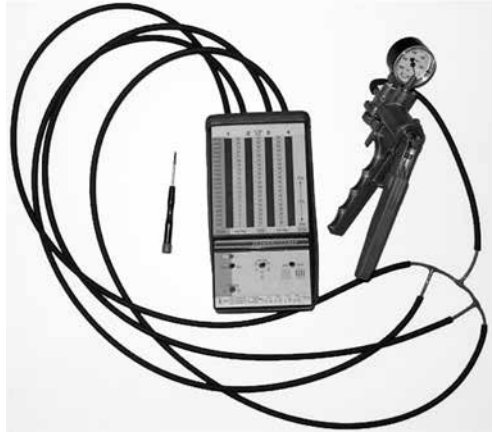
HOW TO CALIBRATE - PREPARATION

The following equipment is required to successfully recalibrate the **VacuumMate**:

A hand operated vacuum pump with a built in dial calibrated in kPa, mBar or cm Hg (e.g. MityVac # 4000), or a hand operated vacuum pump with external in-line vacuum gauge of equivalent accuracy.

A one into four divider which allows all four channels of the VacuumMate to be connected to the hand operated vacuum pump.

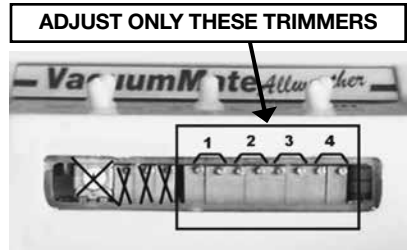
A FLAT instrument screw driver with a shaft diameter of 2,2 -3mm. See page 12, ref. "VMCALKIT".



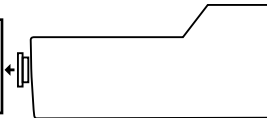
To reach the calibration trimmers, carefully remove the soft rubber sealing plug at the lower end of the **VacuumMate**. You will now see 12 (VMR6ME model) or 11 (VMR6WS model) trimmer-potentiometers.

Adjust **ONLY** the 8 trimmers grouped in 4 pairs on the right. Do **NOT** adjust the other trimmers.

The calibration trimmer positions are marked on the lower edge of the control panel.

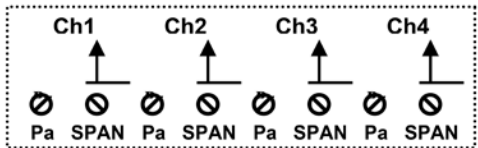


Damage to plug may impair water resistance



HOW TO CALIBRATE - PROCEDURE

Select **"VAC"**, **35-55 cm Hg** and **AVE** with the switches on the control panel. Create a vacuum of 70kPa / 700mBar / 52,5cmHg with the hand operated vacuum pump. Adjust the SPAN trimmers until 52,5cmHg of vacuum is displayed on all 4 channels. Release the vacuum completely by disconnecting at least one tube from the 1 into 4 divider. Select **DYN** with the **AVE/DYN** switch on the **VacuumMate** control panel. Adjust the **Pa** trimmers until all four channels display on the **Pa** pressure line exactly opposite the **Pa** mark.



REPEAT THE WHOLE **PROCEDURE** at least once to recheck your adjustments.

NOTE: In case of calibration or other difficulties, go to www.tecmate.com, click on "VacuumMate" for more details or on "Contact Us" then "Technical Questions" or "Service & Repairs" for further assistance.

Replacement spare parts

Some components may need replacing after some time in case of damage, wear and tear or loss. Do not use the VacuumMate in case of worn or damaged pneumatic connections, hoses or adapters. Never use a damaged or worn battery cord-set, as this may cause anomalous electrical spikes which may badly damage the VacuumMate.

Please quote the article order reference as stated below when re-ordering parts or accessories from your VacuumMate distributor.

ORDER REFERENCE	DESCRIPTION
TS-225	Rubber hose 3ft - Each replacement
TS-233	External battery connection cord-set with clamps.
TA-11	Calibration kit - mini screwdriver & replacement hatch sealing cover.
VMR6MHOLSTER	Rubber holster, yellow, VacuumMate Allweather.
VMR6MBAT	NiMH battery pack for VMR6ME model.
TS-200	Each - Flexi-rigid connection adapter with M5 thread.
TS-201	Each - Flexi-rigid connection adapters with M6 thread.
TS-222	Custom storage nylon bag
TS-202	T-Piece connector
VMR6POSTER	Wall poster "3-in-1".
VMR6MANUAL	User manual

Accessory Items

IMSTAND	StandMate in easily assembled complete kit.
IMSTATANK	Suspendable auxiliary fuel reservoir for use with StandMate.
TS-221	6-Channel adapter - converts from 4 to 6
VM1TO4DIV	One into four divider connection special accessory for calibrating.
TS-205	Permanent "E-Z-fix" connection adapter with 40 cm hose, MS thread.
TS-206	Permanent "E-Z-fix" connection adapter with 40 cm hose. M6 thread.
TS-203	Permanent "E-2-fix" connection adapter without hose, MS thread.
TS-204	Permanent "E-2-fix" connection adapter without hose, M6 thread.

Limited Warranty

VacuumMate is guaranteed against defects in manufacture and component parts for 24 months from date of sale to the user. The manufacturer reserves the right to require presentation of the original invoice or bill of sale to the user as proof of a valid warranty. Failure to observe the instructions contained in this user manual invalidates the warranty. Physical or chemical damage or damage resulting from corrosion or immersion, to cord-sets, hoses, connection adapters, or to the instrument itself, are not covered by this limited warranty. The travel case is excluded from the warranty.

In the event of a claim the owner must return the VacuumMate carriage paid to the distributor after first contacting the distributor to advise him/her. Repairs to or replacement of defective VacuumMates will be effected at the sole discretion of the manufacturer or his duly authorised distributor.

All consequential damages or liabilities arising from or claimed to arise from the use or misuse of the VacuumMate or any accessory are expressly excluded from this limited warranty which is the sole warranty recognised by the manufacturer TecMate North America or his authorised distributors.

Service: www.tecmate.com _____, click on "Contact Us" and go to "Repairs".



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