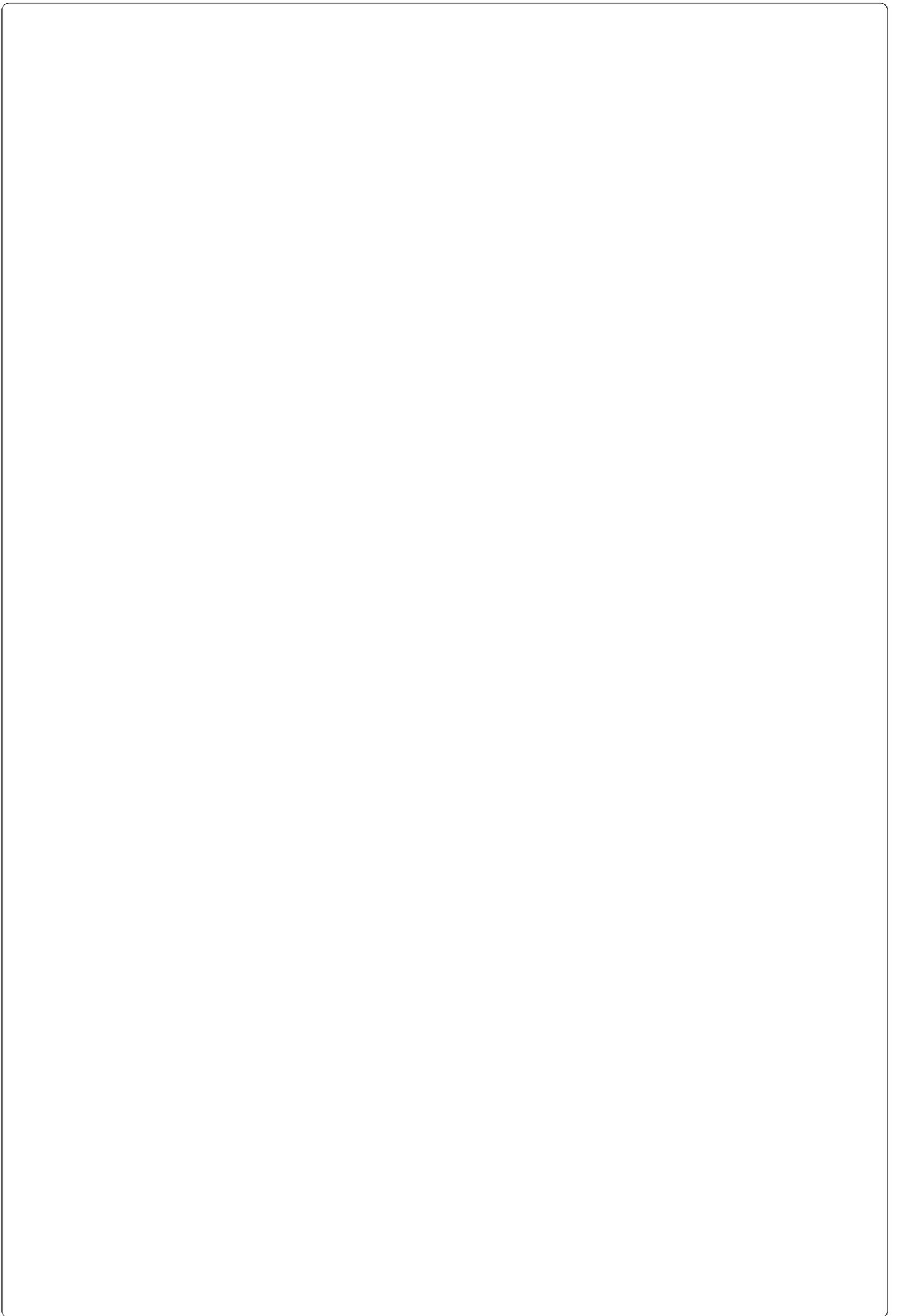


TECHNICAL MANUAL FOR ELECTRONIC SPARK ADVANCE VARIATORS



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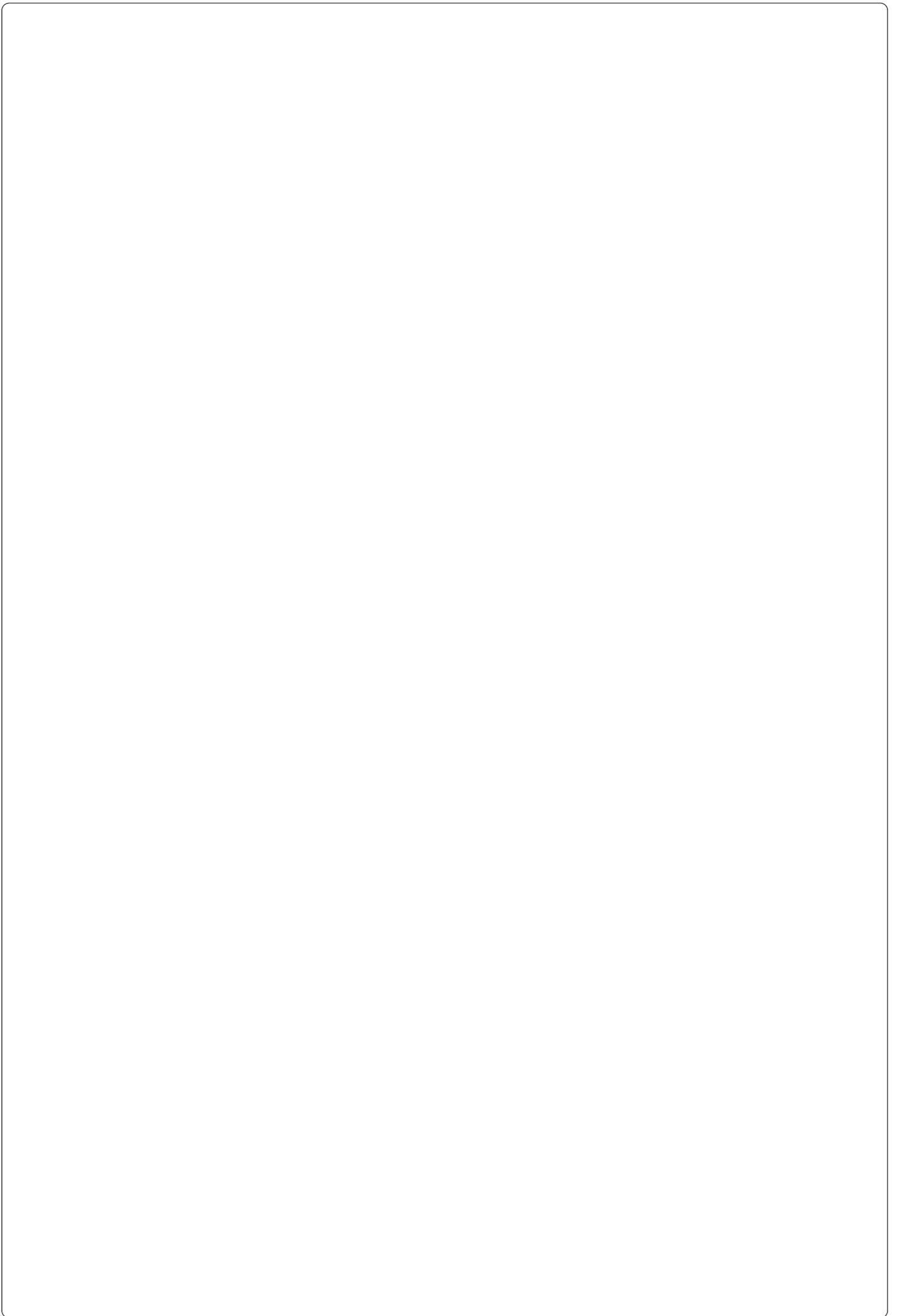
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The A.E.B. Electronic Spark Advance Variator is a device which is capable of modifying the original ignition point, calculated for a correct GASOLINE running of the car, to adapt it to alternative fuels like L.P.G. and C.N.G.. These have a slower combustion time in comparison to GASOLINE, therefore it is necessary for the spark to ignite in advance in comparison to the original point.

The advantages you have with the installation of a Spark Advance Variator are as follows:

- better performance while accelerating;
- lower fuel consumption;
- avoidance of the danger of backfire;
- the spark advance is only modified when the car runs with L.P.G. or C.N.G.; when you come back to GASOLINE, the original value is reset electronically.

The Variator transfers the spark advance management to a MICROPROCESSOR that processes the original curve according to the parameters which are present in the memory and to other parameters that can be modified from outside through micro switches or trimmers to better adapt to different needs.

From outside you can thus select:

- the number of engine cylinders on which the Variator is installed;
- the type of used fuel, C.N.G. or L.P.G.. This is very important because also C.N.G. and L.P.G. have different combustion times one from the other;
- possibility to eliminate the spark advance while decelerating and/or idling (not on any model).

THE SPARK ADVANCE VARIATORS CAN BE SUBDIVIDED INTO TWO MAIN FAMILIES:**1) Spark Advance Variators for High Voltage signals:**

KOALA	Code 512	for RENAULT cars with static ignition and SIEMENS SIRIUS 32 injection (before installing the Variator, see the car list attached to instructions).
WOLF - N	Code 526 - N	for cars with electronic ignition, coil and distributor.
PLATINOS	Code 531	ONLY FOR VEHICLES WITH POINT IGNITION.
SPARK - 2	Code 537	for 4 cylinder cars with multicoil ignition, without distributor.
BIWOLF 548	Code 548	for 4 cylinder cars with multicoil ignition, without distributor.
JOKER - N	Code 549 - N	for cars with electronic ignition, coil and distributor.

These devices anticipate the coil negative signal with voltage peak of approx. 400 V - 500 V.

2) Spark Advance Variators for Low Voltage signals:

M.A.P.	Code 466	for cars with M.A.P. absolute pressure sensor.
PICK - UP	Code 510	for cars with ignition - injection system with C.K.P. sensor and inductive - type revolutions and phonic wheel with 6, 35 or 58 teeth. For the connection of the variator to different sensors you need the suitable connection kits.
MOUSE	Code 511	for cars with ignition - injection system with C.K.P. sensor and Hall - Effect revolutions and phonic wheel with 58 teeth.
BLACK	Code 524	for Volkswagen cars, only new models with electronic ignition, coil and distributor.
DIS - 92	Code 527	for Hall - Effect sensors.
GREEN - MASTER	Code 532	for FORD cars with Motorcraft EDIS static ignition.
GOLD - MASTER	Code 533	for FORD cars with TFI ignition module.
BLUE - MASTER	Code 535	for Hall - Effect sensor, Chrysler cars - old model.
RED - MASTER	Code 536	for G.M. cars with static ignition or HEI, EST, ESC ignition module.
SPARK - MASTER	Code 540	for cars in which the ignition signal comes from the injection central unit and is amplified by a power module that controls the coil.
CAT	Code 547	for HONDA cars with integrated ignition in the distributor.

These devices anticipate the signals coming from sensors or the injection central unit that drive the electronic ignition.

OUT - OF - PRODUCTION

PICK - UP 60		for cars with C.K.P. sensor and inductive - type revolutions and phonic wheel with 58 teeth; Code 522 - 1 for 3 wire sensor, Code 522 - 3 for 90 CV 3 wire sensor, type G.M., Code 522 - 4 for 2 wire sensor.
PICK - UP 36	Code 522 - 2	for cars with C.K.P. sensor and inductive - type 2 WIRE revolutions and phonic wheel with 35 teeth.

TECHNICAL SPECIFICATION

Supply voltage

10 V Min.

14 V Max.

Temperature range conforming with AUTOMOTIVE standards

STANDARD ACCESSORIES

- Wiring for electrical connection

- Emergency connector

- Adhesive warning label to be applied on the car

- Installation and adjusting instructions

- Accessory bag

- Guarantee Certificate to be GIVEN TO THE CUSTOMER

A.E.B. PRODUCTS CONFORM WITH THE FOLLOWING STANDARDS

UL - 94 V - 0

Printed circuits

95 / 54 / CE

R67 / 01 / ECE

R10 / 02 / ECE

Electromagnetic compatibility

DESCRIPTION OF THE USED GRAPHIC SYMBOLS

	<p>How to fix the SPARK ADVANCE VARIATORS:</p> <ul style="list-style-type: none"> - FAR AWAY from possible WATER INLETS. - FAR AWAY from EXCESSIVE HEAT SOURCES (ex. exhaust manifolds). - FAR AWAY from HIGH VOLTAGE CABLES.
	<p>Carry out some good electrical connections by avoiding the use of "POWER REDUCERS". Keep in mind that the best electrical connection is a duly insulated welding.</p>
	<p>Inform the customer that, in case of failure, the Variator is equipped with an EMERGENCY connector that cuts out the Variator and resets the original connection.</p>
	<p>Do not open the Variator box for any reason, mainly with running engine or switched - one control panel in order to avoid high voltage discharges inside. A.E.B. refuses any responsibility for damage to things and persons due to the tampering of the device by unauthorised personnel with the consequent GUARANTEE annulment.</p>
	<p>Apply the adhesive label supplied with the package on the engine compartment in a well - visible position in order to warn this parties on the SPARK ADVANCE VARIATOR presence.</p>

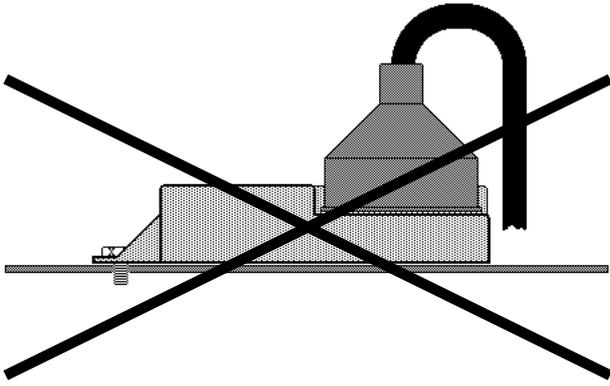
NOTE: before installing any Spark Advance Variator, check that:

- 1) the ignition system (spark plugs, high voltage cables and coil) are in perfect state;
- 2) the Spark Advance is the original one;
- 3) on the instruction manual there is the car diagram on which you are installing it. If it does not appear and you have an oscilloscope, by following the suggestions in this manual you can establish the correct Variator. If you do not gave the necessary tools or have doubts, we suggest you to apply to our Technical Service team for further information, because the Variator you are using could be incorrect (see page 87).

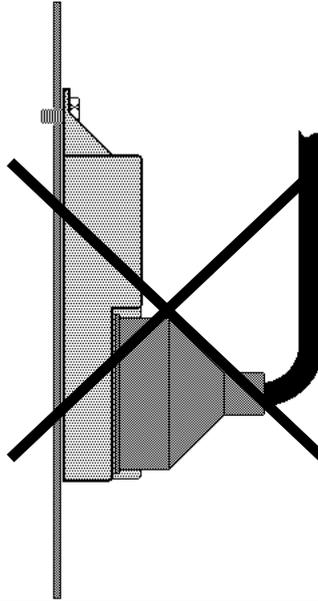
A.E.B. REFUSES ANY RESPONSIBILITY FOR DAMAGE TO THINGS AND PERSONS DUE TO THE INCORRECT INSTALLATION OF DEVICES.

HOW TO FIX THE SPARK ADVANCE VARIATOR

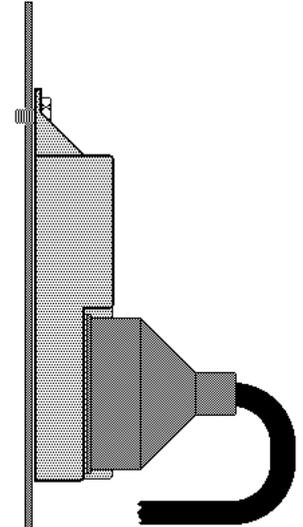
WRONG
INSTALLATION



WRONG
INSTALLATION

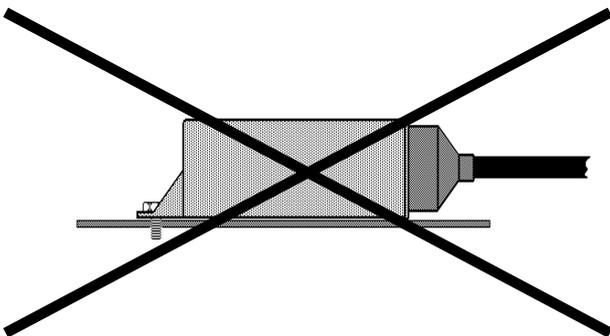


CORRECT
INSTALLATION

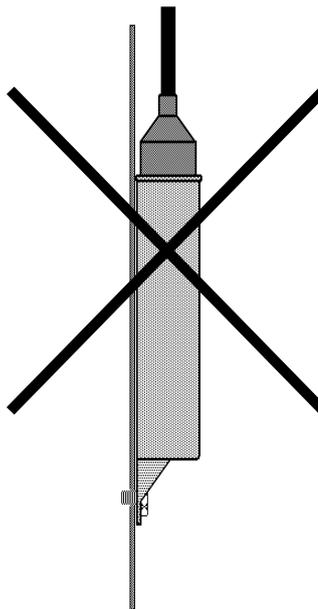


HOW TO FIX THE VARIATOR MODEL PICK - UP

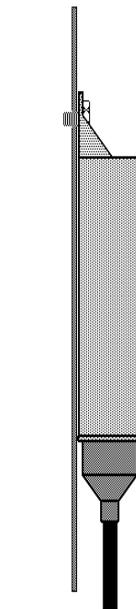
WRONG
INSTALLATION

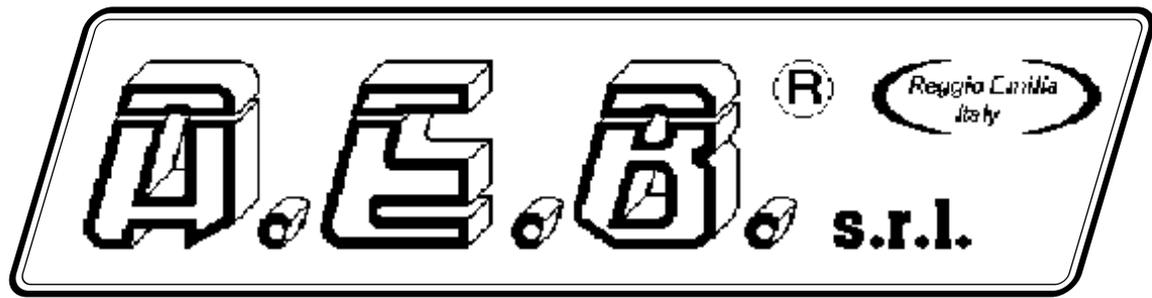


WRONG
INSTALLATION

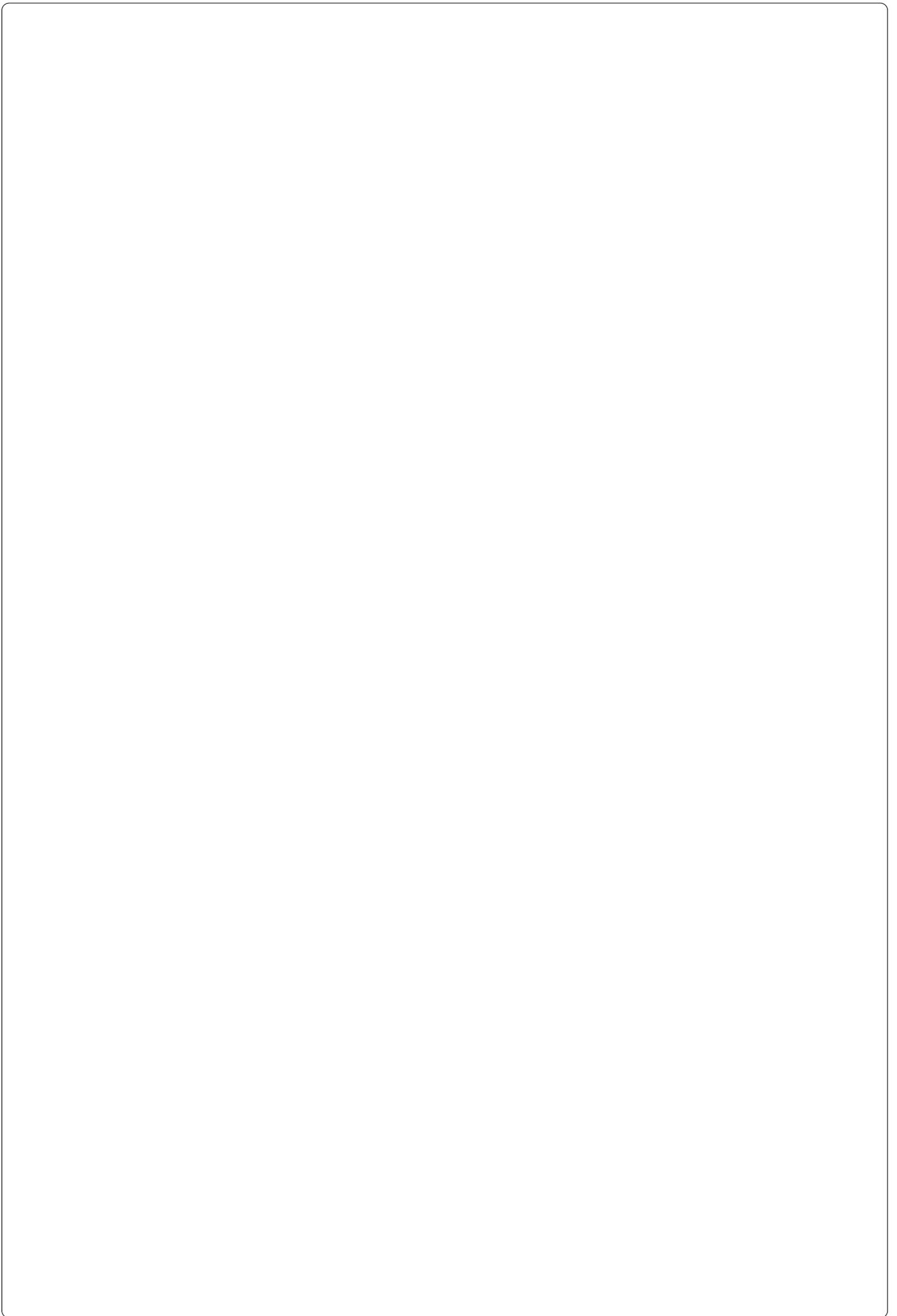


CORRECT
INSTALLATION



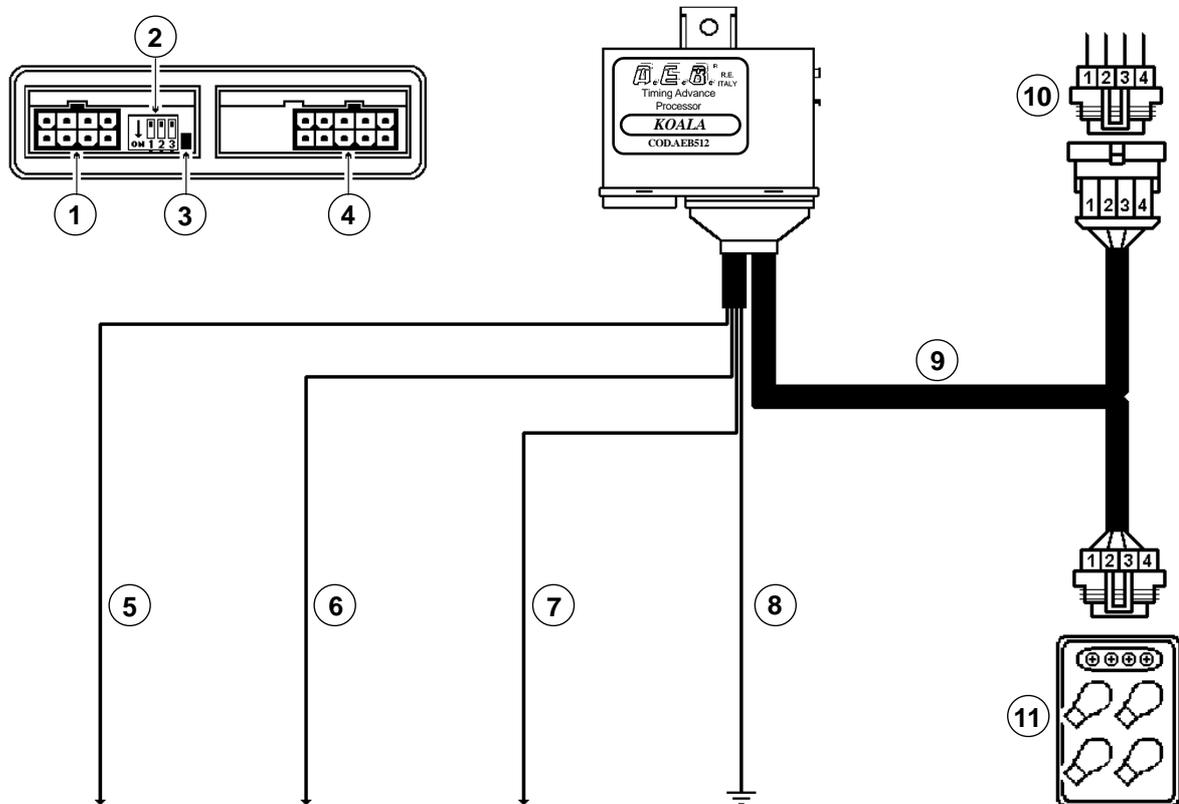


SPARK ADVANCE VARIATORS FOR HIGH VOLTAGE SIGNALS



Electronic Spark Advance Variator KOALA Code 512

Install the variator **KOALA Code 512** on RENAULT cars equipped with static ignition system (before installing the variator, see the car list attached to the instructions).

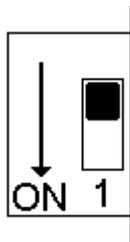


- 1) Connector for programming.
- 2) Micro switches for programming: C.N.G. or L.P.G. running.
- 3) SPARK ADVANCE CONNECTION LED (**led ON, spark advance connected**).
- 4) Connector for connection.
- 5) SKY - BLUE - GREEN WIRE to be connected to the Crankshaft Position Sensor signal.
- 6) BLUE - YELLOW WIRE to be connected to the Throttle Potentiometer (T.P.S.) signal.
- 7) BLUE WIRE to be connected to the BLU GAS outlet wire.
- 8) BLACK WIRE to be connected to GROUND.
- 9) Wiring for the connection of the **Spark Advance Variator** with the ignition Coil Unit (11).
- 10) Original connector of the ignition Coil Unit.

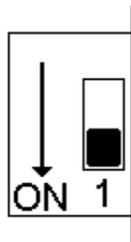
MICRO SWITCH ADJUSTMENT

The Spark Advance Variator has **3** micro switches for the following adjustments:

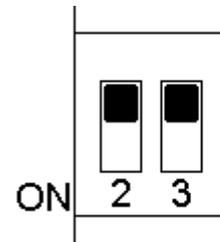
Micro switch **1** makes it possible to adjust the wished spark advance according to the used type of fuel:



for a **C.N.G.**
fed engine



for an **L.P.G.**
fed engine

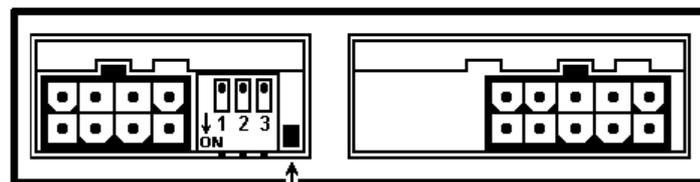


leave set to **OFF**

Micro switches **3** and **4** are not used for the moment, therefore leave them set to OFF.

DESCRIPTION OF THE LED OPERATION

The LED switching - on supplies the following information:



LED ON = SPARK ADVANCE CONNECTED

OFF - Gasoline Running.

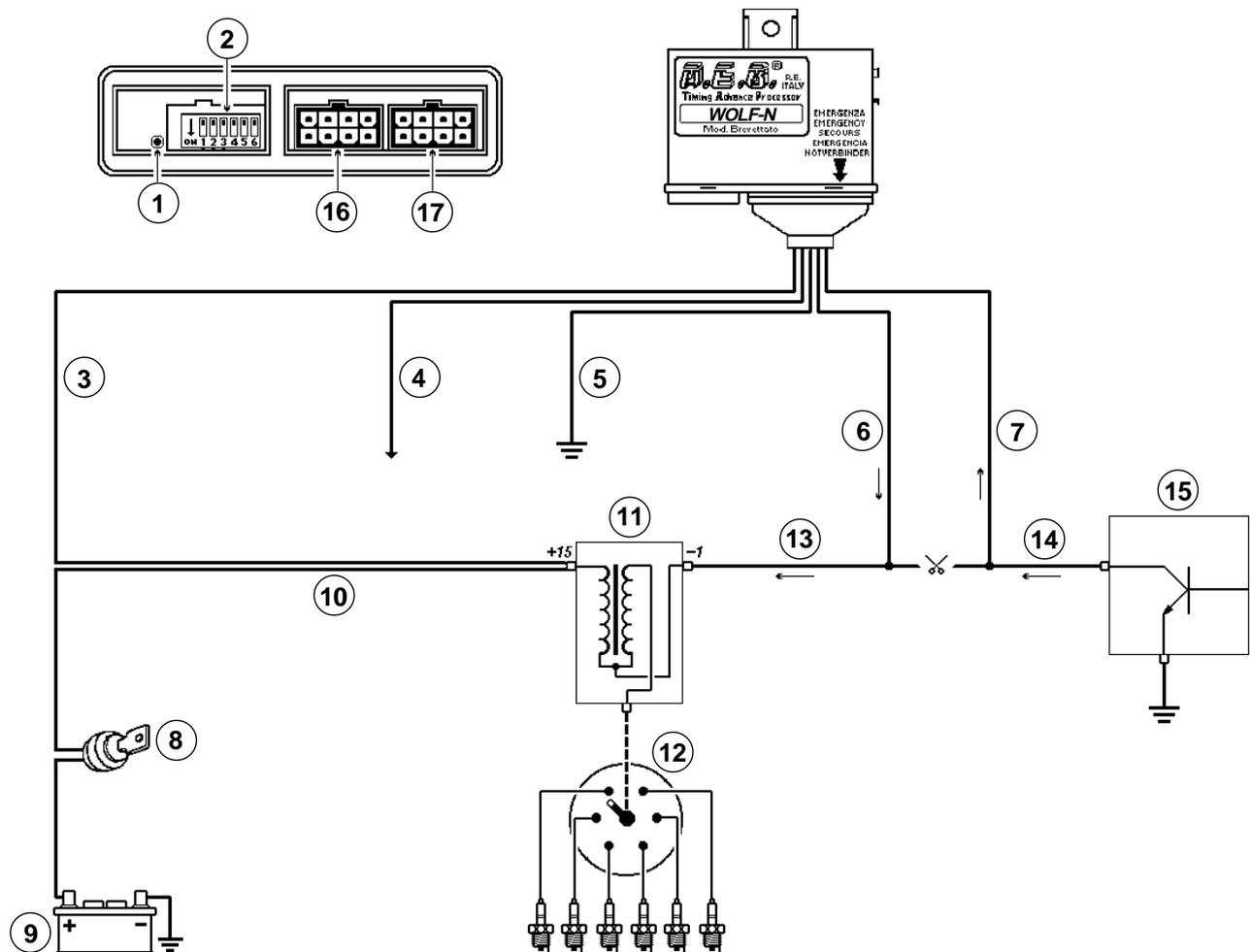
BLINKING - Connection problems (check the connection on the coil).

ON - OK, Variator ON and spark advance connected.

Electronic Spark Advance Variator WOLF - N
Code 526 - N

Install the **Wolf - N Code 526 - N** variator on cars with ignition system made up of: coil, electronic ignition and distributor where the ignition module controls and adjusts the loading current of the coil.

Beyond anticipating the ignition signal, the **Wolf - N** variator also takes care of adjusting the current on the coil, by acting as a downright electronic ignition.



1) SPARK ADVANCE CONNECTION LED (led ON, spark advance connected).

2) Micro switches for adjusting: quantity of cylinders, spark advance degrees and spark advance cut - off when idling or decelerating.

3) RED WIRE to be connected to the + 12 V under key (+ 15) of the ignition coil (**11**).

Contact (+ 15) of coil (**11**) is connected by means of wire (**10**) to the ignition key (**8**) and from this latter to the positive side of the battery (**9**) in order to have power supply only with instrument panel switched on.

4) BLUE WIRE to be connected to the BLU GAS outlet wire.

5) YELLOW - GREEN WIRE to be connected to GROUND.

6) BROWN WIRE (Variator output signal) to be connected to the negative wire (**13**) of the coil (**11**).

7) BLACK WIRE (Variator input signal) to be connected to the wire (**14**) coming out from the ignition module (**15**).

11) Ignition coil connected to the distributor (**12**) by means of the high voltage wire.

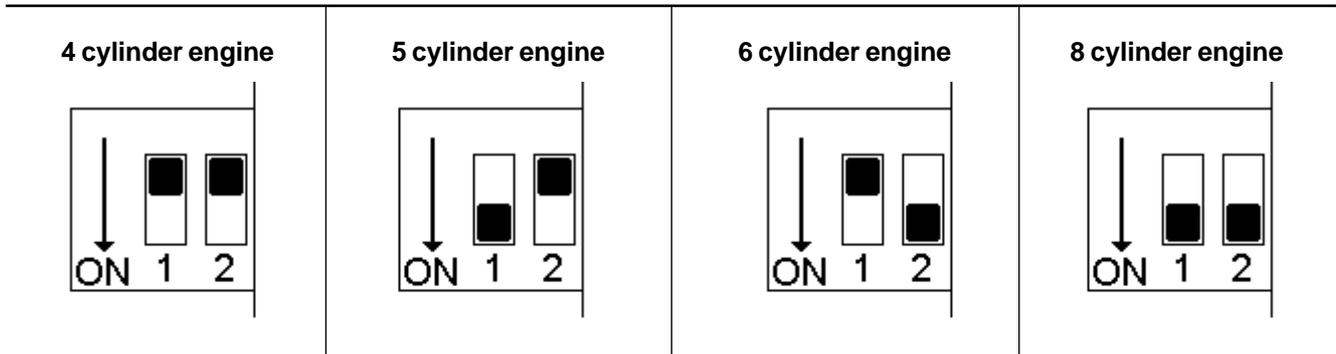
16) Main connector (white colour).

17) Emergency connector (red colour).

SPARK ADVANCE ADJUSTMENT

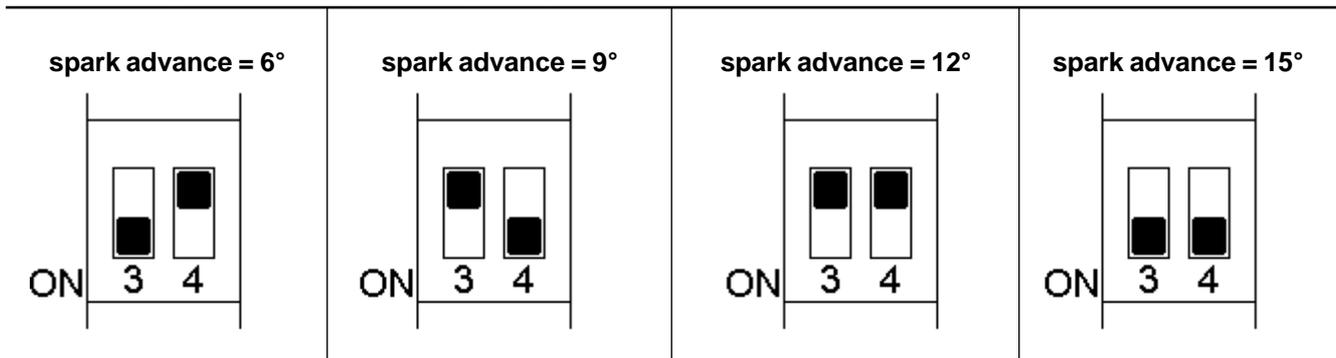
The Spark Advance Variator has 6 micro switches for the following adjustments:

Micro switches 1 and 2 make it possible to adjust the number of cylinders of the engine on which the variator must be installed:

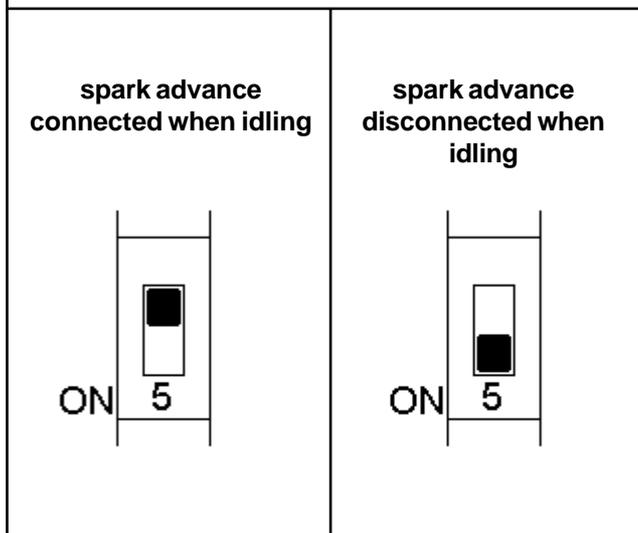


Micro switches 3 and 4 make it possible to adjust the wished spark advance according to the used type of fuel or to the engine features

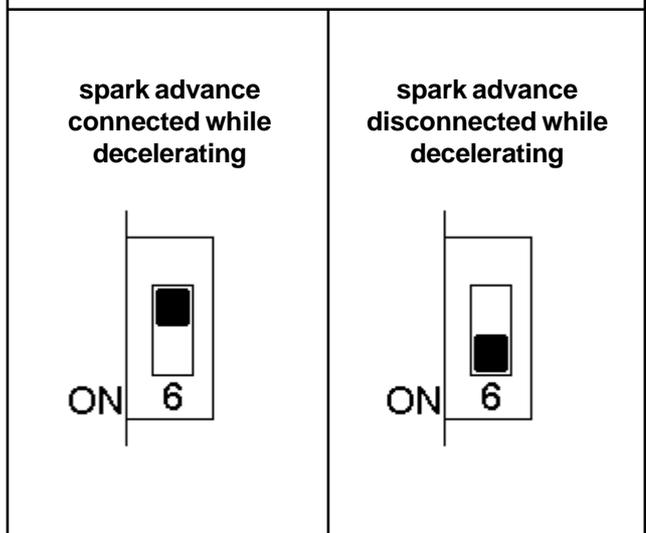
Note: for a C.N.G. fed car, normally the recommended spark advance is of 12° (15° if the car is particularly slow), while for an L.P.G. car the recommended spark advance is of 6° (9° if the car is particularly slow): for non - catalysed cars it is of 9° (12° if the car is particularly slow).



Micro switch 5 allows to disconnect the spark advance under 1100 rpm; this adjustment is useful for those engine that, if advanced when idling, operate irregularly or switch off.

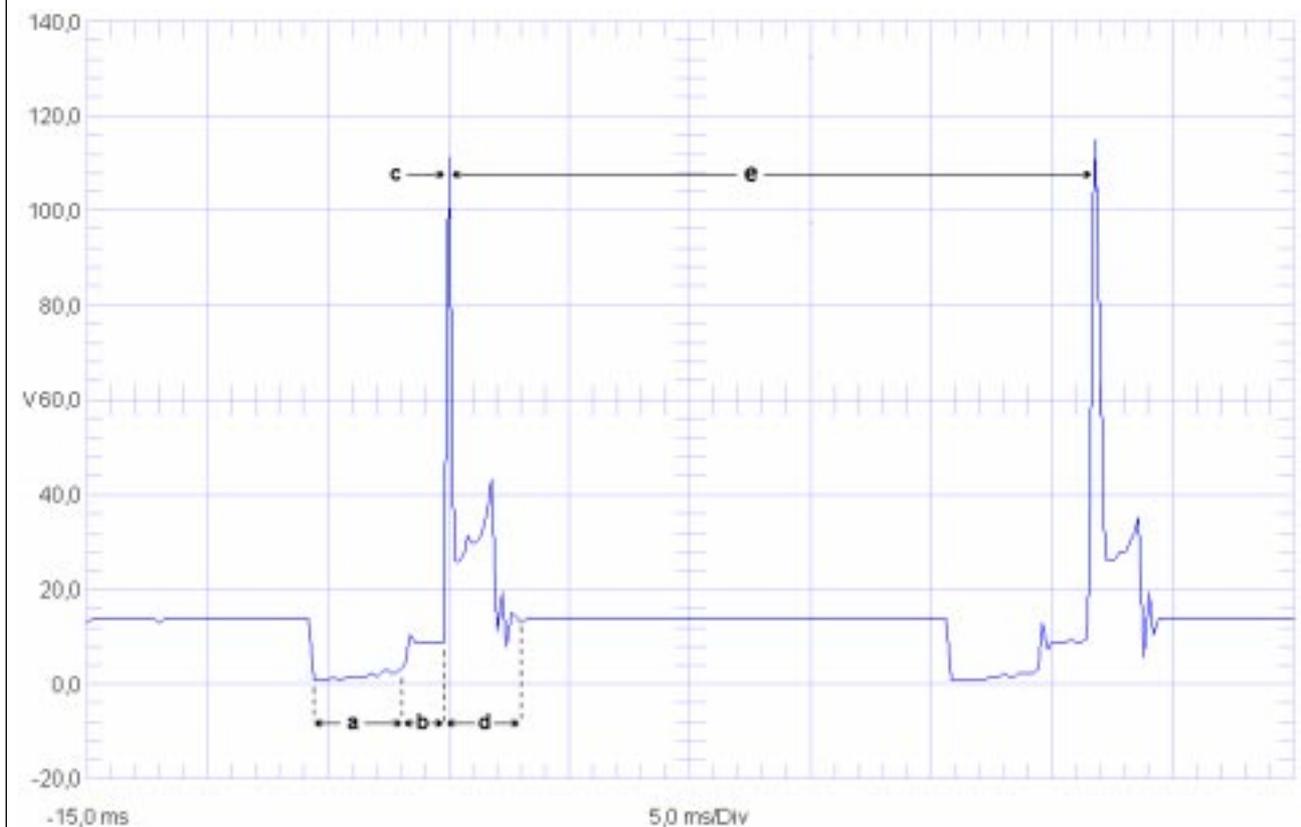


Micro switch 6 allows to disconnect the spark advance when decelerating in the revolution range included between 2100 rpm and 1100 rpm; this adjustment is useful for those engines that during the slowing - down phase show jumps or jerks.



**Electronic Spark Advance Variator WOLF - N
Code 526 - N**

Before installing the variator, by means of an oscilloscope you can measure on the coil negative side the following wave form.



Measurement with engine at approx. 1.000 rpm

a = Loading time (time in which the ignition module circulates the current to load the coil).

b = Limitation (time in which the ignition module circulates a maintenance current to avoid a coil overheating, because the necessary current for a good ignition has already been reached but the spark must not still ignite).

NOTE: the maintenance current that can be considered also as an energy reserve is calculated at any moment by the ignition module, therefore the time - **b** - can change according to the number of revolution or the type of ignition.

c = Spark.

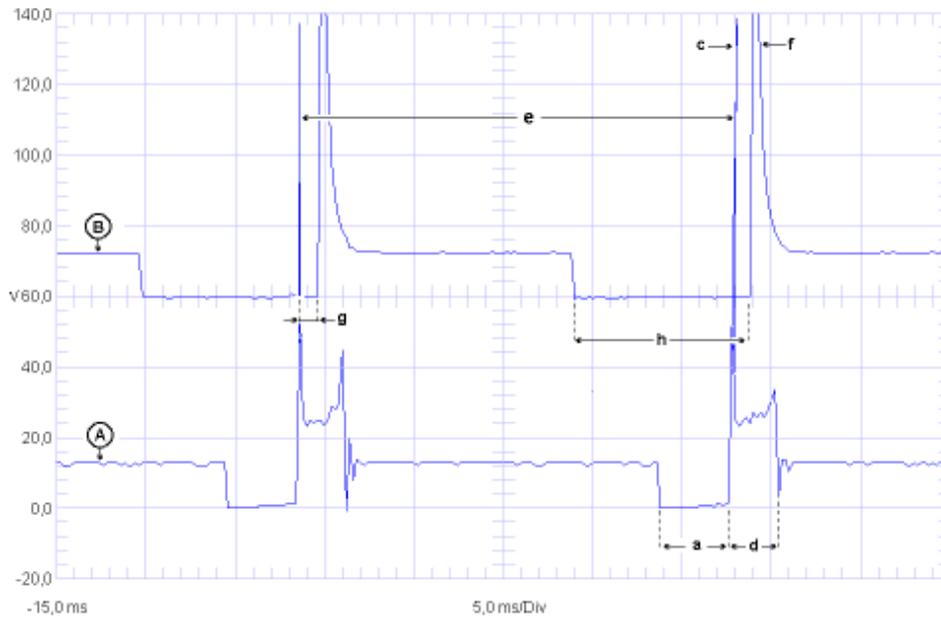
d = Unloading time of the energy stored by the coil on the spark electrodes (spark duration).

e = Period between a spark and the other (180° of revolution of the engine shaft).

Below is a list of the most common ignition module on which "Wolf - N" works correctly:

- Bosch, any model
- Magneti Marelli Digiplex
- Magneti Marelli Digiplex 2
- Magneti Marelli Microplex
- Magneti Marelli BKL 3
- Renix, any model

After the installation of the variator, with the oscilloscope and two traces you can display what follows.



CORRECT OPERATION

Measurement with engine at approx. 1.000 rpm

Trace A = Signal measured on the brown wire of the variator (6) (coil negative side 11).

Trace B = Signal measured on the black wire of the variator (7) (ignition module side 15).

a = Time in which Wolf - N circulates the current to load the coil.

The Wolf - N variator supplies a limitation current only when accelerating, therefore in this case time **b** is equal to zero and is not visualised.

c = Spark.

d = Unloading time of the energy stored by the coil on the spark electrodes (spark duration).

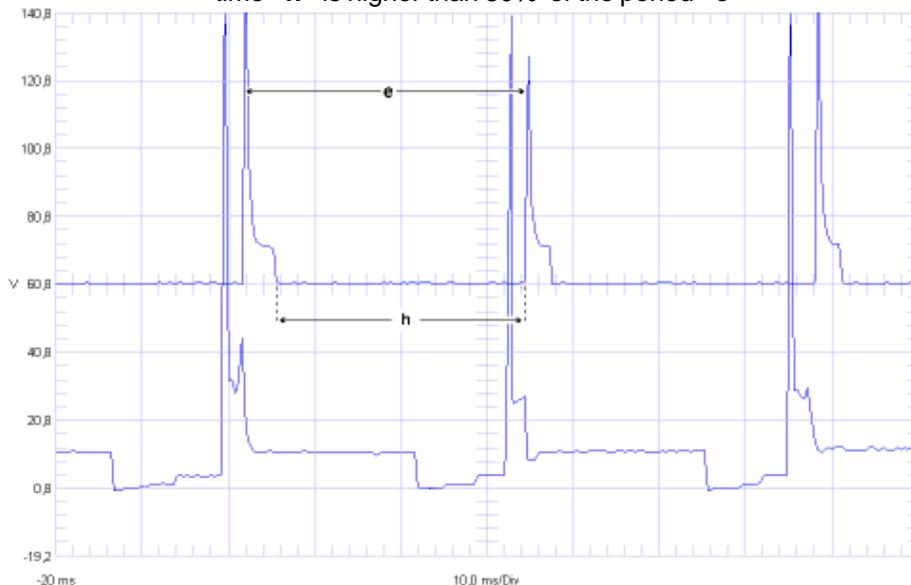
e = Period between a spark and the other (180° of revolution of the engine shaft).

f = Voltage peak generated by Wolf - N to operate a possible revolution counter connected along the wire going from the ignition module to the coil.

g = Ignition spark advance given by the variator.

h = Loading time that the ignition module gives on the input of Wolf - N. Note that the module loading time has increased in comparison to the operation without variator (see previous page); for a good operation of Wolf - N this must not be higher than 80% approx. of the period between a spark and the other - **e** -.

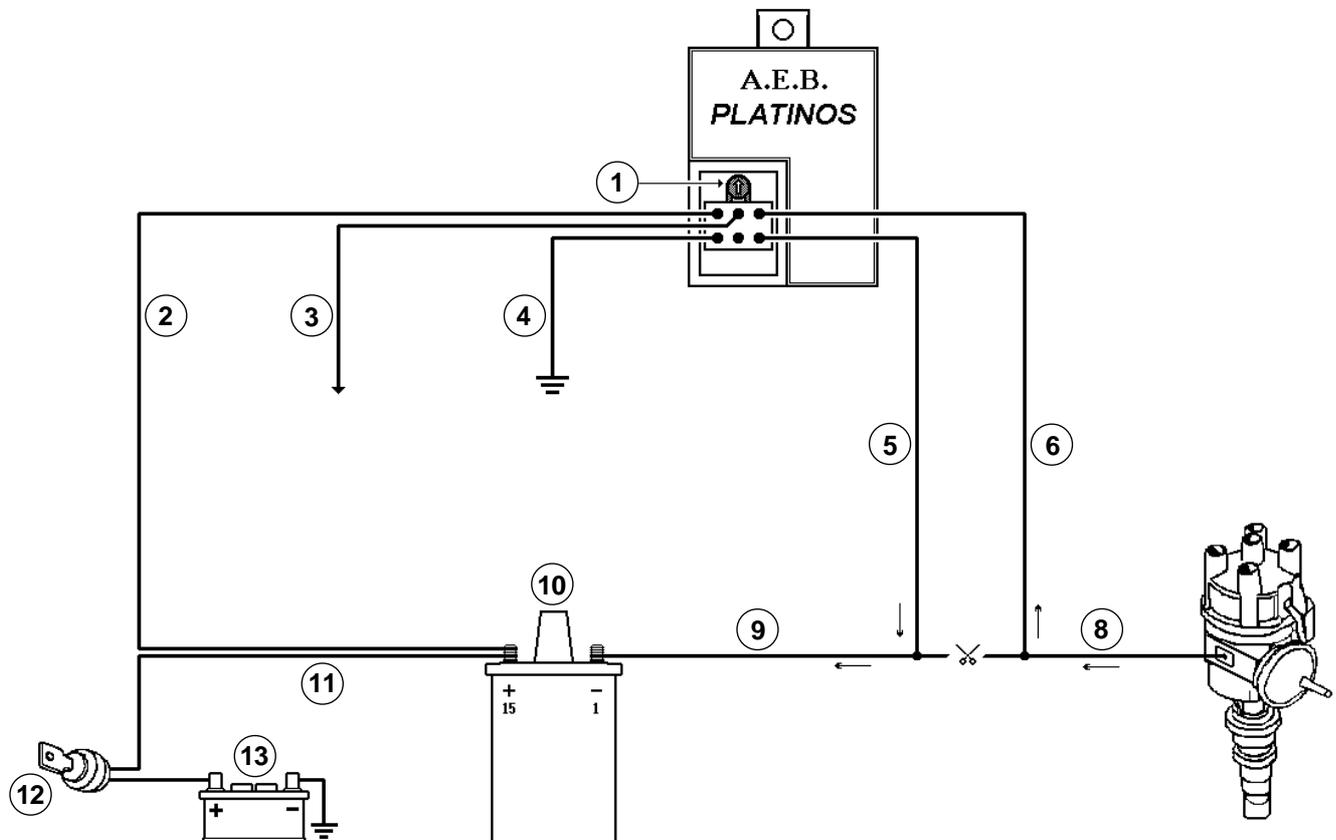
Example of an ignition module that is not compatible with the Wolf - N variator;
time - **h** - is higher than 80% of the period - **e** -



WRONG OPERATION

**Electronic Spark Advance Variator PLATINOS
Code 531**

Install the **Platinos Code 531 - N** variator only on cars with contact (point) ignition system.



1) Fuel delay register.

2) RED WIRE to be connected to the + 12 V under key of the ignition coil (10).

Positive contact of coil (10) is connected by means of wire (11) to the ignition key (12) and from this latter to the positive side of the battery (13) in order to have power supply only with instrument panel switched on.

3) BLUE WIRE to be connected to the BLU GAS outlet wire.

4) YELLOW - GREEN WIRE to be connected to GROUND.

5) BROWN WIRE (**Variator output signal**) to be connected to the negative wire (9) of the coil (10).

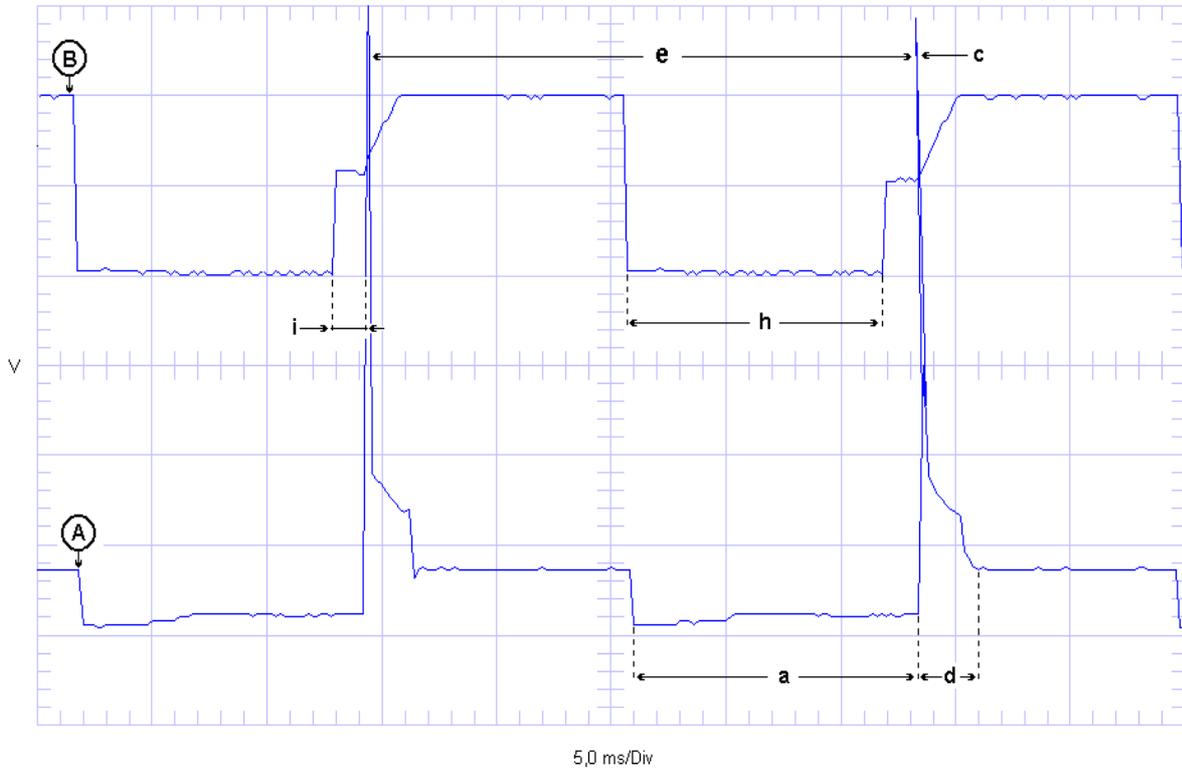
6) BLACK WIRE (**Variator input signal**) to be connected to the wire (8) that is connected to points and comes out from the distributor (7).

7) Distributor with points inside.

10) Ignition coil.

**Electronic Spark Advance Variator PLATINOS
Code 531**

After the installation of the variator, with the oscilloscope and two traces you can display what follows.



Measurement with engine at approx. 1.000 rpm

Trace A (20 V / division) = Signal measured on the brown wire of the variator **5** (coil negative side **10**).

Trace B (5 V / division) = Signal measured on the black wire of the variator **6** (distributor side **7**).

a = Loading time (time in which contacts are closed and circulate the current to load the coil).

c = Spark.

d = Unloading time of the energy stored by the coil on the spark electrodes (spark duration).

e = Period between a spark and the other (180° of revolution of the engine shaft).

f = Loading time that contacts (points) supply to the input of the variator.

i = Ignition delay with gasoline given by the variator.

CAUTION: the PLATINOS Variator DELAYS the GASOLINE spark advance, therefore to adjust it correctly proceed as follows:

- switch on the car with GAS and, by acting on the distributor, adjust the spark advance so as to obtain the maximum performance with GAS;

- shift to GASOLINE and, by acting on the register located next to the Variator connector, bring the spark advance to the original value, by checking it with a stroboscopic gun;

- this adjustment does not modified the one previously made with GAS;

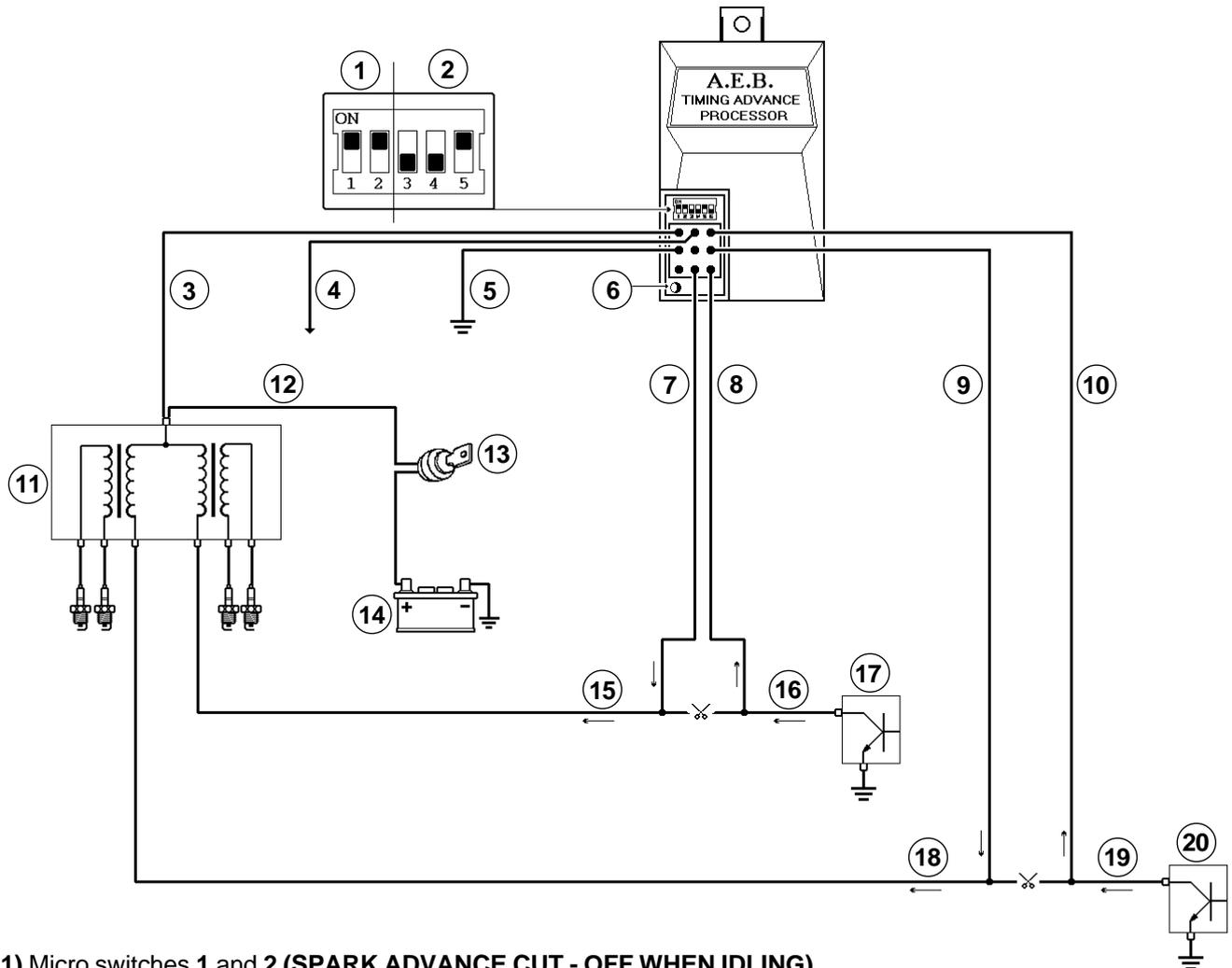
- moreover, we suggest to check the Variator installation before the points are cleaned and with live contacts. Some damaged points could switch off the engine or stroke losses;

- with the Variator the point contact do not wear.

Caution: check that on the coil positive side there is not resistance (BALLAST), otherwise draw the + 12 V under key from another position.

Electronic Spark Advance Variator SPARK - 2 Code 537

Install the variator **Spark - 2 Code 537** on 4 cylinder cars without distributor with double coil (static ignition) where the ignition central unit maintains constant the loading time under any working conditions (acceleration, deceleration, etc.).



1) Micro switches 1 and 2 (SPARK ADVANCE CUT - OFF WHEN IDLING).

2) Micro switches 3, 4, 5 (SPARK ADVANCE DEGREE ADJUSTMENT).

3) RED WIRE to be connected to the + 12 V under key of the ignition coil unit (11). Positive contact of coil unit (11) is connected by means of wire (12) to the ignition key (13) and from this latter to the positive side of the battery (14) in order to have power supply only with instrument panel switched on.

4) BLUE WIRE to be connected to the BLU GAS outlet wire.

5) YELLOW - GREEN WIRE to be connected to GROUND.

6) SPARK ADVANCE CONNECTION LED (led ON, spark advance connected).

7) YELLOW WIRE (Variator output signal 1) to be connected to the negative wire (15) of the coil (11).

8) WHITE WIRE (Variator input signal 1) to be connected to the wire (16) coming out from the ignition module (17).

9) BROWN WIRE (Variator output signal 2) to be connected to the negative wire (18) of the coil (11).

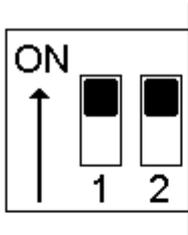
10) BLACK WIRE (Variator input signal 2) to be connected to the wire (19) coming out from the ignition module (20).

11) Ignition coil unit with spark plug cables.

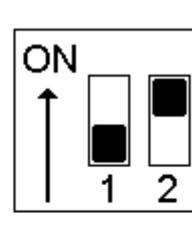
SPARK ADVANCE ADJUSTMENT

This adjustment is useful for those engine that, if advanced when idling, operate irregularly or switch off. To solve this problem by means of micro switches 1 and 2 you have the possibility to cut - off the spark advance when the engine rpm is lowered below 1.100 rpm.

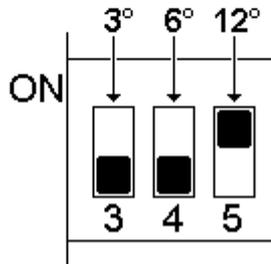
Spark advance always connected



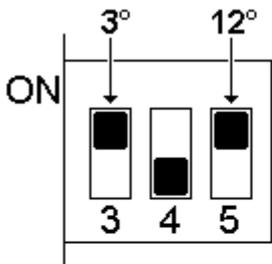
Spark advance disconnected under 1.100 rpm



By means of micro switches 3, 4, 5 you can select the correct spark advance value. To do this it is necessary to set one or more micro switches to "ON".



- Remember that by setting more micro switches to ON at the same time, the spark advance value is summed. - Example:

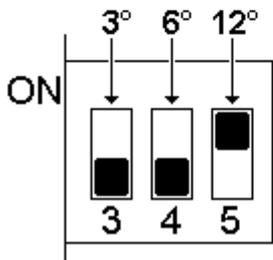


By setting micro switches 3 and 5 to ON, you obtain the following spark advance:

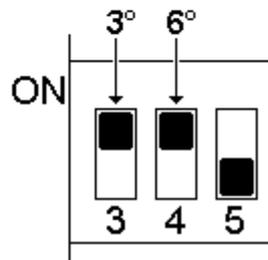
- for a 4 cylinder engine:

3° (of micro switch 3) + 12° (of micro switch 5) **Total 15°** of spark advance

RECOMMENDED SPARK ADVANCE DEGREES FOR TYPE OF FUEL



for a **C.N.G. fed engine** 12° of spark advance

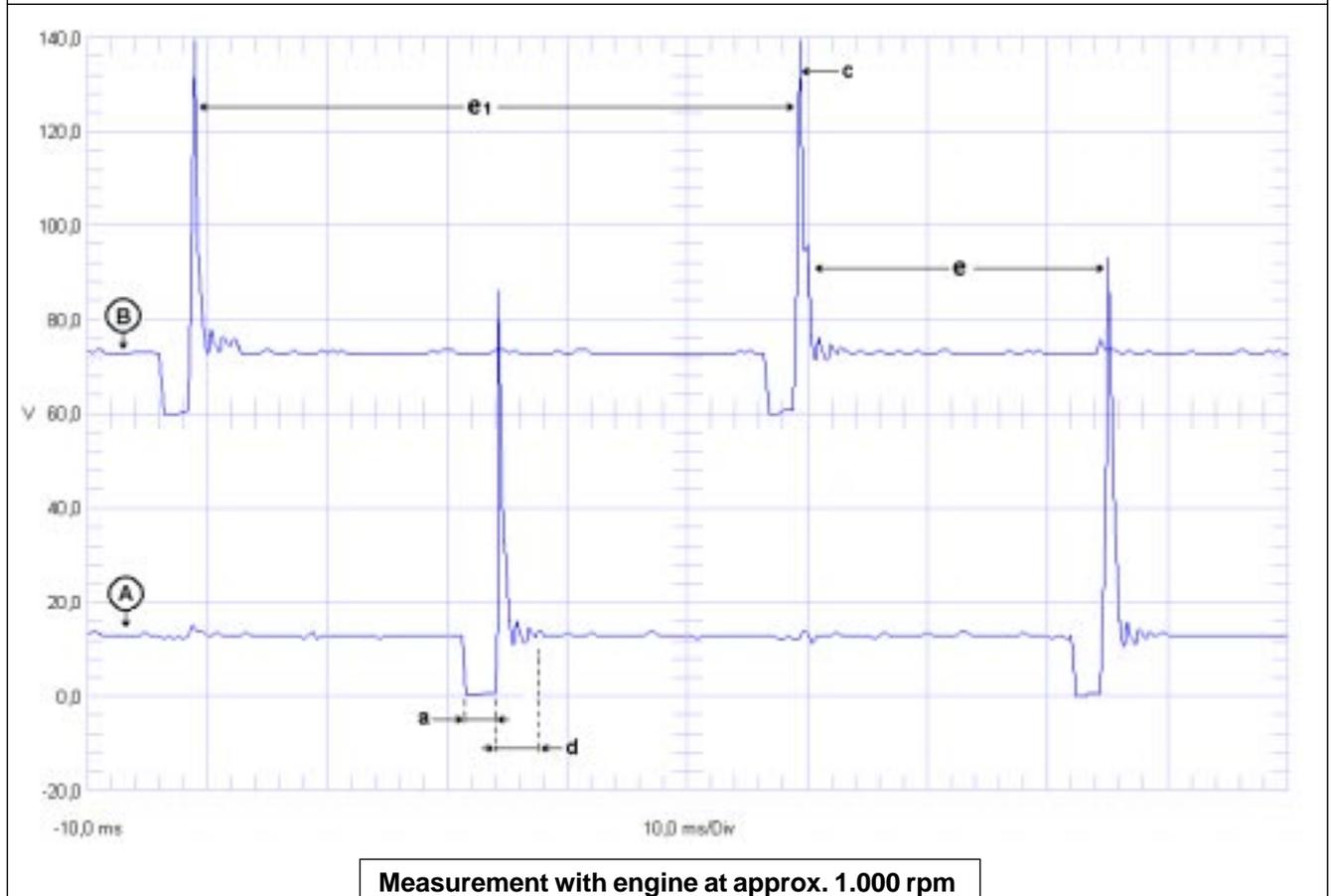


for an **L.P.G. fed engine** 9° of spark advance

The values reported in the table are recommended according to our experience; in any case, you can carry out different adjustments to better adapt the Variator to the different engine features.

**Electronic Spark Advance Variator SPARK - 2
Code 537**

Before installing the variator by means of a double - trace oscilloscope, you can measure the following wave forms on the two coil negative sides.



Trace A = Signal measured on a coil negative side - 15 -.

Trace B = Signal measured on the other coil negative side - 18 -.

a = Loading time (time in which the ignition module circulates the current to load the coil). This is always the same both while accelerating and decelerating.

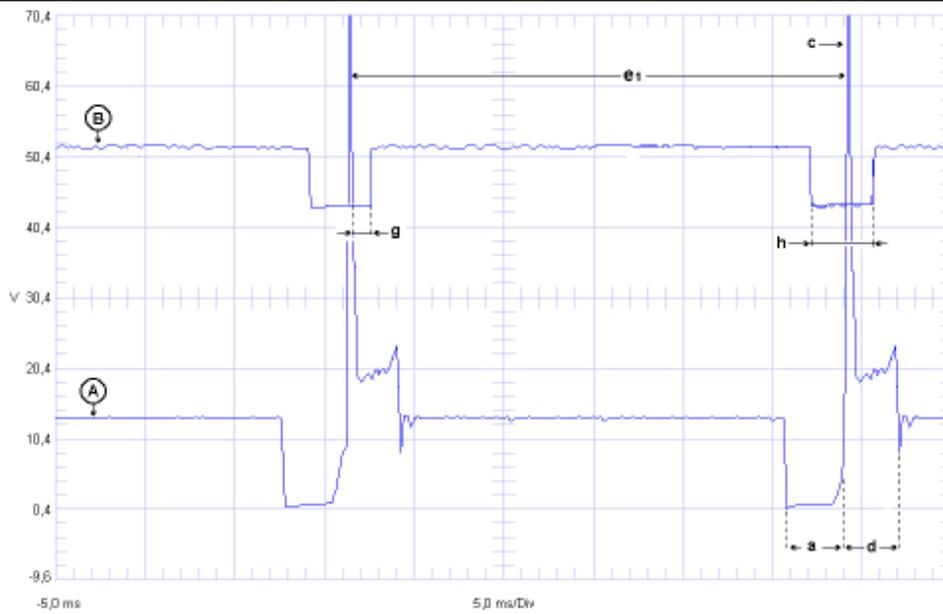
c = Spark.

d = Unloading time of the energy stored by the coil on the spark electrodes (spark duration).

e = Period between the spark of a coil and the spark of the other (180° of revolution of the engine shaft).

e1 = Period between a spark and the other of the same coil (360° of revolution of the engine shaft).

The ones reported on the picture below are the input and output wave forms of a single negative side of the coil, measured after the variator installation.



CORRECT OPERATION

Measurement with engine at approx. 2.000 rpm

Trace A = Signal measured on the brown wire of the variator **9** (coil negative side **11**).

Trace B = Signal measured on the black wire of the variator **10** (ignition module side **20**).

For higher safety, we recommend to carry out the same check also on the other coil negative side, therefore to connect with the oscilloscope in the following way:

Trace A = Signal measured on the yellow wire of the variator **7** (coil negative side **11**).

Trace B = Signal measured on the white wire of the variator **8** (ignition module side **17**).

a = Loading time (time in which the ignition module circulates the current to load the coil).

Note that **a** is equal to **h**, because Spark - 2 circulates the current on the coils for the same time given by the ignition central unit.

c = Spark.

d = Unloading time of the energy stored by the coil on the spark electrodes (spark duration).

e1 = Period between a spark and the other of the same coil (360° of revolution of the engine shaft).

The voltage peak - **f** - is not generated by the variator, because normally the revolution counter is supplied directly by the injection central unit.

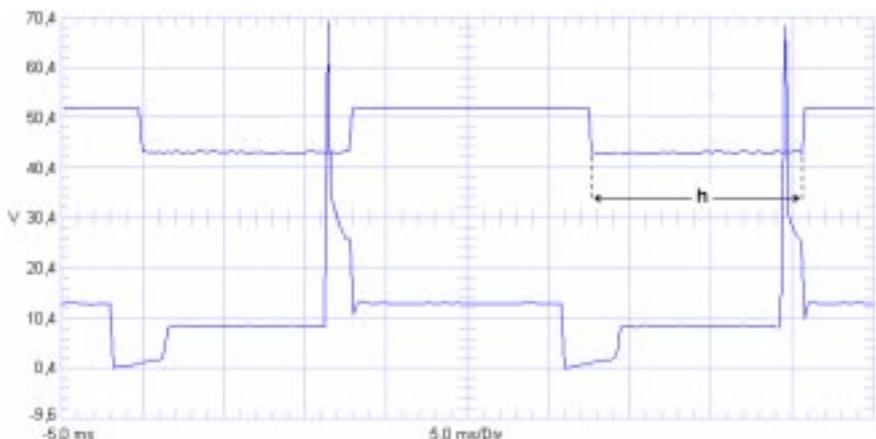
g = Ignition spark advance given by the variator.

h = Loading time that ignition central unit supplies to the input of the variator.

CAUTION: despite the **Spark - 2** variator has a safety device for limiting the current, it circulated the current on the coils for the same time given by the ignition central unit. Therefore, install it only on ignitions that do not increase their loading time - **h** - after the variator installation to avoid any overheating and burning both of the variator and the coil.

IMPORTANT

For higher safety, we recommend to check both coil negative sides.

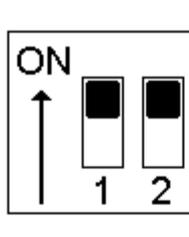


WRONG OPERATION

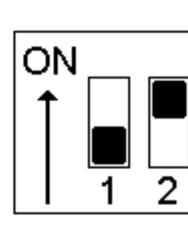
SPARK ADVANCE ADJUSTMENT

This adjustment is useful for those engine that, if advanced when idling, operate irregularly or switch off. To solve this problem by means of micro switches 1 and 2 you have the possibility to cut - off the spark advance when the engine rpm is lowered below 1.100 rpm.

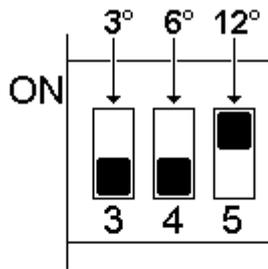
Spark advance always connected



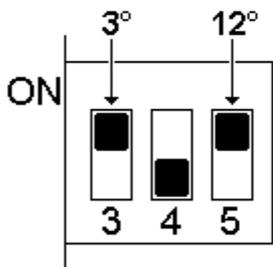
Spark advance disconnected under 1.100 rpm



By means of micro switches 3, 4, 5 you can select the correct spark advance value. To do this it is necessary to set one or more micro switches to "ON".



- Remember that by setting more micro switches to ON at the same time, the spark advance value is summed. - Example:

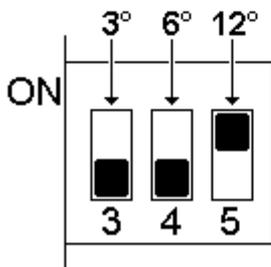


By setting micro switches 3 and 5 to ON, you obtain the following spark advance:

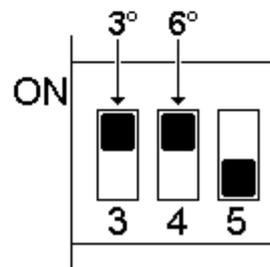
- for a 4 cylinder engine:

3° (of micro switch 3) + 12° (of micro switch 5) **Total 15°** of spark advance

RECOMMENDED SPARK ADVANCE DEGREES FOR TYPE OF FUEL



for a **C.N.G.** fed engine **12°** of spark advance

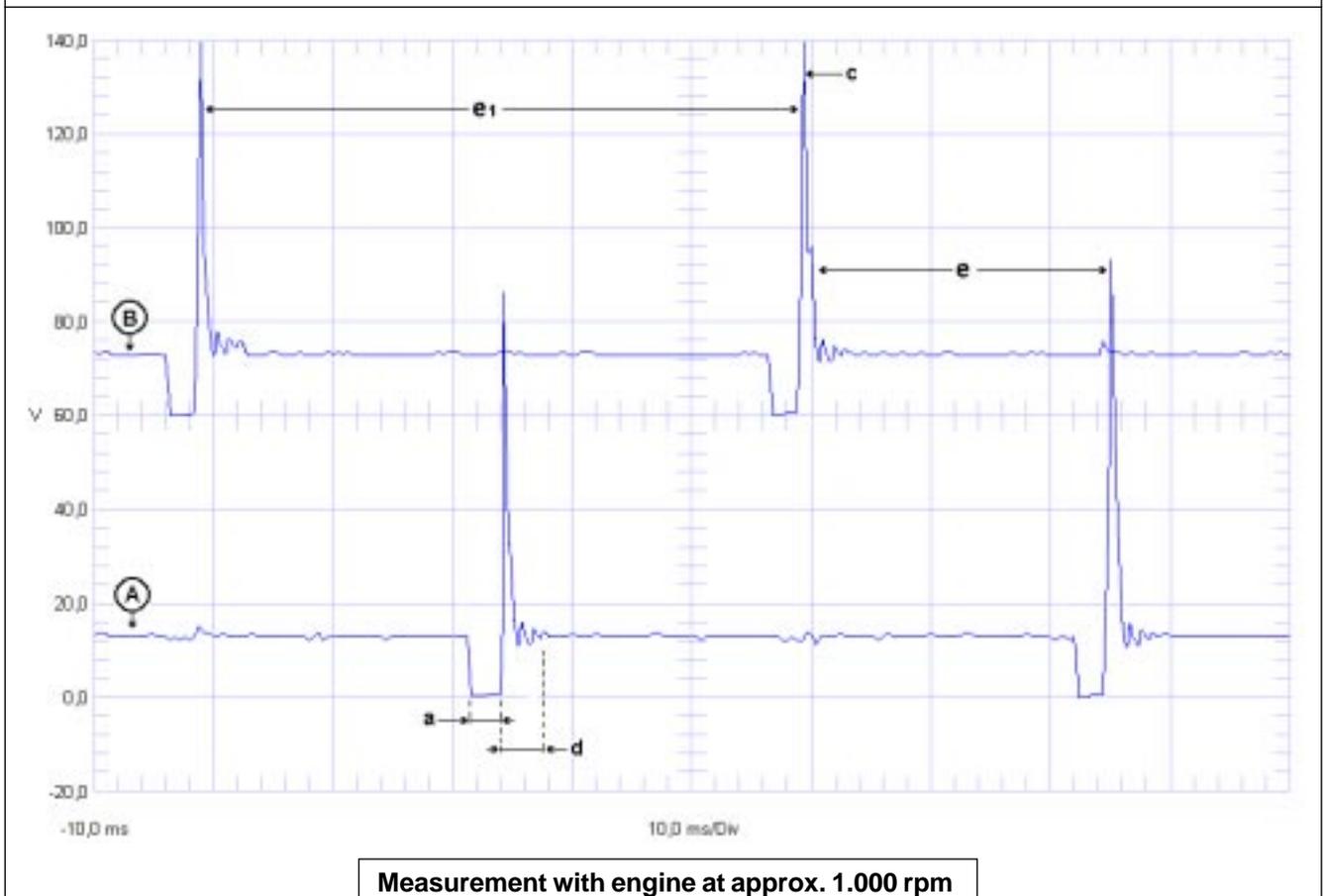


for an **L.P.G.** fed engine **9°** of spark advance

The values reported in the table are recommended according to our experience; in any case, you can carry out different adjustments to better adapt the Variator to the different engine features.

**Electronic Spark Advance Variator BIWOLF
Code 548**

Before installing the variator, by means of an oscilloscope you can measure on the two coil negative sides the following wave forms.



Trace A = Signal measured on a coil negative side - 15 -.

Trace B = Signal measured on the other coil negative side - 18 -.

a = Loading time (time in which the ignition module circulates the current to load the coil).

This is calculated by the ignition central unit according to the engine revolution by taking into account both accelerations and decelerations.

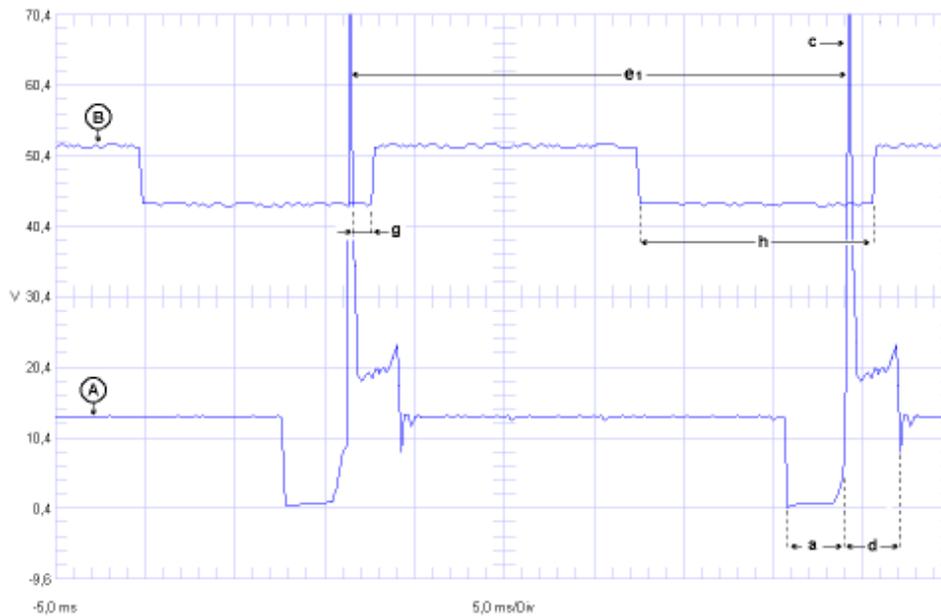
c = Spark.

d = Unloading time of the energy stored by the coil on the spark electrodes (spark duration).

e = Period between the spark of a coil and the spark of the other (180° of revolution of the engine shaft).

e1 = Period between a spark and the other of the same coil (360° of revolution of the engine shaft).

The ones reported in the picture below are the input and output wave forms of one of the two coil negative sides measured after the variator installation.



CORRECT OPERATION

Measurement with engine at approx. 2.000 rpm

Trace A = Signal measured on the brown wire of the variator **9** (coil negative side **11**).

Trace B = Signal measured on the black wire of the variator **10** (ignition module side **20**).

For higher safety, we recommend to carry out the same check also on the other coil negative side, therefore to connect with the oscilloscope in the following way.

Trace A = Signal measured on the yellow wire of the variator **7** (coil negative side **11**).

Trace B = Signal measured on the white wire of the variator **8** (ignition module side **17**).

a = Loading time (time in which the ignition module circulates the current to load the coil).

NOTE: the Biwolf variator supplies a limiting current only while accelerating or at a low number of revolutions (800 rpm approx.), therefore in this case limiting is not displayed.

c = Spark.

d = Unloading time of the energy stored by the coil on the spark electrodes (spark duration).

e1 = Period between a spark and the other of the same coil (360° of revolution of the engine shaft).

The voltage peak **-f** is not generated by the variator, because normally the revolution counter is supplied directly by the injection central unit.

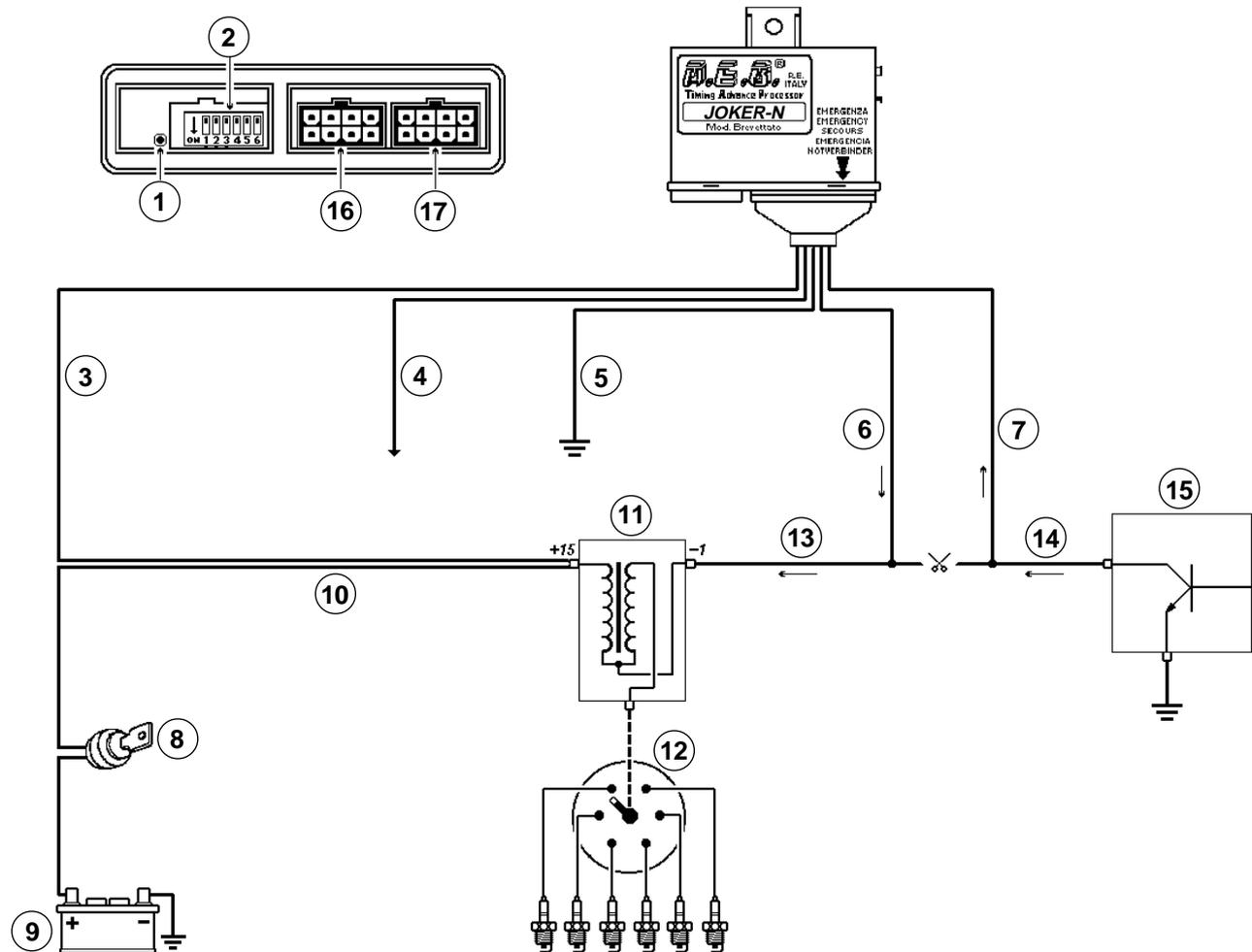
g = Ignition spark advance given by the variator.

h = Loading time that ignition central unit supplies to the input of the variator. Note that the loading time can increase, but not necessarily, according to the operation without variator (see previous page).

Electronic Spark Advance Variator JOKER - N Code 549 - N

Install the **Joker - N Code 549 - N** variator on cars with ignition system made up of: coil, electronic ignition and distributor where the ignition module controls and adjusts the loading current of the coil.

The **Joker - N** variator only advances the ignition signal, by leaving the original ignition module the possibility to adjust the current on the coil.



1) SPARK ADVANCE CONNECTION LED (led ON, spark advance connected).

2) Micro switches for adjusting: quantity of cylinders, spark advance degrees and spark advance cut - off when idling or decelerating.

3) RED WIRE to be connected to the + 12 V under key (+ 15) of the ignition coil (11).

Contact (+ 15) of coil (11) is connected by means of wire (10) to the ignition key (8) and from this latter to the positive side of the battery (9) in order to have power supply only with instrument panel switched on.

4) BLUE WIRE to be connected to the BLU GAS outlet wire.

5) YELLOW - GREEN WIRE to be connected to GROUND.

6) BROWN WIRE (Variator output signal) to be connected to the negative wire (13) of the coil (11).

7) BLACK WIRE (Variator input signal) to be connected to the wire (14) coming out from the ignition module (15).

11) Ignition coil connected to the distributor (12) by means of the high voltage wire.

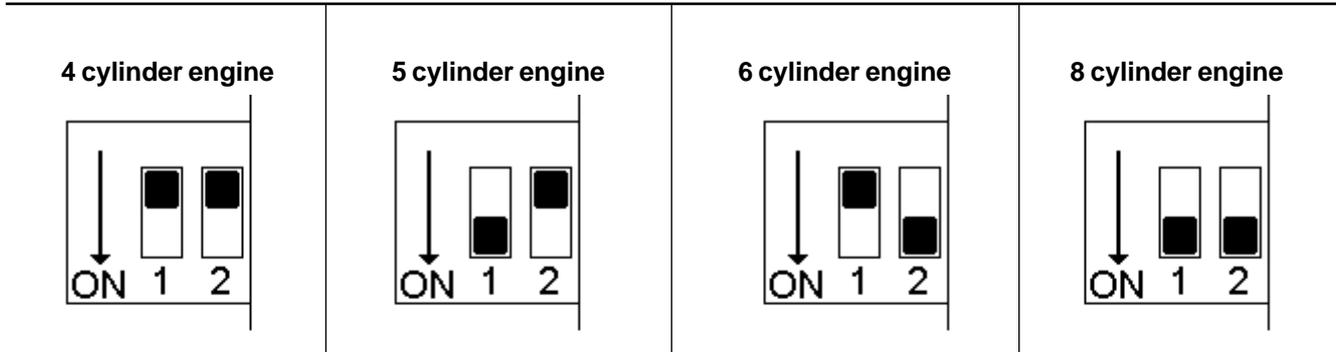
16) Main connector (white colour).

17) Emergency connector (red colour).

SPARK ADVANCE ADJUSTMENT

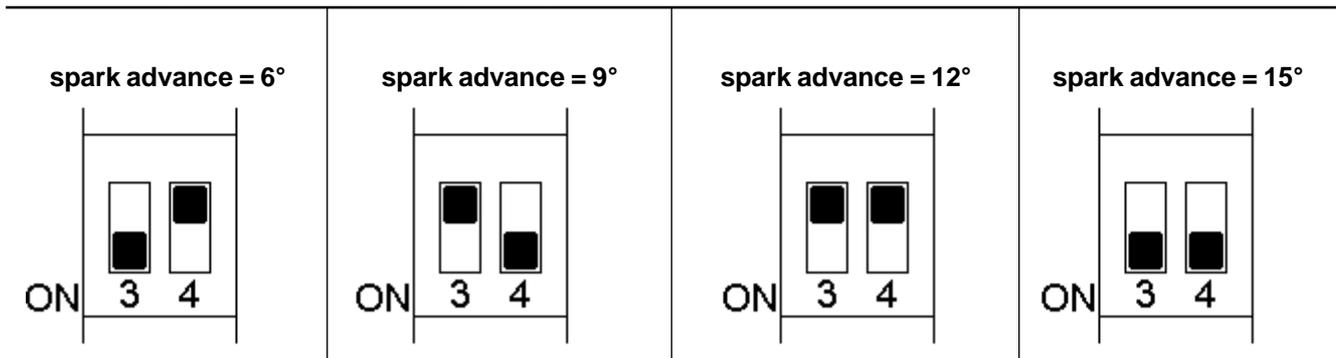
The Spark Advance Variator has 6 micro switches for the following adjustments:

Micro switches 1 and 2 make it possible to adjust the number of cylinders of the engine on which the variator must be installed:



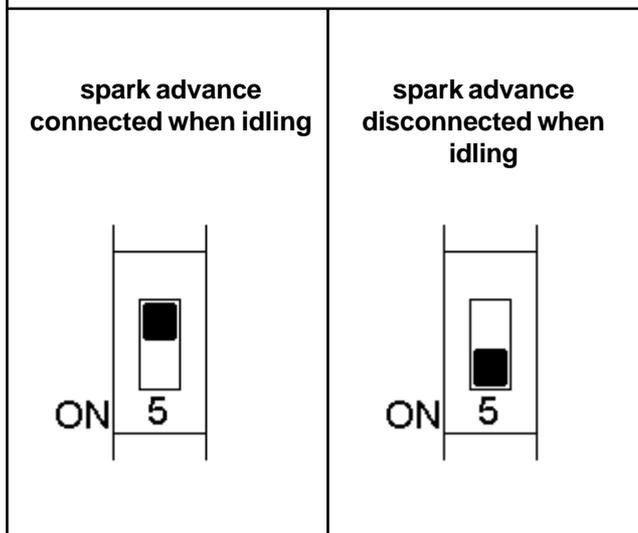
Micro switches 3 and 4 make it possible to adjust the wished spark advance according to the used type of fuel of the engine features.

Note: for a C.N.G. fed car, normally the recommended spark advance is of 12° (15° if the car is particularly slow), while for an L.P.G. car the recommended spark advance is of 6° (9° if the car is particularly slow): for non - catalysed cars it is of 9° (12° if the car is particularly slow).

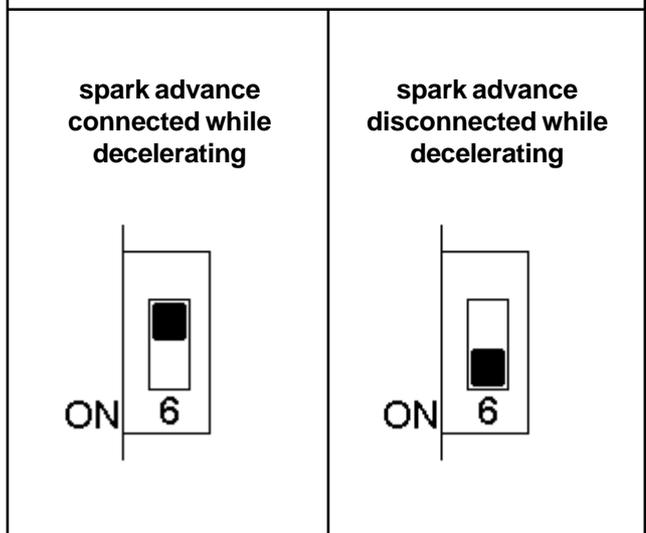


Micro switch 5 allows to disconnect the spark advance under 1100 rpm.

This adjustment is useful for those engine that, if advanced when idling, operate irregularly or switch off.

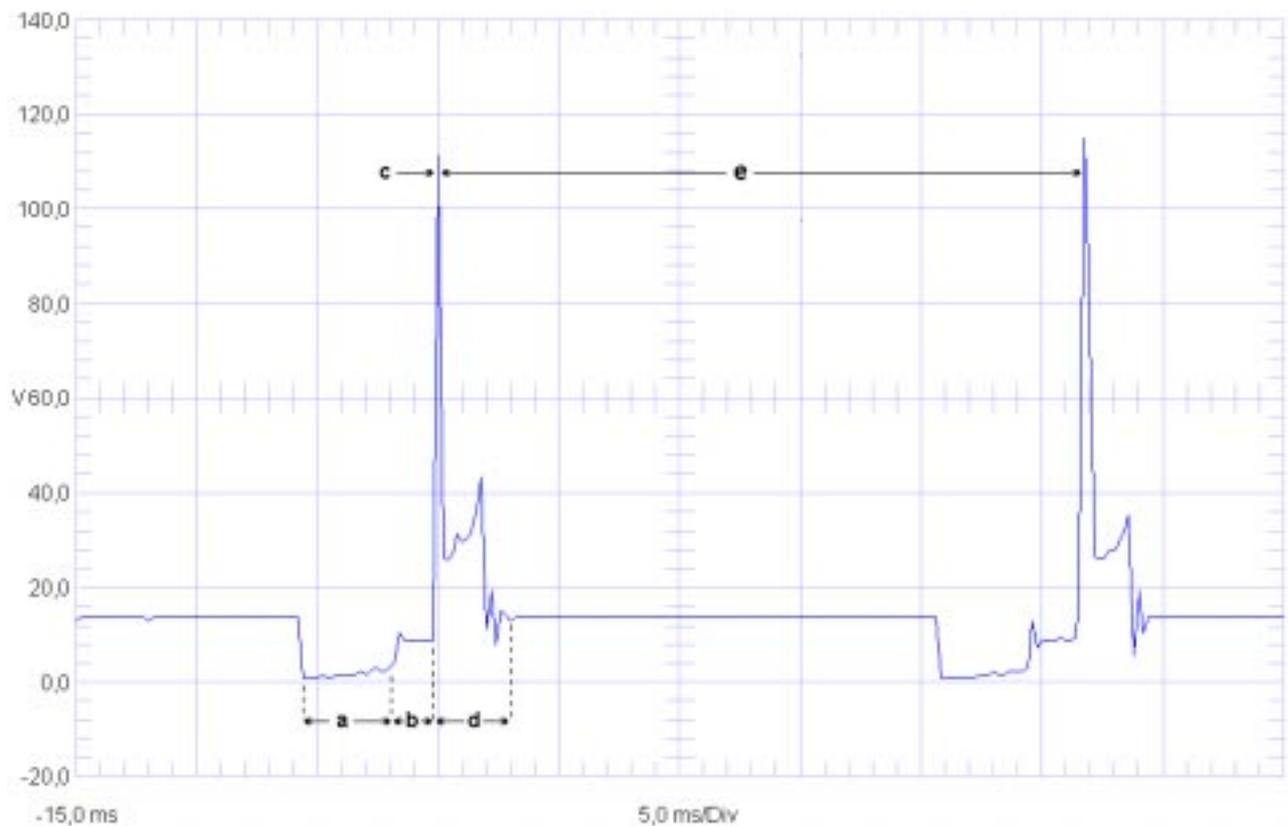


Micro switch 6 allows to disconnect the spark advance when decelerating in the revolution range included between 2100 rpm and 1100 rpm; this adjustment is useful for those engines that during the slowing - down phase show jumps or jerks.



**Electronic Spark Advance Variator JOKER - N
Code 549 - N**

Before installing the variator, by means of an oscilloscope you can measure on the coil negative side the following wave form.



Measurement with engine at approx. 1.000 rpm

a = Loading time (time in which the ignition module circulates the current to load the coil).

b = Limitation (time in which the ignition module circulates a maintenance current to avoid a coil overheating, because the necessary current for a good ignition has already been reached but the spark must not still ignite).

NOTE: the maintenance current that can be considered also as an energy reserve is calculated at any moment by the ignition module, therefore the time - **b** - can change according to the number of revolution or the type of ignition.

c = Spark.

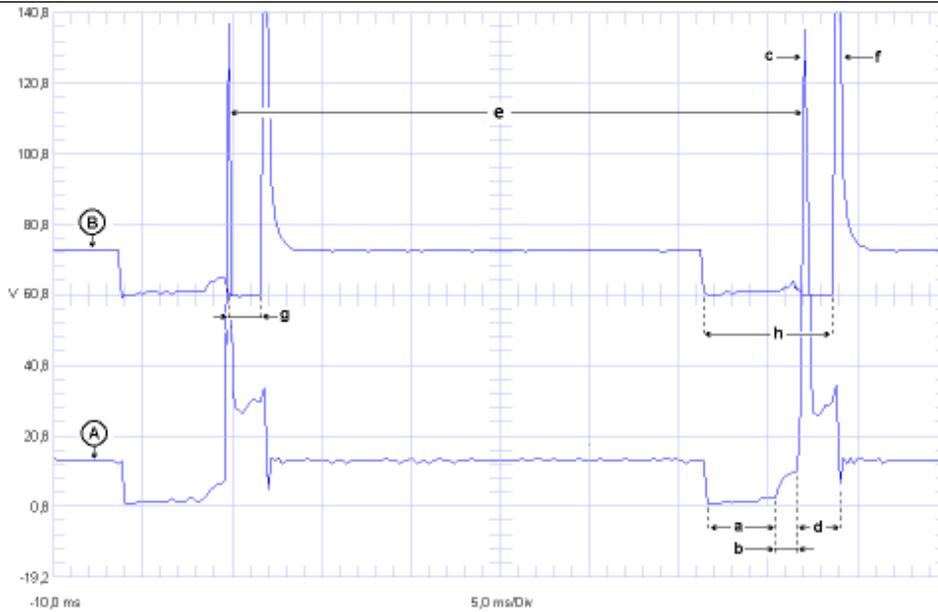
d = Unloading time of the energy stored by the coil on the spark electrodes (spark duration).

e = Period between a spark and the other (180° of revolution of the engine shaft).

Below is a list of the most common ignition module on which "Joker - N" works correctly:

- AC DELCO
- Bosch 0 227 100 111
- Bosch 0 227 100 123
- Bosch 0 227 100 148
- Magneti Marelli AEI 200A
- Magneti Marelli BKL 4
- Magneti Marelli MTR2

After the installation of the variator, with the oscilloscope and two traces you can display what follows.



CORRECT OPERATION

Measurement with engine at approx. 1.000 rpm

Trace A = Signal measured on the brown wire of the variator **6** (coil negative side **11**).

Trace B = Signal measured on the black wire of the variator **7** (ignition module side **15**).

a = Loading time (time in which the ignition module circulates the current to load the coil).

b = Limitation: the limitation time **b** must **never** overcome a 10% more than the original one without variator (see previous page), to avoid any overheating both of the variator and the coil.

c = Spark.

d = Unloading time of the energy stored by the coil on the spark electrodes (spark duration).

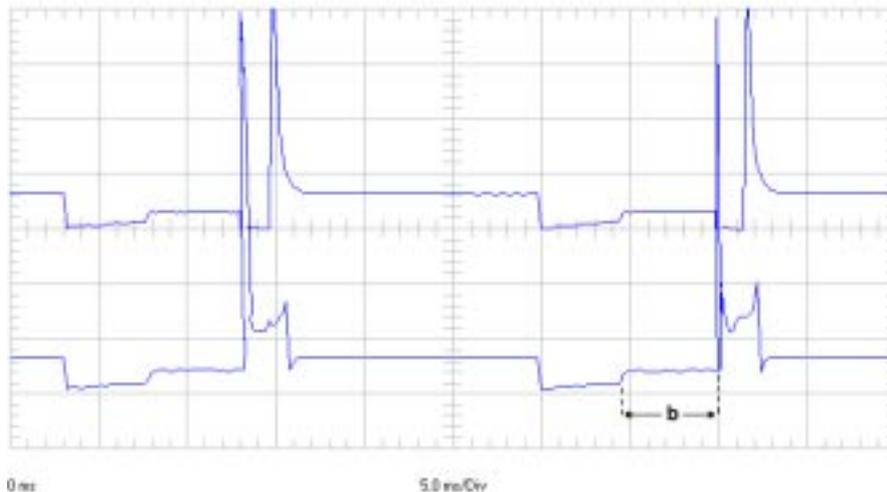
e = Period between a spark and the other (180° of revolution of the engine shaft).

f = Voltage peak generated by Joker - N to operate a possible revolution counter connected along the wire going from the ignition module to the coil.

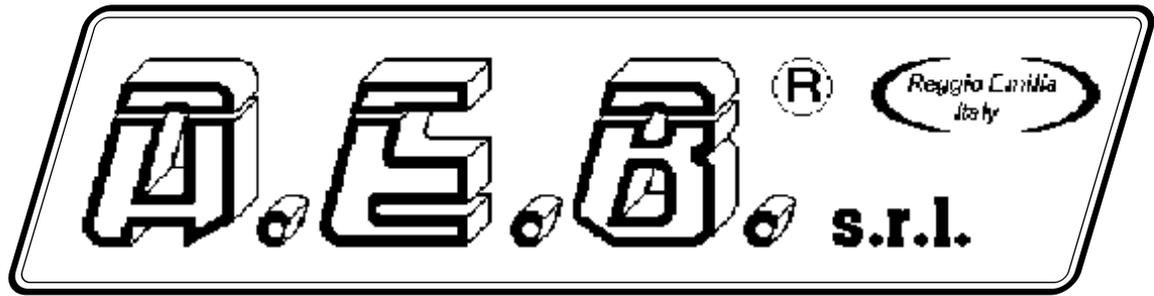
g = Ignition spark advance given by the variator.

h = Loading time that the ignition module gives on the input of the Joker - N variator. Note that the module loading time has increased in comparison to the operation without variator (see previous page); to avoid any overheating of Joker - N and the coil, **h** can be higher of **a + b without variator** only of **10%**.

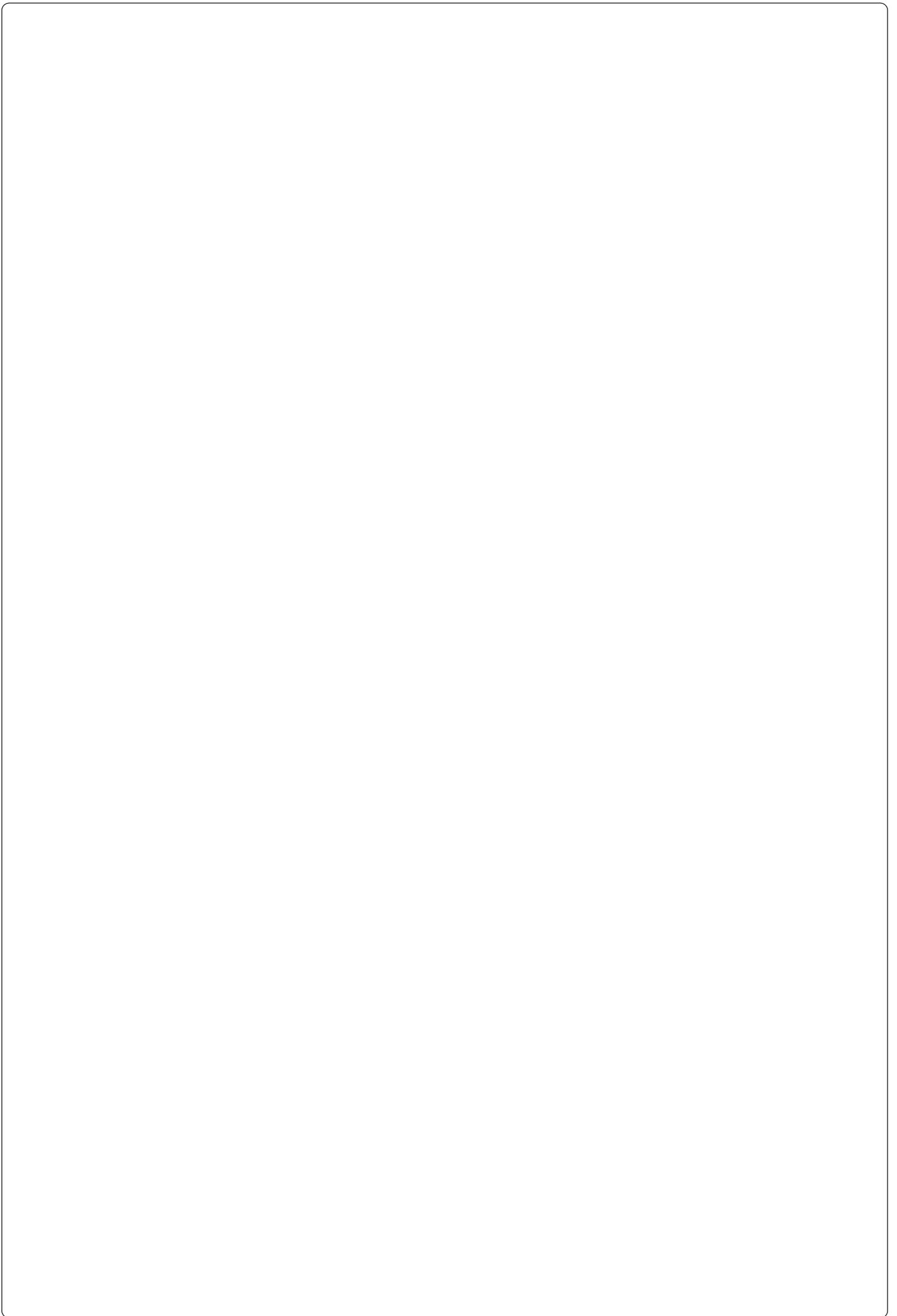
Example of an ignition module that is not compatible with the Joker - N variator; time - **b** - is higher than 10% in comparison to the one without variator.



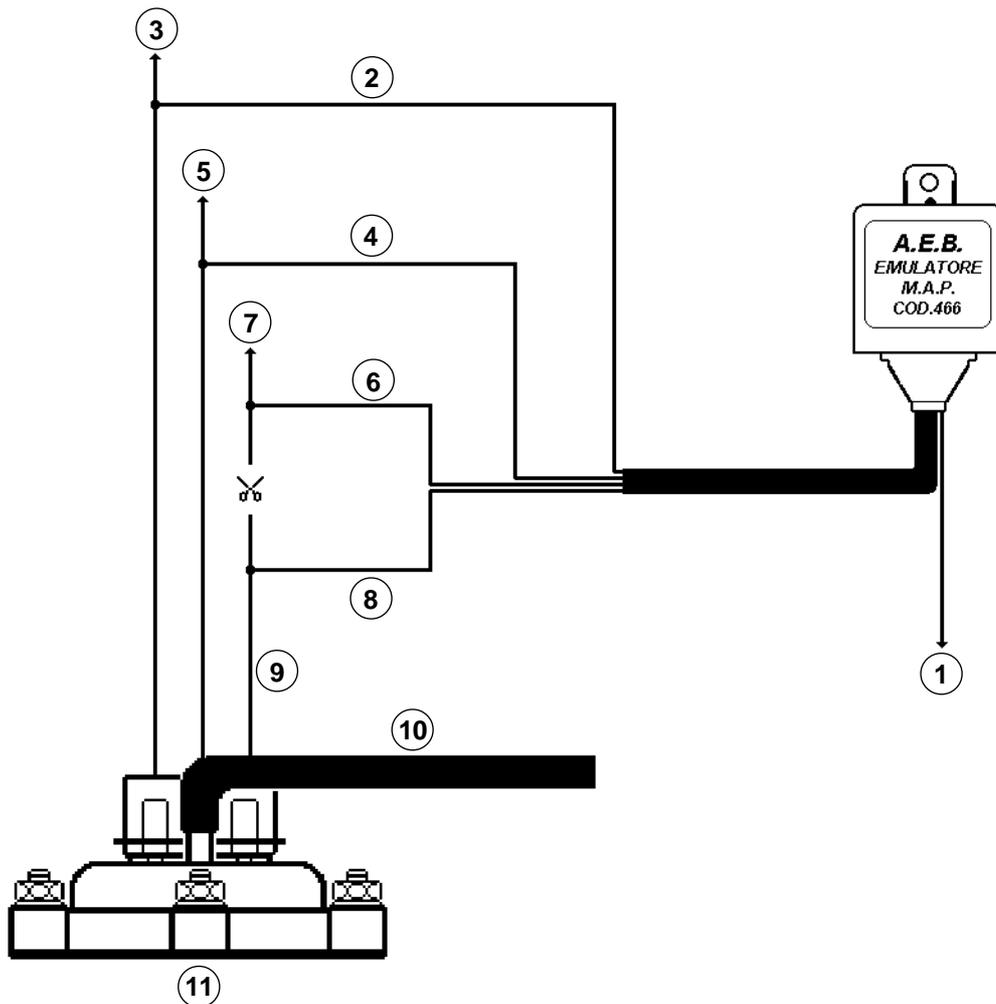
WRONG OPERATION



SPARK ADVANCE VARIATORS FOR LOW VOLTAGE SIGNALS



**M.A.P. Emulator
Code 466**



The **M.A.P. emulator** is supplied with a wiring for the connection to the absolute pressure sensor of Marelli type; anyway, some cars have a different connection, therefore it is necessary to cut the connectors and connect the emulator as per diagram.

We recommend to follow the attached diagrams; in case of problems, apply to the Technical Service.

- 1) BLUE WIRE to be connected to the BLU GAS outlet WIRE.
- 2) BLACK WIRE to be connected to the wire (3) of the ABSOLUTE PRESSURE (M.A.P.) SENSOR (11), ground.
- 4) RED WIRE to be connected to the wire (5) of the ABSOLUTE PRESSURE (M.A.P.) SENSOR (11), power supply + 5 V.
- 6) Signal output BROWN WIRE modified by the M.A.P. emulator to be connected to the WIRE (7) of the ABSOLUTE PRESSURE (M.A.P.) SENSOR, injection central unit side.
- 8) Signal output WHITE WIRE modified for the M.A.P. emulator to be connected to the WIRE (9) that comes out from the ABSOLUTE PRESSURE (M.A.P.) SENSOR (11).
- 10) Pipe connecting the ABSOLUTE PRESSURE (M.A.P.) SENSOR (11) to suction manifolds.

The ABSOLUTE PRESSURE (M.A.P.) SENSOR (11) informs the injection central unit on the value of the vacuum created inside the suction manifolds during accelerations or decelerations; according to this value, the injection central unit changes the quantity of injected gasoline and the ignition SPARK ADVANCE for a better engine yield under any conditions. Generally, the M.A.P. sensors have 3 wires (even if some models can have more than one) with the following signals:

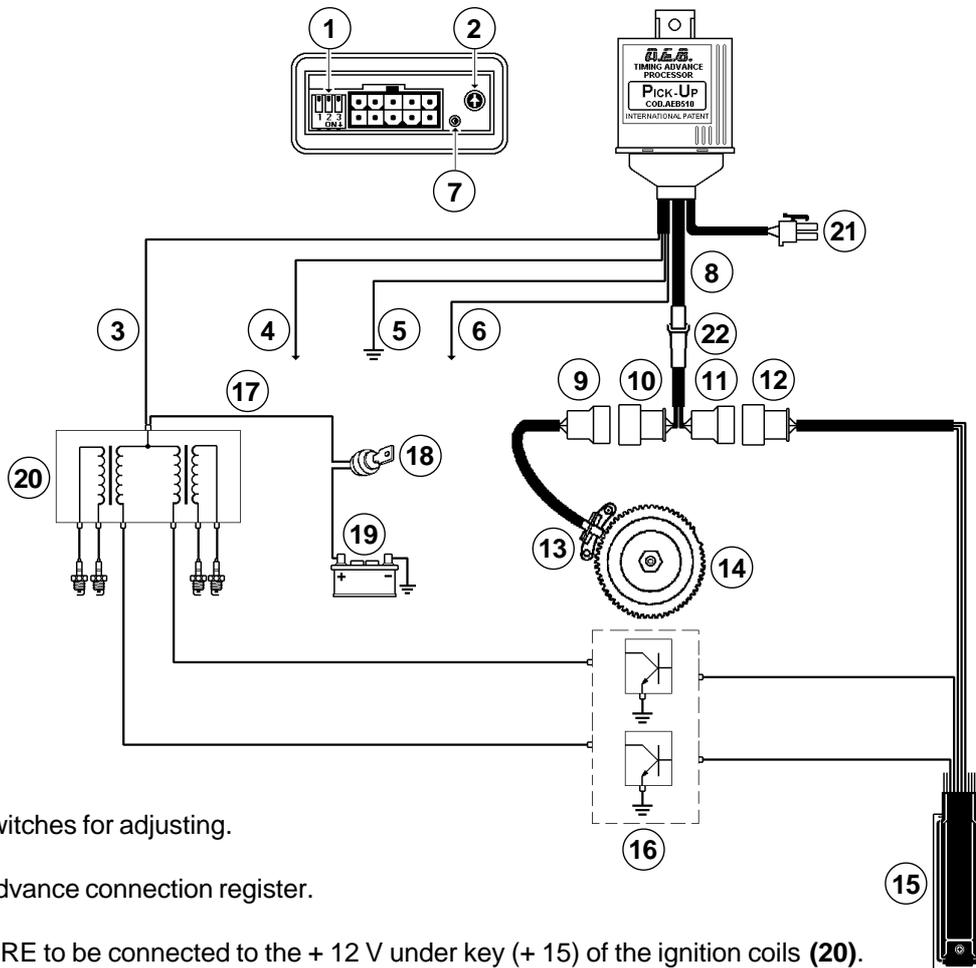
- 5 V power supply.

- Ground.

- Variable signal according to the vacuum in the manifolds; with AEB466 you intervene on this signal by modifying it in the due way, so that the injection central unit uses optimal spark advance mapping for the car gas running. The M.A.P. emulator does not need any adjustment because the spark advance is proportional to the vacuum that is created in manifolds.

**Electronic Spark Advance Variator PICK - UP
Code 510**

Install the **PICK - UP Code 510** variator on cars with ignition - injection system with C.K.P. sensor and inductive - type revolutions and phonic wheel with 6, 35 or 58 teeth.



1) Micro switches for adjusting.

2) Spark advance connection register.

3) RED WIRE to be connected to the + 12 V under key (+ 15) of the ignition coils (20).

Contact (+ 15) of coils is connected by means of wire (17) to the ignition key (18) and from this latter to the positive side of the battery (19) in order to have power supply only with instrument panel switched on.

4) BLUE WIRE to be connected to the BLU GAS outlet wire.

5) BLACK WIRE to be connected to GROUND.

6) BLUE - YELLOW WIRE to be connected to the THROTTLE POTENTIOMETER signal (if the BLUE - YELLOW wire of the Variator is not connected to the throttle potentiometer, it must be connected to the + 12 V under key RED wire of the Variator).

7) SPARK ADVANCE CONNECTION LED (led ON, spark advance connected).

8) Wiring for the connection of the **Spark Advance Variator** with the interface cable (22) to the **revolution and Crankshaft Position Sensor** with the connectors (10) and (11) to be inserted in the original connections (9) and (12).

9) Original connected of the **CRANKSHAFT POSITION SENSOR** sensor (13) of inductive type.

12) Original connector connected to the injection central unit (15).

14) Crankshaft pulley with phonic wheel (6, 35 or 58 teeth); it supplies the CRANKSHAFT POSITION SENSOR indication and the rpm.

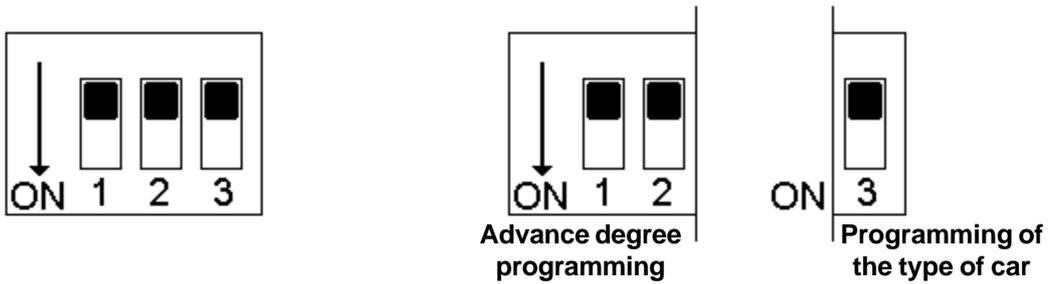
16) Ignition module driving the coils (20). Note: the ignition module can be built in the injection central unit (15).

21) Connector for the connection of the variator to the phase sensor (only for some cars).

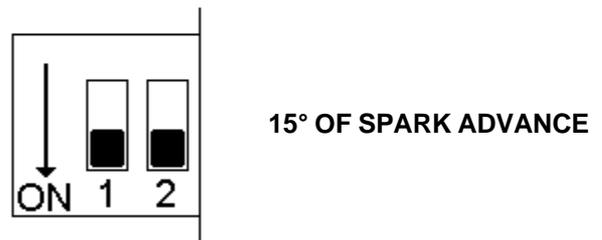
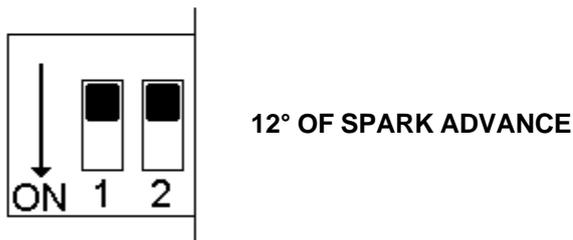
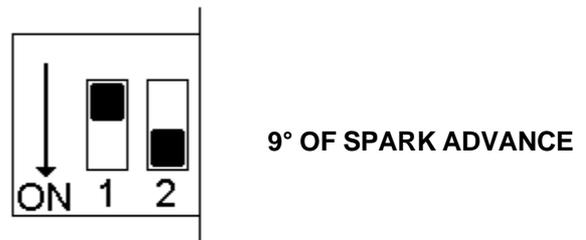
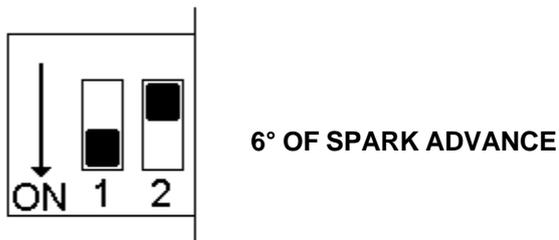
By modifying the signal of the CRANKSHAFT POSITION SENSOR, this Variator advances the moment in which you have the spark on the coil in comparison to the original point.

MICRO SWITCH ADJUSTMENT

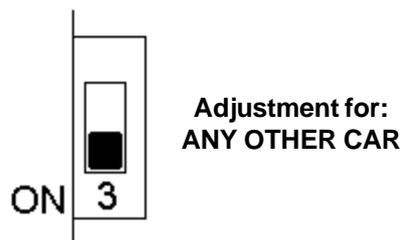
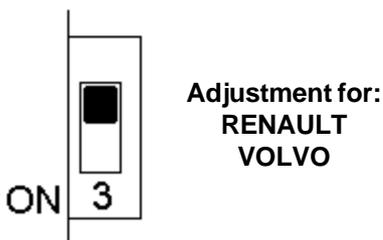
By means of micro switches 1, 2, 3, you can carry out the following adjustments:



ADVANCE DEGREE PROGRAMMING



PROGRAMMING OF THE TYPE OF CAR



THESE ADJUSTMENTS ARE VALID FOR ANY 4, 6, 8 CYLINDER ENGINE.

NOTE: during testing, the Variator is calibrated with 12° of spark advance for Volvo and Renault cars and with spark advance always connected.

HOW AND WHEN TO DISCONNECT THE SPARK ADVANCE

On some cars, it is recommendable to disconnect the spark advance while decelerating and idling, to avoid jerks or irregular operations. On the other hand, the spark advance is used immediately while accelerating in order to improve performance, consumption and to reduce at a minimum the risk of backfire. With the **Pick - Up** Variator, the spark advance can be connected or disconnected automatically by connecting the **BLUE - YELLOW WIRE** of the Variator to one of these signals:

- throttle potentiometer **Picture 1 (T.P.S. or accelerator position sensor)**;
- to the throttle switch that indicates when the accelerator is idling or when you are accelerating.

THROTTLE POTENTIOMETER

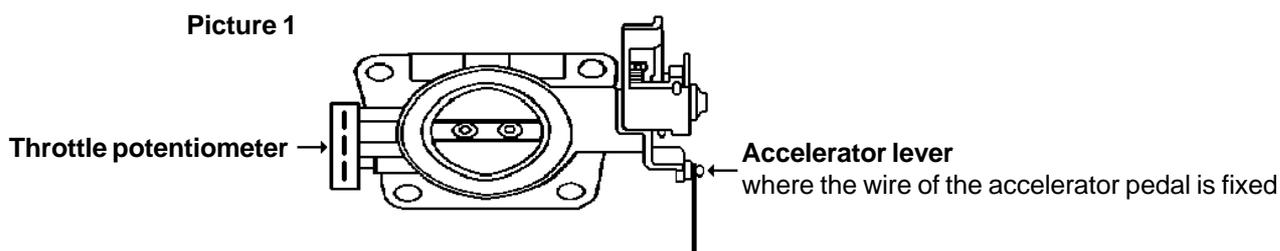
The **throttle potentiometer** or **accelerator position sensor (T.P.S.)** is always on the side opposite the accelerator lever and indicates the throttle position. By using this signal, the Spark Advance Variator can know at any moment if the engine is idling or accelerating to connect or disconnect the spark advance. Generally, the throttle potentiometer receives **3 wires** (even if some models can have more than one) with the following signals:

- **Power supply.**
- **Ground.**
- **Variable signal according to the throttle position.**

For a correct operation of the Spark Advance Variator, it is necessary that the **variable signal** of the throttle has one of these types of range:

- **0,5 V with idling accelerator**, to arrive up to **4,5 V with completely pressed accelerator**. In this case, the voltage increases gradually by following the accelerator position (**linear potentiometer**).
- **0,5 V with idling accelerator**, to arrive up to **4,5 V or 12 V with completely pressed accelerator**. In this case, as soon as you press the accelerator the voltage arrives to the maximum value (**switch - type potentiometer**).

If the range of the VARIABLE SIGNAL of the throttle potentiometer is not equal to at least on of the previously seen cases, we suggest to connect the BLUE - YELLOW WIRE of the Spark Advance Variator to the + 12 V under key (RED WIRE of the Spark Advance Variator).



When idling, the signal of the **Throttle Potentiometer** is not always the same, because there can be small differences due to the different calibrations; therefore, in the Variator there is a calibration of the connection point. The adjustment is carried out by operating on the **spark advance register** in the following way:

- 1) check that the register is completely rotated in clockwise direction;

SPARK ADVANCE CONNECTION REGISTER →



- 2) with idling car, start to rotate the register in counterclockwise direction until the LED switches off (spark advance disconnected);

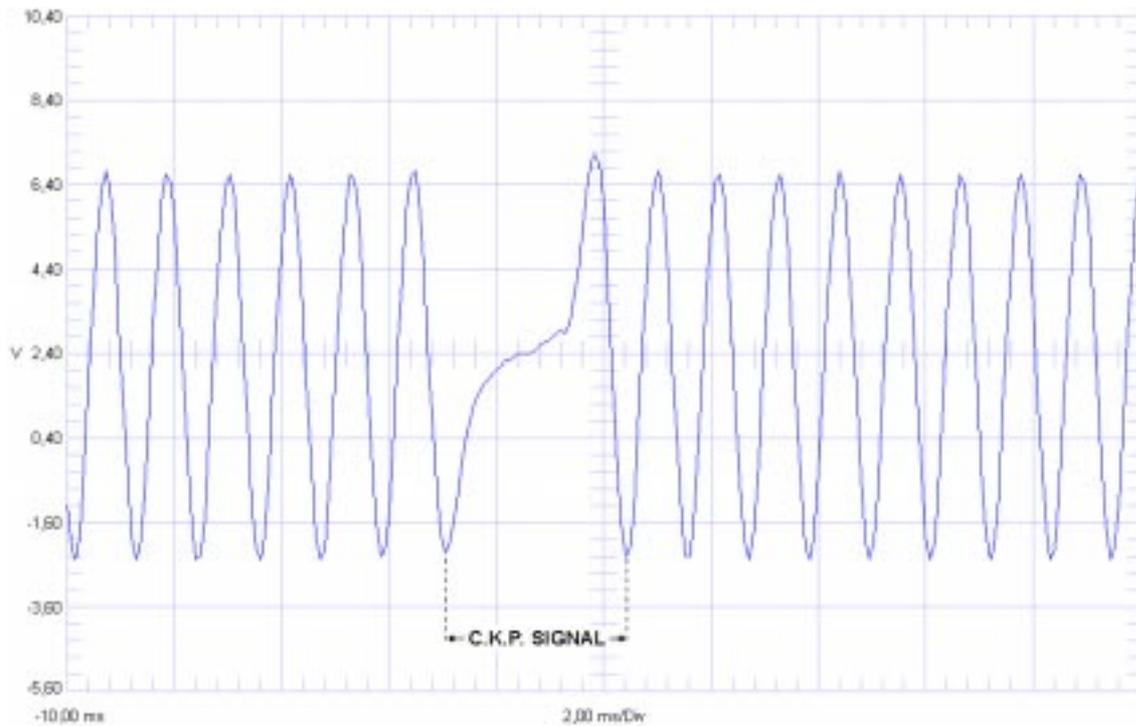
LED ON = SPARK ADVANCE CONNECTED →



- 3) after this adjustment, when you accelerate the LED on the Variator switches on again to switch off when you release the accelerator.

Electronic Spark Advance Variator PICK - UP
Code 510

Before installing the variator, by means of an oscilloscope on the revolution sensor - Crankshaft Position Sensor - 13 - you can measure the following wave forms (examples of wave form of Crankshaft Position Sensor with 58 teeth).



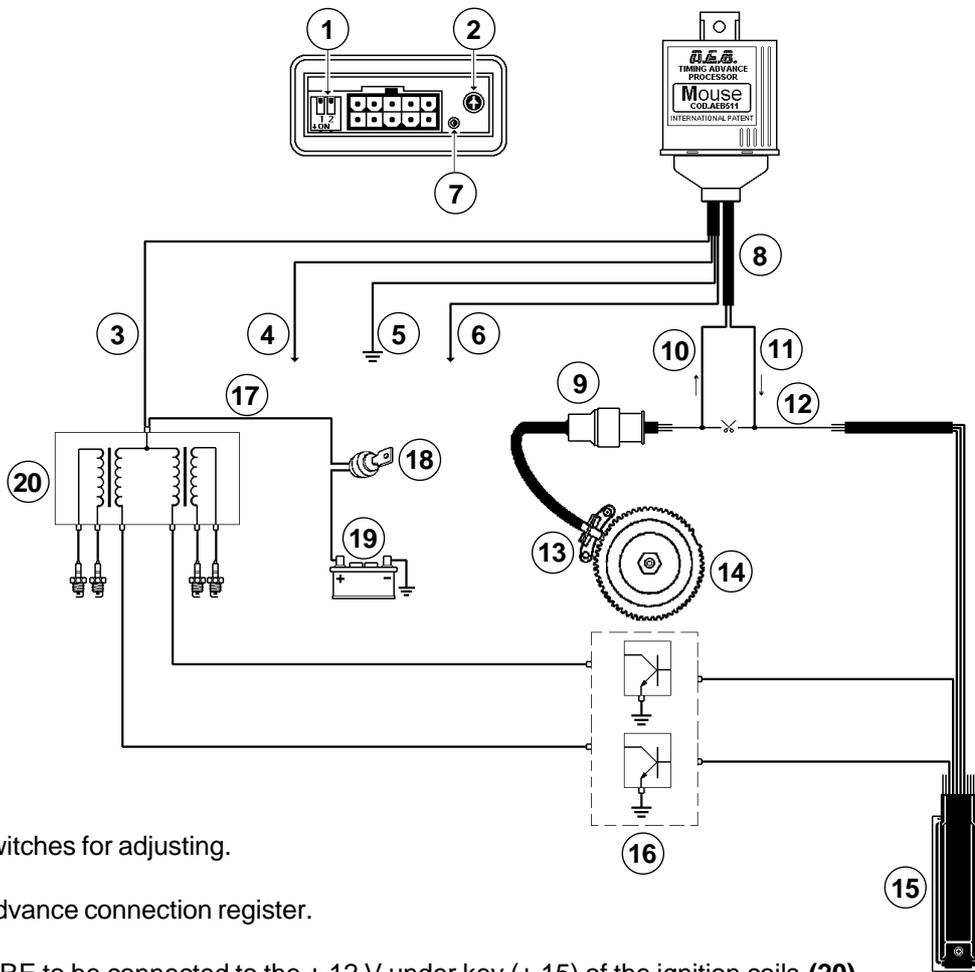
Measurement with engine at approx. 1.000 rpm



Measurement with engine at approx. 1.000 rpm

Electronic Spark Advance Variator MOUSE Code 511

Install the **Mouse Code 511** variator on cars with ignition - injection system with C.K.P. and Hall - Effect revolution sensor and phonic wheel with 58 teeth.



1) Micro switches for adjusting.

2) Spark advance connection register.

3) RED WIRE to be connected to the + 12 V under key (+ 15) of the ignition coils (20).

Contact (+ 15) of coils is connected by means of wire (17) to the ignition key (18) and from this latter to the positive side of the battery (19) in order to have power supply only with instrument panel switched on.

4) BLUE WIRE to be connected to the BLU GAS outlet wire.

5) BLACK WIRE to be connected to GROUND.

6) BLUE - YELLOW WIRE to be connected to the THROTTLE POTENTIOMETER signal (if the BLUE - YELLOW wire of the Variator is not connected to the throttle potentiometer, it must be connected to the + 12 V under key RED wire of the Variator).

7) SPARK ADVANCE CONNECTION LED (led ON, spark advance connected).

8) Wiring for the connection to the **Spark Advance Variator**.

9) Original connected of the **REVOLUTION or CRANKSHAFT POSITION SENSOR (13)** of Hall - Effect type.

12) Wire of the signal of the revolution or Crankshaft Position Sensor that enters directly the injection central unit (15).

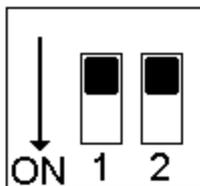
14) Crankshaft pulley with phonic wheel (58 teeth); it supplies the CRANKSHAFT POSITION SENSOR indication and the rpm.

16) Ignition module driving the coils (20). Note: the ignition module can be built in the injection central unit (15).

By modifying the signal of the CRANKSHAFT POSITION SENSOR, this Variator advances the moment in which you have the spark on the coil in comparison to the original point.

MICRO SWITCH ADJUSTMENT

By means of micro switches **1, 2**, you can carry out the following adjustments:

**ADVANCE DEGREE PROGRAMMING**

6° OF SPARK ADVANCE



9° OF SPARK ADVANCE



12° OF SPARK ADVANCE



15° OF SPARK ADVANCE

THESE ADJUSTMENTS ARE VALID FOR ANY 4, 6, 8 CYLINDER ENGINE

NOTE: during testing, the Variator is calibrated with 12° of spark advance always connected.

HOW AND WHEN TO DISCONNECT THE SPARK ADVANCE

On some cars, it is recommendable to disconnect the spark advance while decelerating and idling, to avoid jerks or irregular operations. On the other hand, the spark advance is used immediately while accelerating in order to improve performance, consumption and to reduce at a minimum the risk of backfire. With the **Mouse** Variator, the spark advance can be connected or disconnected automatically by connecting the **BLUE - YELLOW WIRE** of the Variator to one of these signals:

- throttle potentiometer **Picture 1 (T.P.S. or accelerator position sensor)**;
- to the throttle switch that indicates when the accelerator is idling or when you are accelerating.

THROTTLE POTENTIOMETER

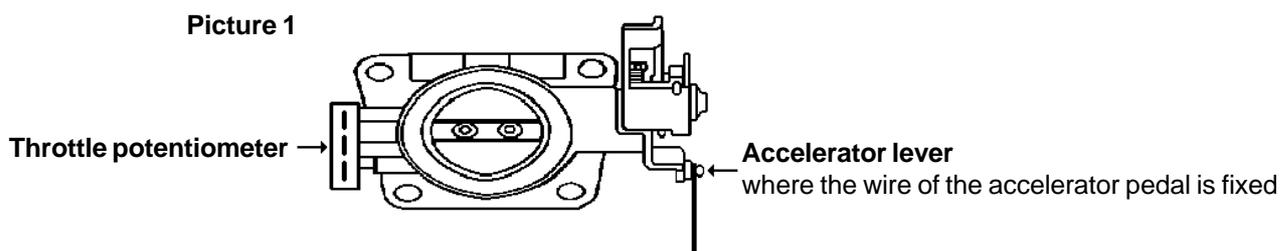
The **throttle potentiometer** or **accelerator position sensor (T.P.S.)** is always on the side opposite the accelerator lever and indicate the throttle position. By using this signal, the Spark Advance Variator can know at any moment if the engine is idling or accelerating to connect or disconnect the spark advance. Generally, the throttle potentiometer receives **3 wires** (even if some models can have more than one) with the following signals:

- **Power supply.**
- **Ground.**
- **Variable signal according to the throttle position.**

For a correct operation of the Spark Advance Variator, it is necessary that the **variable signal** of the throttle has one of these types of range:

- **0,5 V with idling accelerator**, to arrive up to **4,5 V with completely pressed accelerator**. In this case, the voltage increases gradually by following the accelerator position (**linear potentiometer**).
- **0,5 V with idling accelerator**, to arrive up to **4,5 V or 12 V with completely pressed accelerator**. In this case, as soon as you press the accelerator the voltage arrives to the maximum value (**switch - type potentiometer**).

If the range of the VARIABLE SIGNAL of the throttle potentiometer is not equal to at least on of the previously seen cases, we suggest to connect the BLUE - YELLOW WIRE of the Spark Advance Variator to the + 12 volt under key (RED WIRE of the Spark Advance Variator).



When idling, the signal of the **Throttle Potentiometer** is not always the same, because there can be small differences due to the different calibrations; therefore, in the Variator there is a calibration of the connection point. The adjustment is carried out by operating on the **spark advance register** in the following way:

- 1) check that the register is completely rotated in clockwise direction;

SPARK ADVANCE CONNECTION REGISTER →



- 2) with idling car, start to rotate the register in counterclockwise direction until the LED switches off (spark advance disconnected);

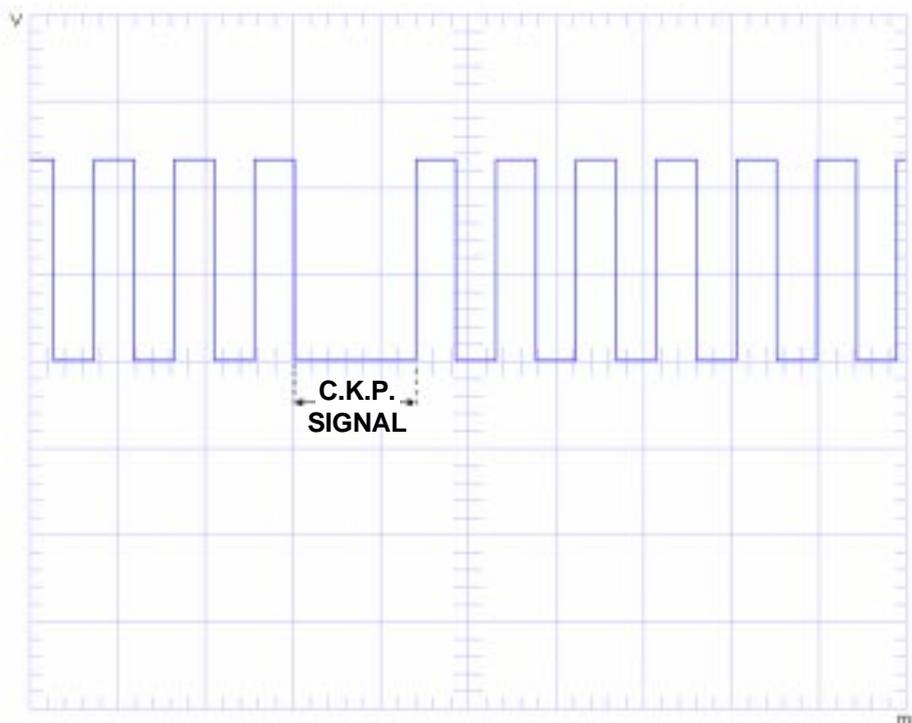
LED ON = SPARK ADVANCE CONNECTED →



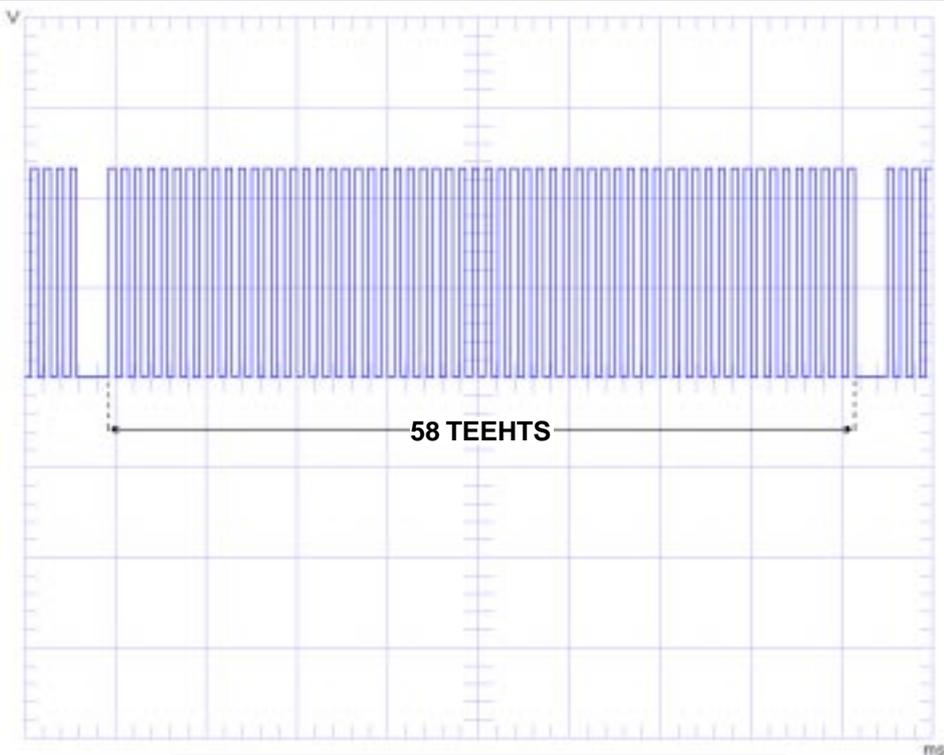
- 3) after this adjustment, when you accelerate the LED on the Variator switches on again to switch off when you release the accelerator.

Electronic Spark Advance Variator PICK - UP
Code 511

Before installing the variator, by means of an oscilloscope on the revolution sensor - Crankshaft Position Sensor - 13 - you can measure the following wave forms (examples of wave form of a Crankshaft Position Sensor with 58 teeth).



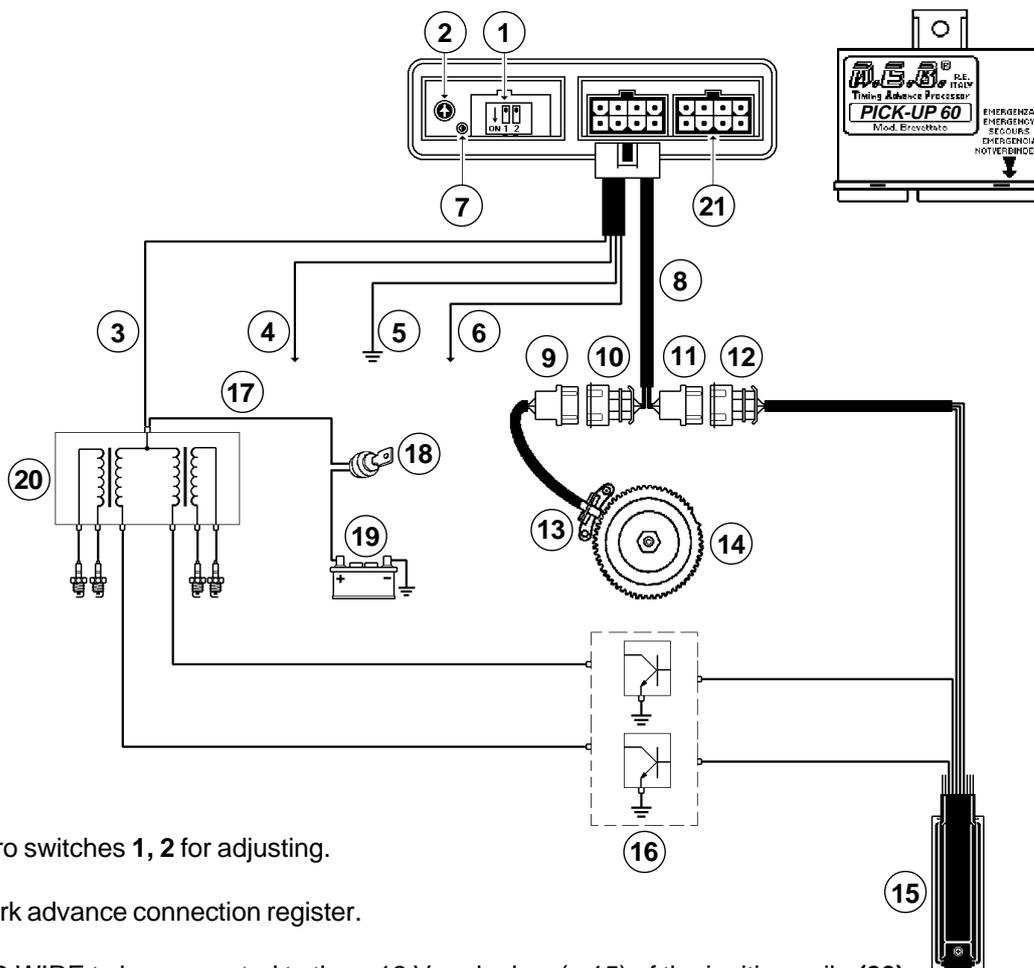
Measurement with engine at approx. 1.000 rpm



Misura rilevata con il motore a 1.000 rpm circa

Electronic Spark Advance Variator PICK - UP 60
Code 522 - 1, Code 522 - 3, Code 522 - 4

Install the **PICK - UP 60** variator on cars with ignition - injection system with C.K.P. signal and 3 WIRE inductive - type sensor and phonic wheel with 58 teeth.



1) Micro switches 1, 2 for adjusting.

2) Spark advance connection register.

3) RED WIRE to be connected to the + 12 V under key (+ 15) of the ignition coils (20).

Contact (+ 15) of coils is connected by means of wire (17) to the ignition key (18) and from this latter to the positive side of the battery (19) in order to have power supply only with instrument panel switched on.

4) BLUE WIRE to be connected to the BLU GAS outlet wire.

5) BLACK WIRE to be connected to GROUND.

6) BLUE - YELLOW WIRE to be connected to the THROTTLE POTENTIOMETER signal (if the BLUE - YELLOW wire of the Variator is not connected to the throttle potentiometer, it must be connected to the + 12 V under key RED wire of the Variator).

7) SPARK ADVANCE CONNECTION LED (led ON, spark advance connected).

8) Wiring for the connection of the **Spark Advance Variator to the sensor** with the connectors (10) and (11) to be inserted in the original connections (9) and (12).

9) Original connected of the **CRANKSHAFT POSITION SENSOR (13)** of inductive type.

12) Original connector connected to the injection central unit (15).

14) Crankshaft pulley with phonic wheel (**58 teeth**); it supplies the CRANKSHAFT POSITION SENSOR indication and the rpm.

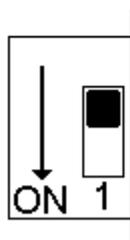
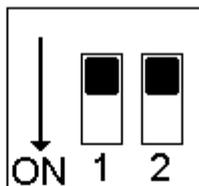
16) Ignition module driving the coils (20). Note: the ignition module can be built in the injection central unit (15).

21) Emergency connector (**red colour**).

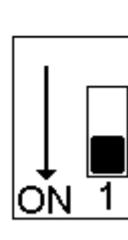
By modifying the signal of the CRANKSHAFT POSITION SENSOR, this Variator advances the moment in which you have the spark on the coil in comparison to the original point.

SPARK ADVANCE ADJUSTMENT

By means of micro switches 1, 2, you can carry out the following adjustments:



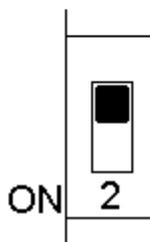
Spark advance always connected



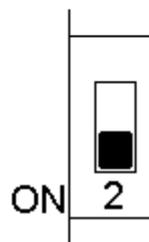
Advance disconnected below 1.100 rpm

This condition is valid only if the Blue - Yellow wire is not connected, otherwise refer to the following page.

RECOMMENDED ADVANCE CURVE FOR C.N.G. OR L.P.G.



Recommended advance curve for the **C.N.G.** operation



Recommended advance curve for the **L.P.G.** operation

THESE ADJUSTMENTS ARE VALID FOR ANY 4, 6, 8 CYLINDER ENGINE

NOTE: during testing, the Variator is calibrated for the C.N.G. running and spark advance always connected.

HOW AND WHEN TO DISCONNECT THE SPARK ADVANCE

On some cars, it is recommendable to disconnect the spark advance while decelerating and idling, to avoid jerks or irregular operations. On the other hand, the spark advance is used immediately while accelerating in order to improve performance, consumption and to reduce at a minimum the risk of backfire. With the **Pick - Up 60** Variator, the spark advance can be connected or disconnected automatically by connecting the **BLUE - YELLOW WIRE** of the Variator to one of these signals:

- throttle potentiometer **Picture 1 (T.P.S. or accelerator position sensor)**;
- to the throttle switch that indicates when the accelerator is idling or when you are accelerating.

THROTTLE POTENTIOMETER

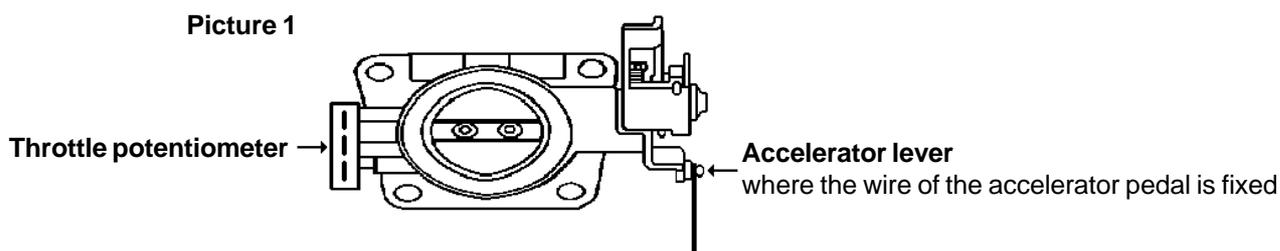
The **throttle potentiometer** or **accelerator position sensor (T.P.S.)** is always on the side opposite the accelerator lever and indicate the throttle position. By using this signal, the Spark Advance Variator can know at any moment if the engine is idling or accelerating to connect or disconnect the spark advance. Generally, the throttle potentiometer receives **3 wires** (even if some models can have more than one) with the following signals:

- **Power supply.**
- **Ground.**
- **Variable signal according to the throttle position.**

For a correct operation of the Spark Advance Variator, it is necessary that the **variable signal** of the throttle has one of these types of range:

- **0,5 V with idling accelerator**, to arrive up to **4,5 V with completely pressed accelerator**. In this case, the voltage increases gradually by following the accelerator position (**linear potentiometer**).
- **0,5 V with idling accelerator**, to arrive up to **4,5 V or 12 V with completely pressed accelerator**. In this case, as soon as you press the accelerator the voltage arrives to the maximum value (**switch - type potentiometer**).

If the range of the VARIABLE SIGNAL of the throttle potentiometer is not equal to at least on of the previously seen cases, we suggest to connect the BLUE - YELLOW WIRE of the Spark Advance Variator to the + 12 V under key (RED WIRE of the Spark Advance Variator).



When idling, the signal of the **Throttle Potentiometer** is not always the same, because there can be small differences due to the different calibrations; therefore, in the Variator there is a calibration of the connection point. The adjustment is carried out by operating on the **spark advance register** in the following way:

- 1) check that the register is completely rotated in clockwise direction;

SPARK ADVANCE CONNECTION REGISTER →



- 2) with idling car, start to rotate the register in counterclockwise direction until the LED switches off (spark advance disconnected);

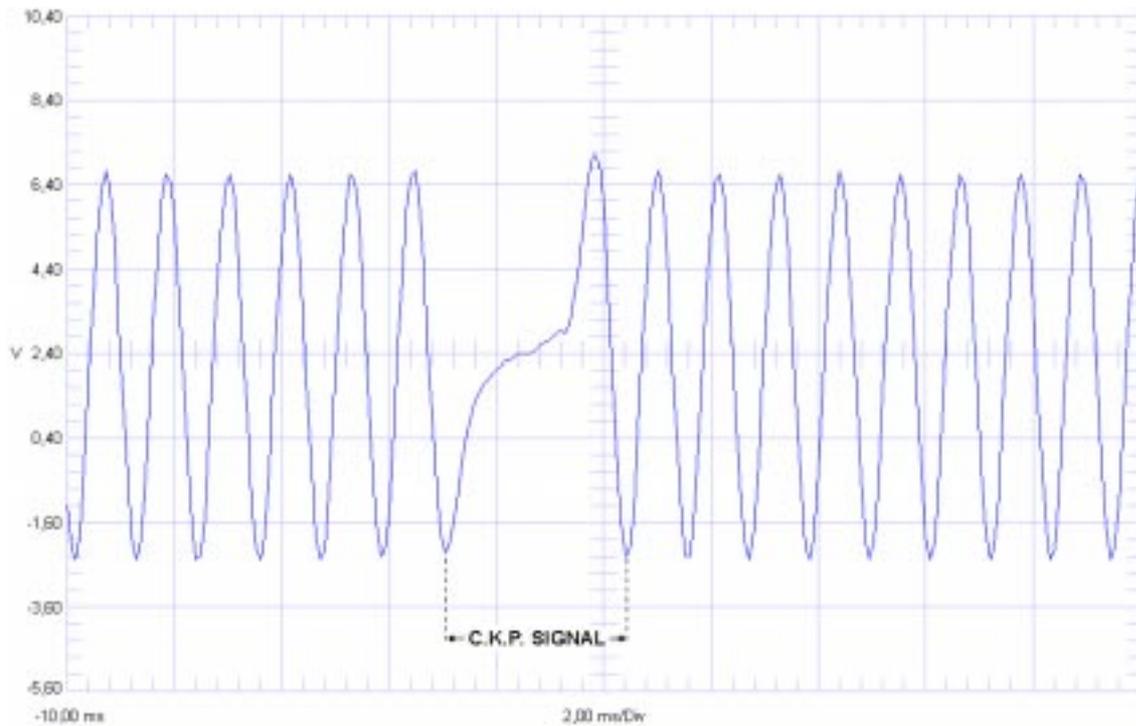
LED ON = SPARK ADVANCE CONNECTED →



- 3) after this adjustment, when you accelerate the LED on the Variator switches on again to switch off when you release the accelerator.

Electronic Spark Advance Variator PICK - UP 60
Code 522 - 1, Code 522 - 3, Code 522 - 4

Before installing the variator, by means of an oscilloscope on the revolution sensor - crankshaft position sensor - 13 - you can measure the following wave forms.



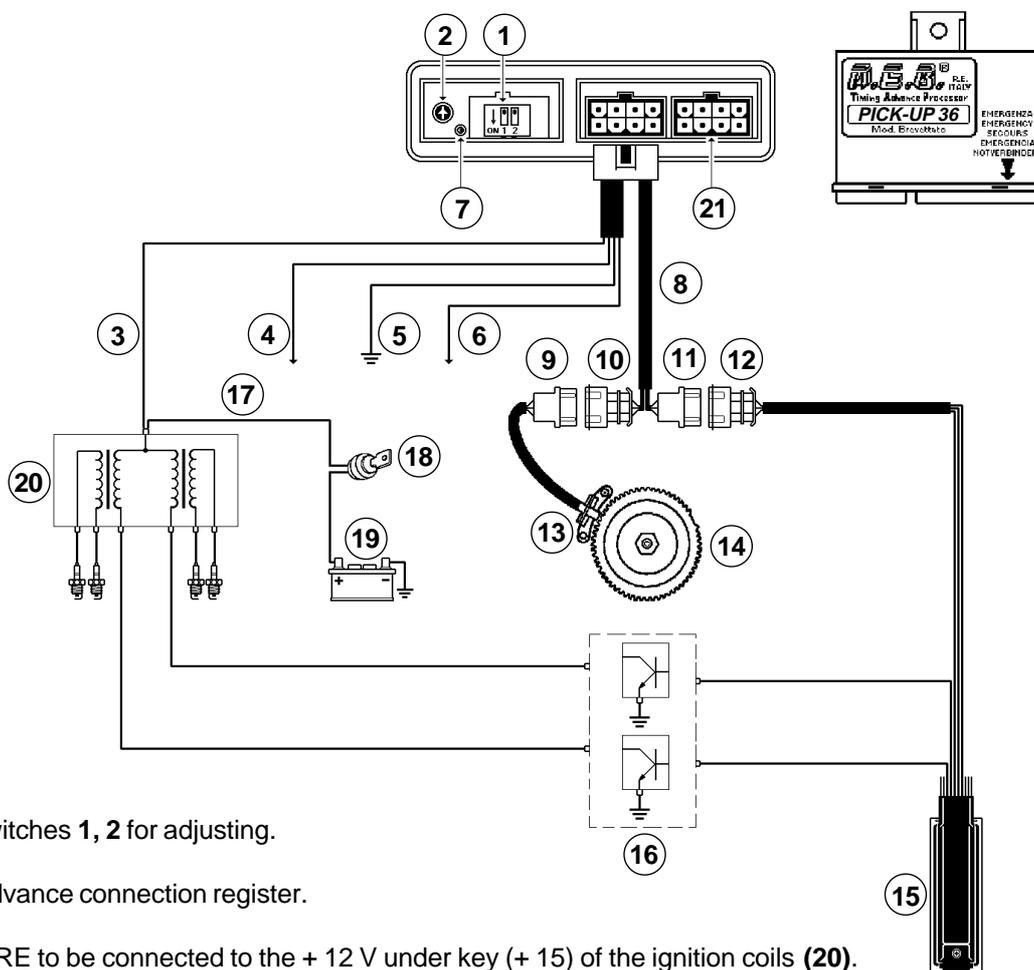
Measurement with engine at approx. 1.000 rpm



Measurement with engine at approx. 1.000 rpm

**Electronic Spark Advance Variator PICK - UP 36
Code 522 - 2**

Install the **PICK - UP 36 code 522 - 2** variator on cars with ignition - injection system with Crankshaft Position Sensor 2 WIRE inductive - type sensor and phonic wheel with 35 teeth.



1) Micro switches **1, 2** for adjusting.

2) Spark advance connection register.

3) RED WIRE to be connected to the + 12 V under key (+ 15) of the ignition coils (20).

Contact (+ 15) of coils is connected by means of wire (17) to the ignition key (18) and from this latter to the positive side of the battery (19) in order to have power supply only with instrument panel switched on.

4) BLUE WIRE to be connected to the BLU GAS outlet wire.

5) BLACK WIRE to be connected to GROUND.

6) BLUE - YELLOW WIRE to be connected to the THROTTLE POTENTIOMETER signal (if the BLUE - YELLOW wire of the Variator is not connected to the throttle potentiometer, it must be connected to the + 12 V under key RED wire of the Variator).

7) SPARK ADVANCE CONNECTION LED (led ON, spark advance connected).

8) Wiring for the connection of the **Spark Advance Variator to the sensor** with the connectors (10) and (11) to be inserted in the original connections (9) and (12).

9) Original connected of the **CRANKSHAFT POSITION SENSOR (13)** of inductive type.

12) Original connector connected to the injection central unit (15).

14) Crankshaft pulley with phonic wheel (**35 teeth**); it supplies the CRANKSHAFT POSITION SENSOR indication and the rpm.

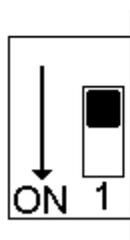
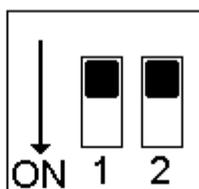
16) Ignition module driving the coils (20). Note: the ignition module can be built in the injection central unit (15).

21) Emergency connector (red colour).

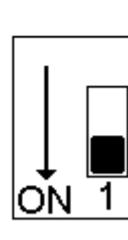
By modifying the signal of the CRANKSHAFT POSITION SENSOR, this Variator advances the moment in which you have the spark on the coil in comparison to the original point.

SPARK ADVANCE ADJUSTMENT

By means of micro switches 1, 2, you can carry out the following adjustments:



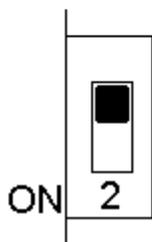
Spark advance always connected



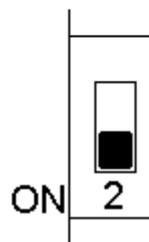
Advance disconnected below 1.100 rpm

This condition is valid only if the Blue - Yellow wire is not connected, otherwise refer to the following page.

RECOMMENDED ADVANCE CURVE FOR C.N.G. OR L.P.G.



Recommended advance curve for the **C.N.G.** operation



Recommended advance curve for the **L.P.G.** operation

THESE ADJUSTMENTS ARE VALID FOR ANY 4, 6, 8 CYLINDER ENGINE

NOTE: during testing, the Variator is calibrated for the C.N.G. running and spark advance always connected.

HOW AND WHEN TO DISCONNECT THE SPARK ADVANCE

On some cars, it is recommendable to disconnect the spark advance while decelerating and idling, to avoid jerks or irregular operations. On the other hand, the spark advance is used immediately while accelerating in order to improve performance, consumption and to reduce at a minimum the risk of backfire. With the **Pick - Up 36** Variator, the spark advance can be connected or disconnected automatically by connecting the **BLUE - YELLOW WIRE** of the Variator to one of these signals:

- throttle potentiometer **Picture 1 (T.P.S. or accelerator position sensor)**;
- to the throttle switch that indicates when the accelerator is idling or when you are accelerating.

THROTTLE POTENTIOMETER

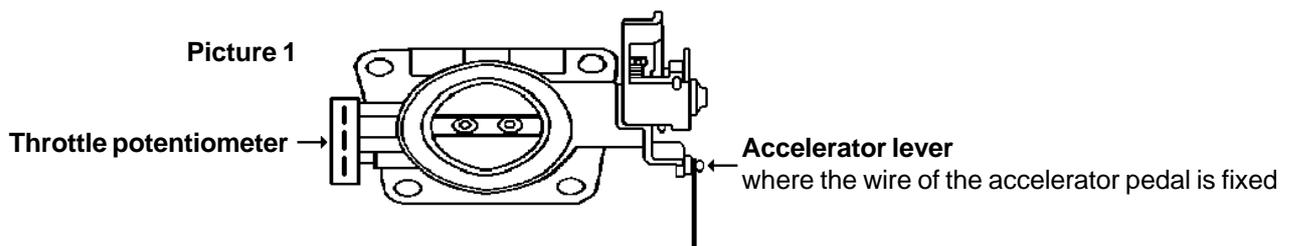
The **throttle potentiometer** or **accelerator position sensor (T.P.S.)** is always on the side opposite the accelerator lever and indicate the throttle position. By using this signal, the Spark Advance Variator can know at any moment if the engine is idling or accelerating to connect or disconnect the spark advance. Generally, the throttle potentiometer receives **3 wires** (even if some models can have more than one) with the following signals:

- **Power supply.**
- **Ground.**
- **Variable signal according to the throttle position.**

For a correct operation of the Spark Advance Variator, it is necessary that the **variable signal** of the throttle has one of these types of range:

- **0,5 V with idling accelerator**, to arrive up to **4,5 V with completely pressed accelerator**. In this case, the voltage increases gradually by following the accelerator position (**linear potentiometer**).
- **0,5 V with idling accelerator**, to arrive up to **4,5 V or 12 V with completely pressed accelerator**. In this case, as soon as you press the accelerator the voltage arrives to the maximum value (**switch - type potentiometer**).

If the range of the VARIABLE SIGNAL of the throttle potentiometer is not equal to at least on of the previously seen cases, we suggest to connect the BLUE - YELLOW WIRE of the Spark Advance Variator to the +12 V under key (RED WIRE of the Spark Advance Variator).



When idling, the signal of the **Throttle Potentiometer** is not always the same, because there can be small differences due to the different calibrations; therefore, in the Variator there is a calibration of the connection point. The adjustment is carried out by operating on the **spark advance register** in the following way:

- 1) check that the register is completely rotated in clockwise direction;

SPARK ADVANCE CONNECTION REGISTER →



- 2) with idling car, start to rotate the register in counterclockwise direction until the LED switches off (spark advance disconnected);

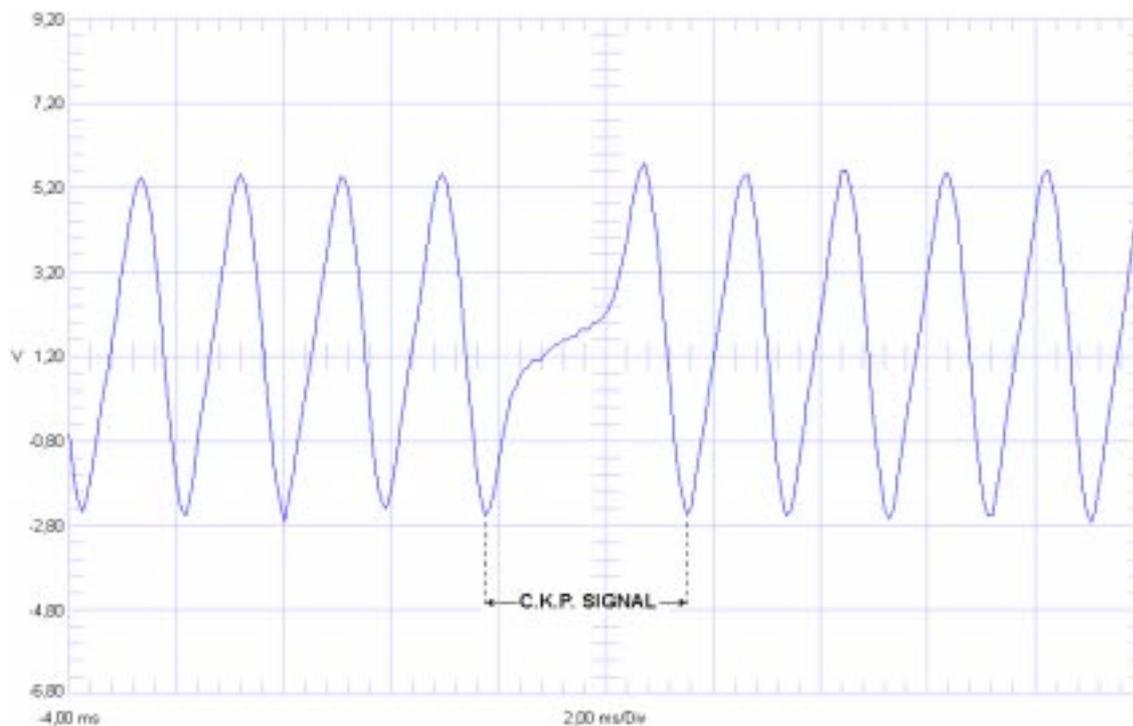
LED ON = SPARK ADVANCE CONNECTED →



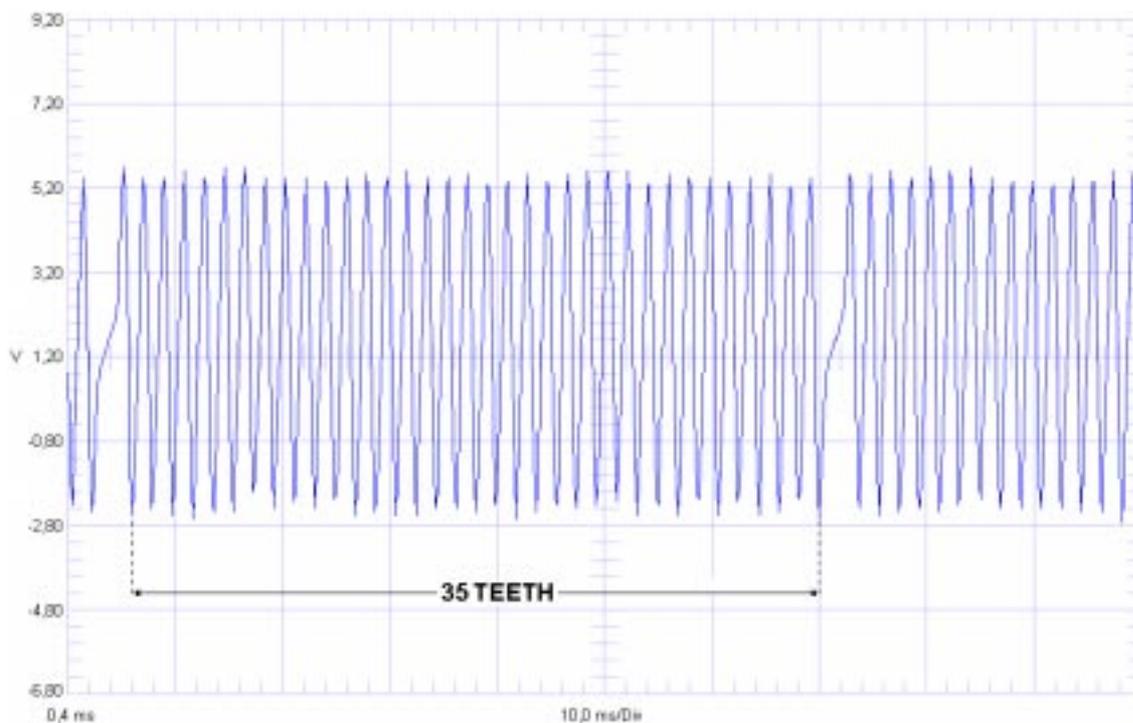
- 3) after this adjustment, when you accelerate the LED on the Variator switches on again to switch off when you release the accelerator.

Electronic Spark Advance Variator PICK - UP 36
Code 522 - 2

Before installing the variator, by means of an oscilloscope on the revolution sensor - Crankshaft Position Sensor - 13 - you can measure the following wave forms.



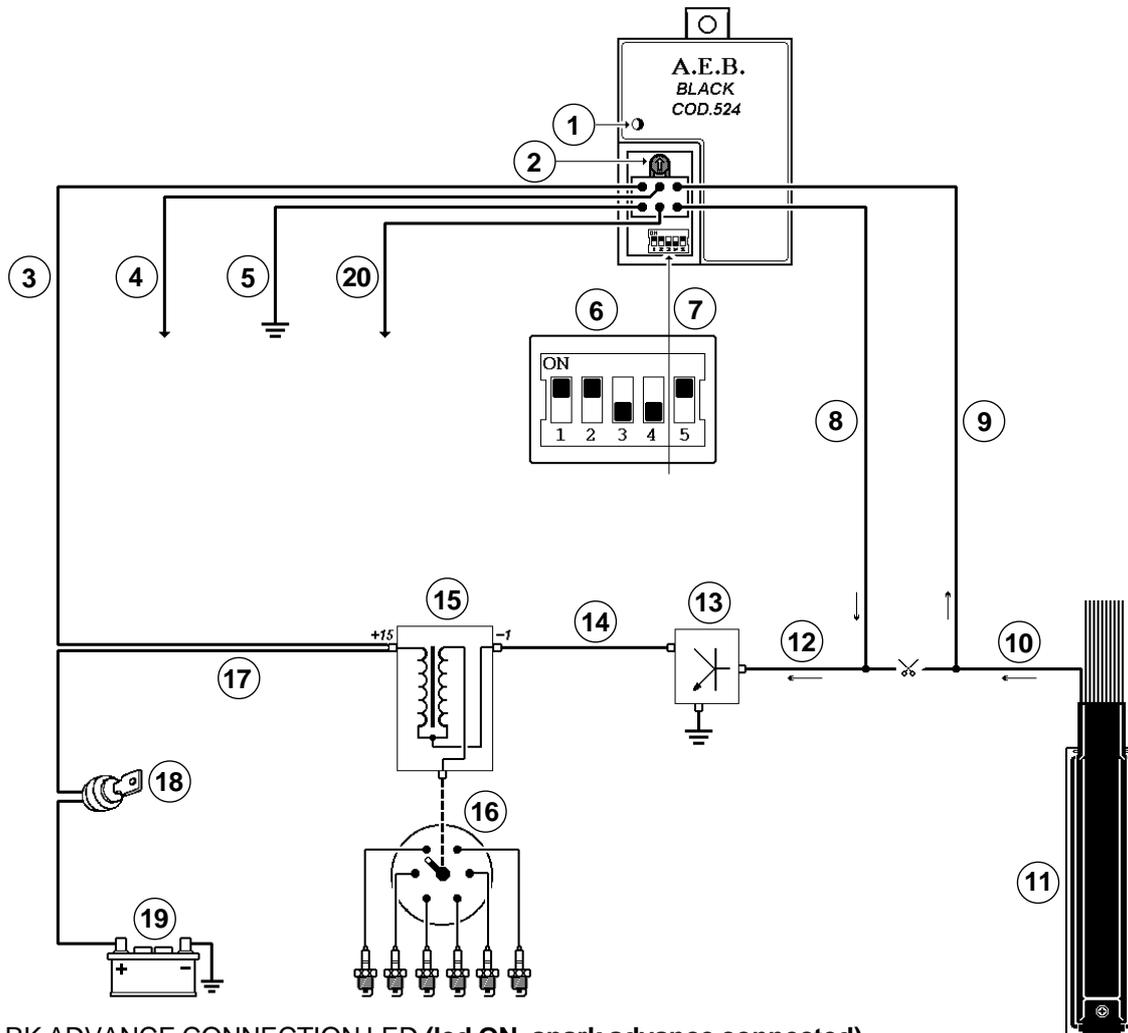
Measurement with engine at approx. 1.000 rpm



Measurement with engine at approx. 1.000 rpm

Electronic Spark Advance Variator BLACK Code 524

Install the **Black Code 524** variator on VOLKSWAGEN vehicles with ignition system made up of: amplifier ignition module built in the coil and distributor.



1) SPARK ADVANCE CONNECTION LED (led ON, spark advance connected).

2) Spark advance connection register.

3) RED WIRE to be connected to the + 12 V under key (+ 15) of the ignition coil (15).

Contact (+ 15) of coil (15) is connected by means of wire (17) to the ignition key (18) and from this latter to the positive side of the battery (19) in order to have power supply only with instrument panel switched on.

4) BLUE WIRE to be connected to the BLU GAS outlet wire.

5) YELLOW - GREEN WIRE to be connected to GROUND.

6) Micro switches 1, 2, 3, 4 (SPARK ADVANCE DEGREE ADJUSTMENT).

7) Micro switch 5 (spark advance curve selection, C.N.G. or L.P.G.).

8) BROWN WIRE (Variator output signal) to be connected to the control wire (12) of the ignition module (13).

9) BLACK WIRE (Variator input signal) to be connected to the wire (10) coming out from the ignition central unit (11).

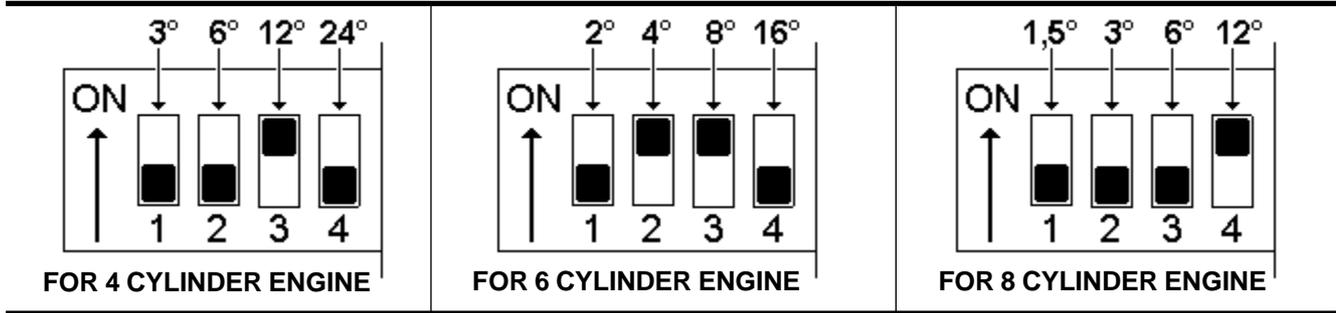
13) Ignition module connected by means of wire (14) to the negative side of ignition coil (15).

16) Distributor.

20) VIOLET WIRE to be connected to the THROTTLE POTENTIOMETER or DEBIMETER signal (in case these sensors do not exist, the Violet wire of the Variator must be connected to the + 12 V under key RED wire of the Variator).

SPARK ADVANCE ADJUSTMENT

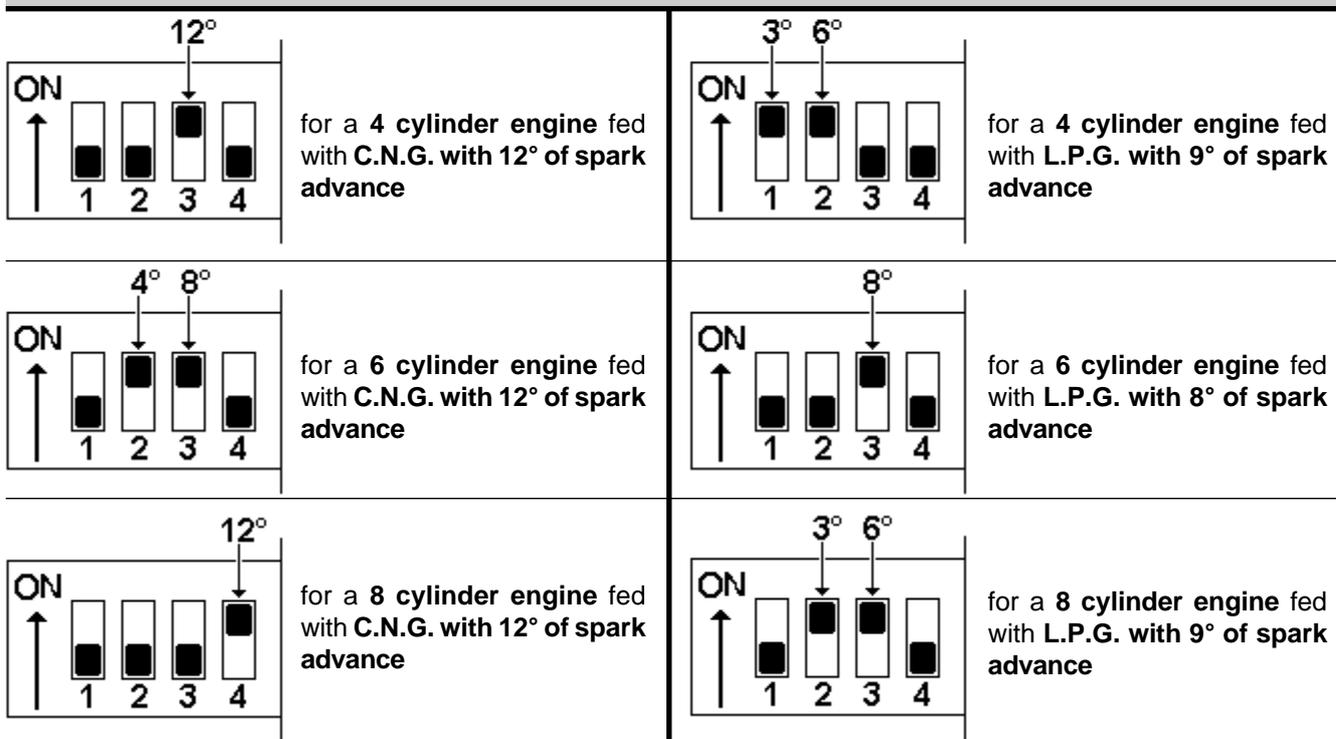
By means of micro switches 1, 2, 3, 4, that have a different value according to the number of cylinders of the engine on which the Variator has been installed, you can select the correct spark advance value. To do this it is necessary to set one or more micro switches to "ON".



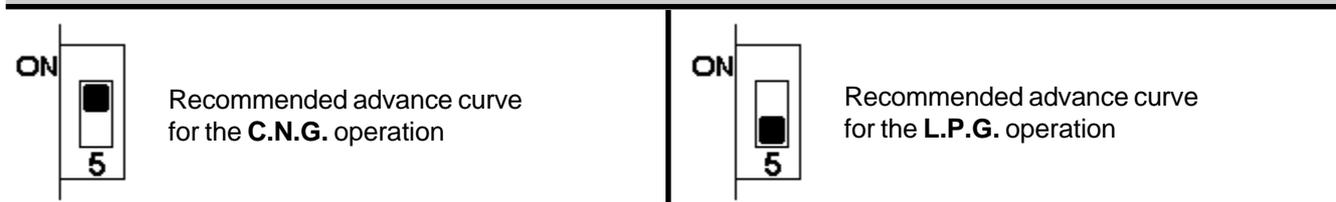
- Remember that by setting more micro switches to ON at the same time, the spark advance value is summed. - Example: by setting micro switches 1 and 3 to ON, you obtain the following spark advance:

	- for a 4 cylinder engine: 3° (of micro switch 1) + 12° (of micro switch 3) Total 15° of spark advance
	- for a 6 cylinder engine: 2° (of micro switch 1) + 8° (of micro switch 3) Total 10° of spark advance
	- for a 8 cylinder engine: 1,5° (of micro switch 1) + 6° (of micro switch 3) Total 7,5° of spark advance

RECOMMENDED SPARK ADVANCE DEGREES FOR TYPE OF FUEL AND NUMBER OF ENGINE



CYLINDERS RECOMMENDED SPARK ADVANCE CURVE FOR C.N.G. OR L.P.G.



The values reported in the table are recommended according to our experience; in any case, you can carry out different adjustments to better adapt the Variator to the different engine features.

HOW AND WHEN TO DISCONNECT THE SPARK ADVANCE

On some cars, it is recommendable to disconnect the spark advance while decelerating and idling, to avoid jerks or irregular operations. On the other hand, the spark advance is used immediately while accelerating in order to improve performance, consumption and to reduce at a minimum the risk of backfire. With the **Black** Variator, the spark advance can be connected or disconnected automatically by connecting the **VIOLET WIRE** of the Variator to one of these signals:

- throttle potentiometer **Picture 1 (T.P.S. or accelerator position sensor)**;
- to the throttle switch that indicates when the accelerator is idling or when you are accelerating.

THROTTLE POTENTIOMETER

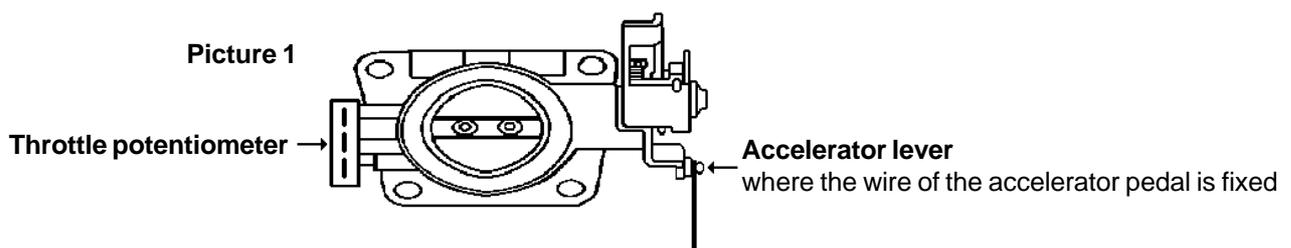
The **throttle potentiometer** or **accelerator position sensor (T.P.S.)** is always on the side opposite the accelerator lever and indicate the throttle position. By using this signal, the Spark Advance Variator can know at any moment if the engine is idling or accelerating to connect or disconnect the spark advance. Generally, the throttle potentiometer receives **3 wires** (even if some models can have more than one) with the following signals:

- **Power supply.**
- **Ground.**
- **Variable signal according to the throttle position.**

For a correct operation of the Spark Advance Variator, it is necessary that the **variable signal** of the throttle has one of these types of range:

- **0,5 V with idling accelerator**, to arrive up to **4,5 V with completely pressed accelerator**. In this case, the voltage increases gradually by following the accelerator position (**linear potentiometer**).
- **0,5 V with idling accelerator**, to arrive up to **4,5 V or 12 V with completely pressed accelerator**. In this case, as soon as you press the accelerator the voltage arrives to the maximum value (**switch - type potentiometer**).

If the range of the VARIABLE SIGNAL of the throttle potentiometer is not equal to at least on of the previously seen cases, we suggest to connect the VIOLET WIRE of the Spark Advance Variator to the + 12 V under key (RED WIRE of the Spark Advance Variator).



When idling, the signal of the **Throttle Potentiometer** is not always the same, because there can be small differences due to the different calibrations; therefore, in the Variator there is a calibration of the connection point. The adjustment is carried out by operating on the **spark advance register** in the following way:

- 1) check that the register is completely rotated in clockwise direction;

SPARK ADVANCE CONNECTION REGISTER →



- 2) with idling car, start to rotate the register in counterclockwise direction until the LED switches off (spark advance disconnected);

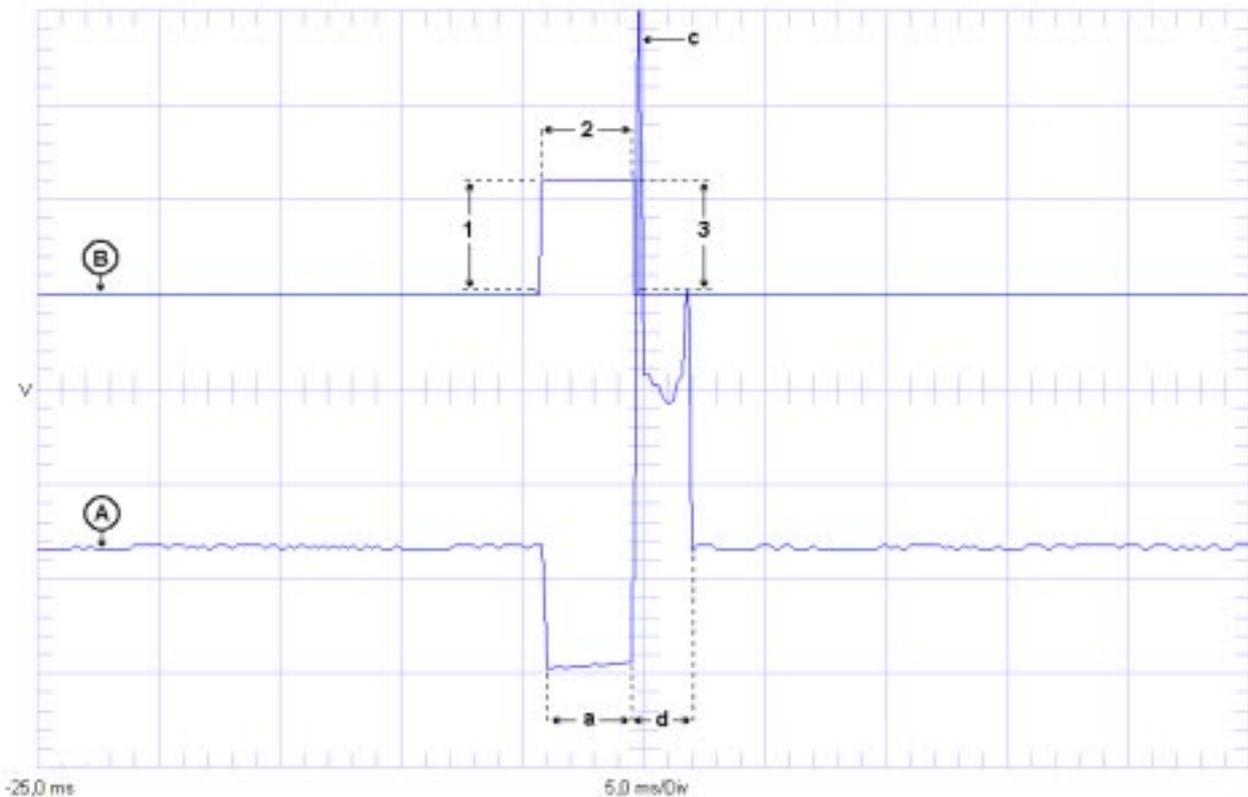
LED ON = SPARK ADVANCE CONNECTED →



- 3) after this adjustment, when you accelerate the LED on the Variator switches on again to switch off when you release the accelerator.

Electronic Spark Advance Variator BLACK
Code 524

Before installing the variator, by means of an oscilloscope on the two coil negative side and on the input wire of the ignition module you can measure the following wave forms.



Measurement with engine at approx. 1.000 rpm

Trace A (10 V / division) = Signal measured on a coil negative side - 14 -.

Trace B (10 V / division) = Signal measured on the input of the ignition module - 12 -.

a = Loading time (time in which the ignition module circulates the current to load the coil). This is controlled by the injection - ignition central unit.

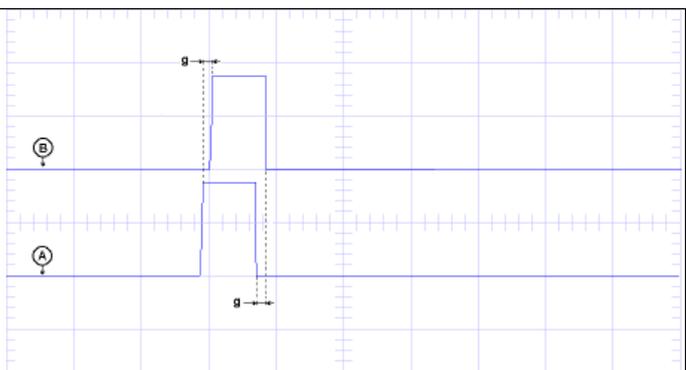
c = Spark.

d = Unloading time of the energy stored by the coil on the spark electrodes (spark duration).

The signal displayed on trace B is interpreted by the ignition module in the following way:

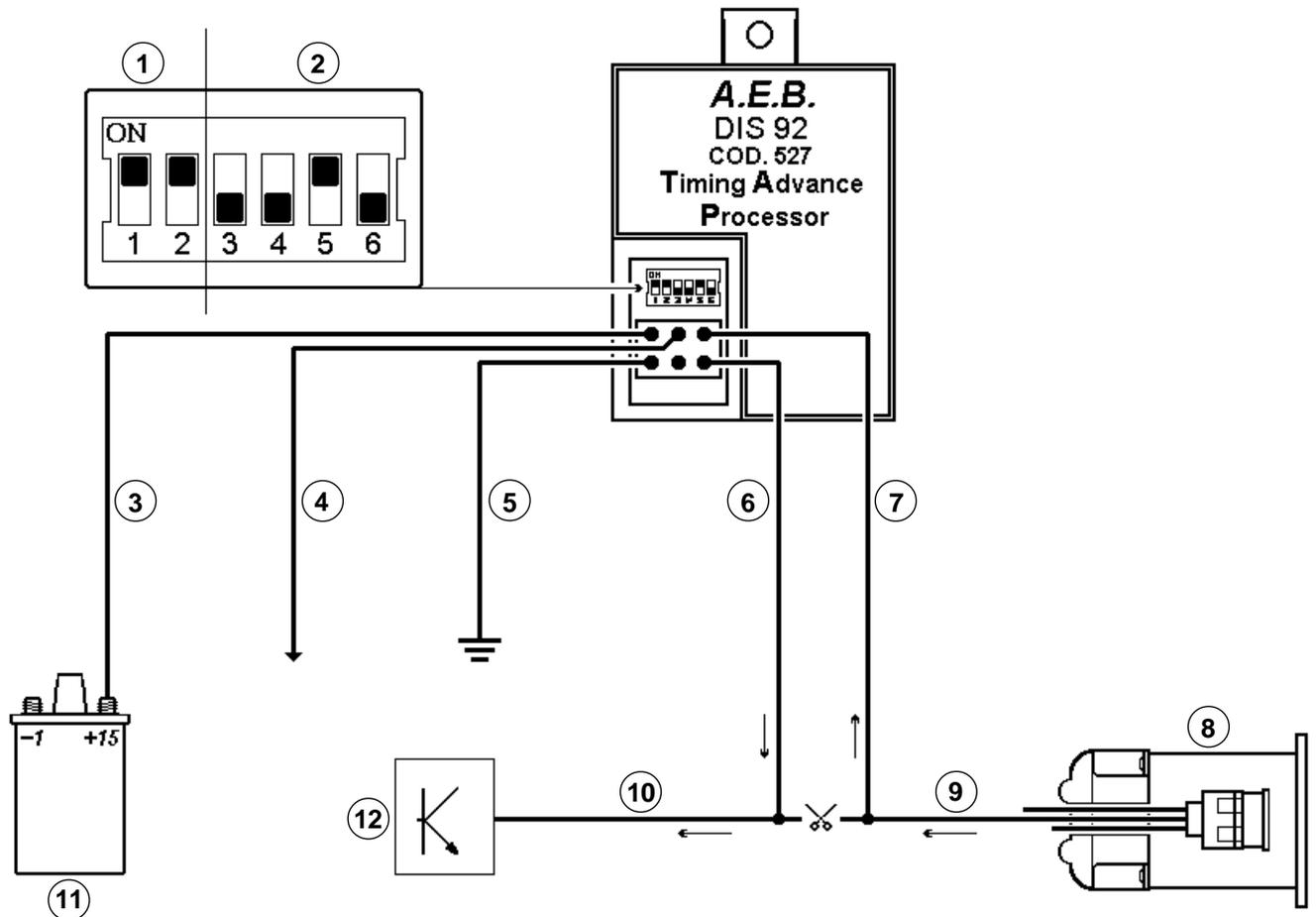
- 1) Increase from 0 ÷ 12 V = coil loading start.
- 2) Constant voltage = coil loading.
- 3) Decrease from 12 ÷ 0 V = end of loading, spark between the spark plug electrodes.

After installing the variator, you can check that the input signal on the black wire 9 (trace B) and the signal on the brown wire 8 (trace A) are the same but only phase displaced of the set spark advance - g -.



**Electronic Spark Advance Variator DIS - 92
Code 527**

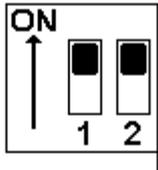
Install the **DIS - 92 Code 527** variator on cars with ignition system made up of: coil, electronic ignition and Hall - Effect phase sensor in the distributor.



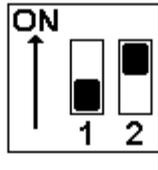
- 1) Micro switches 1 and 2 (**SPARK ADVANCE CUT - OFF WHEN IDLING**).
- 2) Micro switches 1, 4, 5, 6 (**SPARK ADVANCE DEGREE ADJUSTMENT**).
- 3) RED WIRE to be connected to the + 12 V under key (+ 15) of the ignition coil (11).
- 4) BLUE WIRE to be connected to the BLU GAS outlet wire.
- 5) YELLOW - GREEN WIRE to be connected to GROUND.
- 6) BROWN WIRE (**Variator output signal**) to be connected to the wire (10) going to the ignition module (13).
- 7) BLACK WIRE (**Variator input signal**) to be connected to the wire (9) coming out from the Hall - Effect sensor in the distributor (8).
- 8) Distributor with inside the Hall - Effect SENSOR.
- 11) Ignition coil.
- 12) Ignition module.

SPARK ADVANCE ADJUSTMENT

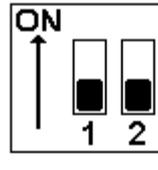
This adjustment is useful for those engine that, if advanced when idling, operate irregularly or switch off. To solve this problem by means of micro switches 1 and 2 you have the possibility to cut - off the spark advance when the engine rpm is lowered below 1.100 rpm.



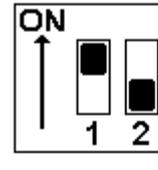
Spark advance always connected



Spark advance disconnected under 1.100 rpm for 4 cylinders

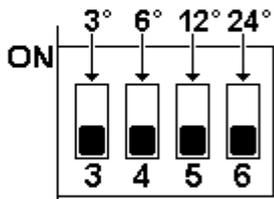


Spark advance disconnected under 1.100 rpm for 6 cylinders

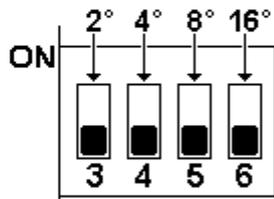


Spark advance disconnected under 1.100 rpm for 8 cylinders

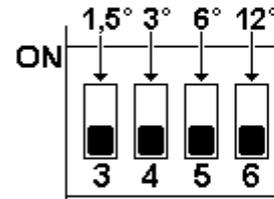
By means of micro switches 3, 4, 5, 6 that have a different value according to the number of cylinders of the engine on which the Variator has been installed, you can select the correct spark advance value. To do this it is necessary to set one or more micro switches to "ON".



FOR 4 CYLINDER ENGINE

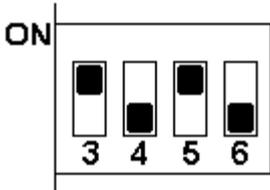


FOR 6 CYLINDER ENGINE



FOR 8 CYLINDER ENGINE

- Remember that by setting more micro switches to ON at the same time, the spark advance value is summed. - Example: by setting micro switches 3 and 5 to ON, you obtain the following spark advance:

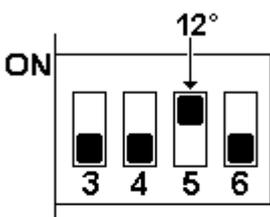


- for a 4 cylinder engine:
3° (of micro switch 3) + 12° (of micro switch 5) **Total 15°** of spark advance

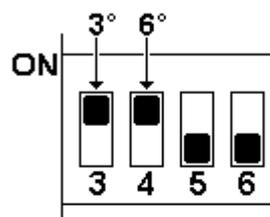
- for a 6 cylinder engine:
2° (of micro switch 3) + 8° (of micro switch 5) **Total 10°** of spark advance

- for a 8 cylinder engine:
1,5° (of micro switch 3) + 6° (of micro switch 5) **Total 7,5°** of spark advance

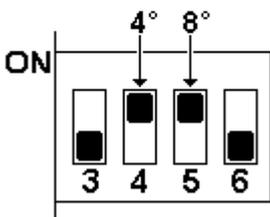
RECOMMENDED SPARK ADVANCE DEGREES FOR TYPE OF FUEL AND NUMBER OF ENGINE CYLINDERS



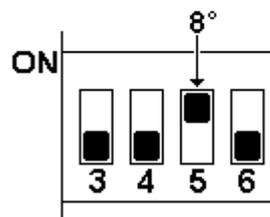
for a 4 cylinder engine fed with C.N.G. with 12° of spark advance



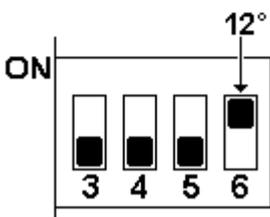
for a 4 cylinder engine fed with L.P.G. with 9° of spark advance



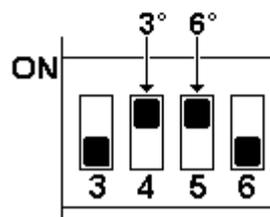
for a 6 cylinder engine fed with C.N.G. with 12° of spark advance



for a 6 cylinder engine fed with L.P.G. with 8° of spark advance



for a 8 cylinder engine fed with C.N.G. with 12° of spark advance

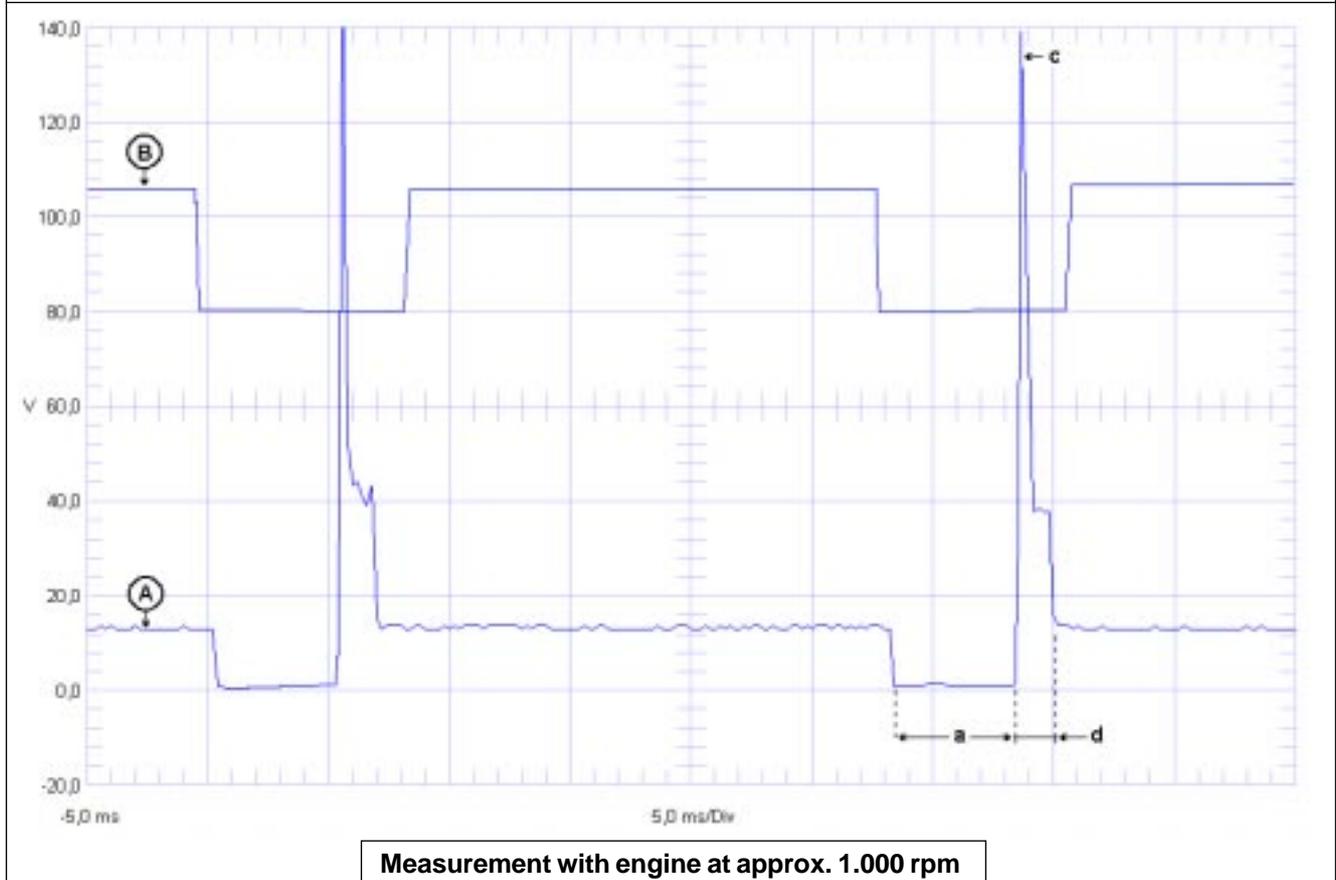


for a 8 cylinder engine fed with L.P.G. with 9° of spark advance

The values reported in the table are recommended according to our experience; in any case, you can carry out different adjustments to better adapt the Variator to the different engine features.

**Electronic Spark Advance Variator DIS - 92
Code 527**

Before installing the variator, by means of an oscilloscope on the two coil negative side and on the signal wire of the Hall - Effect sensor you can measure the following wave forms.



Trace A (10 V / division) = Signal measured on a coil negative side - 11 -.

Trace B (10 V / division) = Signal measured on the signal wire of the Hall - Effect sensor - 9 -.

a = Loading time (time in which the ignition module circulates the current to load the coil).

c = Spark.

d = Unloading time of the energy stored by the coil on the spark electrodes (spark duration).

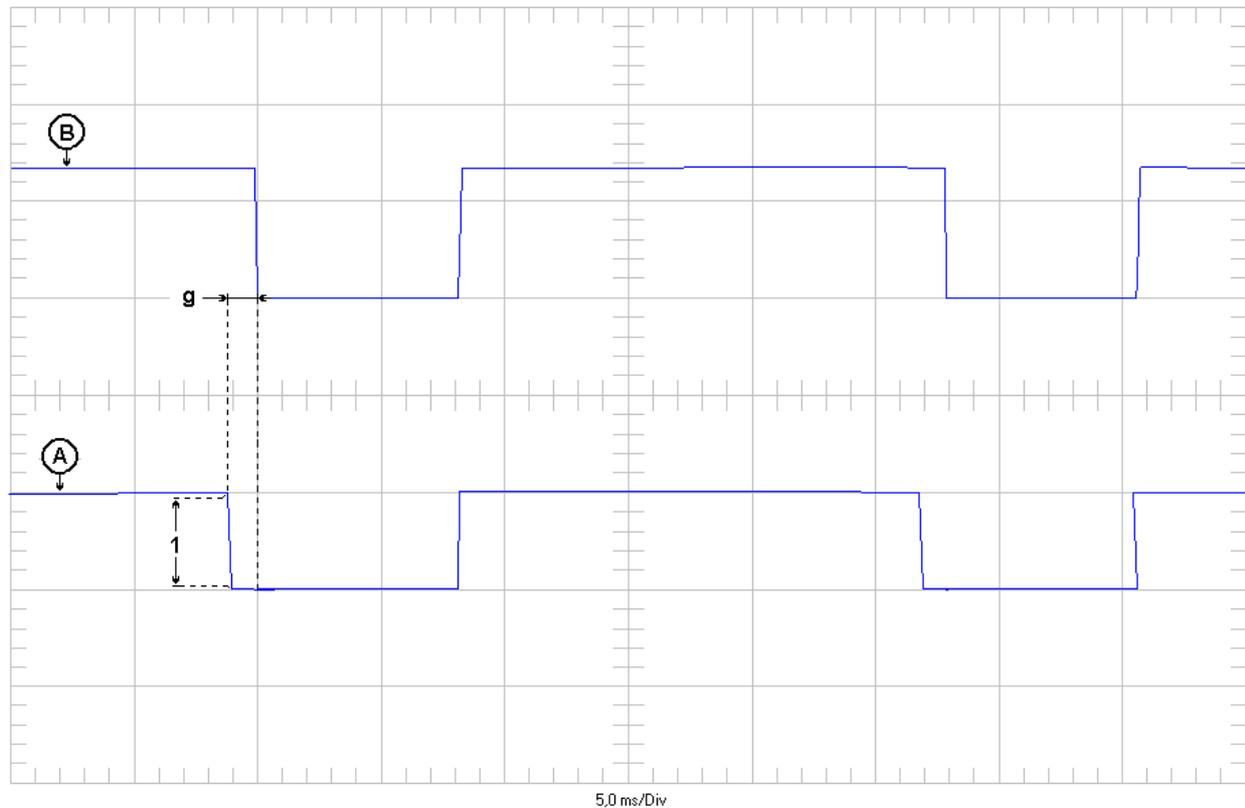
The signal on the Hall - Effect sensor displayed on trace - **B** - is used by the electronic ignition to calculate the ignition spark advance point.

Below is a list of the most common cars where DIS - 92 works correctly:

Audi - Volkswagen:	Any model with carburettor and electronic ignition Any model with Bosch single injector Any model with Digifant injection Any model with K - jetronic injection
Opel:	Vectra 1.6 with carburettor
Saab:	900i
SEAT:	Any model with carburettor and electronic ignition Any model with Bosch single injector
Skoda:	Any model with Bosch single injector

**Electronic Spark Advance Variator DIS - 92
Code 527**

After the installation of the variator, with the oscilloscope and two traces you can display what follows.



Measurement with engine at approx. 1.000 rpm

Trace A (5 V / division) = Anticipated signal measured on the brown wire of the variator **6** (ignition module side **12**).

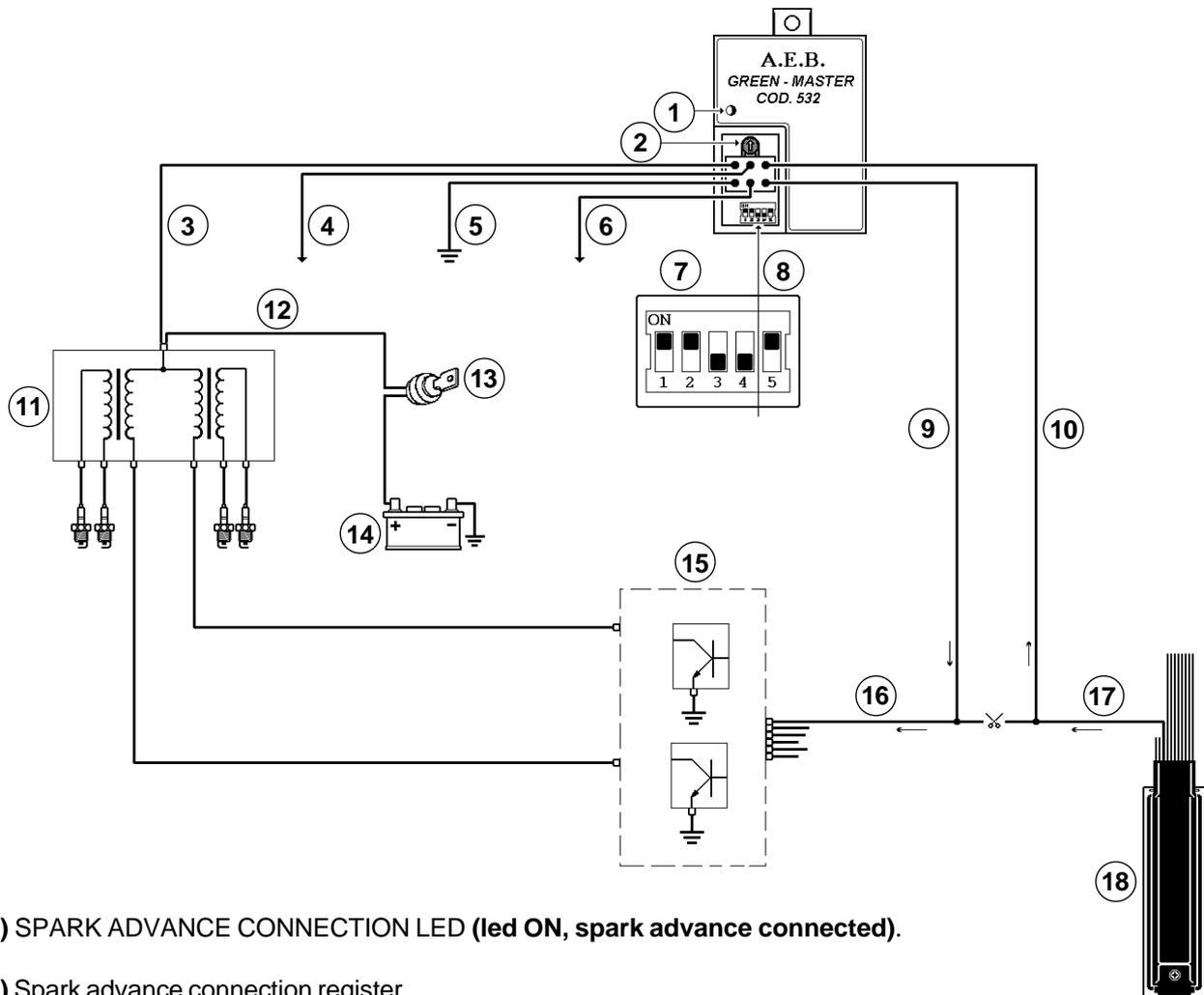
Trace B (10 V / division) = Signal measured on the black wire of the variator **7** (distributor side with Hall - sensor **8**).

1 = Reference that uses the electronic ignition to start the ignition calculation.

g = Spark advance given by the variator.

**Electronic Spark Advance Variator GREEN - MASTER
Code 532**

Install the **Green - Master Code 532** on FORD vehicles with static ignition system with Motorcraft EDIS module.



1) SPARK ADVANCE CONNECTION LED (led ON, spark advance connected).

2) Spark advance connection register.

3) RED WIRE to be connected to the + 12 V under key (+ 15) of the ignition coil **(11)**.

Contact (+ 15) of coil **(15)** is connected by means of wire **(12)** to the ignition key **(13)** and from this latter to the positive side of the battery **(14)** in order to have power supply only with instrument panel switched on.

4) BLUE WIRE to be connected to the BLU GAS outlet wire.

5) YELLOW - GREEN WIRE to be connected to GROUND.

6) VIOLET WIRE to be connected to the THROTTLE POTENTIOMETER signal (if the VIOLET wire of the Variator is not connected to the throttle potentiometer, it must be connected to the + 12 V under key RED wire of the Variator).

7) Micro switches 1, 2, 3, 4 (SPARK ADVANCE DEGREE ADJUSTMENT).

8) Micro switch 5 (spark advance curve selection, C.N.G. or L.P.G.).

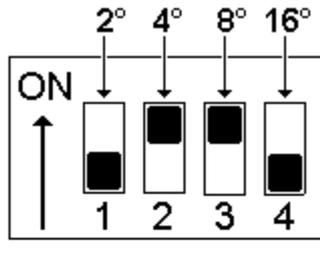
9) BROWN WIRE (Variator output signal) to be connected to the **SPOUT signal wire (16)** entering the ignition module **(15)** and supplying the ignition control to coils **(11)**.

10) BLACK WIRE (Variator input signal) to be connected to the **SPOUT signal wire (17)** coming out from the ignition central unit **(18)**.

11) Ignition coils.

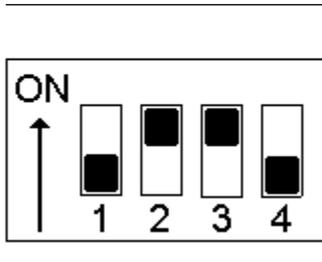
SPARK ADVANCE ADJUSTMENT

By means of micro switches 1, 2, 3, 4 that have the same spark advance value with a 4, 6, 8 cylinder engine, you can select the correct spark advance value. To do this it is necessary to set one or more micro switches to "ON".



FOR 4, 6, 8 CYLINDER ENGINES

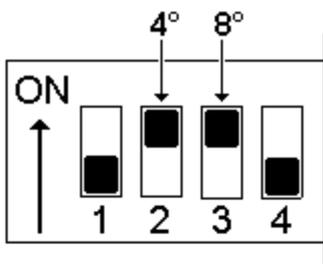
- Remember that by setting more micro switches to ON at the same time, the spark advance value is summed. - Example: by setting micro switches 2 and 3 to ON, you obtain the following spark advance:



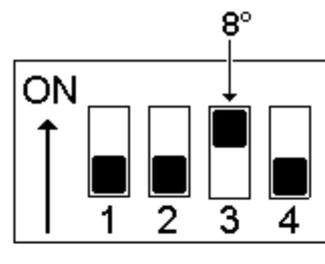
- for 4, 6, 8 cylinder engines:

4° (of micro switch 2) + 8° (of micro switch 3) **Total 12°** of spark advance

RECOMMENDED SPARK ADVANCE DEGREES FOR TYPE OF FUEL AND NUMBER OF ENGINE

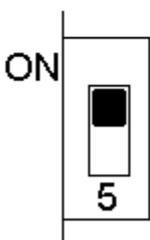


for a 4, 6, 8 cylinder engine fed with L.P.G. with 8° of spark advance

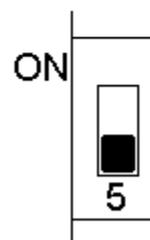


for a 4, 6, 8 cylinder engine fed with L.P.G. with 12° of spark advance

CYLINDERS RECOMMENDED SPARK ADVANCE CURVE FOR C.N.G. OR L.P.G.



Recommended advance curve for the C.N.G. operation



Recommended advance curve for the L.P.G. operation

The values reported in the table are recommended according to our experience; in any case, you can carry out different adjustments to better adapt the Variator to the different engine features.

HOW AND WHEN TO DISCONNECT THE SPARK ADVANCE

On some cars, it is recommendable to disconnect the spark advance while decelerating and idling, to avoid jerks or irregular operations. On the other hand, the spark advance is used immediately while accelerating in order to improve performance, consumption and to reduce at a minimum the risk of backfire. With the **Green - Master** Variator, the spark advance can be connected or disconnected automatically by connecting the **VIOLET WIRE** of the Variator to one of these signals:

- throttle potentiometer **Picture 1 (T.P.S. or accelerator position sensor)**;
- to the throttle switch that indicates when the accelerator is idling or when you are accelerating.

THROTTLE POTENTIOMETER

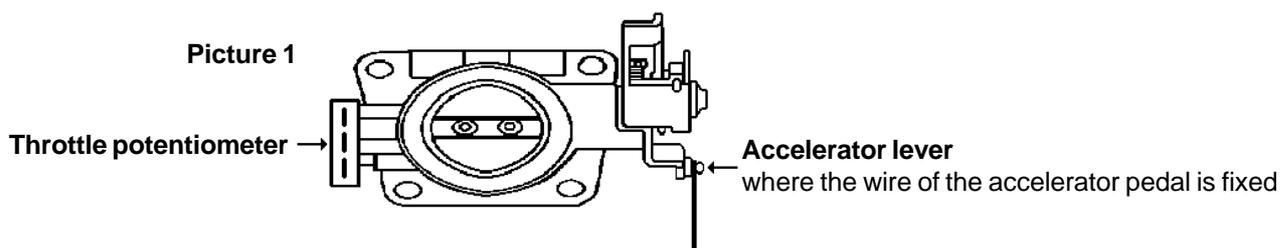
The **throttle potentiometer** or **accelerator position sensor (T.P.S.)** is always on the side opposite the accelerator lever and indicate the throttle position. By using this signal, the Spark Advance Variator can know at any moment if the engine is idling or accelerating to connect or disconnect the spark advance. Generally, the throttle potentiometer receives **3 wires** (even if some models can have more than one) with the following signals:

- **Power supply.**
- **Ground.**
- **Variable signal according to the throttle position.**

For a correct operation of the Spark Advance Variator, it is necessary that the **variable signal** of the throttle has one of these types of range:

- **0,5 V with idling accelerator**, to arrive up to **4,5 V with completely pressed accelerator**. In this case, the voltage increases gradually by following the accelerator position (**linear potentiometer**).
- **0,5 V with idling accelerator**, to arrive up to **4,5 V or 12 V with completely pressed accelerator**. In this case, as soon as you press the accelerator the voltage arrives to the maximum value (**switch - type potentiometer**).

If the range of the VARIABLE SIGNAL of the throttle potentiometer is not equal to at least on of the previously seen cases, we suggest to connect the VIOLET WIRE of the Spark Advance Variator to the + 12 V under key (RED WIRE of the Spark Advance Variator).



When idling, the signal of the **Throttle Potentiometer** is not always the same, because there can be small differences due to the different calibrations; therefore, in the Variator there is a calibration of the connection point. The adjustment is carried out by operating on the **spark advance register** in the following way:

- 1) check that the register is completely rotated in clockwise direction;

SPARK ADVANCE CONNECTION REGISTER →



- 2) with idling car, start to rotate the register in counterclockwise direction until the LED switches off (spark advance disconnected);

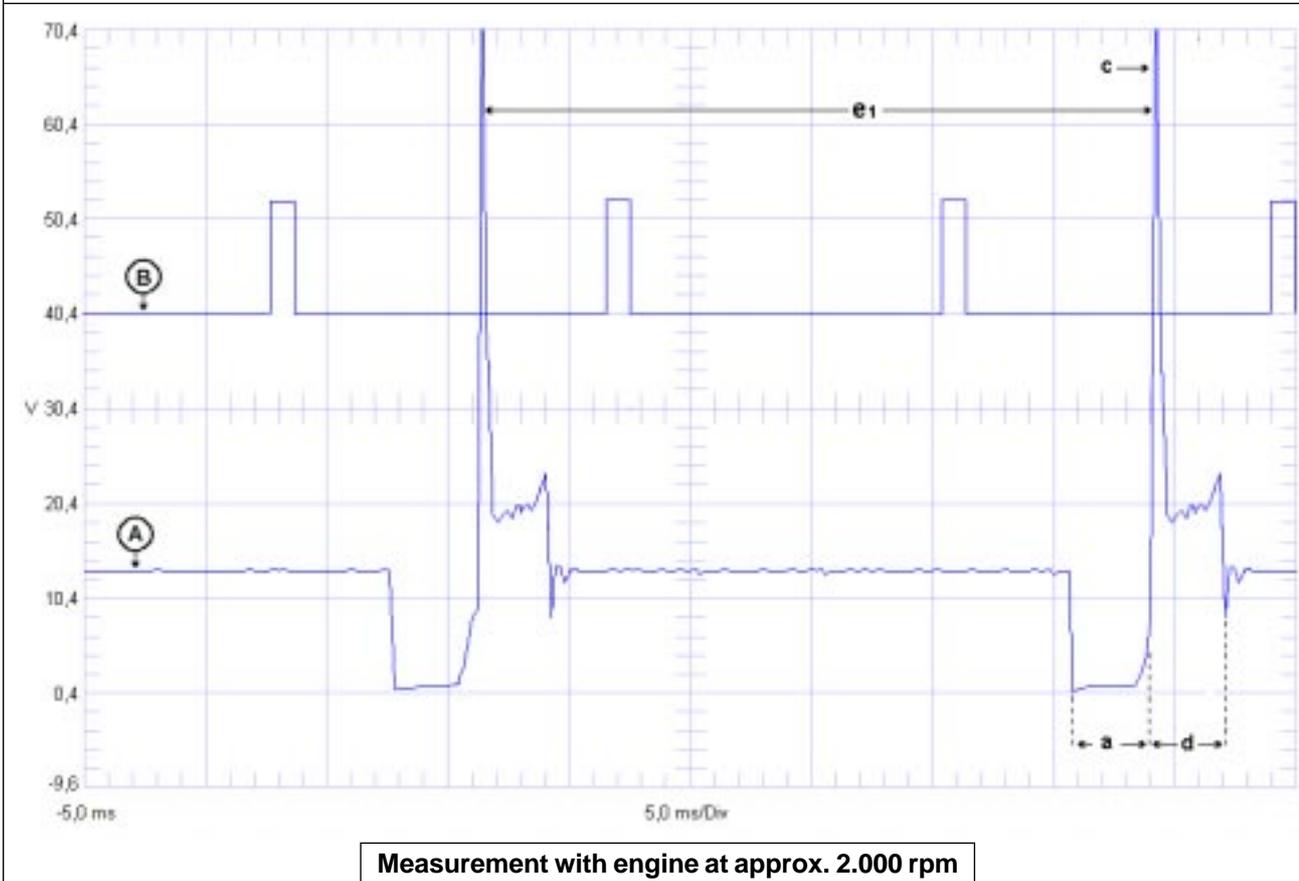
LED ON = SPARK ADVANCE CONNECTED →



- 3) after this adjustment, when you accelerate the LED on the Variator switches on again to switch off when you release the accelerator.

**Electronic Spark Advance Variator GREEN - MASTER
Code 532**

Before installing the variator, by means of an oscilloscope on the two coil negative side and on the SPOUT signal wire of the EDIS module you can measure the following wave forms.



Trace A (10 V / division) = Signal measured on a coil negative side - 11 -.

Trace B (10 V / division) = Signal measured on the SPOUT signal wire of the EDIS module - 17 -.

a = Loading time (time in which the ignition module circulates the current to load the coil). This is controlled by the EDIS module - 17 -.

c = Spark.

d = Unloading time of the energy stored by the coil on the spark electrodes (spark duration).

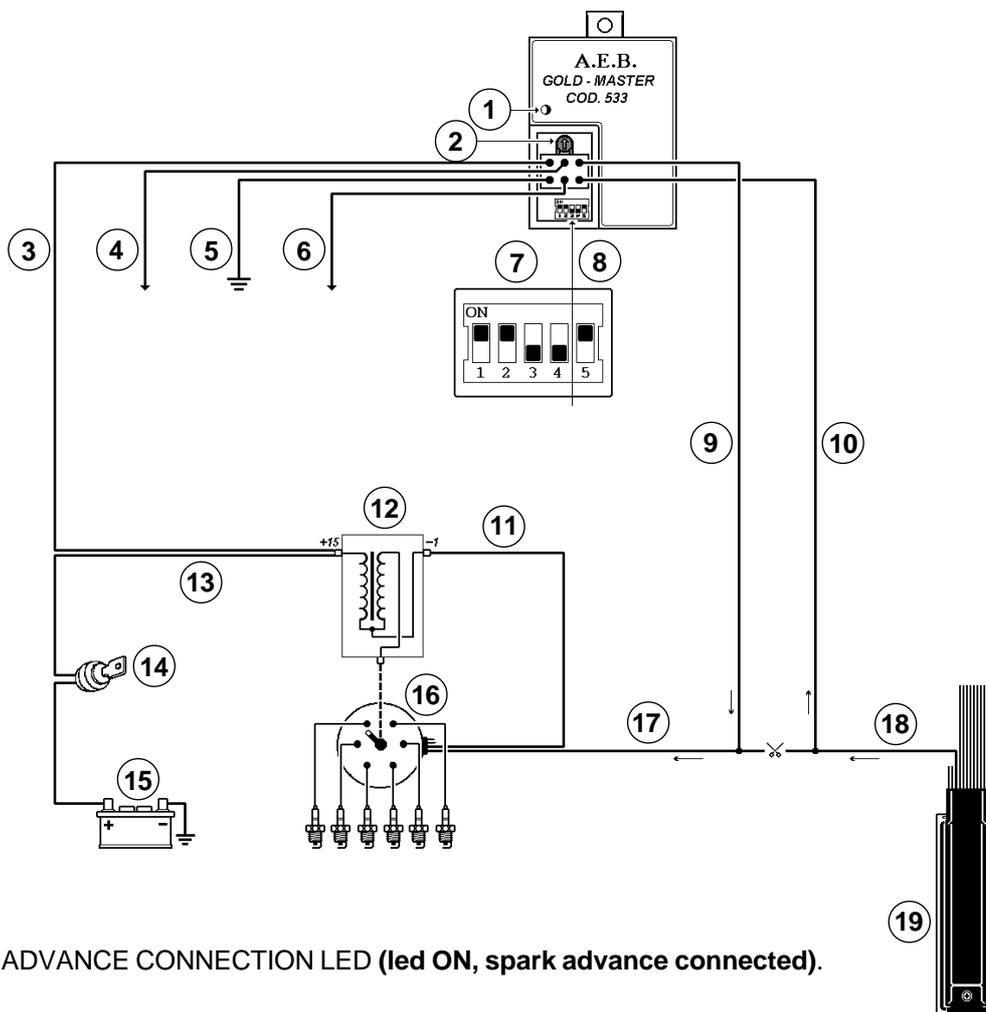
e1 = Period between a spark and the other of the same coil (360° of revolution of the engine shaft).

The SPOUT signal displayed on trace **B** is used by the EDIS module only to calculate the ignition spark advance.

CAUTION: by leaving the SPOUT wire interrupted, the car continues to run with a fix emergency spark advance.

Electronic Spark Advance Variator GOLD - MASTER
Code 533

Install the **Gold - Master Code 533** on FORD vehicles with static ignition system with current distributor and TFI module.



1) SPARK ADVANCE CONNECTION LED (led ON, spark advance connected).

2) Spark advance connection register.

3) RED WIRE to be connected to the + 12 V under key (+ 15) of the ignition coil (**12**).

Contact (+ 15) of coil (**12**) is connected by means of wire (**13**) to the ignition key (**14**) and from this latter to the positive side of the battery (**15**) in order to have power supply only with instrument panel switched on.

4) BLUE WIRE to be connected to the BLU GAS outlet wire.

5) YELLOW - GREEN WIRE to be connected to GROUND.

6) VIOLET WIRE to be connected to the THROTTLE POTENTIOMETER signal (if the VIOLET wire of the Variator is not connected to the throttle potentiometer, it must be connected to the + 12 V under key RED wire of the Variator).

7) Micro switches 1, 2, 3, 4 (SPARK ADVANCE DEGREE ADJUSTMENT).

8) Micro switch 5 (spark advance curve selection, C.N.G. or L.P.G.).

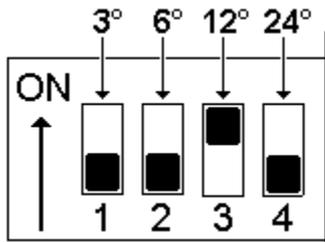
9) BROWN WIRE (Variator output signal) to be connected to the **SPOUT SIGNAL** wire (**17**) that enters the ignition module (**TFI**) connected to the distributor (**16**).

10) BLACK WIRE (Variator input signal) to be connected to the **SPOUT** signal wire (**18**) coming out from the ignition central unit (**19**).

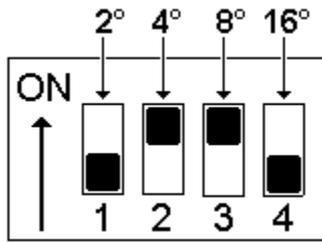
11) Coil negative wire (12) coming out from the ignition module (**TFI**) connected to the distributor (**16**).

SPARK ADVANCE ADJUSTMENT

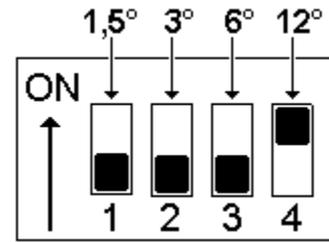
By means of micro switches 1, 2, 3, 4, that have a different value according to the number of cylinders of the engine on which the Variator has been installed, you can select the correct spark advance value. To do this it is necessary to set one or more micro switches to "ON".



FOR 4 CYLINDER ENGINE

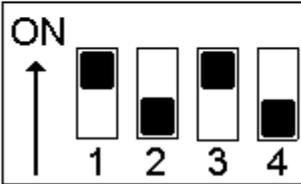


FOR 6 CYLINDER ENGINE



FOR 8 CYLINDER ENGINE

- Remember that by setting more micro switches to ON at the same time, the spark advance value is summed. - Example: by setting micro switches 1 and 3 to ON, you obtain the following spark advance:

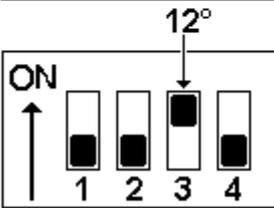


- for a 4 cylinder engine:
3° (of micro switch 1) + 12° (of micro switch 3) **Total 15°** of spark advance

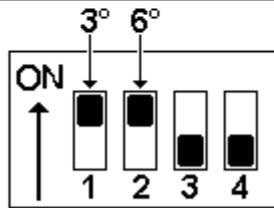
- for a 6 cylinder engine:
2° (of micro switch 1) + 8° (of micro switch 3) **Total 10°** of spark advance

- for a 8 cylinder engine:
1,5° (of micro switch 1) + 6° (of micro switch 3) **Total 7,5°** of spark advance

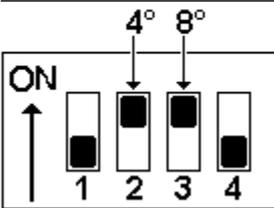
RECOMMENDED SPARK ADVANCE DEGREES FOR TYPE OF FUEL AND NUMBER OF ENGINE



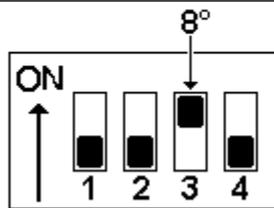
for a 4 cylinder engine fed with C.N.G. with 12° of spark advance



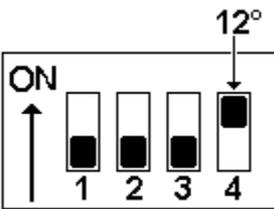
for a 4 cylinder engine fed with L.P.G. with 9° of spark advance



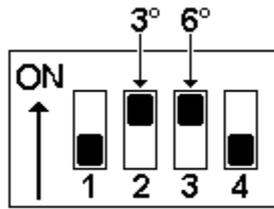
for a 6 cylinder engine fed with C.N.G. with 12° of spark advance



for a 6 cylinder engine fed with L.P.G. with 8° of spark advance

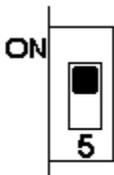


for a 8 cylinder engine fed with C.N.G. with 12° of spark advance

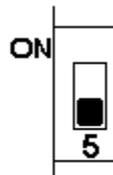


for a 8 cylinder engine fed with L.P.G. with 9° of spark advance

CYLINDERS RECOMMENDED SPARK ADVANCE CURVE FOR C.N.G. OR L.P.G.



Recommended advance curve for the C.N.G. operation



Recommended advance curve for the L.P.G. operation

The values reported in the table are recommended according to our experience; in any case, you can carry out different adjustments to better adapt the Variator to the different engine features.

HOW AND WHEN TO DISCONNECT THE SPARK ADVANCE

On some cars, it is recommendable to disconnect the spark advance while decelerating and idling, to avoid jerks or irregular operations. On the other hand, the spark advance is used immediately while accelerating in order to improve performance, consumption and to reduce at a minimum the risk of backfire. With the **Gold - Master** Variator, the spark advance can be connected or disconnected automatically by connecting the **VIOLET WIRE** of the Variator to one of these signals:

- throttle potentiometer **Picture 1 (T.P.S. or accelerator position sensor)**;
- to the throttle switch that indicates when the accelerator is idling or when you are accelerating.

THROTTLE POTENTIOMETER

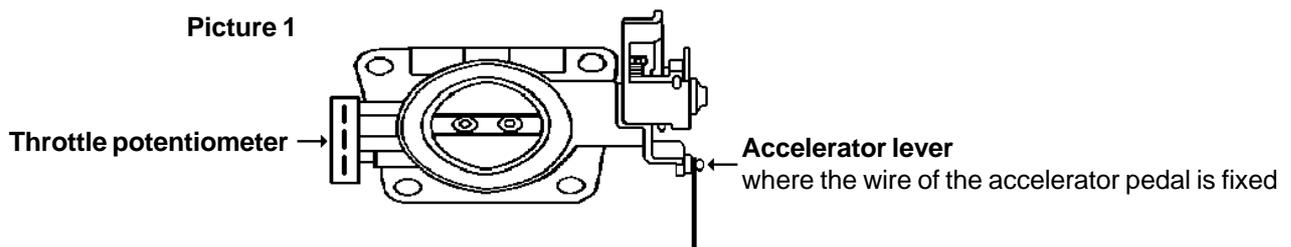
The **throttle potentiometer** or **accelerator position sensor (T.P.S.)** is always on the side opposite the accelerator lever and indicate the throttle position. By using this signal, the Spark Advance Variator can know at any moment if the engine is idling or accelerating to connect or disconnect the spark advance. Generally, the throttle potentiometer receives **3 wires** (even if some models can have more than one) with the following signals:

- **Power supply.**
- **Ground.**
- **Variable signal according to the throttle position.**

For a correct operation of the Spark Advance Variator, it is necessary that the **variable signal** of the throttle has one of these types of range:

- **0,5 V with idling accelerator**, to arrive up to **4,5 V with completely pressed accelerator**. In this case, the voltage increases gradually by following the accelerator position (**linear potentiometer**).
- **0,5 V with idling accelerator**, to arrive up to **4,5 V or 12 V with completely pressed accelerator**. In this case, as soon as you press the accelerator the voltage arrives to the maximum value (**switch - type potentiometer**).

If the range of the VARIABLE SIGNAL of the throttle potentiometer is not equal to at least on of the previously seen cases, we suggest to connect the VIOLET WIRE of the Spark Advance Variator to the + 12 V under key (RED WIRE of the Spark Advance Variator).



When idling, the signal of the **Throttle Potentiometer** is not always the same, because there can be small differences due to the different calibrations; therefore, in the Variator there is a calibration of the connection point. The adjustment is carried out by operating on the **spark advance register** in the following way:

- 1) check that the register is completely rotated in clockwise direction;

SPARK ADVANCE CONNECTION REGISTER →



- 2) with idling car, start to rotate the register in counterclockwise direction until the LED switches off (spark advance disconnected);

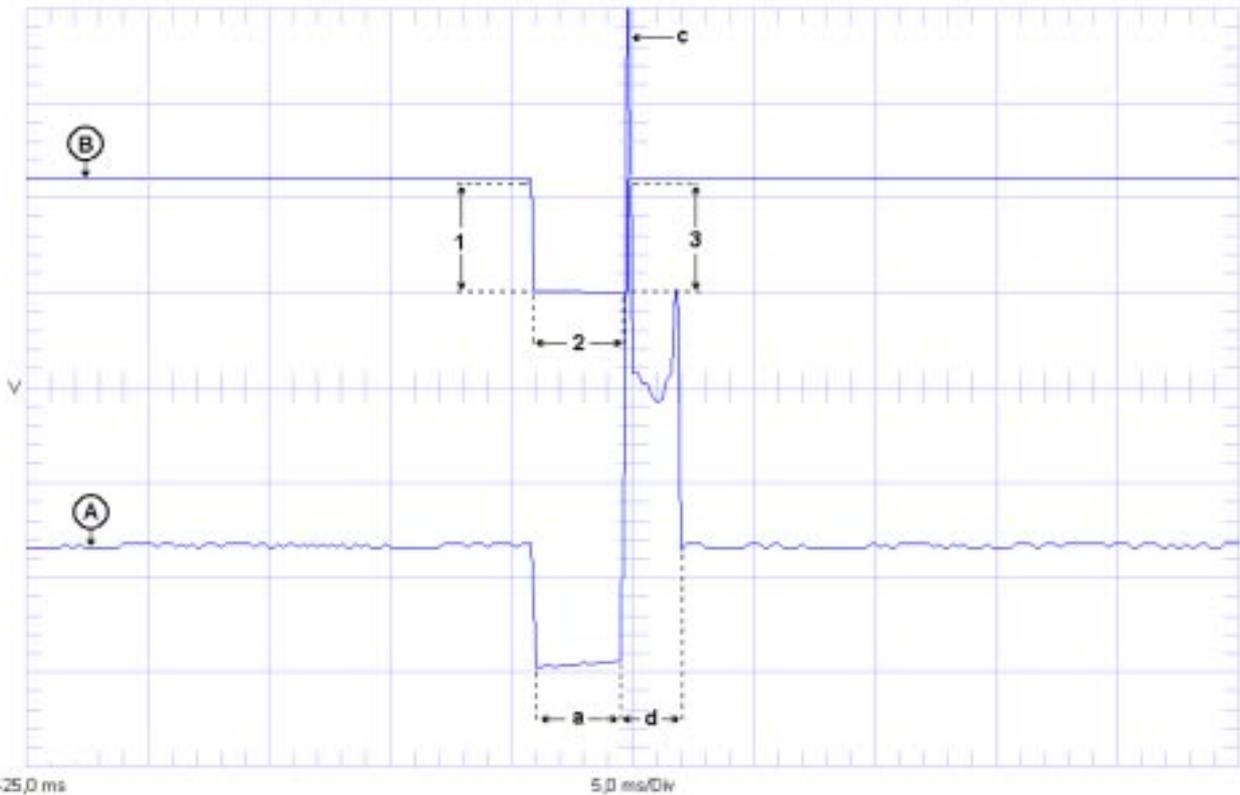
LED ON = SPARK ADVANCE CONNECTED →



- 3) after this adjustment, when you accelerate the LED on the Variator switches on again to switch off when you release the accelerator.

Electronic Spark Advance Variator GOLD - MASTER
Code 533

Before installing the variator, by means of an oscilloscope on the two coil negative side and on the SPOUT signal wire of the TFI ignition module you can measure the following wave forms.



Measurement with engine at approx. 1.000 rpm

Trace A (10 V / division) = Signal measured on a coil negative side - 11 -.

Trace B (10 V / division) = Signal measured on the SPOUT signal wire of the TFI module - 17 -.

a = Loading time (time in which the ignition module circulates the current to load the coil). This is controlled by the injection - ignition central unit.

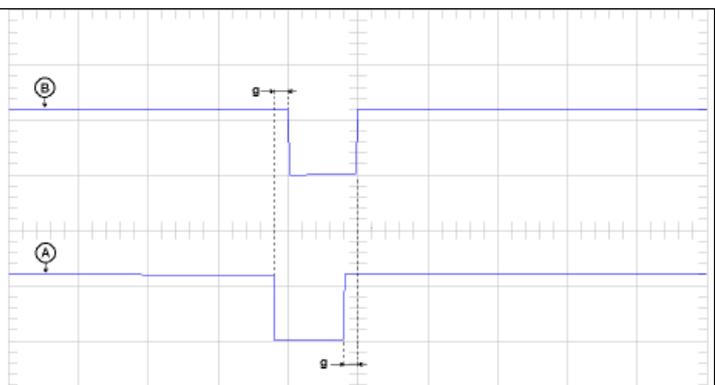
c = Spark.

d = Unloading time of the energy stored by the coil on the spark electrodes (spark duration).

The signal displayed on trace B is interpreted by the ignition module in the following way:

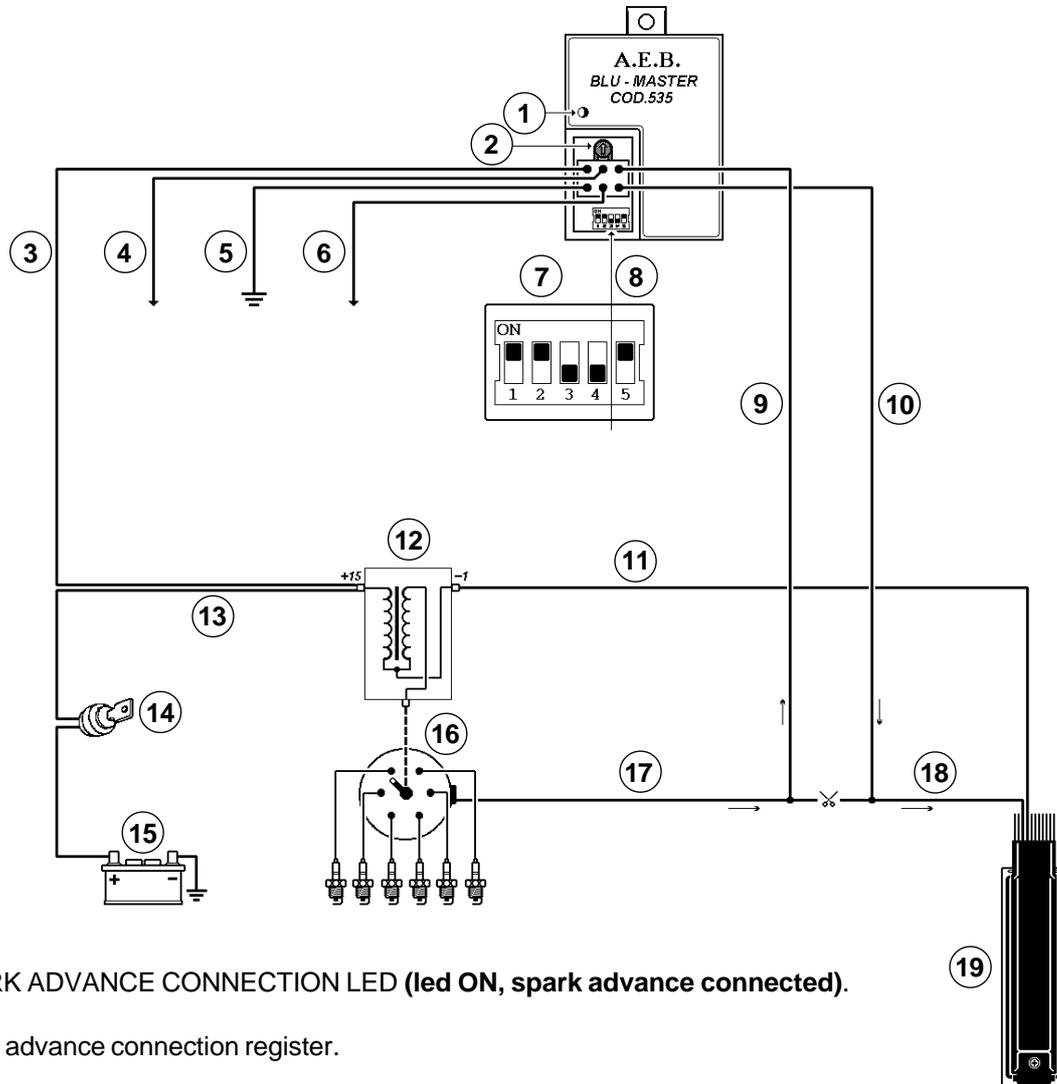
- 1) Decrease from 12 ÷ 0 V = coil loading start.
- 2) Constant voltage = coil loading.
- 3) Increase from 0 ÷ 12 V approx. = end of loading, spark between the spark plug electrodes.

After installing the variator, you can check that the input signal on the black wire 9 (trace B) and the signal on the brown wire 8 (trace A) are the same but only phase - displaced of the set spark advance - g -.



**Electronic Spark Advance Variator BLUE - MASTER
Code 535**

Install the **Blue - Master Code 535** variator on old CHRYSLER cars with ignition system made up of: coil, electronic ignition and Hall - Effect phase sensor in the distributor.



1) SPARK ADVANCE CONNECTION LED (led ON, spark advance connected).

2) Spark advance connection register.

3) RED WIRE to be connected to the + 12 V under key (+ 15) of the ignition coil (15).

Contact (+ 15) of coil (12) is connected by means of wire (13) to the ignition key (14) and from this latter to the positive side of the battery (15) in order to have power supply only with instrument panel switched on.

4) BLUE WIRE to be connected to the BLU GAS outlet wire.

5) YELLOW - GREEN WIRE to be connected to GROUND.

6) VIOLET WIRE to be connected to the THROTTLE POTENTIOMETER signal (if the VIOLET wire of the Variator is not connected to the throttle potentiometer, it must be connected to the + 12 V under key RED wire of the Variator).

7) Micro switches 1, 2, 3, 4 (SPARK ADVANCE DEGREE ADJUSTMENT).

8) Micro switch 5 (spark advance curve selection, C.N.G. or L.P.G.).

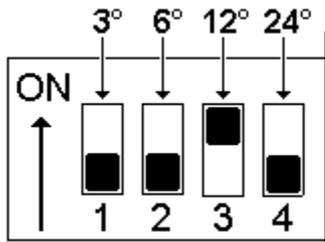
9) BLACK WIRE (Variator input signal) to be connected to the wire (17) coming out from the OPTICAL sensor inside the distributor (16).

10) BROWN WIRE (Variator ADVANCED output signal) to be connected to the wire (18) entering the injection central unit (19).

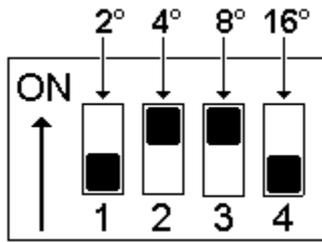
16) Distributor.

SPARK ADVANCE ADJUSTMENT

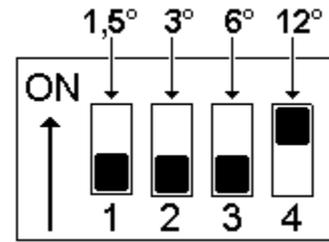
By means of micro switches 1, 2, 3, 4, that have a different value according to the number of cylinders of the engine on which the Variator has been installed, you can select the correct spark advance value. To do this it is necessary to set one or more micro switches to "ON".



FOR 4 CYLINDER ENGINE



FOR 6 CYLINDER ENGINE



FOR 8 CYLINDER ENGINE

- Remember that by setting more micro switches to ON at the same time, the spark advance value is summed. - Example: by setting micro switches 1 and 3 to ON, you obtain the following spark advance:

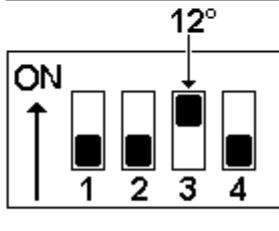


- for a 4 cylinder engine:
3° (of micro switch 1) + 12° (of micro switch 3) **Total 15°** of spark advance

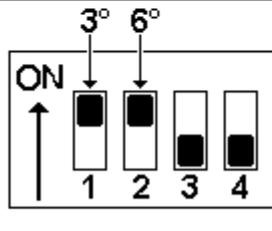
- for a 6 cylinder engine:
2° (of micro switch 1) + 8° (of micro switch 3) **Total 10°** of spark advance

- for a 8 cylinder engine:
1,5° (of micro switch 1) + 6° (of micro switch 3) **Total 7,5°** of spark advance

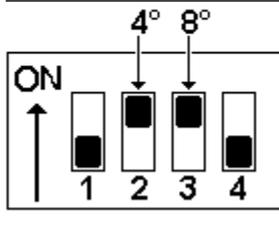
RECOMMENDED SPARK ADVANCE DEGREES FOR TYPE OF FUEL AND NUMBER OF ENGINE



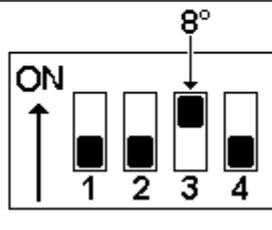
for a 4 cylinder engine fed with C.N.G. with 12° of spark advance



for a 4 cylinder engine fed with L.P.G. with 9° of spark advance



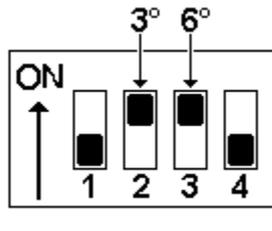
for a 6 cylinder engine fed with C.N.G. with 12° of spark advance



for a 6 cylinder engine fed with L.P.G. with 8° of spark advance

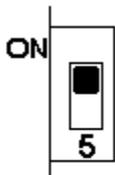


for a 8 cylinder engine fed with C.N.G. with 12° of spark advance



for a 8 cylinder engine fed with L.P.G. with 9° of spark advance

CYLINDERS RECOMMENDED SPARK ADVANCE CURVE FOR C.N.G. OR L.P.G.



Recommended advance curve for the C.N.G. operation



Recommended advance curve for the L.P.G. operation

The values reported in the table are recommended according to our experience; in any case, you can carry out different adjustments to better adapt the Variator to the different engine features.

HOW AND WHEN TO DISCONNECT THE SPARK ADVANCE

On some cars, it is recommendable to disconnect the spark advance while decelerating and idling, to avoid jerks or irregular operations. On the other hand, the spark advance is used immediately while accelerating in order to improve performance, consumption and to reduce at a minimum the risk of backfire. With the **Blue - Master** Variator, the spark advance can be connected or disconnected automatically by connecting the **VIOLET WIRE** of the Variator to one of these signals:

- throttle potentiometer **Picture 1 (T.P.S. or accelerator position sensor)**;
- to the throttle switch that indicates when the accelerator is idling or when you are accelerating.

THROTTLE POTENTIOMETER

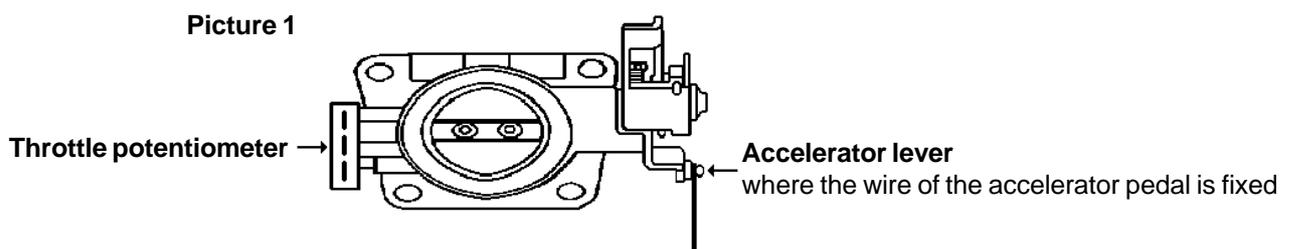
The **throttle potentiometer** or **accelerator position sensor (T.P.S.)** is always on the side opposite the accelerator lever and indicates the throttle position. By using this signal, the Spark Advance Variator can know at any moment if the engine is idling or accelerating to connect or disconnect the spark advance. Generally, the throttle potentiometer receives **3 wires** (even if some models can have more than one) with the following signals:

- **Power supply.**
- **Ground.**
- **Variable signal according to the throttle position.**

For a correct operation of the Spark Advance Variator, it is necessary that the **variable signal** of the throttle has one of these types of range:

- **0,5 V with idling accelerator**, to arrive up to **4,5 V with completely pressed accelerator**. In this case, the voltage increases gradually by following the accelerator position (**linear potentiometer**).
- **0,5 V with idling accelerator**, to arrive up to **4,5 V or 12 V with completely pressed accelerator**. In this case, as soon as you press the accelerator the voltage arrives to the maximum value (**switch - type potentiometer**).

If the range of the **VARIABLE SIGNAL** of the throttle potentiometer is not equal to at least on of the previously seen cases, we suggest to connect the **VIOLET WIRE** of the Spark Advance Variator to the **+ 12 V under key (RED WIRE of the Spark Advance Variator)**.



When idling, the signal of the **Throttle Potentiometer** is not always the same, because there can be small differences due to the different calibrations; therefore, in the Variator there is a calibration of the connection point. The adjustment is carried out by operating on the **spark advance register** in the following way:

- 1) check that the register is completely rotated in clockwise direction;

SPARK ADVANCE CONNECTION REGISTER →



- 2) with idling car, start to rotate the register in counterclockwise direction until the LED switches off (spark advance disconnected);

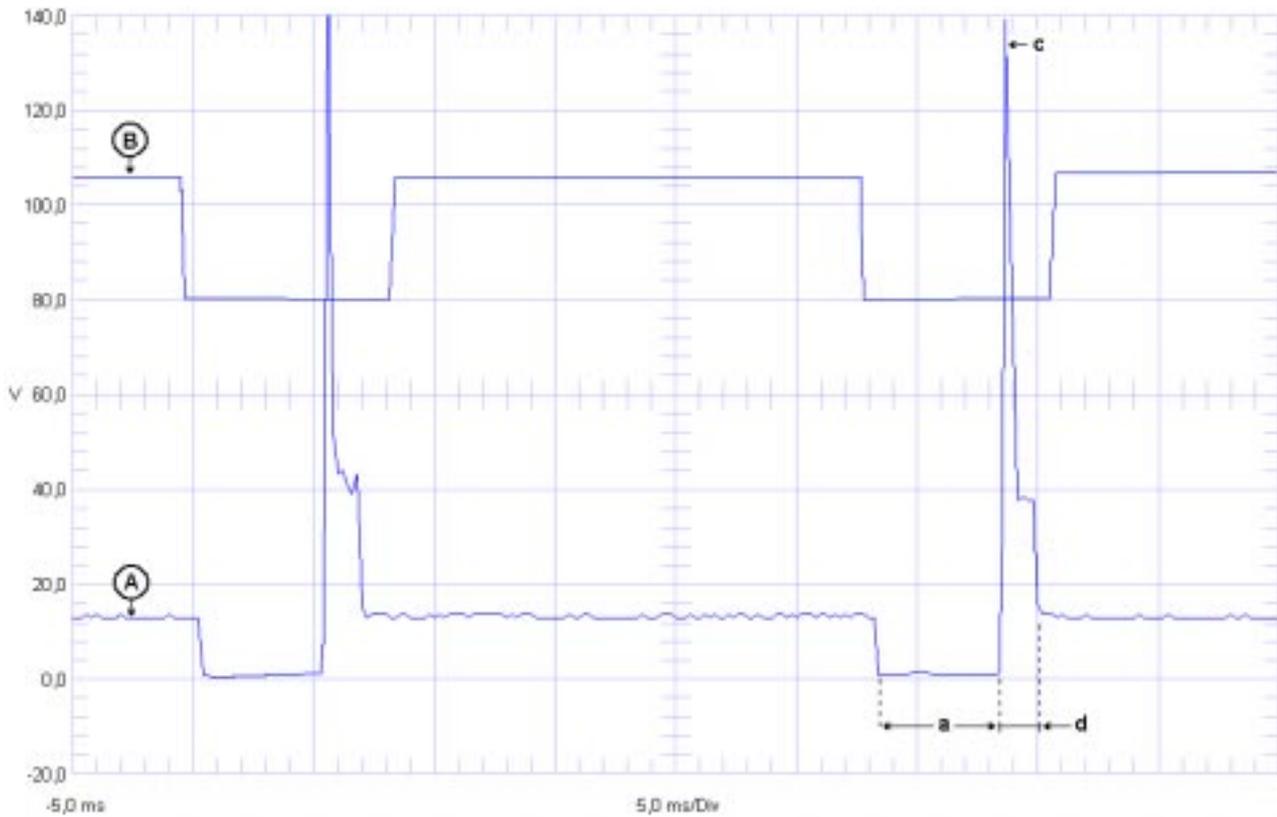
LED ON = SPARK ADVANCE CONNECTED →



- 3) after this adjustment, when you accelerate the LED on the Variator switches on again to switch off when you release the accelerator.

Electronic Spark Advance Variator BLUE - MASTER
Code 535

Before installing the variator, by means of an oscilloscope on the two coil negative side and on the signal wire of the Hall - Effect sensor you can measure the following wave forms.



Measurement with engine at approx. 1.000 rpm

Trace A (10 V / division) = Signal measured on a coil negative side - 11 -.

Trace B (5 V / division) = Signal measured on the signal wire of the Hall - Effect sensor - 17 -.

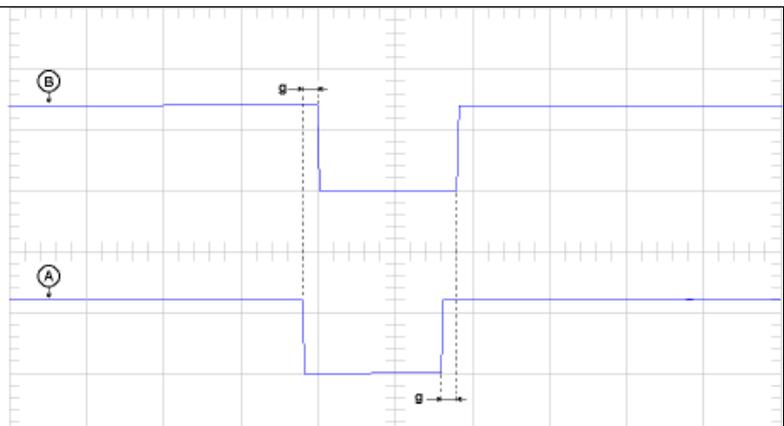
a = Loading time (time in which the ignition module circulates the current to load the coil). This is controlled by the injection - ignition central unit.

c = Spark.

d = Unloading time of the energy stored by the coil on the spark electrodes (spark duration).

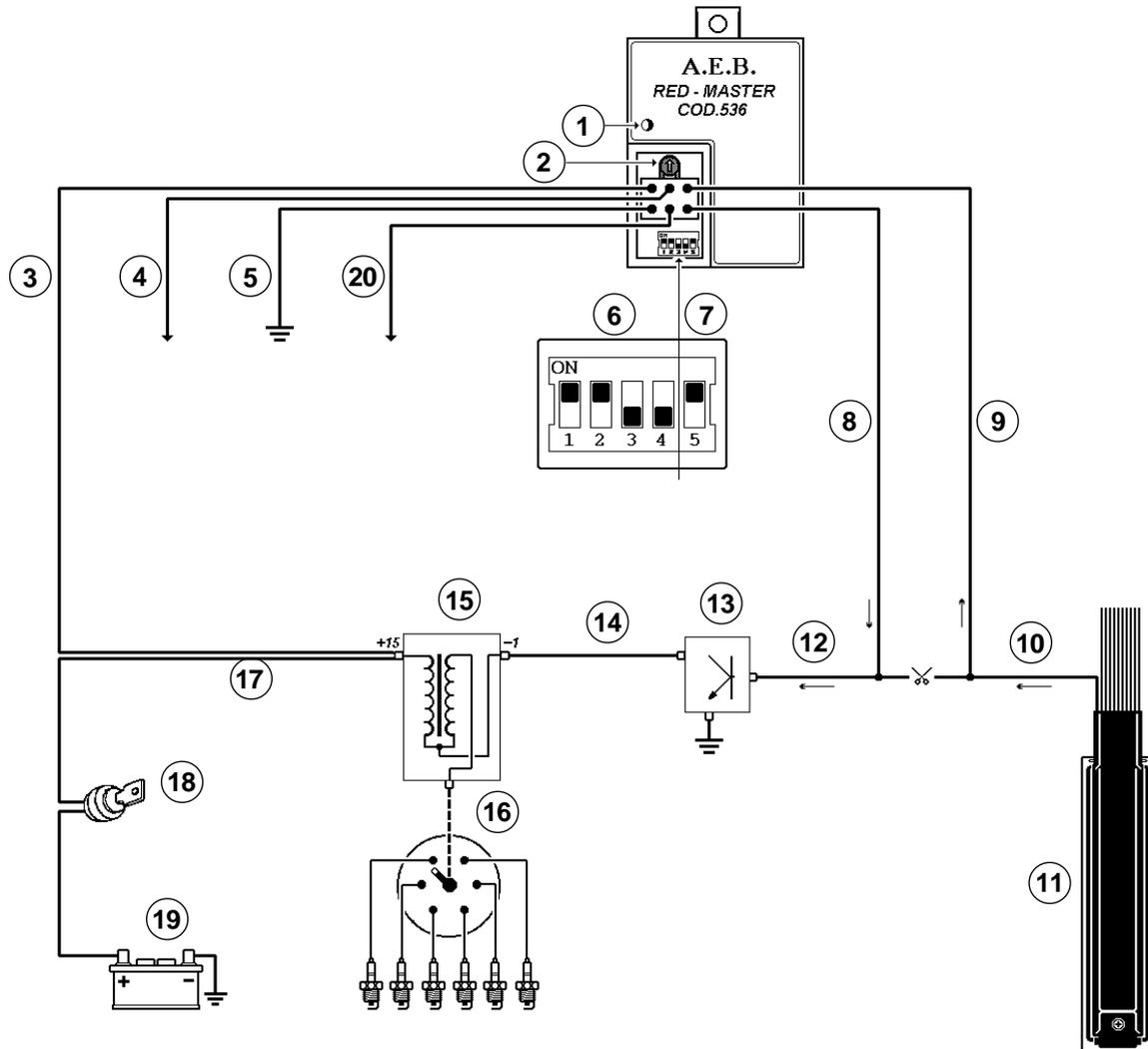
The signal on the Hall - Effect sensor displayed on trace - **B** - is used by the injection - ignition central unit to calculate the ignition spark advance point.

After the installation of the variator, you can check that the inlet signal on the black wire **9** (trace **B**) and the signal on the brown wire **8** (trace **A**) are equal but only phase - displaced of the spark advance- **g** -.



**Electronic Spark Advance Variator RED - MASTER
Code 536**

Install the **Red - Master Code 536** on GENERAL MOTORS vehicles with static ignition system or HEI, EST ,ESC ignition module.



1) SPARK ADVANCE CONNECTION LED (led ON, spark advance connected).

2) Spark advance connection register.

3) RED WIRE to be connected to the + 12 V under key (+ 15) of the ignition coil (**15**).

Contact (+ 15) of coil (**15**) is connected by means of wire (**17**) to the ignition key (**18**) and from this latter to the positive side of the battery (**19**) in order to have power supply only with instrument panel switched on.

4) BLUE WIRE to be connected to the BLU GAS outlet wire.

5) YELLOW - GREEN WIRE to be connected to GROUND.

6) Micro switches 1, 2, 3, 4 (SPARK ADVANCE DEGREE ADJUSTMENT).

7) Micro switch 5 (spark advance curve selection, C.N.G. or L.P.G.).

8) BROWN WIRE (Variator output signal) to be connected to the control wire (**12**) of the ignition module (**13**).

9) BLACK WIRE (Variator input signal) to be connected to the wire (**10**) coming out from the ignition central unit (**11**).

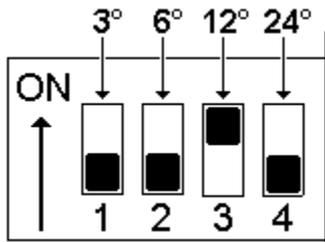
13) Ignition module connected by means of wire (**14**) to the negative side of ignition coil (**15**).

16) Distributor.

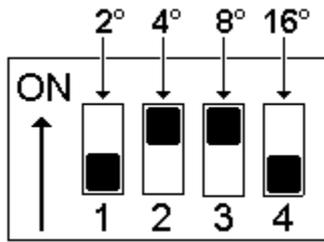
20) VIOLET WIRE to be connected to the THROTTLE POTENTIOMETER signal (if the violet wire of the Variator is not connected to the throttle potentiometer, it must be connected to the + 12 V under key RED wire of the Variator).

SPARK ADVANCE ADJUSTMENT

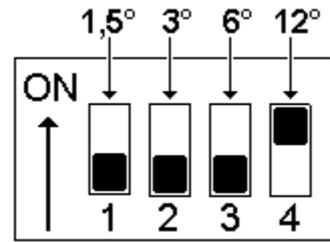
By means of micro switches 1, 2, 3, 4, that have a different value according to the number of cylinders of the engine on which the Variator has been installed, you can select the correct spark advance value. To do this it is necessary to set one or more micro switches to "ON".



FOR 4 CYLINDER ENGINE



FOR 6 CYLINDER ENGINE



FOR 8 CYLINDER ENGINE

- Remember that by setting more micro switches to ON at the same time, the spark advance value is summed. - Example: by setting micro switches 1 and 3 to ON, you obtain the following spark advance:



- for a 4 cylinder engine:
3° (of micro switch 1) + 12° (of micro switch 3) **Total 15°** of spark advance

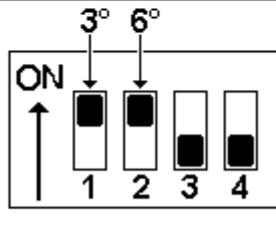
- for a 6 cylinder engine:
2° (of micro switch 1) + 8° (of micro switch 3) **Total 10°** of spark advance

- for a 8 cylinder engine:
1,5° (of micro switch 1) + 6° (of micro switch 3) **Total 7,5°** of spark advance

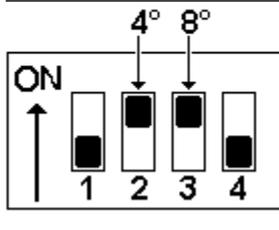
RECOMMENDED SPARK ADVANCE DEGREES FOR TYPE OF FUEL AND NUMBER OF ENGINE



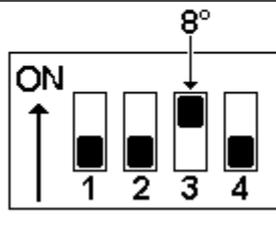
for a 4 cylinder engine fed with C.N.G. with 12° of spark advance



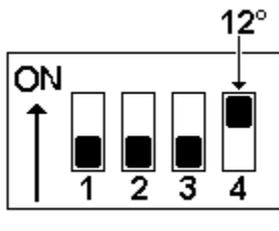
for a 4 cylinder engine fed with L.P.G. with 9° of spark advance



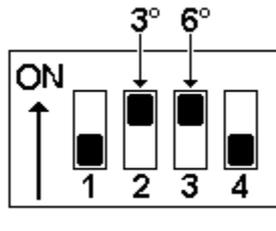
for a 6 cylinder engine fed with C.N.G. with 12° of spark advance



for a 6 cylinder engine fed with L.P.G. with 8° of spark advance

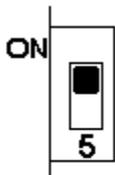


for a 8 cylinder engine fed with C.N.G. with 12° of spark advance

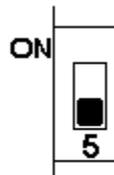


for a 8 cylinder engine fed with L.P.G. with 9° of spark advance

CYLINDERS RECOMMENDED SPARK ADVANCE CURVE FOR C.N.G. OR L.P.G.



Recommended advance curve for the C.N.G. operation



Recommended advance curve for the L.P.G. operation

The values reported in the table are recommended according to our experience; in any case, you can carry out different adjustments to better adapt the Variator to the different engine features.

HOW AND WHEN TO DISCONNECT THE SPARK ADVANCE

On some cars, it is recommendable to disconnect the spark advance while decelerating and idling, to avoid jerks or irregular operations. On the other hand, the spark advance is used immediately while accelerating in order to improve performance, consumption and to reduce at a minimum the risk of backfire. With the **Red - Master** Variator, the spark advance can be connected or disconnected automatically by connecting the **VIOLET WIRE** of the Variator to one of these signals:

- throttle potentiometer **Picture 1 (T.P.S. or accelerator position sensor)**;
- to the throttle switch that indicates when the accelerator is idling or when you are accelerating.

THROTTLE POTENTIOMETER

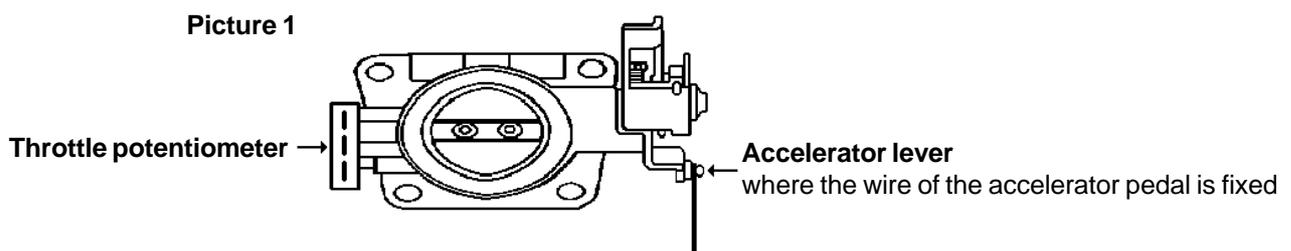
The **throttle potentiometer** or **accelerator position sensor (T.P.S.)** is always on the side opposite the accelerator lever and indicates the throttle position. By using this signal, the Spark Advance Variator can know at any moment if the engine is idling or accelerating to connect or disconnect the spark advance. Generally, the throttle potentiometer receives **3 wires** (even if some models can have more than one) with the following signals:

- **Power supply.**
- **Ground.**
- **Variable signal according to the throttle position.**

For a correct operation of the Spark Advance Variator, it is necessary that the **variable signal** of the throttle has one of these types of range:

- **0,5 V with idling accelerator**, to arrive up to **4,5 V with completely pressed accelerator**. In this case, the voltage increases gradually by following the accelerator position (**linear potentiometer**).
- **0,5V with idling accelerator**, to arrive up to **4,5 V or 12 V with completely pressed accelerator**. In this case, as soon as you press the accelerator the voltage arrives to the maximum value (**switch - type potentiometer**).

If the range of the **VARIABLE SIGNAL** of the throttle potentiometer is not equal to at least on of the previously seen cases, we suggest to connect the **VIOLET WIRE** of the Spark Advance Variator to the **+ 12 V under key (RED WIRE of the Spark Advance Variator)**.



When idling, the signal of the **Throttle Potentiometer** is not always the same, because there can be small differences due to the different calibrations; therefore, in the Variator there is a calibration of the connection point. The adjustment is carried out by operating on the **spark advance register** in the following way:

- 1) check that the register is completely rotated in clockwise direction;

SPARK ADVANCE CONNECTION REGISTER →



- 2) with idling car, start to rotate the register in counterclockwise direction until the LED switches off (spark advance disconnected);

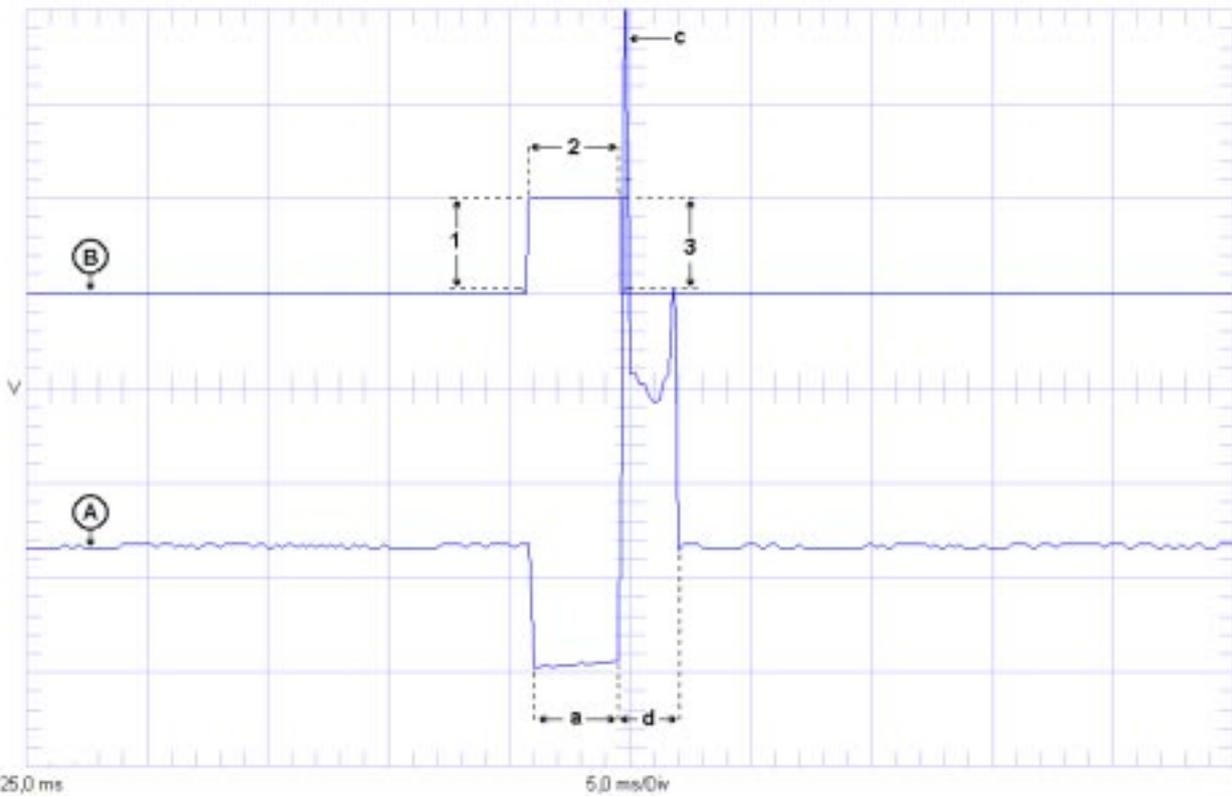
LED ON = SPARK ADVANCE CONNECTED →



- 3) after this adjustment, when you accelerate the LED on the Variator switches on again to switch off when you release the accelerator.

Electronic Spark Advance Variator RED - MASTER
Code 536

Before installing the variator, by means of an oscilloscope on the two coil negative side and on the input wire of the ignition amplifier module you can measure the following wave forms.



Measurement with engine at approx. 1.000 rpm

Trace A (10 V / division) = Signal measured on a coil negative side - 14 -.

Trace B (5 V / division) = Signal measured on the input of the ignition module - 12 -.

a = Loading time (time in which the ignition module circulates the current to load the coil). This is controlled by the injection - ignition central unit.

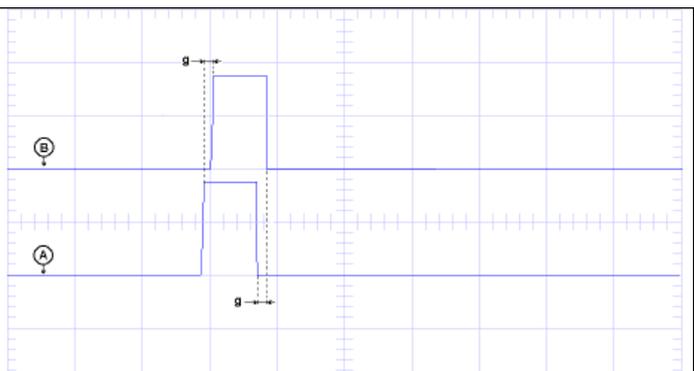
c = Spark.

d = Unloading time of the energy stored by the coil on the spark electrodes (spark duration).

The signal displayed on trace **B** is interpreted by the ignition module in the following way:

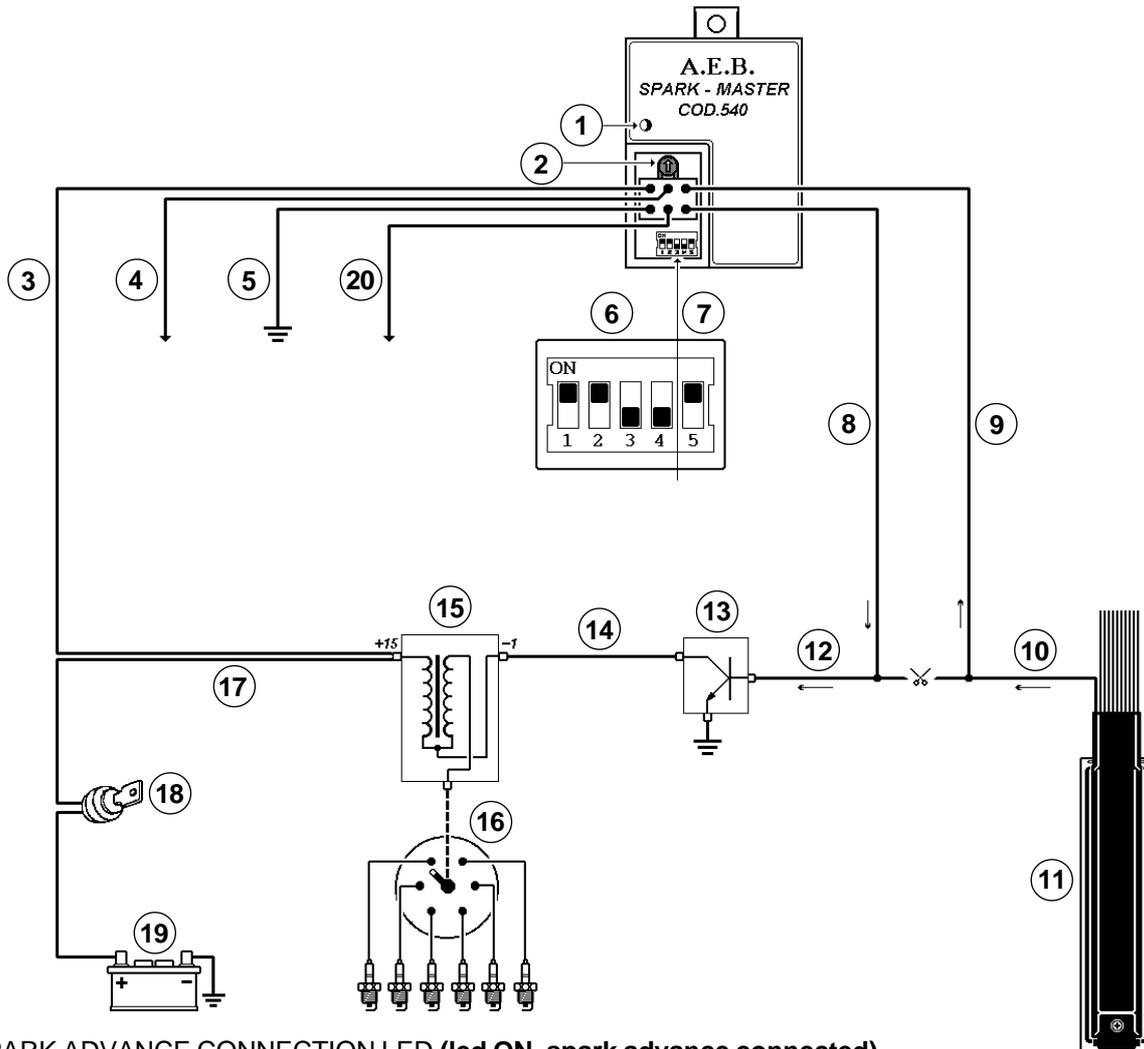
- 1) Increase from 0 ÷ 5 V = coil loading start.
- 2) Constant voltage = coil loading.
- 3) Decrease from 5 ÷ 0 V = end of loading, spark between the spark plug electrodes.

After installing the variator, you can check that the input signal on the black wire **9** (trace **B**) and the signal on the brown wire **8** (trace **A**) are the same but only phase - displaced of the set spark advance - **g** -.



Electronic Spark Advance Variator SPARK - MASTER Code 540

Install the **Spark - Master Code 540 - N** variator on cars with ignition system made up of: coil, ignition central unit built in the injection central unit, amplifier module and distributor.



1) SPARK ADVANCE CONNECTION LED (led ON, spark advance connected).

2) Spark advance connection register.

3) RED WIRE to be connected to the + 12 V under key (+ 15) of the ignition coil (15).

Contact (+ 15) of coil (15) is connected by means of wire (17) to the ignition key (18) and from this latter to the positive side of the battery (19) in order to have power supply only with instrument panel switched on.

4) BLUE WIRE to be connected to the BLU GAS outlet wire.

5) YELLOW - GREEN WIRE to be connected to GROUND.

6) Micro switches 1, 2, 3, 4 (SPARK ADVANCE DEGREE ADJUSTMENT).

7) Micro switch 5 (spark advance curve selection, C.N.G. or L.P.G.).

8) BROWN WIRE (Variator output signal) to be connected to the control wire (12) of the ignition module (13).

9) BLACK WIRE (Variator input signal) to be connected to the wire (10) coming out from the ignition central unit (11).

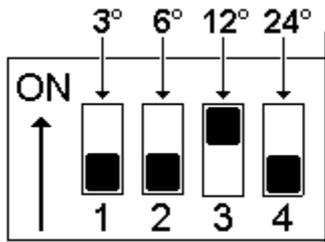
13) Ignition module connected by means of wire (14) to the negative side of ignition coil (15).

16) Distributor.

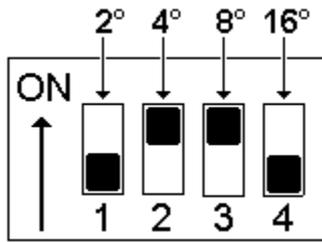
20) VIOLET WIRE to be connected to the THROTTLE POTENTIOMETER or DEBIMETER signal (in case these sensors do not exist, the Violet wire of the Variator must be connected to the + 12 V under key RED wire of the Variator).

SPARK ADVANCE ADJUSTMENT

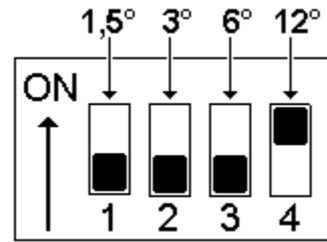
By means of micro switches 1, 2, 3, 4, that have a different value according to the number of cylinders of the engine on which the Variator has been installed, you can select the correct spark advance value. To do this it is necessary to set one or more micro switches to "ON".



FOR 4 CYLINDER ENGINE



FOR 6 CYLINDER ENGINE



FOR 8 CYLINDER ENGINE

- Remember that by setting more micro switches to ON at the same time, the spark advance value is summed. - Example: by setting micro switches 1 and 3 to ON, you obtain the following spark advance:

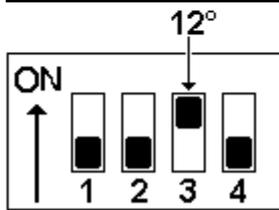


- for a 4 cylinder engine:
3° (of micro switch 1) + 12° (of micro switch 3) **Total 15°** of spark advance

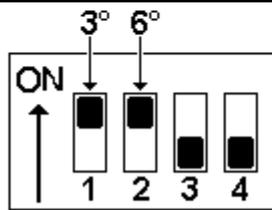
- for a 6 cylinder engine:
2° (of micro switch 1) + 8° (of micro switch 3) **Total 10°** of spark advance

- for a 8 cylinder engine:
1,5° (of micro switch 1) + 6° (of micro switch 3) **Total 7,5°** of spark advance

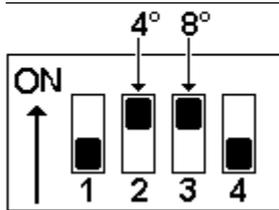
RECOMMENDED SPARK ADVANCE DEGREES FOR TYPE OF FUEL AND NUMBER OF ENGINE



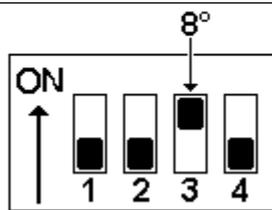
for a 4 cylinder engine fed with C.N.G. with 12° of spark advance



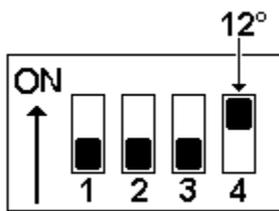
for a 4 cylinder engine fed with L.P.G. with 9° of spark advance



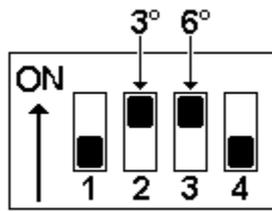
for a 6 cylinder engine fed with C.N.G. with 12° of spark advance



for a 6 cylinder engine fed with L.P.G. with 8° of spark advance

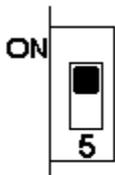


for a 8 cylinder engine fed with C.N.G. with 12° of spark advance



for a 8 cylinder engine fed with L.P.G. with 9° of spark advance

CYLINDERS RECOMMENDED SPARK ADVANCE CURVE FOR C.N.G. OR L.P.G.



Recommended advance curve for the C.N.G. operation



Recommended advance curve for the L.P.G. operation

The values reported in the table are recommended according to our experience; in any case, you can carry out different adjustments to better adapt the Variator to the different engine features.

HOW AND WHEN TO DISCONNECT THE SPARK ADVANCE

On some cars, it is recommendable to disconnect the spark advance while decelerating and idling, to avoid jerks or irregular operations. On the other hand, the spark advance is used immediately while accelerating in order to improve performance, consumption and to reduce at a minimum the risk of backfire. With the **Spark Master** Variator, the spark advance can be connected or disconnected automatically by connecting the **VIOLET WIRE** of the Variator to one of these signals:

- throttle potentiometer **Picture 1 (T.P.S. or accelerator position sensor)**;
- to the throttle switch that indicates when the accelerator is idling or when you are accelerating.

THROTTLE POTENTIOMETER

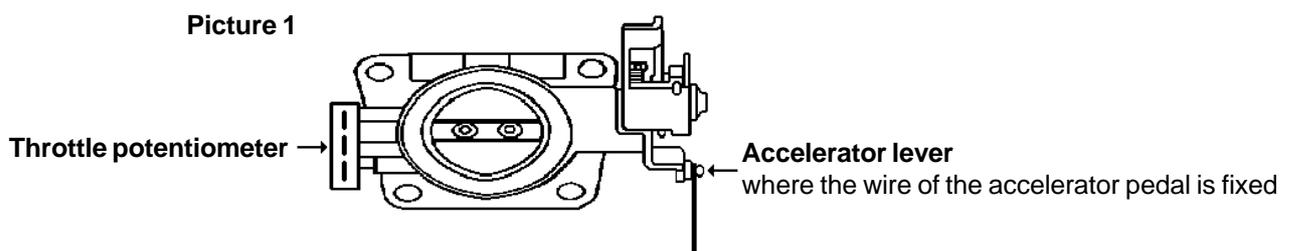
The **throttle potentiometer** or **accelerator position sensor (T.P.S.)** is always on the side opposite the accelerator lever and indicates the throttle position. By using this signal, the Spark Advance Variator can know at any moment if the engine is idling or accelerating to connect or disconnect the spark advance. Generally, the throttle potentiometer receives **3 wires** (even if some models can have more than one) with the following signals:

- **Power supply.**
- **Ground.**
- **Variable signal according to the throttle position.**

For a correct operation of the Spark Advance Variator, it is necessary that the **variable signal** of the throttle has one of these types of range:

- **0,5 V with idling accelerator**, to arrive up to **4,5 V with completely pressed accelerator**. In this case, the voltage increases gradually by following the accelerator position (**linear potentiometer**).
- **0,5 V with idling accelerator**, to arrive up to **4,5 V or 12 V with completely pressed accelerator**. In this case, as soon as you press the accelerator the voltage arrives to the maximum value (**switch - type potentiometer**).

If the range of the VARIABLE SIGNAL of the throttle potentiometer is not equal to at least on of the previously seen cases, we suggest to connect the VIOLET WIRE of the Spark Advance Variator to the + 12 V under key (RED WIRE of the Spark Advance Variator).



When idling, the signal of the **Throttle Potentiometer** is not always the same, because there can be small differences due to the different calibrations; therefore, in the Variator there is a calibration of the connection point. The adjustment is carried out by operating on the **spark advance register** in the following way:

- 1) check that the register is completely rotated in clockwise direction;

SPARK ADVANCE CONNECTION REGISTER →



- 2) with idling car, start to rotate the register in counterclockwise direction until the LED switches off (spark advance disconnected);

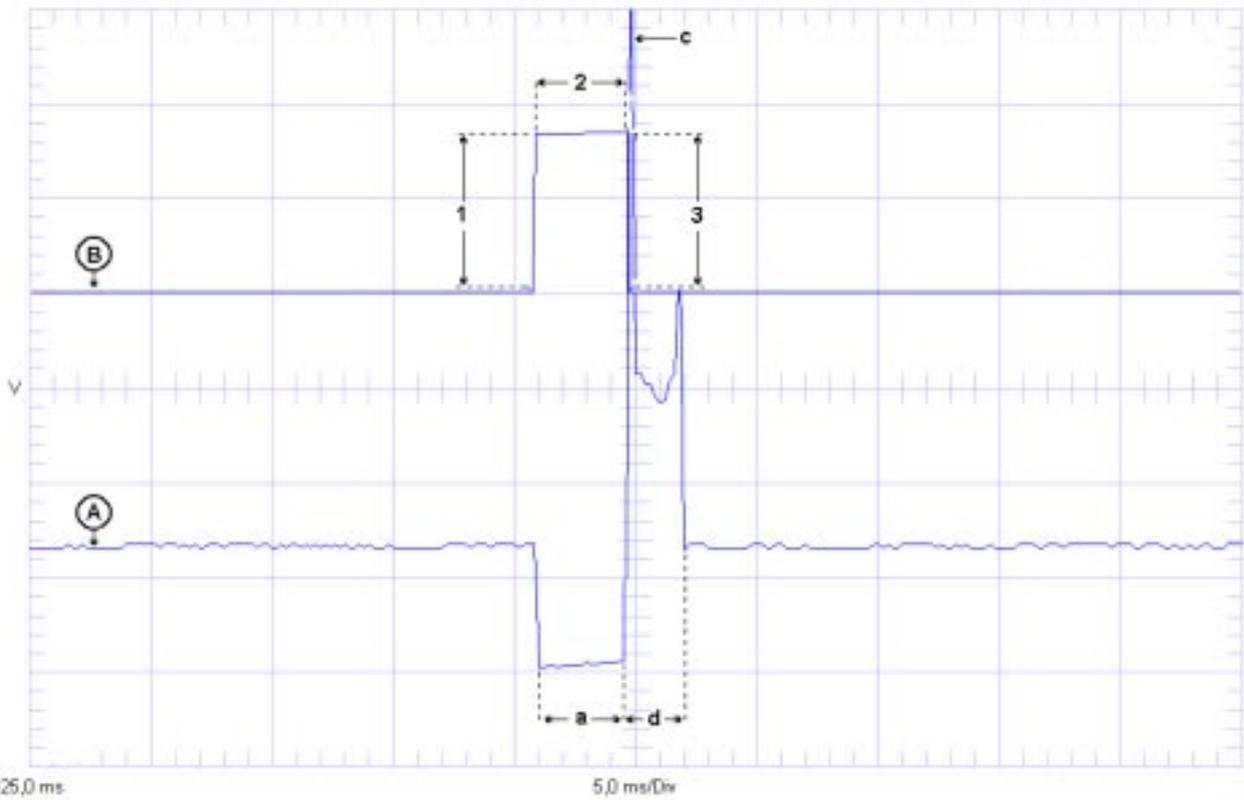
LED ON = SPARK ADVANCE CONNECTED →



- 3) after this adjustment, when you accelerate the LED on the Variator switches on again to switch off when you release the accelerator.

Electronic Spark Advance Variator SPARK - MASTER
Code 540

Before installing the variator, by means of an oscilloscope on the two coil negative side and on the input wire of the ignition amplifier module you can measure the following wave forms.



Measurement with engine at approx. 1.000 rpm

Trace A (10 V / division) = Signal measured on a coil negative side - 14 -.

Trace B (2 V / division) = Signal measured on the input of the ignition module - 12 -.

a = Loading time (time in which the ignition module circulates the current to load the coil). This is controlled by the injection - ignition central unit.

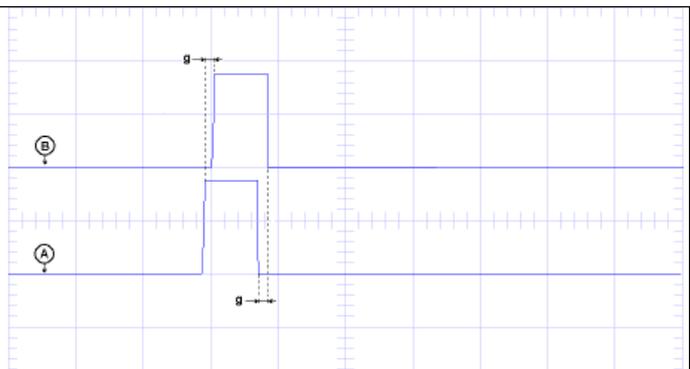
c = Spark.

d = Unloading time of the energy stored by the coil on the spark electrodes (spark duration).

The signal displayed on trace B is interpreted by the ignition module in the following way:

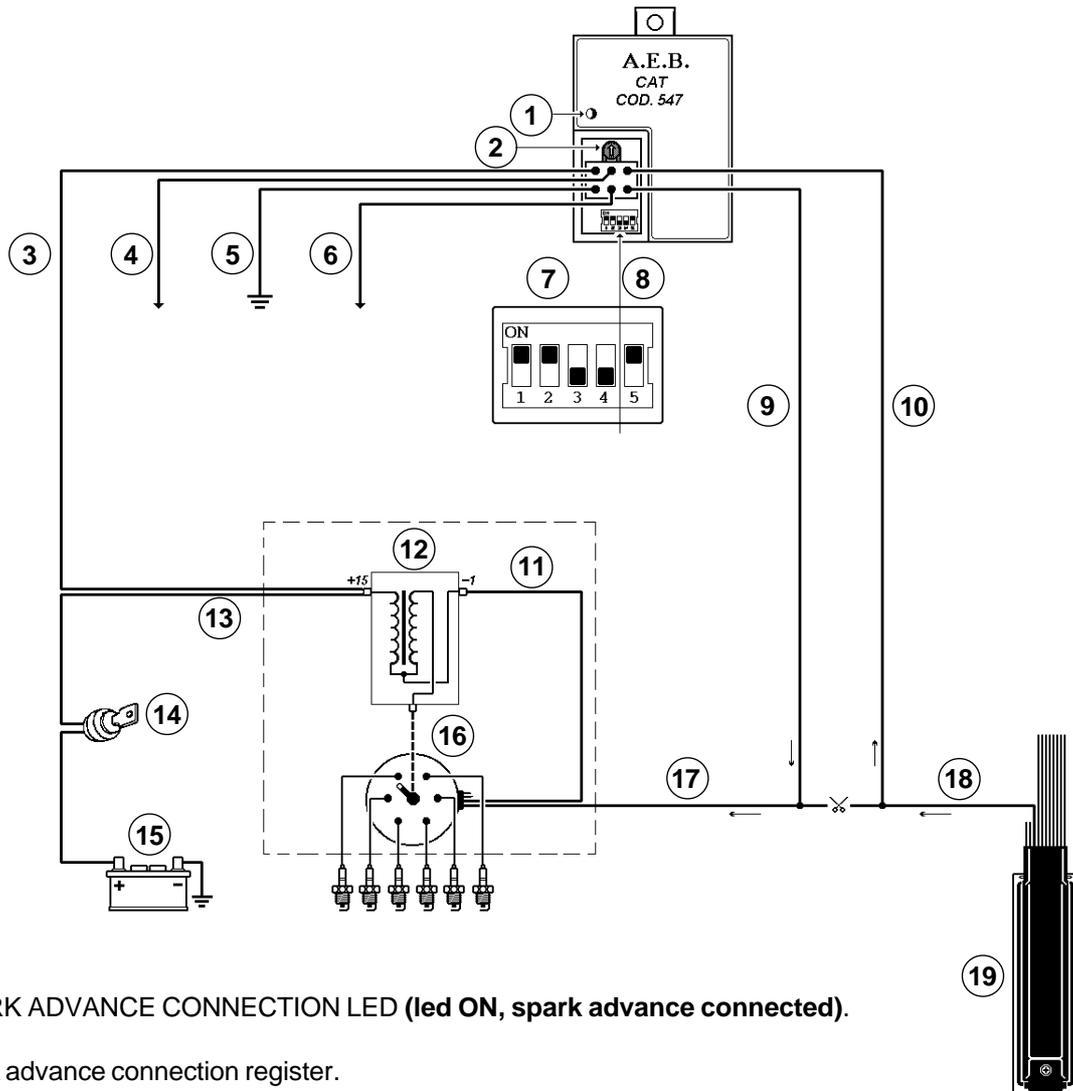
- 1) Increase from 0 ÷ 3,5 V approx. = coil loading start.
- 2) Constant voltage = coil loading.
- 3) Decrease from 3,5 ÷ 0 V approx. = end of loading, spark between the spark plug electrodes.

After installing the variator, you can check that the input signal on the black wire 9 (trace B) and the signal on the brown wire 8 (trace A) are the same but only phase - displaced of the set spark advance - g -.



Electronic Spark Advance Variator CAT Code 547

Install the **CAT Code 547** variator on HONDA and ROVER cars with HONDA engine equipped with ignition system made up of: coil and amplifier ignition module built in the distributor.



1) SPARK ADVANCE CONNECTION LED (led ON, spark advance connected).

2) Spark advance connection register.

3) RED WIRE to be connected to the + 12 V under key (+ 15) of the ignition coil (**12**).

Contact (+ 15) of coil (**12**) is connected by means of wire (**13**) to the ignition key (**14**) and from this latter to the positive side of the battery (**15**) in order to have power supply only with instrument panel switched on.

4) BLUE WIRE to be connected to the BLU GAS outlet wire.

5) YELLOW - GREEN WIRE to be connected to GROUND.

6) VIOLET WIRE to be connected to the THROTTLE POTENTIOMETER signal (if the VIOLET wire of the Variator is not connected to the throttle potentiometer, it must be connected to the + 12 V under key RED wire of the Variator).

7) Micro switches 1, 2, 3, 4 (SPARK ADVANCE DEGREE ADJUSTMENT).

8) Micro switch 5 (spark advance curve selection, C.N.G. or L.P.G.).

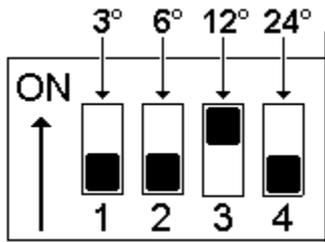
9) BROWN WIRE (Variator output signal) to be connected to the wire (**17**) that enters the ignition module inside the distributor (**16**).

10) BLACK WIRE (Variator input signal) to be connected to the wire (**18**) coming out from the injection central unit (**19**).

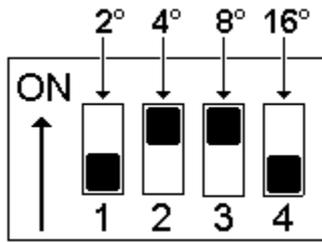
16) Distributor (the coil and the ignition module are inside the distributor, see hatched part).

SPARK ADVANCE ADJUSTMENT

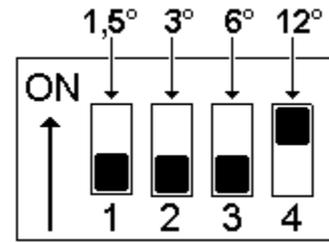
By means of micro switches 1, 2, 3, 4, that have a different value according to the number of cylinders of the engine on which the Variator has been installed, you can select the correct spark advance value. To do this it is necessary to set one or more micro switches to "ON".



FOR 4 CYLINDER ENGINE

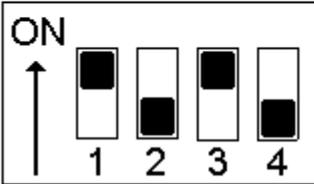


FOR 6 CYLINDER ENGINE



FOR 8 CYLINDER ENGINE

- Remember that by setting more micro switches to ON at the same time, the spark advance value is summed. - Example: by setting micro switches 1 and 3 to ON, you obtain the following spark advance:



- for a 4 cylinder engine:
3° (of micro switch 1) + 12° (of micro switch 3) **Total 15°** of spark advance

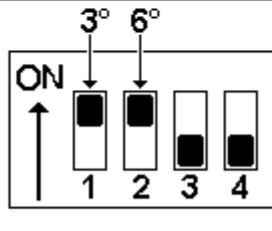
- for a 6 cylinder engine:
2° (of micro switch 1) + 8° (of micro switch 3) **Total 10°** of spark advance

- for a 8 cylinder engine:
1,5° (of micro switch 1) + 6° (of micro switch 3) **Total 7,5°** of spark advance

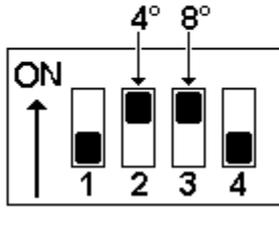
RECOMMENDED SPARK ADVANCE DEGREES FOR TYPE OF FUEL AND NUMBER OF ENGINE CYLINDERS



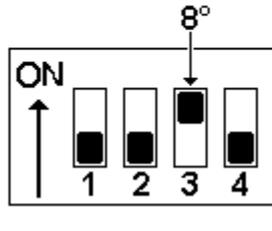
for a 4 cylinder engine fed with C.N.G. with 12° of spark advance



for a 4 cylinder engine fed with L.P.G. with 9° of spark advance



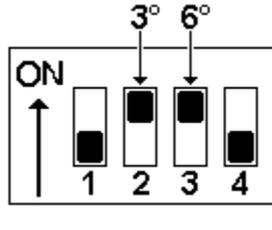
for a 6 cylinder engine fed with C.N.G. with 12° of spark advance



for a 6 cylinder engine fed with L.P.G. with 8° of spark advance

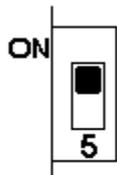


for a 8 cylinder engine fed with C.N.G. with 12° of spark advance



for a 8 cylinder engine fed with L.P.G. with 9° of spark advance

RECOMMENDED ADVANCE CURVE FOR C.N.G. OR L.P.G.



Recommended advance curve for the C.N.G. operation



Recommended advance curve for the L.P.G. operation

The values reported in the table are recommended according to our experience; in any case, you can carry out different adjustments to better adapt the Variator to the different engine features.

HOW AND WHEN TO DISCONNECT THE SPARK ADVANCE

On some cars, it is recommendable to disconnect the spark advance while decelerating and idling, to avoid jerks or irregular operations. On the other hand, the spark advance is used immediately while accelerating in order to improve performance, consumption and to reduce at a minimum the risk of backfire. With the **Cat** Variator, the spark advance can be connected or disconnected automatically by connecting the **VIOLET WIRE** of the Variator to one of these signals:

- throttle potentiometer **Picture 1 (T.P.S. or accelerator position sensor)**;
- to the throttle switch that indicates when the accelerator is idling or when you are accelerating.

THROTTLE POTENTIOMETER

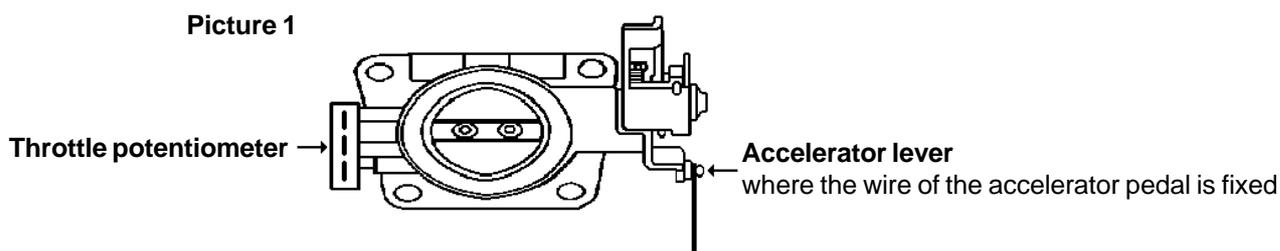
The **throttle potentiometer** or **accelerator position sensor (T.P.S.)** is always on the side opposite the accelerator lever and indicates the throttle position. By using this signal, the Spark Advance Variator can know at any moment if the engine is idling or accelerating to connect or disconnect the spark advance. Generally, the throttle potentiometer receives **3 wires** (even if some models can have more than one) with the following signals:

- **Power supply.**
- **Ground.**
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For a correct operation of the Spark Advance Variator, it is necessary that the **variable signal** of the throttle has one of these types of range:

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If the range of the VARIABLE SIGNAL of the throttle potentiometer is not equal to at least on of the previously seen cases, we suggest to connect the VIOLET WIRE of the Spark Advance Variator to the + 12 V under key (RED WIRE of the Spark Advance Variator).



The signal of the **Throttle potentiometer** when idling is not always the same, because there can be small difference due to different calibrations; therefore, in the Variator there is a calibration of the connection point. The adjustment is carried out by operating on the **spark advance register** in the following way:

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SPARK ADVANCE CONNECTION REGISTER →



- 2) with idling car, start to rotate the register in counterclockwise direction until the LED switches off (spark advance disconnected);

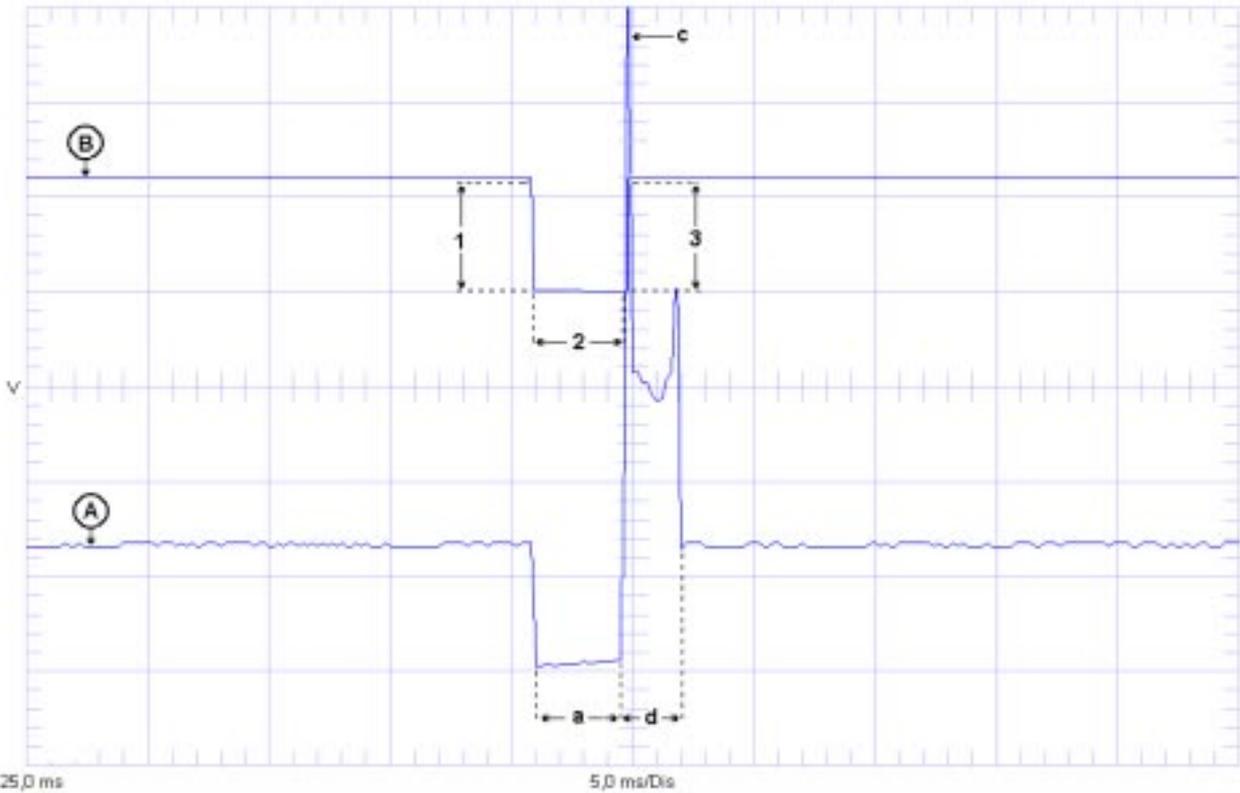
LED ON = SPARK ADVANCE CONNECTED →



- 3) after this adjustment, when you accelerate the LED on the Variator switches on again to switch off when you release the accelerator.

Electronic Spark Advance Variator CAT
Code 547

Before installing the variator, by means of an oscilloscope on the two coil negative side and on the input wire of the ignition amplifier module you can measure the following wave forms.



Measurement with engine at approx. 1.000 rpm

Trace A (10 V / division) = Signal measured on a coil negative side - 11 -.

Trace B (10 V / division) = Signal measured on the ignition signal wire of the module - 17 -.

a = Loading time (time in which the ignition module circulates the current to load the coil). This is controlled by the injection - ignition central unit.

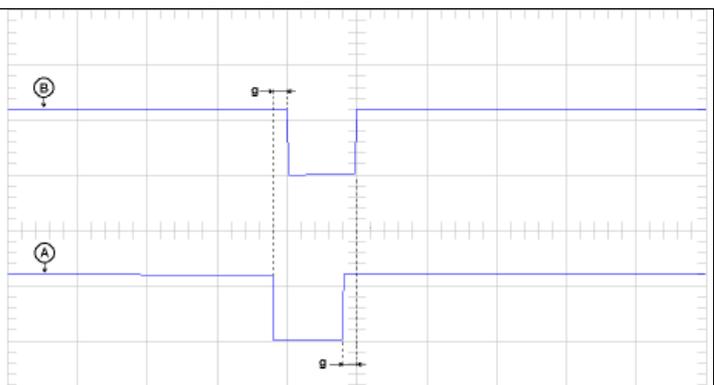
c = Spark.

d = Unloading time of the energy stored by the coil on the spark electrodes (spark duration).

The signal displayed on trace **B** is interpreted by the ignition module in the following way:

- 1) Decrease from 12 ÷ 0 V = coil loading start.
- 2) Constant voltage = coil loading.
- 3) Increase from 0 ÷ 12 V approx. = end of loading, spark between the spark plug electrodes.

After installing the variator, you can check that the input signal on the black wire **9** (trace **B**) and the signal on the brown wire **8** (trace **A**) are the same but only phase - displaced of the set spark advance - **g** -.



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A.E.B.[®] s.r.l.

Via dell'Industria n° 20, 42025 CAVRIAGO (RE) ITALY

Central Tel. (+ 39) 0522 - 941487 (r.a.) Telefax (+ 39) 0522 - 941464

Technical Service Tel. (+ 39) 0522 - 942281 (r.a.)

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