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updated 23.02.2025
application version: 00.250210

PROGRAMMING MANUAL
ZeelProg PIIS-23

Supported control units: **PIIS-23**

ZeelProg is PC application for programming ZEELTRONIC engine *control units*.
For programming special PC-USB programmer is needed.

- ***ZeelProg*** automatically detects PC-USB programmer connection and enables all functions (without PC-USB programmer ***ZeelProg*** application is locked).
- ***ZeelProg*** automatically detects type of engine *control unit* connected to PC-USB programmer.

TECHNICAL DATA

PIIS-23 is twin channel inductive ignition ECU with 2 switchable ignition maps. It can be programmed with handheld programmer, or PC.

Limit values:

- minimum revs	200 RPM
- maximum revs	15000 RPM
- minimum supply voltage	9 Volts
- maximum supply voltage	17 Volts
- recommended power supply voltage	12 ÷ 15 Volts
- recommended ignition coil resistance	2.2 ÷ 4 ohm
- recommended ignition coil inductance	5 ÷ 7 mH
- dimensions	76 x 55 x 28 mm

Features:
- two inputs for magnetic pickup
- two ignition maps with 20 programmable rpm points adjustable in 10 rpm and 0.1 deg steps
- ignition map switch input
- individual rev limit for each ignition map
- shift light output
- fuel pump relay output
- rev counter output (1 pulse per revolution, 5 Volt square wave)
- quick shift
- programmable with handheld, or PC-USB programmer
- ignition test
- ignition coil test
- ECU makes quick test of ignition coils at power up. If error is detected then ignition is disabled

Very important!
Resistor spark plugs must be used, because they produce less electromagnetic disturbances.

Very important!
ECU is protected against static discharge, but too high static charge can damage ECU.
Be careful when using programmer on the dyno, because static charge can build up on the bike frame and static discharge can damage ECU, or programmer. Make ground connection between dyno and bike frame to prevent static discharge.

ZeelProg SOFTWARE INSTALLATION GUIDE

Software can be downloaded from our web site: http://www.zeeltronic.com/page/zeelprog.php

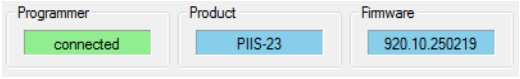
ZeelProg application can be installed on Windows XP/Vista/7/8/10/11.

ZeelProg USER INTERFACE

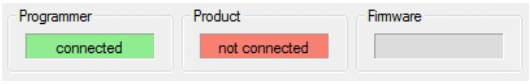
Auto detection

Zeelprog automatically detects USB-Programmer and type of *control unit*.

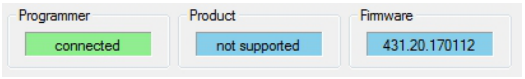
⇨ Programmer connected, product (*control unit*) connected:



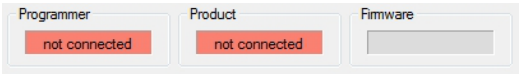
⇨ Programmer connected, product (*control unit*) not connected:



⇨ Programmer connected, product (*control unit*) not supported:

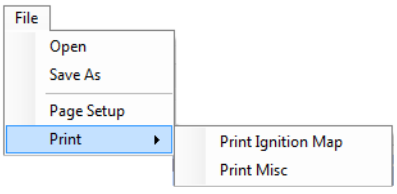


⇨ Programmer not connected, product (*control unit*) not connected:



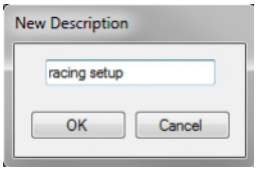
Menu structure

⇨ **File menu** is active when PC-USB programmer is connected

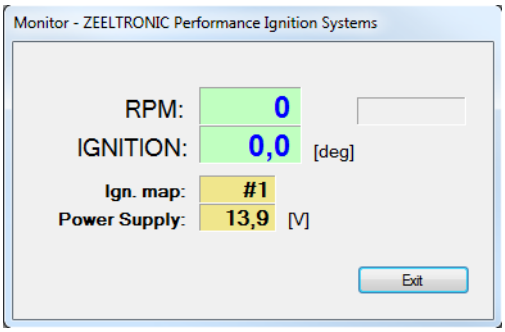


Open → Open an existing *.zee file
Save As → Save all parameters to *.zee file
Page Setup → Page setup for printing
Print Ignition Maps → Print ignition maps page
Print Misc → Print miscellaneous settings

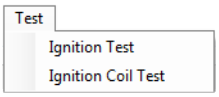
⇨ **Description** can be added to the settings. Description is added to the saved file and also to the ECU while programming.



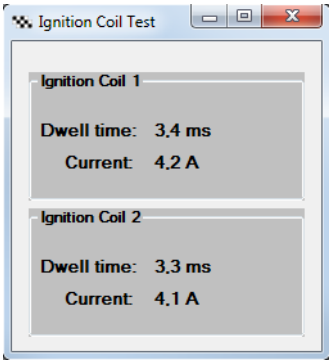
⇨ **Monitor** is active when *control unit* is connected to PC-USB programmer.
Clicking on the **Monitor** opens Monitor window.



⇨ Clicking on **Test** gives two options, **Ignition Test** and **Ignition Coil Test**



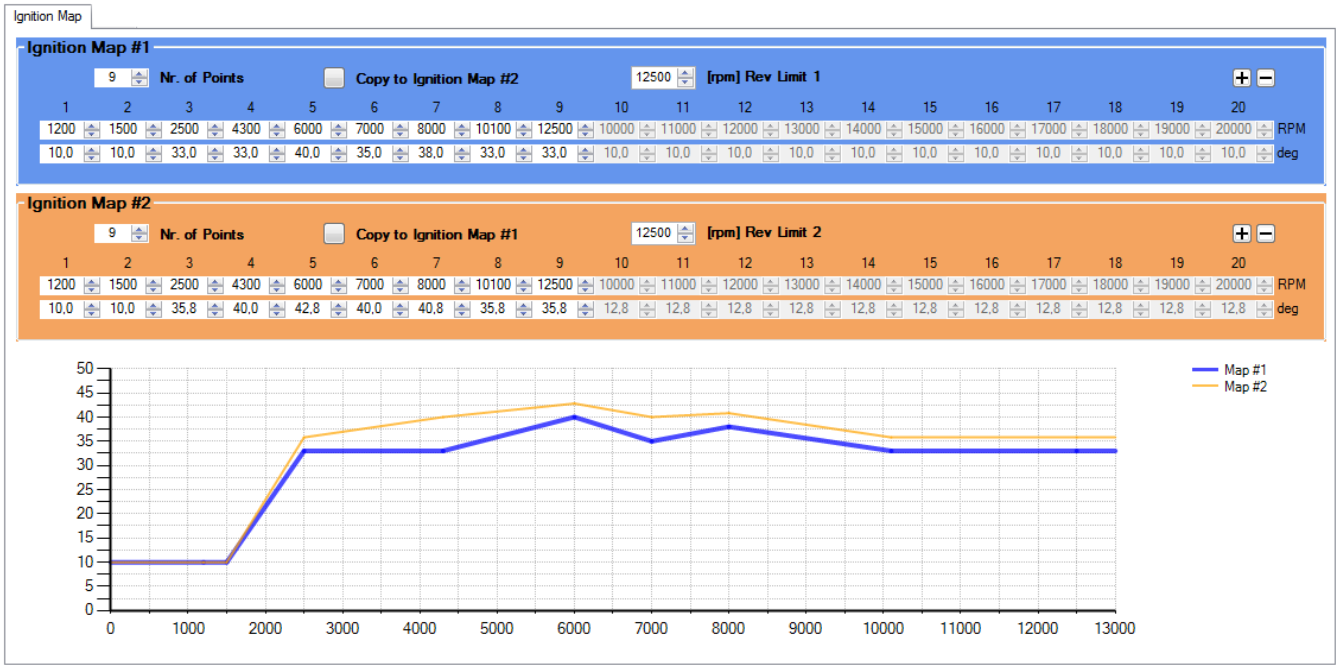
Both tests are possible only when engine does not running.
Ignition Test: Spark execution test without running engine. Spark can be optically checked, with removed spark plug from cylinder and connected to the plug cup and to the frame, or engine.
Ignition coil Test: Test of ignition coils is recommended after installing new ignition coils, or checking ignition coils for possible defect while troubleshooting.
ECU measures dwell time and current of each ignition coil.



Recommended ignition coil dwell time is between 2.5 and 5 ms.
Recommended ignition coil current is between 2.5 and 5.5 Amp at 12.5 Volt power supply.

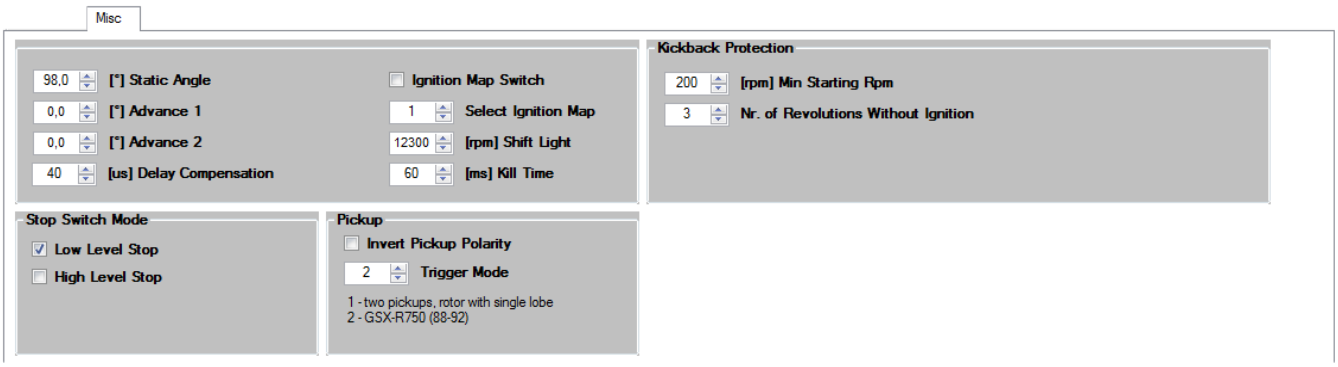
⇨ Clicking on **About** opens about window and shows some basic information about ***ZeelProg*** application.

Ignition Map #1 Parameters



⇨ **Nr. of Points** of each ignition map can be set from 4 to 20.
⇨ **RPM** of each ignition point can be set from 1000 rpm to 20000 rpm in 10 rpm steps. At the left side must be lowest RPM value and each next point must have higher value then previous...
⇨ **deg** ... advance of each ignition point can be set from 0 deg to 85 deg in 0,1 deg steps. Maximum ignition advance is limited by static angle.
⇨ **Rev limit 1** ... rev limit for ignition map #1 ... limits maximum engine revolutions. It can be adjusted to maximum 20000 rpm in 10 rpm steps.
⇨ **Rev limit 2** ... rev limit for ignition map #2 ... limits maximum engine revolutions. It can be adjusted to maximum 20000 rpm in 10 rpm steps.
⇨ ➕... increment all ignition points
⇨ ➖... decrement all ignition points

Misc Parameters



⇨ **Static Angle** represents pickup position and it is reference point for ECU to calculate correct ignition advance. Find more information's about static angle in section **MEASURING STATIC ANGLE** and **Explanation of trigger signal from pickup.**

⇨ **Advance 1** ... advances, or retards ignition advance of the entire ignition map #1, from -10 deg to 10 deg in 0,1 deg steps. Positive value advances and negative value retards.

⇨ **Advance 2** ... advances, or retards ignition advance of the entire ignition map #2, from -10 deg to 10 deg in 0,1 deg steps. Positive value advances and negative value retards.

⇨ **Delay Compensation** ... ensures correct ignition angle through whole revs. Default value is 30 us.
Delay compensation is compensation of signal delay from pickup to spark plugs. Compensation ensures that ignition advance is same as programmed (accurate).
How to check, if compensation is correct:
- program flat ignition curve
- measure ignition advance with strobe light at low and at high revs
- if advance at low and high revs is not same, then compensation delay must be adjusted

⇨ **Ignition Map Switch** ... enables, or disables ignition map switch. Ignition map can be selected with simple on/off switch while riding.

⇨ **Select Ignition Map** ... selection is active only when **Ignition Map Switch** is not enabled.

⇨ **Shift light** ... activates shift light output above programmed revs. It can be adjusted to maximum 20000 rpm in 10 rpm steps.

⇨ **Kill Time**... for shifting without using clutch - shift sensor is required. Function is disabled with setting 0 ms. Default value is 60 ms and should be good in most cases.

Kickback protection:

⇨ **Min Starting RPM**... minimum RPM for starting engine.

⇨ **Nr. of Revolutions Without Ignition** ... number of revolutions without ignition at starting.

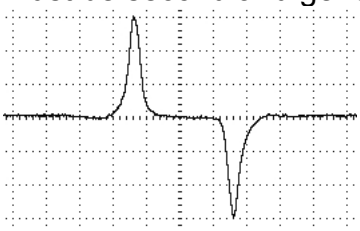
Stop Switch Mode:

⇨ **Low Level Stop**... engine stops when low level signal (when stop switch connected to the ground)

⇨ **High Level Stop**... engine stops when high level signal (when stop switch is opened)

Pickup:

⇨ **Invert Pickup Polarity** ... Trigger signal from pickup consists of positive and negative pulse. Positive pulse must be first and generated by leading edge of trigger lobe ... negative pulse must be second and generated by trailing edge of trigger lobe.



If trigger signal is opposite (first negative and second positive), then wires from the pickup need to be swapped, or **Invert Pickup Polarity** can be enabled.

⇨ **Trigger Mode** ... For the correct ECU operation correct trigger mode have to be selected.
- trigger mode 1 when using two pickups and single lobe at the flywheel
- trigger mode 2 is suitable for Suzuki GSX-R750 1988-1992 trigger system

PROGRAMMING AND SETTING NEW PARAMETERS

➲ While programming, or reading *control unit* does not need to be connected to power supply, because it is supplied through PC-USB programmer.

Changing control unit parameters

① Read parameters from connected *control unit*, by pressing **Read** button.

Progress bar indicate read and verify process.

Successful reading is indicated as: 

Error while reading is indicated as: 

If error occurs, then repeat reading.

② Change parameters

③ Program parameters to connected *control unit*, by pressing **Program** button.

Progress bar indicate program and verify process.

Successful programming is indicated as: 

Error while programming is indicated as: 

If error occurs, then repeat programming.

Make new *.zee file without connecting control unit

① Connect PC-USB programmer to PC.

② Set parameters

③ Save parameters by clicking **Save As** from **File menu**.

MEASURING STATIC ANGLE

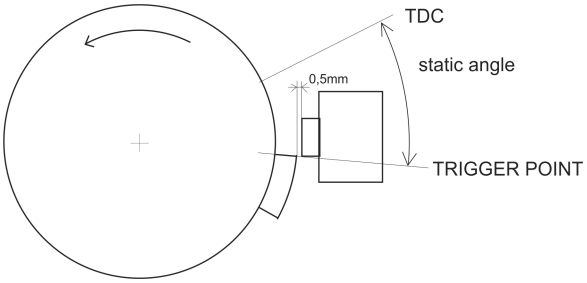
Measuring correct static angle is very important. Wrong static angle will cause inaccurate ignition advance. If static angle is programmed larger than mechanical static angle ignition advance will be smaller than programmed, or vice versa.
The most accurate procedure of measuring static angle is with dial gauge and strobe light.

Procedure applies to single and multiple cylinder engines. If you have a multi cylinder engine with multple pickups it is recommended (but not required) that you perform this procedure on each cylinder/pickup pair for most accurate timing.

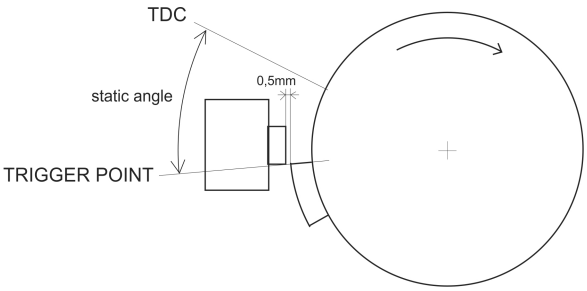
Necessary tools:
- strobe light
- dial gauge

Follow the procedure:
Measure approximate static angle with a degree wheel, just to have starting point...look at the drawing below.

Counterclockwise rotation:



Clockwise rotation:



- program CDI with measured approximate static angle
- program CDI with flat ignition curve...16deg advance is suitable for most engines.
- find information about engine stroke and conrod length
- convert programmed flat ignition advance angle to millimetres

Example:
α =16deg (ignition advance)
L=110mm (conrod length)
R=54/2=27mm (engine stroke divided by 2)
T=1,3mm (calculated ignition advance in mm)
Equation for calculating from degrees to millimetres:

α = ignition advance in degrees
T = ignition advance in mm
R = engine stroke divided by 2 in mm
L = conrod length in mm

$$T = L + R \cdot (1 - \cos\alpha) - \sqrt{L^2 - (R \cdot \sin\alpha)^2}$$

Downloadable spreadsheet is available on request.

- remove sparkplug from cylinder head and mount dial gauge in cylinder.
- find TDC (Top Dead Centre)
- rotate engine backwards (opposite from running engine rotation) to calculated advance in millimetres (in example above it is 1,3mm) and make marks on rotor and stator
- remove dial gauge and install sparkplug back in cylinder head
- start engine and run at constant speed of 3000rpm to 4000rpm
- use a strobe light to check alignment of marks on rotor and stator
- adjust static angle with programmer to align marks on the rotor and stator

Result of above procedure is very accurate static angle.

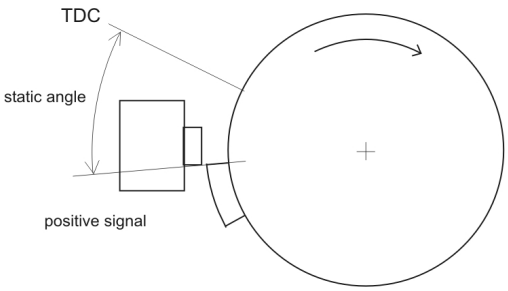
Important!

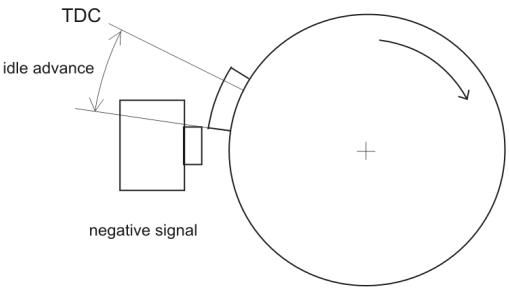
- Static angle is reference point for CDI to calculate delay for programmed ignition advance.
- Static angle has to be greater then maximum ignition advance!
- Example - If maximum advance in ignition map is 30 deg, then static angle has to be at least 31deg.
- Very large static angles are not a good solution, because it decreases electronic ignition advance stability (do not use static angle greater then 45 deg if not necessary).

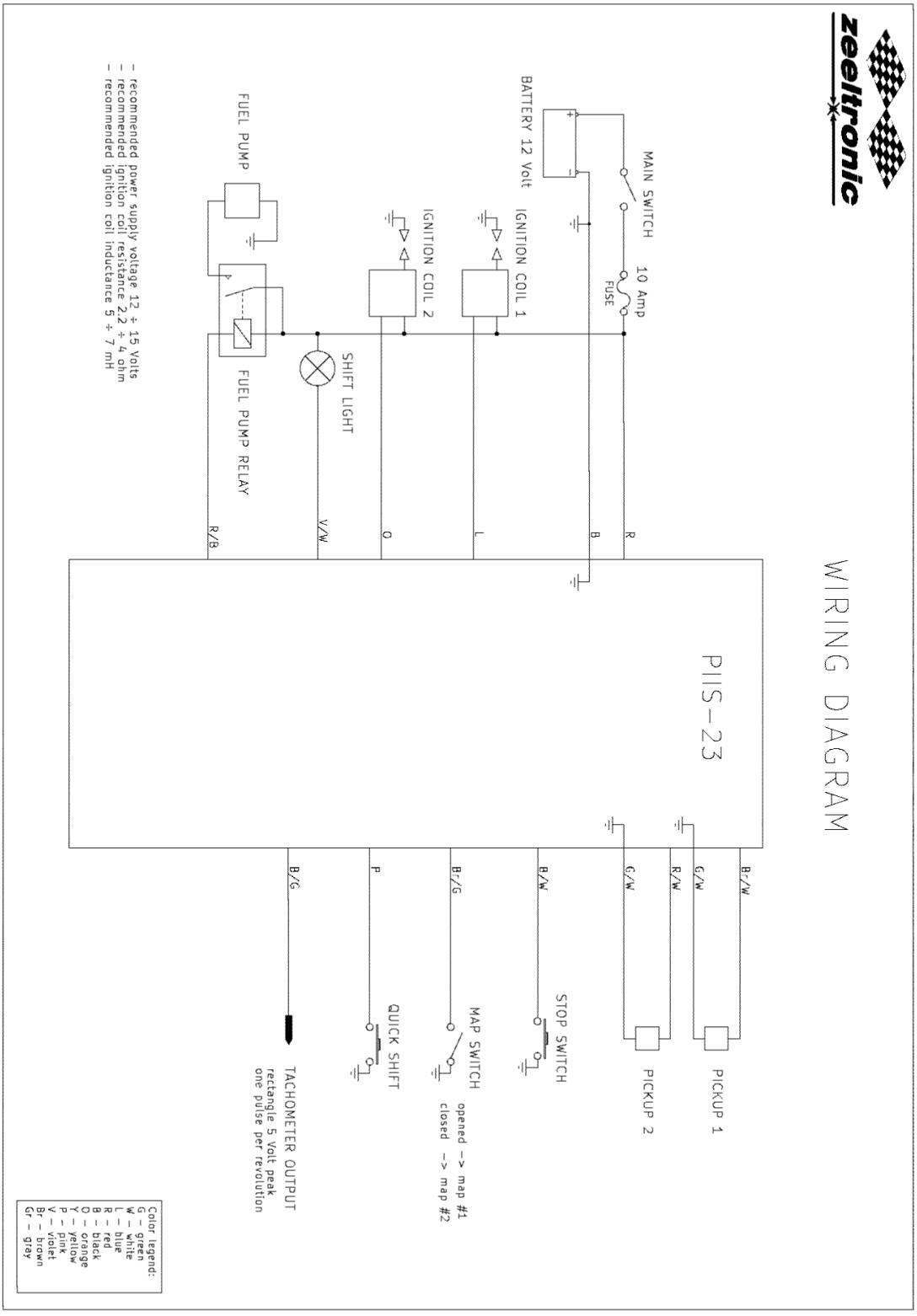
If you find when testing with your strobe light that your timing marks are off by 10 or more degrees it may be neccessary to reverse the wiring from the reluctor pickup to the ignition and test again. Reluctor pickups have polarity but it is rarely marked on the pickups so must be determined by the trial and error method. Incorrect wiring polarity will cause the reluctor pickup to send the trigger signal on the trailing edge of the rotor instead of the required leading edge of the rotor.

Explanation of trigger signal from pickup

Trigger signal from pickup consist of positive and negative pulse. Positive pulse must be first and is generated by leading edge of trigger lobe ... negative pulse must be second and is generated by trailing edge of trigger lobe.
If trigger signal is opposite (first negative and second positive), then wires from the pickup need to be swapped ... that changes polarity of signal from pickup.
Leading edge of trigger lobe defines static angle position and trailing edge defines idle running timing position.
Ignition running from trailing edge from starting and to rpm of first ignition point in the ignition map.


TDC
static angle
positive signal


TDC
idle advance
negative signal


zeeltronic
WIRING DIAGRAM
PIS-23
BATTERY 12 Volt
MAIN SWITCH
10 Amp
FUSE
IGNITION COIL 1
IGNITION COIL 2
SHIFT LIGHT
FUEL PUMP
FUEL PUMP RELAY
R
B
L
O
V/W
R/B
- recommended power supply voltage 12 ÷ 15 Volts
- recommended ignition coil resistance 2,2 ÷ 4 ohm
- recommended ignition coil inductance 5 ÷ 7 mH
Br/W
G/W
R/W
G/W
PICKUP 1
PICKUP 2
B/W
STOP SWITCH
Br/G
MAP SWITCH
opened -> map #1
closed -> map #2
P
QUICK SHIFT
B/G
TACHOMETER OUTPUT
rectangle 5 Volt peak
one pulse per revolution
Color legend:
G - green
W - white
L - blue
R - red
B - black
O - orange
Y - yellow
P - pink
V - violet
Br - brown
Gr - grey