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USER MANUAL
PDCI-20V PROGRAMMABLE CDI IGNITION AND PV CONTROLLER

Limit values:

- minimum revs	200 RPM
- maximum revs	20000 RPM
- minimum supply voltage	7 Volts
- recommended power supply voltage	12÷15 Volts
- maximum supply voltage	17 Volts
- stand-by current draw	< 0.09 Amp
- current draw at 1300 RPM	< 0.3 Amp
- current draw at 12000 RPM	< 1.7 Amp
- maximum continuous current for shift light and power jet output	1 Amp
- peak current for shift light and power jet output	5 Amp
- constant spark energy from idle to 13000 RPM	>50 mJ

Features:
- fast power-up (also starts only with condenser)
- full power starting spark energy already at 7 Volts power supply
- two isolated input (pickup)
- two independent ignition coil outputs
- individual advance/retard of each output
- store and load function for two ignition maps
- external switch for changing ignition map while riding
- TPS input (Throttle Position Sensor)
- shift light/ fuel pump output
- 2 power jet outputs
- duty cycle solenoid output (for regulating A/F ratio on some carburettors)
- quick shift (shift kill)
- soft rev limit (three stage rev limit)
- reduced spark at high revs with closed throttle (TCT mode)
- tachometer output
- easy and fast programming on the field, via hand held programmer
- programming while machine running - you can immediately see effects
- each curve can be set in 4 to 12 curve points
- 3D interpolated ignition map, if TPS selected
- signal delay compensation
- instant monitoring of revs and angle, via LCD(hand held programmer)
- programmable power valve actuation
- store and load function for 5 PV curves
- external switch for changing PV curve while riding

- programmable PV deviation
- programmable max close and max open positions
- self PV test on power-up
- PV error detecting (position sensor failure, servo motor failure)
- fast processing for high accuracy - delays from 1us
- timing calculation for every 1 RPM change (1000, 1002, .. , 9805, 9806, ...)

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

Danger of electric shock!
Avoid connecting PDCI to 12 V power supply before connecting it to ignition coil. High voltage is generated and touching free wires can cause electric shock, or damage the unit.

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

1. HOW TO ENTER MENU

PDCI does not need to be connected to power supply when battery is installed in to the handheld programmer. Connect **programmer** to **PDCI** and wait few seconds for activation of **programmer** and press ENTER. Move through menu with pressing + , or - and choose with pressing ENTER. Exit menu with choosing ***Exit.***

2. MENU ORGANISATION

Set Ign. - set ignition parameters submenu
Set PV - set PV parameters submenu
Exit

2.1. SET IGNITION PARAMETERS SUBMENU

Load Ign. Map - load (select) ignition map (#1, or #2)
Save Ign. Map - save new ignition map (#1, or #2)
Set Ignition Map - ignition map parameters submenu
Advance - advance/retard whole ignition map on both ignition coil outputs
Advance 1 - advance/retard ignition coil output 1
Advance 2 - advance/retard ignition coil output 2
Gear Shift Light - shift light/ fuel pump
Quick Shift - quick shift settings
Rev Limit - rev limit
Static Angle - static angle (stator position)
Compensation - signal delay compensation (from pickup to spark plug)
Power Jet 1 - power jet 1

Solenoid Output - solenoid output settings (power jet 2, or duty solenoid)
TPS - enable, or disable TPS
TPS close [0%] - calibrating TPS close position
TPS open [100%] - calibrating TPS open position
TCT mode - reduced spark at high revs with closed throttle
Ign. Map SW - activating/deactivating external switch for selecting ignition map
Pulses Per Rev - number of pulses per revolution from pickup
Stop SW mode - select low, or high level stop
Ignition Test - sparks are generated for few seconds without running engine
Exit

2.2. SET PV PARAMETERS SUBMENU

Load PV Curve - load (select) PV curve (from #1 to #5)
Save PV Curve - save new PV curve (from #1 to #5)
Set PV Curve - PV curve parameters submenu
Deviation +- - deviation of PV position
Close Position - max close PV position
Open Position - max open PV position
PV Test - PV position test
Power-up Test - enable, or disable test cycle at power-up
PV Curve SW - activating/deactivating external switch for selecting PV curve
Exit

3. LOAD IGN. MAP

Enter ***Set Ign.*** menu and move to ***Load Ign. Map*** with pressing + , or - and then ENTER .
Select number of previously saved ignition map, with pressing + , or - and then ENTER .

4. SAVE IGN. MAP

Enter ***Set Ign.*** menu and move to ***Save Ign. Map*** with pressing + , or - and press ENTER .
Select number to which you want to save your ignition map with pressing + , or - and press ENTER .

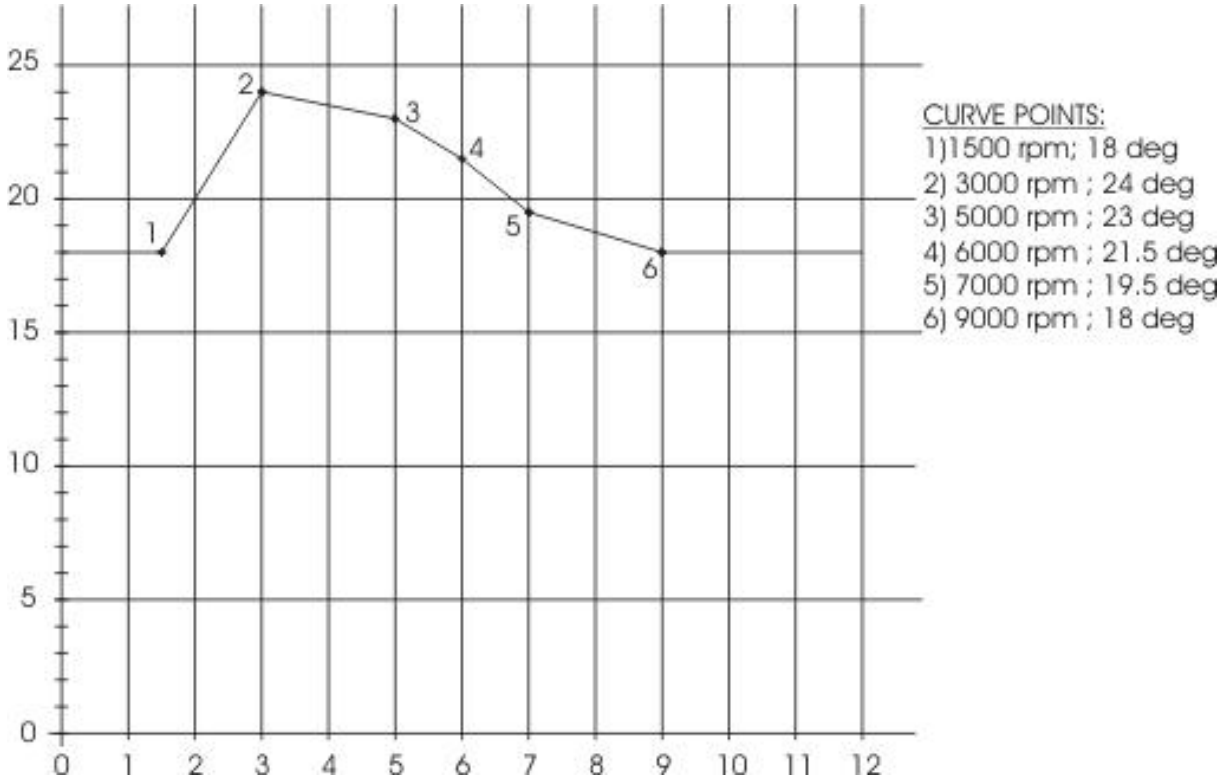
5. SET IGNITION MAP *(if TPS disabled)*

Enter ***Set Ign.*** menu and move to ***Set Ignition Map*** with pressing + , or - and press ENTER .
...you entered submenu for setting ignition map.

Submenu organisation:
Nr. of Points - number of ignition curve points (from 4 to 12)
1) - first ignition curve point
2) - second ignition curve point
... ...
Exit - exit submenu

Important!
To avoid wrong processing, don't make unreasonable curve course.
Every time you make any changes to ignition curve, it is automatically saved to number #0. Later you can save it to any other number #1 or #2.

Curve Example with six curve points:



5.1. SET IGNITION MAP *(if TPS enabled)*

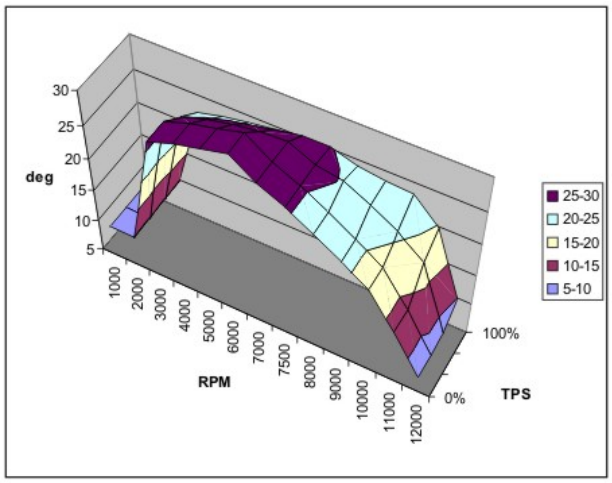
Three ignition curves must be programmed for different TPS positions. **PDCI** does not only switch between ignition curves, but also interpolate 3D map for all TPS positions above 33%.

Enter ***Set Ign.*** menu and move to ***Set Ignition Map*** with pressing + , or - and press ENTER .
...you entered submenu for selecting ignition curve.

Submenu organisation:
Nr. of Points - number of ignition curve points (from 4 to 12)
Curve 0-33% - ignition curve from 0 to 33% TPS
Curve 66% - ignition curve for 66% TPS
Curve 100% - ignition curve for 100% TPS
Exit - exit submenu

Important!
To avoid wrong processing, don't make unreasonable curve course.
Every time you make any changes to ignition curve, it is automatically saved to number #0. Later you can save it to any other number #1 or #2.

Ignition Map Example:



5.2. Change NUMBER OF IGNITION CURVE POINTS

Move to ***Nr. of Points*** with pressing + , or - and press ENTER .
Select number of ignition points with pressing + , or - and press ENTER .

5.3. Change PARAMETERS OF IGNITION CURVE POINT

Move to point you want to change with pressing + , or - and press ENTER .
Change rev point with pressing + , or - (in 100 rpm steps) and press ENTER .
Change advance angle with pressing + , or - (in 0.1 deg steps) and press ENTER .

6. ADVANCE

With this setting is possible to advance, or retard whole ignition map on both ignition coil outputs. When setting is positive, then ignition map is advanced and when setting is negative, than ignition map is retarded. Ignition map is unchanged with setting ***0.0deg***.

Enter ***Set Ign.*** menu and move to ***Advance*** with pressing + , or - and press ENTER .
Set advance with pressing + , or - (in 0.1 deg steps) and press ENTER .

7. ADVANCE 1

With this setting is possible to advance, or retard ignition map only on ignition coil output 1. When setting is positive, then ignition map is advanced and when setting is negative, than ignition map is retarded. Ignition map is unchanged with setting ***0.0deg***.

Enter ***Set Ign.*** menu and move to ***Advance 1*** with pressing + , or - and press ENTER .
Set advance with pressing + , or - (in 0.1 deg steps) and press ENTER .

8. ADVANCE 2

With this setting is possible to advance, or retard ignition map only on ignition coil output 2. When setting is positive then, ignition map is advanced and when setting is negative, than ignition map is retarded. Ignition map is unchanged with setting ***0.0deg***.

Enter ***Set Ign.*** menu and move to ***Advance 2*** with pressing + , or - and press ENTER .
Set advance with pressing + , or - (in 0.1 deg steps) and press ENTER .

9. GEAR SHIFT LIGHT

Shift light output has 2 functions, depends on the setting. When rpm is set to 0 rpm then output function is for fuel pump, otherwise it is shift light function.

Enter ***Set Ign.*** menu and move to ***Gear Shift Light*** with pressing + , or - and press ENTER .
Change rev point with pressing + , or - (in 100 rpm steps) and press ENTER .

10. QUICK SHIFT

Enter ***Set Ign.*** menu and move to ***Quick Shift*** with pressing + , or - and press ENTER .
...you entered submenu for quick shift settings.

Submenu organisation:
Shift Kill Time - basic kill time
Smart Shift - activating/deactivating automatic kill time for different revs
Exit - exit submenu

10.1. SHIFT KILL TIME

Enter ***Quich Shift*** menu and move to ***Shift Kill Time*** with pressing + , or - and press ENTER .
Change kill time with pressing + , or - (in 10 ms steps) and press ENTER .

10.2. SMART SHIFT

Smart shift function automatically adjusts kill time for different revs. Shift kill time must be always set, as basic kill time.
Enter ***Quich Shift*** menu and move to ***Smart Shift*** with pressing + , or - and press ENTER .
Enable, or disable function with pressing + , or - and press ENTER .

11. REV LIMIT

Enter ***Set Ign.*** menu and move to ***Rev Limit*** with pressing + , or - and press ENTER .
Now you can change rev limit with pressing + , or - (in 100 rpm steps) and press ENTER .

12. STATIC ANGLE

Enter ***Set Ign.*** menu and move to ***Static Angle*** with pressing + , or - and press ENTER .
Set static angle with pressing + , or - (in 0.1deg steps) and press ENTER .

13. COMPENSATION

It is compensation of signal delay from pickup to spark plugs. Check this delay with stroboscope lamp. Without this compensation, ignition advance angle decreasing with rising revs.
Compensation helps that advance angles in ignition map are accurate.
How to check, if compensation is correct?
First you have to set flat ignition curve. Then measure with stroboscope lamp, if mark at flywheel moves when changing revs. If mark moves, then compensation delay must be changed.
Default value is 30 us and is correct for most applications.

Change Compensation:
Enter ***Set Ign.*** and move to ***Compensation*** with pressing + , or - and press ENTER .
Change compensation delay with pressing + , or - and press ENTER .

14. POWER JET 1

Enter ***Set Ign.*** menu and move to ***Power Jet 1*** with pressing + , or - and press ENTER .
...you entered submenu for setting ***Power Jet 1*** parameters.

Submenu organisation:

Power Jet 1 ON RPM	- revs for activating power jet 1
Power Jet 1 OFF RPM	- revs for deactivating power jet 1
Power Jet 1 ON TPS *(if TPS enabled)*	- throttle position for activating power jet 1
Power Jet 1 OFF TPS *(if TPS enabled)*	- throttle position for deactivating power jet 1
Exit	- exit submenu

Example:
Power jet 1 ON (RPM) = 8000rpm
Power jet 1 OFF (RPM) = 10000rpm
Power jet 1 ON (TPS) = 70%TPS
power jet 1 OFF (TPS) = 90%TPS

Power jet is switched on when revs are between 8000-10000rpm and throttle position is between 70-90%, otherwise power jet is switched off.

14.1. POWER JET 1 ON RPM

Enter ***Set Ign.*** menu and move to ***Power Jet 1 ON RPM*** with pressing + , or - and press ENTER .
Can change ***Power Jet 1 ON RPM*** with pressing + , or - (in 100 rpm steps) and press ENTER .

14.2. POWER JET 1 OFF RPM

Enter ***Set Ign.*** menu and move to ***Power Jet 1 OFF RPM*** with pressing + , or - and press ENTER.
Change ***Power Jet 1 OFF RPM*** with pressing + , or - (in 100 rpm steps) and press ENTER .

14.3. POWER JET 1 ON TPS *(if TPS enabled)*

Enter ***Set Ign.*** menu and move to ***Power Jet 1 ON TPS*** with pressing + , or - and press ENTER .
Change TPS position with pressing + , or - (in 1%TPS steps) and press ENTER .

14.4. POWER JET 1 OFF TPS *(if TPS enabled)*

Enter ***Set Ign.*** menu and move to ***Power Jet 1 OFF TPS*** with pressing + , or - and press ENTER .
Change TPS position with pressing + , or - (in 1%TPS steps) and press ENTER .

15. SOLENOID OUTPUT

Enter ***Set Ign.*** menu and move to ***Solenoid Output*** with pressing + , or - and press ENTER .
...you entered submenu for setting ***Solenoid Output*** parameters.

Submenu organisation:

Output type	- select output type (Power Jet 2, or Duty Solenoid)
Power Jet 2 *(if selected)*	- set Power Jet 2 parameters
Duty Solenoid *(if selected)*	- set Duty Solenoid parameters
Exit	- exit submenu

15.1. OUTPUT TYPE

Solenoid output function can be configured as Power Jet 2, or Duty Solenoid. Duty solenoid is used for adjusting A/F ratio on some carburettors.

Enter ***Solenoid Output.*** menu and move to ***Output type*** with pressing + , or - and press ENTER .
Change solenoid ***Output type*** with pressing + , or - and press ENTER .

15.2. POWER JET 2 *(if selected in Output Type menu)*

Same settings as ***Power Jet 1***...look at section 14.

15.3. DUTY SOLENOID *(if selected in Output Type menu)*

Three duty cycle curves for different throttle positions can be programmed. Each curve can be programmed in 8 rev points.

Enter ***Solenoid Output*** menu and move to ***Duty Solenoid*** with pressing + , or - and press ENTER .
...you enterd submenu for setting ***Duty Solenoid*** parameters.

Submenu organisation:
Curve 0-33% - duty cycle curve from 0 to 33% TPS
Curve 34-66% - duty cycle curve from 34 to 66% TPS
Curve 67-100% - duty cycle curve from 67 to 100% TPS
Exit - exit submenu

15.3.1 Set PARAMETERS FOR DUTY SOLENOID CURVE POINT

Move to point you want to change, with pressing + , or - and press ENTER .
Now you can change rev point with pressing + , or - (in 100 rpm steps) and press ENTER .
Now you can change duty cycle with pressing + , or - (in 1% steps) and press ENTER .

16. TPS

Enabling, or disabling Throttle Position Sensor.

Enter ***Set Ign.*** menu and move to ***TPS*** with pressing + , or - and press ENTER .
Enable, or disable TPS with pressing + , or - and press ENTER .

17. Set TPS close [0%] *(if TPS enabled)*

For correct operation, TPS close position must be calibrated!
Enter ***Set Ign.*** menu and move to ***TPS close [0%]*** with pressing + , or - and press ENTER .
Leave throttle at close position and confirm calibrating with pressing ENTER , or exit calibration with pressing - . Displayed number should be between 0 and 500.

18. Set TPS open [100%] *(if TPS enabled)*

For correct operation, TPS open position must be calibrated!
Enter ***Set Ign.*** menu and move to ***TPS open [100%]*** with pressing + , or - and press ENTER .
Move throttle to maximum open position and confirm calibrating with pressing ENTER , or exit calibration with pressing - . Displayed number should be between 500 and 1010.

19. TCT mode

Throttle Close spark Termination mode reduces number of sparks (spark is active every third revolution) above 8000 rpm, when throttle is closed. TCT mode ensure better engine cooling.

Enter ***Set Ign.*** menu and move to ***TCT mode*** with pressing + , or - and press ENTER .
Enable, or disable ***TCT mode*** with pressing + , or - and press ENTER .

This setting is primarily for race use, for normal road use recommended setting is 'DISABLED'.
If you have errors on the rev counter 'DISABLE' this setting.

20. IGN. MAP SW

Enabling, or disabling ignition map switch, for changing ignition maps while riding.

Enter ***Set Ign.*** menu and move to ***Ign. Map SW*** with pressing + , or - and press ENTER .
Enable, or disable external switch with pressing + , or - and press ENTER .

21. PULSES PER REV

It is number of pulses per rev from pickup coil and is important for correct rev reading. Setting is 2 for all twins with wasted spark ignition system.
Enter ***Set Ign.*** menu and move to ***Pulses Per Rev*** with pressing + , or - and press ENTER .
Change nr. of pulses per rev with pressing + , or - and press ENTER .

22. STOP SW MODE

Selects stop switch operation mode. Engine can be stopped with low level (stop switch connected to the ground), or with high level (stop switch is opened).

Enter ***Set Ign.*** menu and move to ***Stop SW Mode*** with pressing + , or - and press ENTER .
Select low level stop "0", or high level stop "1" with pressing + , or - and press ENTER .

23. 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 ground.

Enter ***Set Ign.*** menu and move to ***Ignition Test*** with pressing + , or - . With pressing ENTER multiple sparks will occur for about 1 second.

24. LOAD PV CURVE

Enter ***Set PV*** menu and move to ***Load PV Curve*** with pressing + , or - and press ENTER .
Select number of PV curve with pressing + , or - and press ENTER .

25. SAVE PV CURVE

Enter ***Set PV*** menu and move to ***Save PV Curve*** with pressing + , or - and press ENTER .
Select number to save your PV curve, with pressing + , or - and press ENTER .

26. Set PV Curve

Enter ***Set PV*** menu and move to ***Set PV Curve*** with pressing + , or - and press ENTER .
...you entered submenu for setting PV curve.

Submenu organisation:

Nr. of Points	- number of PV curve points (from 2 to 8)
1)	- first valve position point
2)	- second valve position point
...	...
...	...
Exit	- exit submenu

Important!
To avoid wrong processing, don't make unreasonable curve course.
Every time you make any changes to PV curve, it is automatically saved to number #0. Later you can save it to any other number from #1 to #5.

26.1. Change Number of Curve Points

Enter ***Set PV*** menu and move to ***Nr. of Points*** with pressing + , or - and press ENTER .
Select number of curve points, with pressing + , or - and press ENTER .

26.2. Change Parameters of PV Curve Points

Move to point you want to change, with pressing + , or - and press ENTER .
Change rev point with pressing + , or - (in 100 rpm steps) and press ENTER .
Change PV position from 0% to 100%, with pressing + , or - (in 1% steps) and press ENTER .

27. Set Deviation

Enter ***Set PV*** menu and move to ***Deviation*** with pressing + , or - and press ENTER .
Change deviation from 2% to 20% with pressing + , or - (in 1% steps) and press ENTER .
Deviation means how accurate valve is moved to calculated position. If deviation is too low then servo motor won't be stable – it will always search for calculated position in small movements. Default setting is +-5% and should meet in most cases.

28. CLOSE POSITION

Max close position must be calibrated after installation. Max close position is when curve is set to 0%. Close position can be moved to any desired position.

Enter ***Set PV*** menu and move to ***Close Position*** with pressing + , or - and press ENTER .
Set close position with pressing + , or - and press ENTER .

29. OPEN POSITION

Max open position must be calibrated after installation. Max open position is when curve is set to 100%. Open position can be moved to any desired position.

Enter ***Set PV*** menu and move to ***Open Position*** with pressing + , or - and press ENTER .
Set open position with pressing + , or - and press ENTER .

30. PV Test

PV test can be used for testing, or measuring valve position. Valve can be moved to any position from 0% to 100% without engine running.

Enter ***Set PV*** menu and move to ***PV Test*** with pressing + , or - and press ENTER .
Set valve position with pressing + or - and press ENTER to exit.

31. POWER-UP Test

Enabling, or disabling test cycle of PV servo at power-up.

Enter ***Set PV*** menu and move to ***Power-up Test*** with pressing + , or - and press ENTER .
Enable, or disable power-up test with pressing + , or - and press ENTER .

32. PV CURVE SW

Enabling, or disabling PV curve switch for changing PV curves while riding.

Enter ***Set PV*** menu and move to ***PV Curve SW*** with pressing + , or - and press ENTER .
Enable, or disable ***PV Curve*** switch with pressing + , or - and press ENTER .

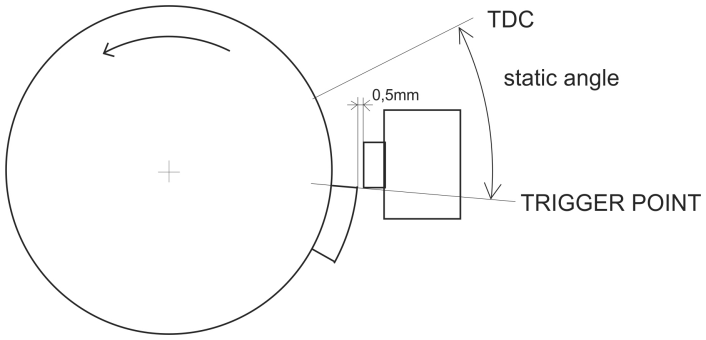
33. MEASURING STATIC ANGLE

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 then 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.

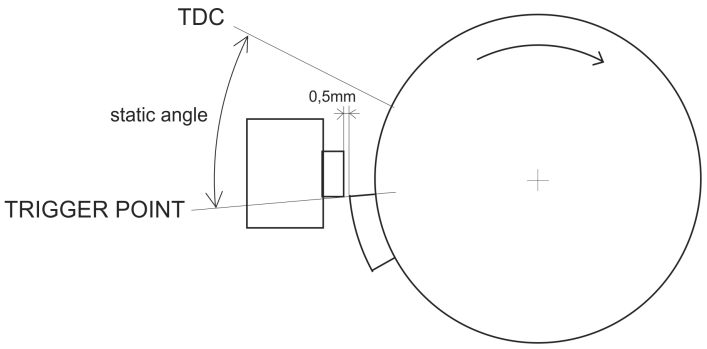
Procedure applies to single and multiple cylinder engines. If you have a multi cylinder engine with multple pickups it is recommended (but not required) that you perform this procedure on each cylinder/pickup pair for most accurate timing.
Necessary tools:
- strobe light
- dial gauge

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...16 deg advance is suitable for most engines.
- find information about engine stroke and conrod length
- convert programmed flat ignition advance angle to millimetres

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

Equation for calculating from degrees to millimetres:
a = 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 1,3 mm) 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 3000 rpm to 4000 rpm
- 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 31 deg.
- 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.

34. MONITORING

Connect **programmer** to **PDCI** and wait few seconds for activation of **programmer.** Fist information displayed on the **programmer** is firmware version.

With **programmer** you can watch revs, calculated advance ignition angle, TPS position ... depends on setting in the menu.

Information!
You can connect, or disconnect **PDCI** unit from **programmer** any time you want without any harm. It is not important, if motor running or not and if power supply is connected or not.

Important!
Do not use too much force when connecting or disconnecting **programmer** unit!

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

35. ERROR REPORTS

PVerr 1 – position sensor error or servo motor disconnected
PVerr 2 – servo motor error (short connection)