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PROGRAMMING MANUAL
PSR-B11T PROGRAMMABLE AC-CDI IGNITION

PSR-B11T is single channel AC-CDI with 2 switchable ignition maps, TPS, power jet and general purpose outputs (GPO).

TECHNICAL DATA

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
- maximum continuous current for and power jet and GPO output	1 Amp
- output energy	75 mJ

Features:
- CDI run without power supply
- power supply need only for power jet, or GPO
- one isolated input for magnetic pickup
- two ignition maps
- external switch for changing ignition map while riding
- TPS input (Throttle Position Sensor)
- power jet output
- general purpose outputs (GPO)
- soft rev limit (three stage rev limit)
- tachometer output
- easy and fast programming on the field, via hand held programmer
- programming with PC
- programming while machine running
- 3D interpolated ignition map, if TPS used
- signal delay compensation ensure accurate ignition advance
- instant monitoring of rev's and angle, via LCD(hand held programmer)
- fast processing for high accuracy - delays from 1us

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

1. HOW TO ENTER MENU

Connect **handheld programmer** to **PSR** and wait few seconds for activation of **handheld programmer** and press ENTER to continue. Move through the menu with pressing + , or - and choose with pressing ENTER .
Exit menu with choosing ***Exit.***

2. MENU ORGANISATION

Select Ign. Map	- select ignition map (from #1 to #2)
Ign. Map Switch	- activating/deactivating external switch for selecting ignition map
Set Ignition Map #1	- ignition map #1 settings
Set Ignition Map #2	- ignition map #2 settings
Advance	- advance/retard whole ignition map
GPO 1	- general purpose output 1 settings
Power Jet	- power jet settings
Rev Limit	- rev limit
Static Angle	- static angle (stator position)
Compensation	- signal delay compensation
Set TPS	- TPS (Throttle Position Sensor) settings
Shift Kill Time	- shift kill time setting
Kickback Protection	- kickback protection settings
Charge Boost	- enable/disable charge boost
Exit	

3. SELECT IGN. MAP

Move to ***Select Ign. Map*** with pressing + , or - and press ENTER to continue.
Select number of ignition map, with pressing + , or - and press ENTER to continue.

4. IGN. MAP SWITCH

Enabling, or disabling ignition map switch. With ignition map switch is possible to change ignition map while riding.

Move to ***Ign. Map Switch*** with pressing + , or - and press ENTER to continue.
Enable, or disable external switch with pressing + , or - and press ENTER to continue.

5. SET IGNITION MAP #1

Ignition advance between programmed points is 3D interpolated

Move to ***Set Ignition Map #1*** with pressing + , or - and press ENTER to continue.

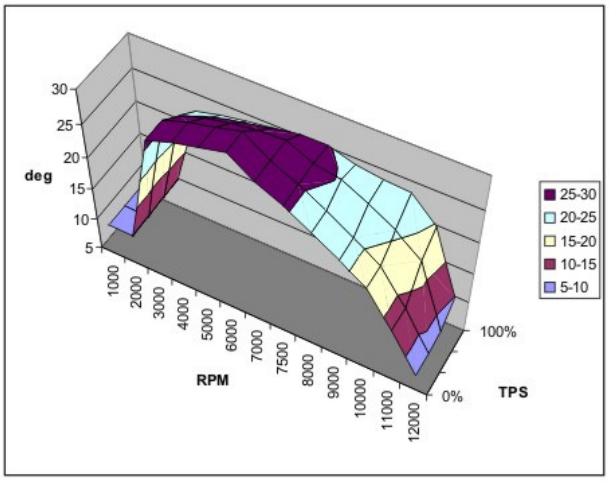
Submenu organisation:

Nr. of Points	- number of ignition curve points (from 4 to 15)
Curve TPS 0%	- first ignition curve
Curve TPS 5%	- second ignition curve
...	...
Curve TPS 100%	-
Exit	- exit submenu

Number of Curves and TPS values depends on TPS settings ... look at section **Set TPS.**

Important!
To avoid wrong processing, don't make unreasonable curve course.

Ignition Map Example:



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

Set Curve TPS xxx%:
Procedure is same for each ignition curve.
xxx% value depend on TPS settings ... look at section **Set TPS.**

Move to ***Curve TPS xxx%*** with pressing + , or - and then press ENTER to continue.
Move to point you want to change, with pressing + , or - and press ENTER to continue.
Change rev point with pressing + , or - (in 10 rpm steps) and press ENTER to continue.
Change advance angle with pressing + , or - (in 0.1deg steps) and press ENTER to continue.
Continue with same procedure for each point you want to change.

6. SET IGNITION MAP #2

Procedure is same as for ignition map #1... look at section **SET IGNITION MAP #1.**

7. ADVANCE

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

Move to ***Advance***, with pressing + , or - and then press ENTER to continue.
Set advance with pressing + , or - (in 0.1deg steps) and press ENTER to continue.

8. GPO 1 (General Purpose Output)

GPO 1 is general purpose output. It can be configured as ***Tachometer output***, or ***Power Jet 2***.

GPO 1 Type - GPO 1 output type as ***Tachometer***, or ***Power Jet 2***

When ***GPO 1*** configured as ***Power Jet 2***:
GPO change state when revs and TPS are higher/lower then programmed value.
GPO is de-energized (OFF) when engine not running!
Display explanation:

```
GPO 1      10%
   OFF   5000    ON
```

- 10% means TPS value
- 5000 means RPM value
- OFF means de-energized GPO
- ON means energized GPO

Explanation of operation of above settings:
GPO is ON when revs are above 5000 rpm and TPS is above 10%, otherwise GPO is OFF.

Move to ***GPO 1*** with pressing + , or - and then press ENTER .
Change ON/OFF state with pressing + , or - and press ENTER to continue.
Change TPS value with pressing + , or - and press ENTER to continue.
Change RPM value with pressing + , or - and press ENTER to continue.

9. SET POWER JET 1

Power jet change state, when TPS value is lower, or higher from programmed value.
Min and max revs setting also change power jet state.
TPS curve is interpolated between RPM points.
Power jet is de-energized (OFF) when engine not running!

Move to ***Set Power Jet 1*** with pressing + , or - and press ENTER to continue.

Submenu organisation:
Invert on/off - inverting power jet operation
Set PJ 1 Map - set power jet map parameters
Exit - exit submenu

Invert on/off:
Inverting power jet operation.

Move to ***Invert on/off*** with pressing + , or - and press ENTER to continue.
Enable, or disable inverting power jet operation with pressing + , or - and press ENTER to continue.

Set PJ 1 Map:
Set power jet map parameters.

Move to ***Set PJ 1 Map*** with pressing + , or - and press ENTER to continue.

Submenu organization:
Nr. of points - number of power jet RPM and TPS points
1) - first PJ point
2) - second PJ point
... ...
... ...
Exit - exit submenu

Nr. of points:
Move to ***Nr. of points*** with pressing + , or - and press ENTER to continue.
Set number of points with pressing + , or - and press ENTER to continue.

Set PJ point:
Move to point you want to change, with pressing + , or - and press ENTER to continue.
Change rev point with pressing + , or - and press ENTER to continue.
Change TPS value with pressing + , or - and press ENTER to continue.
Repeat procedure for each PJ point.

Example of power jet operation:
Invert on/off = yes
Nr. of points = 3
1) 50% @ 3500rpm
2) 50% @ 5000rpm
3) 50% @ 6500rpm

<table>
<tr><td rowspan="4">ON</td><td>3500 rpm</td><td>5000 rpm</td><td>6500 rpm</td><td rowspan="4">ON</td></tr>
<tr><td colspan="3">OFF</td></tr>
<tr><td>50 %TPS</td><td>50 %TPS</td><td>50 %TPS</td></tr>
<tr><td colspan="3">ON</td></tr>
</table>

ON means energized power jet and OFF means de-energized power jet.
PJ is OFF when TPS is higher then 50% and revs are between 3500rpm and 6500rpm.

10. REV LIMIT

Move to ***Rev Limit*** with pressing + , or - and press ENTER to continue.
Change rev limit with pressing + , or - and press ENTER to continue.

11. STATIC ANGLE

Move to ***Static Angle*** with pressing + , or - and press ENTER to continue.
Set static angle with pressing + , or - and press ENTER to continue.

Find more information's about static angle in section **MEASURING STATIC ANGLE** and **Explanation of trigger signal from pickup**.

12. COMPENSATION

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

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

13. Set TPS

Settings for Throttle Position Sensor.

Move to ***Set TPS*** with pressing + , or - and press ENTER to continue.

Submenu organization:

TPS close [0%]	- calibrate TPS close position
TPS open [100%]	- calibrate TPS open position
Nr. of TPS Ign. Points	- number of TPS ignition points
Set TPS Points	- set TPS points for ignition map
Exit	- exit submenu

TPS close [0%]:
For correct operation, TPS close position must be calibrated!
Move to ***TPS close [0%]*** with pressing + , or - and press ENTER to continue.
Hold throttle at close position and confirm calibration with pressing ENTER , or exit calibration with pressing - . Displayed number should be between 0 and 2500mV.

TPS open [100%]:
For correct operation, TPS open position must be calibrated!
Move to ***TPS open [100%]*** with pressing + , or - and press ENTER to continue.
Hold throttle at open position and confirm calibration with pressing ENTER , or exit calibration with pressing - . Displayed number must be greater then for TPS close position.

Set TPS points:
Move to ***Set TPS Points*** with pressing + , or - and press ENTER to continue.
Adjust TPS value with pressing + , or - and press ENTER to continue.
Continue with same procedure for all TPS points.
First TPS point must be lowest value, each next point must have higher value then previous.

14. SHIFT KILL TIME

Move to ***Shift Kill Time*** with pressing + , or - and press ENTER to continue.
Set kill time [ms] with pressing + , or - and press ENTER to continue.

15. KICKBACK PROTECTION

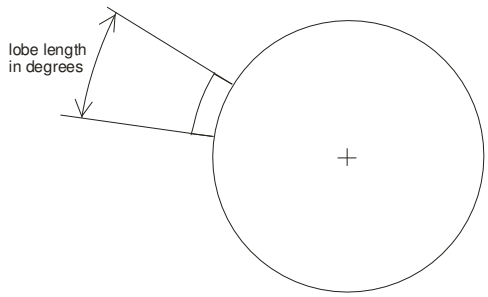
Move to ***Kickback Protection*** with pressing + , or - and press ENTER to continue.

Submenu organization:

Kickback Prot. Enable	- enable/disable kickback protection
Lobe Length	- trigger rotor lobe length in degrees
Min Starting Rpm	- minimal rpm for starting engine
Starting Retard	- ignition retard, only at starting
Exit	- exit submenu

Kickback Prot. Enable:
Move to ***Kickback Prot. Enable*** with pressing + , or - and press ENTER to continue.
Select "yes", or "no" with pressing + , or - and press ENTER to continue.

Lobe Length:
Lobe length is used to calculate RPM at starting. Wrong value result in wrong calculation.



Min Starting Rpm:
Minimal rpm for starting engine.

Move to ***Min Starting Rpm*** with pressing + , or - and press ENTER to continue.

Set rpm with pressing + , or - and press ENTER to continue.

Starting retard:
Ignition retard, only at starting.

Move to ***Starting Retard*** with pressing + , or - and press ENTER to continue.
Set retard with pressing + , or - and press ENTER to continue.

16. CHARGE BOOST

Charge boost must be activated with low resistance stator coils (around 20 ohms) and deactivated with high resistance stator coils.

Enter menu and move to ***Charge Boost*** with pressing + , or - and press ENTER to continue.
Enable, or disable charge boost with pressing + , or - and press ENTER to continue.

17. MONITORING

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

Programmer show revs, calculated ignition advance angle, TPS position...depends on setting in the menu.

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

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

18. MEASURING STATIC ANGLE

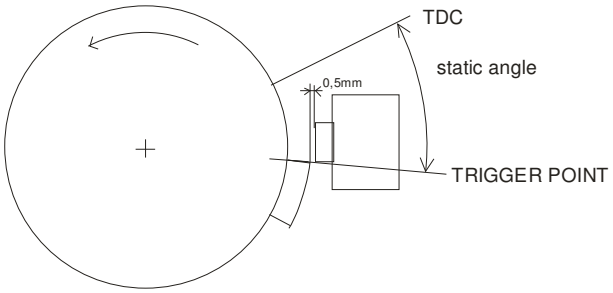
Measuring correct static angle is very important. Wrong static angle will cause inaccurate ignition advance. If static angle is programmed larger than mechanical static angle ignition advance will be smaller than programmed, or vice versa.
The most accurate procedure of measuring static angle is with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

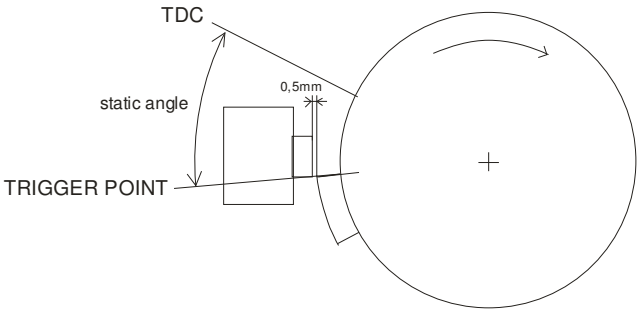
Necessary tools:
- strobe light
- dial gauge

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

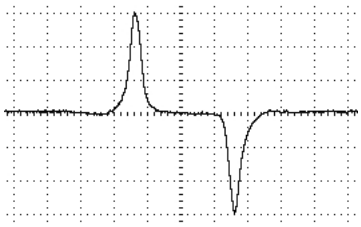
Result of above procedure is very accurate static angle.

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 30deg, 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 45deg 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.

19. 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 bar...negative pulse must be second and is generated by trailing edge of trigger bar.
If trigger signal is opposite (first negative and second positive), then wires from the pickup need to be switched...that changes polarity of signal from pickup.
Leading edge of trigger bar defines static angle position and trailing edge defines idle running timing position.