SRT / SRAE
SOFTWARE
DOCUMENTATION
SUPER-USER

7. IGNITION

chapter 7

Release : 2.0

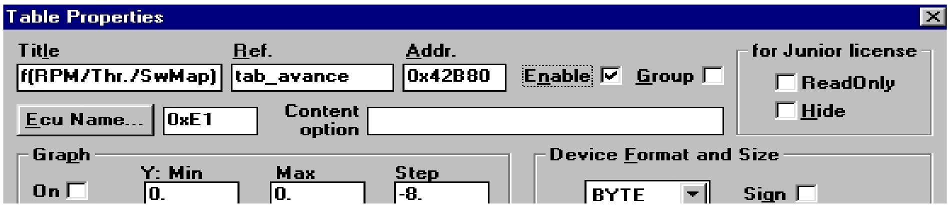
REVISIONS DOCUMENT

Release	*Author*	*Date*	*Modifications*
1.0	**M.Mersier**	**04/05/2004**	• **Creation(SRA)**
2.0	**M.Mersier**	**09/15/2006**	• **Update (SRT/SRAE)**

7.1 Base Ignition Advance

It is extremely important to understand that two possible advance maps presented hereafter cannot coexist. They are at the same address in the ECU, and only one set (the one adapted to your system) must be activated, the other one being deactivated.
In order to achieve this activation selection, you must enter the maps' properties and only enable the map you actually want to use.

Just a quick reminder on the way to change the "enable" tag in the map properties:



7.1.1 Ignition Advance Map as a Function of RPM / Throttle Position / Double map switch position (Non Turbo Engines)

The ignition advance is expressed in crankshaft degrees as a function of RPM and throttle position in ° or %.(**EE.Ign.tab_avance**).
The double map switch position determines the Z-axis (if there isn't a double map switch, the active map is the first one; but in that case it's always safer to copy the same map in the two possible positions of the switch).

7.1.2 Ignition Advance Map as a Function of RPM / Inlet Air Pressure / Double map switch position (Non Turbo Engines)

The ignition advance is expressed in crankshaft degrees as a function of RPM and inlet air pressure in mbar. %.(**Avance1**).
The double map switch position determines the Z-axis (if there isn't a double map switch, the active map is the first one; but in that case it's always safer to copy the same map in the two possible positions of the switch).

7.1.3 Ignition Advance Map for Turbo Engines

See § 9.6.3 "Open Loop Ignition Advance" in documentation Turbo-x.doc

7.2 General Corrections

7.2.1 Air Temperature Correction

The air temperature correction **FD.Ign.Katair** is an additive ignition advance correction expressed in crankshaft degrees, and is interpolated in the map **EE.Ign.tab_Katair** . as a function of air temperature in °C

7.2.2 Water Temperature Correction

The water temperature correction **FD.Ign.Kateau** is an additive ignition advance correction expressed in crankshaft degrees, and is interpolated in the map **EE.Ign.tab_Kateau** . as a function of water temperature in °C

7.2.3 Barometric Pressure Correction

The barometric pressure correction **FD.Ign.Kapatm**is an additive ignition advance correction expressed in crankshaft degrees, and is interpolated in the map **EE.Ign.tab_Kapatm**. as a function of barometric pressure in Mbar.

7.2.4 Global Correction

The global correction **EE.Ign.Ktetatrim** .is an additive ignition advance correction expressed in crankshaft degrees.
This parameter can be used to quickly add or remove advance on the whole map.

7.3 Individual Cylinder Correction

7.3.1 Map Individual correction

An additive ignition advance correction expressed in crankshaft degrees interpolated in the map **EE.Ign.CorAvCyl[cyl]** as a function of RPM. (There are 8 similar maps: one for each of the 8 cylinders)

7.3.2 Knock Individual correction

An additive knock ignition advance correction expressed in crankshaft degrees **FD.Knk.CorrAvCliq**[cyl (see §8.4.4 in Knock_x.doc for more details)

7.4 Cockpit Advance Trimmer Correction

7.4.1 Cockpit Advance Trimmer Breakpoints

The table **EE.Ign.BornesClic** contains five pairs of voltage values (minimum and maximum) defining the electrical limits of each trimmer position.

As usual, with this type of table, the standard rules apply:
- Second value of the pair must be superior to the first
- There must not be any overlap between pairs
- Unused positions (if any) should be filled-in with electrical values impossible to reach (6V for instance)

7.4.2 Cockpit Advance Trimmer Correction

EE.Ign.TbClicAva is an additive ignition advance correction expressed in crankshaft degrees as a function of the Cockpit Advance Trimmer switch position (positions 1 to 5 defined in the previous map).
If the Trimmer's analog input is not within any of the 5 voltage pairs, the default position here is the position 1.

7.5 Ignition Advance Calculation

The ignition advance calculation uses the following formula for each cylinder:

$$\begin{aligned}\mathbf{FD.Ign.Avance} = {} & \mathbf{FD.Ign.Avance\_base} + \mathbf{FD.Ign.Katair} + \mathbf{FD.Ign.Kateau} + \mathbf{EE.Ign.Ktetatrim} \\ & + \mathbf{FD.Ign.Kapatm} + \mathbf{FD.Ign.PotAV} + \mathbf{FD.Ign.Kadyn} + \mathbf{FD.Plus.Ktetafil} \\ & + \mathbf{FD.Ign.ClicAva}\end{aligned}$$

$$\mathbf{FD.Ign.Teta[cyl]} = \mathbf{FD.Ign.Avance} + \mathbf{FD.Knk.CorrAvCliq[cyl]} + \mathbf{EE.Ign.CorAvCyl[cyl]f(rpm)}$$

where:
- **FD.Ign.KavDyn**, dynamic advance for idle RPM stabilisation
- **FD.Ign.KTetaFil**, advance correction during upshift f(gear)
- **FD.Ign.PotAv**, advance correction used during mapping with «VISION»
- **FD.Ign.ClicAva**, advance correction by cockpit trimmer

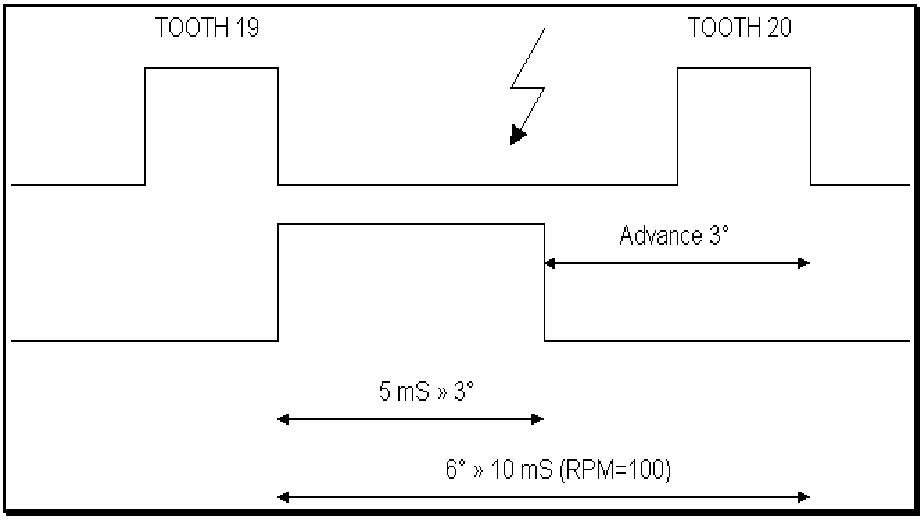
NOTE: All the terms are expressed in crankshaft degrees.

7.6 Starting Ignition Advance

The ignition advance **EE.Ign.AvanceDem** during the engine-starting phase is a special case for low speeds. During fire-up, the beginning of the coil charge is started with reference to the TDC tooth but excluding fractions of a tooth (Example: If the position of the TDC is 23.40 , the coil charge is started on tooth 23.) The ignition is actuated several milliseconds later depending on battery voltage.

It is possible to change the position of the coil charge start (and hence ignition advance) by a certain number of teeth:

It is therefore evident that this correction is best applied with crank trigger wheels whose numbers of teeth are sufficient for allowing a reasonable correction. (Example: 60 teeth ⇒ 6° interval per tooth). The following example is for a standard 60-2 wheel with TDC on tooth 20.00. Starting Advance is programmed with 1 (to give tooth 19.00) and a cranking speed of 100 RPM. With a coil charge time of 5 milliseconds, a real ignition advance of 3° is obtained.



This function is applied when the engine speed is less than the threshold **EE.Ign.RegAllDent** :

And disappears when the engine speed becomes greater than the above threshold plus this hysteresis level: **EE.Ign.HystRegAllDent**

7.7 Dynamic Advance

There is a dynamic advance ignition correction for idle engine speed stabilisation. This function can be authorised by **EE.CfgU.AutoAvaDyn** (see **Client _Configuration.doc**)

7.7.1 Conditions for Applying Dynamic Advance

If this function is enabled, the dynamic advance calculation is made within a zone of RPM defined by two thresholds (**EE.Ign.L_rpm_avd** and **EE.Ign.H_rpm_avd**) and when the throttle is below the threshold **EE.Ign.S_PL** .

7.7.2 Dynamic Advance Calculation

The dynamic spark advance correction is calculated as follows: .

$$\boxed{KAvDyn = -\frac{dRPM}{dt} * EE.Ign.KDC1}$$

where:

- ***dRPM / dt***, in RPM/second.
- ***EE.Ign.KDC1,*** in crankshaft degrees / RPM / second.
- ***KAvDyn,*** in crankshaft degrees.

The term ***KavDyn*** may be positive or negative.
This is then limited between two bounds, ***EE.Ign.MinAvd*** and ***EE.Ign.MaxAvd*** (to give it boundaries).
Attention: ***Min_AvDyn*** is a negative value:

$$\boxed{EE.Ign.MinAvd <= KAvDyn <= EE.Ign.MaxAvd}$$