

[Print](#)[Exit](#)**6AR-FSE ENGINE CONTROL SFI SYSTEM CONTROL ELECTRICAL SPARK ADVANCE (ESA) CONTROL****FUNCTION**

- a. The Direct Ignition System (DIS) is used. Each ignition coil assembly is equipped with a built-in igniter, and one ignition coil assembly is provided for each cylinder. The ECM performs ignition timing control in accordance with the engine status based on the signal from the sensors.
- b. The ECM calculates the most appropriate ignition timing and the time that current is applied to the primary windings of the ignition coil based on the signals sent from various sensors. The ECM then sends an ignition command signal to the igniter of the ignition coil assembly. The default ignition timing is set at 10° before top dead center (BTDC).
- c. The ignition timing is obtained using the following formula:  
Ignition timing = A or B + C  
Where: A: Base ignition timing, B: Basic advance, C: Compensation advance

**Ignition Timing Controls**

A. Fixed advance characteristics	The base ignition timing is 10° BTDC. It is fixed at 5° BTDC while the engine is starting.
B. Basic advance characteristics	The most appropriate ignition timing is selected from a map based on the signals from a variety of sensors.
C. Compensation advance characteristics	The ignition timing is advanced or retarded depending on the signals from a variety of sensors.
C-1. Warm engine advance characteristics	When the engine coolant temperature is low, the ignition timing is advanced in accordance with driving conditions to enhance drivability.
C-2. Idle stabilization advance characteristics	If the idle speed drops, the ignition timing is advanced to stabilize the idle speed. If the idle speed increases, the ignition timing is retarded.
C-3. Transition compensation retard	To prevent knocking, the ignition timing is retarded during sudden acceleration at a coolant temperature of 60°C (140°F) or more.
C-4. Timing retardation during fuel cut recovery	The ignition timing is retarded when the engine is recovered from fuel cut control, reducing shock.
C-5. Retard when accelerating	The ignition timing is temporarily retarded during acceleration to enhance drivability.
C-6. Knock compensation retard	If knock occurs, the ignition timing is corrected based on the signal from the knock control sensor.
C-7. Timing advance during EGR adjustment	Adjustment is performed to advance the ignition timing in accordance with the EGR volume.