

Document title Synchronize fuel injection and firing order function

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- Engine** 276.8 in model 207, 212
as of model year 2014
- Engine** 276.8 in model 218
as of model year 2015
- Engine** 276.9 in model 207, 212 (except 212.095), 218
as of model year 2014

Function requirements synchronization of fuel injection and firing order, general points

- Circuit 87M (engine management ON)
- Engine running

Synchronization of fuel injection and firing order, general points

Y76 Synchronization of the injection and firing order is processed by the ME-SFI [ME] control unit (T1/10) in order to actuate the ignition coils for cylinders 1 to 6 (N3/1 to Y76/6) and fuel injectors for cylinders 1 to 6 (/1 to T1/6).

Furthermore, synchronization is required for knock control and fuel shutoff on the individual cylinders.

The ME-SFI [ME] control unit synchronizes the injection and firing order using the signals from the following sensors:

- Crankshaft Hall sensor (B70), engine speed and crankshaft position
- Left and right intake camshaft hall sensors (B6/4, B6/5), intake camshaft positions
- Left and right exhaust camshaft hall sensors (B6/6, B6/7), exhaust camshaft positions

Function sequence for synchronization of the fuel injection and firing order

The function sequence is described in the following steps:

- **Function sequence for synchronization**
- **Function sequence for coasting detection**

● Function sequence for engine speed signal

Function sequence for synchronization

When the engine is started, the injection sequence is determined according to the firing order, using the voltage signals from the crankshaft Hall sensor and the intake camshaft or exhaust camshaft Hall sensors. To do this the ignition TDC (Top Dead Center) of cylinder 1 must be recognized.

At the 2nd negative signal edge following the gap in the signal from the crankshaft Hall sensor, the ME-SFI [ME] control unit detects the TDC position in cylinders 1 and 6. If the signal from an intake camshaft Hall sensor is at 0 V (low) at this time, the ME-SFI [ME] control unit processes it to detect ignition TDC in cylinder 1.

i If the voltage signal from a camshaft Hall sensor is missing, the voltage signal from another camshaft Hall sensor is taken in a certain sequence and used as a replacement to detect ignition TDC in cylinder 1. If no voltage signal whatsoever is available from a camshaft Hall sensor, injection and ignition take place after a 360° CKA (Crank Angle) in order to allow an emergency engine start.

Function sequence for coasting detection

When the engine shut down coasting detection is started, which also evaluates the engine turn back shortly before standstill.

During a computer run on from the ME-SFI [ME] control unit, the determined rest position of the crankshaft as a °crank angle is stored and used for the next engine start.

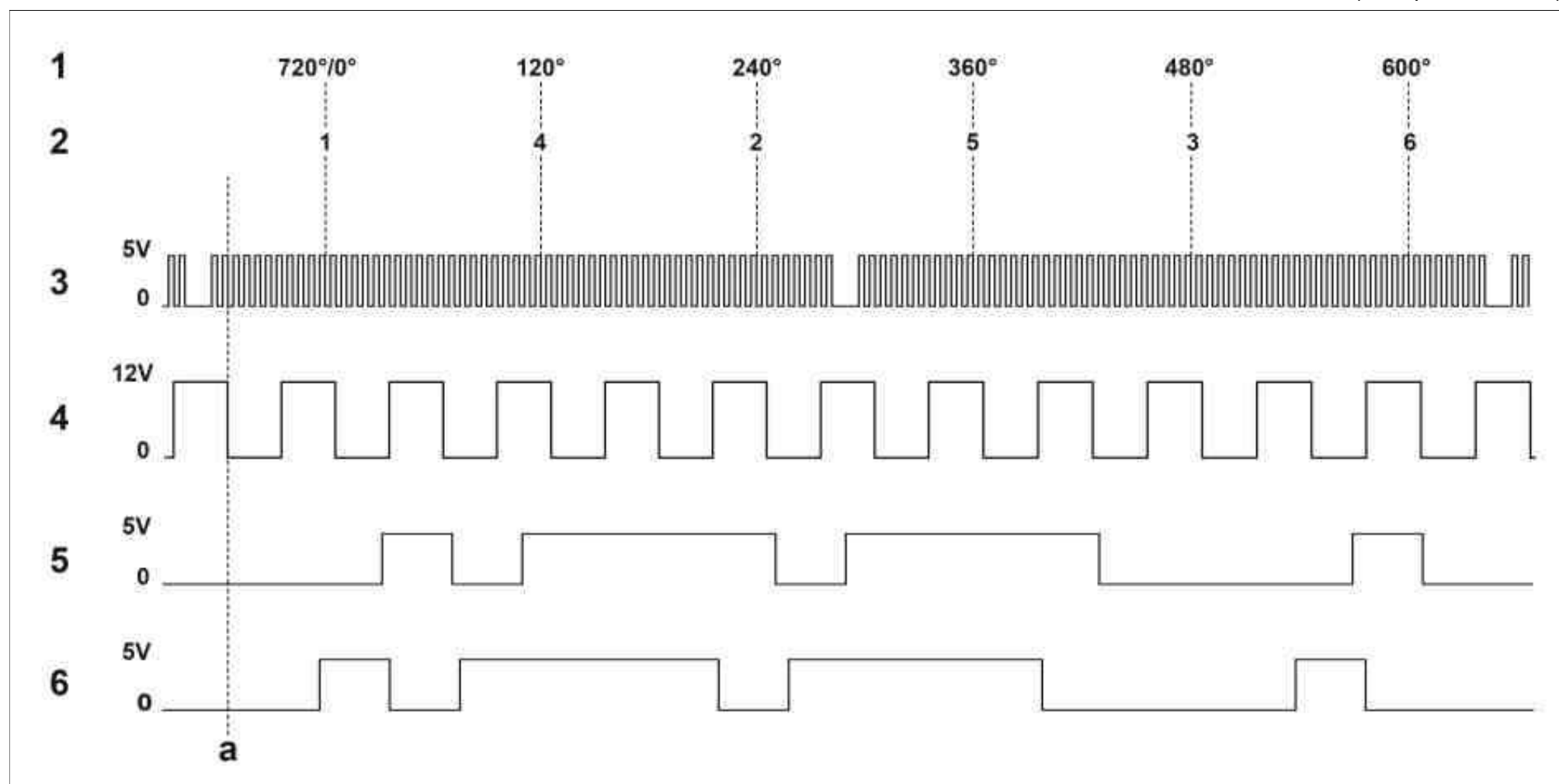
If coasting detection does not produce a result, or the engine has been turned while shut down, injection and firing order are synchronized at engine start.

Function sequence for engine speed signal

Using the signal from the crankshaft Hall sensor, the ME-SFI [ME] control unit generates the short circuit-proof engine speed signal (for example for cold testing and diagnosis) and outputs it via chassis CAN 1 (CAN E1). When the crankshaft is turning, a voltage signal (AC voltage) is generated in the crankshaft Hall sensor by the teeth on the sensor rotor. Here, each tooth generates a voltage pulse. No voltage is generated at the gap where there are 2 missing teeth.

The engine speed signal is a square wave signal with a constant on/off ratio of 6 pulses per engine revolution (60°CKA) and a maximum current of approx. 20 mA.

i If the voltage signal from the crankshaft Hall sensor drops, the voltage signals from the LH and RH intake camshaft Hall sensors or the LH and RH exhaust camshaft Hall sensors are used instead (in limp-home mode).



Signal assignment

- | | | |
|--------------------------------------------------------------------------------------|--------------------------------------------------------------------|---------------------------------------------|
| 1 Crank angle in °CKA | 4 Engine speed signal | a Recognition of ignition TDC of cylinder 1 |
| 2 Ignition TDC and firing order | 5 Voltage signal from LH and RH intake camshaft Hall sensor (low) | |
| 3 Crankshaft hall effect sensor voltage signal (second negative flank after the gap) | 6 Voltage signal from LH and RH exhaust camshaft Hall sensor (low) | |

	Electrical function schematic, synchronization of the injection and firing order	MODEL 207 MODEL 212 Model 218	PE07.10-P-2706-97EAK PE07.10-P-2706-97DAQ PE07.10-P-2706-97XAI
	Overview of system components for gasoline injection and ignition system with direct injection	Engine 276.9 in model 207, 212 (except 212.095), 218 as of model year 2014 Engine 276.8 in model 207, 212 as of model year 2014 Engine 276.8 in model 218 as of model year 2015	GF07.70-P-9998MM GF07.70-P-9998MMP