Electrical Test Program – Ignition System Test

⚠ **WARNING!**
Risk of severe injury when touching ignition parts which produce high voltages. Do not touch ignition components.
Persons with heart pacemakers are not to perform repairs on this type of ignition system.

1. Review **WARNING!** on pages 11/1 and 11/2,
2. Review 11, 21, 22, 23, 24, 31, 33,
3. Review section 0,
4. Connect HHTand readout DTC memory, see 11,
5. Ignition: **OFF**
6. Connect test cable with socket box as per "Connection Diagram - Socket Box", see 22/5.

Connector with red marking is not required at this time since the engine control module has presently no function installed for it. When disconnecting the connectors on the engine control module remove center connector (D) first, when reconnecting connectors install center connector (D) last.

Note regarding "Test Connection" column:
The numbers indicated in parentheses, for example, ⇒ 1.0 (2A) signify:
2 = Socket 2 on wiring diagram.
A = Connector A on wiring diagram

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
1.0	P0 560	**Engine control module (N3/10)** Voltage supply circuit 30	N3/10 3 (3A) — V — 12 (4B)	Ignition: **ON**	11 – 14 V	⇒ 1.1 – 1.2

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⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
1.1		Ground wire	N3/10 — X11/4 3 — 2 (3A) 7 — 2 (7A) 112 — 2 (8F) 119 — 2 (15F)	Ignition: **ON**	11 – 14 V	Wiring, **Model 170 and 202:** Output ground (W16/6), Right component compartment.
1.2		Voltage supply circuit 30	N3/10 — X11/4 X11/4 1 — 12 (4B)	Ignition: **ON**	11 – 14 V	Wiring, **Model 170:** Relay module (K40), **Model 202:** Passenger-side fuse and relay module box (K40/4).
2.0	P0 560	**Engine control module (N3/10)** Voltage supply circuit 87	N3/10 8 (8A) — 2 (2A)	Ignition: **ON**	11 – 14 V	⇒ 2.1 – 2.2

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⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
2.1		Electronics ground	N3/10 X11/4 8 — (8A) — 2	Ignition: **ON**	11 – 14 V	Wiring, **Model 170 and 202:** Output ground (W16/6), Right component compartment.
2.2		Voltage supply circuit 87	N3/10 X11/4 1 — 2 (2A)	Ignition: **ON** Ignition: **OFF**	11 – 14 V < 1 V	Wiring, **Model 170:** Relay module (K40). **Model 202:** Passenger-side fuse and relay module box (K40/4).
3.0		**Ignition coil (T1/1)** Cylinder 1 and 4 Voltage supply	N3/10 3 — (3A) — 124 (20F)	Ignition: **ON** Starter: **Crank**	11 – 14 V > 10 V	Wiring, Fuses: **Model 170:** fuse 11 **Model 202:** fuse and relay module box fuse 6 Ignition coil (T1/1)
4.0		**Ignition coil (T1/2)** Cylinder 2 and 3 Voltage supply	N3/10 3 — (3A) — 117 (13F)	Ignition: **ON** Starter: **Crank**	11 – 14 V > 10 V	Wiring, Fuses: **Model 170:** fuse 11 **Model 202:** fuse and relay module box fuse 6 Ignition coil (T1/2)

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⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
5.0	P0 335	**CKP sensor (L5)** Signal	N3/10 93 (37E) — (±) — 94 (38E)	Test with oscilloscope. Starter: **Crank** Engine: **at Idle**	Signal, see Figure 1 and 3.	⇒ 5.1, Teeth on starter ring gear.
		Voltage	N3/10 93 (37E) — (V) — 94 (38E)	Test with multimeter only if oscilloscope is unavailable. Starter: **Crank** Engine: **at Idle**	> 2.5 V > 5 V Voltage increases with increasing rpm.	
5.1		Resistance of CKP sensor (L5)	N3/10 93 (37E) — (Ω) — 94 (38E)	Ignition: **OFF** Unplug connector **E** on engine control module (N3/10).	700 – 1400 Ω (at 20°C): 600 – 1200 Ω	Wiring, L5

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⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
6.0	P0 341	**Camshaft Hall-effect sensor (B6/1)** Hall-effect signal	N3/10 95 (39E) — (±) — 96 (40E)	Test with oscilloscope. Engine: **at Idle**	Signal: see Figure 2 and 3	⇒ 6.1, Wiring B6/1
			N3/10 96 (40E) — (V) — 2 (2A)	Test with multimeter only if oscilloscope is unavailable. Engine: **at Idle**	1.2 – 1.7 V Value changes.	
6.1		Voltage supply to camshaft Hall-effect sensor (B6/1)	B6/1 1 — (V) — 3	Ignition: **ON** Disconnect connector from Hall-effect sensor (B6/1) and test directly on sockets 1 and 3 of connector.	11 – 14 V	Wiring.

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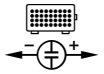
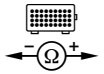
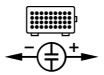
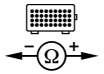
⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
7.0	P0 300 P0 301 P0 304	**Primary voltage** Ignition coil (T1/1), Cylinders 1 and 4	N3/10  124 (20F) — 2 (2A)	Test connection Individual primary pattern Range 400 V Duration 5 milliseconds Starter: **Crank**	200 – 350 V	⇒ 7.1
7.1		Primary winding of T1/1 and T1/2	N3/10  124 (20F) — 117 (13F)	Ignition: **OFF**	0.9 – 1.6 Ω The resistance of a single coil at 20 °C is approx. 0.6 Ω.	Wiring T1/1 or T1/2
8.0	P0 300 P0 302 P0 303	**Primary voltage** Ignition coil (T1/2) Cylinders 2 and 3	N3/10  117 (13F) — 2 (2A)	Test connection Individual primary pattern Range 400 V Duration 5 milliseconds Starter: **Crank**	200 – 350 V	⇒ 8.1
8.1		Primary winding of T1/2 and T1/1	N3/10  117 (13F) — 124 (20F)	Ignition: **OFF**	0.9 – 1.6 Ω The resistance of a single coil at 20 °C is approx. 0.6 Ω.	Wiring T1/2 or T1/1

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⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/remedy
9.0	P0 300 P0 301 P0 302 P0 303 P0 304	**Firing voltage** Ignition coil (T1/1) and (T1/2)	Engine analyzer ⊖ ⏚ ⊕	ℹ Test connection Individual secondary pattern Range 20 kV Duration 5 milliseconds Connect kV pick-ups successively to T1/1 and T1/2. Starter: **Crank**	8 – 20 kV	⇒ 9.1, Spark plugs, N3/10
9.1		Secondary winding of T1/1 or T1/2	T1/1 T1/2 ⊖ Ω ⊕ cir. 4a cir. 4b	Disconnect both ignition cables on T1/1 or T1/2	6 – 8.5 kΩ	T1/1 or T1/2

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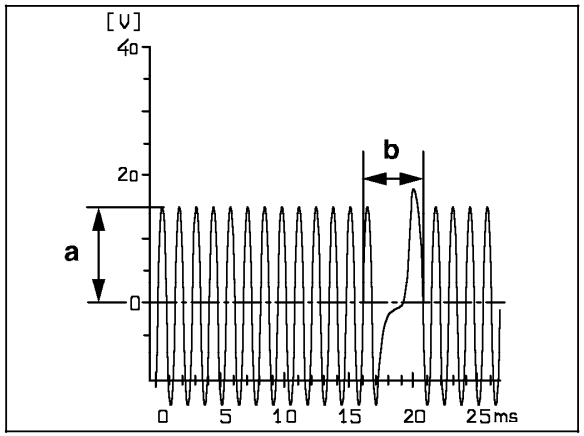

Figure 1

CKP sensor (L5) signal, shown at idle

b=2 missing teeth for cylinder 1 recognition

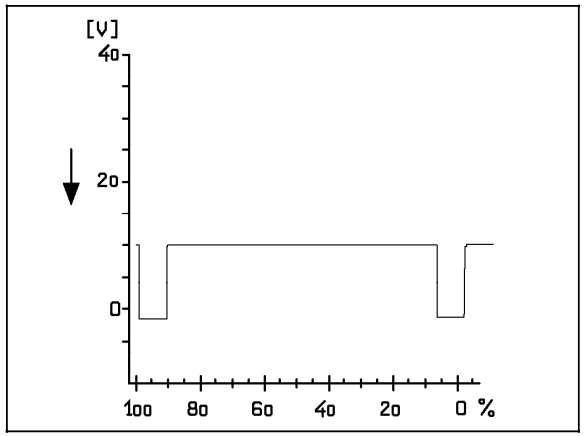

Figure 2

Camshaft Hall-effect sensor (B6/1) signal

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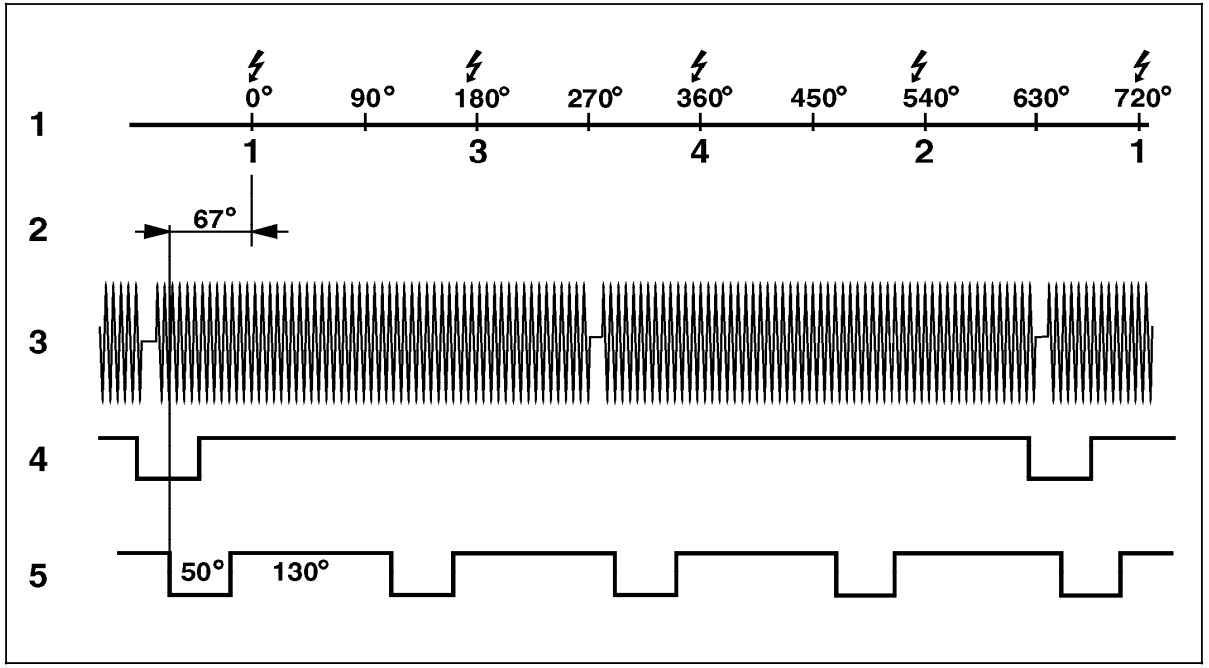
Signal survey



P07.61-0257-05

Figure 3

1 Crank angle (CKA)
2 Cylinder
3 CKP sensor (L5) signal
4 Camshaft Hall-effect sensor (B6/1) signal
5 Engine rpm signal TNA