

Electrical Test Program – Ignition System Test


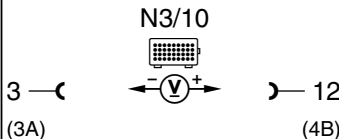
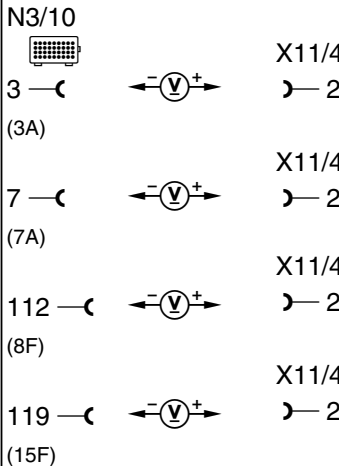
⚠ WARNING!

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.

Preparation for Test:


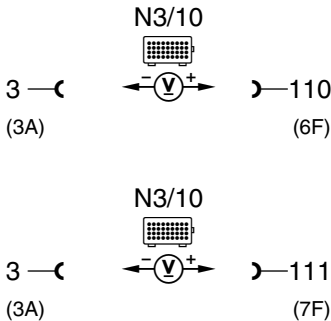
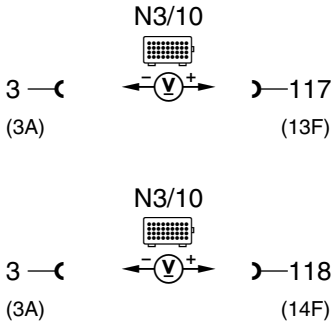
1. Review 11, 21, 22 entirely.
2. Ignition: **OFF**
3. Connect test cable with socket box to engine control module (N3/10), as per connection diagram, see 22

| ⇒ |  | Test scope | Test connection | Test condition | Nominal value | Possible cause/remedy |
|-----|---|---|--|--|---------------|---|
| 1.0 | PO 560 | Engine control module (N3/10) Voltage supply circuit 30 |  | Ignition: ON | 11 – 14 V | ⇒ 1.1 – 1.2 |
| 1.1 | | Ground wire |  | Ignition: ON Model 163: Connect socket 8 to 16-pole connector. | 11 – 14 V | Wiring, Model 202/208/210: Output ground (W16/6), right component compartment. Model 163: Ground (W16), component compartment. ⇒ 1.2 |


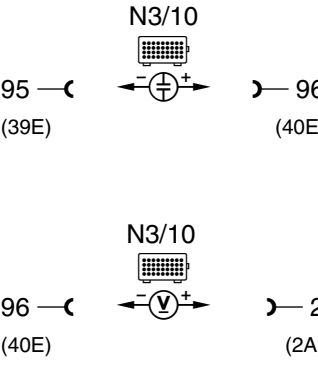
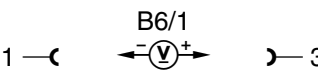
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|-----|--|---|------------------------|-----------------------------|--|----------------------------|---|
| 1.2 | | Voltage supply circuit 30 | X11/4 1 — | N3/10 12 — (4B) | Ignition: ON Model 163: Connect socket 4 to 16-pole connector. | 11 – 14 V | Wiring, Passenger-side fuse and relay module box (K40/4) or Fuse and relay box (F1). |
| 2.0 | | Engine control module (N3/10) Voltage supply circuit 87 | 8 — (8A) | N3/10 2 — (2A) | Ignition: ON | 11 – 14 V | ⇒ 2.1 – 2.2 |
| 2.1 | | Electronics ground | N3/10 8 — (8A) | X11/4 2 — | Ignition: ON | 11 – 14 V | Wiring, Models 202/208/210: Output ground (W16/6), right component compartment. Model 163: Ground (W16), component compartment. |
| 2.2 | | Voltage supply circuit 87 | X11/4 1 — | N3/10 2 — (2A) | Ignition: ON Model 163: Connect socket 4 to 16-pole connector. Ignition: OFF | 11 – 14 V < 1 V | Wiring, Passenger-side fuse and relay module box (K40/4) or fuse and relay box (F1f22). |


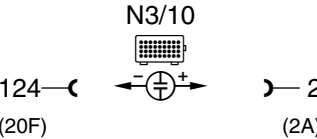
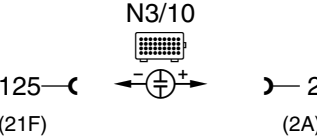
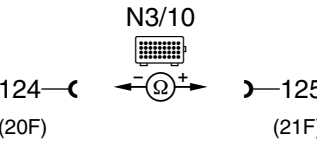
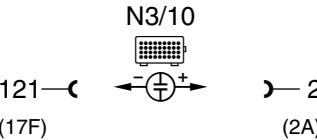
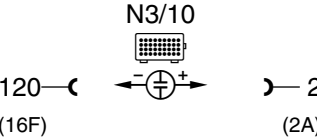
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| ⇒ |  | Test scope | Test connection | Test condition | Nominal value | Possible cause/remedy |
|-----|---|---|--|---------------------|---------------|--|
| 5.0 | | Ignition coil (T1/3) Cylinder 3 Voltage supply Primary coil a Voltage supply Primary coil b |  | Ignition: ON | 11 – 14 V | Wiring, Models 202/208/210: Fuses in passenger-side fuse and relay module box (K40/4f6), Model 163: Fuse and relay box (F1f26), Ignition coil (T1/3). |
| 6.0 | | Ignition coil (T1/4) Cylinder 4 Voltage supply Primary coil a Voltage supply Primary coil b |  | Ignition: ON | 11 – 14 V | Wiring, Models 202/208/210: Fuses in passenger-side fuse and relay module box (K40/4f6), Model 163: Fuse and relay box (F1f26), Ignition coil (T1/4) |


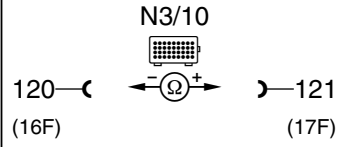
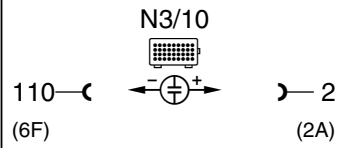
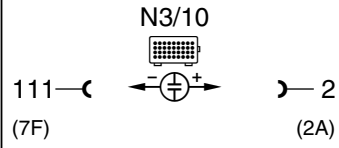
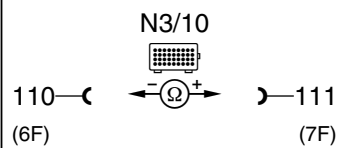
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| ⇒ |  | Test scope | Test connection | Test condition | Nominal value | Possible cause/remedy |
|------|---|--|--|---|--|-------------------------------------|
| 10.0 | P0 341 | <p>Camshaft Hall-effect sensor (B6/1) Hall-effect signal</p> <p>Voltage</p> | <p>N3/10</p>  | <p>Test with oscilloscope. Engine: at Idle</p> <p>Test with multimeter only if oscilloscope is unavailable. Engine: at Idle</p> | <p>Signal: see Figure 2 and 3.</p> <p>1.2 – 2.2 V Value changes.</p> | <p>⇒ 10.1, Wiring, B6/1</p> |
| 10.1 | | <p>Voltage supply to camshaft Hall-effect sensor (B6/1)</p> | <p>B6/1</p>  | <p>Ignition: ON</p> <p>Disconnect connector from Hall-effect sensor (B6/1) and test directly on sockets 1 (brown/green) and 3 (red/blue) of connector.</p> | <p>11 – 14 V</p> | <p>Wiring.</p> |







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|------|---|---|--|---|--|-----------------------|
| 11.0 | PO 300 PO 301 | Primary voltage Ignition coil (T1/1), Cylinder 1 Primary circuit a Primary circuit b |   | Test connection Note: Individual primary pattern Range: 400 V Duration: 100% Starter: Crank | 200 – 350 V | ⇒ 11.1 |
| 11.1 | | Primary winding of T1/1 Primary circuit a and b |  | Ignition: OFF | 0.9 – 1.6 Ω The resistance of a single coil at 20° C is approx. 0.6 Ω. | Wiring, T1/1 |
| 12.0 | PO 300 PO 302 | Primary voltage Ignition coil (T1/2), Cylinder 2 Primary circuit a Primary circuit b |   | Test connection Note: Individual primary pattern Range: 400 V Duration: 100% Starter: Crank | 200 – 350 V | ⇒ 12.1 |


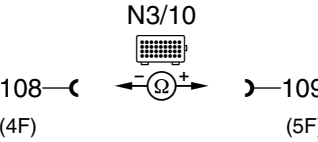
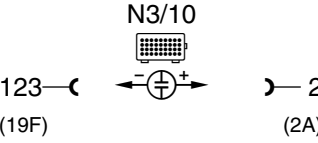
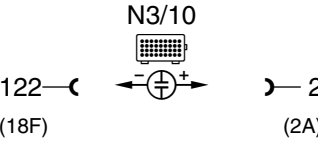
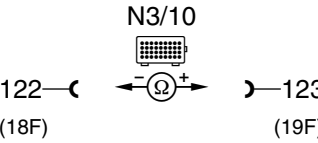
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| ⇒ |  | Test scope | Test connection | Test condition | Nominal value | Possible cause/remedy |
|------|---|---|---|---|---|-----------------------|
| 12.1 | | Primary winding of T1/2 Primary circuit a and b | N3/10  | Ignition: OFF | 0.9 – 1.6 Ω The resistance of a single coil at 20° C is approx. 0.6 Ω. | Wiring, T1/2 |
| 13.0 | PO 300 PO 303 | Primary voltage Ignition coil (T1/3), Cylinder 3 Primary circuit a Primary circuit b | N3/10  N3/10  | Test connection Note: Individual primary pattern Range: 400 V Duration: 100% Starter: Crank | 200 – 350 V | ⇒ 13.1 |
| 13.1 | | Primary winding of T1/3 Primary circuit a and b | N3/10  | Ignition: OFF | 0.9 – 1.6 Ω The resistance of a single coil at 20° C is approx. 0.6 Ω. | Wiring, T1/3 |



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| ⇒ |  | Test scope | Test connection | Test condition | Nominal value | Possible cause/remedy |
|------|---|---|--|---|--|-----------------------|
| 14.0 | PO 300 PO 304 | Primary voltage Ignition coil (T1/4), Cylinder 4 Primary circuit a Primary circuit b |  117—⌋ ← ⊕ → ⌋— 2 (13F) (2A)  118—⌋ ← ⊕ → ⌋— 2 (14F) (2A) | Test connection Note: Individual primary pattern Range: 400 V Duration: 5 millisecc. Starter: Crank | 200 – 350 V | ⇒ 14.1 |
| 14.1 | | Primary winding of T1/4 Primary circuit a and b |  117—⌋ ← Ω → ⌋— 118 (13F) (14F) | Ignition: OFF | 0.9 – 1.6 Ω The resistance of a single coil at 20° C is approx. 0.6 Ω. | Wiring, T1/4 |
| 15.0 | PO 300 PO 305 | Primary voltage Ignition coil (T1/5), Cylinder 5 Primary circuit a Primary circuit b |  109—⌋ ← ⊕ → ⌋— 2 (5F) (2A)  108—⌋ ← ⊕ → ⌋— 2 (4F) (2A) | Test connection Note: Individual primary pattern Range: 400 V Duration: 5 millisecc. Starter: Crank | 200 – 350 V | ⇒ 15.1 |

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| ⇒ |  | Test scope | Test connection | Test condition | Nominal value | Possible cause/remedy |
|------|---|---|---|---|---|-----------------------|
| 15.1 | | Primary winding of T1/5 Primary circuit a and b |  | Ignition: OFF | 0.9 – 1.6 Ω The resistance of a single coil at 20° C is approx. 0.6 Ω. | Wiring, T1/5 |
| 16.0 | PO 300 PO 306 | Primary voltage Ignition coil (T1/6), Cylinder 6 Primary circuit a Primary circuit b |   | Test connection Note: Individual primary pattern Range: 400 V Duration: 5 millisecc. Starter: Crank | 200 – 350 V | ⇒ 16.1 |
| 16.1 | | Primary winding of T1/6 Primary circuit a and b |  | Ignition: OFF | 0.9 – 1.6 Ω The resistance of a single coil at 20° C is approx. 0.6 Ω. | Wiring, T1/6 |

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| ⇒ |  | Test scope | Test connection | Test condition | Nominal value | Possible cause/remedy |
|------|---|---|--|--|---|-----------------------|
| 17.0 | PD 300 PD 301 PD 302 PD 303 PD 304 PD 305 PD 306 | Firing voltage Ignition coil (T1/1) to (T1/6) | Engine analyzer  | Test connection Note: See DM, Engines, Vol. 1, section C Starter: Crank | 8 – 20 kV The resistance of the secondary winding can not be measured due to an installed diode. | Spark plugs, N3/10 |

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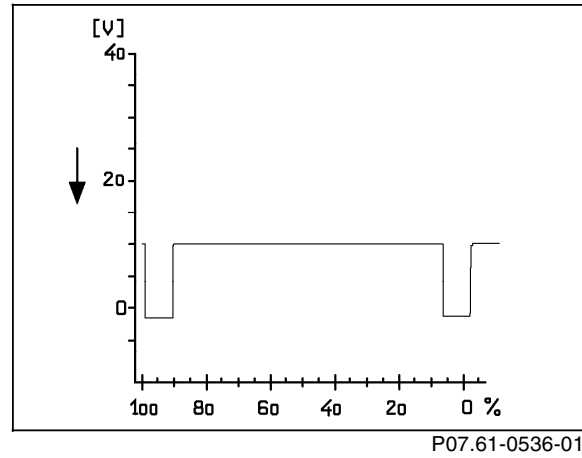
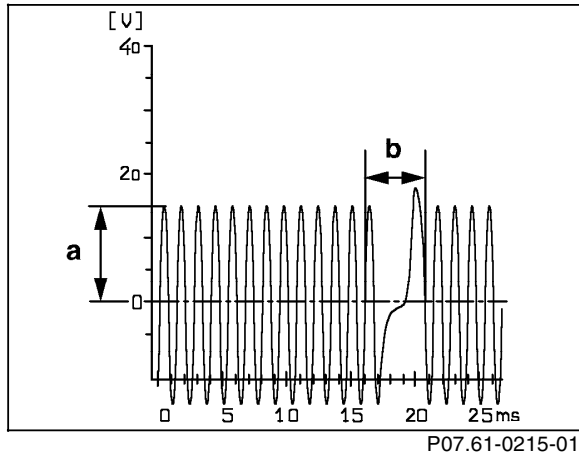


Figure 1
 CKP sensor (L5) signal, shown at idle
 b=2 missing teeth for cylinder 1 recognition

Figure 2
 Camshaft Hall-effect sensor (B6/1) signal

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Signal survey

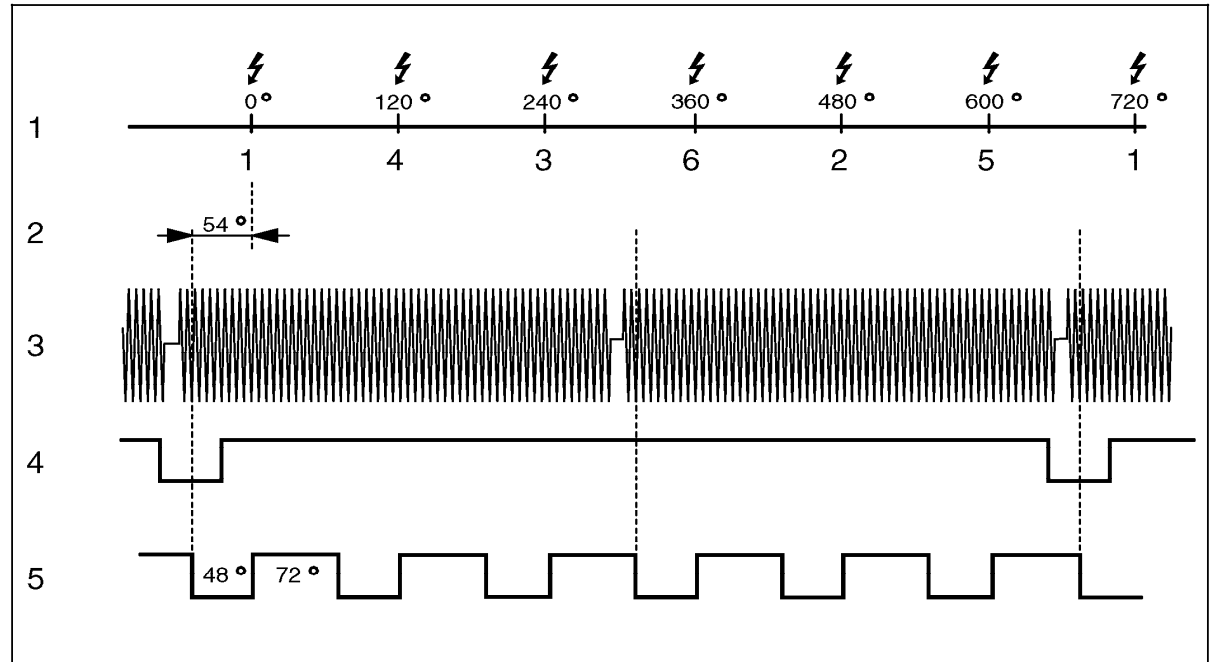


Figure 3

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

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