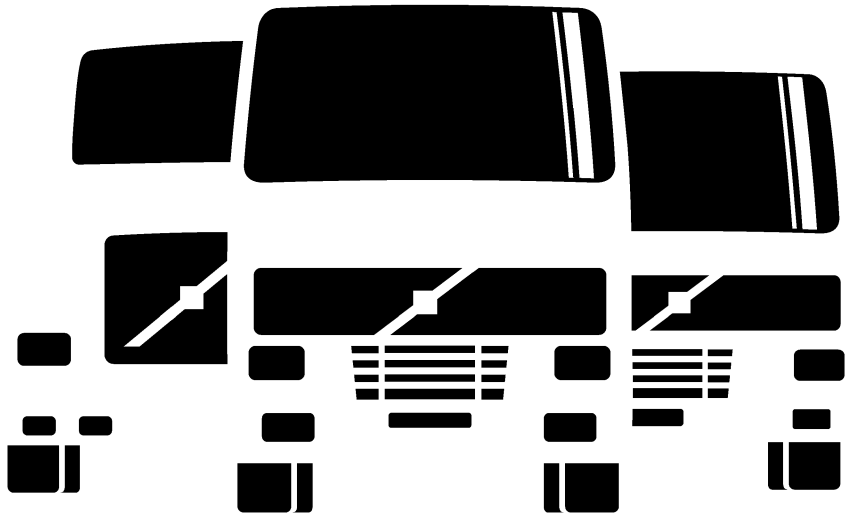
# Service Manual
# Trucks

Group **38**
Release **06**

## Fault codes, instrument
MID 140
VERSION2
From build date September 12, 2005.



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VOLVO

# Foreword

The descriptions and service procedures contained in this manual are based on designs and methods studies carried out up to February 2009.

The products are under continuous development. Vehicles and components produced after the above date may therefore have different specifications and repair methods. When this is judged to have a significant bearing on this manual, supplementary service bulletins will be issued to cover the changes.

The new edition of this manual will update the changes.

In service procedures where the title incorporates an operation number, this is a reference to V.S.T. (Volvo Standard Times).

Service procedures which do not include an operation number in the title are for general information and no reference is made to V.S.T.

The following levels of observations, cautions and warnings are used in this Service Documentation:

**Note:** Indicates a procedure, practice, or condition that must be followed in order to have the vehicle or component function in the manner intended.

**Caution:** Indicates an unsafe practice where damage to the product could occur.

**Warning:** Indicates an unsafe practice where personal injury or severe damage to the product could occur.

**Danger:** Indicates an unsafe practice where serious personal injury or death could occur.

**Volvo Truck Corporation**
Göteborg, Sweden

**Order number: 20199520**



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# Contents

**Operation Numbers**

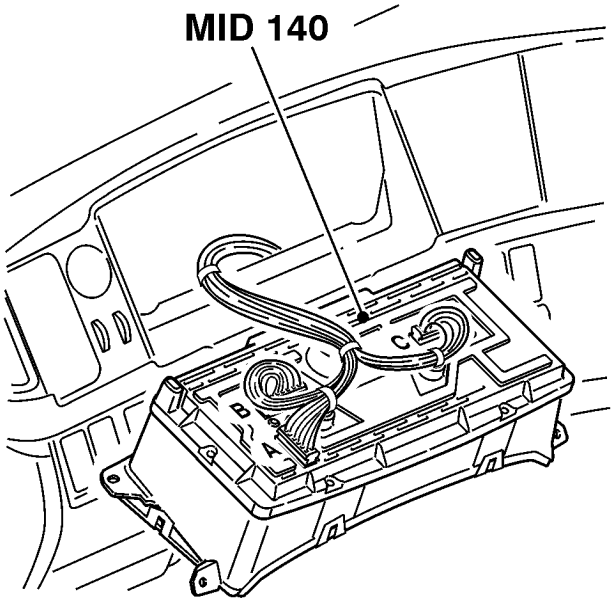
# Specifications

## MID 140 Instrument cluster, signal descriptions

### Instrument (MID 140) - breakout box connected between the control unit and cable harness, connector A

**Requirements:**

- The break-out box 9998699 and extension cable 9990062 are connected to adapter 9998533 between the control unit and the cable harness.
- Control unit connected.
- Ignition key in the drive position.
- Engine switched off.
- Measuring voltage using the multimeter.

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**U** = direct current voltage (V)

**$U_{bat}$** = battery voltage

**R** = resistance in ohms (Ω)

The column “measuring points” first gives the position on the breakout box and then the corresponding terminal on the control unit in brackets.

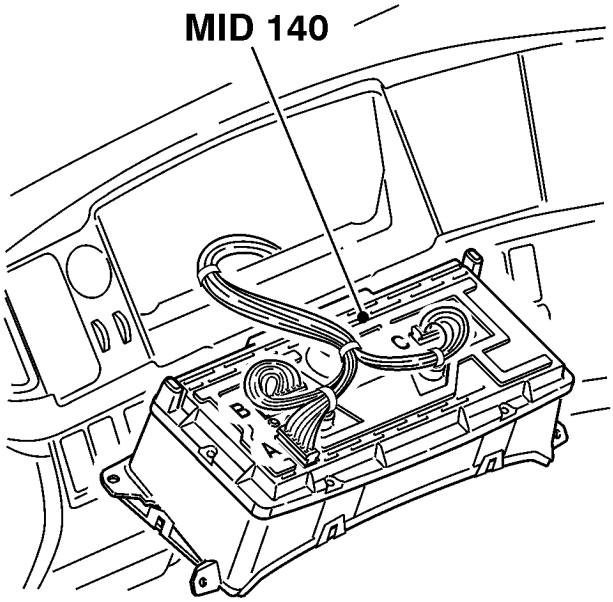
| Terminal | Signal type | Measurement points | Nominal value | Other |
|---|---|---|---|---|
| A1 | Power supply, kl 30 | 31 - 32 (A1 - A2) | U ≈ $U_{bat}$ | |
| A2 | Ground terminal | 32 - ground (A2 - ground) | U≈ 0 V | |
| A3 | Power supply, kl DR | 33 - 32 (A3 - A2) | U ≈ $U_{bat}$(Start key in drive position)<br>U ≈ 0 V (Start key in stop position) | |
| A4 | Control lever, switch, display Enter | 34 - 32 (A4 - A2) | U ≈ 0 V (“Enter” inactive)<br>U ≈ $U_{bat}$(“Enter” active) | |
| A5 | Control lever, switch, display Escape | 35 - 32 (A5 - A2) | U ≈ 0 V (“Escape” inactive)<br>U ≈ $U_{bat}$(“Escape” active) | |
| A6 | Control lever, switch, display Up | 36 - 32 (A6 - A2) | U ≈ 0 V (“Up” inactive)<br>U ≈ $U_{bat}$(“Up” active) | |
| A7 | Control lever, switch, display Down | 37 - 32 (A7 - A2) | U ≈ 0 V (“Down” inactive)<br>U ≈ $U_{bat}$(“Down” active) | |
| A8 | Reserved | | | |
| A9 | Power supply | 39 - 32 (A9 - A2) | U ≈ $U_{bat}$ | |
| A10 | SAE J1939 CAN 3 A | 40 - 32 (A10 - A2) | U ≈ 0 -5 V | |
| A11 | Switch, parking heater | 41 - 32 (A11 - A2) | U ≈ $U_{bat}$ (Switch active) | Does not apply to all variants or markets. |
| A12 | Ground reference for sensor | 42 - 32 (A12 - A2) | U≈ 0 V | |

| Terminal | Signal type | Measurement points | Nominal value | Other |
|---|---|---|---|---|
| A13 | Reserved | | | |
| A14 | Reserved | | | |
| A15 | SAE J1939 CAN 1 A | 45 - 32 (A15 - A2) | U ≈ 3 -5 V | |
| A16 | SAE J1939 CAN 1 B | 46 - 32 (A16 - A2) | U ≈ 0 -3 V | |
| A17 | SAE J1708 A | 47 - 32 (A17 - A2) | U ≈ 0 -5 V | |
| A18 | SAE J1708 B | 48 - 32 (A18 - A2) | U ≈ 0 -5 V | |
| A19 | Parking heater, activating | 49 - 32 (A19 - A2) | U ≈ $U_{bat}$(Heater active) | Does not apply to all variants or markets. |
| A20 | Reserved | | | |
| A21 | Hazard warning lights | 51 - 32 (A21 - A2) | U ≈ 0 V / $U_{bat}$ (Switching) | Hazard warning lights activated |
| A22 | SAE J1939 CAN 3 B | 52 - 32 (A22 - A2) | U ≈ 0 -5 V | |

# Instrument (MID 140) - breakout box connected between the control unit and cable harness, connector B

**Requirements:**

- Break-out box 9998699, extension cable 9990062 and adapter 9813194 connected between vehicle control unit connector B and cable harness.
- Control unit connected.
- Ignition key in the drive position.
- Engine switched off.
- Measuring voltage using the multimeter.

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**U** = direct current voltage (V)

$\mathbf{U_{bat}}$ = battery voltage

**R** = resistance in ohms (Ω)

The column “measuring points” first gives the position on the breakout box and then the corresponding terminal on the control unit in brackets.

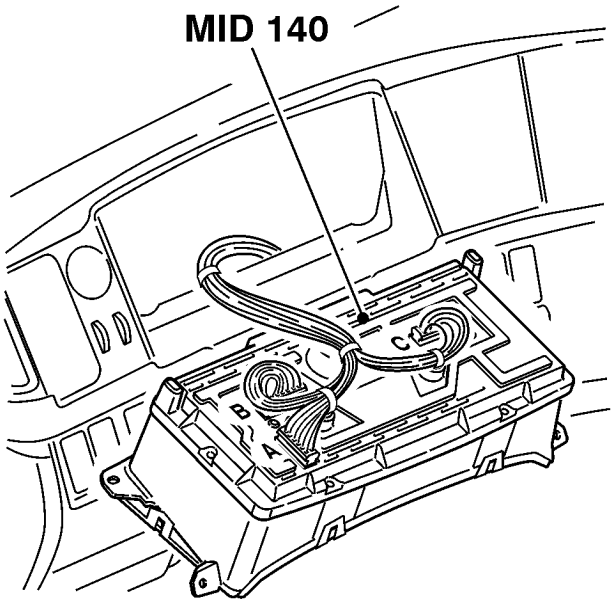
| Terminal | Signal type | Measurement points | Nominal value | Other |
|---|---|---|---|---|
| B1 | Ground terminal, GND | 1 - framework (B1 - framework) | U≈ 0 V | |
| B2 | | | | |
| B3 | Fuel level, sensor | 3 - 1 (B3 - B1) | U ≈ 0 -5 V | |
| B4 | | | | |
| B5 | | | | |
| B6 | | | | |
| B7 | | | | |
| B8 | Battery charging, sensor | 8 - 1 (B8 - B1) | U ≈ 0.5 -4.5 V | Does not apply to all variants or markets. |
| B9 | Outside temperature, sensor | 9 - 1 (B9 - B1) | U ≈ 0 -5 V | |
| B10 | | | | |
| B11 | | | | |
| B12 | Oil temperature, gearbox, sensor | 12 - 1 (B12 - B1) | U ≈ 0 -5 V | Does not apply to all variants or markets. |
| B13 | Brake pressure sensor, front circuit | 13 - 1 (B13 - B1) | U ≈ 0.5 -4.5 V | |
| B14 | Brake pressure sensor, rear circuit | 14 - 1 (B14 - B1) | U ≈ 0.5 -4.5 V | |
| B15 | | | | |
| B16 | | | | |
| B17 | | | | |
| B18 | | | | |
| B19 | | | | |

| Terminal | Signal type | Measurement points | Nominal value | Other |
|---|---|---|---|---|
| B20 | Supply voltage, brake pressure sensor, front circuit | 20 - 1 (B20 - B1) | U ≈ 4.5 -5.5 V | |
| B21 | Supply voltage, brake pressure sensor, rear circuit | 21 - 1 (B21 - B1) | U ≈ 4.5 -5.5 V | |
| B22 | | | | |
| B23 | Supply voltage, radio position | 23 - 1 (B23 - B1) | U ≈ $U_{bat}$ | Start key in radio position. Does not apply to all variants or markets. |
| B24 | | | | |
| B25 | | | | |
| B26 | | | | |
| B27 | Parking lights | 27 - 1 (B27 - B1) | U ≈ $U_{bat}$(Parking lights activated)<br>U ≈ 0 (Parking lights inactive) | Ignition key in stop position. |
| B28 | Switch, bogie lift | 28 - framework (B28 - framework) | U ≈ $U_{bat}$ (Switch active) | Hydraulic bogie lift. |
| B29 | | | | |
| B30 | Power supply battery charging, sensor | 30 - 1 (B30 - B1) | U ≈ 4.5 -5.5 V | Does not apply to all variants or markets. |

# Instrument (MID 140) - breakout box connected between the control unit and cable harness, connector C

**Requirements:**

- Breakout box 9998699, extension cable 9990062 and adapter 9998533 connected to connectors A and C on the cable harness.

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- Control unit connected.
- Ignition key in the drive position.
- Engine switched off.
- Measuring voltage using the multimeter.

**U** = direct current voltage (V)

**$U_{bat}$** = battery voltage

**R** = resistance in ohms (Ω)

The column “measuring points” first gives the position on the breakout box and then the corresponding terminal on the control unit in brackets.

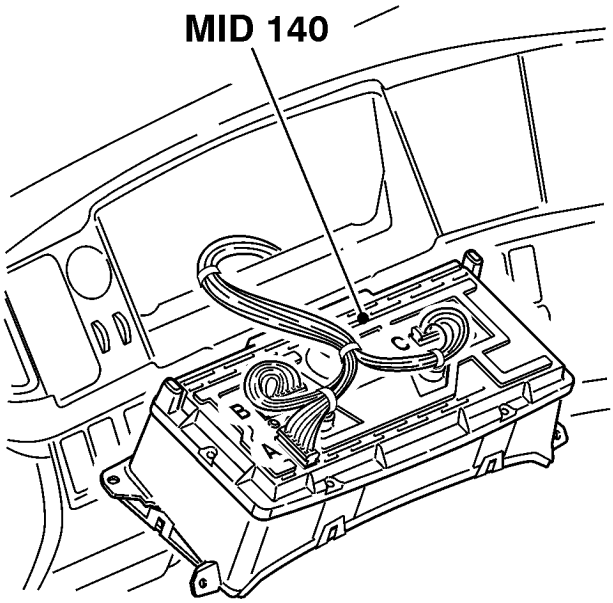
| Terminal | Signal type | Measurement points | Nominal value | Other |
|---|---|---|---|---|
| C1 | | | | |
| C2 | Trailer ABS, status | 2 - 32 (C2 - A2) | U ≈ $U_{bat}$ (Light inactive)<br>U ≈ 0 V (Light active) | |
| C3 | Vehicle ABS, status | 3 - 32 (C3 - A2) | U ≈ $U_{bat}$ (Light inactive)<br>U ≈ 0 V (Light active) | |
| C4 | Drive on front wheels | 4 - 32 (C4 - A2) | U ≈ $U_{bat}$ (Light inactive)<br>U ≈ 0 V (Light active) | |
| C5 | Air filter | | | Only Australia. |
| C6 | Diff lock, front (4x4/6x6)<br>Diff lock, wheels (6x4/8x4) 2nd rear drive axle | 6 - 32 (C6 - A2) | U ≈ $U_{bat}$ (Light inactive)<br>U ≈ 0 V (Light active) | 6x4/8x4 activating from the rear sensor on the rear axle. |
| C7 | Battery charging | 7 - 32 (C7 - A2) | U ≈ 0 V (Start key in stop position)<br>U ≈ $U_{bat}$ (Generator charging) | |
| C8 | Bogie lift | 8 - 32 (C8 - A2) | U ≈ $U_{bat}$ (Bogie lift in limit position) | Leaf spring suspended vehicles. (The vehicles with air suspension the lamp is activated via the data link.) |
| C9 | Tilt lock, cab | 9 - 32 (C9 - A2) | U ≈ $U_{bat}$ (Cab tilted) | |
| C10 | Differential lock, axles | 10 - 32 (C10 - A2) | U ≈ $U_{bat}$ (Switch active) | |
| C11 | Diff lock, wheels (6x4/8x4) 1st rear drive axle<br>(6x6) 1st and 2nd rear drive axles | 11 - 32 (C11 - A2) | U ≈ 0 V (Differential lock active) | |

| Terminal | Signal type | Measurement points | Nominal value | Other |
|---|---|---|---|---|
| C12 | Pre-heating, engine | 12 - 32 (C12 - A2) | U ≈ $U_{bat}$ (Starter element active) | |
| C13 | Bogie lift trailer | | | |
| C14 | | | | |
| C15 | | | | |
| C16 | Servo steering | 16 - 32 (C16 - A2) | U ≈ 0 V (Function active)<br>U ≈ $U_{bat}$(Function inactive) | 8x2/8x4 |
| C17 | Baggage hatch, status | 17 - 32 (C17 - A2) | U ≈ 0 V (Hatch open) | |
| C18 | Gearbox, low split | 18 - 32 (C18 - A2) | U ≈ 0 V (Low split active) | |
| C19 | Seat belt reminder | 19 - 32 (C19 - A2) | U ≈ 0 V (Belt not locked) | |
| C20 | | | | |
| C21 | | | | |
| C22 | Steering wheel buttons | 22 -30 (C22 - C30) | U ≈ 7 -9 V | Does not apply to all variants or markets. |
| C23 | | | | |
| C24 | | | | |
| C25 | Supply voltage, steering wheel buttons | 25 -30 (C25 - C30) | U ≈ 7 -14 V | Does not apply to all variants or markets. |
| C26 | | | | |
| C27 | Superstructure information/warning | 27 - 32 (C27 - A2) | U ≈ 0 V (Function active) | |
| C28 | Trailer without ABS | 28 - 32 (C28 - A2) | U ≈ 0 V (Function active) | Applies only to Australia. |
| C29 | Washer reservoir level | 29 - 32 (C29 - A2) | U ≈ 0 V (Low level) | |
| C30 | Ground connection, steering wheel buttons | 30 - 32 (C30 - A2) | U≈ 0 V | Does not apply to all variants or markets. |

# Instrument (MID 140) - breakout box connected towards cable harness, connector A

**Requirements:**

- The break-out box 9998699 and extension cable 9990062 are connected to adapter 9998533 and the cable harness.
- Control unit disconnected.
- Ignition key in the drive position.
- Engine switched off.
- Measuring voltage using the multimeter.

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**U** = direct current voltage (V)

$\mathbf{U_{bat}}$ = battery voltage

**R** = resistance in ohms (Ω)

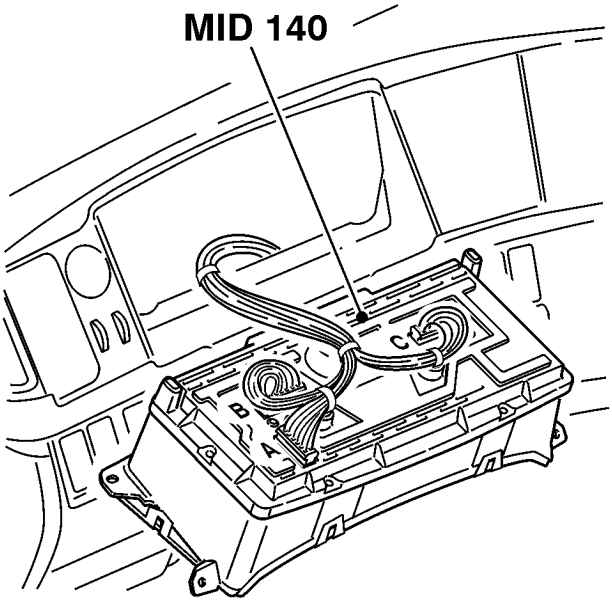
The column “measuring points” first gives the position on the breakout box and then the corresponding terminal on the control unit in brackets.

| Terminal | Signal type | Measurement points | Nominal value | Other |
|---|---|---|---|---|
| A1 | Power supply, kl 30 | 31 - 32 (A1 - A2) | $U \approx U_{bat}$ | |
| A2 | Ground terminal | 32 - ground (A2 - ground) | $R \approx 0\ \Omega$ | Measuring resistance. Ignition key in stop position. |
| A3 | Power supply, kl DR | 33 - 32 (A3 - A2) | $U \approx U_{bat}$(Start key in drive position)<br>U ≈ 0 V (Start key in stop position) | |
| A4 | Control lever, switch, display Enter | 34 - 32 (A4 - A2) | U ≈ 0 V (“Enter” inactive)<br>$U \approx U_{bat}$(“Enter” active) | |
| A5 | Control lever, switch, display Escape | 35 - 32 (A5 - A2) | U ≈ 0 V (“Escape” inactive)<br>$U \approx U_{bat}$(“Escape” active) | |
| A6 | Control lever, switch, display Up | 36 - 32 (A6 - A2) | U ≈ 0 V (“Up” inactive)<br>$U \approx U_{bat}$(“Up” active) | |
| A7 | Control lever, switch, display Down | 37 - 32 (A7 - A2) | U ≈ 0 V (“Down” inactive)<br>$U \approx U_{bat}$(“Down” active) | |
| A8 | Reserved | | | |
| A9 | Power supply | 39 - 32 (A9 - A2) | $U \approx U_{bat}$ | |
| A10 | SAE J1939 CAN 3 A | 40 - 32 (A10 - A2) | U ≈ 0 -3 V | |
| A11 | Switch, parking heater | 41 - 32 (A11 - A2) | $U \approx U_{bat}$ (Switch active) | Does not apply to all variants or markets. |
| A12 | Ground reference for sensor | 42 - 32 (A12 - A2) | U≈ 0 V | |
| A13 | Reserved | | | |
| A14 | Reserved | | | |

| Terminal | Signal type | Measurement points | Nominal value | Other |
|---|---|---|---|---|
| A15 | SAE J1939 CAN 1 A | 45 - 32 (A15 - A2) | U ≈ 3 -5 V | |
| A16 | SAE J1939 CAN 1 B | 46 - 32 (A16 - A2) | U ≈ 0 -3 V | |
| A17 | SAE J1708 A | 47 - 32 (A17 - A2) | U ≈ 0 -5 V | |
| A18 | SAE J1708 B | 48 - 32 (A18 - A2) | U ≈ 0 -5 V | |
| A19 | Parking heater, activating | 49 - 32 (A19 - A2) | U≈ 0 V | Does not apply to all variants or markets. |
| A20 | Reserved | | | |
| A21 | Hazard warning lights | 51 - 32 (A21 - A2) | U ≈ 0 V / $U_{bat}$ (Switching) | Hazard warning lights activated |
| A22 | SAE J1939 CAN 3 B | 52 - 32 (A22 - A2) | U ≈ 0 -5 V | |

# Instrument (MID 140) - breakout box connected to cable harness, connector B

**Requirements:**
- The break-out box 9998699 and extension cable 9990062 are connected to adapter 9813194 and the cable harness.
- Control unit disconnected, except for connector A, which is connected to the instruments.
- Ignition key in the drive position.
- Engine switched off.
- Measuring voltage using the multimeter.

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**U** = direct current voltage (V)

$\mathbf{U_{bat}}$ = battery voltage

**R** = resistance in ohms (Ω)

| Terminal | Signal type | Measurement points | Nominal value | Other |
|---|---|---|---|---|
| B1 | Ground terminal, GND | 1 - framework (B1 - framework) | R ≈ 0 Ω (Connector block A connected)<br>R ≈ ∞ Ω (Connector block A disconnected) | Measuring resistance. Ignition key in stop position. |
| B2 | | | | |
| B3 | Fuel level, sensor | 1 -3 (B3 - B1) | R ≈ 30 - 250 Ω | Measuring resistance. Ignition key in stop position. |
| B4 | | | | |
| B5 | | | | |
| B6 | | | | |
| B7 | | | | |
| B8 | Battery charging, sensor | 8 - 1 (B8 - B1) | R ≈ 6 kΩ | Resistance measurement. Start key in stop position. Does not apply to all variants or markets. |

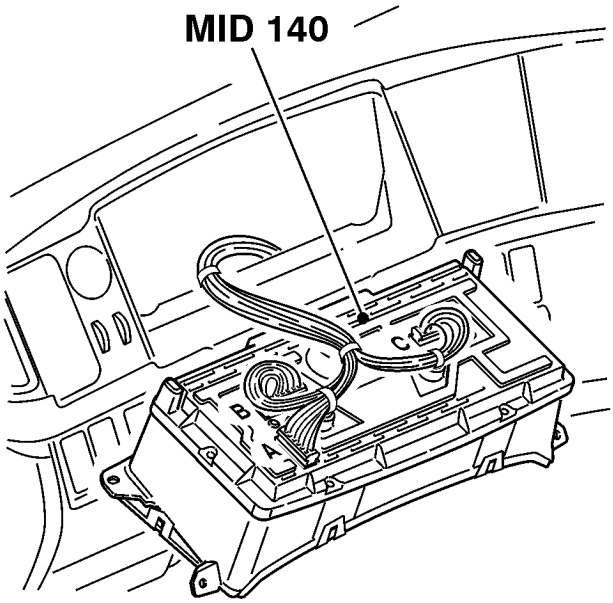
| Terminal | Signal type | Measurement points | Nominal value | Other |
|---|---|---|---|---|
| B9 | Outside temperature, sensor | 9 - 1 (B9 - B1) | R ≈ 8.6 - 12.9 kΩ (-40°C)<br>R ≈ 2.9 - 4.4 kΩ (-20°C)<br>R ≈ 1.8 - 2.7 kΩ (-10°C)<br>R ≈ 1.3 - 2.0 kΩ (-4°C)<br>R ≈ 1.1 - 1.7 kΩ (0°C)<br>R ≈ 0.9 - 1.4 kΩ (4°C)<br>R ≈ 0.7 - 1.1 kΩ (10°C)<br>R ≈ 0.5 - 0.7 kΩ (20°C)<br>R ≈ 0.4 - 0.6 kΩ (25°C)<br>R ≈ 200 - 400 Ω (40°C)<br>R ≈ 100 - 200 Ω (60°C) | Measuring resistance. Ignition key in stop position. |
| B10 | | | | |
| B11 | | | | |
| B12 | Oil temperature, gearbox, sensor | 12 - 1 (B12 - B1) | R ≈ 0.8 - 1.1 kΩ (20°C)<br>R ≈ 150 - 220 Ω (70°C)<br>R ≈ 110 - 160 Ω (80°C)<br>R ≈ 80 - 120 Ω (90°C)<br>R ≈ 60 - 90 Ω (100°C)<br>R ≈ 50 - 70 Ω (110°C)<br>R ≈ 35 - 55 Ω (120°C)<br>R ≈ 30 - 45 Ω (130°C)<br>R ≈ 20 - 35 Ω (140°C)<br>R ≈ 18 - 25 Ω (150°C) | Resistance measurement. Start key in stop position. Does not apply to all variants or markets. |
| B13 | Brake pressure sensor, front circuit | | | No relevant measurement |
| B14 | Brake pressure sensor, rear circuit | | | No relevant measurement |
| B15 | | | | |
| B16 | | | | |
| B17 | | | | |
| B18 | | | | |
| B19 | | | | |
| B20 | Supply voltage, brake pressure sensor, front circuit | | | No relevant measurement |
| B21 | Supply voltage, brake pressure sensor, rear circuit | | | No relevant measurement |
| B22 | | | | |
| B23 | Supply voltage, radio position | 23 - framework (B23 - framework) | $U \approx U_{bat}$ | Start key in radio position. Does not apply to all variants or markets. |
| B24 | | | | |
| B25 | | | | |
| B26 | | | | |
| B27 | Parking lights | 27 - framework (B27 - framework) | $U \approx U_{bat}$(Parking lights active)<br>U ≈ 0 V (Parking lights inactive) | Ignition key in stop position. |
| B28 | Switch, bogie lift | 28 - framework (B28 - framework) | $U \approx U_{bat}$ (Switch active) | Hydraulic bogie lift. |

| Terminal | Signal type | Measurement points | Nominal value | Other |
|---|---|---|---|---|
| B29 | | | | |
| B30 | Power supply battery charging, sensor | | | No relevant measurements. |

# Instrument (MID 140) - breakout box connected to cable harness, connector C

**Requirements:**

- Breakout box 9998699, extension cable 9990062 and adapter 9998533 connected to connectors A and C on the cable harness.
- Control unit disconnected.
- Ignition key in the drive position.
- Engine switched off.
- Measuring voltage using the multimeter.

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**U** = direct current voltage (V)

$\mathbf{U_{bat}}$ = battery voltage

**R** = resistance in ohms (Ω)

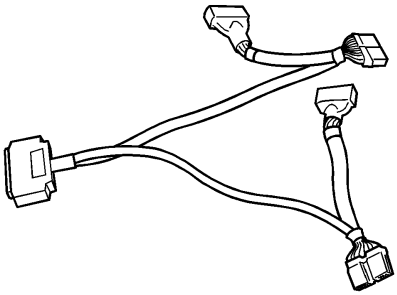
The column “measuring points” first gives the position on the breakout box and then the corresponding terminal on the control unit in brackets.

| Terminal | Signal type | Measurement points | Nominal value | Other |
|---|---|---|---|---|
| C1 | | | | |
| C2 | Trailer ABS, status | 2 - ground (C2 - ground) | U ≈ 500 - 700 mV (Light active) | Diode measurement. |
| C3 | Vehicle ABS, status | 3 - 32 (C3 - A2) | R ≈ 93 kΩ | Measuring resistance. Ignition key in stop position. |
| C4 | Drive on front wheels | 4 - 32 (C4 - A2) | R ≈ ∞ Ω (Inactive)<br>R ≈ 0 Ω (Active) | Measuring resistance. Ignition key in stop position. |
| C5 | Air filter | | | Only Australia. |
| C6 | Diff lock, front (4x4/6x6)<br>Diff lock, wheels (6x4/8x4) 2nd rear drive axle | 6 - 32 (C6 - A2) | R ≈ ∞ Ω (Inactive)<br>R ≈ 0 Ω (Active) | Measuring resistance. Ignition key in stop position. |
| C7 | Battery charging | 7 - 32 (C7 - A2) | U ≈ 0 V (Start key in drive position)<br>U ≈ $U_{bat}$(Alternator charging) | |
| C8 | Bogie lift | 8 - 32 (C8 - A2) | U ≈ $U_{bat}$ (Bogie lift in limit position) | Leaf spring suspended vehicles. (The vehicles with air suspension the lamp is activated via the data link.) |

| Terminal | Signal type | Measurement points | Nominal value | Other |
|---|---|---|---|---|
| C9 | Tilt lock, cab | 9 - 32 (C9 - A2) | R ≈ 20 Ω (Cab lowered)<br>R ≈ ∞ Ω (Cab tilted) | Measuring resistance. Ignition key in stop position. |
| C10 | Differential lock, axles | 10 - 32 (C10 - A2) | U ≈ $U_{bat}$ (Switch active) | |
| C11 | Diff lock, wheels (6x4/8x4) 1st rear drive axle<br>(6x6) 1st and 2nd rear drive axles | 11 - 32 (C11 - A2) | R ≈ ∞ Ω (Diff inactive)<br>R ≈ 0 Ω (Diff active) | Measuring resistance. Ignition key in stop position. |
| C12 | Pre-heating, engine | 12 - 32 (C12 - A2) | U ≈ $U_{bat}$ (Starter element active) | |
| C13 | Bogie lift trailer | | | No relevant measurement |
| C14 | | | | |
| C15 | | | | |
| C16 | Servo steering, pressure too low | 16 - 32 (C16 - A2) | R ≈ ∞ Ω (Function inactive)<br>R ≈ 0 Ω (Function active) | Measuring resistance. Ignition key in stop position. |
| C17 | Baggage hatch, status | 17 - 32 (C17 - A2) | R ≈ 0 Ω (Hatch open)<br>R ≈ ∞ Ω (Hatch closed) | Measuring resistance. Ignition key in stop position. |
| C18 | Gearbox, low split | 18 - 32 (C18 - A2) | R ≈ 0 Ω (Low split active)<br>R ≈ ∞ Ω (Low split inactive) | Measuring resistance. Ignition key in stop position. |
| C19 | Seat belt reminder | 19 - 32 (C19 - A2) | R ≈ 0 Ω (Belt not locked)<br>R ≈ ∞ Ω (Belt locked) | Measuring resistance. Ignition key in stop position. |
| C20 | | | | |
| C21 | | | | |
| C22 | Steering wheel buttons | | | No relevant measurements. |
| C23 | | | | |
| C24 | | | | |
| C25 | Supply voltage, steering wheel buttons | | | No relevant measurements. |
| C26 | | | | |
| C27 | Superstructure information/warning | 27 - 32 (C27 - A2) | R ≈ 0 Ω (Function active) | Measuring resistance. Ignition key in stop position. |
| C28 | Trailer without ABS | 28 - 32 (C28 - A2) | U ≈ $U_{bat}$ (Active)<br>U ≈ 0 V (Inactive) | Applies only to Australia. |
| C29 | Washer reservoir level | 29 - 32 (C29 - A2) | R ≈ 0 Ω (Low level)<br>R ≈ ∞ Ω (One low level) | Measuring resistance. Ignition key in stop position. |
| C30 | Ground connection, steering wheel buttons | | | No relevant measurements. |

# Tools

## Special tools



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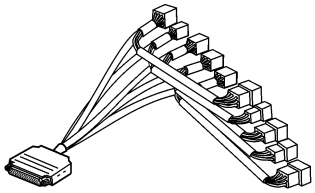
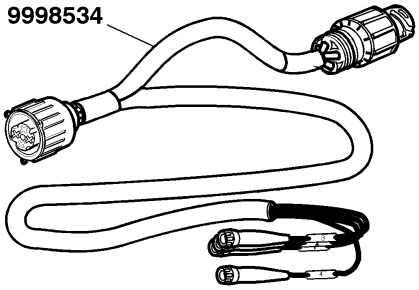
**9998533** Adapter between control unit, connectors, break-out box 9998699 and extension cable 9990062



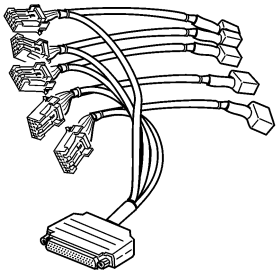
T0010668

**9998596** Adapter



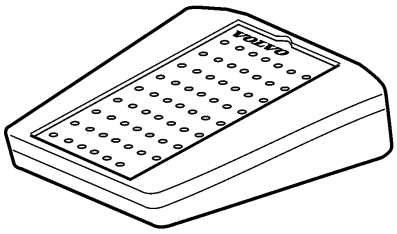

T3009611

**9998534** Adapter for DIN connector



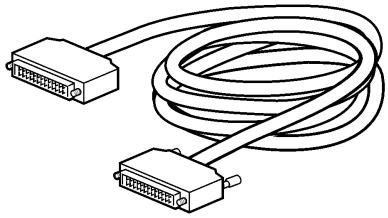
T3011702

**9998604** Adapter



T0010602

**9998699** Adapter 62–pin



T0010359

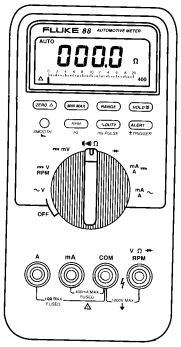
**9990062** Extension cable


**9990008**

T3015505

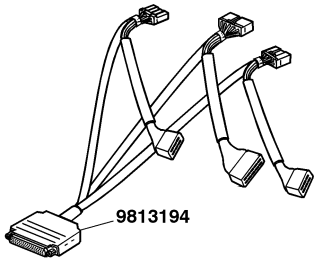
**9990008** Set with test pins

# Other special equipment




T3006898

**9510060** Multimeter.




T3009536

**9813194** Adapter between control unit, connectors, adapter 9998699 and extension cable 9990062

# Malfunction

## MID 140 Instrumentation, fault codes

**MID:**
Message Identification Description (identification of control unit).

**PID:**
Parameter Identification Description (identification of parameter (value)).

**PPID:**
Proprietary Parameter Identification Description (Volvo unique identification of parameter (value)).

**SID:**
Subsystem Identification Description (identification of component).

**PSID:**
Proprietary Subsystem Identification Description (Volvo unique component identification).

**FMI:**
Failure Mode Identifier (identification of fault type).

For more detailed information concerning these designations, see service information function group 000 Vehicle Electronics in the Information binder.

| Fault code | Component / function | FMI | Section |
|---|---|---|---|
| PID 96 | Fuel level | 5, 6 | “MID 140 PID 96 Fuel level” page 22 |
| PID 114 | Ammeter | 3, 4 | “MID 140 PID 114 Ammeter” page 27 |
| PID 117 | Brake pressure, front circuit | 3, 4 | “MID 140 PID 117 Air brake pressure, front” page 29 |
| PID 118 | Brake pressure, rear circuit | 3, 4 | “MID 140 PID 118 Air brake pressure, rear” page 30 |
| PID 158 | Battery voltage | 3, 4 | “MID 140 PID 158 Battery Voltage” page 35 |
| | | | |
| PID 171 | Exterior temperature | 5, 6 | “MID 140 PID 171 Ambient temperature” page 37 |
| PID 177 | Oil temperature, gearbox | 5, 6 | “MID 140 PID 177 Gearbox oil temperature” page 42 |
| SID 250 | SAE J1708/J1587 data link | 12 | “MID 140 SID 250 SAE J1708 Information link” page 47 |
| SID 251 | Power supply | — | “MID 140 SID 251 Power supply” page 47 |
| PSID 39 | Steering wheel buttons, YES | 12 | “MID 140 PSID 39 Steering wheel buttons, YES” page 49 |
| PSID 40 | Steering wheel buttons, NO | 12 | “MID 140 PSID 40 Steering wheel buttons, NO” page 50 |
| PSID 41 | Steering wheel buttons, arrow left | 12 | “MID 140 PSID 41 Arrow left” page 51 |
| PSID 42 | Steering wheel buttons, arrow right | 12 | “MID 140 PSID 42 Arrow right” page 52 |
| PSID 43 | Steering wheel buttons, volume (+) | 12 | “MID 140 PSID 43 Volume (+)” page 53 |
| PSID 44 | Steering wheel buttons, volume (-) | 12 | “MID 140 PSID 44 Volume (-)” page 54 |
| PSID 45 | Power supply, switch steering wheel buttons | 3, 5, 6 | “MID 140 PSID 45 Power supply switch steering wheel buttons” page 55 |
| PSID 46 | Data link, switch steering wheel buttons | 9 | “MID 140 PSID 46 Data link, switch steering wheel buttons” page 57 |

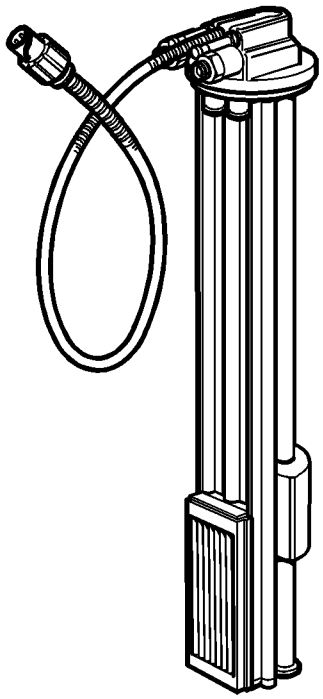
| Fault code | Component / function | FMI | Section |
|---|---|---|---|
| PSID 47 | Switch, display Escape | 12 | “MID 140 PSID 47 Switch display, Escape” page 61 |
| PSID 48 | Switch, display Enter | 12 | “MID 140 PSID 48 Switch display, Enter” page 62 |
| PSID 49 | Switch, display Up | 12 | “MID 140 PSID 49 Switch display, Up” page 63 |
| PSID 50 | Switch, display Down | 12 | “MID 140 PSID 50 Switch display, Down” page 64 |
| PSID 200 | Data link, engine control unit | 12 | “MID 140 PSID 200 Communication interference, data link, engine control unit” page 69 |
| PSID 201 | Data link, vehicle control unit | 12 | “MID 140 PSID 201 Communication interference, data link, vehicle control unit” page 69 |
| PSID 204 | Data link, brakes control unit | 12 | “MID 140 PSID 204 Communication interference, data link, brake control unit” page 69 |
| PSID 205 | Data link, gearbox control unit | 12 | “MID 140 PSID 205 Communication interference, data link, gearbox control unit” page 69 |
| PSID 206 | Data link, retarder control unit | 12 | “MID 140 PSID 206 Communication interference, data link, retarder control unit” page 70 |
| PSID 208 | Data link, air suspension | 12 | “MID 140 PSID 208 Communication interference, data link, air suspension” page 70 |
| PSID 210 | Data link, exterior lighting control unit | 12 | “MID 140 PSID 210 Data link, external lighting control unit” page 70 |
| PSID 211 | Data link, adaptive cruise control | 12 | “MID 140 PSID 211 Data link adoptive cruise control” page 70 |
| PSID 212 | Data link, tachograph | 12 | “MID 140 PSID 212 Data link, tachograph” page 71 |
| PSID 215 | Data link, electronically controlled bogie axle | 12 | “MID 140 PSID 215 Data link electronical steered bogie axle” page 71 |
| PSID 233 | Data link, electronic starter inhibitor | 12 | “MID 140 PSID 233 Data link, electronic starting inhibitor” page 71 |
| PSID 234 | Data link, burglar alarm control unit | 12 | “MID 140 PSID 234 Data link, control unit burglar alarm” page 71 |
| PSID 235 | Data link, air bag control unit | 12 | “MID 140 PSID 235 Data link, control unita airbag” page 71 |
| PSID 236 | Data link, FMS Gateway control unit | 9 | “MID 140 PSID 236 Data link, control unit FMS Gateway” page 72 |
| PSID 238 | Data link, air-conditioning control unit | 12 | “MID 140 PSID 238 Data link, control unit climate unit” page 72 |
| PSID 239 | Data link, Volvo Link | 12 | “MID 140 PSID 239 Data link, Volvo Link” page 72 |

# FMI table

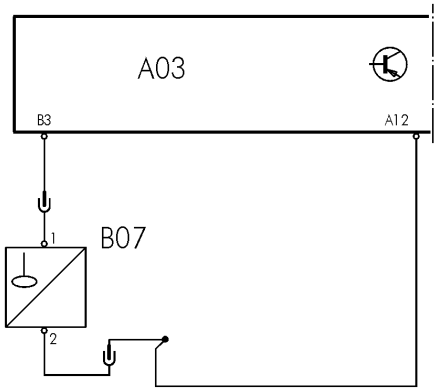
**SAE standard**

| FMI | Display text | SAE-text |
|---|---|---|
| 0 | “Value too high” | Data valid, but above the normal working range. |
| 1 | “Value too low” | Data valid, but below the normal working range. |
| 2 | “Incorrect data” | Intermittent or faulty data. |
| 3 | “Electrical fault” | Abnormally high voltage or short-circuit to higher voltage. |
| 4 | “Electrical fault” | Abnormally low voltage or short-circuit to lower voltage. |
| 5 | “Electrical fault” | Abnormally low current or open-circuit. |
| 6 | “Electrical fault” | Abnormally high current or short-circuit to ground. |
| 7 | “Mechanical fault” | Incorrect response from the mechanical system. |
| 8 | “Mechanical or electrical fault” | Abnormal frequency. |
| 9 | “Communication error” | Abnormal update rate. |
| 10 | “Mechanical or electrical fault” | Abnormally large variations. |
| 11 | “Unknown fault” | Unidentifiable fault. |
| 12 | “Component fault” | Defective unit or component. |
| 13 | “Incorrect calibration” | Calibration values outside limits |
| 14 | “Unknown fault” | Special instructions. |
| 15 | “Unknown fault” | Reserved for future use. |

# MID 140 PID 96 Fuel level



T3009920




T3015669

## General information

**Component:** B 07 Sensor, fuel level

**Cable harness:** 1,040A

## Fault code

### *FMI 5*

Abnormally low current or open-circuit.

*Conditions for fault code:*

- If the instrument control unit registers a resistance greater than 1 k Ω, the control unit interprets this as a fault and a fault code is set.

*Possible cause:*

- Open-circuit in the ground lead.
- Open-circuit in the signal cable.
- Faulty sensor.
- Contact resistance and oxidation.

*Reaction from the control unit:*

- fault code is stored.

*Noticeable external symptoms:*

- Fuel gauge is permanently at min. level.

*Appropriate check:*

- “MID 140 PID 96 Fuel level, check” page 23.

### *FMI 6*

Abnormally high current or short-circuit to ground.

*Conditions for fault code:*

- If the instrument control unit registers a resistance of less than 20 Ω the control unit interprets this as a fault and a fault code is stored.

*Possible cause:*

- Signal cable short-circuited to ground.
- Faulty sensor.

*Reaction from the control unit:*

- fault code is stored.

*Noticeable external symptoms:*

- Fuel gauge is permanently at min. level.

*Appropriate check:*

- “MID 140 PID 96 Fuel level, check” page 23.

# 38162-3
# MID 140 PID 96 Fuel level, check

*Special tools: 9998534, 9998699/9990062*
*Other special equipment: 9510060, 9813194*

## NOTE!

- Read off other fault codes for the instrument control unit.
- Switch off the current in the vehicle before disconnecting the connector.
- Check the relevant connectors with regard to loose connections, resistance and oxidation. For a more detailed description of electrical fault tracing, see the separate service information under group 371, information type diagnostics “Wiring and connectors, fault tracing”.

## Relevant tests in VCADS Pro

The following tests are useful for a closer examination of the component function:

- “38117-8 Instrument test”.
- “38118-6 Gauge checks, instrument”.

## Measurement at the component's connector to the control unit

**Note:** Faults in the control unit cable harness can damage the component. Check the component if any of the readings is outside its permitted range.

### *Ground lead*

**1**

**Requirements:**

- The connector for the fuel level sensor disconnected.
- Adapter connected to the control unit.
- Measuring resistance using a multimeter.
- Control unit connected.
- Ignition key in stop position.
- Measurement to the control unit.

| Measurement points | Nominal value |
|---|---|
| 2 - ground | R ≈ 0 Ω |

**Note:** If the correct value is not achieved, cut the voltage from the battery.

9998534
9510060

### *Signal cable*

**2**

**Requirements:**

- The connector for the fuel level sensor disconnected.
- Adapter connected to the control unit.
- Measuring voltage using the multimeter.
- Control unit connected.
- Ignition key in the drive position.
- Measurement to the control unit.

| Measurement points | Nominal value |
|---|---|
| 1 - ground | $U_{max}$ ≈ 5 V<br>$U_{min}$ ≈ 0 V |

9998534
9510060

### *Cable harness*

**3**
For checking the cable harness, refer to the service information in Group 371, information type diagnostics "Wiring and connectors, fault tracing".

## Checking component

**Note:** Faults in the component may be caused by faults in the cable harness to the control unit. Check the cable harness before connecting a new component.

### *Sensor, fuel level*

**1**

**Requirements:**

- The connector for the fuel level sensor disconnected.
- Adapter connected to sensor for fuel level.
- Measuring resistance using a multimeter.
- Ignition key in stop position.
- Measurement to sensor for fuel level.

| Measurement points | Nominal value |
|---|---|
| 1 - 2 | R ≈ 30- 35 Ω (100%) |
| | R ≈ 45 - 65 Ω (75%) |
| | R ≈ 85 - 115 Ω (50%) |
| | R ≈ 145 - 170 Ω (25%) |
| | R ≈ 230 - 250 Ω (0%) |

**Note:** The amount of fuel is measured as a percentage of the possible volume of fuel.

---

9998534
9510060

## Checking sub-systems

### *Ground lead*

**1**

**Requirements:**

- Breakout box with adapter connected between control unit connector B and cable harness.
- Measuring resistance using a multimeter.
- Ignition key in stop position.
- Control unit connected.

| Measurement points | Nominal value |
|---|---|
| B1 - ground | R ≈ 0 Ω |

**Note:** If the correct value is not achieved, cut the voltage from the battery.

9813194
, 9998699
, 9990062
9510060

### *Signal cable*

**2**

**Requirements:**

- Breakout box with adapter connected between control unit connector B and cable harness.
- Measuring voltage using the multimeter.
- Ignition key in the drive position.
- Control unit connected.

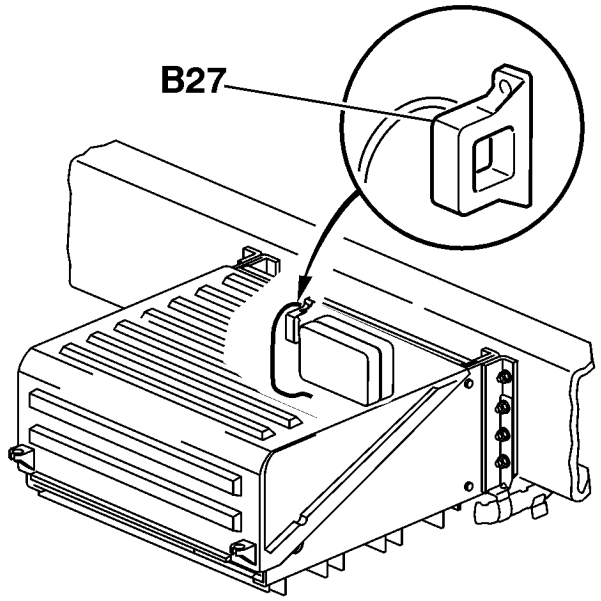
| Measurement points | Nominal value |
|---|---|
| B1 - B3 | $U_{max}$ ≈ 5 V<br>$U_{min}$ ≈ 0 V |

9813194
, 9998699
, 9990062
9510060

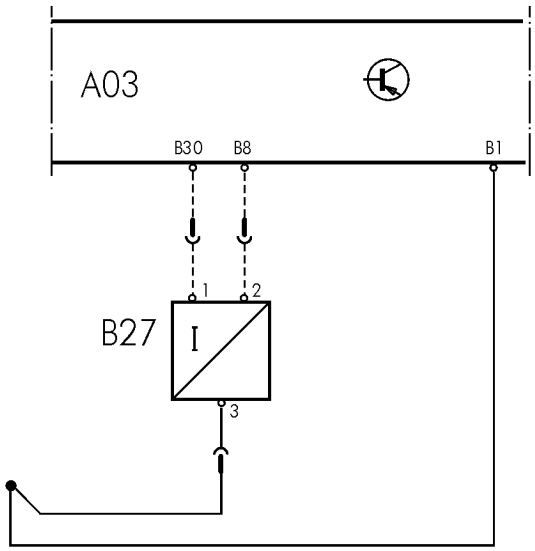
## Verification

In order to check that the fault has been rectified use tests in VCADS Pro (Refer to “Relevant tests in VCADS Pro” page 23).

# MID 140 PID 114 Ammeter




T3015903




T3015766

## General information

**Component:** A 03 B27 Sensor, battery charging

**Cable harness:** 1460

## Fault code

### *FMI 3*

Abnormally high voltage or short-circuit to higher voltage.

*Conditions for fault code:*

- Over 5 V sets fault codes.

*Possible cause:*

- Signal cable short-circuited to higher voltage.
- Faulty sensor.

*Reaction from the control unit:*

- fault code is stored.

*Noticeable external symptoms:*

- The gauge shows – –.

*Appropriate check:*

- “MID 140 PID 114 Ammeter, check” page 28.

### *FMI 4*

Abnormally low voltage or short-circuit to lower voltage.

*Conditions for fault code:*

- Less than 0.25 V sets fault codes.

*Possible cause:*

- Open-circuit in the signal cable.
- Signal cable short-circuited to ground.
- Faulty sensor.

*Reaction from the control unit:*

- fault code is stored.

*Noticeable external symptoms:*

- The gauge shows – –.

*Appropriate check:*

- “MID 140 PID 114 Ammeter, check” page 28.

# 38163-3
# MID 140 PID 114 Ammeter, check

*Special tools: 9998699/9990062, 9990062*
*Other special equipment: 9510060, 9813194*

## NOTE!

- Read off other fault codes for the instrument control unit.
- Switch off the current in the vehicle before disconnecting the connector.
- Check the relevant connectors with regard to loose connections, resistance and oxidation. For a more detailed description of electrical fault tracing, see the separate service information under group 371, information type diagnostics “Wiring and connectors, fault tracing”.

## Checking sub-systems

**1**

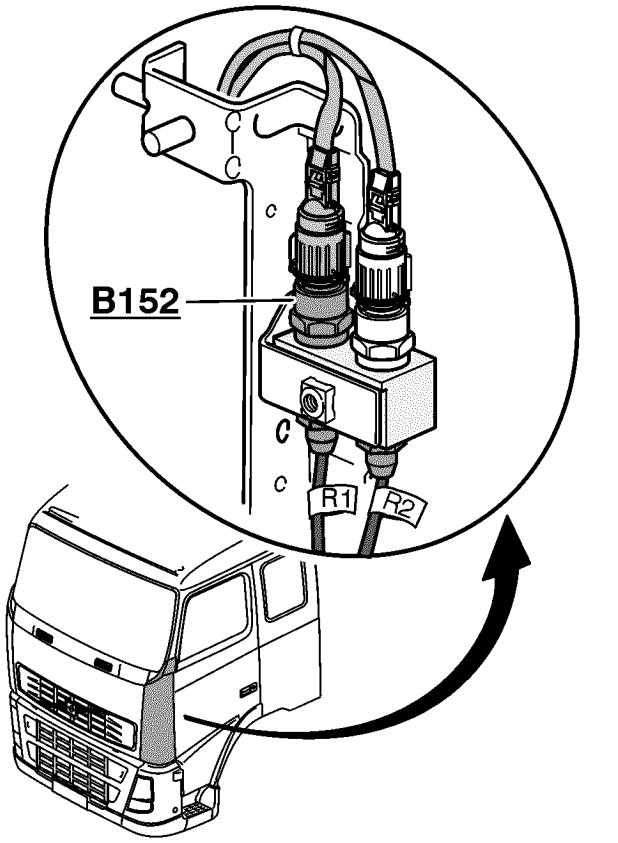
**Requirements:**

- Breakout box with adapter connected between control unit connector B and cable harness.
- Measuring voltage using the multimeter with the *MIN / MAX* - function engaged.
- Ignition key in the drive position.
- Energy consumers disconnected.
- Control unit connected.

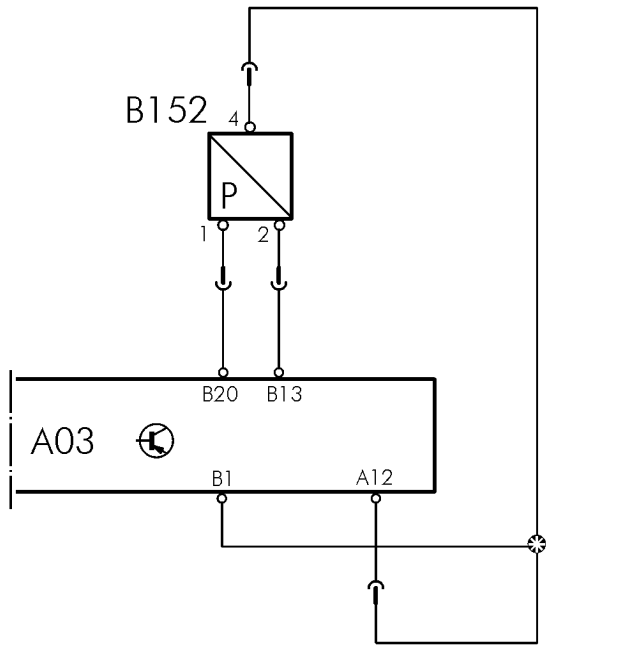
| Measurement points | Nominal value |
|---|---|
| B8 - B1 | 2.3 -2.7 V |

9998699
, 9990062
9510060
, 9813194

# MID 140 PID 117 Air brake pressure, front




T3018083




T3018084

## General information

**Component:** B152, sensor, brake air pressure, front

**Cable harness:** 1000, 1504

## Fault code

### *FMI 3*

Abnormally high voltage or short circuit to higher voltage

*Conditions for fault code:*

- If the instrument control unit registers a voltage above 4.8 V, the control unit interprets this as a fault and an error code is set.

*Possible cause:*

- Break in the ground cable
- Signal cable short-circuited to higher voltage
- Faulty sensor

*Reaction from the control unit:*

- fault code is stored.
- Red lamp requested.

*Noticeable external symptoms:*

- Red lamp lights.
- The gauge is permanently at min. level.

*Appropriate check:*

- “MID 140 PID 117/118 Brake air system sensor, check” page 31

### *FMI 4*

Abnormally low voltage or short circuit to lower voltage

*Conditions for fault code:*

- If the instrument control unit registers a voltage below 0.3 V, the control unit interprets this as a fault and an error code is set.

*Possible cause:*

- Break in the supply cable
- Break in the signal cable
- Signal cable short-circuited to ground
- Connector resistance or oxidization in connector block

*Reaction from the control unit:*

- fault code is stored.
- Red lamp requested.

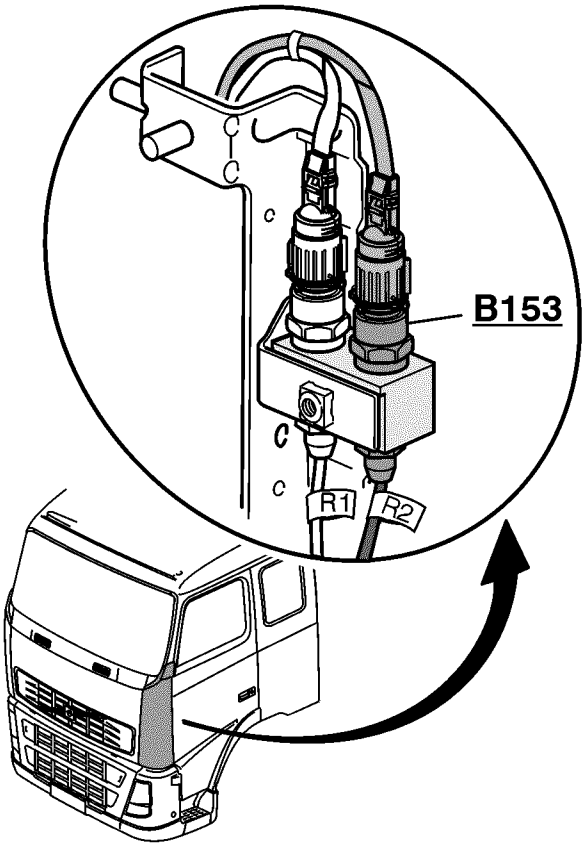
*Noticeable external symptoms:*

- Red lamp lights.
- The gauge is permanently at min. level.

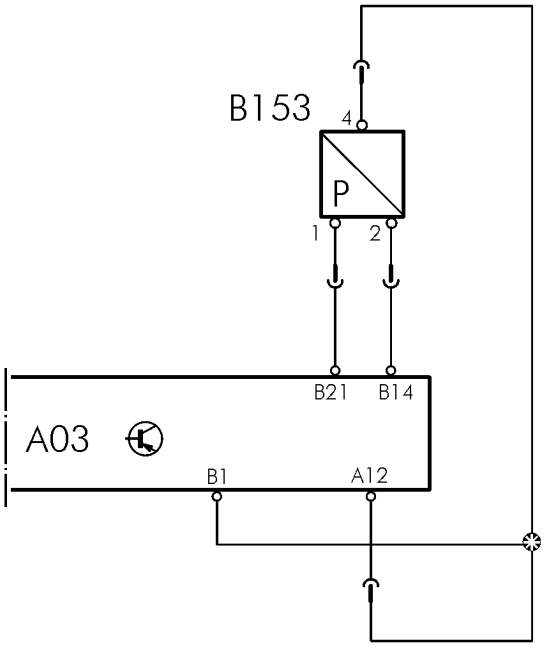
*Appropriate check:*

- “MID 140 PID 117/118 Brake air system sensor, check” page 31

# MID 140 PID 118 Air brake pressure, rear




T3018085




T3018086

## General information

**Component:** B153, sensor, brake air pressure, rear

**Cable harness:** 1000, 1504

## Fault code

### *FMI 3*

Abnormally high voltage or short circuit to higher voltage

*Conditions for fault code:*

- If the instrument control unit registers a voltage above 4.8 V, the control unit interprets this as a fault and an error code is set.

*Possible cause:*

- Break in the ground cable
- Signal cable short-circuited to higher voltage
- Faulty sensor

*Reaction from the control unit:*

- fault code is stored.
- Red lamp requested.

*Noticeable external symptoms:*

- Red lamp lights.
- The gauge is permanently at min. level.

*Appropriate check:*

- “MID 140 PID 117/118 Brake air system sensor, check” page 31

### *FMI 4*

Abnormally low voltage or short circuit to lower voltage

*Conditions for fault code:*

- If the instrument control unit registers a voltage below 0.3 V, the control unit interprets this as a fault and an error code is set.

*Possible cause:*

- Break in the supply cable
- Break in the signal cable
- Signal cable short-circuited to ground
- Connector resistance or oxidization in connector block

*Reaction from the control unit:*

- fault code is stored.
- Red lamp requested.

*Noticeable external symptoms:*

- Red lamp lights.
- The gauge is permanently at min. level.

*Appropriate check:*

- “MID 140 PID 117/118 Brake air system sensor, check” page 31

# 38183-3
# MID 140 PID 117/118 Brake air system sensor, check

*Special tools: 9998533, 9998534, 9990062/9998699*
*Other special equipment: 9510060*

## NOTE!

- Read off other fault codes for the instrument control unit.
- Switch off the current in the vehicle before disconnecting the connector.
- Check the relevant connectors with regard to loose connections, resistance and oxidation. For a more detailed description of electrical fault tracing, see the separate service information under group 371, information type diagnostics “Wiring and connectors, fault tracing”.

## Measurement at the component’s connector to the control unit

**Note:** Faults in the control unit cable harness can damage the component. Check the component if any of the readings is outside its permitted range.

### *Ground lead*

**1**

**Requirements:**

- Connector block for sensor to front/rear brake pressure disconnected.
- Adapter connected to the control unit.
- Measuring resistance using a multimeter.
- Control unit connected.
- Ignition key in stop position.
- Measurement to the control unit.

| Measurement points | Nominal value |
|---|---|
| 4 - ground | R ≈ 0 Ω |

9998534
9510060

## *Supply cable*

**2**

**Requirements:**

- Connector block for sensor to front/rear brake pressure disconnected.
- Adapter connected to the control unit.
- Measuring voltage using the multimeter.
- Control unit connected.
- Ignition key in the drive position.
- Measurement to the control unit.

| Measurement points | Nominal value |
|---|---|
| 1 - 4 | U ≈ 4.5 -5.5 V |

9998534
9510060

## *Signal cable*

**3**

**Requirements:**

- Connector block for front/rear brake pressure sensor **connected**.
- Adaptor connected between control unit and sensor for front/rear brake pressure.
- Measuring voltage using the multimeter.
- Control unit connected.
- Ignition key in the drive position.
- Measurement to the control unit.

| Measurement points | Nominal value |
|---|---|
| 2 - 4 | U ≈ 0.5 -4.5 V |

9998534
9510060

## *Cable harness*

**4**
For checking the cable harness, refer to the service information in Group 371, information type diagnostics “Wiring and connectors, fault tracing”.

# Checking sub-systems

## *Ground lead*

**1**

**Requirements:**

- Breakout box with adapter connected to the control unit, connector B and the cable harness.
- Measuring resistance using a multimeter.
- Control unit connected.
- Ignition key in stop position.

| Measurement points | Nominal value |
|---|---|
| B1 - ground | R ≈ 0 Ω |

9813194, 9998699, 9990062
9510060

## *Supply cable*

**2**

**Requirements:**

- Breakout box with adapter connected to the control unit, connector B and the cable harness.
- Measuring voltage using the multimeter.
- Control unit connected.
- Ignition key in the drive position.

**Front circuit**

| Measurement points | Nominal value |
|---|---|
| B20 - B1 | U ≈ 4.5 -5.5 V |

**Rear circuit**

| Measurement points | Nominal value |
|---|---|
| B21 - B1 | U ≈ 4.5 -5.5 V |

9813194, 9998699, 9990062
9510060

### *Signal cable*

**3**

**Requirements:**

- Breakout box with adapter connected to the control unit, connector B and the cable harness.
- Measuring voltage using the multimeter.
- Control unit connected.
- Ignition key in the drive position.

**Front circuit**

| Measurement points | Nominal value |
|---|---|
| B13 - B1 | U ≈ 0.5 -4.5 V |

**Rear circuit**

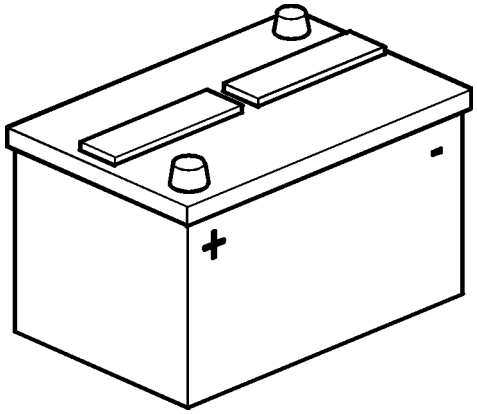
| Measurement points | Nominal value |
|---|---|
| B14 - B1 | U ≈ 0.5 -4.5 V |

9813194, 9998699, 9990062
9510060

## Verification

Read off fault codes and perform a “Gauge check, instruments” to make sure the fault has been rectified.

# MID 140 PID 158 Battery Voltage




T3009517

## Fault code

*FMI 3*

Abnormally high voltage or short-circuit to higher voltage.

*Conditions for fault code:*

- Voltage is above 31 V.

*Possible cause:*

- Rapid charger or start-assist device is connected.
- Defective alternator.
- Defective battery.

*Reaction from the control unit:*

- fault code is stored.

*Appropriate check:*

- “MID 140 PID 158 Battery voltage, check” page 36.

*FMI 4*

Abnormally low voltage or short-circuit to lower voltage.

*Conditions for fault code:*

- Voltage is below 8 V.
- Engine is running and the voltage is below 24 V for longer than 250 sec.

*Possible cause:*

- Defective battery.
- Defective alternator.

*Reaction from the control unit:*

- fault code is stored.

*Noticeable external symptoms:*

- Warning is shown.

*Appropriate check:*

- “MID 140 PID 158 Battery voltage, check” page 36.

# 38171-3
# MID 140 PID 158 Battery voltage, check

*Other special equipment: 9510060*

## NOTE!

- Read off other fault codes for the instrument control unit.
- Switch off the current in the vehicle before disconnecting the connector.
- Check the relevant connectors with regard to loose connections, resistance and oxidation. For a more detailed description of electrical fault tracing, see the separate service information under group 371, information type diagnostics “Wiring and connectors, fault tracing”.

## Checking sub-systems

*Power supply control unit*

**1**

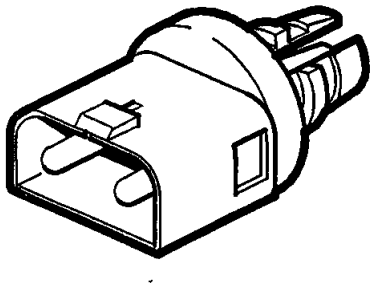
**Requirements:**

- Check to see if several control units have set a fault code for supply voltage.
  Perform a charging check on the vehicle.

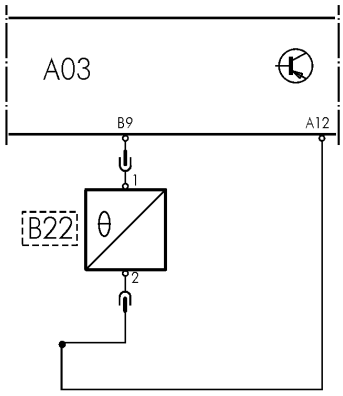
---

9510060

# MID 140 PID 171 Ambient temperature



T3006581




T3015670

## General information

**Note:** Only applies to vehicles with an ambient temperature sensor.

**Component:** B 22 Sensor, ambient temperature

**Cable harness:** 1501

## Fault code

### *FMI 5*

Abnormally low current or open-circuit.

*Conditions for fault code:*

- If the instrument control unit registers a resistance greater than 25 k Ω, the control unit interprets this as a fault and a fault code is set.

*Possible cause:*

- Open-circuit in the ground lead.
- Open-circuit in the signal cable.
- Faulty sensor.
- Contact resistance and oxidation.
- Extreme cold (Colder than -50°C).

*Reaction from the control unit:*

- Fault code is set.

*Noticeable external symptoms:*

- The gauge shows – –.

*Appropriate check:*

- “MID 140 PID 171 Ambient temperature, check” page 38.

### *FMI 6*

Abnormally high current or short-circuit to ground.

*Conditions for fault code:*

- If the instrument control unit registers a resistance less than 25 Ω, the control unit interprets this as a fault and a fault code is set.

*Possible cause:*

- Signal cable short-circuited to ground
- Faulty sensor.
- Extreme heat (Hotter than 90°C).

*Reaction from the control unit:*

- fault code is stored.

*Noticeable external symptoms:*

- The gauge shows – –.

*Appropriate check:*

- “MID 140 PID 171 Ambient temperature, check” page 38.

# 38164-3
# MID 140 PID 171 Ambient temperature, check

*Special tools: 9998699/9990062, 9990008*
*Other special equipment: 9510060, 9813194*

## NOTE!

- Read off other fault codes for the instrument control unit.
- Switch off the current in the vehicle before disconnecting the connector.
- Check the relevant connectors with regard to loose connections, resistance and oxidation. For a more detailed description of electrical fault tracing, see the separate service information under group 371, information type diagnostics “Wiring and connectors, fault tracing”.

## Measurement at the component's connector to the control unit

**Note:** Faults in the control unit cable harness can damage the component. Check the component if any of the readings is outside its permitted range.

### *Ground lead*

**1**

**Requirements:**

- The connector for the ambient temperature sensor disconnected.
- Measuring resistance using a multimeter.
- Control unit connected.
- Ignition key in stop position.
- Measurement to the control unit.

| Measurement points | Nominal value |
|---|---|
| 2 - ground | R ≈ 0 Ω |

**Note:** If the correct value is not achieved, cut the voltage from the battery.

9990008
9510060

### *Signal cable*

**2**

**Requirements:**

- The connector for the ambient temperature sensor disconnected.
- Measuring voltage using the multimeter.
- Control unit connected.
- Ignition key in the drive position.
- Measurement to the control unit.

| Measurement points | Nominal value |
|---|---|
| 1 - ground | $U_{max}$ ≈ 5 V<br>$U_{min}$ ≈ 0 V |

9990008
9510060

### *Cable harness*

**3**
For checking the cable harness, refer to the service information in Group 371, information type diagnostics "Wiring and connectors, fault tracing".

## Checking component

**Note:** Faults in the component may be caused by faults in the cable harness to the control unit. Check the cable harness before connecting a new component.

### *Ambient temperature sensor*

**1**

**Requirements:**

- The connector for the ambient temperature sensor disconnected.
- Measuring resistance using a multimeter.
- Ignition key in stop position.
- Measurement at ambient temperature sensor.

| Measurement points | Nominal value |
|---|---|
| 1 - 2 | R ≈ 8.6 - 12.9 kΩ (-40°C) |
| | R ≈ 2.9 - 4.4 kΩ (-20°C) |
| | R ≈ 1.8 - 2.7 kΩ (-10°C) |
| | R ≈ 1.3 - 2.0 kΩ (-4°C) |
| | R ≈ 1.1 - 1.7 kΩ (0°C) |
| | R ≈ 0.9 - 1.4 kΩ (+4°C) |
| | R ≈ 0.7 - 1.1 kΩ (+10°C) |
| | R ≈ 0.5 - 0.7 kΩ (+20°C) |
| | R ≈ 0.4 - 0.6 kΩ (+25°C) |
| | R ≈ 200 - 400 Ω (+40°C) |
| | R ≈ 100 - 200 Ω (+60°C) |

9990008
9510060

# Checking sub-systems

## *Ground lead*

**1**

**Requirements:**

- Breakout box with adapter connected between control unit connector B and cable harness.
- Measuring resistance using a multimeter.
- Ignition key in stop position.
- Control unit connected.

| Measurement points | Nominal value |
|---|---|
| B1 - ground | R ≈ 0 Ω |

**Note:** If the correct value is not achieved, cut the voltage from the battery.

9813194
, 9998699
, 9990062
9510060

## *Signal cable*

**2**

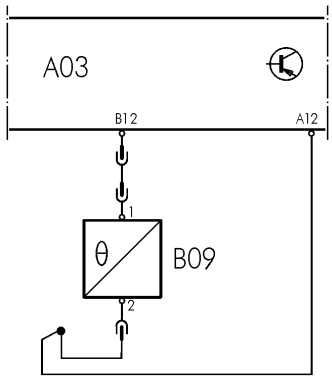
**Requirements:**

- Breakout box with adapter connected between control unit connector B and cable harness.
- Measuring voltage using the multimeter.
- Ignition key in the drive position.
- Control unit connected.

| Measurement points | Nominal value |
|---|---|
| B1 - B9 | $U_{max}$ ≈ 5 V<br>$U_{min}$ ≈ 0 V |

9998699
, 9990062
9510060, 9813194

# MID 140 PID 177 Gearbox oil temperature




T3015671

## General information

**Note:** Applies only to vehicles that are not equipped with I-shift, Geartronic or Powertronic, and that have a sensor for the gearbox oil temperature as an optional extra.

**Component:** B 09 Sensor, oil temperature, gearbox

**Cable harness:** 1494

## Fault code

### *FMI 5*

Abnormally low current or open-circuit.

*Conditions for fault code:*

- If the instrument control unit registers a resistance greater than 5 k Ω, the control unit interprets this as a fault and a fault code is set.

*Possible cause:*

- Open-circuit in the ground lead.
- Open-circuit in the signal cable.
- Faulty sensor.
- Contact resistance and oxidation.

*Reaction from the control unit:*

- "CHECK" yellow lamp requested.

*Noticeable external symptoms:*

- "CHECK" yellow lamp lights up.
- The display shows an icon and the text “DATA MISSING”.

*Appropriate check:*

- “MID 140 PID 177 Gearbox oil temperature, check” page 43.

### *FMI 6*

Abnormally high current or short-circuit to ground.

*Conditions for fault code:*

- If the instrument control unit registers a resistance less than 10 Ω, the control unit interprets this as a fault and a fault code is set.

*Possible cause:*

- Signal cable short-circuited to ground
- Faulty sensor.
- The gearbox oil is overheated.

*Reaction from the control unit:*

- White lamp requested.

*Noticeable external symptoms:*

- White lamp lights.
- The display shows an icon and the text “DATA MISSING”.

*Appropriate check:*

- “MID 140 PID 177 Gearbox oil temperature, check” page 43.

# 38165-3
# MID 140 PID 177 Gearbox oil temperature, check

*Special tools: 9998699/9990062, 9998534*
*Other special equipment: 9510060, 9813194*

## NOTE!

- Read off the other fault codes for the control unit.
- Switch off the current in the vehicle before disconnecting the connector.
- Check the relevant connectors with regard to loose connections, resistance and oxidation. For a more detailed description of electrical fault tracing, see the separate service information under group 371, information type diagnostics “Wiring and connectors, fault tracing”.

## Measurement at the component's connector to the control unit

**Note:** Faults in the control unit cable harness can damage the component. Check the component if any of the readings is outside its permitted range.

### *Ground lead*

**1**

**Requirements:**

- The connector for the sensor for the gearbox oil temperature disconnected.
- Measuring resistance using a multimeter.
- Control unit connected.
- Ignition key in stop position.
- Measurement to the control unit.

| Measurement points | Nominal value |
|---|---|
| 2 - ground | R ≈ 0 Ω |

**Note:** If the correct value is not achieved, cut the voltage from the battery.

9998534
9510060

### *Signal cable*

**2**

**Requirements:**

- The connector for the sensor for the gearbox oil temperature disconnected.
- Measuring voltage using the multimeter.
- Control unit connected.
- Ignition key in the drive position.
- Measurement to the control unit.

| Measurement points | Nominal value |
|---|---|
| 1 - ground | $U_{max}$ ≈ 5 V<br>$U_{min}$ ≈ 0 V |

9998534
9510060

### *Cable harness*

**3**
For checking the cable harness, refer to the service information in Group 371, information type diagnostics "Wiring and connectors, fault tracing".

## Checking component

**Note:** Faults in the component may be caused by faults in the cable harness to the control unit. Check the cable harness before connecting a new component.

### *Sensor, oil temperature, transmission*

**1**

**Requirements:**

- The connector for the sensor for the gearbox oil temperature disconnected.
- Measuring resistance using a multimeter.
- Ignition key in stop position.
- Measurement at the sensor for the gearbox oil temperature

| Measurement points | Nominal value |
|---|---|
| 1 - 2 | R ≈ 0.8 - 1.1 kΩ (20°C) |
| | R ≈ 150 - 220 Ω (70°C) |
| | R ≈ 110 - 160 Ω (80°C) |
| | R ≈ 80 - 120 Ω (90°C) |
| | R ≈ 60 - 90 Ω (100°C) |
| | R ≈ 50 - 70 Ω (110°C) |
| | R ≈ 35 - 55 Ω (120°C) |
| | R ≈ 30 - 45 Ω (130°C) |
| | R ≈ 20 - 35 Ω (140°C) |
| | R ≈ 18 - 25 Ω (150°C) |

9998534
9510060

# Checking sub-systems

## *Ground lead*

**1**

**Requirements:**

- Breakout box with adapter connected between control unit connector B and cable harness.
- Measuring resistance using a multimeter.
- Ignition key in stop position.
- Control unit connected.

| Measurement points | Nominal value |
|---|---|
| B1 - ground | R ≈ 0 Ω |

**Note:** If the correct value is not achieved, cut the voltage from the battery.

9998699
, 9990062
9510060
, 9813194

## *Signal cable*

**2**

**Requirements:**

- Breakout box with adapter connected between control unit connector B and cable harness.
- Measuring voltage using the multimeter.
- Ignition key in the drive position.
- Control unit connected.

| Measurement points | Nominal value |
|---|---|
| B1 - B12 | $U_{max}$ ≈ 5 V<br>$U_{min}$ ≈ 0 V |

9998699
, 9990062
9510060
, 9813194

# MID 140 SID 251 Power supply

See “MID 140 PID 158 Battery Voltage” page 35.

# MID 140 SID 250 SAE J1708 Information link

## General information

**Component:** A 03

**Cable harness:** 1000

## Fault code

*FMI 12*

Defective unit or component.

*Conditions for fault code:*

- If no control units send PID 44 to the instruments, but the instrument control unit still has contact with the link (there is echo), the control unit interprets this as a fault and a fault code is set.

*Possible cause:*

- One of the control units is being programmed and has sent a command to the other control units not to transmit signals on the information link in the meantime.

*Reaction from the control unit:*

- fault code is stored.

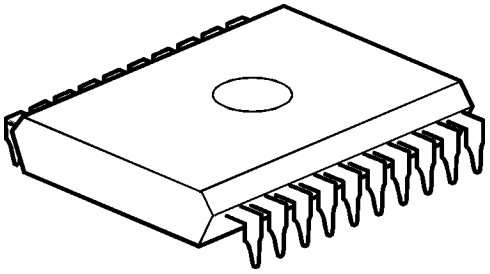
*Noticeable external symptoms:*

- The display shows the text “CHECK DATA LINK OPEN-CIRCUIT”.

*Appropriate check:*

- Fault trace the SAE J1708 data link, refer to service information Group 3711, information type diagnostics, “Data links, fault tracing”.

# MID 140 SID 253 Calibration memory, EEPROM



T2012704

## General information

At start-up a check sum is calculated for the data set in the control unit's EEPROM memory. This is compared with a previously stored check sum to check that the data set is correct.

**Component:** A03

**Cable harness:** -

## Fault code

*FMI 2*

Intermittent or incorrect data.

*Conditions for fault code:*

- If the content of the memory circuit is faulty the instrument control unit interprets this as a fault and an fault codes is set.

*Possible cause:*

- Error when programming.
- Fault in the memory circuit.

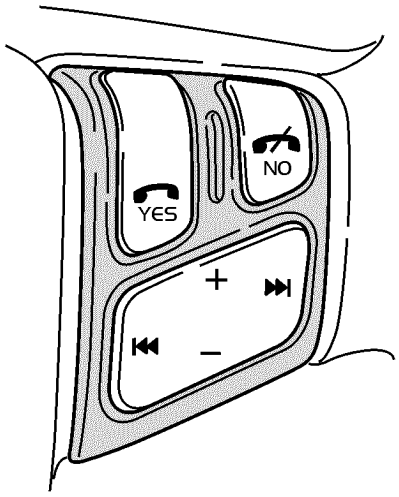
*Reaction from the control unit:*

- Unable to predict.

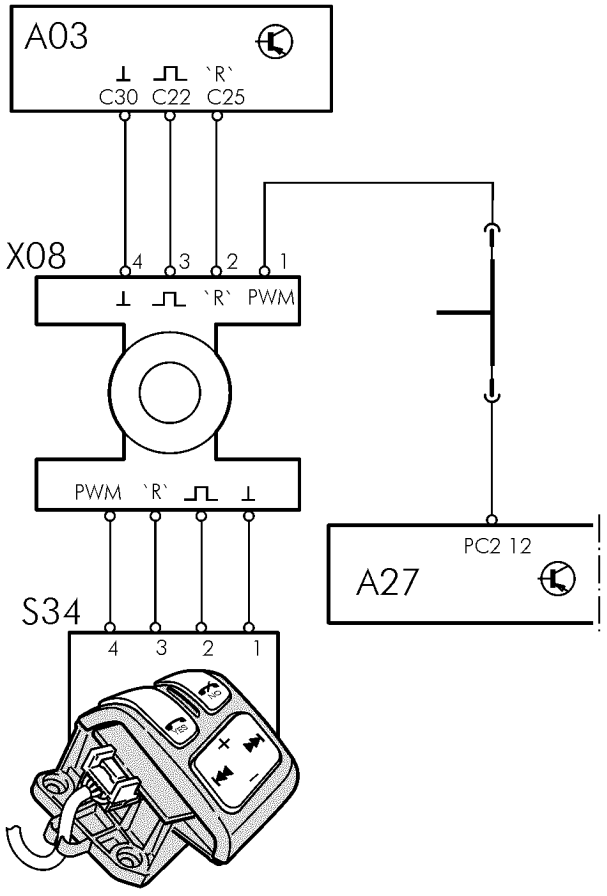
*Noticeable external symptoms:*

- Unable to predict.

# MID 140 PSID 39 Steering wheel buttons, YES




T3014551




T3018087

## General information

There are two versions of steering wheel buttons: with or without telephone operation. The difference is that steering wheel buttons without telephone operation do not have the buttons “Yes” and “No”.

“Yes” is used to make calls, answer incoming calls and select from telephone menus.

**Component:** Steering wheel buttons switch (S34), Instrument (A03), Contact reel air bag (X08), Control unit (LCM) exterior lighting (A27).

**Cable harness:** 1000.

## Fault code

*FMI 12*

Defective unit or component.

*Conditions for fault code:*

- If “Yes” is depressed for longer than one minute, the control unit interprets this as a fault and a fault code is set.

*Possible cause:*

- Button depressed for longer than one minute.
- Faulty button set.

*Reaction from the control unit:*

- fault code is stored.
- “Yes” shuts off.

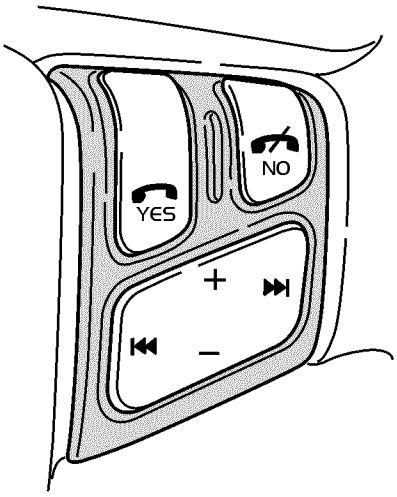
*Noticeable external symptoms:*

- “Yes” does not function.

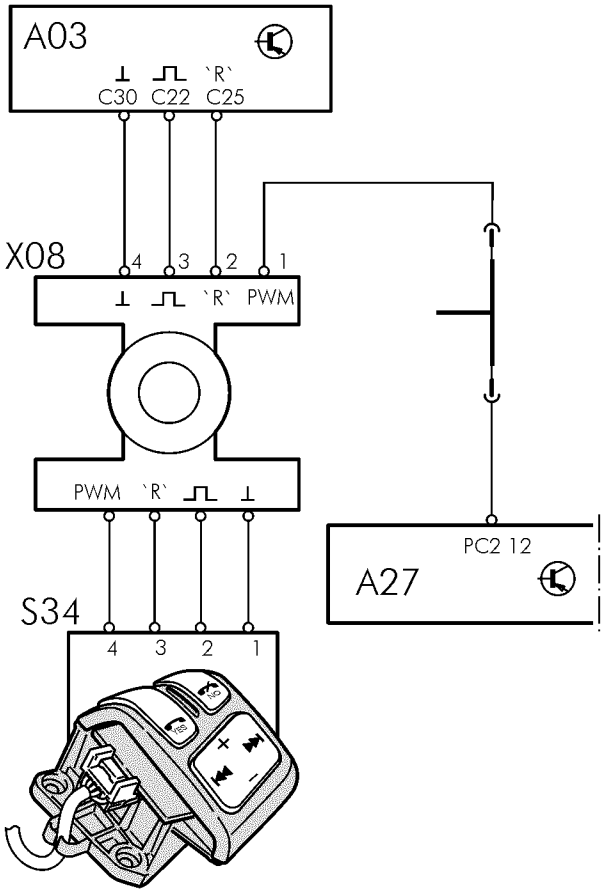
*Appropriate check:*

- “MID 140 PSID 39/40/41/42/43/44/45/46 Steering wheel buttons, check” page 58

# MID 140 PSID 40 Steering wheel buttons, NO




T3014551




T3018087

## General information

There are two versions of steering wheel buttons: with or without telephone operation. The difference is that steering wheel buttons without telephone operation do not have the buttons “Yes” and “No”.

“No” is used to exit the telephone menus in the display, to replace the receiver and to deny incoming calls.

**Component:** Steering wheel buttons switch (S34), Instrument (A03), Contact reel air bag (X08), Control unit (LCM) exterior lighting (A27).

**Cable harness:** 1000.

## Fault code

### *FMI 12*

Defective unit or component.

*Conditions for fault code:*

- If “No” is depressed for longer than one minute, the control unit interprets this as a fault and a fault code is set.

*Possible cause:*

- Button depressed for longer than one minute.
- Faulty button set.

*Reaction from the control unit:*

- fault code is stored.
- “No” shuts off.

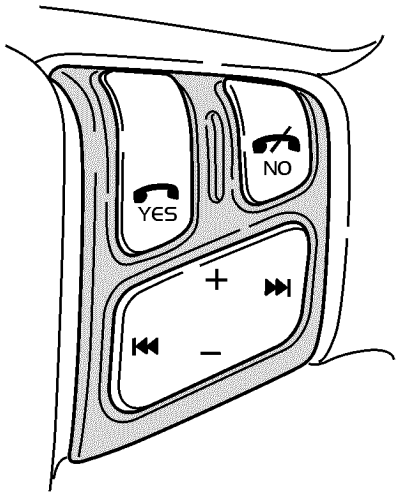
*Noticeable external symptoms:*

- “No” does not function.

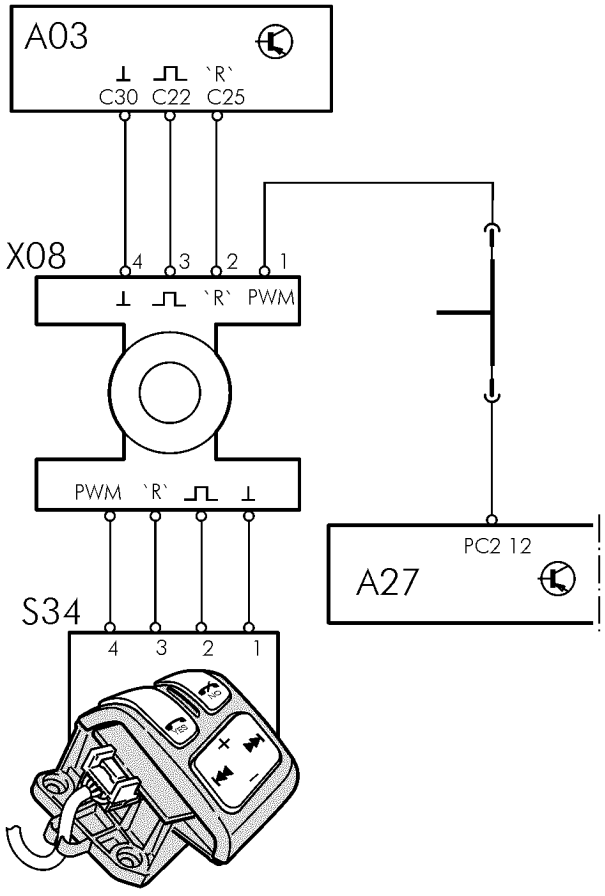
*Appropriate check:*

- “MID 140 PSID 39/40/41/42/43/44/45/46 Steering wheel buttons, check” page 58

# MID 140 PSID 41 Arrow left




T3014551




T3018087

## General information

"Arrow left (<<)" has different functions depending on whether the telephone menus are activated or not.

**Radio position**
In radio position "Arrow left (<<)" is used to tune-in to radio stations.

**Telephone position**
If the telephone menus are activated by pressing "Yes", "Arrow left (<<)" is used to navigate the menus.

**Component:** Steering wheel buttons switch (S34), Instrument (A03), Contact reel air bag (X08), Control unit (LCM) exterior lighting (A27).

**Cable harness:** 1000.

## Fault code

*FMI 12*
Defective unit or component.

*Conditions for fault code:*

- If "Arrow left (<<)" is depressed for longer than one minute, the control unit interprets this as a fault and a fault code is set.

*Possible cause:*

- Button depressed for longer than one minute.
- Faulty button set.

*Reaction from the control unit:*

- fault code is stored.
- "Volume" shuts off.
- "Search" shuts off.

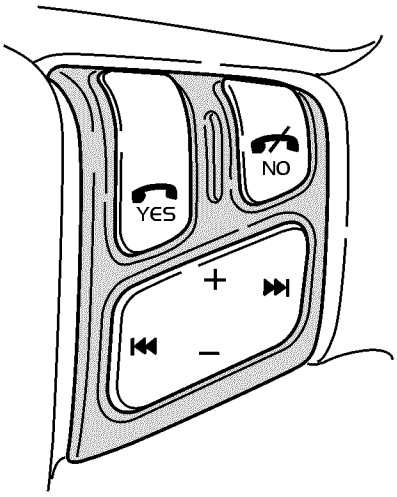
*Noticeable external symptoms:*

- "Volume" does not function
- "Search" does not function.

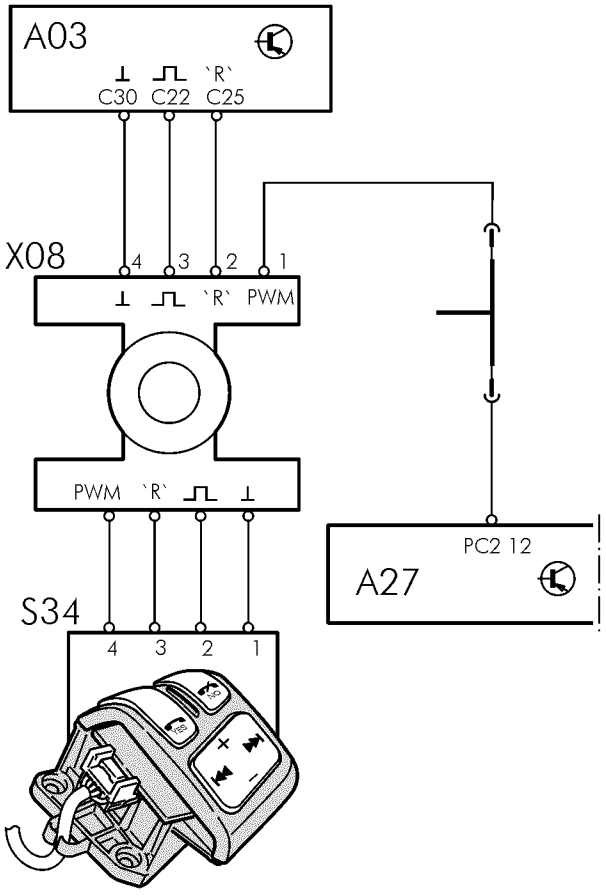
*Appropriate check:*

- "MID 140 PSID 39/40/41/42/43/44/45/46 Steering wheel buttons, check" page 58

# MID 140 PSID 42 Arrow right




T3014551




T3018087

## General information

"Arrow right (>>)" has different functions depending on whether the telephone menus are activated or not.

**Radio position**
In radio position "Arrow right (>>)" is used to tune-in to radio stations.

**Telephone position**
If the telephone menus are activated by pressing "Yes", the "Arrow right (>>)" is used to navigate the telephone menus.

**Component:** Steering wheel buttons switch (S34), Instrument (A03), Contact reel air bag (X08), Control unit (LCM) exterior lighting (A27).

**Cable harness:** 1000.

## Fault code

### *FMI 12*

Defective unit or component.

*Conditions for fault code:*

- If "Arrow right (>>)" is depressed for longer than one minute, the control unit interprets this as a fault and a fault code is set.

*Possible cause:*

- Button depressed for longer than one minute.
- Faulty button set.

*Reaction from the control unit:*

- fault code is stored.
- "Volume" shuts off.
- "Search" shuts off.

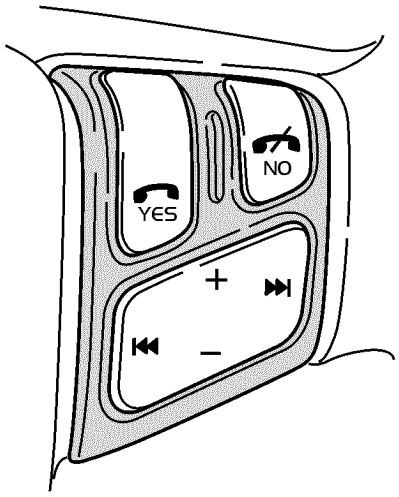
*Noticeable external symptoms:*

- "Volume" does not function
- "Search" does not function.

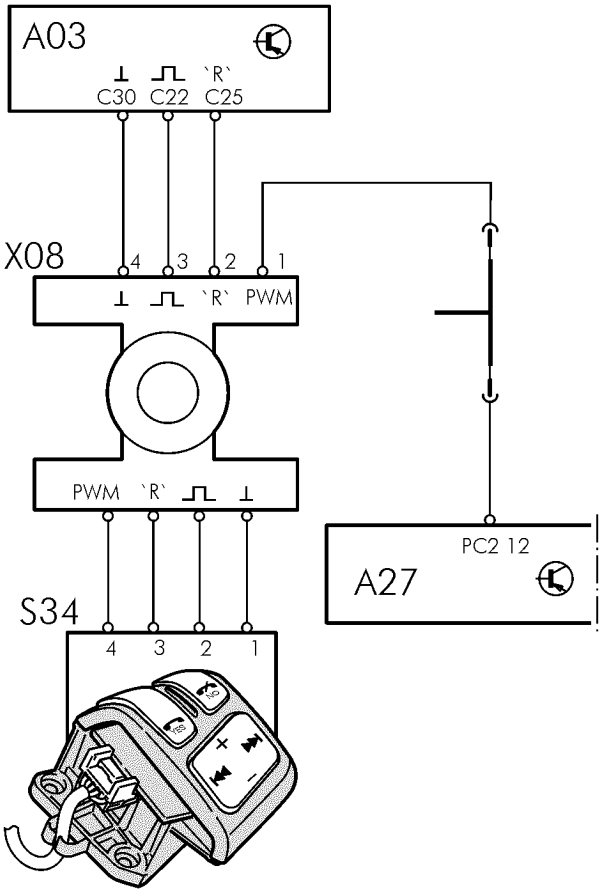
*Appropriate check:*

- "MID 140 PSID 39/40/41/42/43/44/45/46 Steering wheel buttons, check" page 58

# MID 140 PSID 43 Volume (+)




T3014551




T3018087

## General information

Volume (+) has different functions depending on whether the telephone menus are activated or not.

**Radio position**
In radio position “Volume (+)” us used to increase the radio volume.

**Telephone position**
If the telephone menus are activated by pressing “Yes”, “Volume (+)” is used to increase the telephone volume.

**Component:** Steering wheel buttons switch (S34), Instrument (A03), Contact reel air bag (X08), Control unit (LCM) exterior lighting (A27).

**Cable harness:** 1000.

## Fault code

*FMI 12*
Defective unit or component.

*Conditions for fault code:*

- If “Volume (+)” is depressed for longer than one minute, the control unit interprets this as a fault and a fault code is set.

*Possible cause:*

- Button depressed for longer than one minute.
- Faulty button set.

*Reaction from the control unit:*

- fault code is stored.
- “Volume” shuts off.
- “Search” shuts off.

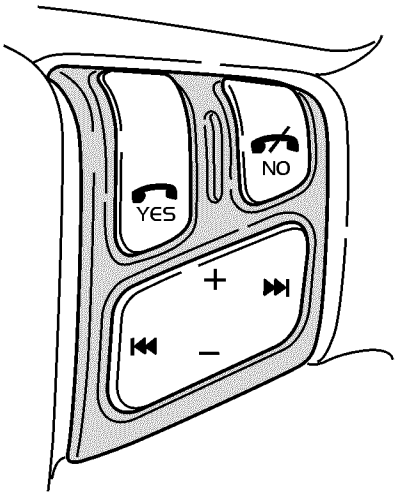
*Noticeable external symptoms:*

- “Volume” does not function
- “Search” does not function.

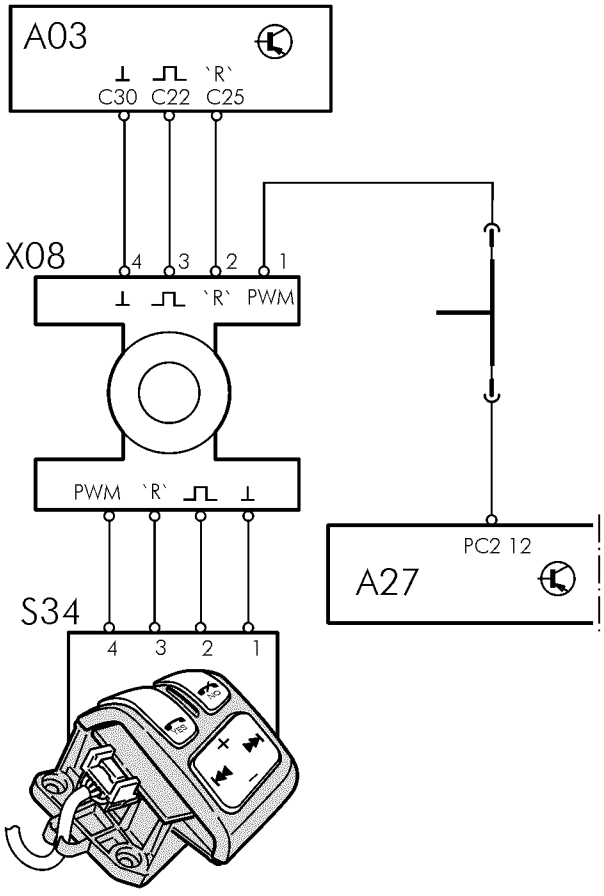
*Appropriate check:*

- “MID 140 PSID 39/40/41/42/43/44/45/46 Steering wheel buttons, check” page 58

# MID 140 PSID 44 Volume (-)




T3014551




T3018087

## General information

Volume (-) has different functions depending on whether the telephone menus are activated or not.

**Radio position**
In radio position “Volume (-)” us used to decrease the radio volume.

**Telephone position**
If the telephone menus are activated by pressing “Yes”, “Volume (-)” is used to decrease the telephone volume.

**Component:** Steering wheel buttons switch (S34), Instrument (A03), Contact reel air bag (X08), Control unit (LCM) exterior lighting (A27).

**Cable harness:** 1000.

## Fault code

*FMI 12*
Defective unit or component.

*Conditions for fault code:*

- If “Volume (-)” is depressed for longer than one minute, the control unit interprets this as a fault and a fault code is set.

*Possible cause:*

- Button depressed for longer than one minute.
- Faulty button set.

*Reaction from the control unit:*

- fault code is stored.
- “Volume” shuts off.
- “Search” shuts off.

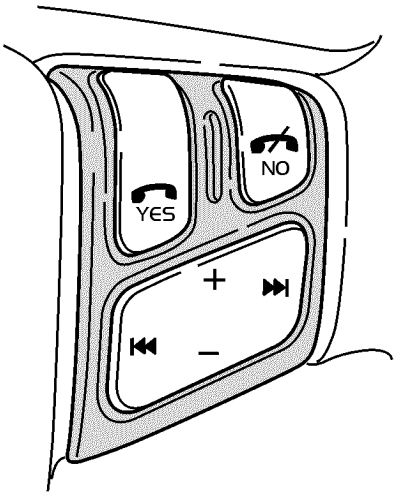
*Noticeable external symptoms:*

- “Volume” does not function
- “Search” does not function.

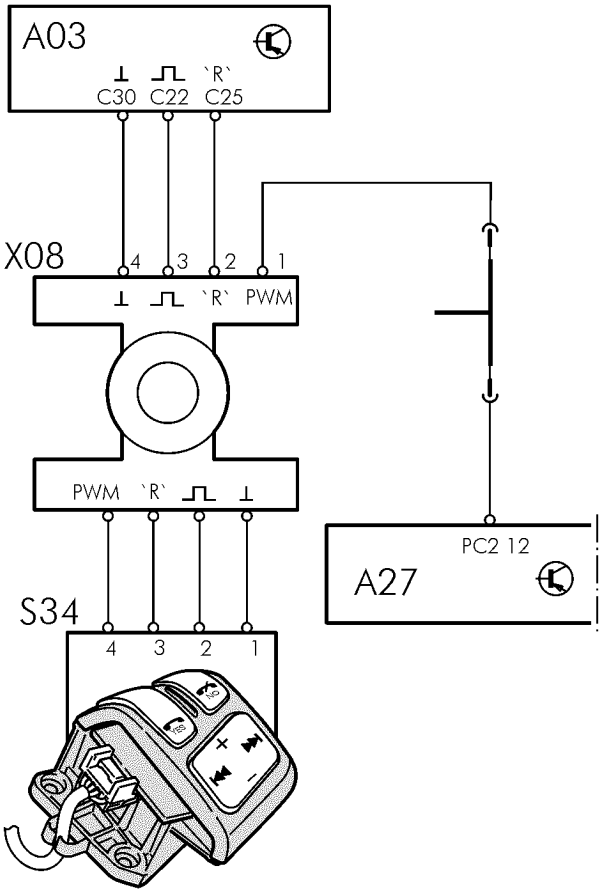
*Appropriate check:*

- “MID 140 PSID 39/40/41/42/43/44/45/46 Steering wheel buttons, check” page 58

# MID 140 PSID 45 Power supply switch steering wheel buttons




T3014551




T3018087

## General information

The power supply to the steering wheel buttons switch is monitored by the instrument.

**Component:** Steering wheel buttons switch (S34), Contact reel air bag (X08), Control unit (LCM) exterior lighting (A27).

**Cable harness:** 1000.

## Fault code

### *FMI 3*

Abnormally high voltage or short-circuit to higher voltage.

*Conditions for fault code:*

- If the voltage in the control unit's outlet to the switch for the steering wheel push buttons is more than 14 V for more than 5 seconds, the control unit interprets this as a fault and a fault code is set.

*Possible cause:*

- Short circuit to voltage in the cable harness between steering wheel buttons switch and control unit.

*Reaction from the control unit:*

- fault code is stored.
- Switch for steering wheel buttons is switched off.

*Noticeable external symptoms:*

- Steering wheel buttons do not function.

*Appropriate check:*

- "MID 140 PSID 39/40/41/42/43/44/45/46 Steering wheel buttons, check" page 58

### *FMI 5*

Abnormally low current or open-circuit.

*Conditions for fault code:*

- If the internal control of the control unit detects interruption in the outlet to the switch for steering wheel buttons, a fault code is set.

*Possible cause:*

- Interruption in the cable harness between switch for steering wheel buttons and control unit.

*Reaction from the control unit:*

- fault code is stored.
- Switch for steering wheel buttons is switched off.

*Noticeable external symptoms:*

- Steering wheel buttons do not function.

*Appropriate check:*

- "MID 140 PSID 39/40/41/42/43/44/45/46 Steering wheel buttons, check" page 58

### *FMI 6*

Abnormally high current or short-circuit to ground.

*Conditions for fault code:*

- If the voltage in the control unit's outlet to the switch for steering wheel buttons is below 1 V for more than 5 seconds, the control unit interprets this as a fault and a fault code is set.

*Possible cause:*

- Short circuit to frame in the cable harness between the steering wheel buttons switch and the control unit.

*Reaction from the control unit:*

- fault code is stored.
- Switch for steering wheel buttons is switched off.

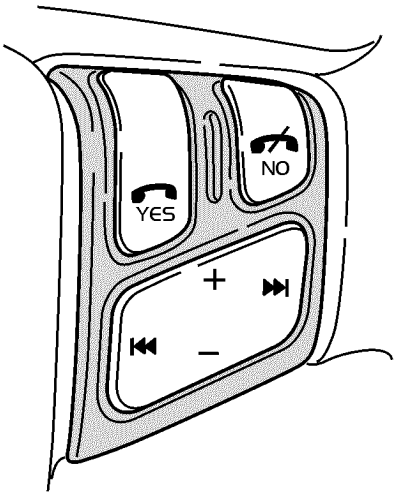
*Noticeable external symptoms:*

- Steering wheel buttons do not function.

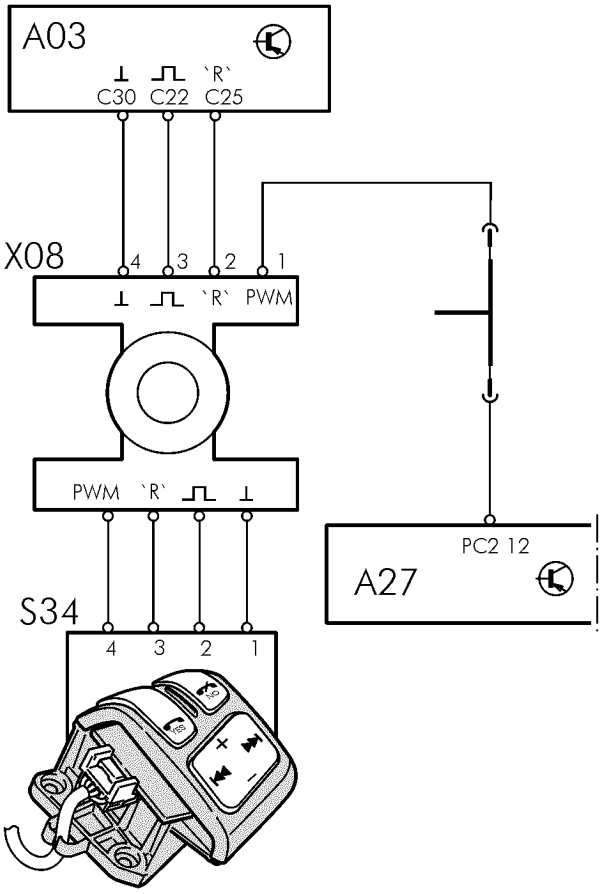
*Appropriate check:*

- "MID 140 PSID 39/40/41/42/43/44/45/46 Steering wheel buttons, check" page 58

# MID 140 PSID 46 Data link, switch steering wheel buttons




T3014551




T3018087

## General information

**Component:** S34

**Cable harness:** 1000

## Fault code

*FMI 9*

Abnormal update rate.

*Conditions for fault code:*

- If the instrument receives no signal from the steering wheel buttons or if the signal is corrupt, for more than 30 sec, the instrument interprets this as a communication error from the buttons and a fault code is set.

*Possible cause:*

- Fault in the link between the instrument control unit and the steering wheel.

*Reaction from the control unit:*

- fault code is stored.

*Noticeable external symptoms:*

- Steering wheel buttons do not function.

*Appropriate check:*

- “MID 140 PSID 39/40/41/42/43/44/45/46 Steering wheel buttons, check” page 58

# 38184-3
# MID 140 PSID 39/40/41/42/43/44/45/46 Steering wheel buttons, check

*Special tools: 9998699/9990062, 9998604, 9998533*
*Other special equipment: 9510060*

## NOTE

**DANGER**

The steering wheel buttons switch, is located in the steering wheel. Great care must be taken when performing measurements close to the steering wheel and the airbag slip rings, on vehicles with air bags (SRS). For further information on airbags (SRS), see service information group 85.

- Switch off the current in the vehicle before disconnecting the connector.
- Start fault tracing by making sure that buttons have not got stuck in the depressed position.
- Check the relevant connectors, while fault tracing, with regard to loose connections, resistance and oxidation. For a more detailed description of fault tracing in cables and connectors, see the separate service information under group 371 information type diagnostics “Wiring and connectors, fault tracing”.
- Check the fuses for the instruments, radio and telephone.
- The measurement points in brackets refer to connections within the connector block.

## Suitable tests in VCADS Pro

- Fault codes
- Steering wheel buttons, test

## Measurement at the control unit

**1**

**Requirements:**

**Note:** Some active fault codes will shut of steering wheel button functions, partially or completely.

- If the voltage measurements below are not possible due to fault codes, check the connector block in question between the instrument panel and steering wheel buttons with regard to loose connections, connector resistance and oxidisation. Also check the wiring for open circuits and short circuits to ground and voltage, refer to separate service information in function group 371, information type diagnostics, “Wiring and connectors, fault tracing”.
- Breakout box with adaptor connected between cable harness, connector block A, C and instrument.
- Measuring voltage using the multimeter.
- Control unit connected.
- Ignition key in the drive position.

| Measurement points | Nominal value |
|---|---|
| 30 - 32 (C30 - A2) | U≈ 0 V |
| 25 - 32 (C25 - A2) | U ≈ 7 -14 V |
| 25 -30 (C25 - C30) | U ≈ 7 -14 V |
| 22 -30 (C22 - C30) | U ≈ 7 -9 V |

9998699, 9990062, 9998533
9510060

## Measurement at component

**2**

**DANGER**

The air bag unit (SRS) must be unfastened before performing this measurement. The air bag unit (SRS) shall only be removed by certified personnel.

**Requirements:**

- Breakout box with adaptor connected between the cable harness and steering wheel buttons switch.
- Measuring voltage using the multimeter.
- Control unit connected.
- Ignition key in the drive position.

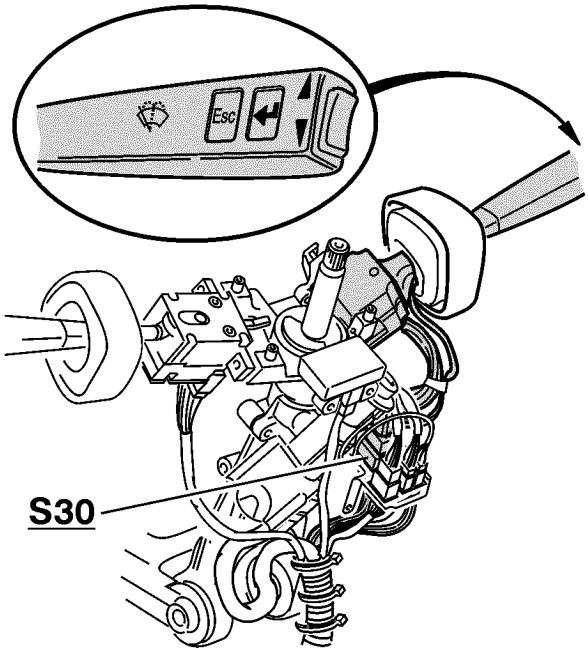
| Measurement points | Nominal value |
|---|---|
| 26 - framework (1 - framework) | U≈ 0 V |
| 28 - framework (3 - framework) | U ≈ 7 -14 V |
| 27 - 26 (2 - 1) | U ≈ 7 -9 V |
| 28 - 26 (3 - 1) | U ≈ 7 -14 V |
| 29 - 26 (4 - 1) | U ≈ 2 - 26 V (Lighting on)<br>U ≈ 0.5 - 1.5 V (Lighting off) |

9998699, 9990062, 9998604
9510060

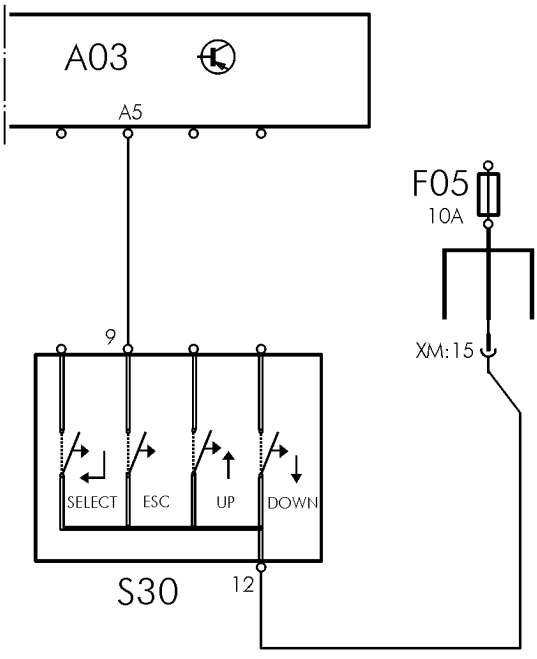
## Verification

To check that the fault is eliminated, read off fault codes. Perform “Steering wheel buttons, test”.

# MID 140 PSID 47 Switch display, Escape




T3018089




T3018090

## General information

**Component:** S30

**Cable harness:** 1000

## Fault code

*FMI 12*

Defective unit or component.

*Conditions for fault code:*

- If “Escape” is depressed for longer than one minute, the control unit interprets this as a fault and a fault code is set.

*Possible cause:*

- Button depressed for longer than one minute.
- Faulty button set.

*Reaction from the control unit:*

- fault code is stored.
- “Escape” shuts off.

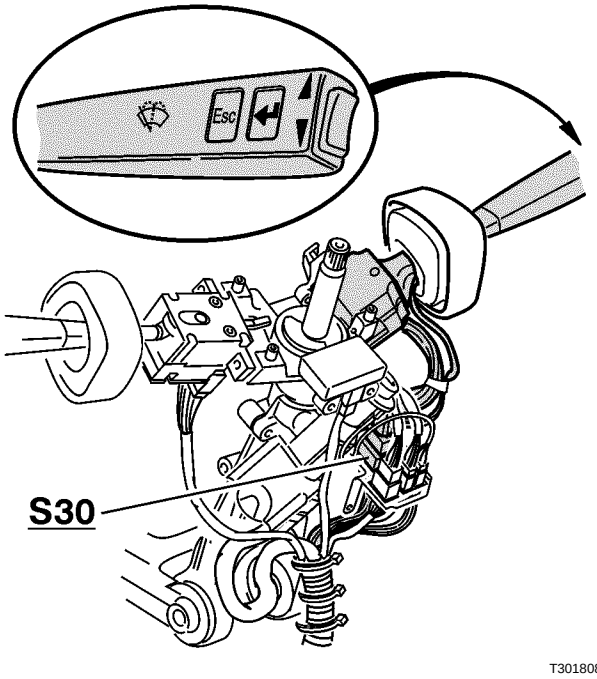
*Noticeable external symptoms:*

- “Escape” does not function.

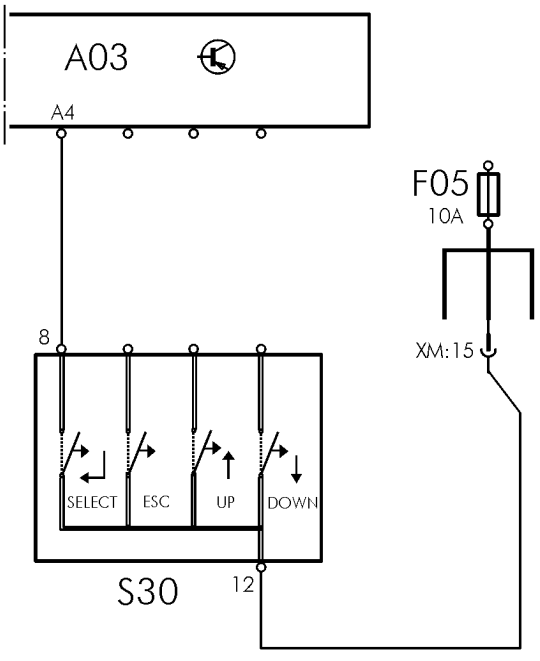
*Appropriate check:*

- “MID 140 PSID 47/48/49/50 Switches display, check” page 65

# MID 140 PSID 48 Switch display, Enter




T3018089




T3018091

## General information

**Component:** S30

**Cable harness:** 1000

## Fault code

*FMI 12*
Defective unit or component.

**FMI 12**
Defective unit or component.

*Conditions for fault code:*

- If “Enter” is depressed for longer than one minute, the control unit interprets this as a fault and a fault code is set.

*Possible cause:*

- Button depressed for longer than one minute.
- Faulty button set.

*Reaction from the control unit:*

- fault code is stored.
- “Enter” shuts off.

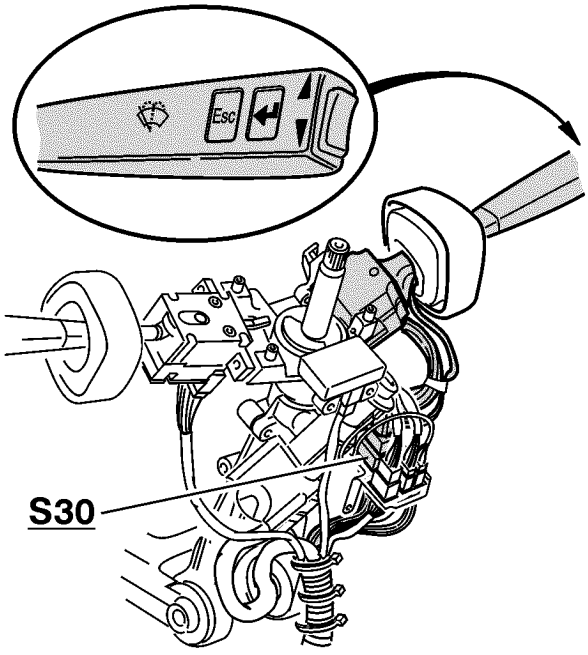
*Noticeable external symptoms:*

- “Enter” does not function.

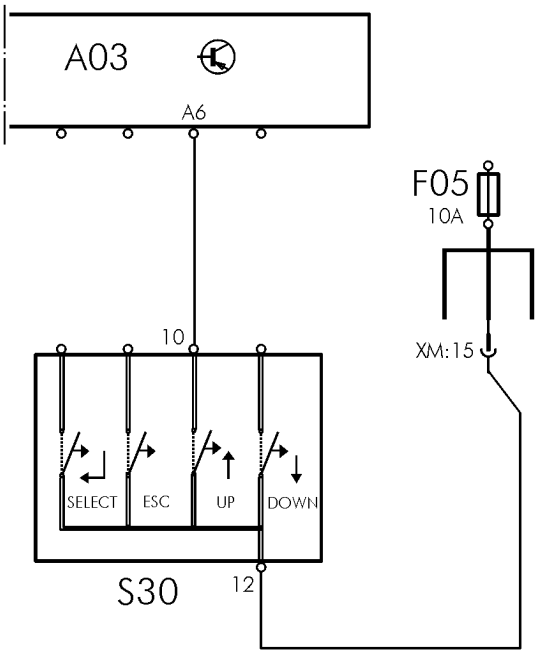
*Appropriate check:*

- “MID 140 PSID 47/48/49/50 Switches display, check” page 65

# MID 140 PSID 49 Switch display, Up




T3018089




T3018092

## General information

**Component:** S30

**Cable harness:** 1000

## Fault code

*FMI 12*

Defective unit or component.

*Conditions for fault code:*

- If “Up” is depressed for longer than one minute, the control unit interprets this as a fault and a fault code is set.

*Possible cause:*

- Button depressed for longer than one minute.
- Faulty button set.

*Reaction from the control unit:*

- fault code is stored.
- “Up” shuts off.

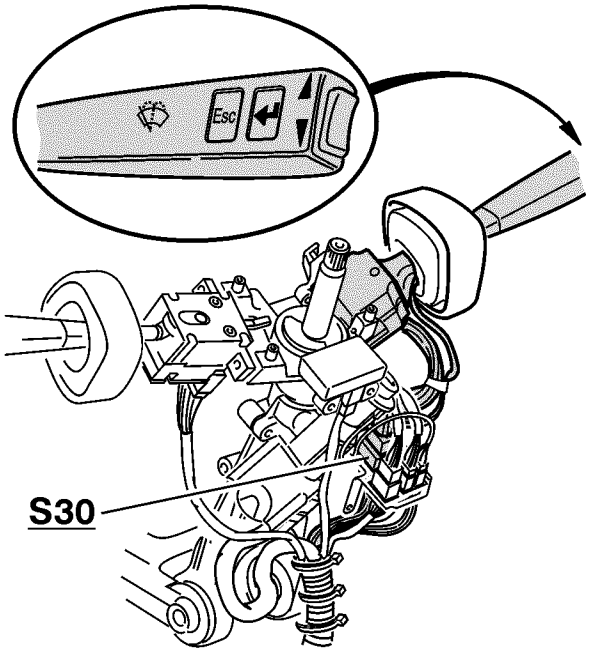
*Noticeable external symptoms:*

- “Up” does not function.

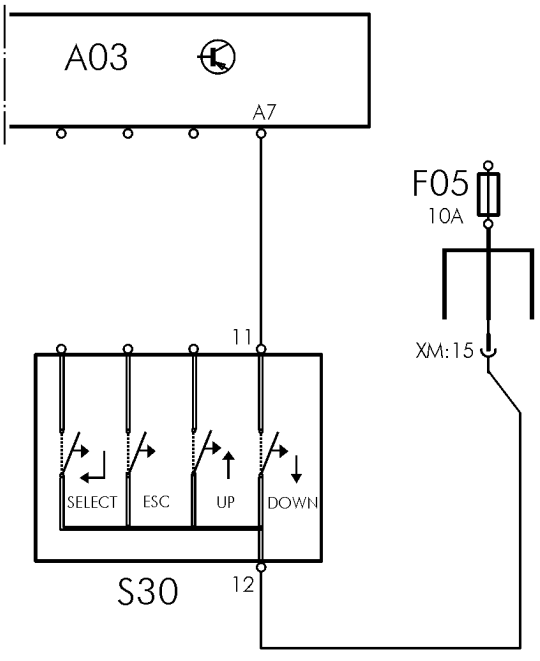
*Appropriate check:*

- “MID 140 PSID 47/48/49/50 Switches display, check” page 65

# MID 140 PSID 50 Switch display, Down




T3018089




T3018093

## General information

**Component:** S30

**Cable harness:** 1000

## Fault code

*FMI 12*

Defective unit or component.

*Conditions for fault code:*

- If “Down” is depressed for longer than one minute, the control unit interprets this as a fault and a fault code is set.

*Possible cause:*

- Button depressed for longer than one minute.
- Faulty button set.

*Reaction from the control unit:*

- fault code is stored.
- “Down” shuts off.

*Noticeable external symptoms:*

- “Down” does not function.

*Appropriate check:*

- “MID 140 PSID 47/48/49/50 Switches display, check” page 65

# 38185-3
# MID 140 PSID 47/48/49/50 Switches display, check

*Special tools: 9998699/9990062, 9998604, 9998596, 9998533*
*Other special equipment: 9510060, 9813194*

## NOTE

**DANGER**

The switch display is located next to the steering wheel. Great care must be taken when performing measurements close to the steering wheel and the airbag slip rings, on vehicles with air bags (SRS). For further information on airbags (SRS), see service information group 85.

- Switch off the current in the vehicle before disconnecting the connector.
- Start fault tracing by making sure that buttons have not got stuck in the depressed position.
- Check the relevant connectors, while fault tracing, with regard to loose connections, resistance and oxidation. For a more detailed description of fault tracing in cables and connectors, see the separate service information under group 371 information type diagnostics “Wiring and connectors, fault tracing”.
- Check the fuses to the instrument and switch display.
- The measurement points in brackets refer to connections within the connector block.

## Suitable tests in VCADS Pro

- Fault codes
- Instrument, test

## Measurement at the control unit

**1**

**Requirements:**

**Note:** If an active fault code is set for the switch, the instrument with shut off the function of the relevant button.

- Breakout box connected between the cable harness and the instrument connector block A.
- Measuring voltage using the multimeter.
- Control unit disconnected.
- Ignition key in stop position.

| **Meas-urement points** | **Switch** | **Activated** | **Not activated** |
|---|---|---|---|
| 35 - 32 (A5 - A2) | “Escape” | $U \approx U_{bat}$ | U≈ 0 V |
| 34 - 32 (A4 - A2) | “Enter” | $U \approx U_{bat}$ | U≈ 0 V |
| 36 - 32 (A6 - A2) | “Up” | $U \approx U_{bat}$ | U≈ 0 V |
| 37 - 32 (A7 - A2) | “Down” | $U \approx U_{bat}$ | U≈ 0 V |

9998699, 9990062, 9998533
9510060

## Measurement at component

**2**

**Requirements:**

- Breakout box with adaptor connected between cable harness and switch display.
- Measuring voltage using the multimeter.
- Control unit disconnected.
- Ignition key in stop position.

| **Measurement point** | | |
|---|---|---|
| 60 - framework (12 - framework) | Power supply to switch display | $U \approx U_{bat}$ |

| **Meas-urement points** | **Switch** | **Activated** | **Not activated** |
|---|---|---|---|
| 57 - framework (9 - framework) | “Escape” | $U \approx U_{bat}$ | U≈ 0 V |
| 56 - framework (8 - framework) | “Enter” | $U \approx U_{bat}$ | U≈ 0 V |
| 58 - framework (10 - framework) | “Up” | $U \approx U_{bat}$ | U≈ 0 V |
| 59 - framework (11 - framework) | “Down” | $U \approx U_{bat}$ | U≈ 0 V |

9998699, 9990062, 9998596
9510060

## Checking component

**3**
**Note:** Faults in components may be caused by faults in the cable harness for the control unit. Check the cable harness to the control unit before connecting a new component.

**Requirements:**

- Breakout box with adapter connected to the switch display.
- Measuring resistance using a multimeter.
- Control unit disconnected.
- Ignition key in stop position.

| Measurement points | Switch | Activated | Not activated |
|---|---|---|---|
| 57 - 60 (9 - 12) | “Escape” | R ≈ 0 Ω | R ≈ ∞ |
| 56 - 60 (8 - 12) | “Enter” | R ≈ 0 Ω | R ≈ ∞ |
| 58 - 60 (10 - 12) | “Up” | R ≈ 0 Ω | R ≈ ∞ |
| 59 - 60 (11 - 12) | “Down” | R ≈ 0 Ω | R ≈ ∞ |

9998699, 9990062, 9998596
9510060

## Verification

To check that the fault is eliminated, read off fault codes. Perform “Instrument, test”.

# MID 140 PSID 200 Communication interference, data link, engine control unit

## Fault code

*FMI 12*
Defective unit or component.

*Conditions for fault code:*

- The expected signal does not reach the instrument.

*Possible cause:*

- Fault in cable harness.
- Fault in the connector

*Reaction from the control unit:*

- fault code is stored.

*Appropriate check:*

- See service information under group 3711, information type diagnostics, “Data links, fault tracing”.

# MID 140 PSID 201 Communication interference, data link, vehicle control unit

## Fault code

*FMI 12*
Defective unit or component.

*Conditions for fault code:*

- If the instrument does not receive a message from the vehicle control unit within a given time, it interprets this as a communication fault from the vehicle control unit and sets the fault code.

*Possible cause:*

- Fault in cable harness.
- Fault in the connector

*Reaction from the control unit:*

- fault code is stored.
- Brake lights requested.

*Noticeable external symptoms:*

- Speed signal missing.
- Warning light lights up.

*Appropriate check:*

- See service information under group 3711, information type diagnostics, “Data links, fault tracing”.

# MID 140 PSID 204 Communication interference, data link, brake control unit

## Fault code

*FMI 12*
Defective unit or component.

*Conditions for fault code:*

- The expected signal does not reach the instrument.

*Possible cause:*

- Fault in cable harness.
- Fault in the connector.

*Reaction from the control unit:*

- fault code is stored.
- Brake lights requested.

*Noticeable external symptoms:*

- Warning light lights up.

*Appropriate check:*

- See service information under group 3711, information type diagnostics, “Data links, fault tracing”.

# MID 140 PSID 205 Communication interference, data link, gearbox control unit

## Fault code

*FMI 12*
Defective unit or component.

*Conditions for fault code:*

- The expected signal does not reach the instrument.

*Possible cause:*

- Fault in cable harness.
- Fault in the connector.

*Reaction from the control unit:*

- fault code is stored.

*Appropriate check:*

- See service information under group 3711, information type diagnostics, “Data links, fault tracing”.

# MID 140 PSID 206 Communication interference, data link, retarder control unit

## Fault code

*FMI 12*
Defective unit or component.

*Conditions for fault code:*

- The expected signal does not reach the instrument.

*Possible cause:*

- Fault in cable harness.
- Fault in the connector.

*Reaction from the control unit:*

- fault code is stored.

*Appropriate check:*

- See service information under group 3711, information type diagnostics, “Data links, fault tracing”.

# MID 140 PSID 208 Communication interference, data link, air suspension

## Fault code

*FMI 12*
Defective unit or component.

*Conditions for fault code:*

- The expected signal does not reach the instrument.

*Possible cause:*

- Fault in cable harness.
- Fault in the connector.

*Reaction from the control unit:*

- fault code is stored.

*Appropriate check:*

- See service information under group 3711, information type diagnostics, “Data links, fault tracing”.

# MID 140 PSID 210 Data link, external lighting control unit

## Fault code

*FMI 12*
Defective unit or component.

*Conditions for fault code:*

- The expected signal does not reach the instrument.

*Possible cause:*

- Fault in cable harness.
- Fault in the connector.

*Reaction from the control unit:*

- fault code is stored.

*Noticeable external symptoms:*

- Lighting functions missing.

*Appropriate check:*

- See service information under group 3711, information type diagnostics, “Data links, fault tracing”.

# MID 140 PSID 211 Data link adoptive cruise control

## Fault code

*FMI 12*
Defective unit or component.

*Conditions for fault code:*

- The expected signal does not reach the instrument.
- CAN message logs ACC1.

*Possible cause:*

- Fault in cable harness.
- Fault in the connector.

*Reaction from the control unit:*

- fault code is stored.

*Appropriate check:*

- See service information under group 3711, information type diagnostics, “Data links, fault tracing”.

# MID 140 PSID 212 Data link, tachograph

## Fault code

*FMI 12*
Defective unit or component.

*Conditions for fault code:*

- The expected signal does not reach the instrument.

*Possible cause:*

- Fault in cable harness.
- Fault in the connector.

*Reaction from the control unit:*

- fault code is stored.

*Appropriate check:*

- See service information under group 3711, information type diagnostics, “Data links, fault tracing”.

# MID 140 PSID 215 Data link electronical steered bogie axle

## Fault code

*FMI 12*
Defective unit or component.

*Conditions for fault code:*

- The expected signal does not reach the instrument.

*Possible cause:*

- Fault in cable harness.
- Fault in the connector.

*Reaction from the control unit:*

- fault code is stored.

*Appropriate check:*

- See service information under group 3711, information type diagnostics, “Data links, fault tracing”.

# MID 140 PSID 233 Data link, electronic starting inhibitor

## Fault code

*FMI 12*
Defective unit or component.

*Conditions for fault code:*

- The expected signal does not reach the instrument.

*Possible cause:*

- Fault in cable harness.
- Fault in the connector.

*Reaction from the control unit:*

- fault code is stored.

*Appropriate check:*

- See service information under group 3711, information type diagnostics, “Data links, fault tracing”.

# MID 140 PSID 234 Data link, control unit burglar alarm

## Fault code

*FMI 12*
Defective unit or component.

*Conditions for fault code:*

- The expected signal does not reach the instrument.

*Possible cause:*

- Fault in cable harness.
- Fault in the connector.

*Reaction from the control unit:*

- fault code is stored.

*Appropriate check:*

- See service information under group 3711, information type diagnostics, “Data links, fault tracing”.

# MID 140 PSID 235 Data link, control unita airbag

## Fault code

*FMI 12*
Defective unit or component.

*Conditions for fault code:*

- The expected signal does not reach the instrument.

*Possible cause:*

- Fault in cable harness.
- Fault in the connector.

*Reaction from the control unit:*

- fault code is stored.
- Brake lights requested.

*Noticeable external symptoms:*

- Warning light lights up.

*Appropriate check:*

- See service information under group 3711, information type diagnostics, “Data links, fault tracing”.

# MID 140 PSID 236 Data link, control unit FMS Gateway

## Fault code

*FMI 12*
Defective unit or component.

*Conditions for fault code:*

- The expected signal does not reach the instrument.

*Possible cause:*

- Fault in cable harness.
- Fault in the connector.

*Reaction from the control unit:*

- fault code is stored.

*Appropriate check:*

- See service information under group 3711, information type diagnostics, “Data links, fault tracing”.

# MID 140 PSID 238 Data link, control unit climate unit

## Fault code

*FMI 12*
Defective unit or component.

*Conditions for fault code:*

- The expected signal does not reach the instrument.

*Possible cause:*

- Fault in cable harness.
- Fault in the connector.

*Reaction from the control unit:*

- fault code is stored.

*Appropriate check:*

- See service information under group 3711, information type diagnostics, “Data links, fault tracing”.

# MID 140 PSID 239 Data link, Volvo Link

## Fault code

*FMI 12*
Defective unit or component.

*Conditions for fault code:*

- The expected signal does not reach the instrument.

*Possible cause:*

- Fault in cable harness.
- Fault in the connector.

*Reaction from the control unit:*

- fault code is stored.

*Appropriate check:*

- See service information under group 3711, information type diagnostics, “Data links, fault tracing”.

# Operation Numbers

The operation numbers used in this manual refer to V.S.T.

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