2.2 Models 129 with HFM-SFI, 140 (722.5)

Diagnosis – Function Test

Test Drive Evaluation [1)]

Determine if transmission shifts into all 5 gears during test drive.

A. Allow vehicle to reach highest gear.
   1. Place selector lever in transmission range (TR) “4.”
   2. Maintain a vehicle speed of 56 mph (90 km/h).
   3. Release accelerator pedal.
   4. Immediately moved selector lever from TR “4” into TR “D”.
   5. The transmission should shift 4 → 5.
   6. Move selector lever from TR “D” to TR “4,” transmission should downshift from 5 → 4.
   7. Move selector lever from TR “4” to TR “3,” transmission should downshift from 4 → 3.
   8. If both downshifts occur, all gears are in operating condition.
   9. If only one downshift occurs, a gear (4GR or 5GR) is not functioning properly.

B. Determine engine rpm vs. transmission gear ratio.
   10. Maintain vehicle speed at 62 mph (100 km/h).
   11. Check engine rpm with selector lever in transmission ranges (TR) “3,” “4,” and “D.”

   On vehicles with 3.69 rear axle ratio:
   TR “3” = approximately 4300 rpm
   TR “4” = approximately 3000 rpm
   TR “D” = approximately 2200 rpm

   On vehicles with 3.46 rear axle ratio:
   TR “3” = approximately 4000 rpm
   TR “4” = approximately 2800 rpm
   TR “D” = approximately 2100 rpm

   Non-functioning gear can be determined by checking corresponding engine rpm.

1) MBUSA neither recommends nor requires testing on public roads which exceeds posted speed limits. In those states or provinces where the recommended vehicle speed exceeds posted speed limits, testing should be conducted on a test rack or a dynamometer.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

Test Preparation for DTC Readout

1. Connect Hand-Held Tester (HHT) to data link connector (X11/4) according to connection diagram (see section 0).
2. Ignition: **ON**.
3. Read DTC memory for transmission control module (N15/1). (if no DTC's are stored im DTC memory which are relative to the complaint, perform entire Electrical Test Program 23

Special Tools

965 589 00 01 00

Hand-Held-Tester

965 589 00 40 00

Test cable

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause	Test step/Remedy [1]
–	No fault in system	In case of complaint: 23 (entire test)
002	Engine control module (N3/4) does not match TCM (N15/1)	Reset and reactivate engine control module: See DM, Engines, Vol. 2, section 1.1 11
003	Transmission overload protection switch 4GR/5GR	23⇒ 9.0 Read out DTC memory for DI control module (N1/3) and Engine control module (N3/4): See DM, Engines, Vol. 2, section 5.2 to 5.3 11 or 1.1 11
004	CAN data line from EA/CC/ISC control module (N4/1) distorted	23⇒ 10.0 Read out DTC memory for EA/CC/ISC control module (N4/1) See DM, Engines, Vol. 3, section 6.2 to 6.4 11
005	CAN data line from DI control module (N1/3) or HFM-SFI control module (N3/4) distorted	23⇒ 10.0 Read out DTC memory for DI control module (N1/3) and Engine control module (N3/4): See DM, Engines, Vol. 2, section 5.2 to 5.3 11 or 1.1 11

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC 	Possible cause	Test step/Remedy [1]
006	CAN data line distorted	23⇒ 10.0. Read out DTC memory for EA/CC/ISC control module (N4/1): DM, Engines, Vol.3, section 6.2 to 6.4 11 Read out DTC memory for DI control module (N1/3) and Engine control module (N3/4): DM, Engines, Vol. 2, section 5.2 to 5.3 12 or 1.1 12 Read out DTC memory for ABS/ASR or ASR/SPS control module (N30/1 or 47-1): DM, Chassis and Drivetrain, Vol. 2, section 5.2 12 Vol. 3, section 9.1 and 9.3 12
007	Valve block control valve (Y3/1y2), open circuit orTCM (N15/1)	23⇒ 4.0 Replace N15/1
008	TCM (N15/1)	Replace N15/1
009 [2]	Valve block control valve (Y3/1y2)	23⇒ 4.0
010	Valve block control valve (Y3/1y2), short circuit	23⇒ 4.0

1) Observe Preparation for Test, see 22.

2) If DTC 9 is displayed, it may be attributable to previous repair work done on the vehicle. For example, the valve block connector (Y3/1x1) on the transmission was not connected/reconnected while the engine was idling > 1000 rpm. Clear DTC 9 by using HHT. Start engine and idle at > 1000 rpm for approximately 10 seconds, check DTC with HHT, if DTC 9 reappears, see 23 ⇒ 9.0.

Diagnosis – Complaint Related Diagnostic Chart

Complaint/Problem	Possible cause	Test step/Remedy [1]
Customer complaint: Transmission does not shift into 5GR or 4GR (vague complaint)	**Determine exact complaint by performing a test drive**	**11**
Customer complaint: Transmission intermittently does not shift into 5GR	Multiple 4-5 to 5-4 shifts occuring in a short period of time will delay the 5 GR upshift in order to prevent thermal overload of the overdrive brake.	Normal operation of the transmission overload protection
Model 140 with LH-SFI only Transmission shifts into 5GR only under WOT	Vacuum line from intake manifold and DI control module (N1/3) not connected or leaking.	Re-connect or replace vacuum line
Transmission shifts 3 → 5, DTC 9	Valve block connector (Y3/1x1) on transmission not reconnected after repair work with engine speed > 1000 rpm	Erase DTC 9 If DTC 9 reappears 23⇒ 9.0
Transmission occasionally does not shift into 5GR	Loose contact on 5-speed AT/engine connector (X22/5)	Repair loose contact
Model 140 with HFM-SFI only Transmission does not shift into 5GR , DTC 6	Wrong TCM (N15/1) installed	Verify and install correct TCM (N15/1)
Hard shifting 4 → 5 or 5 → 4 or hunts 4 → 5 → 4	Valve block control valve (Y31y2) defective (resistance)	Replace Y3/1y2

[1] Observe Preparation for Test, see 22.

Electrical Test Program – Component Locations

Model 140 shown

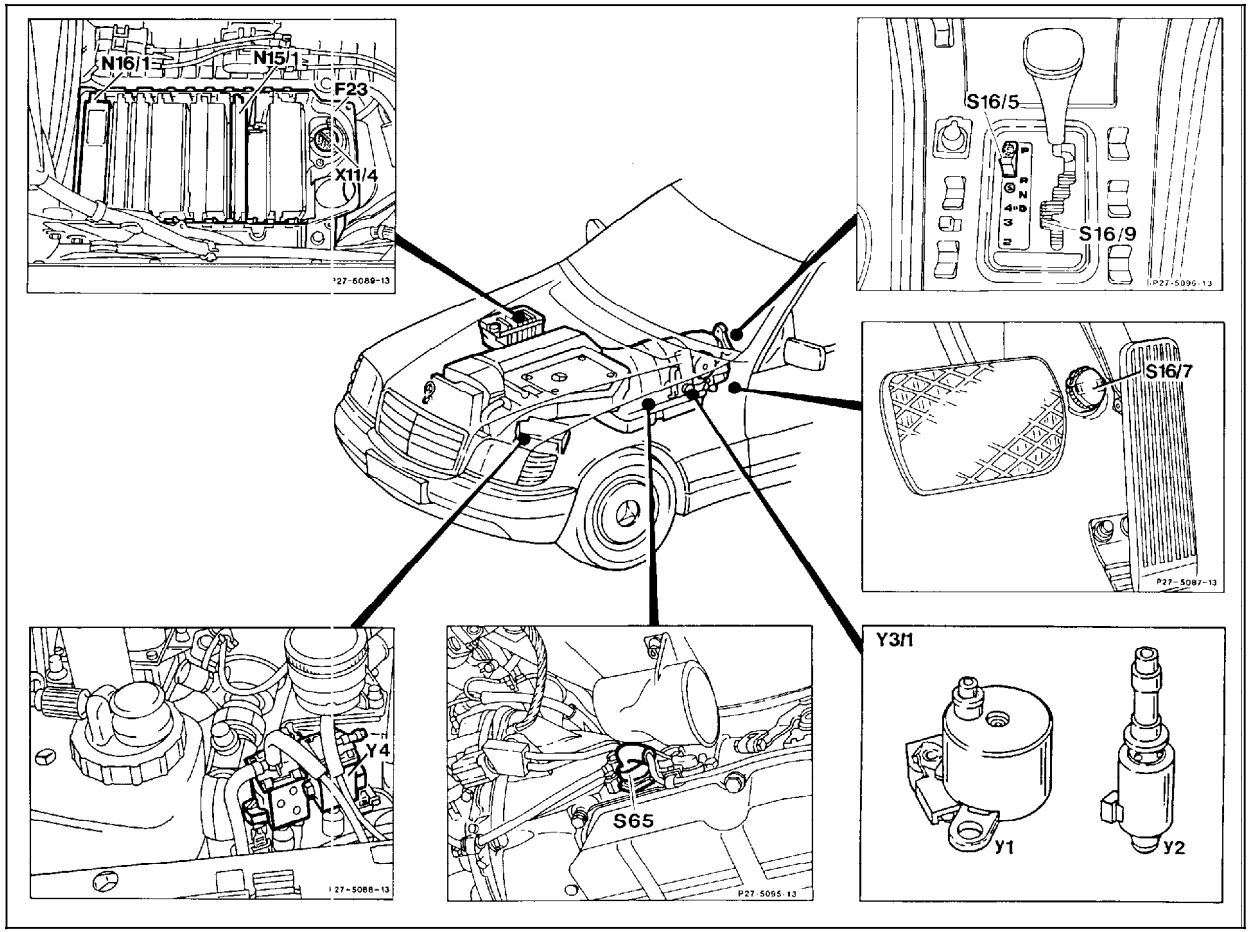

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Figure 1

F23	Module box
N15/1	Transmission control module (TCM)
N16/1	Base module (BM)
S16/5	Transmission mode switch
S16/7	Kickdown switch (transmission mode)
S16/9	Transmission range "D" contact switch
X11/4	Data link connector (DTC readout)
Y3/1	Valve block (5-speed AT)
Y3/1y1	Kickdown solenoid valve
Y3/1y2	Control valve

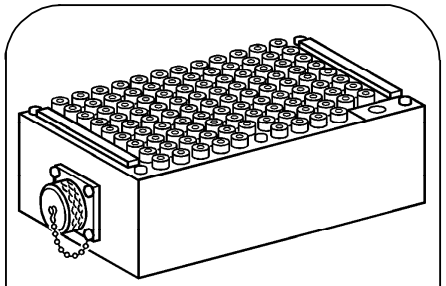
Electrical Test Program – Preparation for Test

Preliminary work:
Diagnosis - Diagnostic Trouble Code (DTC) Memory 12

1. Ignition: **OFF**
2. Disconnect TCM (N15/1). Connect socket box (126-pole) with contact module 3 and contact box according to connection diagram.

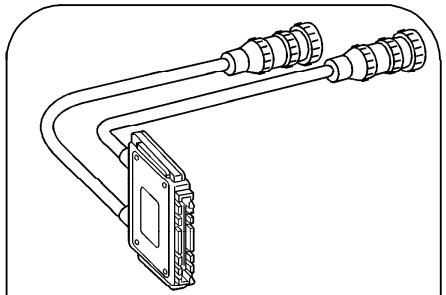
Wiring Diagrams:
Electrical Troubleshooting Manual, Model 129, Volume 1, group 00 and 27,
Electrical Troubleshooting Manual, Model 140, Volume 1 and 2,
Group 00 and 27.

Special Tools



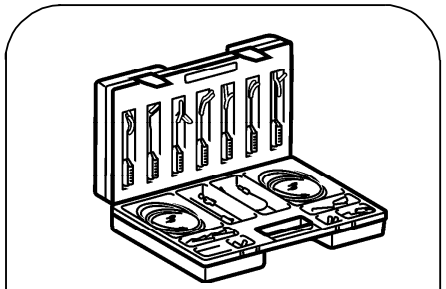
129 589 00 21 00

126-pin socket box



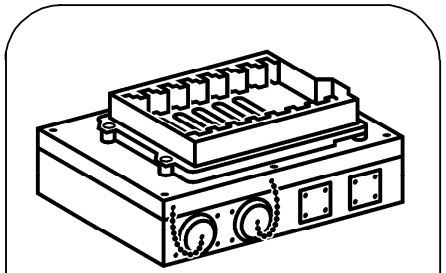
140 589 03 63 00

Contacting module 3



201 589 00 99 00

Electrical connecting set

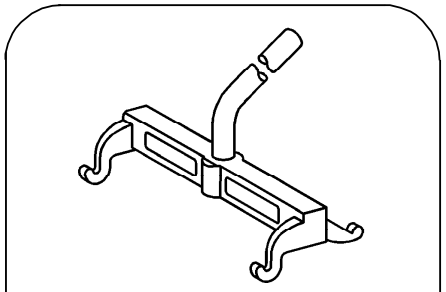


140 589 06 63 00

Contacting box

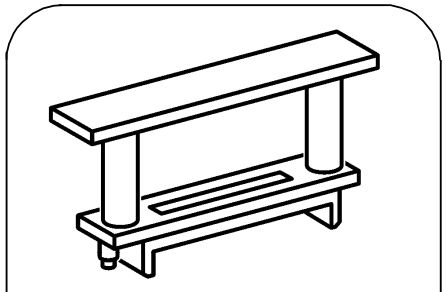
Electrical Test Program – Preparation for Test

Special Tools



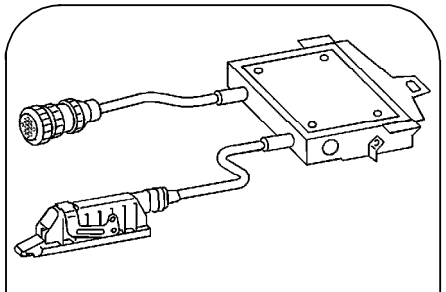
140 589 01 33 00

Mounting lever



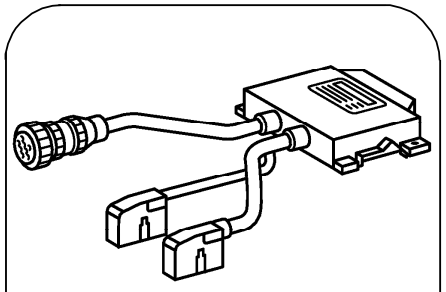
140 589 10 33 00

Spacer



129 589 13 63 00

41-pin test cable



140 589 43 63 00

Test cable, 30-pin

Equipment

Digital multimeter [1)]	Fluke models 23, 83, 85, 87, 88

1) Available through the MBUSA Standard Equipment Program.

Electrical Test Program – Preparation for Test

Connection Diagram - Socket Box
Model 129 with HFM-SFI

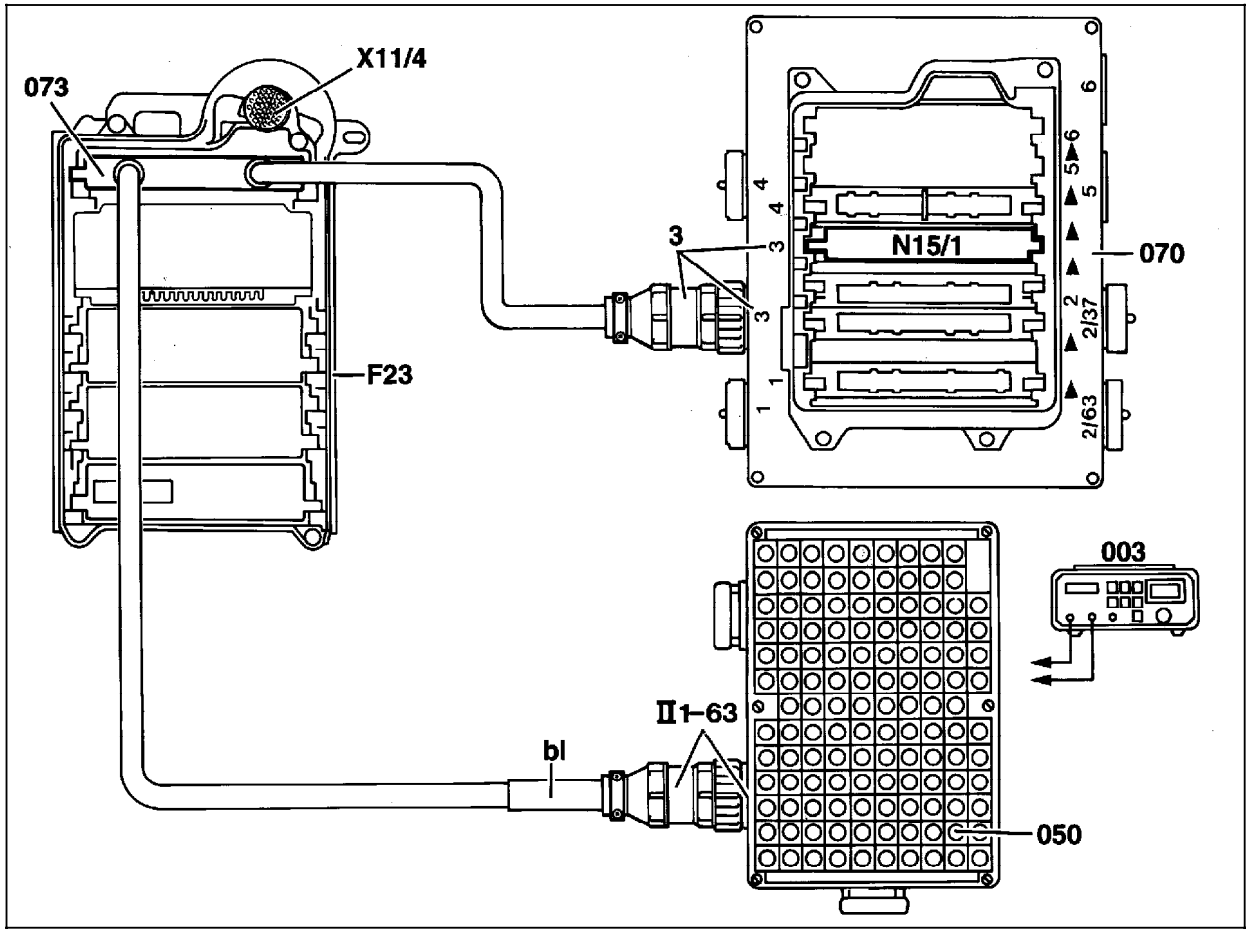


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Figure 1

003	Digital multimeter
050	Socket box (126-pole)
070	Contact box
073	Contact module 3
F23	Module box
N15/1	Transmission control module (TCM)
X11/4	Data link connector (DTC readout)
bl	blue

Electrical Test Program – Preparation for Test

Connection Diagram - Socket Box
Model 140 with LH-SFI

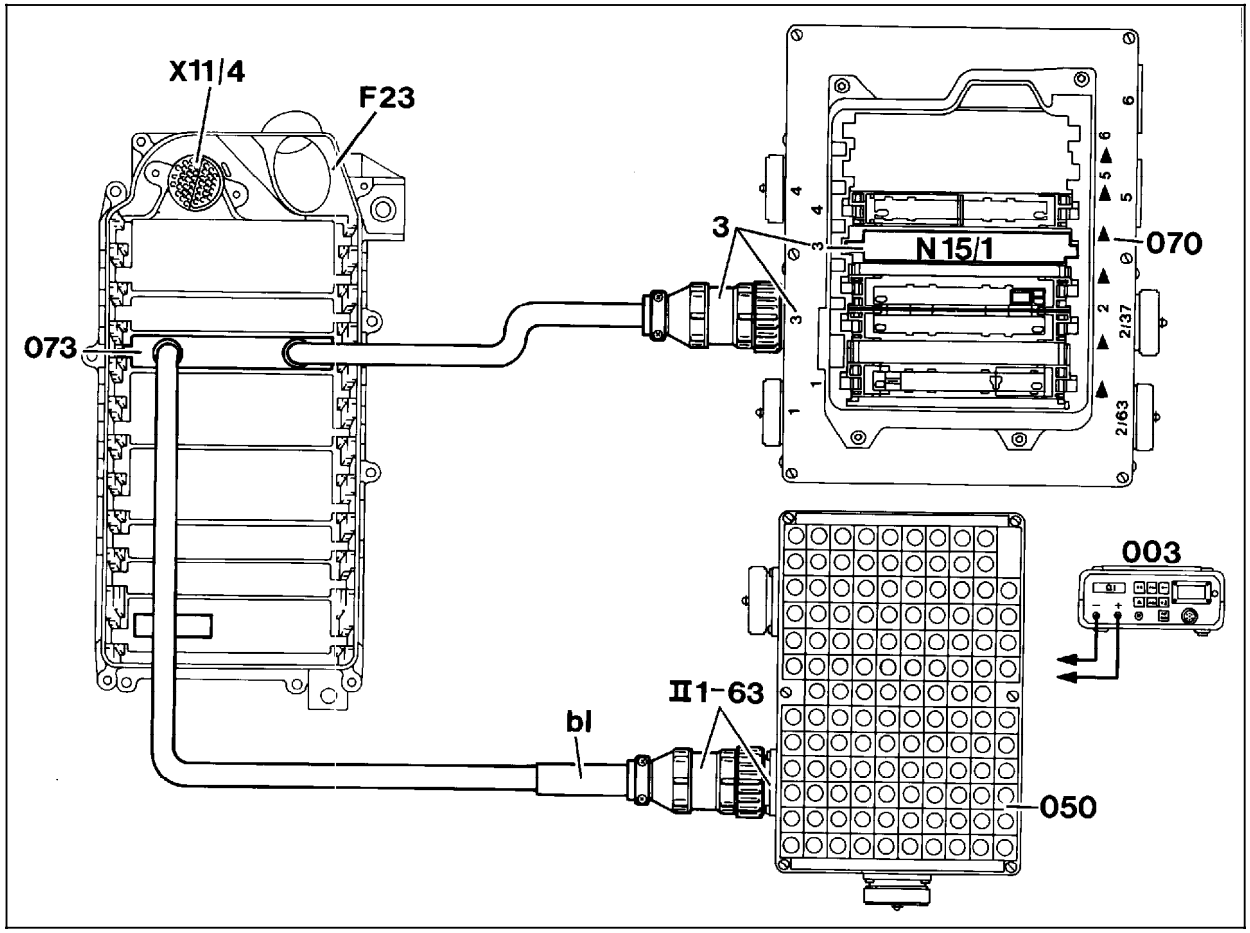
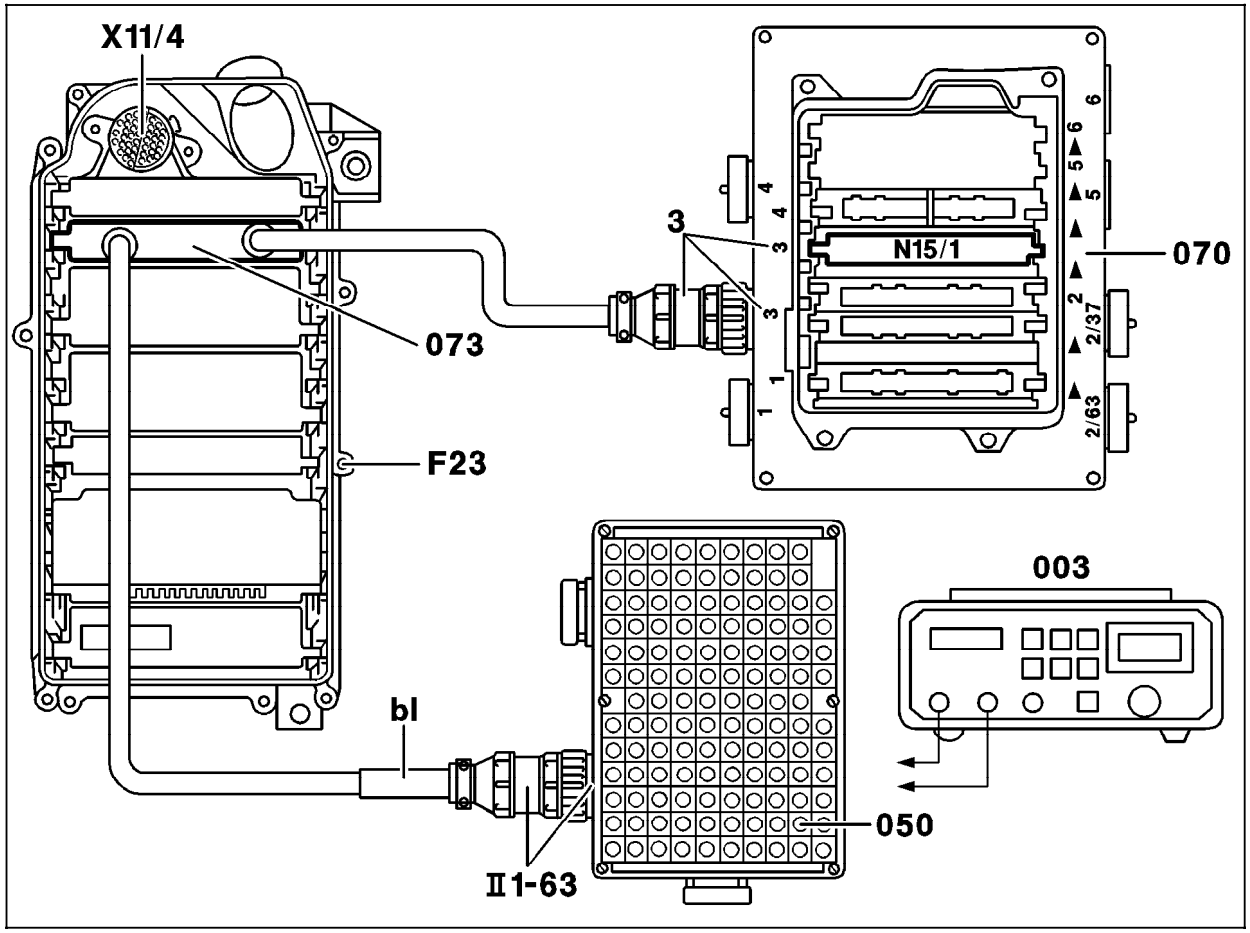


Figure 2

003	Digital multimeter
050	Socket box (126-pole)
070	Contact box
073	Contact module 3
F23	Module box
N15/1	Transmission control module (TCM)
X11/4	Data link connector (DTC readout)
bl	blue

Electrical Test Program – Preparation for Test

Connection Diagram - Socket Box
Model 140 with HFM-SFI

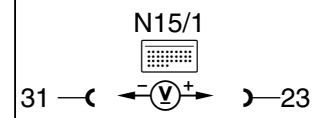
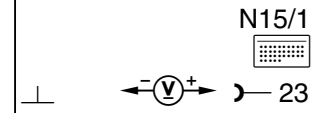
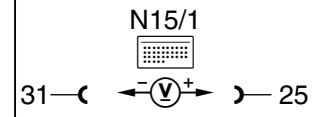


P27-5193-57

Figure 3

003	Digital multimeter
050	Socket box (126-pole)
070	Contact box
073	Contact module 3
F23	Module box
N15/1	Transmission control module (TCM)
X11/4	Data link connector (DTC readout)
bl	blue

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
⇒ 1.0		**Transmission control module (TCM) (N15/1)** Voltage supply Circuit 87 SA		Ignition: **ON**	11 – 14 V	⇒ 1.1, Ground (electronics output ground - right footwell) (W15), Wiring.
⇒ 1.1		Voltage supply from base module (N16/1)		Ignition: **ON**	11 – 14 V	Wiring, Fuse (F3) at base module (N16/1), ⇒ 1 23
⇒ 2.0		**Diagnosis output**		Ignition: **ON**	10 – 14 V	Wiring, TCM (N15/1).

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
⇒ 3.0		**TR "D" contact switch (S16/9)** Activation	N15/1 31 — (V) — 28	Ignition: **ON** Selector lever in: **P-R-N-D** **4-3-2**	 11 – 14 V < 1 V	⇒ 3.1
⇒ 3.1		Switch operation	N15/1 23 — (Ω) — 28	Ignition: **OFF** Disconnect TCM (N15/1). Selector lever in: **P-R-N-D** **4-3-2**	 < 1 Ω > 20 Ω	Wiring, S16/9

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
4.0	007 009 010	**Valve block control valve (Y3/1y2)** Activation for 4GR	N15/1 10 — (V) — 1	Engine: **at Idle** Engine speed > 1000 rpm	 > 5 V	⇒ 4.1, TCM (N15/1).
4.1		Coil resistance	N15/1 10 — (Ω) — 1	Ignition: **OFF** Disconnect N15/1	4 – 8 Ω (temperature dependent, see Figure 2)	Wiring, Valve block control valve (Y3y12).
5.0		**Kickdown switch (S16/7)** Activation kickdown solenoid valve (Y3/1y1)	N15/1 31 — (V) — 27	 Engine: **at Idle** Depress kickdown switch (S16/7) by hand (behind accelerator pedal).	 < 1 V 11 – 14 V	Wiring, ⇒ 4.0, S16/7, TCM (N15/1). Base module (N16/1):
6.0		**Transmission Mode switch (S16/5)**	N15/1 31 — (Ω) — 29	Engine: **at Idle** **S16/5** in position: **W** **S**	 11 – 14 V < 1 V	Wiring, S16/5, TCM (N15/1).

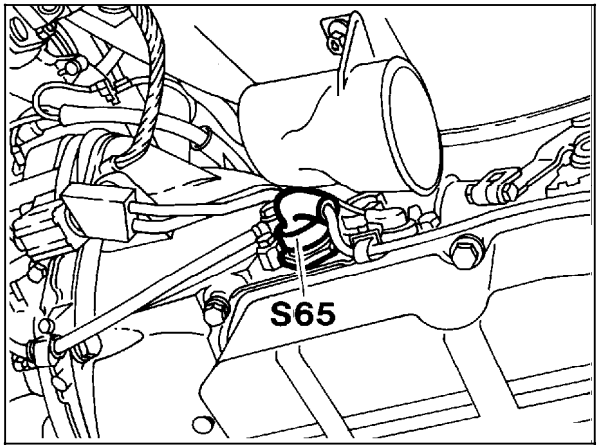
Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
7.0		**Valve block kickdown solenoid valve (Y3/1y1)** Coil resistance	N15/1  31 — 27	Ignition: **OFF** Disconnect TCM (N15/1).	10 – 30 Ω	Wiring, Y3/1y1.
8.0		***Non-USA vehicles only.***				
9.0	003 009	**Overload protection** Wiring to DI control module (N1/3)	N15/1  31 — 34	**Vehicles with 2GR Start:** Engine: **at Idle** Selector lever in: **D** **Vehicles with 1GR Start:** Engine: **at Idle** Drive vehicle on dynamometer above 13 mph	 4.7 – 5.3 V < 1 V 4.7 – 5.3 V < 1 V	Wiring, ⇒ 9.1, If reading of 2 – 3 V is obtained, TCM (N15/1).
9.1			N15/1  31 — 34	Disconnect TCM (N15/1). Engine: **at Idle**	 4.7 – 5.3 V	Wiring, **Model 140 with LH-SFI:** Read out DTC memory for DI control module (N1/3), (DM, Engines, Vol. 2, section 5.2 or 5.3 11). **Model 129, 140 with HFM-SFI:** Read out DTC memory for engine control module (N3/4), (DM, Engines, Vol. 2, section 1.1 11).

Electrical Test Program – Test

⇒		Test scope	Test connection	Test condition	Nominal value	Possible cause/Remedy
10.0	004 005 006	**CAN data bus**	N15/1 L — ◄ –Ω+ ► — H	Ignition: **OFF** Disconnect contact module or TCM (N15/1). Test with ohmmeter directly at the two wide pins in the TCM (N15/1) connector.	55 – 65 Ω	Databus, Check resistance directly at LH-SFI (N3/1), DI/KSS (N1/3), HFM-SFI (N3/4), EA/CC/ISC (N4/1) or CC/ISC (N3/4) control modules. See D.M., Engines and D.M., Body and Accessories.

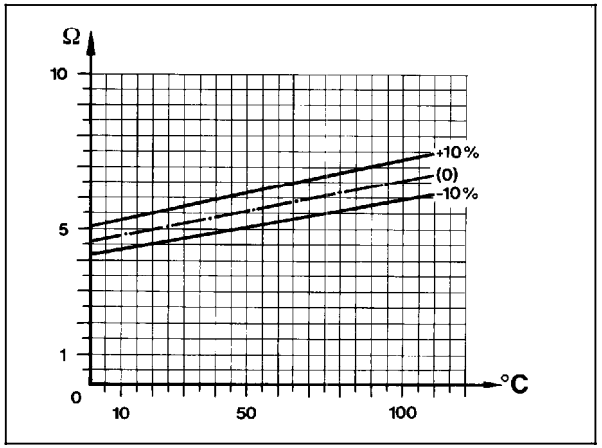
Electrical Test Program – Test



P27-5095-13

Figure 1

S65 Transmission overload protection switch



P27-0187-13

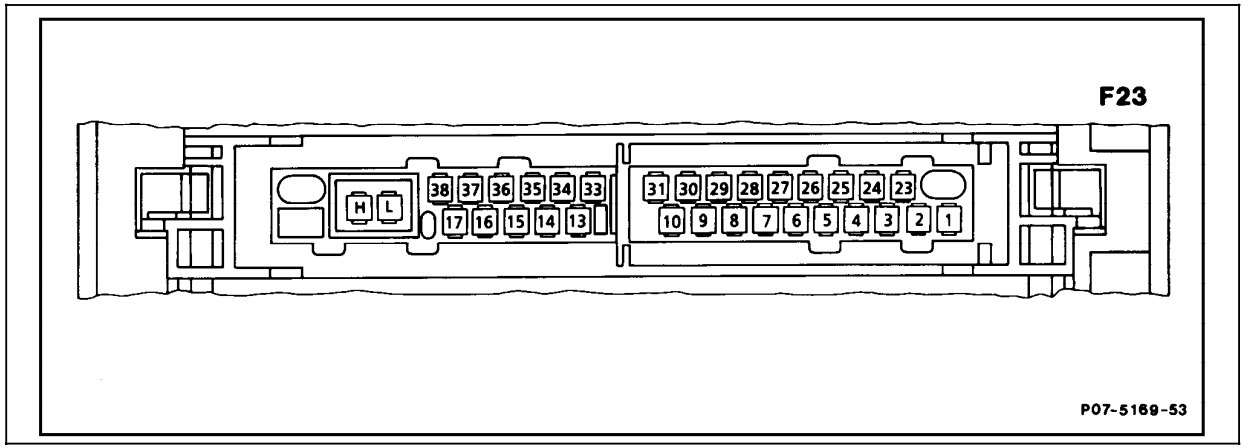
Figure 2

Diagram

Resistance of kickdown solenoid valve (Y3/1y2) dependent on temperature

Electrical Test Program – Test

TCM (N15/1) connector layout
Models 140, 129 control module
Located in module box (aluminum)



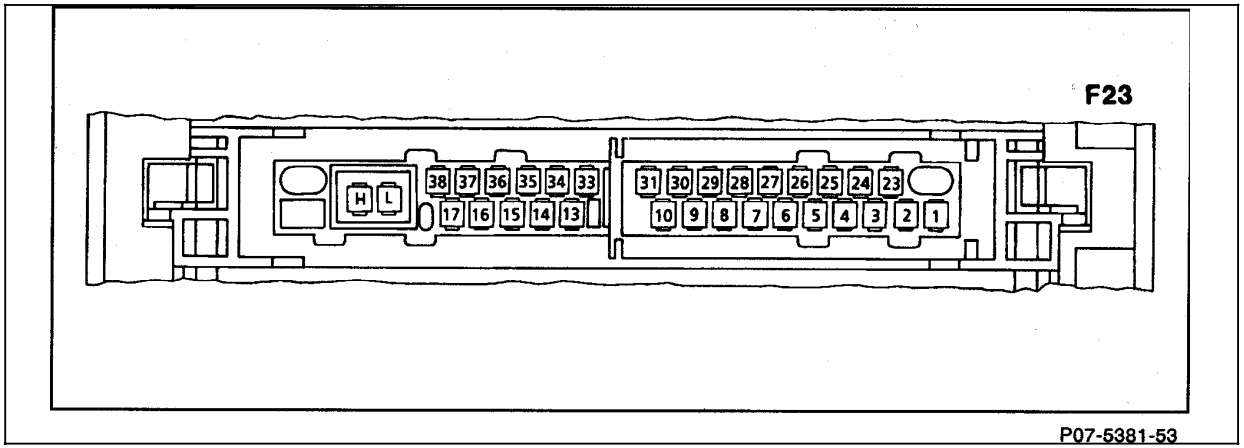
P07-5169-53

Figure 3

F23	Module box
1	Valve block control valve (Y3/1y2) (+)
2-9	Not used
10	Valve block control valve (Y3/1y2) (–)
13-17	Not used
23	Voltage supply circuit 87SA (from base module N16/1)
24	Not used
25	Diagnosis (output)
26	Not used
27	Kickdown switch (S16/6)
28	TR “D“ contact switch (S16/9)
29	Transmission mode switch (S16/5)
30	Not used
31	Ground (W15)
33	Not used
34	Transmission overload protection switch (S65)
35-38	Not used
L	CAN Data line (–)
H	CAN Data line (+)

Electrical Test Program – Test

TCM (N15/1) connector layout
Models 129, 140 control module
Located in module box (plastic)



P07-5381-53

Figure 4

1	Valve block control valve (Y3/1y2) (+)
2-9	Not used
10	Valve block control valve (Y3/1y2) (–)
12-17	Not used
23	Voltage supply circuit 87SA
24	Not used
25	Diagnosis (output)
26	Not used
27	Kickdown switch (S16/6)
28	TR “D“ contact switch (S16/9)
29	Transmission mode switch (S16/5)
30	Ground (W15, W15/1)
33	Not used
34	Transmission overload protection switch (S65)
35-38	Not used
L	CAN Data line (–)
H	CAN Data line (+)