Refer to Parts Microfiche Gr. 54 to identify control modules.

Engine 104.942/992 starting 09/92 until 02/94, Engine 104.991 starting 06/93 until 02/94, Engine 104.994 starting 08/93 until 02/94, Engine 104.941 starting 02/93 until 02/94

Engine	104.941/942	104.991/992/994
Models	124.028, 202.028	124.032/052/066/092 129.063 140.032/033
HFM-SFI system designation	3.4	3.4
Closed throttle position (CTP), check, adjust (07-2053 or 07-2056) [9]		
Selector lever position	P/N	P/N
ECT ° C approx.	>80	>80
Engine speed rpm	600 – 800	600 – 800
Ignition timing with premium unleaded fuel (91 posted/95 RON) °CKA	6 – 10 [1]	6 – 10 [1]
On-off ratio %	0±10 [2]	0±10 [2]
Closed throttle contact (accelerator pedal not depressed) HHT display	**ON**	**ON**

1) The ignition timing is also used for idle speed stabilization. In extreme cases the timing can briefly vary by ±10° from specification.
2) In case of complaint, on-off ratio must be measured at idle speed and at 2500 rpm with purge line to engine disconnected and plugged.
9) Time Guide operation no. and/or SMS job no.

Engine 104.942/992 starting 09/92 until 02/94, Engine 104.991 starting 06/93 until 02/94, Engine 104.994 starting 08/93 until 02/94, Engine 104.941 starting 02/93 until 02/94

Engine		104.941/942/943/944	104.991/992/994
Models		124.028 202.028	129.063 124.032/052/066/092 140.032/033
HFM-SFI system designation		3.4	3.4
Engine, check, adjust (07-1100) [9]			
ECT	° C approx.	>80	>80
Engine speed (selector lever in P/N position)	rpm	600 – 800	600 – 800
Injection duration	ms	2.5 – 3.8	2.5 – 3.8
Air mass	kg/h	16 – 18	16 – 18
O2S 1 voltage (oscillates around 300mV after 2 min.)	mV	–200 to +1000	–200 to +1000
O2S 2 voltage (oscillates around 300mV after 2 min.)	mV	–200 to +1000	–200 to +1000
On-off ratio	%	0±10 [2]	0±10 [2]
Self adaptation idle air	kg/h	±2 [3]	±2 [3]
Self adaptation idle air	%	±15 [3]	±15 [3]
Self adaptation factor lower/upper range of part load		0.85 – 1.15 [4]	0.85 – 1.15 [4]
Ignition timing with premium unleaded fuel (91 posted/95 RON)	°CKA	6 – 10 [1]	6 – 10 [1]
Throttle valve angle	°	1.0 – 1.8	1.0 – 1.8
AIR pump after start, maximum of 20 seconds	<40° C	**ON**	**ON**
Resonance flap >4000 rpm	HHT display	**ON**	**ON**
Resonance flap idle	HHT display	**OFF**	**OFF**
CTP contact (accelerator pedal not depressed)	HHT display	**ON**	**ON**
WOT contact (accelerator pedal in WOT)	HHT display	**ON**	**ON**

1) The ignition timing is also used for idle speed stabilization. In extreme cases the timing can briefly vary by ±10° from specification.
2) In case of complaint, on-off ratio must be measured at idle speed and at 2500 rpm with purge line to engine disconnected and plugged.
3) Base setting idle, 0.0 kg/h (Bosch) or 0.0% (VDO), mixture tendency **rich** < 0.0 kg/h or 0.0%, mixture tendency **lean** > 0.0 kg/h or 0.0%.
4) Base setting part load = 1.0, mixture tendency **rich** <1.0 mixture tendency **lean** > 1.0.
9) Time Guide operation no. and/or SMS job no.

Engine 104.942/992 starting 09/92 until 02/94, Engine 104.991 starting 06/93 until 02/94, Engine 104.994 starting 08/93 until 02/94, Engine 104.941 starting 02/93 until 02/94

Engine		104.941/942/943/944		104.991/992/994	
Models		124.028 202.028		124.032/052/066/092 129.063 140.032/033	
HFM-SFI system designation		3.4		3.4	
Cold start					
ECT	° C approx.	[5]		[5]	
Engine rpm		[5]		[5]	
Starter signal circuit 50, during cranking	HHT display	**ON**		**ON**	
After start enrichment < 70° C maximum of 20 seconds	HHT display	**ON**		**ON**	
CTP contact	HHT display	**ON**		**ON**	
Warmup					
Transmission selector lever position		P/N	D	P/N	D
Warmup speed (raised idle speed) time dependent					
ECT <+20° C for approximately 20 seconds after start	rpm	1150±100		1150±100	
Warmup speed (raised idle speed) temperature dependent					
ECT <0° C	rpm	1000±50		1000±50	
ECT 0 – 30° C	rpm	950±50	850±50	950±50	850±50
ECT 30 – 40° C	rpm	750±50	650±50	750±50	650±50
ECT >40° C	rpm	700±50	600±50	700±50	600±50
Warmup	HHT display	<80° C **ON** >80° C **OFF**		<80° C **ON** >80° C **OFF**	
CTP contact (accelerator pedal not depressed)	HHT display	**ON**		**ON**	
AIR pump after >20 seconds	HHT display	**OFF**		**OFF**	
Selector lever	HHT display	**ON**		**ON**	
A/C compressor (not engaged)	HHT display	**OFF**		**OFF**	
IAT	° C	>20		>20	

[5] Temperature at which complaint occurs.

Engine 104.942/992 starting 09/92 until 02/94, Model 124

Engine			104.942	104.992
Models			124.028	124.032/052/066/092
HFM-SFI system designation			3.4	3.4
Engine performance [6]	(07-1203 or 07-1206) [9]			
Engine speed		rpm	5500	5500
Ignition timing with premium unleaded gasoline (91 posted/95 RON)		°CKA	20 – 24	20 – 24
Injection duration		ms	11 – 14	14 – 17
Air mass		kg/h	520 – 580	580 – 620
WOT recognition		HHT display	**ON**	**ON**
Camshaft timing adjustment >2000 rpm		HHT display	**OFF**	**OFF**
Intake manifold resonance flap		HHT display	**ON**	**ON**
VSS		mph (km/h)	> 62 (100)	> 62 (100)
Deceleration shut-off >2100 rpm		HHT display	**ON**	**ON**
Output, 4-speed AT, TR 3		hp	141 [7]	160

6) These are minimum performance values. Do not exceed speed of 80 mph. It is not possible to simulate coolant and intake air temperature as these are determined by the HFM-SFI system. Provide adequate cooling using external fan when checking wide open throttle performance.

7) As of 01/93, output at wide open throttle has been reduced by 4 hp.

9) Time Guide operation no. and/or SMS job no.

Engine 104.941 starting 02/93 until 02/94
Model 202

Engine			104.941
Models			202.028
HFM-SFI system designation			3.4
Engine performance [6]	(07-1203 or 07-1206) [9]		
Engine speed		rpm	5400
Ignition timing with premium unleaded gasoline (91 posted/95 RON)		°CKA	22 – 26
Injection duration		ms	11 – 14
Air mass		kg/h	520 – 580
WOT recognition		HHT display	**ON**
Camshaft timing adjustment >2000 rpm		HHT display	**OFF**
Intake manifold resonance flap		HHT display	**ON**
VSS		mph (km/h)	> 62 (100)
Deceleration shut-off >2100 rpm [8]		HHT display	**ON**
Output, 4-speed AT, TR 3		hp	141

6) These are minimum performance values. Do not exceed speed of 80 mph. It is not possible to simulate coolant and intake air temperature as these are determined by the HFM-SFI system. Provide adequate cooling using external fan when checking wide open throttle performance.

8) On model 202, deceleration fuel shut off cannot be checked on a chassis dynamometer.

9) Time Guide operation no. and/or SMS job no.

Engine 104.991 starting 06/93 until 02/94, Model 129

Engine			104.991
Models			129.063
HFM-SFI system designation			3.4
Engine performance [6]	(07-1203 or 07-1206) [9]		
Engine speed		rpm	5500
Ignition timing with premium unleaded gasoline (91 posted/95 RON)		°CKA	20 – 24
Injection duration		ms	14 – 17
Air mass		kg/h	580 – 620
WOT recognition		HHT display	**ON**
Camshaft timing adjustment >2000 rpm		HHT display	**OFF**
Intake manifold resonance flap		HHT display	**ON**
VSS		mph (km/h)	> 62 (100)
Deceleration shut off >2100 rpm		HHT display	**ON**
Output, 5-speed AT, TR 3		hp	168

6) These are minimum performance values. Do not exceed speed of 80 mph. It is not possible to simulate coolant and intake air temperature as these are determined by the HFM-SFI system. Provide adequate cooling using external fan when check wide open throttle performance.

9) Time Guide operation no. and/or SMS job no.

Engine 104.994 starting 08/93 until 02/94, Model 140

Engine			104.994
Models			140.032
HFM-SFI system designation			3.4
Engine performance [6]	(07-1203 or 07-1206) [9]		
Engine speed		rpm	5500
Ignition timing with premium unleaded gasoline (91 posted/95 RON)		°CKA	20 – 24
Injection duration		ms	14 – 17
Air mass		kg/h	580 – 620
WOT recognition		HHT display	**ON**
Camshaft timing adjustment >2000 rpm		HHT display	**OFF**
Intake manifold resonance flap		HHT display	**ON**
VSS		mph (km/h)	> 62 (100)
Deceleration shut off >2100 rpm		HHT display	**ON**
Output, 5-speed AT, TR 3		hp	165

6) These are minimum performance values. Do not exceed speed of 80 mph. It is not possible to simulate coolant and intake air temperature as these are determined by the HFM-SFI system. Provide adequate cooling using external fan when check wide open throttle performance.

9) Time Guide operation no. and/or SMS job no.

Engine 104.942/992 starting 09/92 until 02/94, Engine 104.991 starting 06/93 until 02/94, Engine 104.994 starting 08/93 until 02/94, Engine 104.941 starting 02/93 until 02/94

Engine		104.941/942	104.991/992/994
Models		124.028, 202.028	124.032/052/066/092 129.063 140.032/033
HFM-SFI system designation		3.4	3.4
On-off ratio			
Engine speed at idle	rpm	600 – 800	600 – 800
Engine speed	rpm	3500	3500
On-off ratio at WOT and TR 3	%	0 ± 10 constant	0 ± 10 constant
On-off ratio at upper partial load and TR “D”, 75 mph (120 km/h), 32 hp (24 kW)	%	±10 oscillates	±10 oscillates
On-off ratio at upper partial load and TR “D”, 31 mph (50 km/h), 9 hp (7 kW)	%	±10 oscillates	±10 oscillates
Exhaust gas back pressure	mbar	< 600	< 700

Refer to Parts Microfiche Gr. 54 to identify control modules.

Engine 104.941/991/992/994 as of 03/94

Engine	104.941	104.991/992/994
Models	202.028	124.032/052/066/092 129.063 140.032/033
HFM-SFI system designation	3.4	3.4
Closed throttle position (CTP), check, adjust (07-2053 or 07-2056) 12)		
Selector lever position	P/N	P/N
ECT ° C approx.	>80	>80
Engine speed rpm	600 – 800	600 – 800
Ignition timing with premium unleaded fuel (91 posted/95 RON) °CKA	6 – 10 1)	6 – 10 1)
On-off ratio %	0±10 2)	0±10 2)
CTP contact (accelerator pedal not depressed) HHT display	**ON**	**ON**

1) The ignition timing is also used for idle speed stabilization. In extreme cases the timing can briefly vary by ±10° from specification.

2) In case of complaint, on-off ratio must be measured at idle speed and at 2500 rpm with purge line to engine disconnected and plugged.

12) Time Guide operation no. and/or SMS job no.

Engine 104.941/991/992/994 as of 03/94

Engine			104.941	104.991/992/994
Models			202.028	129.063 124.032/052/066/092 140.032/033
HFM-SFI system designation			3.4	3.4
Engine, check, adjust	(07-1100) [12]	Page 1		
ECT		° C approx.	>80	>80
Engine speed (selector lever in P/N position)		rpm	600 – 800	600 – 800
Injection duration		ms	2.5 – 3.8	2.5 – 3.8
Air mass		kg/h	16 – 18	16 – 18
Battery voltage		V	10	10
O2S 1 voltage		mV	–200 to +1000 [9]	–200 to +1000 [9]
O2S 1 heater		HHT display	**ON**	**ON**
O2S 2 voltage		mV	–200 to +1000 [9]	–200 to +1000 [9]
O2S 2 heater		HHT display	**ON**	**ON**
Fuel shut-off		HHT display	**ON**	**ON**
Self adaptation idle air		kg/h	±2 [3]	±2 [3]
Self adaptation lower range of part load		Factor	±15 [3]	±15 [3]
Self adaptation factor lower/upper range of part load		HHT display	0.85 – 1.15 [4]	0.85 – 1.15 [4]
CTP contact (accelerator pedal not depressed)		HHT display	**ON**	**ON**
WOT contact (accelerator pedal in WOT)		HHT display	**ON**	**ON**

3) Base setting idle, 0.0 kg/h (Bosch) or 0.0% (VDO), mixture tendency **rich**, < 0.0 kg/h or 0.0%, mixture tendency **lean** > 0.0 kg/h or 0.0%.
4) Base setting part load = 1.0, mixture tendency **rich** <1.0 mixture tendency **lean** > 1.0.
9) Oscillates around 300mV after 2 minutes at idle.
12) Time Guide operation no. and/or SMS job no.

Engine 104.941/991/992/994 as of 03/94

Engine		104.941	104.991/992/994
Models		202.028	129.063 124.032/052/066/092 140.032/033
HFM-SFI system designation		3.4	3.4
Engine, check, adjust (07-1100) [12] Page 2			
Ignition timing with premium unleaded fuel (91 posted/95 RON)	°CKA	6 – 10 [1]	6 – 10 [1]
Throttle valve angle	°	0.3 – 1.0	0.3 – 1.0
Actual value potentiometer voltage	V	3 – 4.2	3 – 4.2
HFM-SFI voltage (Increasing rpm = increasing voltage)	V	0.8 – 1.3	0.8 – 1.3
On-off ratio	%	0 ± 10 [2]	0 ± 10 [2]
Clutch actuated	HHT display	**ON**	**ON**
EA/CC/ISC actuator	Output value	255	255
Purge valve on-off ratio	%	10 ± 5	10 ± 5
Adjustable camshaft timing solenoid < 2000 rpm	HHT display	**OFF**	**OFF**
Resonance flap >4000 rpm	HHT display	**ON**	**ON**
Resonance flap idle	HHT display	**OFF**	**OFF**
Ignition fault counter	HHT display	0	0
Coil fault counter	HHT display	0	0
Coil spark duration	ms	1.5 – 1.9	1.5 – 1.9
Coil spark voltage [10]	V	34 – 37	34 – 37
Knock control approved	HHT display	**ON**	**ON**
Knock ignition angle/cylinder	°CKA	0.0	0.0

1) The ignition timing is also used for idle speed stabilization. In extreme cases the timing can briefly vary by ±10° from specification.

2) In case of complaint, on-off ratio must be measured at idle speed and at 2500 rpm with purge line to engine disconnected and plugged.

10) Display only on Bosch control modules.

12) Time Guide operation no. and/or SMS job no.

Engine 104.941/991/992/994 as of 03/94

Engine		104.941	104.991/992/994
Models		202.028	124.032/052/066/092 129.063 140.032/033
HFM-SFI system designation		3.4	3.4
Cold start (07-2321) [12]			
Starter signal circuit 50, during cranking	HHT display	**ON**	**ON**
Battery voltage	V	10	10
ECT at starting	° C	[5]	[5]
ECT	° C	[5]	[5]
After start enrichment < 70° C maximum of 20 seconds	HHT display	**ON**	**ON**
Engine speed	rpm	[5]	[5]
IAT	° C	> 20	> 20
CTP contact	HHT display	**ON**	**ON**

[5] Temperature at which complaint occurs.
[12] Time Guide operation no. and/or SMS job no.

Engine 104.941/991/992/994 as of 03/94

Engine		104.941		104.991/992/994	
Models		202.028		124.032/052/066/092 129.063 140.032/033	
HFM-SFI system designation		3.4		3.4	
Warmup (07-2321) [12]					
Transmission selector lever position		P/N	D	P/N	D
Warmup speed (raised idle speed) time dependent					
ECT <+20° C for approximately 20 seconds after start	rpm	1150±100		1150±100	
Warmup speed (raised idle speed) temperature dependent					
ECT <0° C	rpm	1000±50		1000±50	
ECT 0 – 30° C	rpm	950±50	850±50	950±50	850±50
ECT 30 – 40° C	rpm	750±50	650±50	750±50	650±50
ECT >40° C	rpm	700±50	600±50	700±50	600±50
Warmup	HHT display	<80° C **ON** >80° C **OFF**		<80° C **ON** >80° C **OFF**	
AIR pump after >20 seconds	HHT display	**OFF**		**OFF**	
Selector lever	HHT display	**ON**		**ON**	
A/C compressor (not engaged)	HHT display	**OFF**		**OFF**	
IAT	° C	>20		>20	
CTP contact (accelerator pedal not depressed)	HHT display	**ON**		**ON**	
Catalytic converter heating, idle	HHT display	**ON**		**ON**	
Transmission upshift delay	HHT display	**ON**		**ON**	

[12] Time Guide operation no. and/or SMS job no.

Engine 104.992 as of 03/94
Model 124

Engine		104.992
Models		124.032/052/066/092
HFM-SFI system designation		3.4
Engine performance [6] (07-1203 or 07-1206) [12]		
Engine speed	rpm	5500
Ignition timing with premium unleaded gasoline (91 posted/95 RON)	°CKA	20 – 24
Injection duration	ms	14 – 17
Air mass	kg/h	580 – 620
WOT recognition	HHT display	**ON**
Camshaft timing adjustment >2000 rpm	HHT display	**OFF**
Intake manifold resonance flap	HHT display	**ON**
VSS	mph (km/h)	> 62 (100)
Deceleration shut-off >2100 rpm	HHT display	**ON**
Transmission overload protection switch, TR “D” [11]	V	< 1
Altitude	mbar	refer to barometer
CC operation	HHT display	**OFF/ON**
Output, 4-speed AT, TR 3	hp	160
Ignition fault counter	HHT display	0
Coil fault counter	HHT display	0
Coil spark duration	ms	1.5 – 1.9
Coil spark voltage [10]	V	34 – 37
Knock ignition angle/cylinder	°CKA	0.0

6) These are minimum performance values. Do not exceed speed of 80 mph. It is not possible to simulate coolant and intake air temperature as these are determined by the HFM-SFI system. Provide adequate cooling using external fan when checking wide open throttle performance.

10) Display only on Bosch control modules.

11) On vehicles, which start in 1st gear, drive in transmission range “D” above 12 mph (20 km/h).

12) Time Guide operation no. and/or SMS job no.

Engine 104.941 as of 03/94
Model 202

Engine		104.941
Models		202.028
HFM-SFI system designation		3.4
Engine performance [6] (07-1203 or 07-1206) [12]		
Engine speed	rpm	5400
Ignition timing with premium unleaded gasoline (91 posted/95 RON)	°CKA	20 – 24
Injection duration	ms	11 – 14
Air mass	kg/h	520 – 580
WOT recognition	HHT display	**ON**
Camshaft timing adjustment >2000 rpm	HHT display	**OFF**
Intake manifold resonance flap	HHT display	**ON**
VSS	mph (km/h)	> 62 (100)
Deceleration shut-off >2100 rpm	HHT display	**ON**
Transmission overload protection switch, TR “D” [11]	V	< 1
Altitude	mbar	refer to barometer
CC operation	HHT display	**OFF/ON**
Output, 4-speed AT, TR 3	hp	141
Ignition fault counter	HHT display	0
Coil fault counter	HHT display	0
Coil spark duration	ms	1.5 – 1.9
Coil spark voltage [10]	V	34 – 37
Knock ignition angle/cylinder	°CKA	0.0

6) These are minimum performance values. Do not exceed speed of 80 mph. It is not possible to simulate coolant and intake air temperature as these are determined by the HFM-SFI system. Provide adequate cooling using external fan when checking wide open throttle performance.

10) Display only on Bosch control modules.

11) On vehicles, which start in 1st gear, drive in transmission range “D” above 12 mph (20 km/h).

12) Time Guide operation no. and/or SMS job no.

Engine 104.991 as of 03/94
Model 129

Engine		104.991
Models		129.063
HFM-SFI system designation		3.4
Engine performance [6]	(07-1203 or 07-1206) [12]	
Engine speed	rpm	5500
Ignition timing with premium unleaded gasoline (91 posted/95 RON)	°CKA	20 – 24
Injection duration	ms	14 – 17
Air mass	kg/h	580 – 620
WOT recognition	HHT display	**ON**
Camshaft timing adjustment >2000 rpm	HHT display	**OFF**
Intake manifold resonance flap	HHT display	**ON**
VSS	mph (km/h)	> 62 (100)
Deceleration shut-off >2100 rpm	HHT display	**ON**
Transmission overload protection switch, TR “D” [11]	V	< 1
Altitude	mbar	refer to barometer
CC operation	HHT display	**OFF/ON**
Output, 5-speed AT, TR 3	hp	141
Ignition fault counter	HHT display	0
Coil fault counter	HHT display	0
Coil spark duration	ms	1.5 – 1.9
Coil spark voltage [10]	V	34 – 37
Knock ignition angle/cylinder	°CKA	0.0

6) These are minimum performance values. Do not exceed speed of 80 mph. It is not possible to simulate coolant and intake air temperature as these are determined by the HFM-SFI system. Provide adequate cooling using external fan when checking wide open throttle performance.

10) Display only on Bosch control modules.

11) On vehicles, which start in 1st gear, drive in transmission range “D” above 12 mph (20 km/h).

12) Time Guide operation no. and/or SMS job no

Engine 104.994 as of 03/94
Model 140

Engine		104.994
Models		140.032/033
HFM-SFI system designation		3.4
Engine performance [6] (07-1203 or 07-1206) [12]		
Engine speed	rpm	5500
Ignition timing with premium unleaded gasoline (91 posted/95 RON)	°CKA	20 – 24
Injection duration	ms	14 – 17
Air mass	kg/h	580 – 620
WOT recognition	HHT display	**ON**
Camshaft timing adjustment >2000 rpm	HHT display	**OFF**
Intake manifold resonance flap	HHT display	**ON**
VSS	mph (km/h)	> 62 (100)
Deceleration shut-off >2100 rpm	HHT display	**ON**
Transmission overload protection switch, TR “D” [11]	V	< 1
Altitude	mbar	refer to barometer
CC operation	HHT display	**OFF/ON**
Output, 5-speed AT, TR 3	hp	141
Ignition fault counter	HHT display	0
Coil fault counter	HHT display	0
Coil spark duration	ms	1.5 – 1.9
Coil spark voltage [10]	V	34 – 37
Knock ignition angle/cylinder	°CKA	0.0

6) These are minimum performance values. Do not exceed speed of 80 mph. It is not possible to simulate coolant and intake air temperature as these are determined by the HFM-SFI system. Provide adequate cooling using external fan when checking wide open throttle performance.

10) Display only on Bosch control modules.

11) On vehicles, which start in 1st gear, drive in transmission range “D” above 12 mph (20 km/h).

12) Time Guide operation no. and/or SMS job no

Engine 104.941/991/992/994 as of 03/94

Engine		104.941	104.991/992/994
Models		202.028	124.032/052/066/092 129.063 140.032/033
HFM-SFI system designation		3.4	3.4
On-off ratio			
Idle speed	rpm	600 – 800	600 – 800
Engine speed	rpm	3500	3500
On-off ratio at WOT and TR 3	%	0 ± 10 constant	0 ± 10 constant
On-off ratio at upper partial load and TR “D”, 75 mph (120 km/h), 32 hp (24 kW)	%	±10 oscillates	±10 oscillates
On-off ratio at upper partial load and TR “D”, 31 mph (50 km/h), 9 hp (7 kW)	%	±10 oscillates	±10 oscillates
Exhaust gas back pressure	mbar	< 600	< 700

Refer to Parts Microfiche Gr. 54 to identify control modules.

Engine 111.961 starting 02/93 until 02/94

Engine	111.961
Models	202.022
HFM-SFI system designation	3.4
Closed throttle position (CTP), check, adjust (07-2053 or 07-2056) [9]	
Selector lever position	P/N
ECT ° C approx.	>80
Engine speed rpm	650 – 850
Ignition timing with premium unleaded fuel (91 posted/95 RON) °CKA	5 – 13 [1]
On-off ratio %	0±10 [2]
CTP contact (accelerator pedal not depressed) HHT display	**ON**

1) The ignition timing is also used for idle speed stabilization. In extreme cases the timing can briefly vary by ±10° from specification.
2) In case of complaint, on-off ratio must be measured at idle speed and at 2500 rpm with purge line to engine disconnected and plugged.
9) Time Guide operation no. and/or SMS job no.

Engine 111.961 starting 02/93 until 02/94

Engine		111.961
Models		202.022
HFM-SFI system designation		3.4
Engine, check, adjust (07-1100) [9]		
ECT	° C approx.	>80
Engine speed (selector lever in P/N position)	rpm	650 – 850
Injection duration	ms	3 – 5
Air mass	kg/h	9 – 13
O2S 1 voltage (oscillates around 300mV after 2 min.)	mV	–200 to +1000
O2S 2 voltage (oscillates around 300mV after 2 min.)	mV	–200 to +1000
On-off ratio	%	0±10 [2]
Self adaptation idle air	kg/h	±2 [3]
Self adaptation idle air	%	±15 [3]
Self adaptation factor lower/upper range of part load		0.85 – 1.15 [4]
Ignition timing with premium unleaded fuel (91 posted/95 RON)	°CKA	5 – 13 [1]
Throttle valve angle	°	1.0 – 1.8
Deceleration shut-off > 2100 rpm	HHT display	**ON**
Air pump after start, maximum of 20 seconds	<40° C	**ON**
CTP contact (accelerator pedal not depressed)	HHT display	**ON**
WOT contact (accelerator pedal in WOT)	HHT display	**ON**

1) The ignition timing is also used for idle speed stabilization. In extreme cases the timing can briefly vary by ±10° from specification.
2) In case of complaint, lambda must be measured at idle speed and at 2500 rpm with purge line to engine disconnected and plugged.
3) Base setting idle, 0.0 kg/h (Bosch) or 0.0% (VDO), mixture tendency **rich**, < 0.0 kg/h or 0.0%, mixture tendency **lean** > 0.0 kg/h or 0.0%.
4) Base setting part load = 1.0, mixture tendency **rich** <1.0 mixture tendency **lean** > 1.0.
9) Time Guide operation no. and/or SMS job no.

Engine 111.961 starting 02/93 until 02/94

Engine			111.961
Models			202.022
HFM-SFI system designation			3.4
Cold start, (07–2321) [9]			
ECT	° C approx.		[5]
Engine rpm			[5]
Starter signal circuit 50, during cranking	HHT display		**ON**
After start enrichment < 70° C maximum of 20 seconds	HHT display		**ON**
CTP contact (accelerator pedal not depressed)	HHT display		**ON**
Warmup, (07–2023) [9]			
Transmission selector lever position			P/N D
Warmup speed (raised idle speed) time dependent			
ECT <+20° C for approximately 20 seconds after start	rpm		1150±100
Warmup speed (raised idle speed) temperature dependent			
ECT <0° C	rpm		1000±50 800±50
ECT 0 – 30° C	rpm		850±50 700±50
ECT 30 – 40° C	rpm		800±50 650±50
ECT >40° C	rpm		750±50 600±50
Warmup	HHT display		<80° C **ON** / >80° C **OFF**
CTP contact (accelerator pedal not depressed)	HHT display		**ON**
Partial intake manifold preheater	HHT display		<70° C **ON** / >70° C **OFF**
Selector lever position (P/N)	HHT display		**OFF**
A/C compressor (not engaged)	HHT display		**OFF**
IAT	° C		>20

[5] Temperature at which complaint occurs.
[9] Time Guide operation no. and/or SMS job no.

Engine 111.961 starting 02/93 until 02/94

Engine		111.961
Models		202.022
HFM-SFI system designation		3.4
Engine performance [6]	(07-1203 or 07-1206) [9]	
Engine speed	rpm	5400
Ignition timing with premium unleaded gasoline (91 posted/95 RON)	°CKA	18 – 21
Injection duration	ms	14 – 16
Air mass	kg/h	380 – 400
WOT contact (accelerator pedal fully depressed)	HHT display	**ON**
Camshaft timing adjustment <2000 rpm	HHT display	**OFF**
Camshaft timing adjustment >2000 rpm	HHT display	**ON**
Camshaft timing adjustment >4000 rpm	HHT display	**OFF**
Output, 4-speed AT, TR 3	hp	103
VSS	mph (km/h)	> 62 (100)
Deceleration shut-off >2100 rpm [8]	HHT display	**ON**

6) These are minimum performance values. Do not exceed speed of 80 mph. Do not exceed speed of 80 mph. It is not possible to simulate coolant and intake air temperature as these are determined by the HFM-SFI system. Provide adequate cooling using external fan when check wide open throttle performance.

8) On model 202, deceleration fuel shut off cannot be tested on a chassis dynamometer.

9) Time Guide operation no. and/or SMS job no.

Engine 111.961 starting 02/93 until 02/94

Engine		111.961
Models		202.022
HFM-SFI system designation		3.4
On-off ratio		
Idle speed	rpm	650 – 850
Engine speed	rpm	3500
On-off ratio at WOT and TR 3	%	0 ± 10 constant
On-off ratio at upper partial load and TR ”D“, 75 mph (120 km/h), 32 hp (24 kW)	%	±10 oscillates
On-off ratio at upper partial load and TR ”D“, 31 mph (50 km/h), 9 hp (7 kW)	%	±10 oscillates
Exhaust gas back pressure	mbar	< 300

Refer to Parts Microfiche Gr. 54 to identify control modules.

Engine 111.961 starting 03/94

Engine	111.961
Models	202.022
HFM-SFI system designation	3.4
Closed throttle position (CTP), check, adjust (07-2053 or 07-2056) [12)]	
Selector lever position	P/N
ECT ° C approx.	>80
Engine speed rpm	650 – 850
Ignition timing with premium unleaded fuel (91 posted/95 RON) °CKA	5 – 13 [1)]
On-off ratio %	0±10 [2)]
CTP contact (accelerator pedal not depressed) HHT display	**ON**

1) The ignition timing is also used for idle speed stabilization. In extreme cases the timing can briefly vary by ±10° from specification.
2) In case of complaint, on-off ratio must be measured at idle speed and at 2500 rpm with purge line to engine disconnected and plugged.
12) Time Guide operation no. and/or SMS job no.

Engine 111.961 starting 03/94

Engine		111.961
Models		202.022
HFM-SFI system designation		3.4
Engine, check, adjust (07-1100) [12] Page 1		
ECT	° C approx.	>80
Engine speed (selector lever in P/N position)	rpm	650 – 850
Injection duration	ms	3 – 5
Air mass	kg/h	9 – 13
Battery voltage	V	10
O2S 1 voltage	mV	–200 to +1000 [9]
O2S 1 heater	HHT display	**ON**
O2S 2 voltage	mV	–200 to +1000 [9]
O2S 2 heater	HHT display	**ON**
Safety fuel shut-off	HHT display	**ON**
Self adaptation idle air	kg/h	±2 [3]
Self adaptation idle air	%	±15 [3]
Self adaptation factor lower/upper range of part load		0.85 – 1.15 [4]
CTP contact (accelerator pedal not depressed)	HHT display	**ON**
WOT contact (accelerator pedal in WOT)	HHT display	**ON**

3) Base setting idle, 0.0 kg/h (Bosch) or 0.0% (VDO), mixture tendency **rich**, < 0.0 kg/h or 0.0%, mixture tendency **lean** > 0.0 kg/h or 0.0%.
4) Base setting part load = 1.0, mixture tendency **rich** <1.0 mixture tendency **lean** > 1.0.
9) Oscillates around 300 mV after 2 minutes at idle.
12) Time Guide operation no. and/or SMS job no.

Engine 104.941/942/991/992/994 starting 03/94,

Engine		111.961
Models		202.022
HFM-SFI system designation		3.4
Engine, check, adjust (07-1100) [12] Page 2		
Ignition timing with premium unleaded fuel (91 posted/95 RON)	°CKA	5 – 13 [1]
Throttle valve angle	°	1.0 – 1.8
Actual value potentiometer voltage	V	3 – 4.2
MAF sensor voltage (Increasing rpm = increasing voltage)	V	0.8 – 1.3
On-off ratio	%	0 ± 10 [2]
Clutch actuated	HHT display	**ON**
EA/CC/ISC actuator	Output value	255
Purge valve on-off ratio	%	10 ± 5
Adjustable camshaft timing solenoid < 2000 rpm	HHT display	**OFF**
Ignition fault counter	HHT display	0
Coil fault counter	HHT display	0
Coil spark duration	ms	1.5 – 1.9
Coil spark voltage [10]	V	34 – 37
Knock control approved	HHT display	**ON**
Knock ignition angle/cylinder	°CKA	0.0

1) The ignition timing is also used for idle speed stabilization. In extreme cases the timing can briefly vary by ±10° from specification.
2) In case of complaint, on-off ratio must be measured at idle speed and at 2500 rpm with purge line to engine disconnected and plugged.
10) Display only on Bosch control modules.
12) Time Guide operation no. and/or SMS job no.

Engine 111.961 starting 03/94

Engine			111.961
Models			202.022
HFM-SFI system designation			3.4
Cold start, (07–2321) [12]			
Starter signal circuit 50, during starting process		HHT display	**ON**
Battery voltage		V	10
ECT at starting		° C	[5]
ECT		° C	[5]
After start enrichment < 70° C maximum of 20 seconds		HHT display	**ON**
Engine speed		rpm	[5]
IAT		° C	> 20
CTP contact (accelerator pedal not depressed)		HHT display	**ON**

[5] Temperature at which complaint occurs.
[12] Time Guide operation no. and/or SMS job no.

Engine 111.961 starting 03/94

Engine			111.961
Models			202.022
HFM-SFI system designation			3.4
Warmup, (07–2023) [12]			
Transmission selector lever position			P/N D
Warmup speed (raised idle speed) time dependent			
ECT <+20° C for approxmately 20 seconds after start	rpm		1150±100
Warmup speed (raised idle speed) temperature dependent			
ECT <0° C	rpm		1000±50 800±50
ECT 0 – 30° C	rpm		850±50 700±50
ECT 30 – 40° C	rpm		800±50 650±50
ECT >40° C	rpm		750±50 600±50
Warmup	HHT display		<80° C **ON** / >80° C **OFF**
Partial intake manifold preheater	HHT display		<70° C **ON** / >70° C **OFF**
Selector lever position	HHT display		**OFF**
A/C compressor (not engaged)	HHT display		**OFF**
IAT	° C		>20
CTP contact (accelerator pedal not depressed)	HHT display		**ON**
Catalytic converter heating, idle	HHT display		**ON**
Transmission upshift delay	HHT display		**ON**

[12] Time Guide operation no. and/or SMS job no.

Engine 111.961 starting 03/94

Engine			111.961
Models			202.022
HFM-SFI system designation			3.4
Engine performance [6]	(07-1203 or 07-1206) [12]		
Engine speed		rpm	5400
Ignition timing with premium unleaded gasoline (91 posted/95 RON)		°CKA	18 – 21
Injection duration		ms	14 – 16
Air mass		kg/h	380 – 400
WOT contact (accelerator pedal in WOT)		HHT display	**ON**
Camshaft timing adjustment <2000 rpm		HHT display	**OFF**
Camshaft timing adjustment >2000 rpm		HHT display	**ON**
Camshaft timing adjustment >4000 rpm		HHT display	**OFF**
VSS		mph (km/h)	> 62 (100)
Deceleration shut-off >2100 rpm [8]		HHT display	**ON**
Transmission overload protection switch, TR “D” [11]		V	< 1
Altitude		mbar	refer to barometer
CC operation		HHT display	**OFF/ON**
Output, 4-speed AT, TR 3		hp	103
Ignition fault counter		HHT display	0
Coil fault counter		HHT display	0
Coil spark duration		ms	1.5 – 1.9
Coil spark voltage [10]		V	34 – 37
Knock ignition angle/cylinder		°CKA	0.0

6) These are minimum performance values. Do not exceed speed of 80 mph. Do not exceed speed of 80 mph. It is not possible to simulate coolant and intake air temperature as these are determined by the HFM-SFI system. Provide adequate cooling using external fan when check wide open throttle performance.

8) On model 202, deceleration fuel shut off cannot be tested on a chassis dynamometer.

10) Display only on Bosch control modules.

11) On vehicles, which start in 1st gear, drive in transmission range “D” above 12 mph (20 km/h).

12) Time Guide operation no. and/or SMS job no.

Engine 111.961 starting 02/93 until 02/94

Engine		111.961
Models		202.022
HFM-SFI system designation		3.4
On-off ratio		
Idle speed	rpm	650 – 850
Engine speed	rpm	3500
On-off ratio at WOT and TR 3	%	0 ± 10 constant
On-off ratio at upper partial load and TR ”D“, 75 mph (120 km/h), 32 hp (24 kW)	%	±10 oscillates
On-off ratio at upper partial load and TR ”D“, 31 mph (50 km/h), 9 hp (7 kW)	%	±10 oscillates
Exhaust gas back pressure	mbar	< 300

Refer to Parts Microfiche Gr. 54 to identify control modules.

Engine 104.995

Engine	104.995
Models	210.055
HFM-SFI system designation	4.1
Closed throttle position (CTP), check, adjust (07-2053 or 07-2056) [12)]	
Engine oil temperature . . . . . °C	>60
Selector lever position	P/N
ECT . . . . . ° C approx.	>80
Engine speed . . . . . rpm	600 – 800
Ignition timing with premium unleaded fuel (91 posted/95 RON) . . . . . °CKA	6 – 10 [1)]
On-off ratio . . . . . %	0±10 [2)]
CTP contact (accelerator pedal not depressed) . . . . . HHT display	**ON**

1) The ignition timing is also used for idle speed stabilization. In extreme cases the timing can briefly vary by ±10° from specification.

2) In case of complaint, on-off ratio must be measured at idle speed and at 2500 rpm with purge line to engine disconnected and plugged.

12) Time Guide operation no. and/or SMS job no.

Engine 104.995

Engine		104.995
Models		210.055
HFM-SFI system designation		4.1
Engine, check, adjust (07-1100) [12] Page 1		
Engine oil temperature	° C	>60
ECT	° C approx.	>80
Engine speed (selector lever in P/N position)	rpm	600 – 800
Injection duration	ms	2.5 – 3.8
Air mass	kg/h	15 – 18
Battery voltage	V	10
O2S 1 voltage	mV	–200 to +1000 [10]
O2S 1 heater	HHT display	**ON**
O2S 2 voltage	mV	–200 to +1000 [10]
O2S 2 heater	HHT display	**ON**
WOT (accelerator pedal in WOT)	HHT display	**ON**
Fuel shut-off	HHT display	**OFF**
Self adaptation	HHT display	**OFF/ON** [13]
Self adaptation idle air	kg/h	0±2 [4]
Self adaptation lower range of part load	Factor	0.85 – 1.15 [5]
Ignition timing	°CKA	6 – 10 [1]
Throttle valve angle	°	0.3 – 1.8
MAF sensor voltage (increasing rpm, increasing voltage)	V	0.8 – 1.3
On-off ratio	%	0±10 [2]
Purge valve on-off ratio	%	10±5

1) The ignition timing is also used for idle speed stabilization. In extreme cases the timing can briefly vary by ±10° from specification.
2) In case of complaint, on-off ratio must be measured at idle speed and at 2500 rpm with purge line to engine disconnected and plugged.
4) Base setting idle, 0.0 kg/h (Bosch) or 0.0% (VDO), mixture tendency **rich**, < 0.0 kg/h or 0.0%, mixture tendency **lean** > 0.0 kg/h or 0.0%.
5) Base setting part load = 1.0, mixture tendency **rich** <1.0 mixture tendency **lean** > 1.0.
10) Oscillates around 300mV after 2 minutes at idle.
12) Time Guide operation no. and/or SMS job no.
13) HHT display ON if self adaptation is required.

Engine 104.995

Engine		104.995
Models		210.055
HFM-SFI system designation		4.1
Engine, check, adjust (07-1100) [12]	Page 2	
Camshaft adjustment solenoid <2000 rpm	HHT display	**OFF**
Camshaft adjustment solenoid >2000 rpm	HHT display	**ON**
Camshaft adjustment solenoid >4000 rpm	HHT display	**OFF**
Intake manifold switchover valve CTP	HHT display	**OFF**
Intake manifold switchover valve >4000 rpm	HHT display	**ON**
DTC counter ignition cylinders 1 – 6	Count	0
DTC counter ignition coil T1/1, cylinders 2/5	Count	0
DTC counter ignition coil T1/2, cylinders 3/4	Count	0
DTC counter ignition coil T1/3, cylinders 1/6	Count	0
Spark duration ignition coil T1/1, cylinders 2/5	ms	1.5 – 1.9
Spark duration ignition coil T1/2, cylinders 3/4	ms	1.5 – 1.9
Spark duration ignition coil T1/3, cylinders 1/6	ms	1.5 – 1.9
Spark voltage ignition coil T1/1, cylinders 2/5 [11]	V	34 – 37
Spark voltage ignition coil T1/2, cylinders 3/4 [11]	V	34 – 37
Spark voltage ignition coil T1/3, cylinders 1/6 [11]	V	34 – 37
Knock control approved	HHT display	**OFF/ON** [14]
Knock ignition angle, cylinders 1 – 6	°CKA	0

11) Display only on Bosch control modules.
12) Time Guide operation no. and/or SMS job no.
14) HHT display ON if knock control is required.

Engine 104.995

Engine			104.995
Models			210.055
HFM-SFI system designation			4.1
Cold start (07-2321) [12]			
Starter signal circuit 50, during cranking		HHT display	**ON**
Battery voltage		V	10
ECT at starting		° C	[7]
ECT		° C	[7]
After start enrichment < 70° C maximum of 20 seconds		HHT display	**ON**
IAT		° C	[7]
CTP contact (accelerator pedal not depressed)		HHT display	**ON**

7) Temperature at which complaint occurs.
12) Time Guide operation no. and/or SMS job no.

Engine 104.995

Engine			104.995
Models			210.055
HFM-SFI system designation			4.1
Warmup (07-2023) [12]			
Transmission selector lever position			P/N D
Warmup speed (raised idle speed) [15]		rpm	1150±100
Warmup speed (raised idle speed) temperature dependent			
ECT <0° C		rpm	1000±50
ECT 0 – 30° C		rpm	950±50 850±50
ECT 30 – 40° C		rpm	750±50 650±50
ECT >40° C		rpm	700±50 600±50
Warmup		HHT display	<80° C **ON** >80° C **OFF**
AIR pump after >20 seconds		HHT display	**OFF**
A/C compressor (not engaged)		HHT display	**OFF**
IAT		° C	>20
CTP contact (accelerator pedal not depressed)		HHT display	**ON**
Catalytic converter heating, idle		HHT display	**ON** [15]

12) Time Guide operation no. and/or SMS job no.

15) Raised idle speed if ECT < =20 °C for approx. 20 seconds after start.

Engine 104.995

Engine		104.995
Models		210.055
HFM-SFI system designation		4.1
Engine performance [7]	Page 1	
Engine speed	rpm	5300
Ignition timing with premium unleaded gasoline (91 posted/95 RON)	°CKA	20 – 24
Injection duration	ms	14 – 17
Air mass	kg/h	510 – 540
WOT recognition	HHT display	**ON**
Output, 4-speed AT, TR 3	hp	162
Exhaust gas back pressure	mbar	<300
Camshaft timing adjustment <2000 rpm	HHT display	**OFF**
Camshaft timing adjustment >2000 rpm	HHT display	**ON**
Camshaft timing adjustment >4000 rpm	HHT display	**OFF**
Intake manifold switchover valve at CTP	HHT display	**OFF**
Intake manifold switchover valve at >4000 rpm	HHT display	**ON**
VSS	mph (km/h)	> 62 (100)
Deceleration shut-off >2100 rpm	HHT display	**OFF**
Transmission overload protection switch, 4-speed AT	V	3 – 5
Altitude	mbar	refer to barometer
CC operation	HHT display	**OFF**

[7] These are minimum performance values. Do not exceed speed of 80 mph. It is not possible to simulate coolant and intake air temperature as these are determined by the HFM-SFI system. Provide adequate cooling using external fan when checking wide open throttle performance.

Engine 104.941 as of 03/94
Model 202

Engine		104.941
Models		202.028 [C 36 AMG]
HFM-SFI system designation		3.4
Engine performance [7]	Page 2	
DTC counter ignition cylinders 1 – 6	Count	0
DTC counter ignition coil T1/1, cylinders 2/5	Count	0
DTC counter ignition coil T1/2, cylinders 3/4	Count	0
DTC counter ignition coil T1/3, cylinders 1/6	Count	0
Spark duration ignition coil T1/1, cylinders 2/5	ms	1.5 – 1.9
Spark duration ignition coil T1/2, cylinders 3/4	ms	1.5 – 1.9
Spark duration ignition coil T1/3, cylinders 1/6	ms	1.5 – 1.9
Spark voltage ignition coil T1/1, cylinders 2/5 [11]	V	34 – 37
Spark voltage ignition coil T1/2, cylinders 3/4 [11]	V	34 – 37
Spark voltage ignition coil T1/3, cylinders 1/6 [11]	V	34 – 37
Knock control approved	HHT display	**OFF/ON** [14]
Knock ignition angle, cylinders 1 – 6	°CKA	0

7) These are minimum performance values. Do not exceed speed of 80 mph. It is not possible to simulate coolant and intake air temperature as these are determined by the HFM-SFI system. Provide adequate cooling using external fan when checking wide open throttle performance.

11) Display only on Bosch control modules.

14) HHT display ON if knock control is required.

Engine 104.995

Engine		104.995
Models		210.055
HFM-SFI system designation		4.1
On-off ratio		
Idle speed	rpm	600 – 800
Engine speed	rpm	3500
On-off ratio at WOT and TR 3	%	0 ± 10 constant
On-off ratio at upper partial load and TR “D”, 75 mph (120 km/h), 32 hp (24 kW)	%	±10 oscillates
On-off ratio at upper partial load and TR “D”, 31 mph (50 km/h), 9 hp (7 kW)	%	±10 oscillates
Exhaust gas back pressure	mbar	< 300