

MERCEDES-BENZ MECHANICAL TYPE

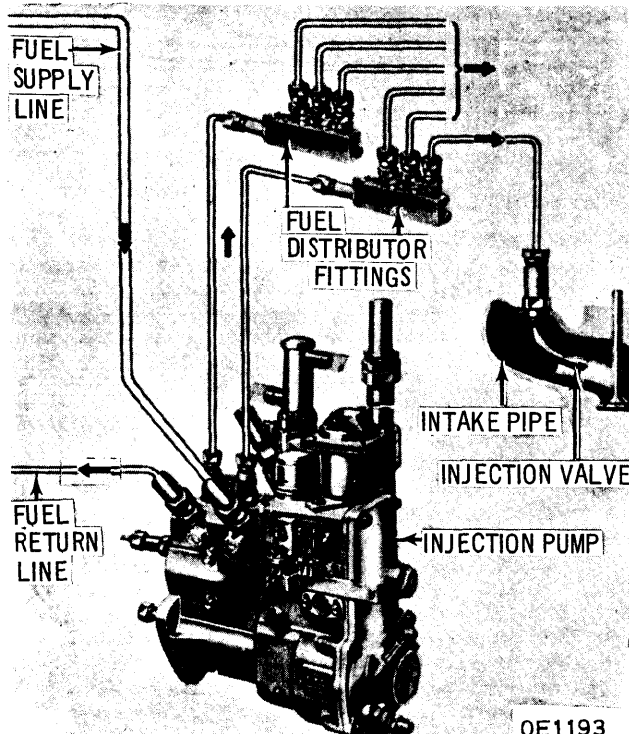
- 220 SEB (1962-65)
- 230 SL (1963-67)
- 250 SE (1965-67)
- 250 SL (1966-67)
- 280 SE/8 (1968-70)
- 280 SL/8 (1968-70)
- 300 SE (1962-67)
- 300 SEB (1965-67)
- 300 SEL (1966-67)
- 300 SEL/8 (1968-70)
- 300 SEL/8 6.3 (1968-70)
- 600 (1964-70)

NOTE - Pressure (pounds per square inch (psi) and Vacuum (inches of Mercury (in. Hg) are listed here in Atmospheres (atm). For conversion; 1 atmosphere of pressure equals 14.70 psi and 1 atmosphere of vacuum equals 29.92 in. Hg.

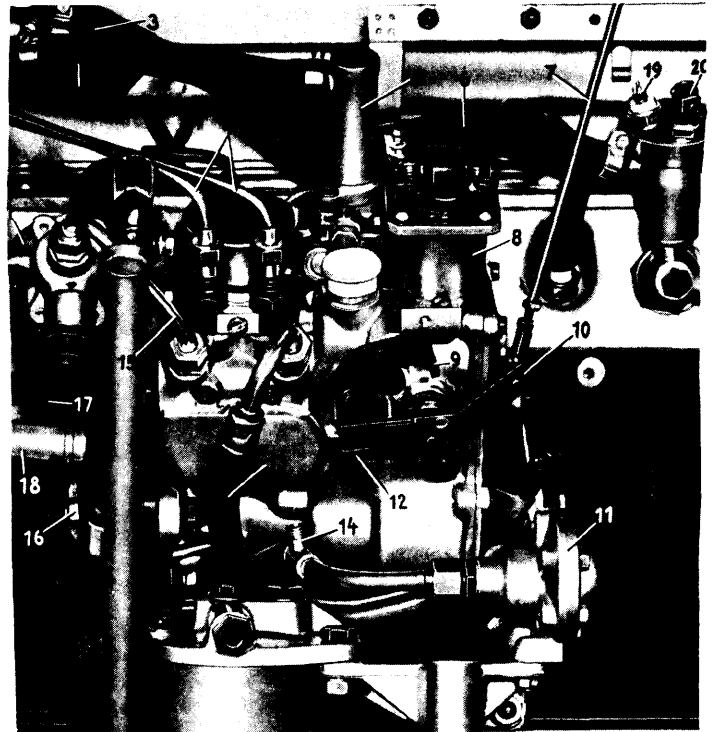
DESCRIPTION

With Two-Plunger Injection Pump

This system may be found on all 220 SEB models and only on those 300 SE models with engine types 189.984 and 189.985. System works on principle of intermittent intake pipe injection. The two pump elements of injection pump, via two fuel distributor assemblies, supply the six injection valves, which are located in the intake pipe in front of intake valves. With intake pipe injection, injected fuel mixes partly in intake ports, and partly inside cylinders to form combustible fuel/air mixture. This pump injects fuel not in the usual way separately for each cylinder at a certain fixed time, but injects finely atomized fuel into intake pipe simultaneously for three cylinders at a time.



TWO-PLUNGER INJECTION PUMP (TYPICAL)

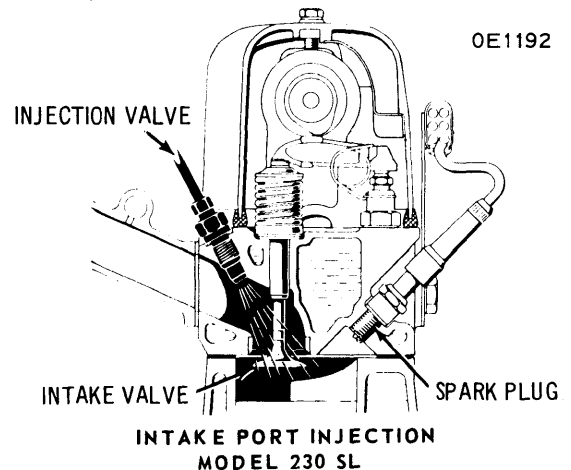


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|-------------------------------------|--|
| 1 - DAMPER UNIT (FUEL RETURN LINE) | 13 - FUEL SUPPLY LINE |
| 2 - WATER HOSE | 14 - FUEL LINE CONNECTION FOR COLD START VALVE |
| 3 - SUPPLEMENTARY AIR LINE | 15 - FUEL RETURN LINE |
| 4 - INJECTION PIPES | 16 - HEXAGON NUT |
| 5 - THERMOSTAT | 17 - OIL LINE |
| 6 - WATER HOSE | 18 - OIL CONTAINER FOR POWER STEERING |
| 7 - PUSH ROD | 19 - THERMO-TIME SWITCH |
| 8 - COLD START MAGNET | 20 - THERMO-TIME SWITCH |
| 9 - FULL-LOAD STOP | |
| 10 - ADJUSTMENT LEVER | |
| 11 - DAMPER UNIT (FUEL SUPPLY LINE) | |
| 12 - IDLE STOP | |

OE1184

TWO-PLUNGER INJECTION PUMP MODELS 220 SEB AND 300 SE

This means that fuel is not always injected during suction stroke with intake valve open, but injection takes place at various times although time does not vary for any one cylinder. Since camshaft of injection pump turns at half engine speed but has double cams, fuel is injected at every turn of crankshaft, so that fuel quantity for any one cylinder is injected in two equal parts. Independently of valve position, fuel is continually injected into intake pipe and together with intake air forms the fuel/air mixture.

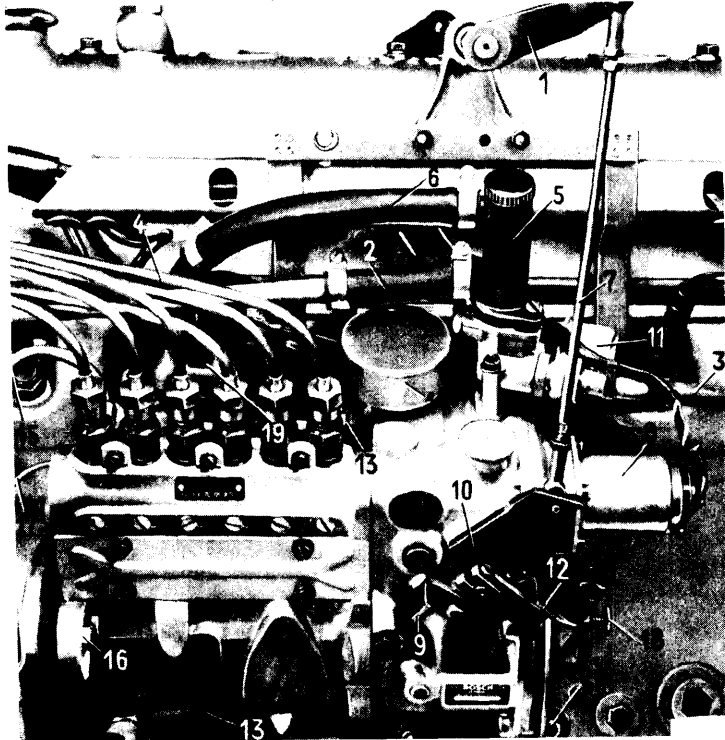


INTAKE PORT INJECTION
MODEL 230 SL

MERCEDES-BENZ MECHANICAL TYPE (Cont.)

With Six or Eight-Plunger Injection Pump

Six-plunger pumps will be found on all other six cylinder vehicles including those 300 SE models with engine types 189,986 and 189,987. Eight-plunger pumps are used on all eight cylinder vehicles. This system also uses principle of intermittent injection. Injection plungers are actuated through pump camshaft via roller tappets. Plungers force fuel to cylinders through six (or eight) fuel lines, and fuel is discharged into ports on intake stroke by means of injectors located in cylinder heads.



- | | |
|----------------------------|--------------------------------------|
| 1 - CONTROL LEVER | 12 - IDLE STOP |
| 2 - WATER HOSE | 13 - FUEL SUPPLY LINE |
| 3 - SUPPLEMENTARY AIR LINE | 14 - BAROMETRIC CELL |
| 4 - INJECTION PIPES | 15 - FUEL RETURN LINE |
| 5 - THERMOSTAT | 16 - HEXAGON SCREW |
| 6 - WATER HOSE | 17 - OIL LINE |
| 7 - CONTROL ROD | 18 - SPRING-LOADED IDLE CONTROL KNOB |
| 8 - COLD START MAGNET | 19 - HOUSING FOR THERMO-SWITCHES |
| 9 - FULL-LOAD STOP | 20 - HEXAGON SCREW |
| 10 - ADJUSTMENT LEVER | |
| 11 - AIR CLEANER | |

SIX-PLUNGER INJECTION PUMP MODEL 230 SL OPERATION

Injection Pump

Depending on type of injection pump used, pump housing may contain two, six or eight pump units. Each unit consists of a cylinder and a plunger. Each plunger is connected to a tappet which rides on cam lobe. Pump cylinders are fastened to pump housing and each cylinder is immersed in fuel which can enter cylinder compression chamber through an inlet port. Camshaft exerts a force upon tappet and causes it to move delivery plunger up. As a result, fuel contained in compression chambers is forced out through a check valve into pressure lines connected to injection valves. Maximum lift of delivery plungers is determined by camshaft design and remains constant. Injection quantity is regulated by turning delivery plungers, thus resetting a metering land in each. A toothed control rack, engaging its toothed counterpart in each delivery plunger, can slide

back or forth and to turn delivery plungers as required. As a result, slanted metering land closes fuel inlet port at an earlier or later time, causing greater or smaller amounts of fuel to be delivered on each stroke, depending on relative position of injection plunger.

Control Unit

To obtain required air/fuel mixture ratio, engine must be supplied with different quantities of fuel under varying engine speed and loads.

With Two-Plunger Injection Pump - Movements of adjustment lever are transmitted inside injection pump to fuel control rod via the cam plate and cam lever which is controlled by the centrifugal governor and overrides engine speed influence.

With Six or Eight-Plunger Injection Pump - Accomplished by a contoured cam which is mounted on camshaft together with a centrifugal governor. Contoured cam can be moved axially by centrifugal governor and rotated on its axis by accelerator pedal in relation to given engine loads. Riding on contoured cam is a sensor (roller) which transfers appropriate fuel volume requirements to control rack via a guide lever.

Inlet Air Thermostat

With increasing air temperature, fuel quantity injected must be decreased. In order to obtain a constant fuel/air ratio, inlet air thermostat at injection pump transfers action to compensating mechanism moving fuel control rod so that quantity of injected fuel is decreased.

Cooling Water Thermostat

During warming up period, engine needs more air and fuel. Enrichment is controlled by a cooling water thermostat attached to injection pump and connected to water circulation system. When cold, thermostat opens supplementary air valve and moves control rod to a rich setting. As engine warms up, thermostat gradually releases control until supplementary air valve is closed and fuel control rod has returned to its normal position.

Barometric Cell

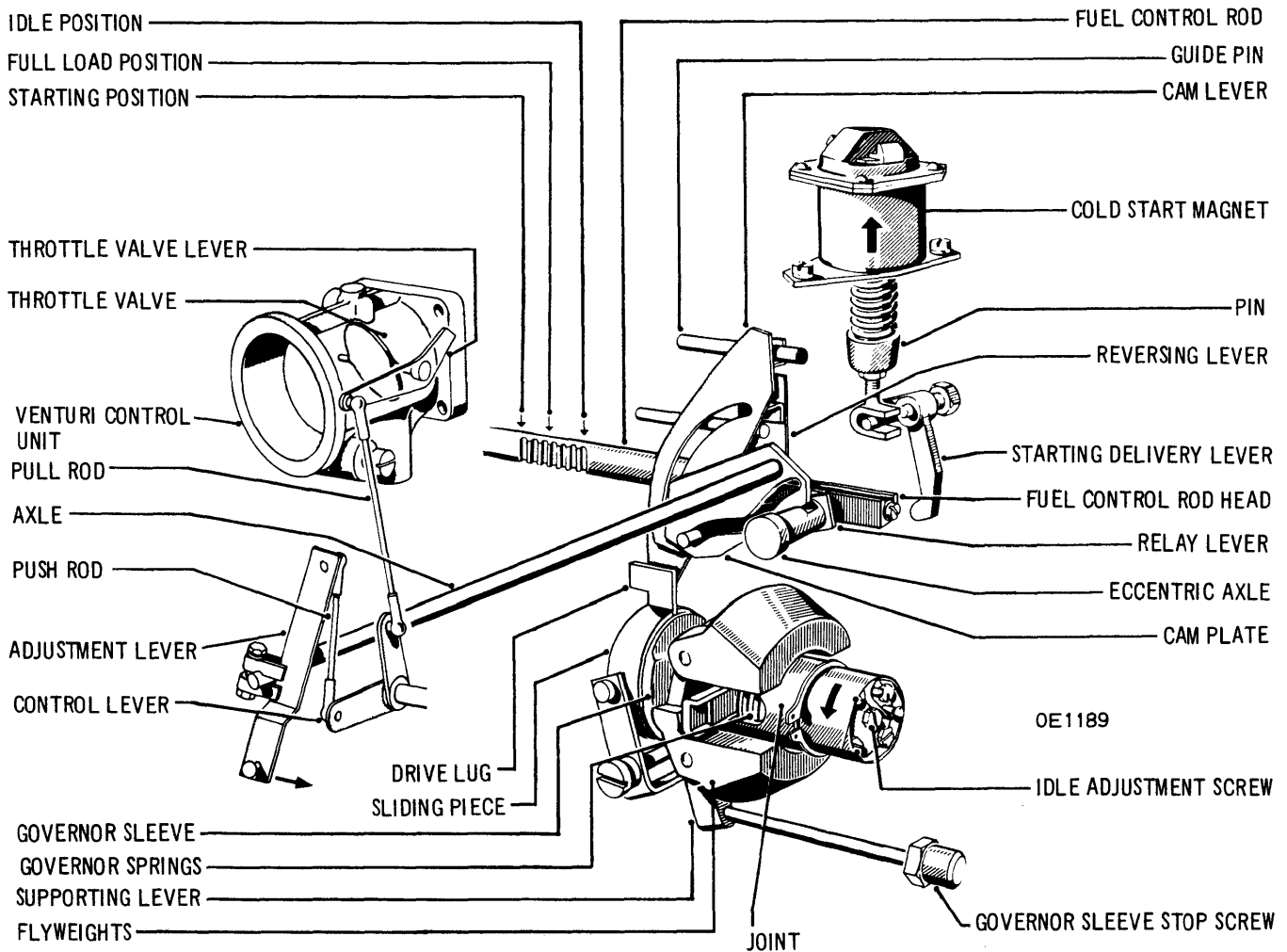
Compensates for changes in air pressure. When aneroid mechanism expands, action is transferred to compensating mechanism which corrects given position of fuel control rod so that quantity of injected fuel is increased at high air pressures, and reduced when pressure drops, such as in changing weather or when driving in mountains.

Enrichment Solenoid

Enriches combustion mixture in cold and hot starting (controlled by thermo-limit switch and time-limit relay). Enrichment solenoid has been incorporated in pump and acts directly on plunger control rack, moving it beyond "full power" position with plunger aligning for starting-rate fuel delivery. Time-limit relay closes solenoid circuit for two seconds during each starting procedure, without regard to temperature. A thermo-limit switch keeps energizing circuit closed over an appropriately longer period of time during cold starts. An additional thermo-switch also activates a supplemental cold-starting device at lower temperatures.

Bosch Fuel Injection

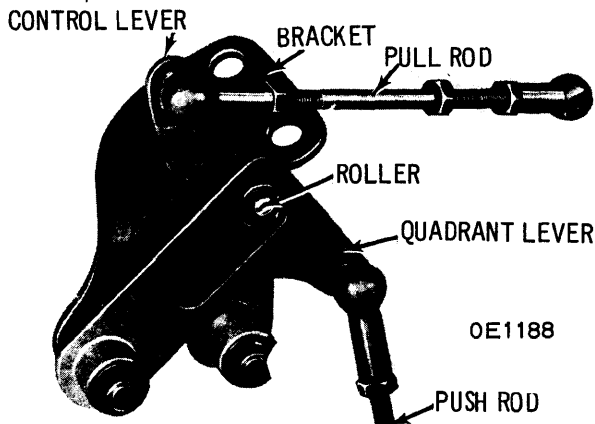
MERCEDES-BENZ MECHANICAL TYPE (Cont.)



**CONTROL UNIT (TYPICAL)
WITH CAM PLATE AND CAM LEVER**

2) Actuate control shaft and adjust protractor on venturi control unit to throttle valve angle given in table and read off angle indicated on protractor on injection pump. This angle must be within tolerances given in table. Small differences can be removed by readjusting control rods. In full load position, adjustment lever on injection pump must rest against full load stop, and there must be a clearance of about .004" (1 mm) between throttle valve lever and full load stop.

3) On engines with progressive linkage check limit stop of roller in quadrant lever and if necessary adjust pull rod in such a way that the roller lightly rests against limit stop in quadrant lever without exerting any force.



PROGRESSIVE CONTROL LINKAGE

Throttle Valve Angle (°)	Governor Angle (°)
0	0
2.5	4-4.5
5	8-8.5
7.5	11.5-12.5
10	15.5-16.5
15	22.5-23.5
20	29-30
30	40.5-42
40	50.5-51.5
50	59-60
60	67-68
70	73.5-75
80-82	79-82

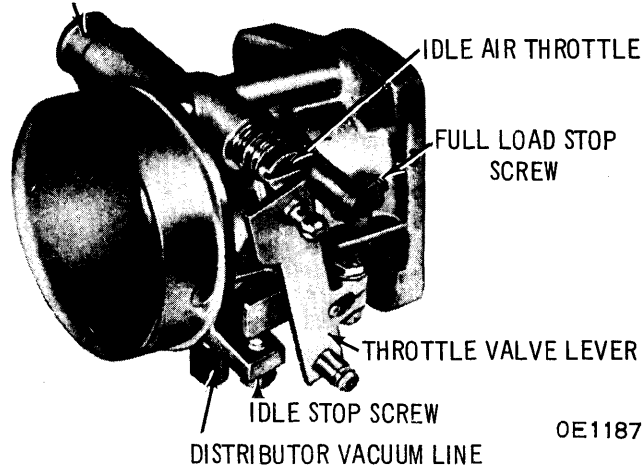
MERCEDES-BENZ MECHANICAL TYPE (Cont.)

Idle Speed Adjustment

With engine at normal operating temperature, manual transmission in Neutral and automatic transmission in Park, adjust idle speed as follows:

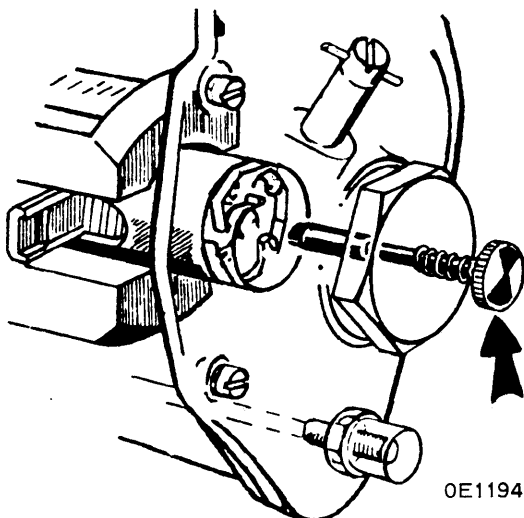
Connect tachometer and adjust idle to specified RPM by means of idle air throttle on Venturi control unit. If engine runs properly, no further correction required. If engine speed fluctuates, fuel/air mixture too rich. If engine vibrates, mixture too lean. If further adjustment is required, idle speed injection quantity may be adjusted with spring-loaded idle control knob on injection pump. Before attempting this adjustment STOP THE ENGINE. This idle control knob must only be operated when engine is stopped since knob rotates as soon as it engages in slot of adjusting screw on centrifugal governor. To adjust, press in on spring-loaded idle control knob and turn it until it engages slot of adjustment screw. Turn knob one notch to left if mixture is too rich and one notch to right if mixture

ENGINE AIR VENT CONNECTION



MODEL 220 SEB VENTURI CONTROL

too lean. **NOTE** - This adjustment must only be moved from notch to notch and at most, up to three notches to left or right of basic position. Readjust idle to specified RPM by means of idle air throttle. If engine still does not run smoothly, repeat correction until engine has been properly adjusted.



SPRING-LOADED IDLE CONTROL KNOB

SPECIFICATIONS

Engine Idle Speed (RPM)

Model	Manual Trans.	Auto. Trans.
Without Exhaust Emission Control		
220 SEB	750-800	750-800
230 SL, 250 SE, 250 SL	750-800	700-750
280 SE/8, 280 SL/8, and 300 SEL/8	700-800	700-800
300 SE, 300 SEB, and 300 SEL	650-700	680-720
300 SEL/8 6.3, 600		560-600
Exhaust Emission Control, Version 1968/69		
250 SE, 250 SL	700-750	700-750
280 SE/8, 280 SL/8 and 300 SEL/8	700-800	700-800
300 SEL/8 6.3, 600		560-600
Exhaust Emission Control, Version 1970		
280 SE/8, 280 SL/8, and 300 SEL/8	750-850	750-850
300 SEL/8 6.3, 600		560-600

Fuel Pump Pressure & Volume

Engines With Two-Plunger Injection Pumps

Pressure (psi)

Delivery Pressure	① 8.8-11.8 (0.6-0.8 atm)
Delivery End Pressure (minimum)	② 17.6 (1.2 atm)
Delivery Volume (in 20 seconds)	② ③ 2.1 pts (1.0 ltr)

Engines With Six or Eight-Plunger Injection Pumps

Delivery Pressure	③ 11.8-16.2 (0.8-1.1 atm)
Delivery End Pressure (minimum)	④ 19.1 (1.3 atm)
Delivery Volume (in 15 seconds)	④ ⑤ 2.1 pts (1.0 ltr)

- ① - Measured after fuel fine filter.
- ② - Measured after return flow damper bowl.
- ③ - Measured in front of starter valve.
- ④ - Measured behind overflow valve of injection pump.
- ⑤ - Fuel tank must be at least half full for test.

NOTE - All tests are made with engine stopped and a minimum of 11 volts at fuel pump.

Position Of Crankshaft When Installing Injection Pump

Model	Setting
With Two-Cylinder Injection Pump	
220 SEB, 300 SE	TDC
With Six or Eight Cylinder Injection Pump	
230 SL, 250 SE, 250 SL, 280 SL/8, and 300 SEL/8	20° ATDC
300 SE, 300 SEB, 300 SEL, 300 SEL/8 6.3, and 600	60° ATDC

NOTE - Injection pump timing is correct when mark on camshaft lines up with mark on pump bearing cover.