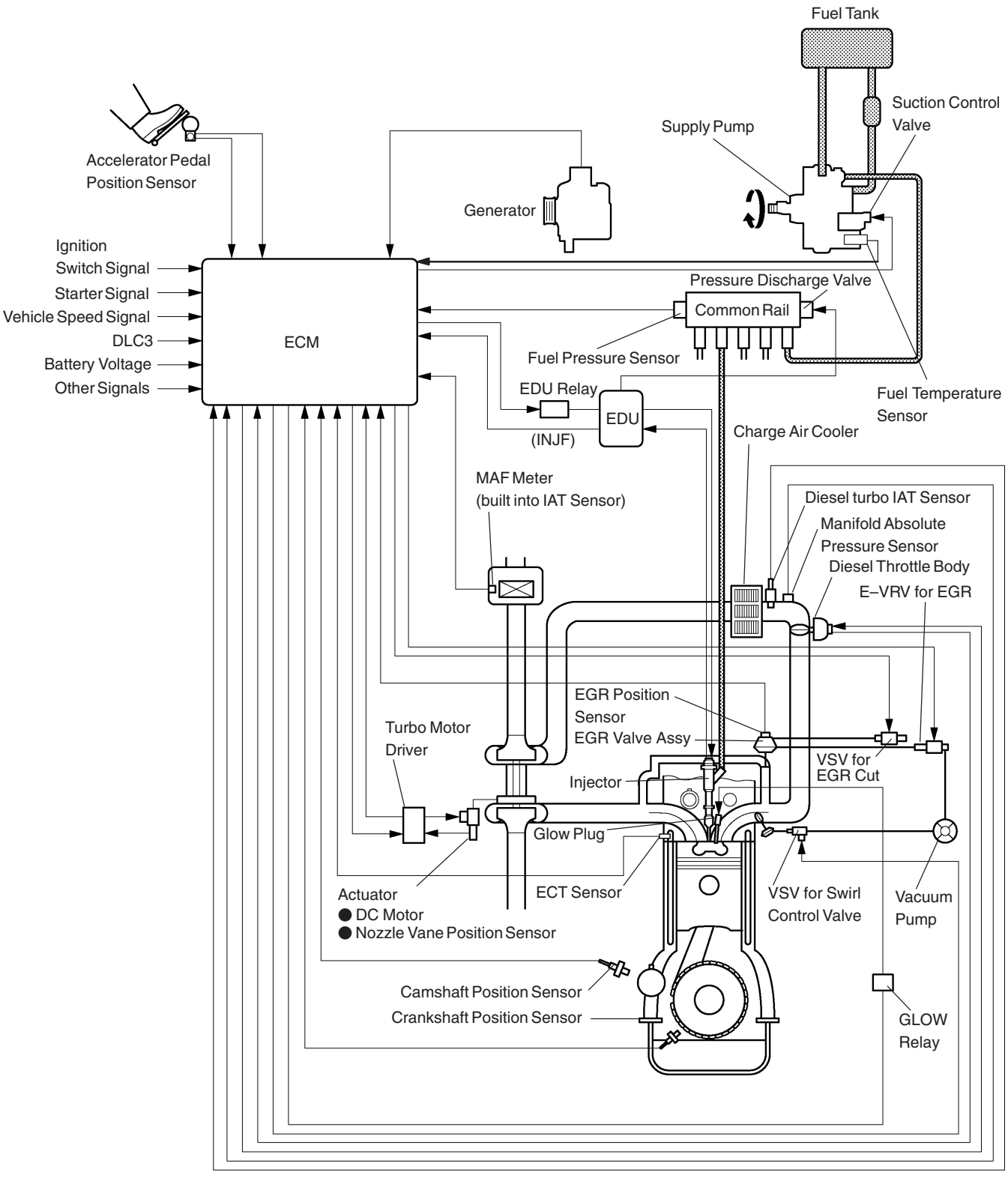
05NIZ–01

SYSTEM DESCRIPTION

1. ENGINE CONTROL SYSTEM

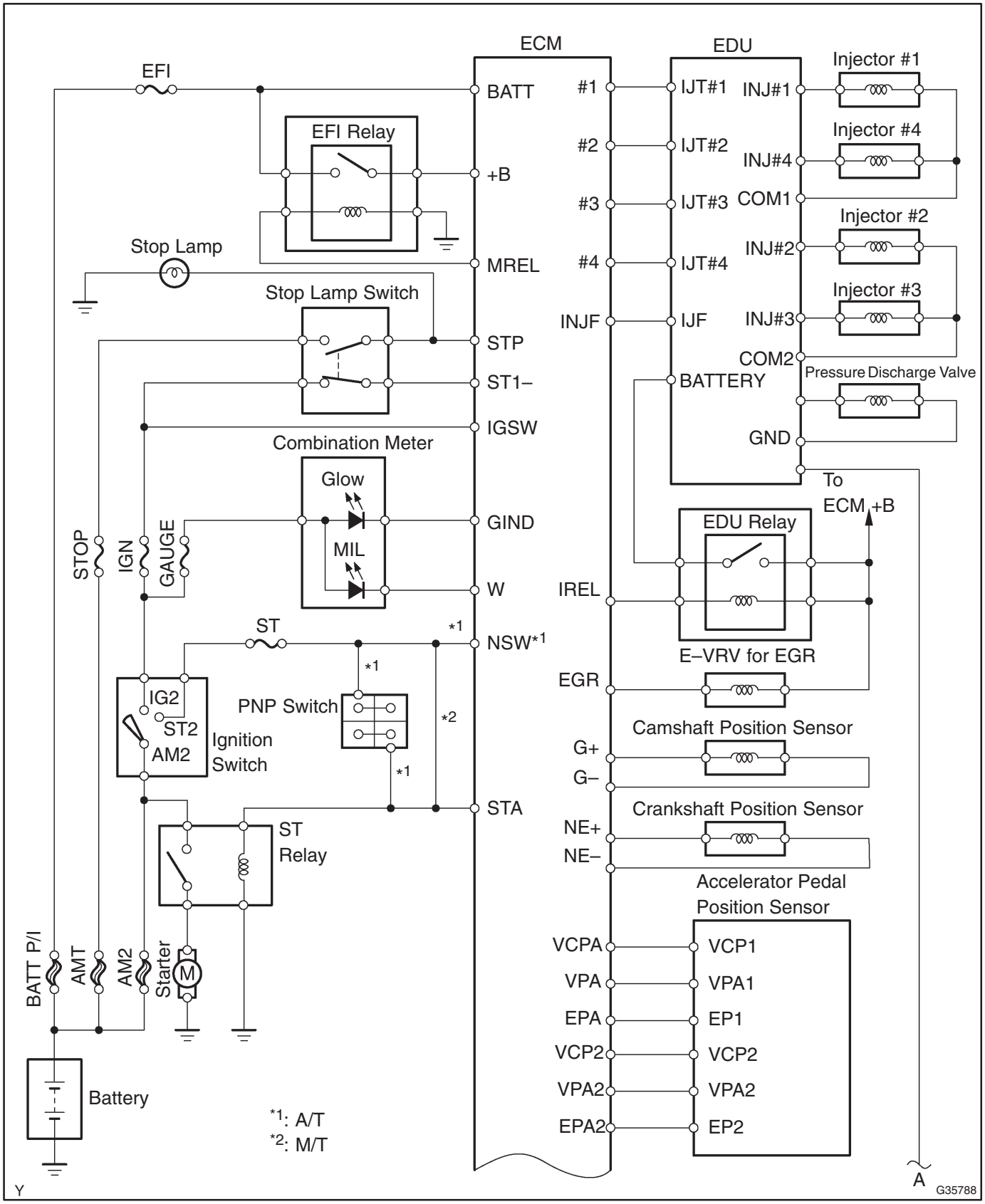
System Diagram

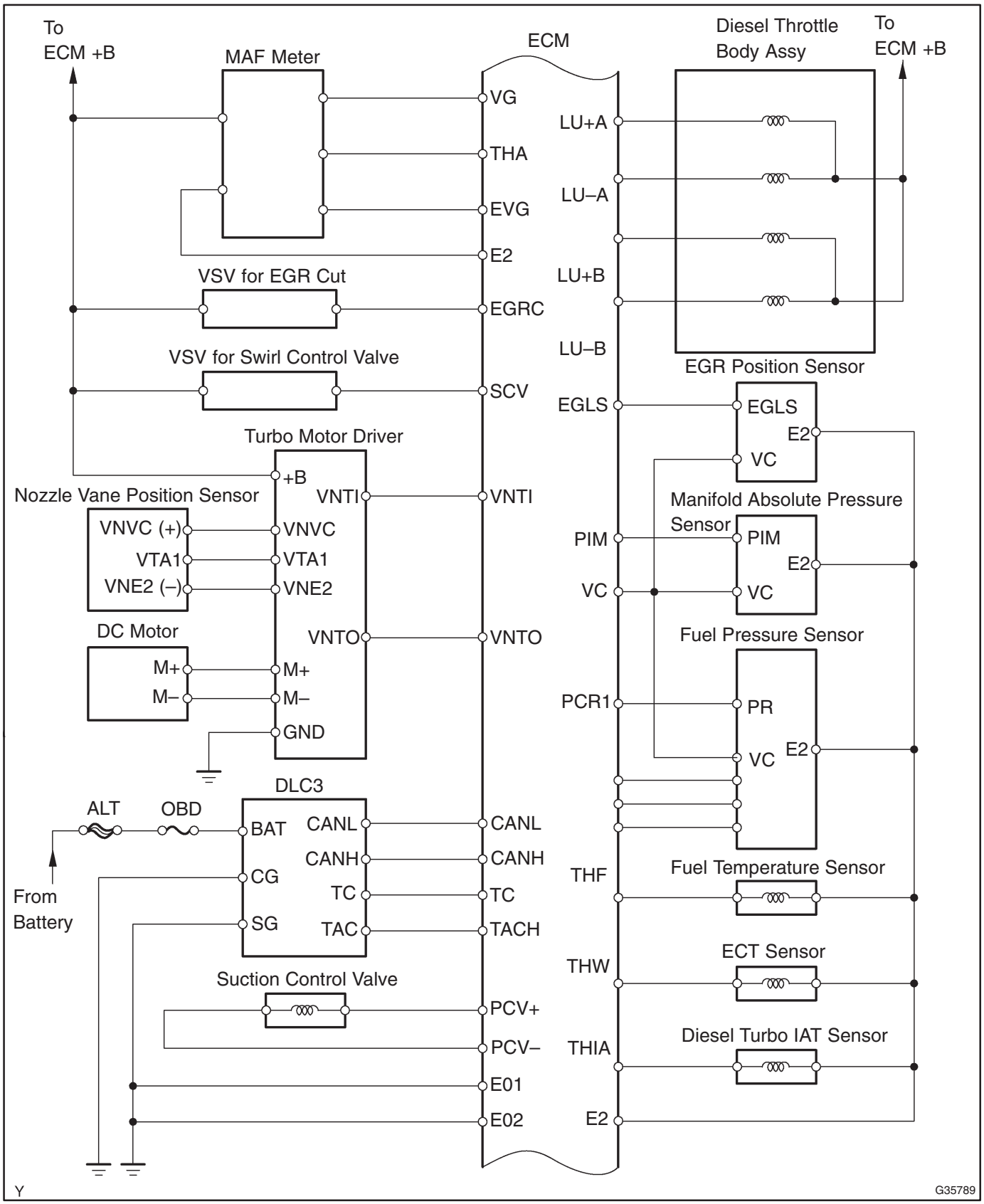


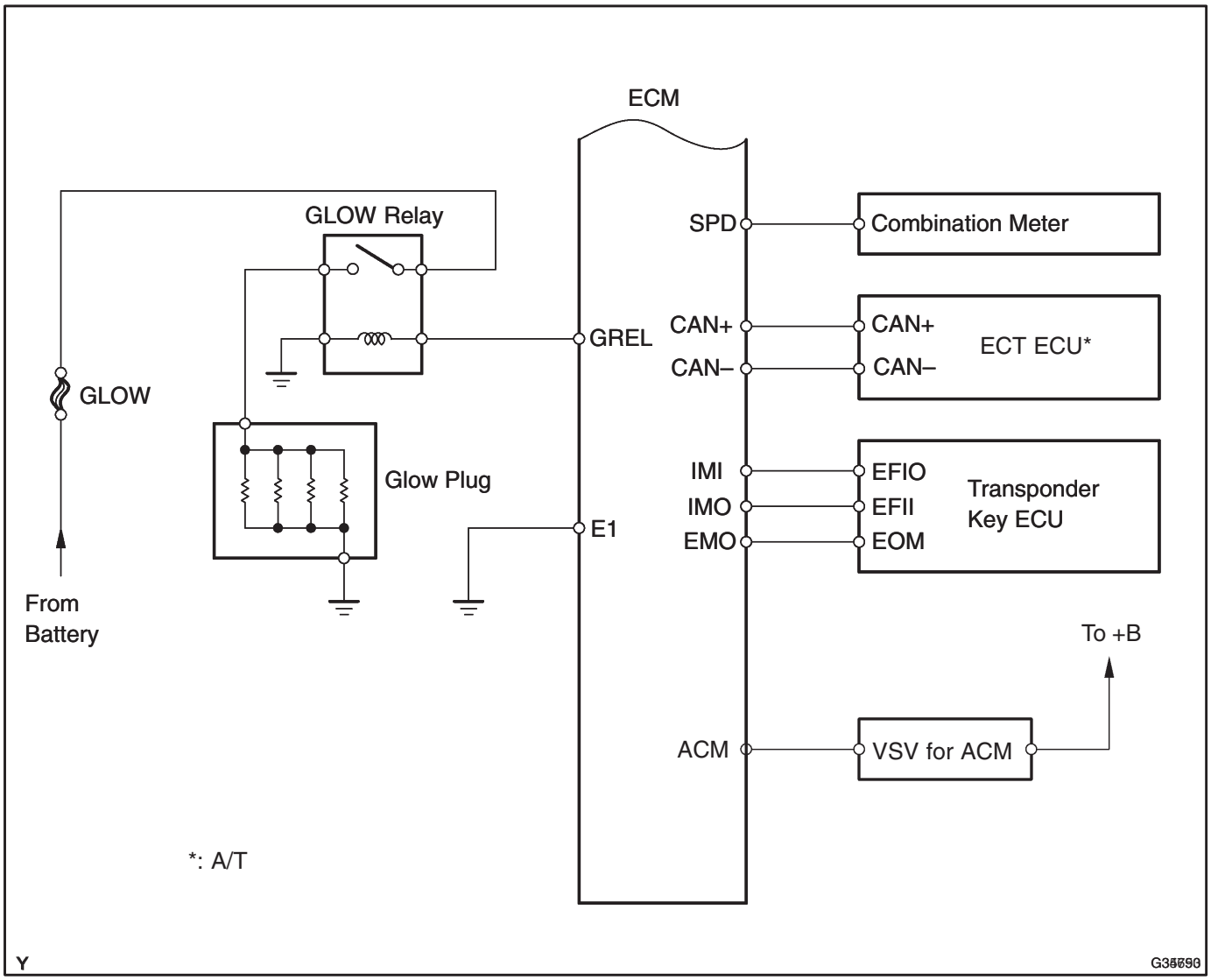
Y

G35791

2. ECM WIRING DIAGRAM




To
ECM +B
MAF Meter
ECM
Diesel Throttle
Body Assy
To
ECM +B
VG
THA
EVG
E2
LU+A
LU–A
LU+B
LU–B
VSV for EGR Cut
EGRC
VSV for Swirl Control Valve
SCV
EGR Position Sensor
EGLS
E2
VC
Turbo Motor Driver
+B
VNTI
VNTI
Nozzle Vane Position Sensor
VNVC (+)
VTA1
VNE2 (–)
VNVC
VTA1
VNE2
Manifold Absolute Pressure
Sensor
PIM
VC
DC Motor
M+
M–
GND
VNTO
VNTO
Fuel Pressure Sensor
PCR1
PR
DLC3
ALT
OBD
BAT
CG
SG
CANL
CANH
TC
TAC
CANL
CANH
TC
TACH
From
Battery
THF
Fuel Temperature Sensor
ECT Sensor
THW
Suction Control Valve
PCV+
PCV–
E01
E02
Diesel Turbo IAT Sensor
THIA
Y
G35789


ECM
GLOW Relay
GLOW
Glow Plug
From
Battery
GREL
E1
SPD
Combination Meter
CAN+
CAN–
CAN+
CAN–
ECT ECU*
IMI
IMO
EMO
EFIO
EFII
EOM
Transponder
Key ECU
To +B
ACM
VSV for ACM
*: A/T
Y
G35790

3. COMMON RAIL SYSTEM DESCRIPTION

(a) COMMON RAIL SYSTEM:

The common rail system uses high–pressurized fuel for improved fuel economy and to provide robust engine power, while suppressing engine vibration and noise.

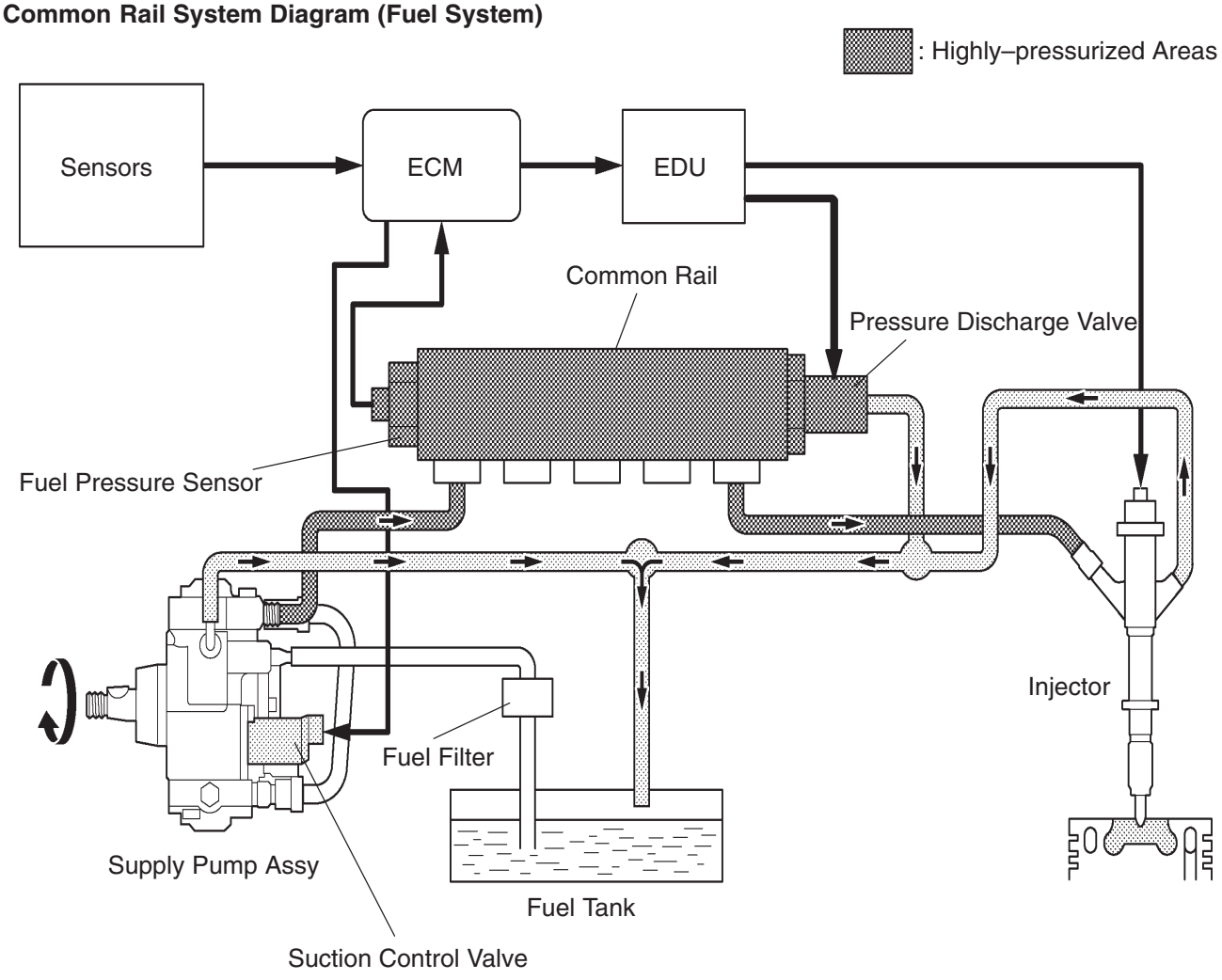
This system stores fuel, which has been pressurized and supplied by the supply pump, in the common rail. By storing fuel at high–pressure, the common rail system can provide fuel at stable fuel injection pressures, regardless of engine speed or engine load.

The ECM provides an electric current to the solenoid valve in the injector, using the EDU, to regulate the fuel injection timing and volume, and also monitors the internal fuel pressure of the common rail using the fuel pressure sensor. The ECM causes the supply pump to supply the fuel necessary to obtain the target fuel pressure.

In addition, this system uses the 2–Way Valve (TWV) inside the injector to open and close the fuel passage. Therefore, both fuel injection time and fuel injection volume can be precisely regulated by the ECM.

The common rail system provides two split fuel injections. In order to soften combustion shock, this system performs ”pilot–injection” as the subsidiary fuel injection prior to the main fuel injection. This helps to reduce engine vibration and noise.

Common Rail System Diagram (Fuel System)



(b) COMMON RAIL SYSTEM COMPONENTS:

Component	Description
Common rail	Stores high–pressure fuel produced by supply pump
Supply pump	Operated by crankshaft. Supplies high–pressure fuel to common rail
Injector	Injects fuel to combustion chamber based on signals from ECM
Fuel pressure sensor	Monitors internal fuel pressure of common rail and sends signals to ECM
Pressure discharge valve	Based on signals from ECM, opens valve when sudden deceleration is occurred, or when engine switch is OFF to prevent fuel pressure from becoming too high
Suction control valve	Based on signals from ECM, adjusts fuel volume supplied to common rail and regulates internal fuel pressure

(c) DIAGNOSTICS TROUBLE CODES (DTCS) TABLE FOR COMMON RAIL SYSTEM:

HINT:

This table indicates typical DTC combinations for each malfunction occurrence.

( ): Potential DTCs

DTC No.	A	B	C	D	E	F	G	H	I	J	K
P0087/78 (see page 05–486)				●							
P0088/49 (see page 05–495)						(●)	(●)	(●)			
P0093/78 (see page 05–501)	(●)	●			●					(●)	●
P0190/49 (see page 05–486)				●							
P0192/49 (see page 05–486)				●							
P0193/49 (see page 05–486)				●							
P0200/97 (see page 05–547)	●									(●)	
P0627/78 (see page 05–593)							●				
P1229/78 (see page 05–495)							●	●			
P1271 (see page 05–596)					●						(●)
P1272 (see page 05–596)					●		●				(●)

Trouble Area	Malfunction	Refer to
Injector	Open or short in injector circuit	A
Injector	Stuck open	B
Injector	Stuck closed	C
Fuel pressure sensor	Open or short in fuel pressure sensor circuit or pressure sensor output fixed	D
Pressure discharge valve	Open or short in pressure discharge valve circuit	E
Pressure limiter	Stuck closed	F
Suction control valve	Open or short in suction control valve circuit	G
Suction control valve	Stuck open	H
Suction control valve	Stuck closed	I
EDU	Faulty EDU	J
Common rail system (Fuel system)	Fuel leaks in high–pressure areas	K

(d) DIAGNOSTICS TROUBLE CODE DESCRIPTION FOR COMMON RAIL SYSTEM:

DTC No.	Description
P0087/78	Fuel pressure sensor output does not change
P0088/49	Internal fuel pressure too high (200 MPa [2,039 kgf/cm^2, 29,007 psi] or more)
P0093/78	Fuel leaks in high–pressure areas
P0190/49	Open or short in fuel pressure sensor circuit (output voltage is too low or too high)
P0192/49	Open or short in fuel pressure sensor circuit (output voltage is too low)
P0193/49	Open or short in fuel pressure sensor circuit (output voltage is too high)
P0200/97	Open or short in EDU or injector circuit
P0627/78	Open or short in suction control valve circuit
P1229/78	Fuel over–feed

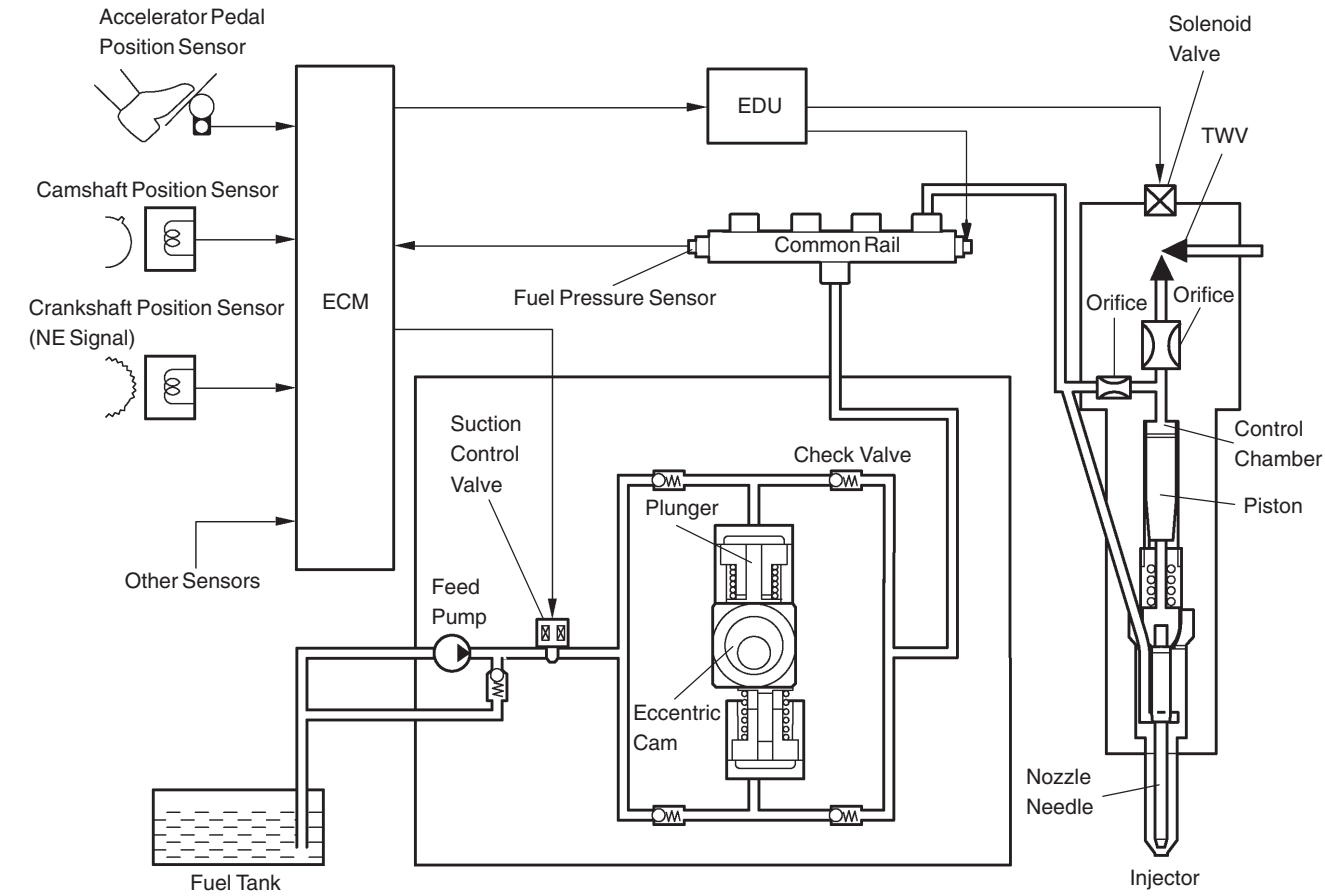
DTC No.	Description
P1271	Open or short in pressure discharge valve circuit
P1272	Closed malfunction of the pressure discharge valve

4. INJECTION CONTROL SYSTEM DESCRIPTION

The ECM controls the fuel injection system by using the injectors and supply pump. The ECM regulates the fuel injection volume and fuel injection timing by controlling both the duration and timing of energization to the solenoid valve in the injector. The ECM regulates injection pressure by controlling the suction control valve located in the supply pump.

The feed pump is used to pump fuel from the fuel tank to the supply pump.

Injection Control Diagram

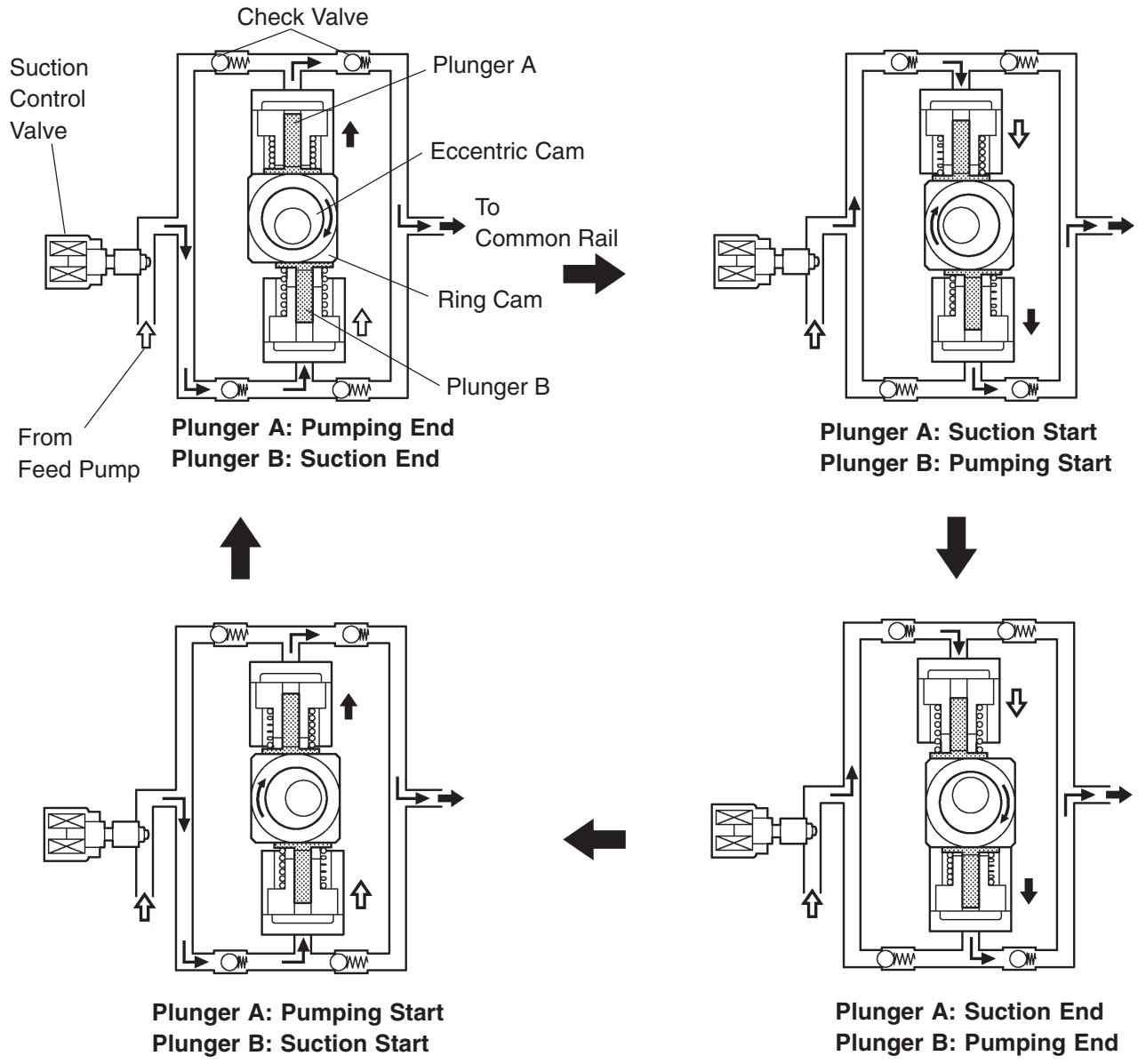


Y A81479

5. SUPPLY PUMP OPERATION SYSTEM DESCRIPTION

The rotation of the eccentric cam causes the ring cam to push plunger A upward as illustrated below. The spring force pulls plunger B (located opposite plunger A) upward. As a result, plunger B draws the fuel in, and plunger A pumps fuel out at the same time.

Supply Pump Operation Diagram



Y

A96633

6. SUCTION CONTROL VALVE OPERATION SYSTEM DESCRIPTION

HINT:

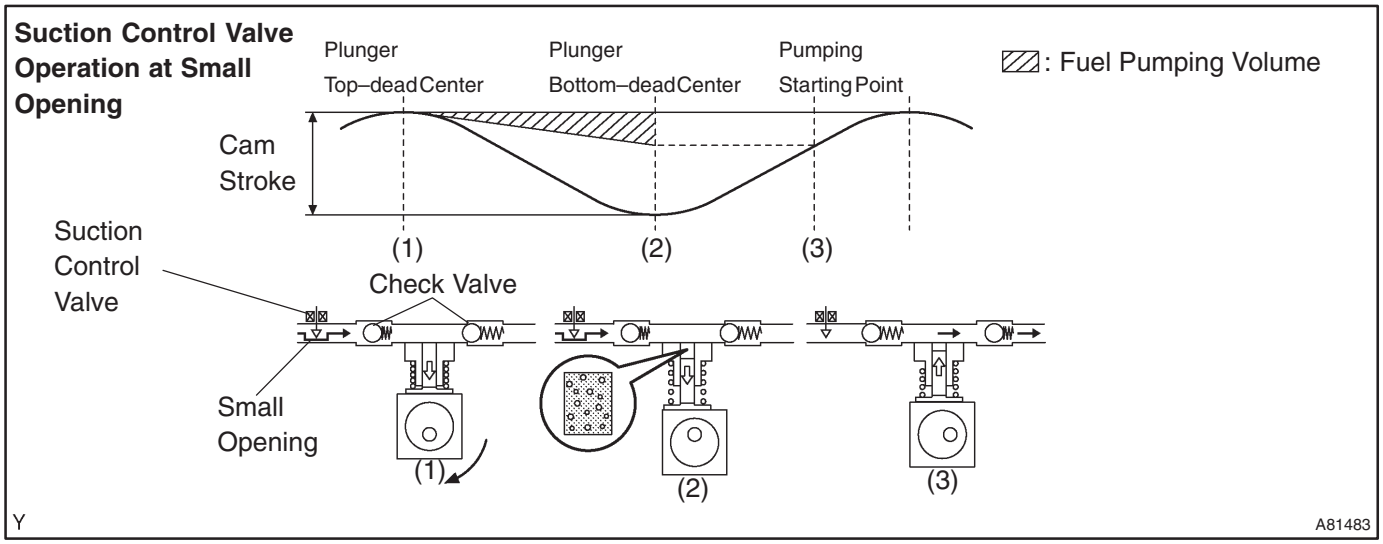
The ECM controls the suction control valve operation to regulate the fuel volume that is pumped by the supply pump to the common rail. This control is performed to adjust the internal fuel pressure of the common rail to the targeted injection pressure.

(a) Small opening of the suction control valve:

(1) When the opening of the suction control valve is small, the fuel suction path is kept narrow. Therefore the transferable fuel volume is reduced.

(2) The suction volume becomes small due to the narrow path despite the plunger stroke being full. The difference between the geometrical volume and suction volume creates a vacuum.

(3) Pumping will start at the time when the fuel pressure becomes higher than the common rail pressure.



(b) Large opening of the suction control valve:

(1) When the opening of the suction control valve is large, the fuel suction path is kept wide. Therefore the transferable fuel volume is increased.

(2) If the plunger stroke is full, the suction volume becomes large because of the wide path.

(3) Pumping will start at the time when the fuel pressure becomes higher than the common rail pressure.

