My random collection of 1.8L documents.

HIGH TENSION WIRE RESISTANCE

HIGH TENSION WIRE RESISTANCE

Application	Ohms
All Models	3000-6700 Per Foot

SPARK PLUGS

SPARK PLUG TYPE

Application	Nippondenso	NGK
Sidekick	K20PR-U	BKR6E

SPARK PLUG SPECIFICATIONS

Application	Gap: In. (mm)	Torque: Ft. Lbs. (N.m)
Sidekick 1.8L	.028-.031 (.7-.8)	18 (25)

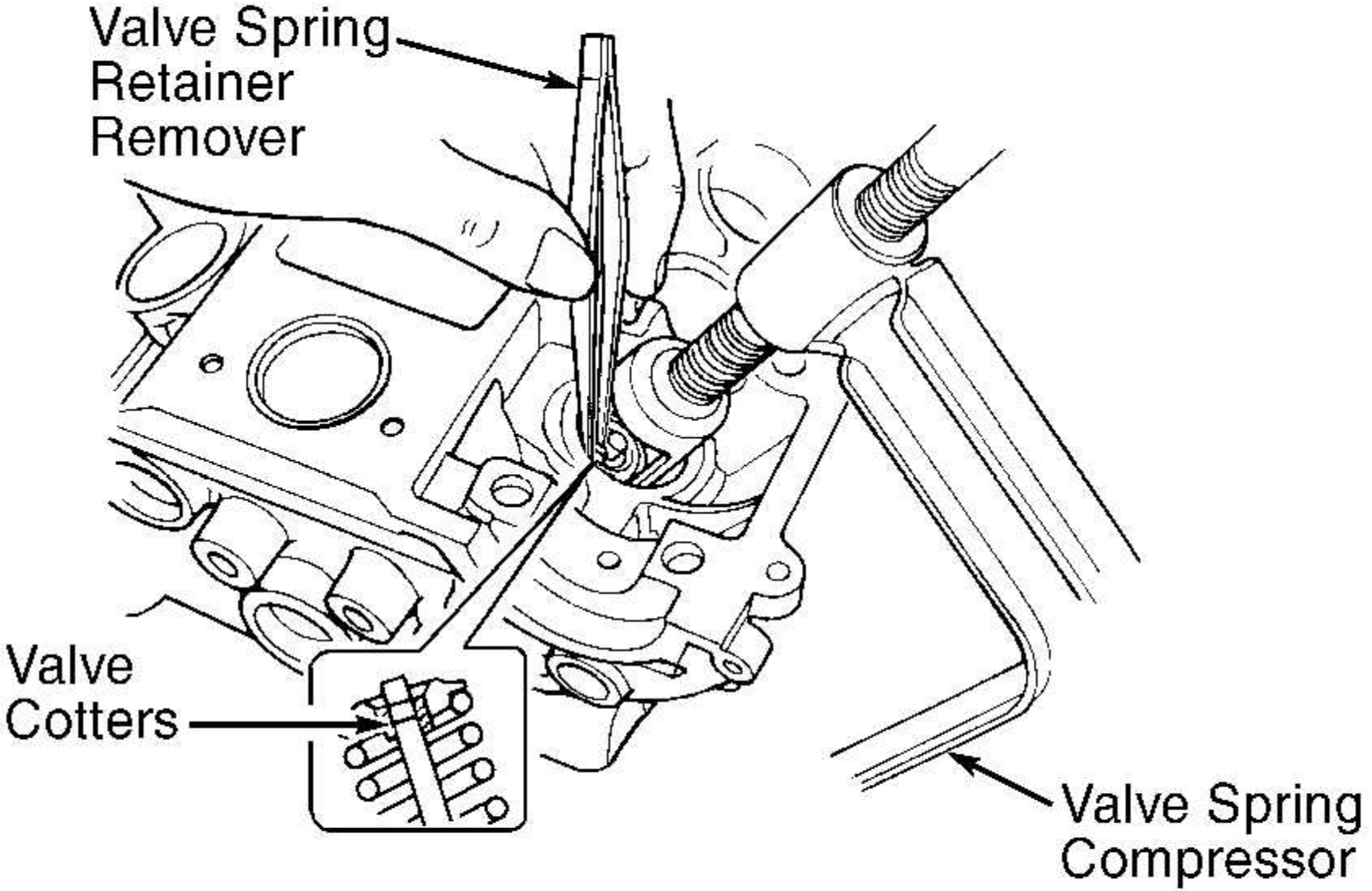
IGNITION TIMING

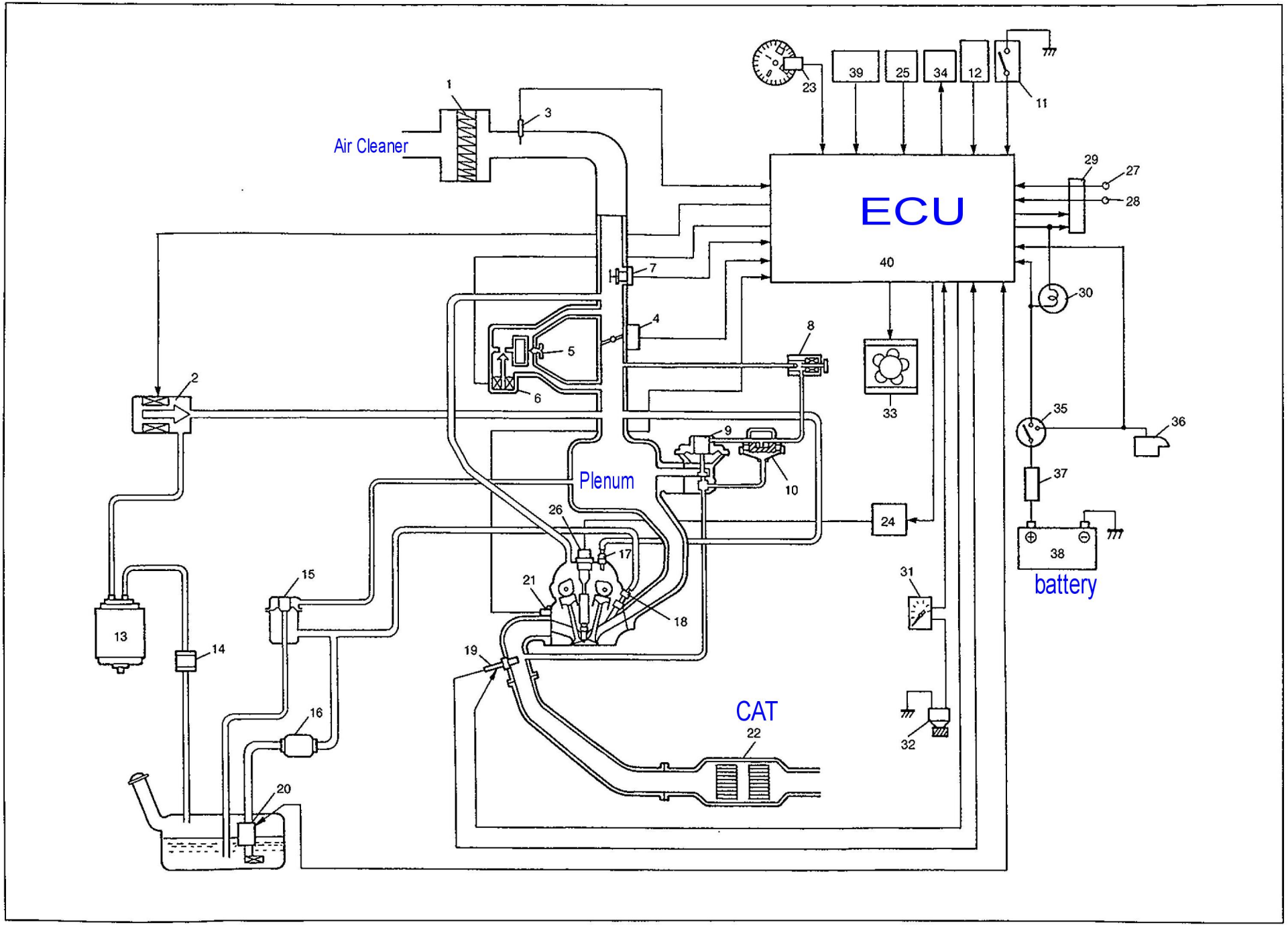
IGNITION TIMING (Degrees BTDC @ RPM) (1)

Application	Man. Trans.	Auto. Trans.
Sidekick 1.8L	(2) 4-6 @ 750-850	(2) 4-6 @ 750-850

(1) See **Fig. 2** for timing mark location.

(2) With jumper wire installed between terminals No. 4 (Black wire) and No. 5 (Blue/Red wire) of test connector (White) located next to left strut tower.


Valve Spring
Retainer
Remover
Valve
Cotters
Valve Spring
Compressor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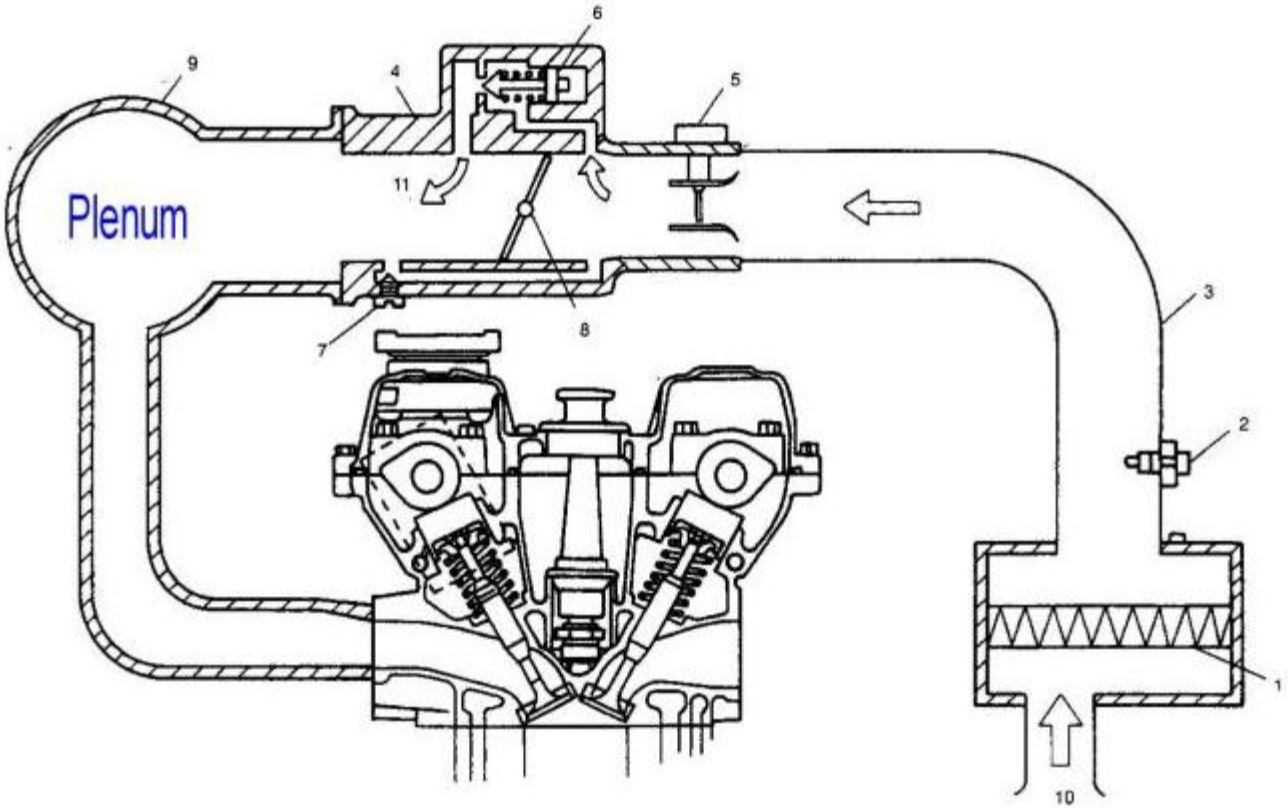
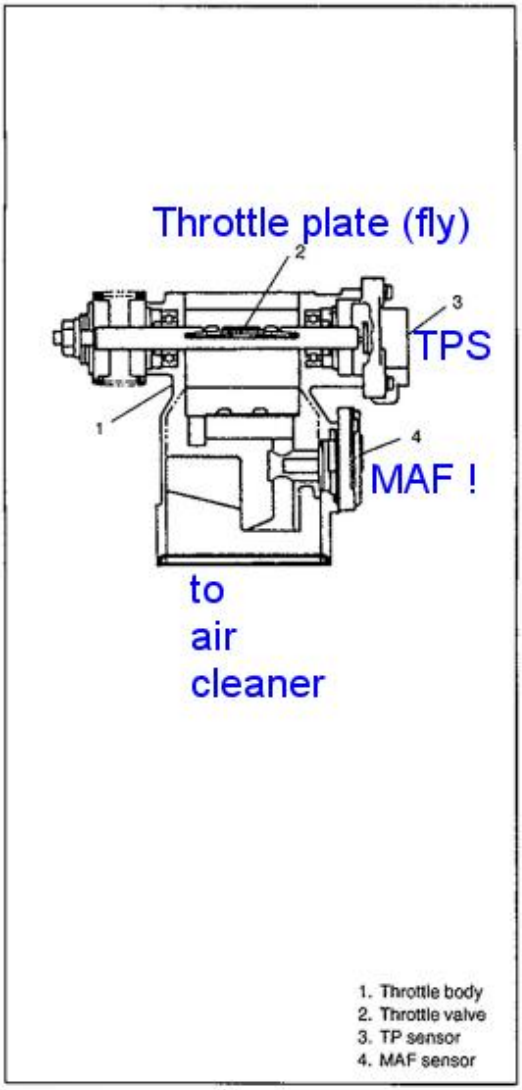


1. Air cleaner
2. IAT sensor
3. Air cleaner outlet hose
4. Throttle body
5. MAF sensor
6. IAC valve
7. Idle speed adjusting screw
8. Throttle valve
9. Intake manifold
10. Intake air
11. Bypass air

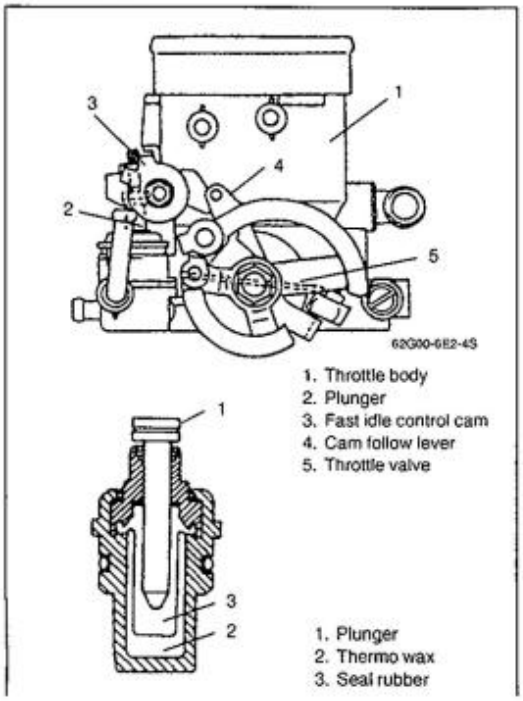
THROTTLE BODY



1. Throttle body
2. Throttle valve
3. TP sensor
4. MAF sensor

TB

FAST IDLE CONTROL SYSTEM

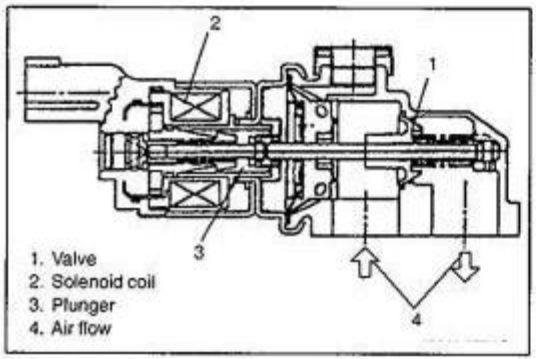


1. Throttle body
2. Plunger
3. Fast idle control cam
4. Cam follow lever
5. Throttle valve

1. Plunger
2. Thermo wax
3. Seal rubber

IAC Plunger

ISC

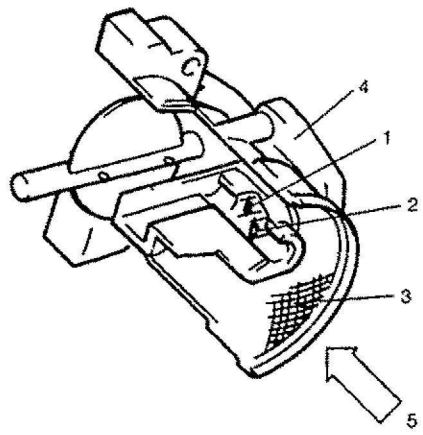


IDLE AIR CONTROL VALVE

The IAC valve controls opening of the bypass air passage (i.e.,bypass air flow). The opening increase and decreases according to the electric current flow to the IAC valve which is controlled by ECM.

the coil is 14 ohms
and is diode clamped.

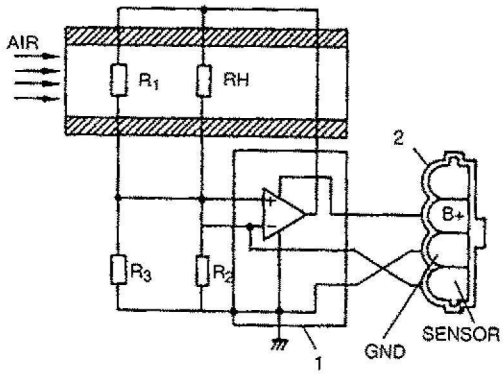
This means
its POLARIZED
do not power it up
backwards



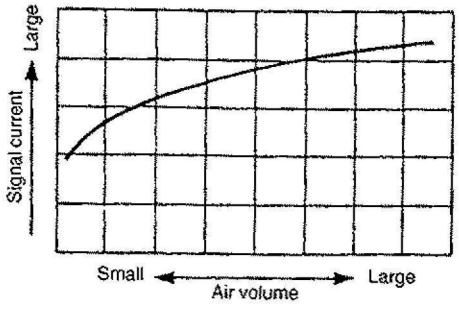
1. Heat-resistor
2. Metering duct
3. Straightening net
4. Control circuit
5. Air from air cleaner

Mass Air Flow Sensor (MAF Sensor)

The MAF sensor is incorporated with throttle body and consists of heat resistor, metering duct, straightening net, body, control circuit, etc.
It detects the mass flow of the air drawn into the engine and sends that information to ECM as a current signal.
ECM uses the signal as one of the signals to control various devices.



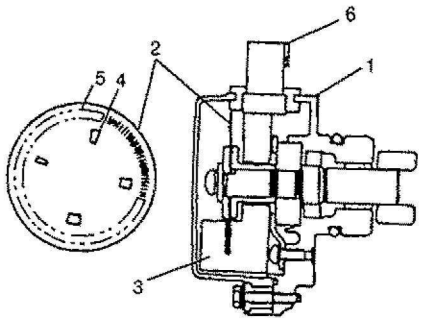
This MAF sensor is a thermal control type including a heat-resistor and a control circuit.
The heat resistor is cooled off by the intake air and the control circuit controls the heat-resistor temperature (the amount of electric current flowing to the heat-resistor) so as to keep it within a certain difference range from the ambient temperature. Then this control value is output as a current signal.

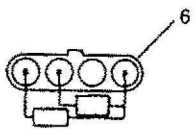


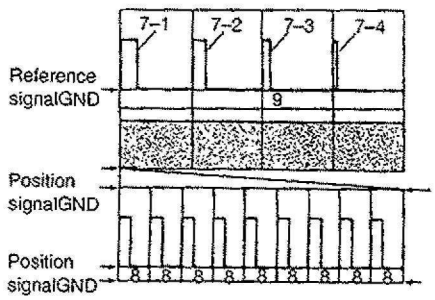
1. Control circuit
2. Coupler

RH: Heat-resistor
R: Resistor

A Pathetic chart , if ever.







1. CMP sensor
2. Slits plate
3. Photo transistor
4. Slits for Reference signal (4 pulses)
5. Slits for Position signal (360 pulses)
6. CMP sensor coupler
7-1. BTDC 110° of No.1 piston
7-2. BTDC 110° of No.3 piston
7-3. BTDC 110° of No.4 piston
7-4. BTDC 110° of No.2 piston
8. 1° of camshaft angle. (2° of crankshaft angle)
9. A revolution of camshaft (2 revolutions of crankshaft)

Camshaft Position Sensor (CMP sensor)

The CMP sensor located on the rearward of left side cylinder head consists of the signal generator (photo transistors) and signal rotor (slits plate).

The signal generator generates Reference signal and Position signal through two types of slits in the slit plate which turns together with the camshaft.

Reference signal

The CMP sensor generates 4 pulses of signals each of which has a different wave form while the camshaft makes one full rotation.

Based on these signals, ECM judges which cylinder piston is at the ignition BTDC 110°.

Position signal

The CMP sensor generates 360 pulses of signals while the camshaft makes one full rotation (i.e., 1 pulse per 1° movement of the camshaft).

Based on these signals, ECM judges the size of Reference signal, the engine speed and piston position.

Engine Start Signal

This signal is sent from the engine starter circuit.

Receiving it, ECM judges whether the engine is cranking or not and uses it as one of the signals to control the fuel injector and fuel pump relay.

Closed loop system (Air/fuel ratio feed back compensation) (Vehicle with Heated oxygen sensor only)

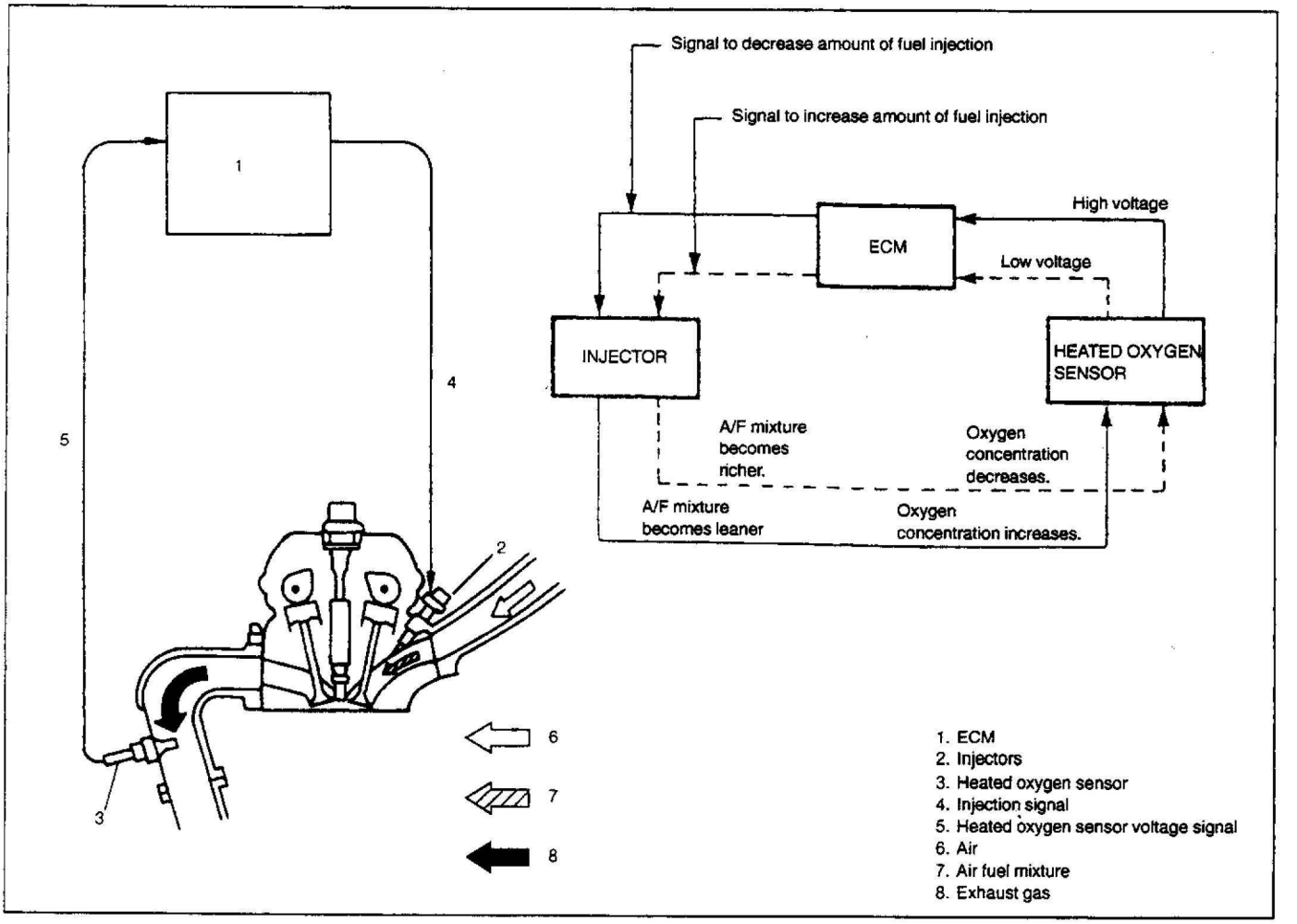
It is necessary to keep the air/fuel mixture close to the theoretical air/fuel ratio (14.7) to obtain efficient performance of the three way catalytic converter and high clarification rate of CO, HC and NOx in the exhaust gas. For that purpose, ECM operates as follows. First, ECM compares the signal from the heated oxygen sensor which is installed to the exhaust manifold and the specified reference voltage.

If the signal from the heated oxygen sensor is higher than the specified reference voltage, ECM judges that the air/fuel ratio is richer than the theoretical air/fuel ratio and reduces the fuel injection time (volume) for injectors. On the other hand, if the signal from the heated oxygen sensor is lower than the specified reference voltage, ECM judges that the air/fuel ratio is leaner than the theoretical air/fuel ratio and increases the fuel injection time (volume) for injectors. By repeating these operations, ECM compensates injection so that the air/fuel ratio becomes closer to the theoretical value.

1) When oxygen concentration in the exhaust gas is low, that is, when the air/fuel ratio is smaller than the theoretical air/fuel ratio (fuel is richer), electromotive force of the oxygen sensor increases and a rich signal is sent to ECM.
2) Upon receipt of the rich signal, ECM decreases the amount of fuel injection, which causes oxygen concentration in the exhaust gas to increase and electromotive force of the oxygen sensor to decrease. Then a lean signal is sent to ECM.
3) As ECM increases the amount of fuel injection according to the lean signal, oxygen concentration in the exhaust gas decreases and the situation is back to above 1).

This control process, however, will not take place under any of the following conditions.

- When engine coolant temperature is low
- During fuel cut
- When heated oxygen sensor is cold
- When the engine is running at high speed (higher than about 4.500 r/min).
- When highly loaded.



IDLE AIR CONTROL SYSTEM

This system controls the bypass air flow by means of ECM and idle air control valve (IAC valve) for the following four purposes.

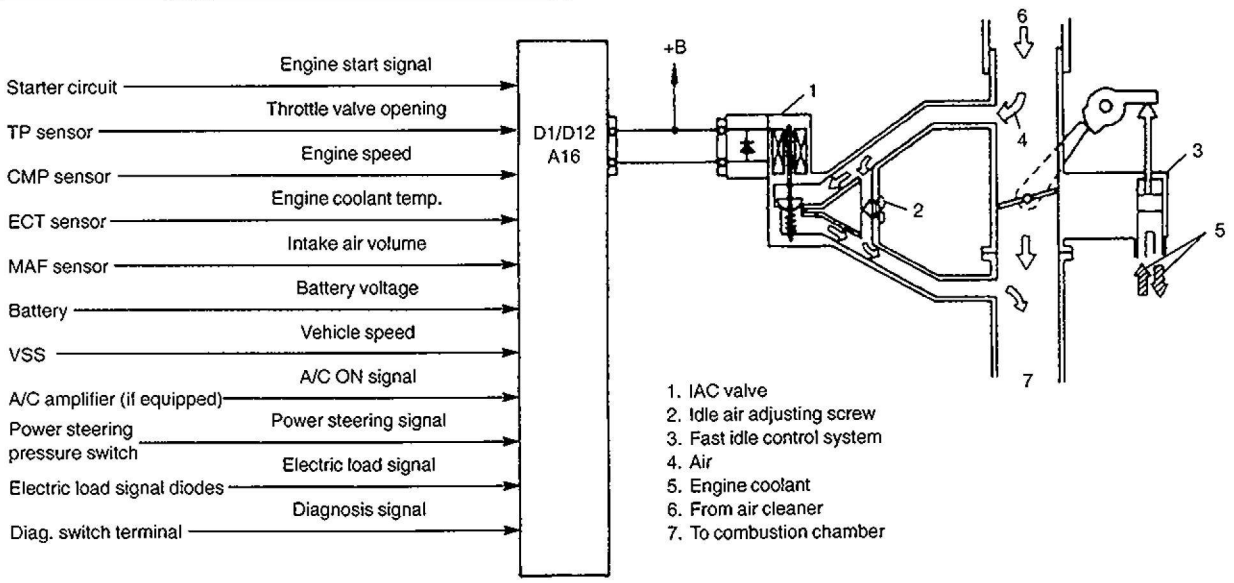
- To keep the engine idle speed as specified at all time. The engine idle speed can vary due to following reasons.
  - * Load applied to engine (when electric load is applied, A/C is turned ON, etc.)
  - * Variation in atmospheric pressure
  - * Change in engine itself with passage of time
  - * Other factors causing idle speed to change
- To improve starting performance of engine
- To compensate air/fuel mixture ratio when decelerating (Dash-pot effect)
- To improve driveability when while engine is warmed up.

Operation

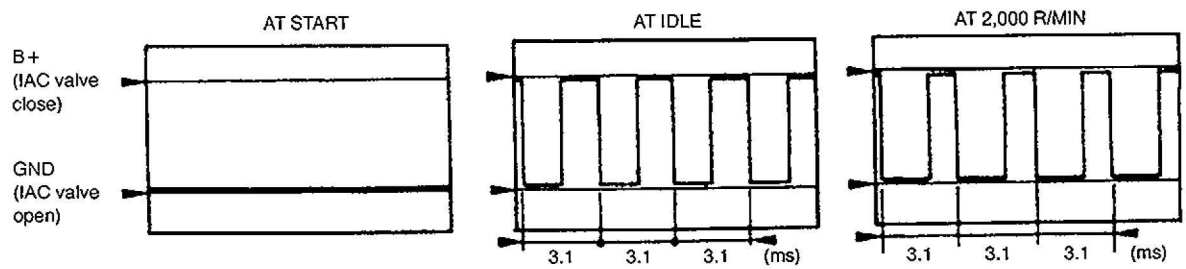
IAC valve opens the bypass passage when it is turned ON by ECM and closes when turned OFF.

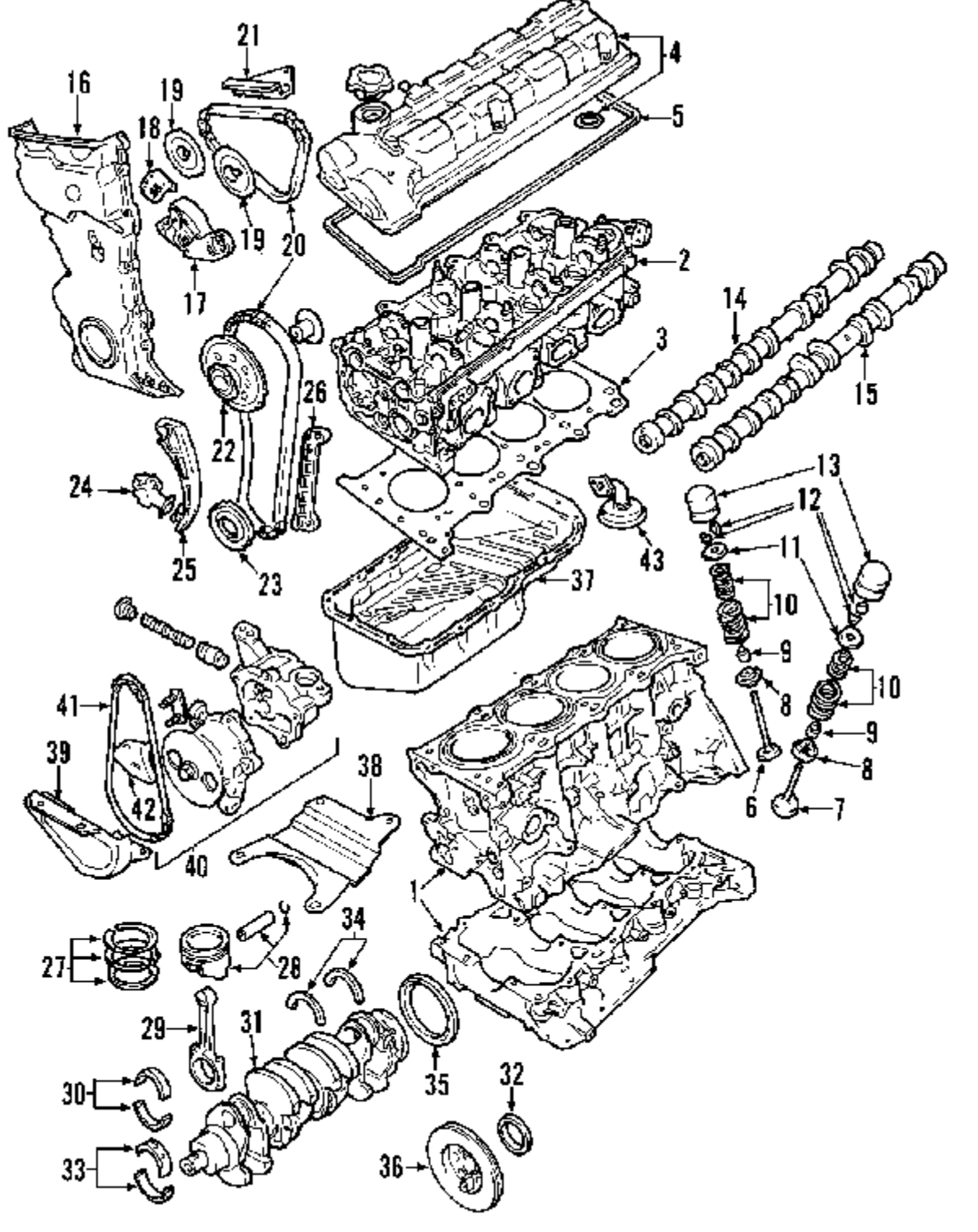
ECM detects the engine condition by using signals from various sensors and switches and while repeating ON and OFF cycle of IAC valve at a certain rate (320 times a second), it controls bypass air flow (IAC valve opening) by increasing and decreasing its ON time within a cycle. When the vehicle is at a stop, the throttle valve is at the idle position and the engine is running, the engine speed is kept at a specified idle speed.

	A/C OFF	A/C ON
Engine idle speed specification	800 ± 50 r/min.	900 ± 50 r/min.



REFERENCE (VOLTAGE WAVEFORM OF ECM A16 TERMINAL)

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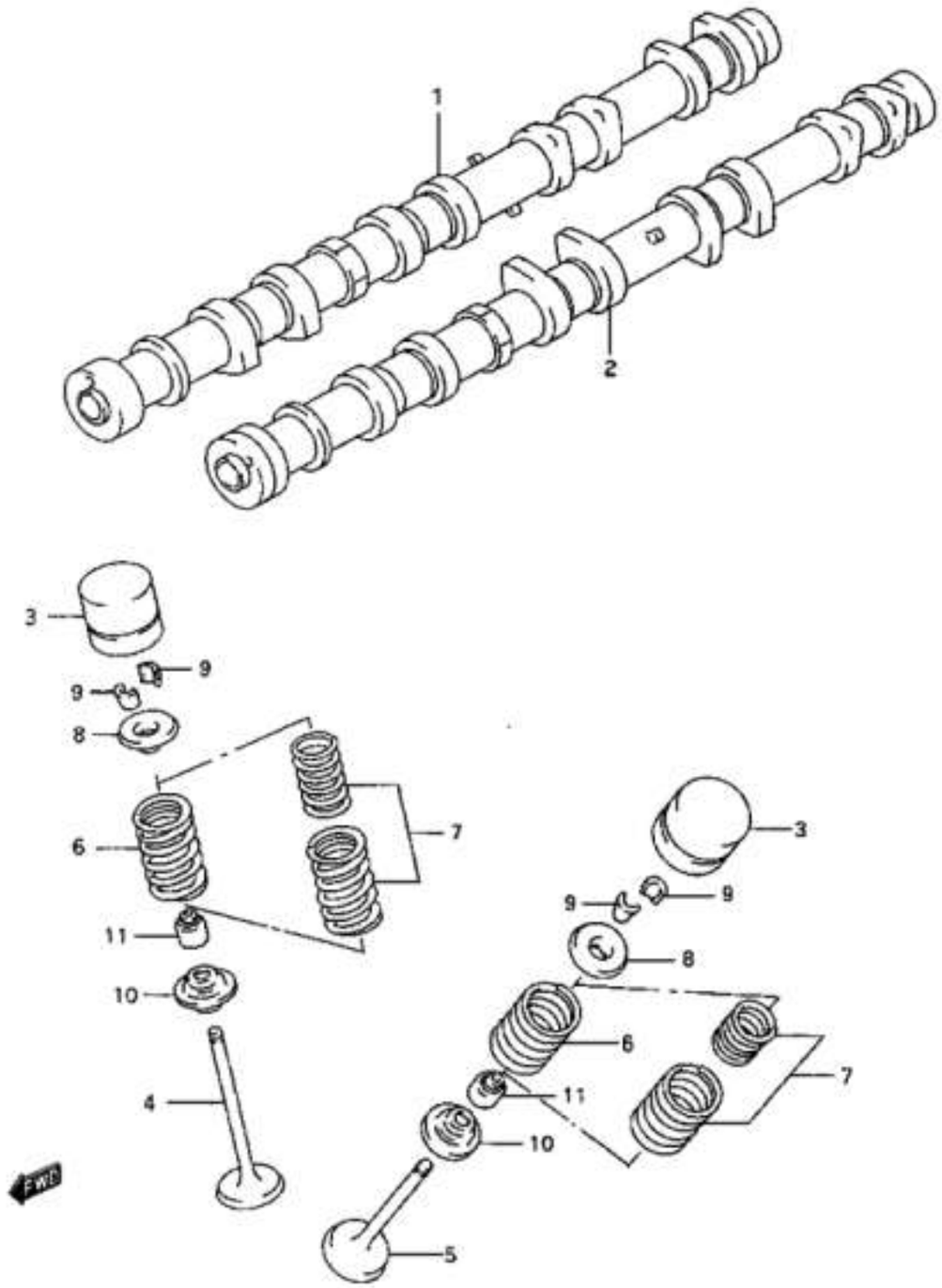
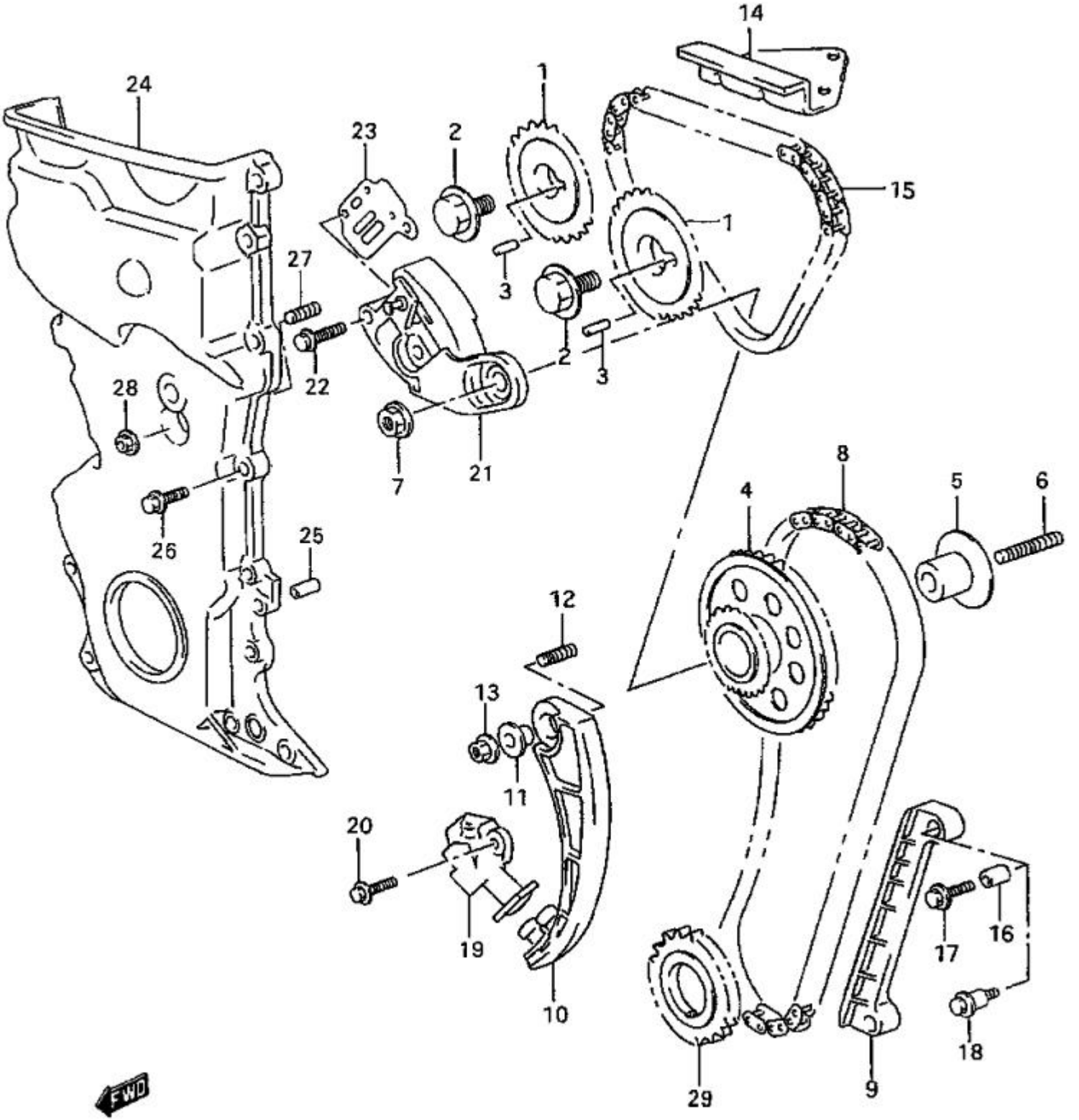
18 CAM SHAFT / VALVE (SV418)

Ref.No.	Part No.	Description	QTY V
1-1	12711-77E00	CAM SHAFT, INTAKE	1
1-2	12711-62G00	CAM SHAFT, INTAKE	1
2-1	12721-77E00	CAM SHAFT, EXHAUST	1
2-2	12721-62G00	CAM SHAFT, EXHAUST	1
3	12891-86512	ADJUSTER, HYDRAULIC VALVE RUSH	16
4	12911-86FA0	VALVE, INTAKE	8
5	12915-86F50	VALVE, EXHAUST	8
6	12921-85FA0	SPRING, VALVE	16
7	12920-62G00	SPRING SET, VALVE	16
8-1	12931-85FA1	RETAINER, VALVE SPRING	16
8-2	12931-62G00	RETAINER, VALVE SPRING	16
9	12932-85FA0	COTTER, VALVE	32
10-1	12933-86510	SEAT, VALVE SPRING	16

Top of List | 15 Records | Image 1 of 1

Catalog	Group
SV418 (MY:96-98) E03,33,63	1-18

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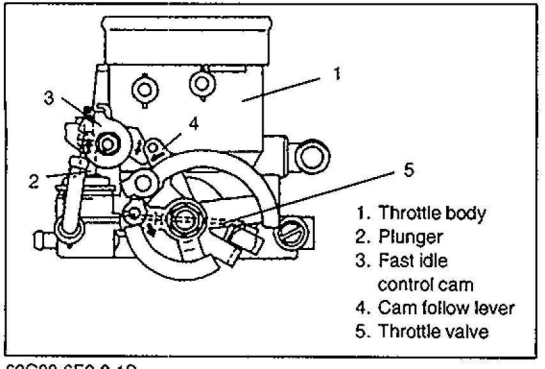
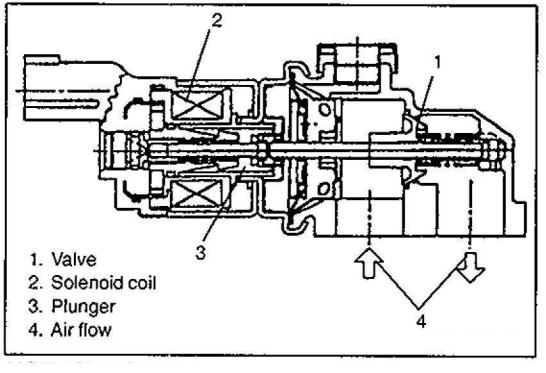
FWD



62G00-6E2-8-1S

As the engine gets warmer, the thermowax expands gradually and pushes the fast idle cam upward. Then, the cam follow lever goes over the crest of the fast idle cam about the point when the engine coolant temperature exceeds 60°C (140°F). As a result, the throttle valve returns to the throttle lever linked to it contacts the stop screw and the engine idle speed reduces to the normal idle speed after the engine being warmed up.



IDLE AIR CONTROL VALVE (IAC VALVE)

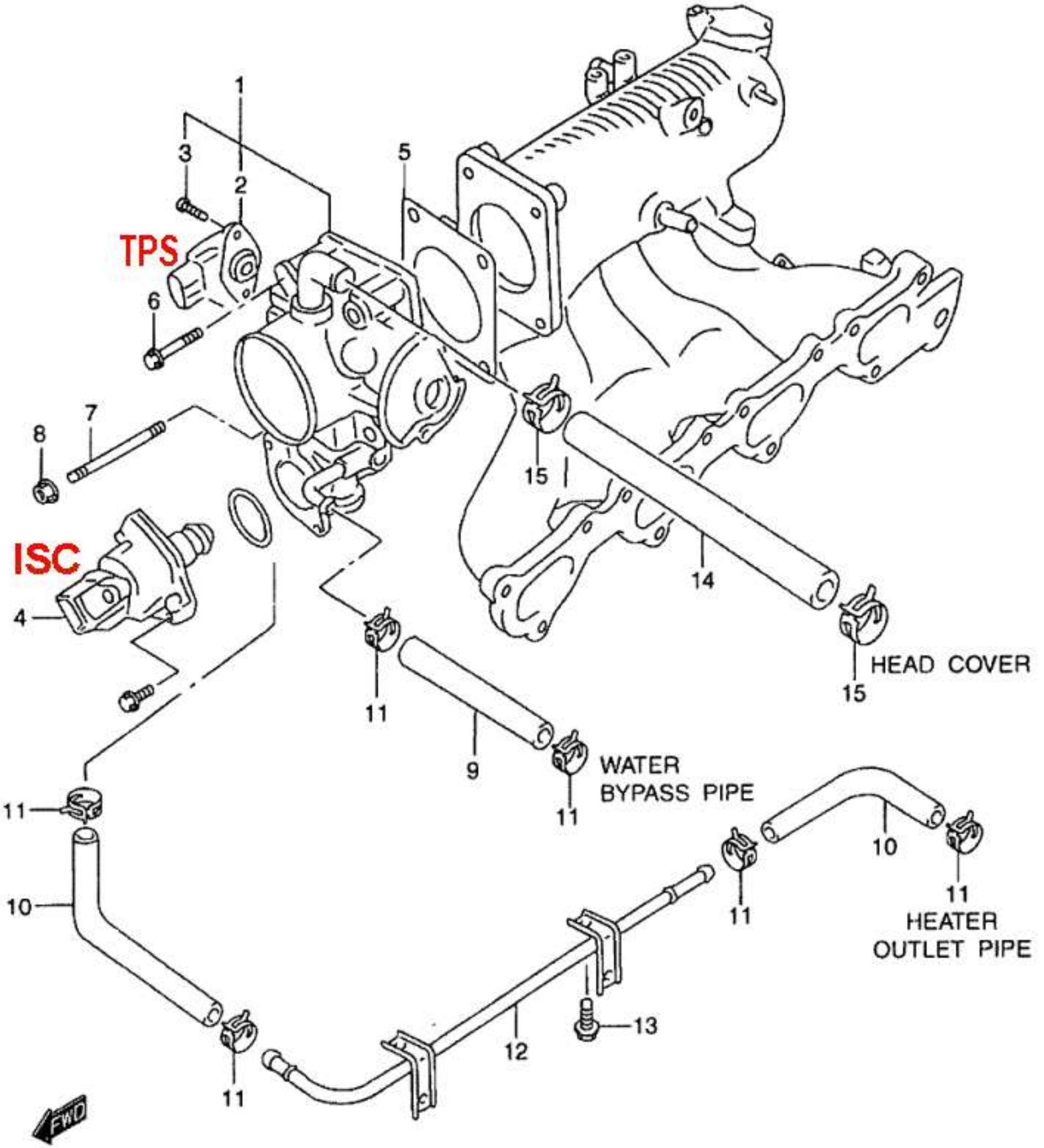
The IAC valve controls opening of the bypass air passage (i.e.,bypass air flow). The opening increase and decreases according to the electric current flow to the IAC valve which is controlled by ECM.

1.8L cams in head

1.8L on a pallet

no water pump

1.8L front cover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HEAD COVER
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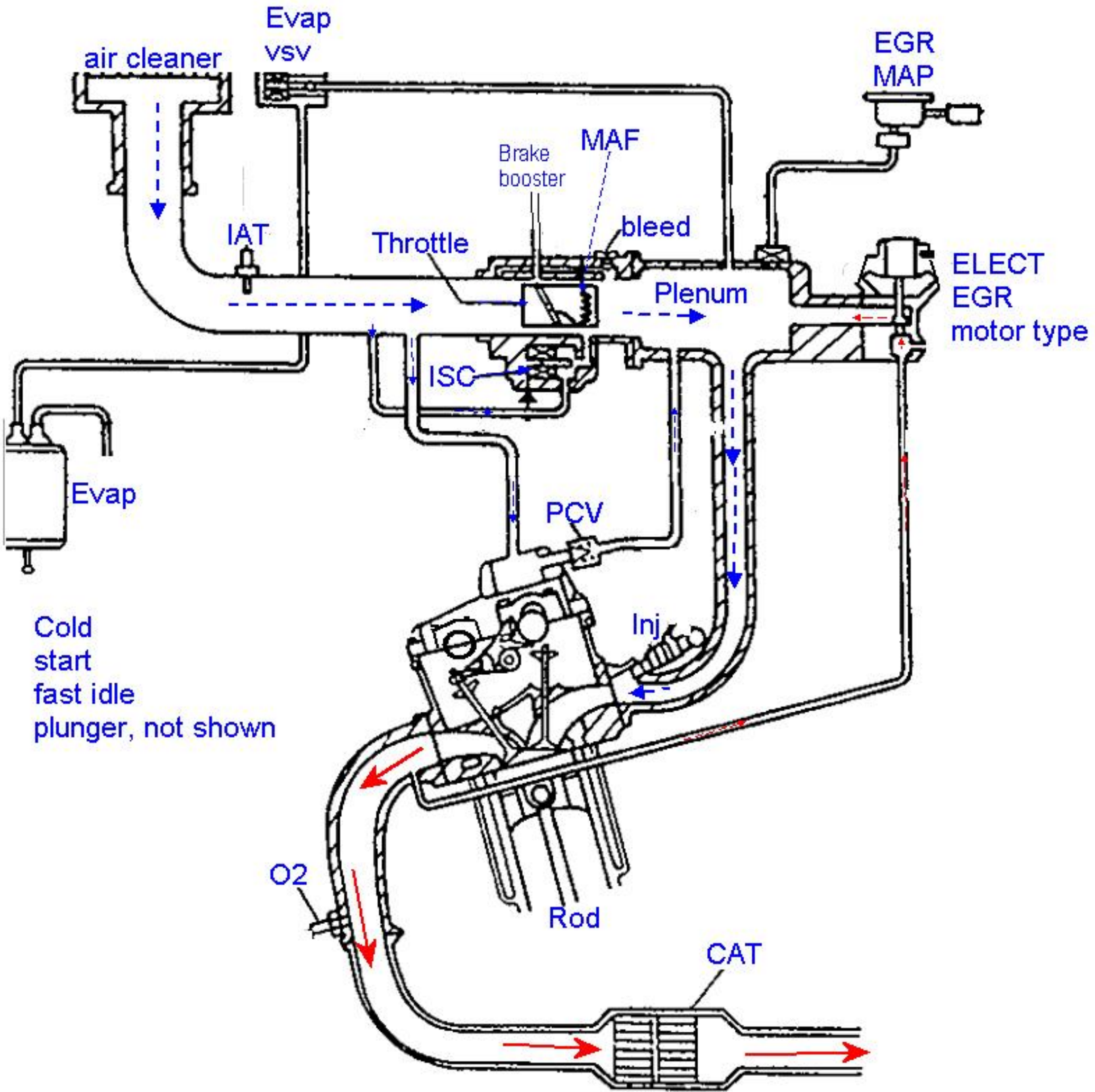
Evap
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Brake
booster
MAF
IAT
Throttle
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Plenum
ELECT
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motor type
ISC
Evap
PCV
Inj
Cold
start
fast idle
plunger, not shown
O2
Rod
CAT

ARTICLE BEGINNING
ENGINE IDENTIFICATION
Engine code is stamped on rear portion of cylinder block at exhaust side of bellhousing. Vehicle Identification Number (VIN) is stamped on a metal tag attached to left side of instrument panel, near pillar. The sixth character of VIN identifies engine model.
ENGINE IDENTIFICATION CODE

Application	VIN
Sidekick Sport	2

ADJUSTMENTS
VALVE CLEARANCE ADJUSTMENT
NOTE: Engine uses hydraulic lifters. Adjustment is not required.
REMOVAL & INSTALLATION
NOTE: For reassembly reference, label all electrical connectors, vacuum hoses and fuel lines before removal. Also, place mating marks on engine hood and other major assemblies before removal.
WARNING: ALWAYS relieve fuel pressure before disconnecting any fuel injection-related component. DO NOT allow fuel to contact engine or electrical components.
FUEL PRESSURE RELEASE
1. Place transmission in Neutral (M/T) or Park (A/T). Set parking brake and block drive wheels. Remove fuel pump relay connector (relay with Pink wire). Fuel pump relay is located on right side of heater unit. See Fig. 1 .
2. Remove fuel filler cap to release pressure. Reinstall fuel filler cap. Start engine, and idle until engine dies. Crank engine 2 or 3 times to ensure lines are empty. Turn ignition off.
Reconnect fuel pump relay connector.
Fig. 1: Locating Fuel Pump Relay
ENGINE
= Page 1 =

CAUTION: When raising or supporting engine or automatic transmission for any reason, DO NOT use a jack under oil pan. Damage to oil pump and pick-up strainer could result.
Removal
1. Relieve fuel pressure. See FUEL PRESSURE RELEASE . Disconnect battery cables and remove battery. Mark and remove hood. Remove air cleaner and duct. Drain radiator. Remove cooling fan and clutch.
2. Remove fan shroud and radiator. Remove A/C condenser (if equipped). Disconnect accelerator cable and kickdown cable (if equipped). Remove strut tower bar. Remove engine oil level gauge (dipstick) and A/T fluid level gauge guide.
3. Mark and disconnect all wiring harness connectors from exhaust manifold, intake manifold, and throttle body. Mark and remove fuel and vacuum hoses from engine. Remove coolant and heater hoses.
4. Disconnect coolant temperature switch and oil pressure sensor. Without disconnecting hoses, detach power steering pump and A/C compressor. Disconnect wires from starter motor and generator terminals. Raise vehicle. Disconnect exhaust pipe from exhaust manifold.
5. On manual transmission models, remove clutch cable. On automatic transmission models, remove automatic transmission cooling hoses from clamps. Remove right side transmission stiffener, and torque converter housing lower cover. Remove torque converter bolts.
6. On all models, lower vehicle. Remove nuts and bolts fastening engine to

transmission.
Support transmission. Attach hoist to engine. Remove engine mounting bolts, and remove
engine from body and transmission. Remove engine mountings from brackets.
Installation
Install engine mountings to brackets. Install bolts into frame brackets. Tighten bolts to
specification. See TORQUE SPECIFICATIONS . Lower engine into vehicle. To complete
installation, reverse removal procedure. Replace cooling system, engine and
transmission fluids.
INTAKE MANIFOLD
Removal
1. Release fuel pressure. See FUEL PRESSURE RELEASE . Disconnect negative battery
cable. Drain cooling system. Remove strut tower bar. Remove air intake hoses and air
breather hoses.
2. Remove air cleaner assembly. Label and disconnect all electrical connections from intake
manifold, injectors and throttle body. Label and disconnect vacuum hoses from intake
manifold.
3. Disconnect coolant hoses from manifold and throttle body. Remove fuel supply and return
lines from delivery pipe. Disconnect all control cables. Disconnect intake manifold front and
rear stiffeners. See Fig. 2 .

4. Disconnect coolant pipe from intake manifold. Remove intake manifold-to-cylinder head
bolts. Remove intake manifold and throttle body and gasket. Remove remaining components
from intake manifold as required.
Installation
To install, reverse removal procedure. Use NEW gaskets. Tighten bolts to specification. See
TORQUE SPECIFICATIONS . Adjust all control cables and fill cooling system.
Fig. 2: Exploded View Of Intake Manifold
EXHAUST MANIFOLD
Removal
1. Disconnect negative battery cable. Remove strut tower bar. Disconnect oxygen sensor wire
connector. Remove exhaust manifold upper cover.
2. Remove exhaust manifold stiffener. Disconnect exhaust pipe from exhaust manifold.
Remove exhaust manifold-to-cylinder head bolts. Remove exhaust manifold and gasket.
Installation
To install, reverse removal procedure. Use NEW exhaust manifold gasket. Tighten bolts to
specification. See TORQUE SPECIFICATIONS .
CYLINDER HEAD COVER
Removal & Installation
Disconnect negative battery cable. Remove ignition coil cover. Disconnect and remove ignition
coils. Detach accelerator cable from clamp. Remove oil level dipstick. Disconnect breather hose
and PCV hose from cylinder head cover. Remove cylinder head cover. To install, reverse removal
procedure. Apply sealant to cylinder head and cover. See Fig. 3 .
Fig. 3: Installing Cylinder Head Cover
CYLINDER HEAD

Removal
1. Release fuel pressure. See FUEL PRESSURE RELEASE . Disconnect negative battery cable. Drain cooling system and engine oil. Remove strut tower bar. Remove air cleaner outlet hose. Disconnect accelerator cable and A/T throttle cable at throttle body.
2. Remove 1st timing chain. See 1ST TIMING CHAIN & CHAIN TENSIONER . Remove camshafts and valve lash adjusters. See CAMSHAFT & VALVE LASH ADJUSTERS .
= Page 3 =

Label and remove hoses, lines and electrical connectors from cylinder head, intake manifold and exhaust manifold.
3. Remove intake manifold stiffener. Disconnect coolant pipe from intake manifold. Disconnect exhaust pipe from exhaust manifold and remove stiffener. Loosen cylinder head bolts in order shown in illustration. See Fig. 4 . Remove cylinder head.
Fig. 4: Cylinder Head Bolt Removal Sequence
Inspection
1. Check cylinder head for evidence of water leakage or damage. Remove carbon from combustion chambers. Check cylinder head for cracks in intake and exhaust ports, combustion chambers and head surface.
2. Check head warpage at 6 locations. If warpage exceeds specification, cylinder head should be machined or replaced. See CYLINDER HEAD under ENGINE SPECIFICATIONS.
3. Check intake and exhaust manifold seating faces on cylinder head for warpage. Warpage limit for manifold seating faces is .004" (.10 mm). If warpage exceeds specification, machine or replace cylinder head.
Installation
1. To install, reverse removal procedure. Use NEW head and manifold gaskets. Tighten cylinder head bolts to 39 ft. lbs (53 N.m) using proper sequence. See Fig. 5 .
2. Increase cylinder head bolt torque to 62 ft. lbs (84 N.m) using proper sequence. Now LOOSEN all bolts until torque is reduced to zero (0). See Fig. 4
3. Now tighten cylinder head bolts to 27 ft. lbs (37 N.m) using proper sequence. See Fig. 5 .
Finish tightening cylinder head bolts to 77 ft. lbs. (105 N.m). Tighten the 6-mm bolt on side of cylinder head to 97 INCH lbs. (11 N.m).
Fig. 5: Cylinder Head Bolt Tightening Sequence
TIMING CHAIN COVER
Removal
1. Disconnect negative battery cable. Drain engine oil and coolant. Remove oil pan and oil pump strainer. See OIL PAN. Remove cylinder head cover. See CYLINDER HEAD COVER .
2. Remove coolant by-pass pipe and hose. Detach cooling fan from pulley. Remove fan belt, pulley, and cooling fan. Remove generator belt by turning tensioner center bolt clockwise to loosen tension on belt.
3. Remove water pump and generator belt tensioner. Remove generator belt idler pulley. Disconnect radiator outlet hose from thermostat cap. Without disconnecting refrigerant lines, remove A/C compressor and bracket.
= Page 4 =

4. Remove crankshaft pulley bolt and crankshaft pulley. Remove timing chain cover. Remove

crankshaft oil seal.
Installation
To install, reverse removal procedure. Drive in NEW oil seal until it is flush with cover. Apply sealant along edge of engine block, where timing cover comes into contact with block, and at cylinder block-to-cylinder head parting surfaces.
2ND TIMING CHAIN & CHAIN TENSIONER
Removal
1. Disconnect negative battery cable. Drain engine oil and coolant. Remove oil pan and oil pump strainer. See OIL PAN. Remove cylinder head cover. See CYLINDER HEAD COVER .
2. Remove timing chain cover. See TIMING CHAIN COVER . Align all sprocket timing marks with timing marks on block. See Fig. 6 . Ensure key on crankshaft sprocket is pointing up.
3. Remove timing chain tensioner adjuster by turning intake camshaft slightly counterclockwise while pushing back pad. Remove intake and exhaust camshaft sprocket bolts. Remove camshaft sprockets and 2nd timing chain.
CAUTION: DO NOT turn camshafts more than 15 degrees or crankshaft more than 90 degrees in either direction from aligned position. Doing so could damage pistons and/or valves.
Installation
1. Align all sprocket timing marks with timing marks on block. See Fig. 6 . Ensure key on crankshaft sprocket is pointing up. Check that arrow on idler sprocket faces up.
2. Install 2nd timing chain by aligning Yellow plate of timing chain with arrow on idler sprocket. Install sprockets on intake and exhaust camshafts by aligning Dark Blue plate of 2nd timing chain.
3. Insert a push pin into timing chain tensioner and press plunger back into tensioner body.
Ensure plunger does not come out. Install timing chain tensioner with gasket and tighten to specification.
4. Remove push pin from timing chain tensioner. Turn crankshaft clockwise 2 rotations then align timing marks. Ensure all timing marks align. Apply oil to timing chains, tensioner, sprockets, and guide. To complete installation, reverse removal procedure.
Fig. 6: Aligning 2nd Timing Chain & Sprockets
1ST TIMING CHAIN & CHAIN TENSIONER
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Removal
1. Disconnect negative battery cable. Drain engine oil and coolant. Remove oil pan and oil pump strainer. See OIL PAN . Remove cylinder head cover. See CYLINDER HEAD COVER .
2. Remove timing chain cover. See TIMING CHAIN COVER . Align all sprocket timing marks with timing marks on block. See Fig. 7 . Ensure key on crankshaft sprocket is pointing up.
3. Remove 2nd timing chain and chain tensioner. See 2ND TIMING CHAIN & CHAIN TENSIONER . Remove 1st timing chain guide, chain tensioner adjuster, and timing chain tensioner. Remove idler sprocket and 1st timing chain. Remove crankshaft timing chain

sprocket.
Installation
1. Ensure key on crankshaft sprocket is pointing up. See Fig. 7 . Apply oil to bushing of idler sprocket. Install 1st timing chain by aligning Dark Blue plate of timing chain with mark on idler sprocket.
2. Align Yellow plate of timing chain with mark on crankshaft sprocket. Install timing chain tensioner. Release latch on tensioner adjuster, insert a pin to hold latch in place, and press plunger back into tensioner adjuster body.
3. Ensure plunger does not come out. Install timing chain adjuster and tighten to specification.
Remove pin from timing chain adjuster. Install timing chain guide. Ensure Dark Blue plate and Yellow plate of timing chain are aligned with timing marks. To complete installation, reverse removal procedure.
Fig. 7: Aligning 1st Timing Chain & Sprockets
Courtesy of SUZUKI OF AMERICA CORP.
CAMSHAFT & VALVE LASH ADJUSTERS
Removal
1. Disconnect negative battery cable. Drain engine oil and coolant. Remove oil pan and oil pump strainer. See OIL PAN. Remove cylinder head cover. See CYLINDER HEAD COVER .
2. Remove timing chain cover. See TIMING CHAIN COVER . Remove 2nd timing chain and chain tensioner. See 2ND TIMING CHAIN & CHAIN TENSIONER . Remove camshaft position sensor from end of camshaft.
3. After removing 2nd timing chain, turn crankshaft clockwise 90 degrees to prevent valves from hitting pistons. Remove camshaft bearing cap bolts in reverse order of tightening sequence. See Fig. 9 . Remove camshaft bearing caps and camshafts.
4. Remove valve lash adjusters. Completely immerse valve lash adjusters in clean engine oil to keep them from collapsing. DO NOT apply force to body of adjuster nor place adjuster on its side or with bucket body facing up.
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Installation
1. Fill valve lash adjuster pockets on cylinder head with clean engine oil. Ensure oil comes out of oil passages. Lubricate valve lash adjusters and install on cylinder head.
2. Ensure key on crankshaft sprocket is pointing up and aligned with timing mark. See Fig. 6 .
Lubricate camshafts and install on cylinder head, ensuring pins align with timing marks. See Fig. 6 .
3. Apply sealant to exhaust camshaft sealing surface. See Fig. 8 . Ensure camshaft bearing caps are marked with an "I" for intake camshaft and "E" for exhaust. Ensure arrow on caps point toward timing chain.
4. Lubricate camshaft bearing cap bolts and tighten them in sequence, in 2-3 steps, to specified torque. See Fig. 9 . To complete installation, reverse removal procedure.
CAUTION: DO NOT turn camshafts or start engine for 30 minutes after installing valve lash adjusters and camshafts. Operating engine within 30 minutes and hour may cause valve and/or piston damage.
NOTE: If air is trapped in valve lash adjuster, valve may make a tapping

sound when engine is operated. To correct this condition, run engine for 30 minutes at 2000 RPM to purge air from valve lash adjuster. If condition is not corrected, replace defective valve lash adjuster(s).
Fig. 8: Exhaust Camshaft Bearing Cap Sealing Surface
Courtesy of SUZUKI OF AMERICA CORP.
Fig. 9: Camshaft Bearing Cap Bolt Tightening Sequence
Courtesy of SUZUKI OF AMERICA CORP.
WATER PUMP
Removal
1. Disconnect negative battery cable. Drain cooling system. Remove radiator hose from thermostat housing. Remove heater outlet pipe bolt. Remove drive belts.
2. Remove cooling fan, fan shroud, and fan clutch. Remove water pump pulley. Remove water pump, being careful not to lose dowel when removing pump.
Installation
To install, reverse removal procedure. Ensure all mating surfaces are clean. Use NEW water pump gasket.
NOTE: For further information on cooling systems, see ENGINE COOLING SPECIFICATIONS & ENGINE COOLING FANS article in ENGINE COOLING.

OIL PAN
Removal
1. Remove oil level gauge (dipstick). Raise and support vehicle. Remove front differential assembly. See DIFFERENTIALS & REAR AXLE SHAFTS article in DRIVE AXLES. Remove tie rod, center link, and idler arm.
2. Drain engine oil. Remove oil pan bolts and lower oil pan until it comes in contact with crossmember and oil pump strainer. Using wrench, remove oil pump strainer. Remove oil pan from vehicle.
Installation
Apply sealant to oil pan. Tighten bolts to specification. See TORQUE SPECIFICATIONS . To complete installation, reverse removal procedure.
OVERHAUL
CYLINDER HEAD
Disassembly
1. Remove cylinder head. See CYLINDER HEAD under REMOVAL & INSTALLATION. Remove manifolds and fuel injectors. Remove water outlet pipe and thermostat housing.
Remove camshafts. See CAMSHAFT & VALVE LASH ADJUSTERS under REMOVAL & INSTALLATION.
2. Use Valve Spring Compressor (09916-14510) and Valve Lifter Attachment (09916-14910) to compress valve spring. Use tweezers to remove retainer locks. See Fig. 10 . Remove retainers, springs, spring seats and valves. Keep all components in order for reassembly reference.
Reassembly
To assemble, reverse disassembly procedure. Ensure valve springs are installed with close coiled (small pitch) end down, toward cylinder head.
Fig. 10: Removing Valve Retainer Locks
Courtesy of SUZUKI OF AMERICA CORP.
Valve Springs
Check valve springs for damage. Use a square and flat surface plate to check spring

squareness.
Maximum out-of-square is .079" (2.00 mm). Using valve spring tester, check valve spring preload
pressure. See VALVES & VALVE SPRINGS under ENGINE SPECIFICATIONS. Replace any weak or out-of-square springs.
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1.8L 4-CYL VIN [2] -1998 Suzuki Sidekick Sport JLX Page 9 of 20
Valve Stem Oil Seals
Use Handle (09917-98221) and Valve Stem Seal Installer (09916-58210) to install seal. Place
NEW lubricated stem seal on valve stem seal installer. Press seal on valve guide using hand
pressure only. When installer bottoms on head, seal is properly positioned. Avoid twisting seals
during installation.
Valve Guides
1. Check valve stem-to-guide clearance. If clearance exceeds specification, replace with
oversize valve guide. See CYLINDER HEAD under ENGINE SPECIFICATIONS.
2. Use Valve Guide Remover (09916-44910) to drive out old guide. Ream guide bore in

cylinder head with 11-mm Reamer (09916-38210) and Handle (09916-34542). Heat cylinder
head to 176-212°F (80-100°C).
3. Using Valve Guide Installer (09917-87810) and Handle (09916-58210), drive in NEW

oversized valve guide until valve guide installer contacts cylinder head.
4. Ensure valve guide protrusion is .53" (13.5 mm). Ream guide bore in cylinder head with 6-
mm Reamer (09916-37810) and Handle (09916-34542). Clean valve guide bore after reaming.
Valve Seats
1. Inspect valve seats for damage or wear. If valve seat rework is necessary, use cutters to
obtain required angles. On exhaust valve seats, first cut should be 15 degrees. Second cut
should be 45 degrees to obtain correct seat angle.
2. On intake valve seats, first cut should be 15 degrees. Second cut should be 60 degrees, and
third cut should be 45 degrees to obtain correct seat angle. After cutting valve seats to
correct angles, lap valve seats.
Valves
1. Remove carbon deposits. Inspect for wear, burns or distortion at face and stem. Replace as
necessary. Measure valve head margin. Check valve stem end for pitting or wear.
2. Valve stem end may be resurfaced if not too much material is removed from valve length.
Measure valve length. See VALVES & VALVE SPRINGS under ENGINE SPECIFICATIONS.
CYLINDER BLOCK ASSEMBLY
Piston & Rod Assembly
1. Remove cylinder head. See CYLINDER HEAD under REMOVAL & INSTALLATION. Remove oil pump. See OIL PUMP under ENGINE OILING.
2. Ensure pistons, connecting rods and rod caps are marked for reassembly reference. Remove
carbon from top of cylinder bores. Remove connecting rod caps. Install protective hose over
connecting rod bolts.
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1.8L 4-CYL VIN [2] -1998 Suzuki Sidekick Sport JLX Page 10 of 20
3. Remove connecting rod and piston assembly through top of cylinder block. Mark cylinder

number on piston crown. Remove piston rings. Remove circlips and push piston pin out by
hand.
4. Check piston pin-to-bore fit. Pin should press in piston smoothly by hand at room
temperature. When assembling, apply engine oil to outside of pin and to piston pin bore.
Install circlips and piston pin. Install circlips with opening facing down.
Fitting Pistons
1. Check cylinder bore for damage, wear and taper. See CYLINDER BLOCK under
OVERHAUL. See CYLINDER BLOCK under ENGINE SPECIFICATIONS to determine
if block must be rebored.
2. Pistons are available in .0098" (.25 mm) and .0197" (.50 mm) oversizes. Check outside
diameter of piston. Measure at a point 1.04" (26.5 mm) from bottom of skirt and at 90
degrees to pin bore.
3. Standard pistons are available in 2 sizes. Piston diameter is determined by numerical mark
("1" or "2") stamped on piston crown. Cylinder bore diameter is determined by mark (Red or
Blue) on cylinder block.
4. When installing piston into cylinder, ensure piston numerical mark matches cylinder bore
numerical mark to provide correct piston-to-cylinder clearance. See Fig. 11 .
Fig. 11: Matching Pistons To Cylinders
Courtesy of SUZUKI OF AMERICA CORP.
Piston Rings
1. Install rings with "R" or "RN" mark facing upward. Install oil ring spacer first, then rails.
Position piston ring gaps 45 degrees apart. Lubricate all internal surfaces with engine oil
before installation.
2. Ensure arrow on piston head faces front of engine (crankshaft pulley side). Ensure "77E"
mark on connecting rod faces front of engine. See Fig. 12 . Install cylinder head and oil
pump. To complete installation, reverse removal procedure.
Rod Bearings
1. Inspect journals for wear, taper and out-of-round. If specifications are exceeded, grind
journals to undersize or replace crankshaft. See CRANKSHAFT, MAIN &
CONNECTING ROD BEARINGS under ENGINE SPECIFICATIONS.
2. Inspect bearing shells for signs of fusion, pitting, burning or flaking. Standard bearings are
unmarked or colored Green, Black, Yellow or Blue on edge of bearing. Undersized bearing
is painted Red on edge of bearing. Undersize bearing thickness is .0632-.0636" (1.605-1.615
mm) at center of bearing.
3. Check bearing clearance using Plastigage. See CRANKSHAFT, MAIN &
CONNECTING ROD BEARINGS . Standard connecting rod side play is .010-.015" (.25-
.40 mm), with a service limit of .0157" (.40 mm).
4. Connecting rod crank pin diameter is determined by letter ("A", "B" or "C") stamped on
crank web No. 3. See Fig. 12 . Connecting rod large end bore diameter is stamped ("1", "2"
= Page 10 =

or "3") on side of connecting rod. See the appropriate connecting rod tables for specific
information.
CONNECTING ROD CRANK PIN DIAMETERS

Letters Stamped On Web In. (mm)
"A" 1.9683-1.9685 (49.994-50.000)
"B" 1.9680-1.9683 (49.988-49.994)
"C" 1.9678-1.9680 (49.982-49.988)
CONNECTING ROD MAIN BEARING CAP BORE DIAMETERS
Number Stamped On Rod In. (mm)
"1" 2.0866-2.0868 (53.000-53.006)
"2" 2.0868-2.0870 (53.006-53.012)
"3" 2.0870-2.0873 (53.012-53.018)
COLOR CODE FOR STANDARD CONNECTING ROD BEARINGS
Color Painted Thickness - In. (mm)
Green .0583-.0585 (1.482-1.485)
Black .0585-.0586 (1.485-1.488)
No Paint .0586-.0587 (1.488-1.491)
Yellow .0587-.0588 (1.491-1.494)
Blue .0588-.0589 (1.494-1.497)
STANDARD CONNECTING ROD BEARING APPLICATIONS
Letter Stamped On Crank Numbers Stamped On Color
Web No. 3 Connecting Rod
"A" "1" Green
"A" "2" Black
"A" "3" No Paint
"B" 1 Black
"B" "2" No Paint
"B" "3" Yellow
"C" 1 No Paint
"C" "2" Yellow
"C" "3" Blue
Fig. 12: Locating Connecting Rod Crank Pin Diameter On Crankshaft Web No. 3
Courtesy of SUZUKI OF AMERICA CORP.
Crankshaft & Main Bearings
1. Loosen crankshaft bearing caps in sequence shown. See Fig. 15 . Inspect journals for wear,
taper and out-of-round condition. I f specifications are exceeded, grind journals to undersize
= Page 11 =

or replace crankshaft. See CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS
under ENGINE SPECIFICATIONS.
2. Standard main bearings are available in 5 different sizes and are color-coded. Upper bearing
half has an oil groove. Bearing No. 1 is at crankshaft pulley end of engine. Bearing No. 5 is
at flywheel end of engine.
3. Main bearing journal diameter is determined by numerical mark ("1", "2" or "3") stamped on
crankshaft web No. 2. See Fig. 13 . The numerical marks on crankshaft web No. 2, read left
to right, indicate journal diameters of bearings No. 1, 2, 3, 4 and 5, respectively. See
CRANKSHAFT MAIN BEARING JOURNAL DIAMETERS .
4. Determine bearing cap bore diameter with bearing removed. Bearing cap bore diameter is
determined by letter ("A", "B" or "C"). See Fig. 14 . See appropriate MAIN BEARING
CAP BORE DIAMETER .
5. The letters stamped on cylinder block, read left to right, indicate cap bore diameters of
bearing caps No. 1, 2, 3, 4 and 5, respectively. Five standard main bearing sizes are
available. Bearing thickness is determined by color code. See COLOR CODE FOR
STANDARD MAIN BEARINGS .
6. Use numerical marks on crankshaft webs and letters stamped on cylinder block

mating
surface to determine correct replacement bearing. See STANDARD MAIN BEARING APPLICATIONS . Tighten crankshaft bearing caps to specification and in sequence shown.
See Fig. 16 .
Fig. 13: Locating Main Bearing Journal Diameter On Crankshaft Web No. 2
Courtesy of SUZUKI OF AMERICA CORP.
CRANKSHAFT MAIN BEARING JOURNAL DIAMETERS
Numbers Stamped On Web No. 2 In. (mm)
"1" 2.2832-2.2835 (57.994-58.000)
"2" 2.2830-2.2832 (57.988-57.994)
"3" 2.2828-2.2830 (57.982-57.988)
MAIN BEARING CAP BORE DIAMETERS
Letters Stamped On Block In. (mm)
"A" 2.4409-2.4412 (62.000-62.006)
"B" 2.4412-2.4414 (62.006-62.012)
"C" 2.4414-2.4416 (62.012-62.018)
COLOR CODE FOR STANDARD MAIN BEARINGS
Color Painted Thickness - In. (mm)
Green .0785-.0786 (1.993-1.997)
Black .0786-.0787 (1.997-2.000)
No Paint .0787-.0788 (2.000-2.003)
Yellow .0788-.0789 (2.003-2.006)
Blue .0789-.0791 (2.006-2.009)
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STANDARD MAIN BEARING APPLICATIONS
Letter Stamped On Block Numbers Stamped On Color
Crankshaft Webs
"A" "1" Green
"A" "2" Black
"A" "3" No Paint
"B" 1 Black
"B" "2" No Paint
"B" "3" Yellow
"C" 1 No Paint
"C" "2" Yellow
"C" "3" Blue
Fig. 14: Locating Bore Diameter Letters Stamped On Cylinder Block
Courtesy of SUZUKI OF AMERICA CORP.
Undersize Bearings
1. Bearings are available in .010" (.25 mm) undersize. Undersize bearing thickness is .0836-
.0838" (2.124-2.128 mm) at center of bearing.
2. On .010" (.25 mm) undersize crankshaft, ensure journal finished diameter is 2.2716-
2.2734" (57.698-57.744 mm). Use Plastigage to ensure correct clearance of installed undersize bearing.
Thrust Bearing
1. With crankshaft bearing caps installed, check thrust clearance (end play) using dial gauge to
read displacement in axial thrust direction of crankshaft.
2. Standard thickness of thrust bearing is .0984" (2.50 mm). Oversize thrust bearings are
available in increments of .0049" (.125 mm). If clearance exceeds specification, replace
thrust bearing. See CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS under ENGINE SPECIFICATIONS.
Cylinder Block
Inspect block for distortion of deck surface. Inspect block for cracks, scratches and other defects.
Measure bores at 2 levels for wear, taper and out-of-round condition. If bore wear, taper or out-of-

round exceed specification, rebore cylinders. See CYLINDER BLOCK under ENGINE SPECIFICATIONS.
Fig. 15: Loosening Crankshaft Bearing Bolts
Courtesy of SUZUKI OF AMERICA CORP.
Fig. 16: Tightening Crankshaft Bearing Bolts
Courtesy of SUZUKI OF AMERICA CORP.
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ENGINE OILING
ENGINE LUBRICATION SYSTEM
A force-feed type lubrication system is used. The oil pump is a trochoid-type pump mounted on the forward portion of the crankshaft. Oil is drawn up through the oil strainer, passed through pump, and then the oil filter. The filtered oil flows through 2 passages in cylinder block.
Crankcase Capacity
Total oil capacity, including filter, is 5.4 qts. (5.2L). Check dipstick to verify oil level is correct.
Oil Pressure
Normal oil pressure is 55.5-66.8 psi (3.9-4.7 kg/cm^2) at 4000 RPM.
OIL PUMP
Removal & Disassembly
1. Disconnect negative battery cable. Remove oil pan and oil strainer. See OIL PAN under REMOVAL & INSTALLATION. Remove oil pump sprocket cover. DO NOT remove oil pump sprocket as oil pump may be damaged.
2. Remove oil pump assembly. Mark oil pump for reassembly reference. Remove bolts, inner and outer oil pump gears. Remove plug, relief spring and relief valve.
Inspection
1. Inspect oil pump housing for cracks or damage. Ensure relief valve slides smoothly in bore. Inspect pressure relief spring for damaged coils.
2. Inspect oil pump gears for wear or damage. Using a feeler gauge, measure radial and side clearance. If clearance exceeds specification, replace outer gear rotor or case. See OIL PUMP SPECIFICATIONS .
OIL PUMP SPECIFICATIONS
Clearance	In. (mm)
Radial	.006 (.15)
Side	.004 (.11)

Reassembly & Installation
1. Ensure gears are assembled in same direction as originally installed. Apply thin coat of engine oil to inner and outer gear rotors, and inside surfaces of oil pump case. Install inner and outer gear rotors.
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2. Ensure gears turn freely by hand after pump is assembled. Install oil pump and tighten bolts to specification. See TORQUE SPECIFICATIONS . To complete installation, reverse removal procedure.
ENGINE SPECIFICATIONS
GENERAL SPECIFICATIONS
GENERAL SPECIFICATIONS
(1)
Application	Specification
Displacement	109.8 Cu. In. (1.8L)

(2)

Compression Pressure
2
Standard 199 psi (14 kg/cm)
2
Minimum Limit 171 psi (12 kg/cm)
2
Maximum Variation 14.2 psi (1.0 kg/cm)
Fuel System SFI
(1)
Additional information is not available.
(2)
Checked at 250 RPM or higher.
CONNECTING RODS
CONNECTING RODS
Application In. (mm)
Pin Bore .8269-.8272 (21.003-21.011)
Maximum Bend .002 (.05)
Maximum Twist .004 (.10)
Side Play
Standard .010-.016 (.25-.40)
Service Limit .016 (.40)
CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS
CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS
Application In. (mm)
Crankshaft
End Play
Standard .004-.014 (.10-.35)
Service Limit .017 (.42)
Runout .002 (.06)
Main Bearings
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Application In. (mm)
(1)
Journal Diameter
"1" 2.2832-2.2834 (57.994-58.000)
"2" 2.2830-2.2832 (57.988-57.994)
"3" 2.2828-2.2830 (57.982-57.988)
Journal Out-Of-Round .0004 (.010)
Journal Taper .0004 (.010)
Oil Clearance
Standard .0010-.0018 (.026-.046)
Service Limit .0024 (.060)
(2)
Main Bearing Cap Bore Diameter
"A" 2.4409-2.4412 (62.000-62.006)
"B" 2.4412-2.4414 (62.006-62.012)
"C" 2.4414-2.4416 (62.012-62.018)
Connecting Rod Bearings
(3)
Standard Journal Diameter
"A" 1.9683-1.9685 (49.994-50.000)
"B" 1.9680-1.9683 (49.988-49.994)
"C" 1.9678-1.9680 (49.982-49.988)
Undersize Journal Diameter
.25 mm 1.9580-1.9586 (49.732-49.750)
Journal Out-Of-Round .0004 (.010)
Journal Taper .0004 (.010)
Oil Clearance
Standard .0018-.0025 (.045-.063)
Service Limit .0031 (.080)
(1)
Main bearing journal diameter is determined by numerical mark ("1", "2" or "3")

stamped on crankshaft web No. 2. See Fig. 13 .
(2)
Main bearing cap bore diameter is determined by letter ("A", "B" or "C") stamped on cylinder block. See Fig. 14 .
(3)
Connecting rod bearing journal diameter is determined by letter stamped on crankshaft
web No. 3. See Fig. 12 .
PISTONS, PINS & RINGS
PISTONS, PINS & RINGS
Application In. (mm)
Pistons
Clearance .0008-.0016 (.020-.040)
(1)
Standard Diameter
"1" 3.3063-3.3067 (83.980-83.990)
"2" 3.3059-3.3063 (83.970-83.980)
= Page 16 =

Application In. (mm)
Oversize Diameter
.010" (.25 mm) 3.3157-3.3165 (84.220-84.240)
.020" (.50 mm) 3.3256-3.3264 (84.470-84.490)
Pins
Diameter .8267-.8268 (20.997-21.000)
Piston Fit Slip
Rod Fit .0001-.0005 (.003-.014)
Rings
No. 1
End Gap
Standard .0079-.0138 (.20-.35)
Service Limit .0276 (.70)
Side Clearance .0012-.0028 (.030-.070)
No. 2
End Gap
Standard .0138-.0196 (.35-.50)
Service Limit .0276 (.70)
Side Clearance .0008-.0024 (.02-.06)
No. 3 (Oil)
End Gap
Standard .0079-.0276 (.20-.70)
Service Limit .0709 (1.8)
Side Clearance .0024-.0059 (.06-.15)
(1)
Piston diameter is determined by numerical mark ("1" or "2") stamped on top of piston.
VALVES & VALVE SPRINGS
VALVES & VALVE SPRINGS
Application Specification
Intake Valves
Seat Angle 45°
Valve Head Thickness
Standard .040" (1.0 mm)
Service Limit .024" (.6 mm)
Stem Diameter .2348-.2354" (5.965-5.980 mm)
Exhaust Valves
Seat Angle 45°
Valve Head Thickness
Standard .047" (1.2 mm)
Service Limit .028" (.7 mm)
Stem Diameter .2339-.2344" (5.940-5.955 mm)
Valve Springs
= Page 17 =

Application Specification
Free Length
Standard 1.6791" (42.65 mm)
Service Limit 1.6339" (41.50 mm)
Out-Of-Square .079" (2.0 mm)
Valve Spring Preload: Lbs. @ In. (kg @ mm)
Standard 49.2-56.7 @ 1.28 (22.3-25.7 @ 32.6)
Service Limit 46.7 @ 1.28 (21.2 @ 32.6)
CYLINDER BLOCK
CYLINDER BLOCK
Application In. (mm)
Cylinder Bore
(1)
Standard Diameter
Red 3.3075-3.3079 (84.010-84.020)
Blue 3.3071-3.3075 (84.000-84.010)
Maximum Taper .004 (.10)
Maximum Out-Of-Round .004 (.10)
Maximum Deck Warpage .002 (.05)
(1)
Cylinder bore diameter is determined by color mark (Red or Blue) on cylinder block. See
Fig. 11 .
CYLINDER HEAD
CYLINDER HEAD
Application Specification
Maximum Warpage
Head-To-Block .002" (.05 mm)
Manifold-To-Head .004" (.10 mm)
Valve Seats
Seat Angle 45°
Seat Width .0433-.0512" (1.1-1.3 mm)
Valve Guides
Intake Valve
Valve Guide I.D. .2362-.2367" (6.000-6.012 mm)
Valve Guide Installed Height .53" (13.5 mm)
Valve Stem-To-Guide Oil Clearance
Standard .0008-.0019" (.020-.047 mm)
Service Limit .0028" (.07 mm)
Exhaust Valve
Valve Guide I.D. .2362-.2367" (6.000-6.012 mm)
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Application Specification
Valve Guide Installed Height .53" (13.5 mm)
Valve Stem-To-Guide Oil Clearance
Standard .0018-.0028" (.045-.072 mm)
Service Limit .0035" (.09 mm)
CAMSHAFT
CAMSHAFT
Application In. (mm)
Bore Diameter 1.0236-1.0249 (26.000-26.033)
Journal Diameter 1.0220-1.0228 (25.959-25.980)
Journal Runout .004 (.10)
Lobe Height
Intake
Standard 1.5917-1.5979 (40.428-40.588)
Service Limit 1.5838 (40.228)
Exhaust
Standard 1.5717-1.5780 (39.922-40.082)
Service Limit 1.5639 (39.722)
Oil Clearance

Standard .0008-.0029 (.020-.074)
Service Limit .0047 (.12)
TORQUE SPECIFICATIONS
TORQUE SPECIFICATIONS
Application Ft. Lbs. (N.m)
A/C Compressor Bracket Bolts 41 (55)
Camshaft Sprocket Bolts 44 (60)
Connecting Rod Cap Nut 32 (44)
Crankshaft Main Bearing Cap Bolts
8-mm Bolt 18 (25)
10-mm Bolt 44 (60)
Crankshaft Pulley Bolt 111 (150)
(1)
Cylinder Head Bolt 77 (105)
Engine Side Mounting Bracket Bolts 37 (50)
Engine-To-Transmission Bolts 59 (80)
Exhaust Manifold Bolt 17 (23)
(2)
Exhaust Manifold Stiffener 37 (50)
Exhaust Pipe 37 (50)
Flex Plate/Flywheel Bolts 52 (70)
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Application Ft. Lbs. (N.m)
Generator Belt Idler Pulley Bolt 33 (45)
Generator Belt Tensioner Bolts 18 (25)
Intake Manifold Bolt 17 (23)
(2)
Intake Manifold Stiffener 37 (50)
Lower Crankcase-To-Cylinder Block Bolt
8-mm Bolt 20 (27)
10-mm Bolt 42 (58)
Oil Pan Drain Plug 26 (35)
Oil Pump Mounting Bolts 15 (21)
Oil Pump Relief Valve Plug 21 (29)
Strut Tower Bar 66 (90)
Timing Chain (1st) Tensioner 18 (25)
(3)
Timing Chain Tensioner Adjuster Bolt 32 (44)
Torque Converter Bolts 47 (64)
Transmission Stiffener Bolts 37 (50)
INCH Lbs. (N.m)
Camshaft Bearing Cap Bolts 97 (11)
Oil Pan Bolts 97 (11)
Oil Pump Bolts 106 (12)
Oil Pump Sprocket Cover Bolts 97 (11)
Oil Strainer Bolts 97 (11)
Timing Chain Cover Bolts 97 (11)
Timing Chain Guide 97 (11)
Throttle Body Bolts 115 (13)
Valve Cover Nuts 97 (11)
(1)
Follow tightening procedure listed under CYLINDER HEAD installation. See Fig. 4 and
Fig. 5 . Tighten 6-mm bolt to 97 INCH lbs. (11 N.m).
(2)
Tighten smaller bolts to 18 ft. lbs. (25 N.m).
(3)
Tighten smaller bolts to 97 INCH lbs. (11 N.m).

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