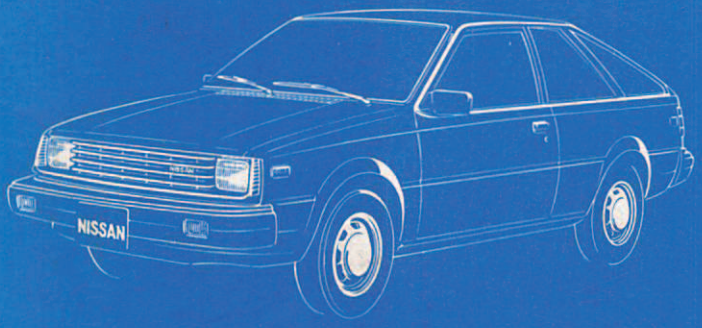


DATSUN

1983 DATSUN NISSAN SENTRA

SERVICE MANUAL

THE NAME OF QUALITY
NISSAN
NISSAN MOTOR CO.,LTD.

NISSAN SENTRA

Model B11 Series

FOREWORD

This service manual has been prepared primarily for the purpose of assisting service personnel in providing effective service and maintenance of the 1983 NISSAN SENTRA.

This manual includes procedures for maintenance, adjustments, removal and installation, disassembly and assembly of components, and trouble-shooting.

All information, illustrations and specifications contained in this manual are based on the latest product information available at the time of publication. If your DATSUN model differs from the specifications contained in this manual, consult your NISSAN/ DATSUN dealer for information.

The right is reserved to make changes in specifications and methods at any time without notice.

NISSAN MOTOR CO., LTD.

QUICK REFERENCE INDEX

HOW TO USE THIS MANUAL

- This Service Manual is designed as a guide for servicing cars.
- This manual deals with the engine, chassis, body and the electrical system.
- **A QUICK REFERENCE INDEX** is provided on the first page. Refer to this index along with the index of the particular section you wish to consult.
- The first page of each section lists the contents and gives the page numbers for the respective topics.
- **SERVICE DATA AND SPECIFICATIONS** are contained in each section.
- **TROUBLE DIAGNOSES AND CORRECTIONS** are also included in each section. This feature of the manual lists the likely causes of trouble and recommends the appropriate corrective actions to be taken.
- A list of **SPECIAL SERVICE TOOLS** is included in each section. The special service tools are designed to assist you in performing repair safely, accurately and quickly. For information concerning how to obtain special service tools, write to the following address:

  Kent-Moore Corporation
  29784 Little Mack
  Roseville, Michigan 48066

  Kent-Moore of Canada, Ltd.
  5466 Timberlea Blvd., Unit 2
  Mississauga, Ontario
  Canada L4W 2T7

- The measurements given in this manual are primarily expressed with the SI unit (International System of Unit), and alternately expressed in the metric system and in the yard/pound system.
- The back cover of the manual provides maintenance data for quick reference.
- In the text, the following abbreviations are used:

S.D.S.:	Service Data and Specifications	L.H., R.H.:	Left Hand, Right Hand
Ⓣ:	Tightening Torque	M/T, A/T:	Manual Transaxle, Automatic Transaxle

- The captions **CAUTION and WARNING** warn you of steps that must be followed to prevent personal injury and/or damage to some part of the car.

IMPORTANT SAFETY NOTICE

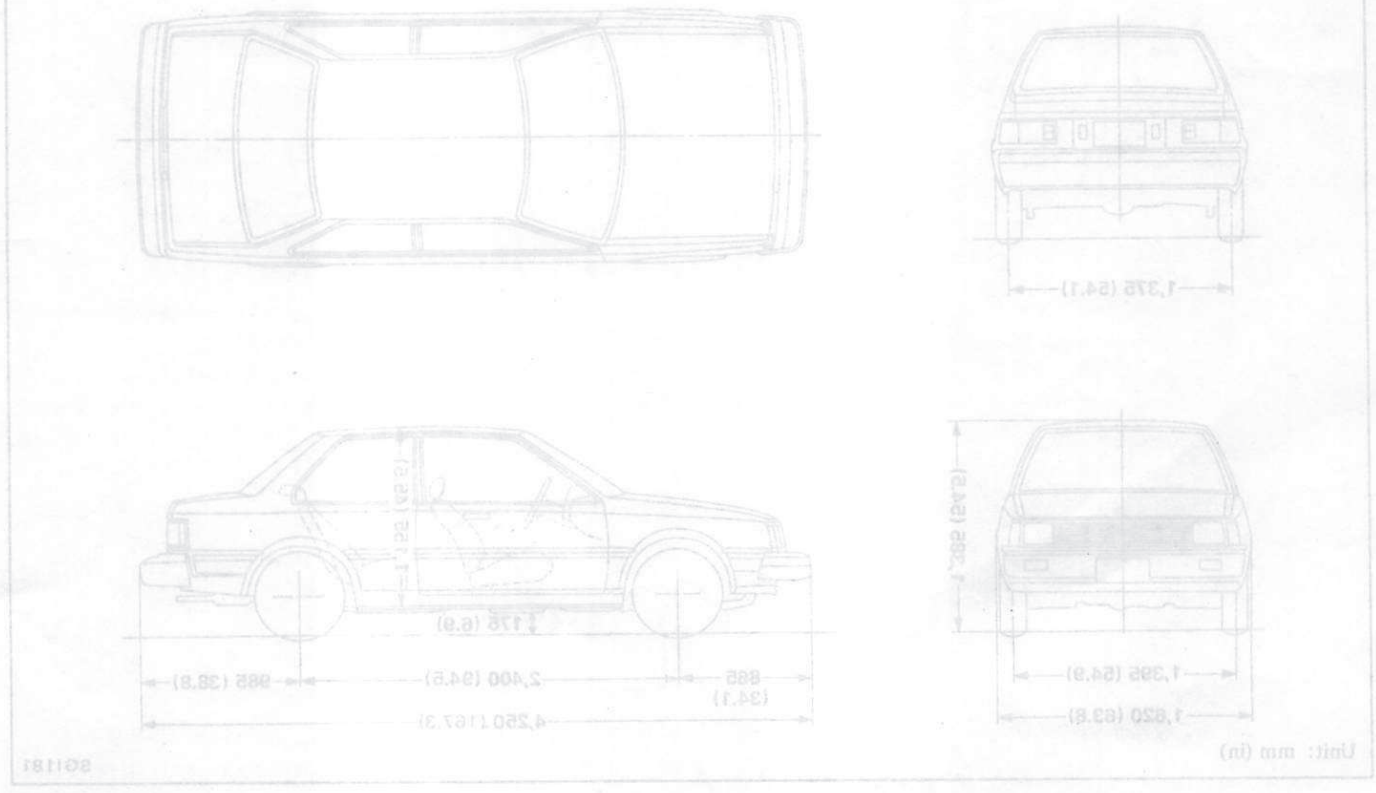
The proper performance of service is essential for both the safety of the mechanic and the efficient functioning of the car.
The service methods in this Service Manual are described in such a manner that the service may be performed safely and accurately.
Special service tools have been designed to permit safe and proper performance of service. Be sure to use them.

Service varies with the procedures used, the skills of the mechanic and the tools and parts available. Accordingly, anyone using service procedures, tools or parts which are not specifically recommended by NISSAN must first completely satisfy himself that neither his safety nor the car's safety will be jeopardized by the service method selected.

GENERAL INFORMATION

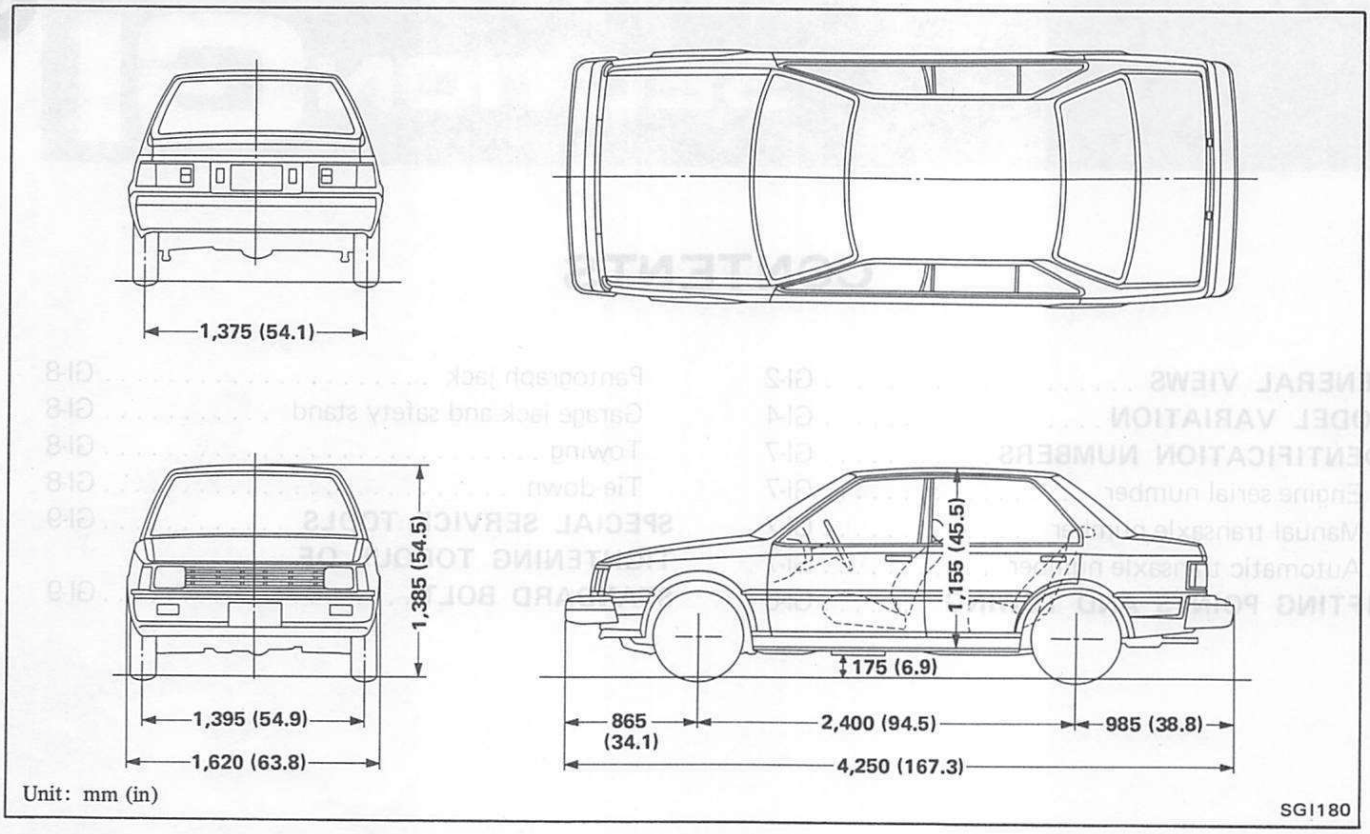
SECTION GI

CONTENTS



GENERAL VIEWS

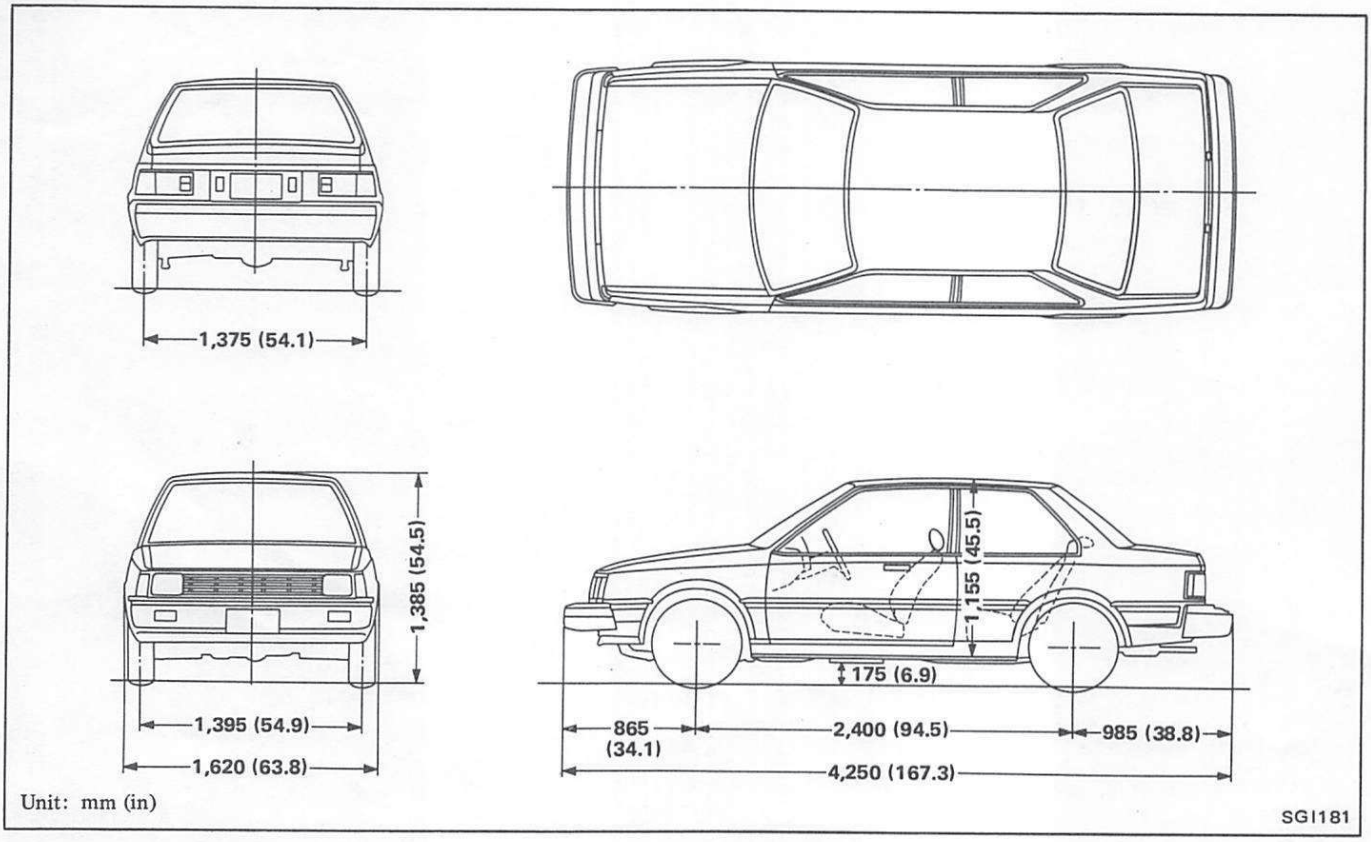
4-door Sedan



Unit: mm (in)

SGI180

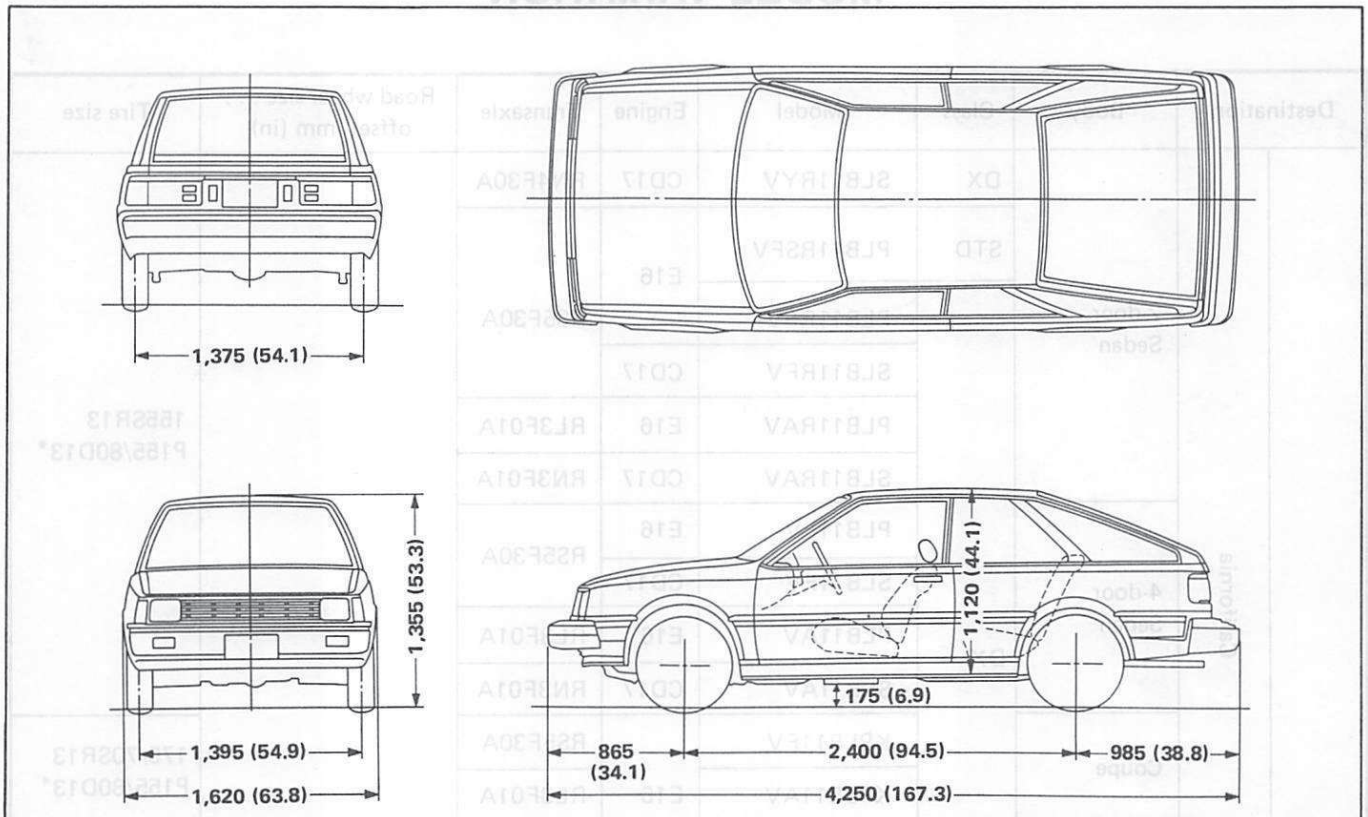
2-door Sedan



Unit: mm (in)

SGI181

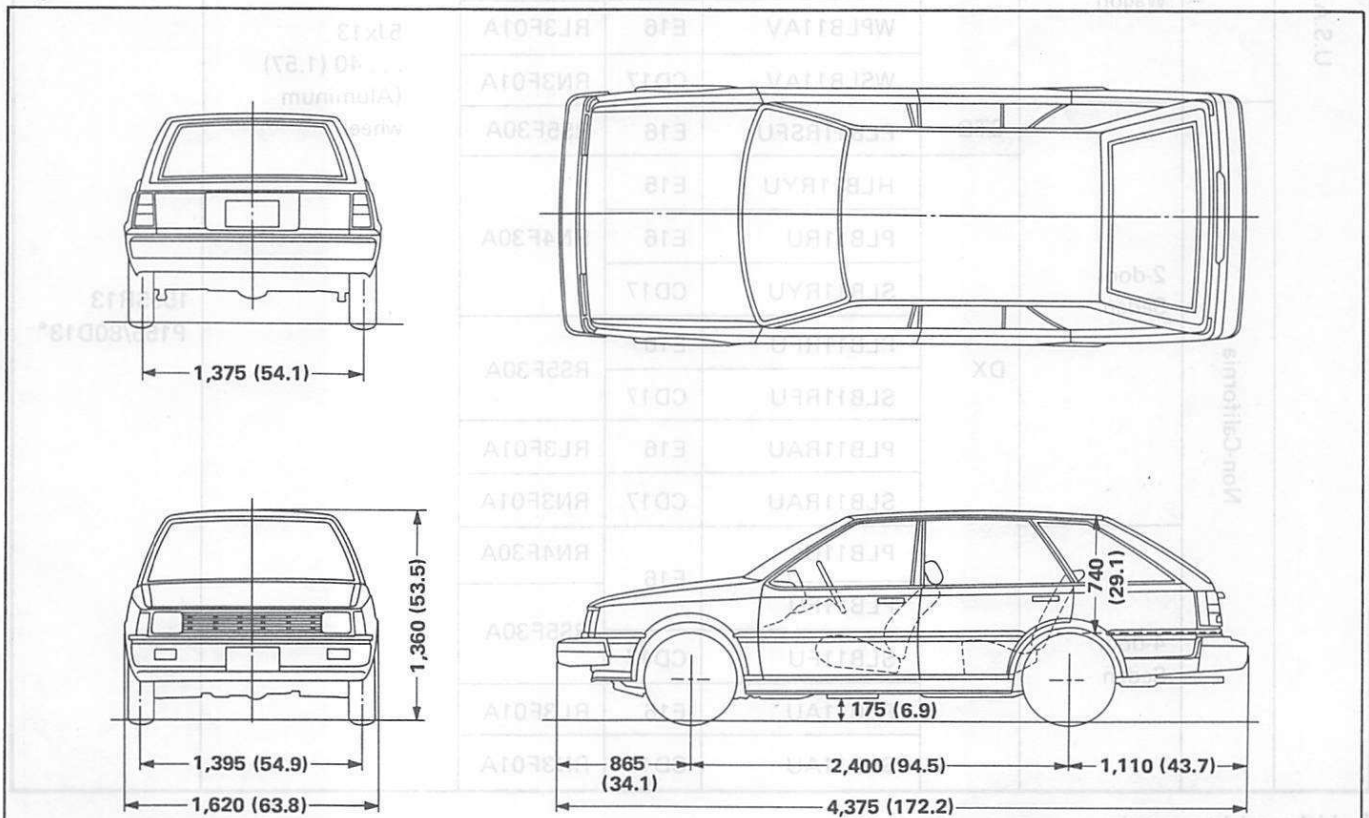
Coupe



Unit: mm (in)

SGI182

Wagon



Unit: mm (in)

SGI183

MODEL VARIATION

Destination		Body	Class	Model	Engine	Transaxle	Road wheel size . . . offset mm (in)	Tire size
U.S.A.	California	2-door Sedan	DX	SLB11RYV	CD17	RN4F30A	4-1/2Jx13 . . . 42 (1.65) 5Jx13 . . . 40 (1.57) (Aluminum wheel)	155SR13 P155/80D13*
			STD	PLB11RSFV	E16	RS5F30A		
			DX	PLB11RFV				
				SLB11RFV	CD17			
				PLB11RAV	E16	RL3F01A		
				SLB11RAV	CD17	RN3F01A		
		4-door Sedan		PLB11FV	E16	RS5F30A		
				SLB11FV	CD17			
				PLB11AV	E16	RL3F01A		
				SLB11AV	CD17	RN3F01A		
		Coupe		KPLB11FV	E16	RS5F30A		175/70SR13 P155/80D13*
				KPLB11AV		RL3F01A		
		Wagon		WPLB11FV		RS5F30A		155SR13 P155/80D13*
				WSLB11FV	CD17			
				WPLB11AV	E16	RL3F01A		
				WSLB11AV	CD17	RN3F01A		
	Non-California	2-door Sedan	STD	PLB11RSFU	E16	RS5F30A		
			DX	HLB11RYU	E15	RN4F30A		
				PLB11RU	E16			
				SLB11RYU	CD17			
				PLB11RFU	E16	RS5F30A		
				SLB11RFU	CD17			
				PLB11RAU	E16	RL3F01A		
				SLB11RAU	CD17	RN3F01A		
		4-door Sedan		PLB11U	E16	RN4F30A		
				PLB11FU		RS5F30A		
				SLB11FU	CD17			
				PLB11AU	E16	RL3F01A		
				SLB11AU	CD17	RN3F01A		

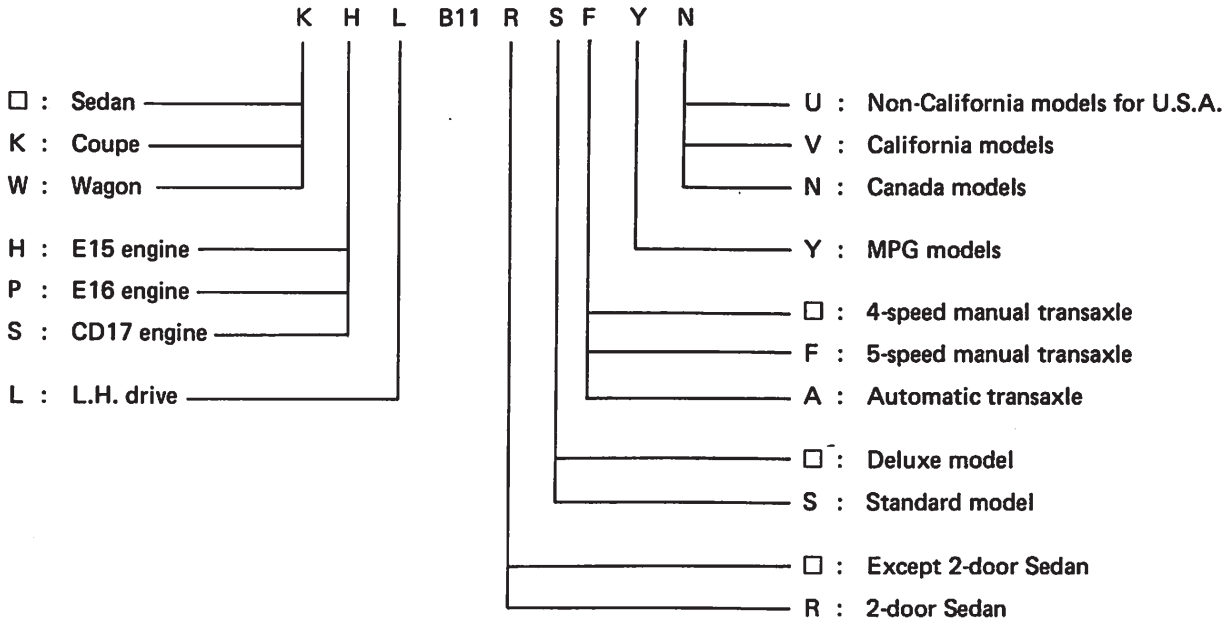
* Light weight spare tire

MODEL VARIATION

Destination		Body	Class	Model	Engine	Transaxle	Road wheel size . . . offset mm (in)	Tire size
U.S.A.	Non-California	Coupe	DX	KPLB11U	E16	RN4F30A	4-1/2Jx13 . . . 42 (1.65) 5Jx13 . . . 40 (1.57) (Aluminum wheel)	175/70SR13 P155/80D13*
				KPLB11FU		RS5F30A		
				KPLB11AU		RL3F01A		
		Wagon		WPLB11U		RN4F30A		155SR13 P155/80D13*
				WPLB11FU		RS5F30A		
				WSLB11FU	CD17			
				WPLB11AU	E16	RL3F01A		
				WSLB11AU	CD17	RN3F01A		
Canada		2-door Sedan	STD	PLB11RSFN	E16	RS5F30A		
				PLB11RSAN		RL3F01A		
			DX	HLB11RFYN	E15	RS5F30A		
				SLB11RFN	CD17			
				PLB11RAN	E16	RL3F01A		
				SLB11RAN	CD17	RN3F01A		
		4-door Sedan		PLB11FN	E16	RS5F30A		
				SLB11FN	CD17			
				PLB11AN	E16	RL3F01A		
				SLB11AN	CD17	RN3F01A		
		Coupe		KPLB11FN	E16	RS5F30A		175/70SR13 P155/80D13*
				KPLB11AN		RL3F01A		
		Wagon		WPLB11FN		RS5F30A		155SR13 P155/80D13*
				WSLB11FN	CD17			
				WPLB11AN	E16	RL3F01A		
				WSLB11AN	CD17	RN3F01A		

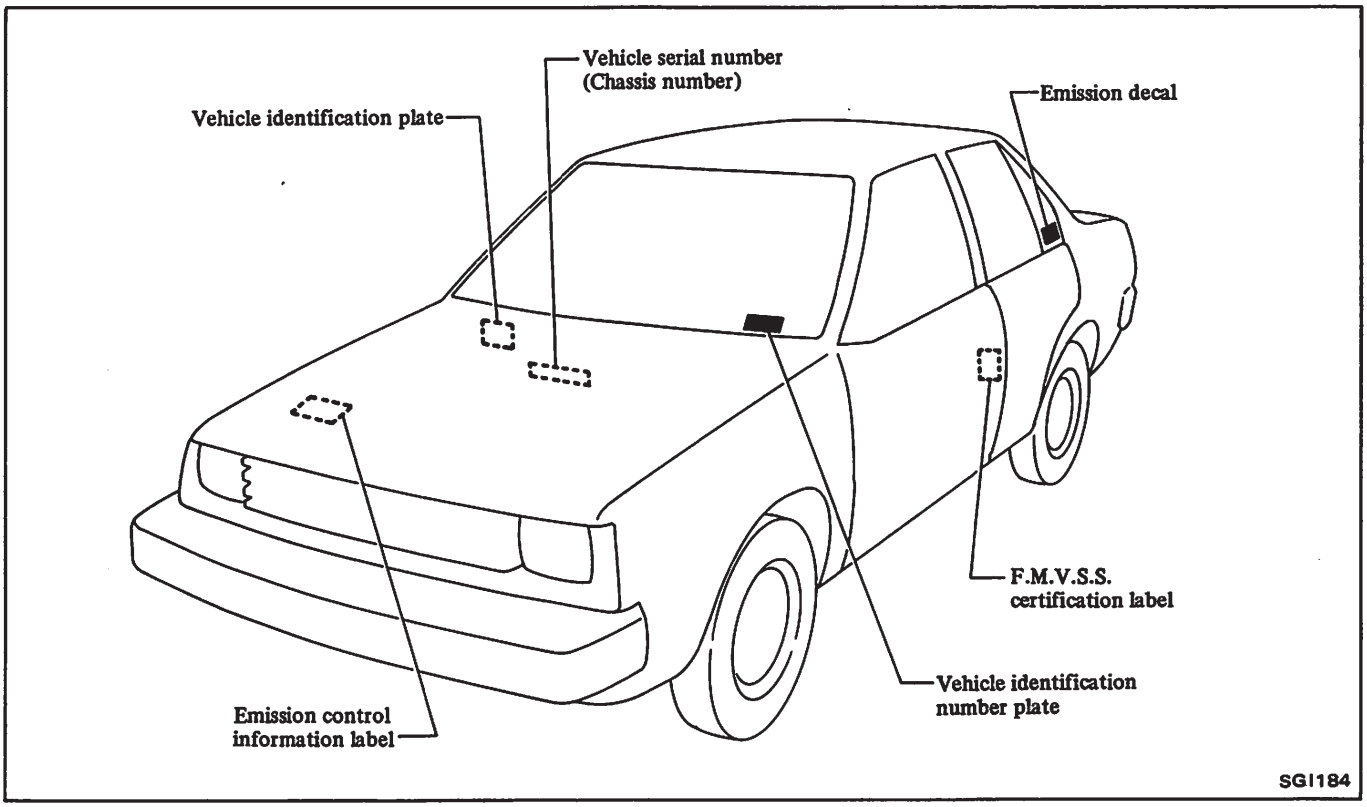
* Light weight spare tire

Prefix and suffix designations



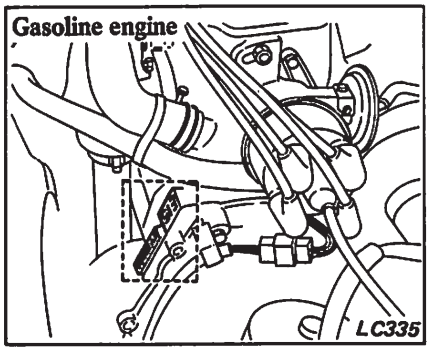
Note: □ means no indication.

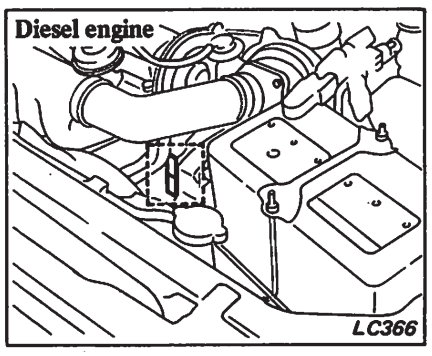
IDENTIFICATION NUMBERS



ENGINE SERIAL NUMBER

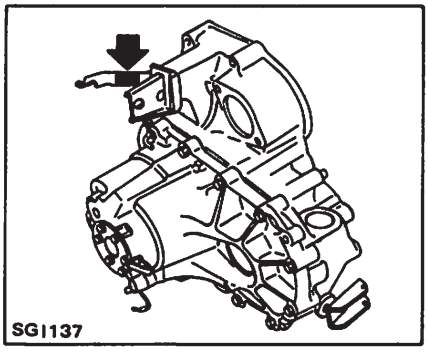
The engine serial number is stamped as shown in the illustrations.





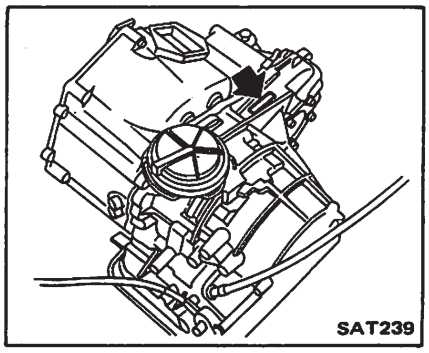
MANUAL TRANSAXLE NUMBER

The manual transaxle serial number label is attached on the clutch withdrawal lever.



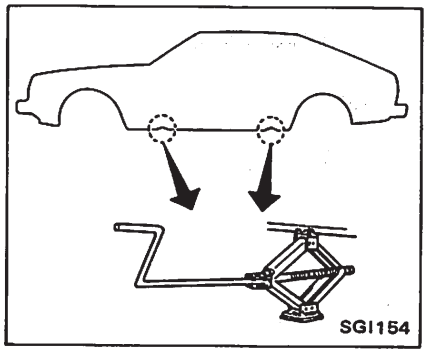
AUTOMATIC TRANSAXLE NUMBER

The automatic transaxle serial number label is attached on the upper face of the transmission case.



LIFTING POINTS AND TOWING

PANTOGRAPH JACK

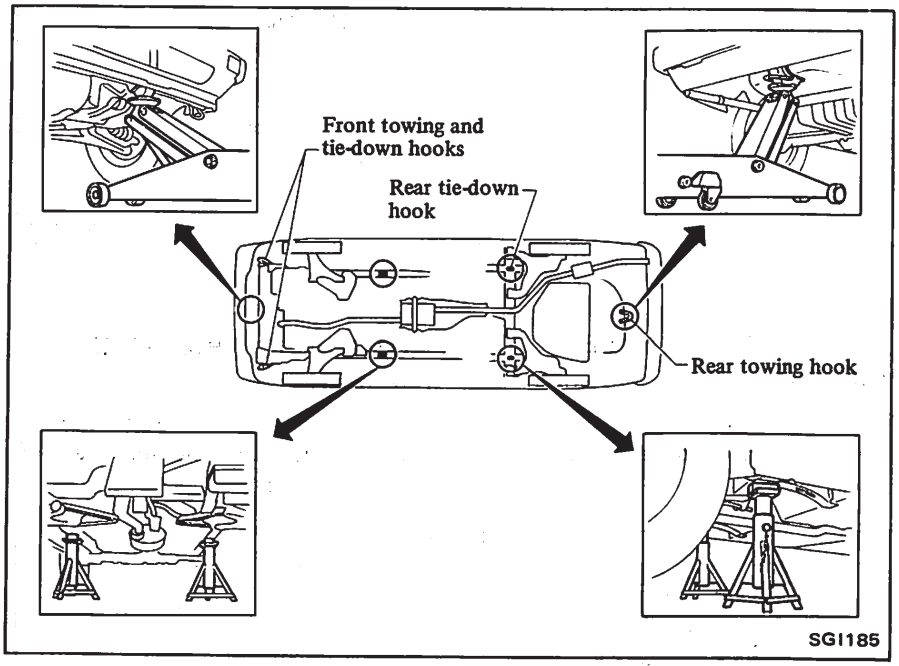


WARNING:

a. Never get under the vehicle while it is supported only by the jack. Always use safety stands to support frame when you have to get under the vehicle.
b. Place wheel chocks at both front and back of the wheel diagonally opposite the jack position.

Apply the pantograph jack furnished with the vehicle to the position indicated in the figure in a safe manner.

GARAGE JACK AND SAFETY STAND



WARNING:

a. When carrying out operations with the garage jack, be sure to support the vehicle with safety stands.
b. When jacking up the rear (front) of the vehicle, place the chocks at the front (rear) of the front (rear) wheels to hold them.

CAUTION:

Always place a wood block between safety stand and vehicle body when supporting body with safety stand.

Apply the garage jack and safety stand to the position indicated in the figure in a safe manner.

TOWING

CAUTION:

a. It is necessary to use proper towing equipment to avoid possible damage to the vehicle during a towing operation.
   Towing is in accordance with Towing Procedure Manual at dealer side.
b. All applicable State or Provincial (in Canada) laws and local laws regarding the towing operation must be obeyed.
c. Before towing, make sure that the transaxle, steering system and power train are in good order. If any unit is damaged, a dolley must be used.
d. Never tow an automatic transaxle model with rear wheels raised (with front wheels on ground) as this may cause serious damage to the vehicle. If it is necessary to tow it with rear wheels raised, always use a towing dolly under the front wheels.
e. If the transaxle is inoperative, tow the vehicle with the front wheels off the ground.
f. When the vehicle is towed with its front wheels on the ground, secure the steering wheel in a straight ahead position with the ignition key turned in "OFF" position.
g. Release the parking brake and set the gearshift lever in "Neutral" position before starting to tow the vehicle.
h. When towing an automatic transaxle model, try to restrict towing speed below 30 km/h (20 MPH) and towing distance less than 30 km (20 miles).
   With manual transaxle model, try to restrict towing speed below 80 km/h (50 MPH) and towing distance less than 80 km (50 miles).
i. Do not apply force to the towing hook in a lateral direction.
   Keep the tow rope or similar device straight ahead, in line with the vehicle.

TIE-DOWN

CAUTION:

Do not tow the vehicle with the rear tie-down hooks.

SPECIAL SERVICE TOOLS

Special Service Tools play very important role in the maintenance of cars. These are essential to the safe, accurate and speedy servicing.
The working times listed in the column under FLAT RATE TIME in FLAT RATE SCHEDULE are computed based on the use of Special Service Tools.
The identification code of maintenance tools is made up of 2 alphabetical letters and 8-digital figures.
The heading two letters roughly classify tools or equipment as:

ST00000000:	Special Service Tool
KV00000000:	Special Service Tool
EM00000000:	Engine Overhauling Machine
GG00000000:	General Gauge
LM00000000:	Garage Tool
HT00000000:	Hand Tool

TIGHTENING TORQUE OF STANDARD BOLT

Grade	Bolt or nut size	Bolt or nut diameter* mm	Pitch mm	Tightening torque		
				N·m	kg-m	ft-lb
4T	M6	6.0	1.0	3 - 4	0.3 - 0.4	2.2 - 2.9
	M8	8.0	1.25	8 - 11	0.8 - 1.1	5.8 - 8.0
			1.0	8 - 11	0.8 - 1.1	5.8 - 8.0
	M10	10.0	1.5	16 - 22	1.6 - 2.2	12 - 16
			1.25	16 - 22	1.6 - 2.2	12 - 16
	M12	12.0	1.75	26 - 36	2.7 - 3.7	20 - 27
			1.25	30 - 40	3.1 - 4.1	22 - 30
	M14	14.0	1.5	46 - 62	4.7 - 6.3	34 - 46
7T	M6	6.0	1.0	6 - 7	0.6 - 0.7	4.3 - 5.1
	M8	8.0	1.25	14 - 18	1.4 - 1.8	10 - 13
			1.0	14 - 18	1.4 - 1.8	10 - 13
	M10	10.0	1.5	25 - 35	2.6 - 3.6	19 - 26
			1.25	26 - 36	2.7 - 3.7	20 - 27
	M12	12.0	1.75	45 - 61	4.6 - 6.2	33 - 45
			1.25	50 - 68	5.1 - 6.9	37 - 50
	M14	14.0	1.5	76 - 103	7.7 - 10.5	56 - 76
9T	M6	6.0	1.0	8 - 11	0.8 - 1.1	5.8 - 8.0
	M8	8.0	1.25	19 - 25	1.9 - 2.5	14 - 18
			1.0	20 - 27	2.0 - 2.8	14 - 20
	M10	10.0	1.5	36 - 50	3.7 - 5.1	27 - 37
			1.25	39 - 51	4.0 - 5.2	29 - 38
	M12	12.0	1.75	65 - 88	6.6 - 9.0	48 - 65
			1.25	72 - 97	7.3 - 9.9	53 - 72
	M14	14.0	1.5	109 - 147	11.1 - 15.0	80 - 108

1. Special parts are excluded.
2. This standard is applicable to bolts having the following marks embossed on the bolt head.

Grade	Mark
4T	4
7T	7
9T	9

*: Nominal diameter

M 6
- Nominal diameter of bolt threads (Unit: mm)
- Metric screw threads

SECTION MA

CONTENTS

PERIODIC MAINTENANCE

The following charts show the normal maintenance schedule. Under severe driving conditions, additional or more frequent maintenance will be required. Refer to "Maintenance under severe driving conditions".

The periodic maintenance schedule is repeated beyond the last mileage and period shown.

EMISSION CONTROL SYSTEM MAINTENANCE
— Gasoline engine (U.S.A. and Canada 2-door Sedan MPG models)

MAINTENANCE OPERATION		MAINTENANCE INTERVAL				Reference page
Periodic maintenance should be performed at number of miles, kilometers or months, whichever comes first.	Miles x 1,000	15	30	45	60	
	(Kilometers x 1,000)	(24)	(48)	(72)	(96)	
	Months	12	24	36	48	
Drive belts			I		I	MA-11
Air cleaner filter			R		R	MA-11
Air induction valve filter (Except MPG & California models)			R		R	MA-11
Choke mechanism (choke valve and linkage)			I		I	MA-12
Positive crankcase ventilation (P.C.V.) filter			See NOTE (1)*.			MA-12
Vapor lines			I*		I*	MA-12
Fuel lines (hoses, piping, connections, etc.)			I*		I*	MA-12
Fuel filter			See NOTE (1)*.			MA-13
Engine coolant			R		R	MA-13
Engine oil & oil filter		Replace every 7,500 miles (12,000 km) or 6 months.				MA-13
Spark plugs			R		R	MA-14
Ignition wires			I*		I*	MA-14
Intake & exhaust valve clearance	See NOTE (2).	A	A	A	A	MA-15
Idle rpm	See NOTE (3).	I*	I*	I*	I*	MA-16
Automatic temperature control air cleaner			I*		I*	MA-15
Exhaust gas sensor (MPG & California models only)			I		I	MA-19

NOTE: (1) If vehicle is operated under extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high, the filters might become clogged. In such an event, replace them immediately.

(2) The first 1,000 mile (1,600 km) adjustment is required.

(3) The first 1,000 mile (1,600 km) inspection is required.

(4) Maintenance items and intervals with "*" are recommended by NISSAN MOTOR CO., LTD. Other maintenance items and intervals are required.

Abbreviations: A = Adjust
R = Replace
I = Inspect. Coorect or replace if necessary.

EMISSION CONTROL SYSTEM MAINTENANCE

— Gasoline engine (Canada models except 2-door Sedan MPG)

MAINTENANCE OPERATION			MAINTENANCE INTERVAL				Reference page
Periodic maintenance should be performed at number of miles, kilometers or months, whichever comes first.		Miles x 1,000	15	30	45	60	
		(Kilometers x 1,000)	(24)	(48)	(72)	(96)	
		Months	12	24	36	48	
Drive belts				I		I	MA-11
Air cleaner filter				R		R	MA-11
Air induction valve filter				R		R	MA-11
Choke mechanism (choke valve and linkage)			I	I	I	I	MA-12
Positive crankcase ventilation (P.C.V.) filter			See NOTE (1)*.				MA-12
Vapor lines				I*		I*	MA-12
Fuel lines (hoses, piping, connections, etc.)				I*		I*	MA-12
Fuel filter			See NOTE (1)*.				MA-13
Engine coolant				R		R	MA-13
Engine oil & oil filter			Replace every 7,500 miles (12,000 km) or 6 months.				MA-13
Spark plugs			R	R	R	R	MA-14
Ignition wires				I*		I*	MA-14
Intake & exhaust valve clearance		See NOTE (3).	A	A	A	A	MA-15
Ignition timing			A	A	A	A	MA-17
Idle rpm & mixture ratio	Idle rpm	See NOTE (3).	A	A	A	A	MA-17
	Mixture ratio	See NOTE (4).	I	I	I	I	MA-17
Automatic temperature control air cleaner			I	I	I	I	MA-15
Fuel tank vacuum relief valve (If so equipped)				I		I	EF & EC-87

— Diesel engine (Non-California)

MAINTENANCE OPERATION			MAINTENANCE INTERVAL				Reference page
Periodic maintenance should be performed at number of miles, kilometers or months, whichever comes first.		Miles x 1,000	15	30	45	60	
		(Kilometers x 1,000)	(24)	(48)	(72)	(96)	
		Months	12	24	36	48	
Drive belts		See NOTE (4).	I	I	I	I	MA-32
Air cleaner filter				R		R	MA-32
Fuel lines (hoses, piping, connections, etc.)				I*		I*	MA-37
Rubber hoses (water, air, fuel, blow-by, oil, etc.)				I		I	MA-37
Fuel filter		See NOTE (1).		R		R	MA-33
Engine coolant				R		R	MA-32
Engine oil		See NOTE (2).	Replace every 7,500 miles (12,000 km) or 6 months.				MA-36
Engine oil filter	During the first 15,000 miles (24,000 km):		Replace every 7,500 miles (12,000 km) or 6 months.				MA-36
	After the first 15,000 miles (24,000 km):		Replace every 15,000 miles (24,000 km) or 12 months.				MA-36
Injection nozzle tips			I	I	I	I	MA-34
Intake & exhaust valve clearance		See NOTE (3).	A	A	A	A	MA-36
Idle rpm		See NOTE (4).		I		I	MA-36
Fuel injection timing				I		I	MA-33
Timing belts			Replace every 60,000 miles (100,000 km).				MA-34

NOTE: (1) If vehicle is operated under extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high, the filters might become clogged. In such an event, replace them immediately.
(2) Old engine oil should be drained completely, then new oil added. Never mix new oil with old oil.
(3) The first 1,000 mile (1,600 km) adjustment is required.
(4) The first 1,000 mile (1,600 km) inspection is required.
(5) Maintenance items and intervals with "*" are recommended by NISSAN MOTOR CO., LTD. Other maintenance items and intervals are required.

Abbreviations: A = Adjust
R = Replace
I = Inspect. Coorect or replace if necessary.

CHASSIS AND BODY MAINTENANCE

MAINTENANCE OPERATION		MAINTENANCE INTERVAL				Reference page
Periodic maintenance should be performed at number of miles, kilometers or months, whichever comes first.	Miles x 1,000	15	30	45	60	
	(Kilometers x 1,000)	(24)	(48)	(72)	(96)	
	Months	12	24	36	48	
Brake lines & hoses		I	I	I	I	MA-49
Brake pads, discs, drums & linings		I	I	I	I	MA-49
Brake fluid			R		R	MA-48
Manual and automatic transaxle gear oil		I	I	I	I	MA-44, 45
Power steering lines & hoses		I	I	I	I	MA-55
Steering gear & linkage, & suspension parts		I	I	I	I	MA-45, 47, 55
Steering linkage ball joints & front suspension ball joints					I	MA-46
Looks, hinges & hood latch		L	L	L	L	MA-56
Front wheel bearing grease			I		I	MA-46
Exhaust system		I	I	I	I	MA-44
Seat belts, buckles, retractors, anchors & adjuster		I	I	I	I	MA-56

Abbreviations: L = Lubricate
R = Replace
I = Inspect. Correct or replace if necessary

MAINTENANCE UNDER SEVERE DRIVING CONDITIONS

The maintenance intervals shown on the preceding pages are for normal operating conditions. If the vehicle is operated under severe driving conditions as shown below, more frequent maintenance must be performed on the following items as shown in the table.

Severe driving conditions

A – Repeated short distance driving
B – Extensive idling
C – Driving in dusty conditions
D – Driving in extremely low or high ambient temperatures
E – Towing a trailer
F – Driving in areas using road salt or other corrosive materials
G – Driving on rough and/or muddy roads
H – Driving in high humidity areas or in mountainous areas

Driving condition	Maintenance item	Maintenance operation	Maintenance interval
. . C	Air cleaner filter & air induction valve filter	R	More frequently
A B C . E . . .	Engine oil (Gasoline engine)	R	Every 3,000 miles (5,000 km) or 3 months
	(Diesel engine)	R	Every 3,750 miles (6,000 km) or 3 months
A B C . E . . .	Engine oil filter (Gasoline engine)	R	Every 3,000 miles (5,000 km) or 3 months
	(Diesel engine*1)	R	Every 3,750 miles (6,000 km) or 3 months
	(Diesel engine*2)	R	Every 7,500 miles (12,000 km) or 6 months
A . C . E F G .	Brake pads, discs, drums & lining	I	Every 7,500 miles (12,000 km) or 6 months
. . . . . H	Brake fluid	R	Every 15,000 miles (24,000 km) or 12 months
. . . . E . G .	Manual and automatic transaxle gear oil	R	Every 30,000 miles (48,000 km) or 24 months
. . . . . G .	Steering gear & linkage, & suspension parts	I	Every 7,500 miles (12,000 km) or 6 months
. . . D . F G .	Front drive shaft boots	I	Every 7,500 miles (12,000 km) or 6 months
. . C D . F G .	Steering linkage ball joints & front suspension ball joints	I	Every 7,500 miles (12,000 km) or 6 months
. . . . . F . .	Locks, hinges & hood latch	I	Every 7,500 miles (12,000 km) or 6 months
A . . . E F G .	Exhaust system	I	Every 7,500 miles (12,000 km) or 6 months

*1: During the first 15,000 miles (24,000 km)
*2: After the first 15,000 miles (24,000 km)
Maintenance operations: I = Inspect. Correct or replace if necessary R = Replace

GENERAL MAINTENANCE

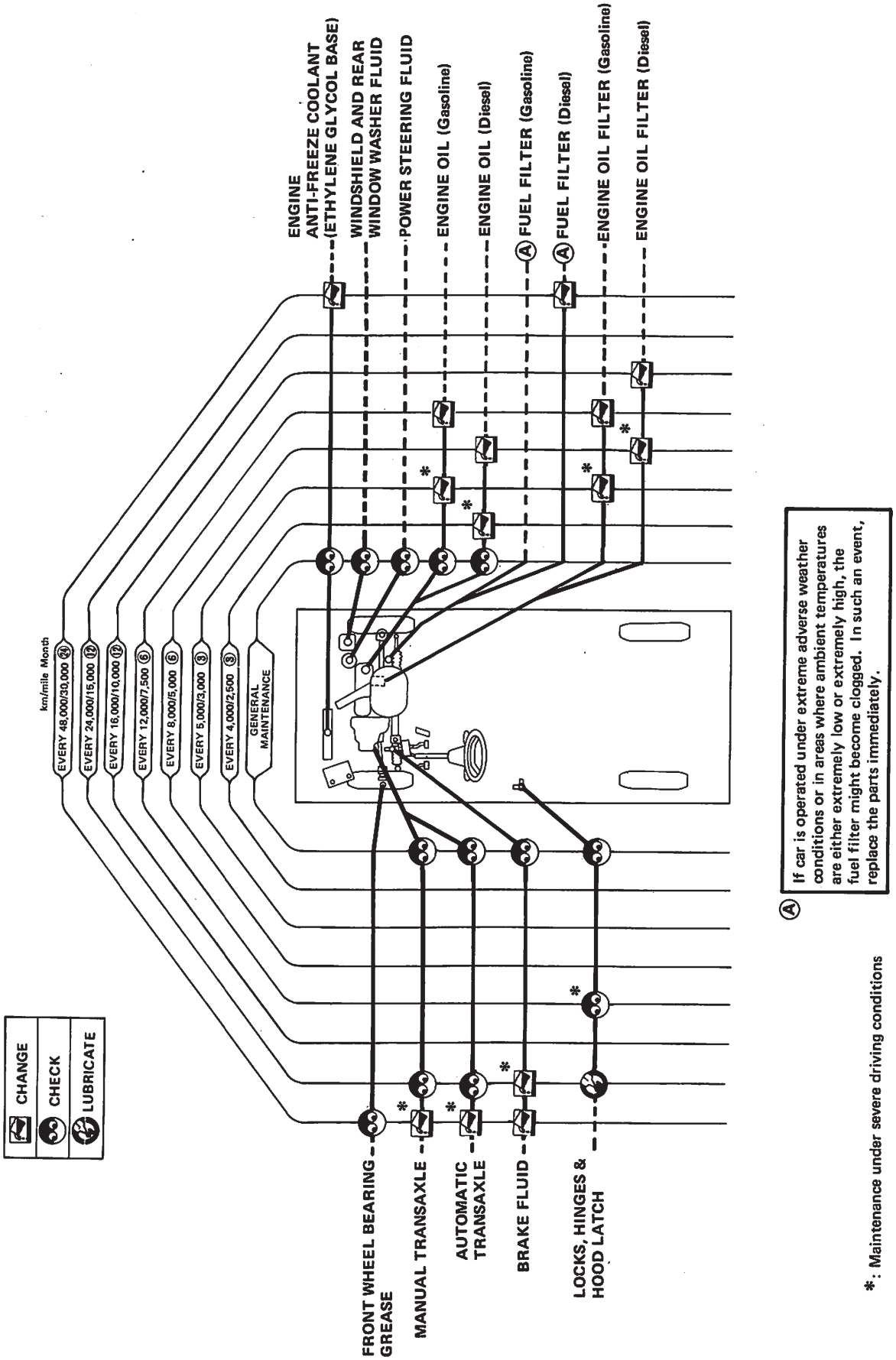
General maintenance includes those items which should be checked during the normal day-to-day operation of the vehicle. They are essential if the vehicle is to continue operating properly. The owners can perform the checks and inspections themselves or they can have their NISSAN/DATSUN dealers do them for a nominal charge.

Item	Reference item in MA section
OUTSIDE THE VEHICLE	
Tires Check the pressure with a gauge periodically when at a service station, including the spare, and adjust to the specified pressure if necessary. Check carefully for damage, cuts or excessive wear.	• CHECKING TIRE CONDITION
Wheel nuts When checking the tires, make sure no nuts are missing, and check for any loose nuts. Tighten if necessary.	• TIRE REPLACEMENT Wheel nut.
Tire rotation Tires should be rotated every 24,000 km (15,000 miles).	• TIRE ROTATION
Wheel alignment and balance If the vehicle should pull to either side while driving on a straight and level road, or if you detect uneven or abnormal tire wear, there may be a need for wheel alignment. If the steering wheel or seat vibrates at normal highway speeds, wheel balancing may be needed.	• CHECKING TIRE CONDITION Abnormal tire wear • CHECKING WHEEL ALIGNMENT • WHEEL INSPECTION
Windshield glass Check for abrasions or scratches.	–
Windshield wiper blades Check for cracks or wear if they do not wipe properly.	–
Fluid leaks Check under the vehicle for fuel, oil, water or other fluid leaks after the vehicle has been parked for a while. Water dripping from the air conditioner after use is normal. If you should notice any leaks or gasoline fumes are evident, check for the cause and correct it immediately.	• INSPECTING MANUAL TRANSAXLE OIL • INSPECTING AUTOMATIC TRANSAXLE FLUID • INSPECTING FRONT AXLE AND SUSPENSION PARTS • INSPECTING REAR AXLE AND SUSPENSION PARTS • INSPECTING BRAKE LINES & HOSES • CHECKING POWER STEERING LINE & HOSES
Doors and engine hood Check that all doors and the eingine hood operate smoothly as well as the trunk lid and back hatch. Also ensure, that all latches lock securely. Lubricate if necessary. Make sure that the secondary latch keeps the hood from opening when the primary latch is released.	• LUBRICATING LOCKS, HINGES AND HOOD LATCH
INSIDE THE VEHICLE	
The maintenance items listed here should be checked on a regular basis, such as when performing periodic maintenance, cleaning the vehicle, etc.	
Lights Make sure that the headlights, stop lights, tail lights, turn signal lights, and other lights are all operating properly and installed securely. Also check headlight aim.	–

Item	Reference item in MA section
Warning lights and buzzers/chimes Make sure that all warning lights and buzzers/chimes are operating properly.	–
Horn Make sure it operates properly.	–
Windshield wiper and washer Check that the wipers and washer operate properly and that the wipers do not streak.	–
Windshield defroster Check that the air comes out of the defroster outlets properly and in sufficient quantity when operating the heater or air conditioner.	–
Rear view mirror Make sure that it is secure.	–
Sun visors Make sure that they can be moved freely and are secure.	–
Steering wheel Check that it has the specified freeplay. Be sure to check for changes in the steering condition, such as excessive freeplay, hard steering or strange noises.	**Specification** **Free play: Less than 35 mm (1.38 in)**
Seats Check front seat position controls such as seat adjusters, seatback recliner, etc. to ensure they operate smoothly and that all latches lock securely in every position. Check that the head restraints move up and down smoothly and that the locks (if so equipped) hold securely in all latched positions. Check that the latches lock securely for folding-down rear seatbacks.	–
Seat belts Check that all parts of the seat belt system e.g. buckles, anchors and retractors operate property and smoothly. Check the belt webbing for cuts, fraying, wear or damage.	• **INSPECTING SEAT BELTS, BUCKLES, ANCHORS, RETRACTORS AND ADJUSTER**
Accelerator pedal Check the pedal for smooth operation and make sure the pedal does not catch or require uneven effort.	–
Clutch pedal Make sure the pedal operates smoothly and check that it has the proper free travel.	• **ADJUSTING CLUTCH PEDAL HEIGHT AND FREE PLAY**
Brakes Check that the brake does not pull the vehicle to one side when applied.	–
Brake pedal Check the pedal for smooth operation and make sure it has the proper distance under it when depressed fully. Check the brake booster function.	• **CHECKING BRAKE PEDAL DEPRESSED HEIGHT** • **CHECKING BRAKE BOOSTER FUNCTION**
Parking brake Check that the lever has the proper travel and confirm that your vehicle is held securery on a fairly steep hill with only the parking brake applied.	• **CHECKING PARKING BRAKE**
Automatic transaxle "Park" mechanism Check that the lock release button on the selector lever operates properly and smoothly. On a fairly steep hill check that your vehicle is held securely with the selector lever in the "P" position without applying any brakes.	–

Item	Reference Item in MA section
UNDER THE HOOD AND VEHICLE The maintenance items listed here should be checked periodically e.g. each time you check the engine oil or refuel.	
Windshield washer fluid Check that there is adequate fluid in the tank.	–
Engine coolant level Check the coolant level when the engine is cold.	–
Radiator and hoses Check the front of the radiator and clean off any dirt, insects, leaves, etc., that may have accumulated. Make sure the hoses have no cracks, deformation, rot or loose connections.	–
Brake fluid level Make sure that the brake fluid level is between the "MAX" and "MIN" lines on the reservoir.	• INSPECTING BRAKE LINES & HOSES
Engine drive belts Make sure that no belt if frayed, worn, cracked or oily.	• CHECKING AND ADJUSTING DRIVE BELT
Engine oil level Check the level on the dipstick after parking the vehicle on a level spot and turning off the engine.	–
Power steering fluid level Check the level on the dipstick when the fluid is cold and the engine is turned off.	• CHECKING POWER STEERING FLUID LEVEL
Automatic transaxle fluid level Check the level on the dipstick after putting the selector lever in "P" with the engine idling.	• CHECKING AUTOMATIC TRANSAXLE FLUID LEVEL
Exhaust system Make sure there are no loose supports, cracks or holes. If the sound of the exhaust seems unusual or there is a smell of exhaust fumes, immediately locate the trouble and correct it.	• INSPECTING EXHAUST SYSTEM
Underbody The underbody is frequently exposed to corrosive substances such as those used on icy roads or to control dust. It is very important to remove these substances, otherwise rust will form on the floor pan, frame, fuel lines and around the exhaust system. At the end of winter, the underbody should be thoroughly flushed with plain water, being careful to clean those areas where mud and dirt can easily accumulate.	–

LUBRICATION CHART



Ⓐ If car is operated under extreme adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high, the fuel filter might become clogged. In such an event, replace the parts immediately.

*: Maintenance under severe driving conditions

SMA440A

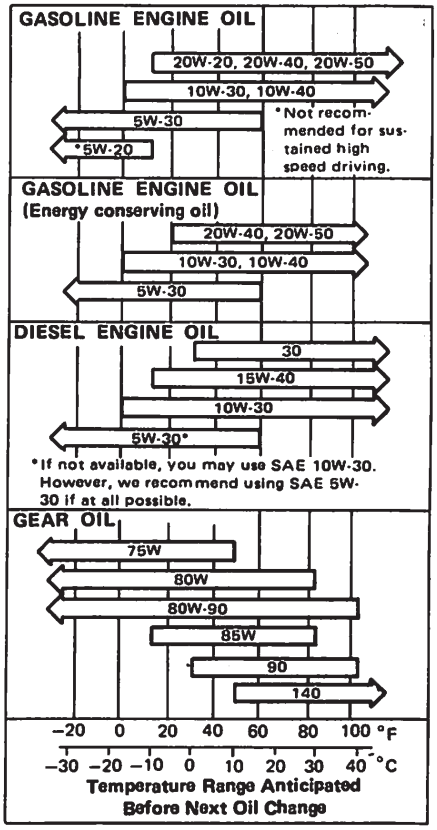
RECOMMENDED FUEL AND LUBRICANTS

FUEL

		Outside temperature	Fuel	Octane (Gasoline)/ Cetane (Diesel) number (minimum)	
				RON	(R+M)/2
Gasoline engine	U.S.A. and Canada 2-door Sedan MPG	–	Unleaded	91	87
	Canada models except 2-door Sedan MPG	–	Unleaded or leaded		
Diesel engine		above 20°F (–7°C)	*2-D Diesel fuel or equivalent blended diesel fuel	42	
		below 20°F (–7°C)	*1-D Diesel fuel or equivalent blended diesel fuel		

*: Check with the service station operator to be sure you get the properly blended fuel.

SAE VISCOSITY NUMBER



LUBRICANTS

Lubricant		Specifications	Remarks
Engine oil	Gasoline (except MPG model)	API SF (Energy Conserving Oils)	For further details, refer to "Engine oil and oil filter recommendation" in Owner's Manual.
	Gasoline (MPG model)	API SF (Energy Conserving Oils) or SE	
	Diesel	API SE/CC, SF/CC, SE/CD, SF/CD or CD	
Manual transaxle gear oil		API GL-4	For further details, refer to the recommended SAE viscosity chart.
Automatic transaxle and power steering gear fluid		Type DEXRON	–
Multi-purpose grease		NLGI No. 2	Lithium soap base
Brake fluid		DOT 3	US FMVSS No. 116
Anti-freeze		–	Ethylene glycol base

APPROXIMATE REFILL CAPACITIES

				Liter	US measure	Imp measure
Fuel tank				50	13-1/4 gal	11 gal
Engine coolant	With heater		M/T	4.7	5 qt	4-1/8 qt
			A/T	5.3	5-5/8 qt	4-5/8 qt
	Without heater		M/T	4.1	4-3/8 qt	3-5/8 qt
			A/T	4.7	5 qt	4-1/8 qt
	Reservoir tank			0.7	3/4 qt	5/8 qt
Engine oil	With oil filter			3.9	4-1/8 qt	3-3/8 qt
	Without oil filter			3.4	3-5/8 qt	3 qt
Transaxle	Manual	4-speed		2.3	4-7/8 pt	4 pt
		5-speed		2.7	5-3/4 pt	4-3/4 pt
	Automatic			6.0	6-3/8 qt	5-1/4 qt
Windshield washer tank				1.5	1-5/8 qt	1-3/8 qt
Power steering system				1.0	1-1/8 qt	7/8 qt
Air conditioning system	Compressor oil			0.15	5.1 fl oz	5.3 fl oz
	Refrigerant			0.8 - 1.0 kg	1.8 - 2.2 lb	1.8 - 2.2 lb

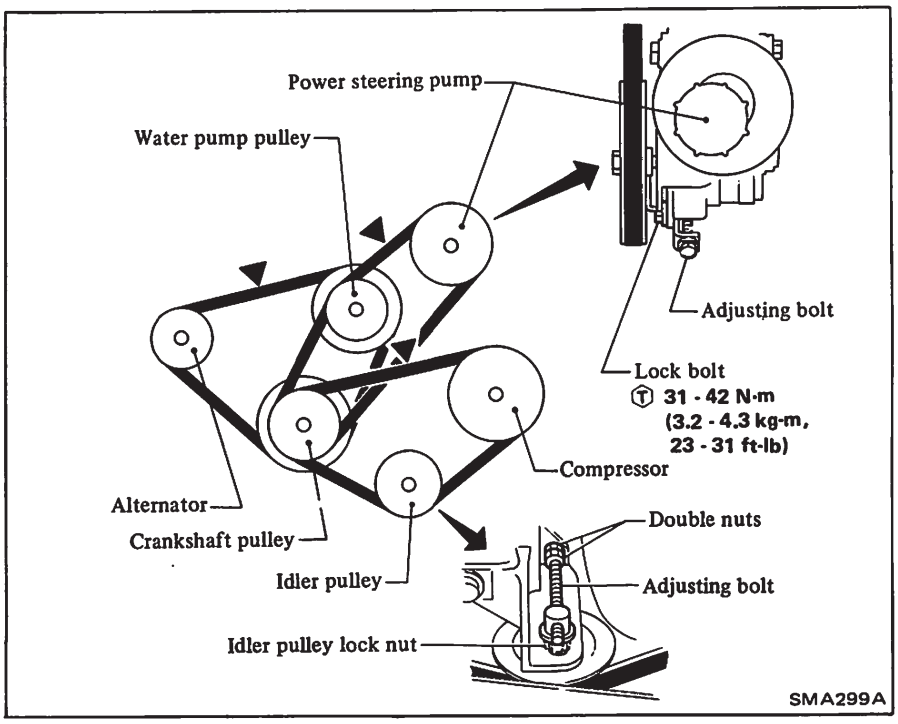
ENGINE MAINTENANCE (E15 & E16)

BEFORE ENGINE START

CHECKING DRIVE BELTS

1. Inspect for cracks and wear. Replace if necessary.
2. Check drive belt deflections by pushing midway between pulleys.
   Adjust if necessary.

Drive belt deflection mm (in)	Adjust deflection of used belt	Set deflection of new belt
Alternator	13 - 17 (0.51 - 0.67)	10 - 14 (0.39 - 0.55)
Air conditioner	9 - 11 (0.35 - 0.43)	7 - 9 (0.28 - 0.35)
Power steering	7 - 9 (0.28 - 0.35)	6.5 - 8.5 (0.256 - 0.335)
Applied pushing force N (kg, lb)	98 (10, 22)	



Alternator belt

1. Loosen the upper and lower alternator securing bolts until the alternator can be moved slightly.
2. Move the alternator with a prying bar until the belt deflection is within the specified range. Then tighten the bolts securely.

Air conditioner belt

1. Loosen the idler pulley lock nut and adjusting bolt double nuts for the belt being adjusted.
2. Adjust the adjusting bolt until the belt deflection is within the specified range.
3. Tighten the adjusting bolt double nuts and idler pulley lock nut securely.

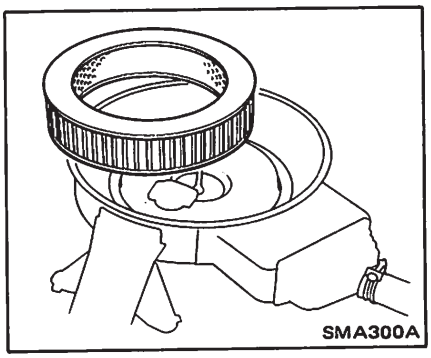
Power steering belt

1. Loosen the power steering oil pump adjusting lock bolt and its securing bolt for the belt being adjusted.
2. Adjust the adjusting bolt until the belt deflection is within the specified range.
3. Tighten the adjusting bolt lock bolt and oil pump securing bolt securely.

REPLACING AIR CLEANER FILTER

Air cleaner filter is a viscous paper type and does not require cleaning.

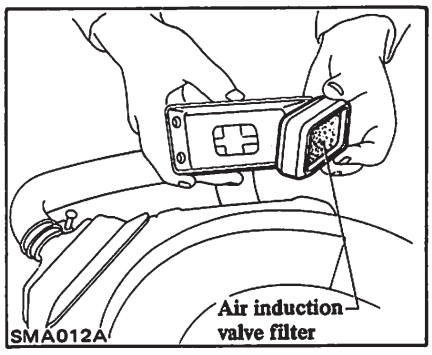
1. Remove air cleaner cover and remove air cleaner filter.



2. Install new air cleaner filter and install air cleaner cover.

REPLACING AIR INDUCTION VALVE FILTER

Stop engine and remove air induction valve case, and remove filter.



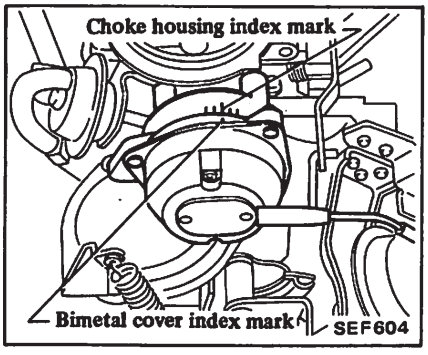
CHECKING CHOKE MECHANISM (Lubrication and cleaning of choke plate and linkage) (U.S.A.)

1. Check choke valve and linkage for free operation, and clean choke valve or lubricate choke linkage if necessary.
2. Before starting engine, fully open throttle valve and ensure that choke valve closes properly.

CHECKING CHOKE MECHANISM (Choke plate and linkage) (Canada)

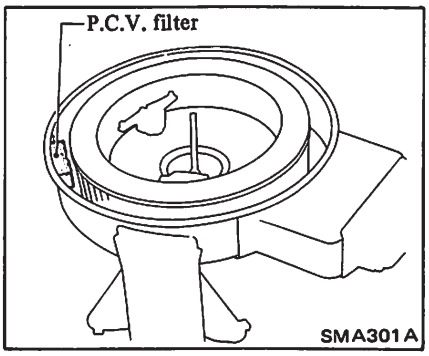
1. Check choke valve and mechanism for free operation, and clean or replace if necessary. Binding can result from petroleum gum formation on choke shaft or from damage.
2. Before starting engine, fully open throttle valve and ensure that choke valve closes properly.
3. Push choke valve with your finger, and check for binding.
4. Check to be sure that bi-metal cover index mark is set at the center of choke housing index mark as shown below.

Do not set bimetal cover index mark at any position except the center of choke housing index mark.



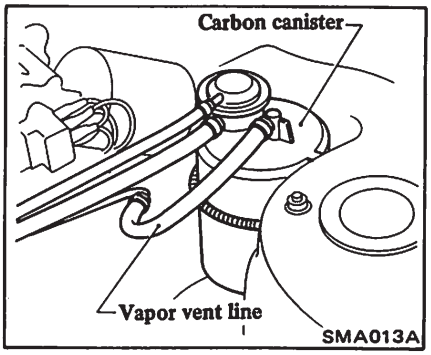
REPLACING P.C.V. FILTER

Remove air cleaner cover, and replace filter.



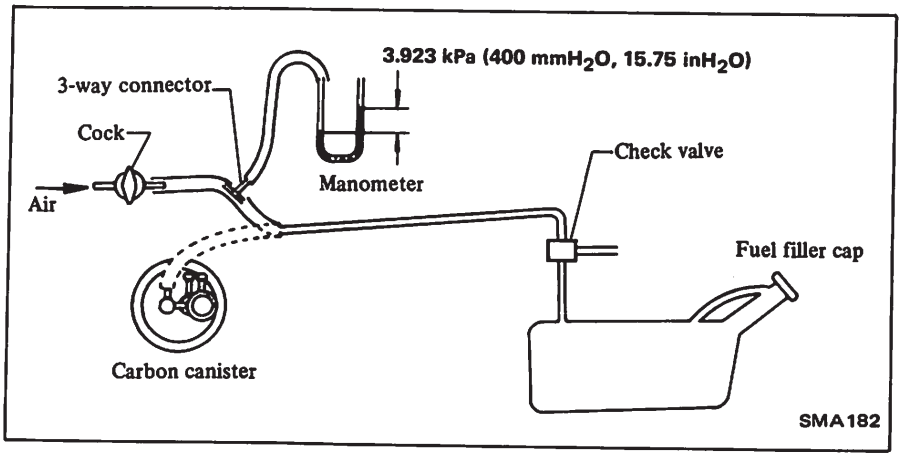
CHECKING VAPOR LINES

1. Check all hoses and fuel tank filler cap.
2. Disconnect vapor vent line connecting carbon canister to fuel tank.



3. Connect 3-way connector, manometer and cock (or equivalent 3-way charge cock) to end of vent line.
4. Slowly supply fresh air into vapor vent line through cock until pressure reaches 3.923 kPa (400 mmH_2O, 15.75 inH_2O).
5. Shut cock completely.
6. After 2-1/2 minutes, measure height of liquid in manometer.
7. Variation in height should remain 0.245 kPa (25 mmH_2O, 0.98 inH_2O).
8. When filler cap does not close completely, height should soon drop to zero.
9. If height does not soon drop to zero when filler cap is removed, the cause is a clogged hose.

If vent line is clogged, breathing in fuel tank is poor, thus causing insufficient delivery of fuel to engine or vapor lock. It must, therefore, be repaired or replaced.



CHECKING FUEL LINES (Hoses, piping, connections, etc.)

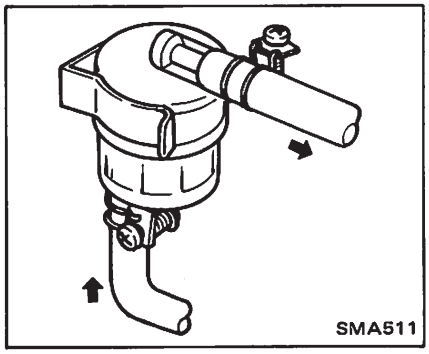
Check fuel lines for loose connections, cracks and deterioration. Retighten loose connections and replace any damaged or deformed parts.

REPLACING FUEL FILTER

Disconnect battery cable.

1. Disconnect fuel hoses from fuel filter and replace it.
2. Check filter for contamination and water deposit.

Plug open of fuel hose immediately after fuel hose has been removed from fuel filter.

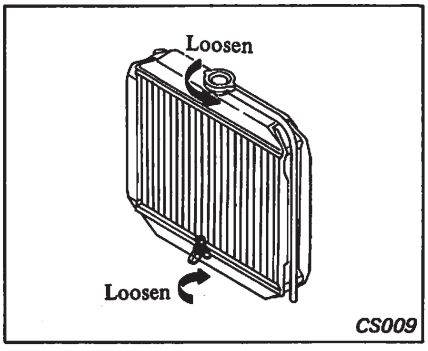


CHANGING ENGINE COOLANT

WARNING:
To avoid being scalded, never change the coolant when the engine is hot.

- **When replacing engine coolant, set heater "TEMP" control lever to fully "HOT" position.**

1. To flush system, open drain cock at bottom of radiator. Then thoroughly flush until clear water comes out.

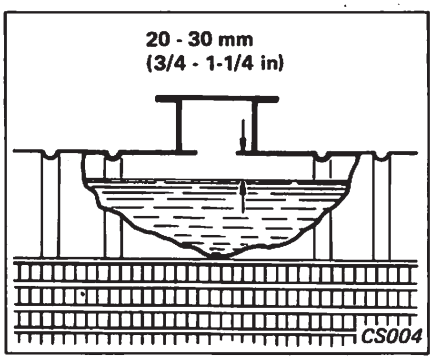


2. Close drain cock.
3. Fill radiator with coolant up to specified level. Follow instructions attached to anti-freeze container for mixing ratio of anti-freeze to water.

Coolant capacity:

Liter (US qt, Imp qt)

	M/T	A/T
With heater	4.7 (5, 4-1/8)	5.3 (5-5/8, 4-5/8)
Without heater	4.1 (4-3/8, 3-5/8)	4.7 (5, 4-1/8)
Reservoir tank	0.7 (3/4, 5/8)	

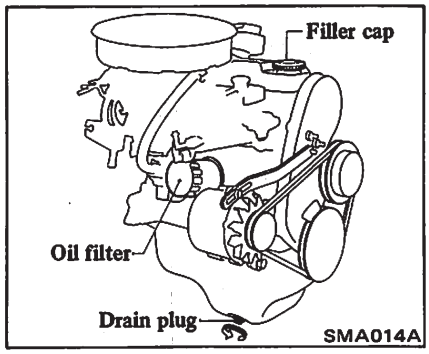


4. Install filler cap and fill reservoir tank with coolant up to "MAX" level.
5. Start engine and warm up engine until water temperature indicator points to the middle of gauge.
6. Stop engine and cool engine off completely.
7. Refill radiator with coolant up to filler opening if the coolant level is lever the specified level.
8. Also, refill reservoir tank with coolant up to "MAX" level.

CHANGING ENGINE OIL AND REPLACING OIL FILTER

1. Start engine and warm it up until water temperature indicator points to middle of gauge, then turn off engine.
2. Remove oil filler cap and oil pan drain plug, and allow oil to drain.

WARNING:
Use care as the engine oil is hot.

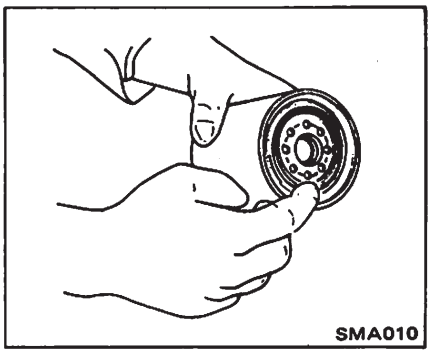


- **A milky oil indicates the presence of cooling water. Isolate the cause and take corrective measure.**
- **An oil with extremely low viscosity indicates dilution with gasoline.**

3. Using oil filter wrench, remove oil filter.
4. After draining engine oil, wipe oil pan drain hole with a clean rag.
5. Clean and install oil pan drain plug with washer.

Ⓣ : **Oil pan drain plug**
35 - 47 N·m
(3.6 - 4.8 kg-m, 26 - 35 ft-lb)

6. Wipe oil filter mounting surface with a clean rag.
7. Smear a little engine oil on rubber seal of new oil filter.



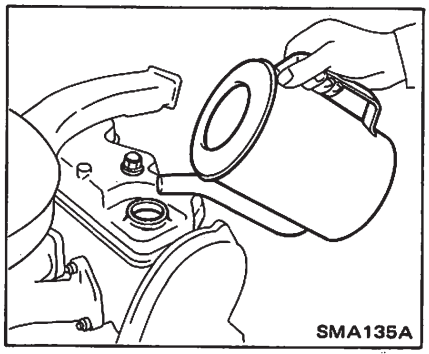
8. Install new oil filter by hand.

Do not use oil filter wrench to tighten the filter.

9. Refill engine with the appropriate new engine oil by referring to Recommended Lubricants.

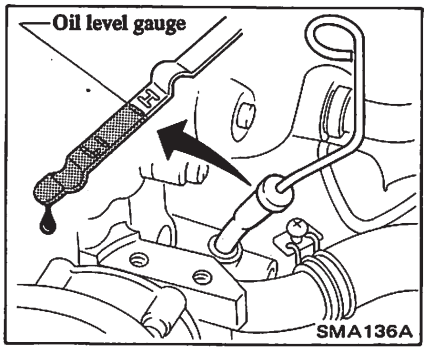
Check oil level with dipstick.

Oil capacity:
With oil filter
3.9 liters
(4-1/8 US qt, 3-3/8 Imp qt)
Without oil filter
3.4 liters
(3-5/8 US qt, 3 Imp qt)



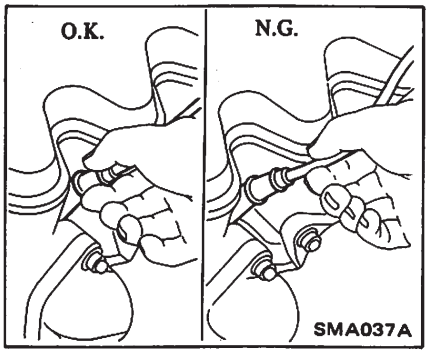
10. Install oil filler cap and start engine.
11. Check area around drain plug and oil filter for any sign of oil leakage.
If leakage is evident, retighten or replace.
12. Run engine until water temperature indicator points to middle of gauge. Then turn off engine and wait several minutes. Check oil level with oil level gauge. If necessary, add engine oil.

When checking oil level, park car on a level surface.

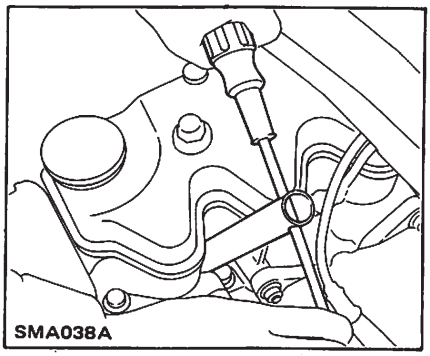


REPLACING SPARK PLUG

1. Remove air cleaner.
2. Disconnect spark plug wire at boot. **Do not pull on the wires.**



3. Remove spark plugs with spark plug wrench.



4. Install new spark plugs are reconnect high tension cables.

Spark plug type:

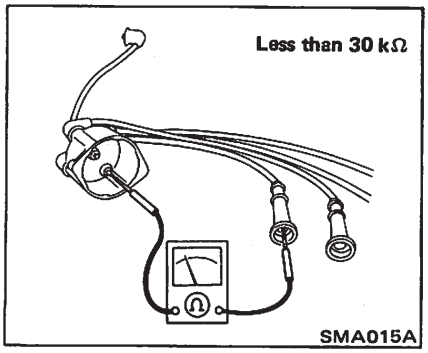
	U.S.A. and Canada M.P.G. models	*Canada models
Standard	BPR5ES-11	BPR5ES
Hot type	BPR4ES-11	BPR4ES
Cold type	BPR6ES-11	BPR6ES
Plug gap mm (in)	1.0 - 1.1 (0.039 - 0.043)	0.8 - 0.9 (0.031 - 0.035)

*: Not including Canada M.P.G. model

Ⓣ : **Spark plug**
20 - 29 N·m
(2.0 - 3.0 kg-m,
14 - 22 ft-lb)

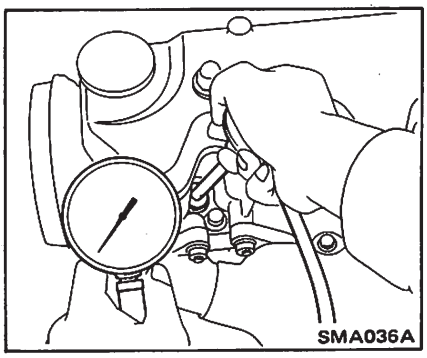
CHECKING IGNITION WIRES

1. Visually check wiring for cracks, and damaged and burned terminals.
2. Using an ohmmeter, measure the resistance between cable terminal on the spark plug side and corresponding electrode inside cap.
- **Shake the wire while measuring resistance to ckeck for intermittent brakes.**



CHECKING ENGINE COMPRESSION PRESSURE

1. Warm up engine until water temperature indicator points to middle of gauge.
2. Remove air cleaner and all spark plugs.
3. Disconnect anti-dieseling solenoid valve connector.
4. Properly attach a compression tester to spark plug hole in cylinder being tested.



5. Depress accelerator pedal to fully open throttle and choke valve.
6. Crank engine and read gauge indication.
- Run engine at about 350 rpm.
- Engine compression measurement should be made as quickly as possible.

Compression pressure:
kPa (kg/cm^2, psi)/at rpm
Standard
1,245 (12.7, 181)/350
Minimum
981 (10.0, 142)/350

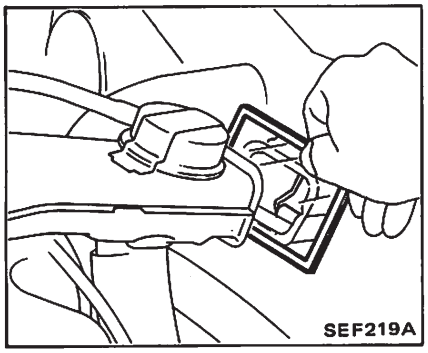
7. If cylinder compression in one or more cylinders is low, pour a small amount of engine oil into cylinders through the spark plug holes and retest compression.

- **If adding oil helps the compression pressure,** chances are that piston rings are worn or damaged.
- **If pressure stays low,** valve may be sticking or seating improperly.
- **If cylinder compression in any two adjacent cylinders is low, and if adding oil does not help the compression,** there is leakage past the gasketed surface.
  Oil and water in combustion chambers can result from this problem.

CHECKING AUTOMATIC TEMPERATURE CONTROL (A.T.C.) AIR CLEANER

1. Check that vacuum hoses (Intake manifold to temperature sensor, idle compensator and vacuum motor) are securely connected in correct position.
2. Check each hose for cracks or distortion.
3. Check A.T.C. system for function by proceeding as follows:
   Confirm that engine is cold before starting test.

With engine turned off, check position of air control valve by hand or mirror.



Air control valve is in correct position if its cold air inlet is open and hot air inlet is closed.

4. Start engine and keep idling.
   Immediately after starting engine, air control valve is in correct position if its cold air inlet is closed and hot air inlet is open.
5. Check that air control valve gradually opens to cold air inlet side as engine warms up. When environmental temperature around temperature sensor is low, allow more time for engine warming up to facilitate smooth operation of air control valve.

If the above test reveals any problem in the operation of air control valve, carry out the further inspection described in Section EF.

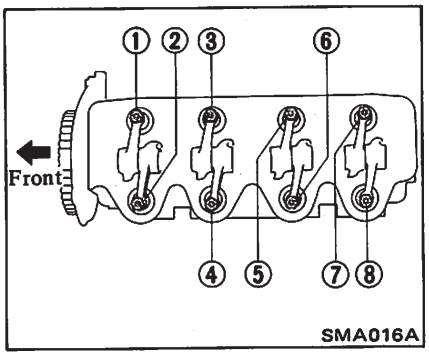
AFTER ENGINE WARM-UP

ADJUSTING INTAKE AND EXHAUST VALVE CLEARANCE

Adjustment should be made while engine is warm but not running.

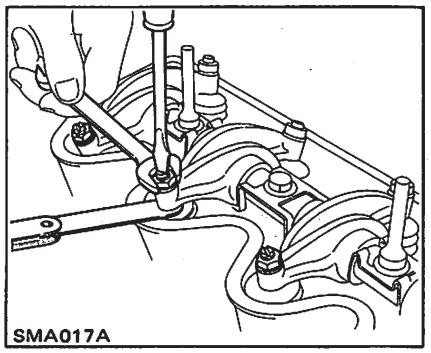
1. Start engine and warm it up until water temperature indicator points to middle of gauge. Then turn off engine.
2. Remove air cleaner securing bolts.
3. Remove valve rocker cover.
4. Rotate crankshaft.
5. Set No. 1 cylinder in top dead center on its compression stroke, and adjust valve clearance ①, ②, ③ and ⑥.
6. Set No. 4 cylinder in top dead center on its compression stroke and adjust valve clearance ④, ⑤, ⑦ and ⑧.

Valve clearance (Hot):
Intake and exhaust
0.28 mm (0.011 in)



(1) Loosen valve rocker adjusting screw lock nut and turn adjusting screw until specified clearance is obtained.
(2) After adjustment, tighten lock nut and recheck clearance.

Ⓣ : **Adjusting screw lock nut**
16 - 21 N·m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)



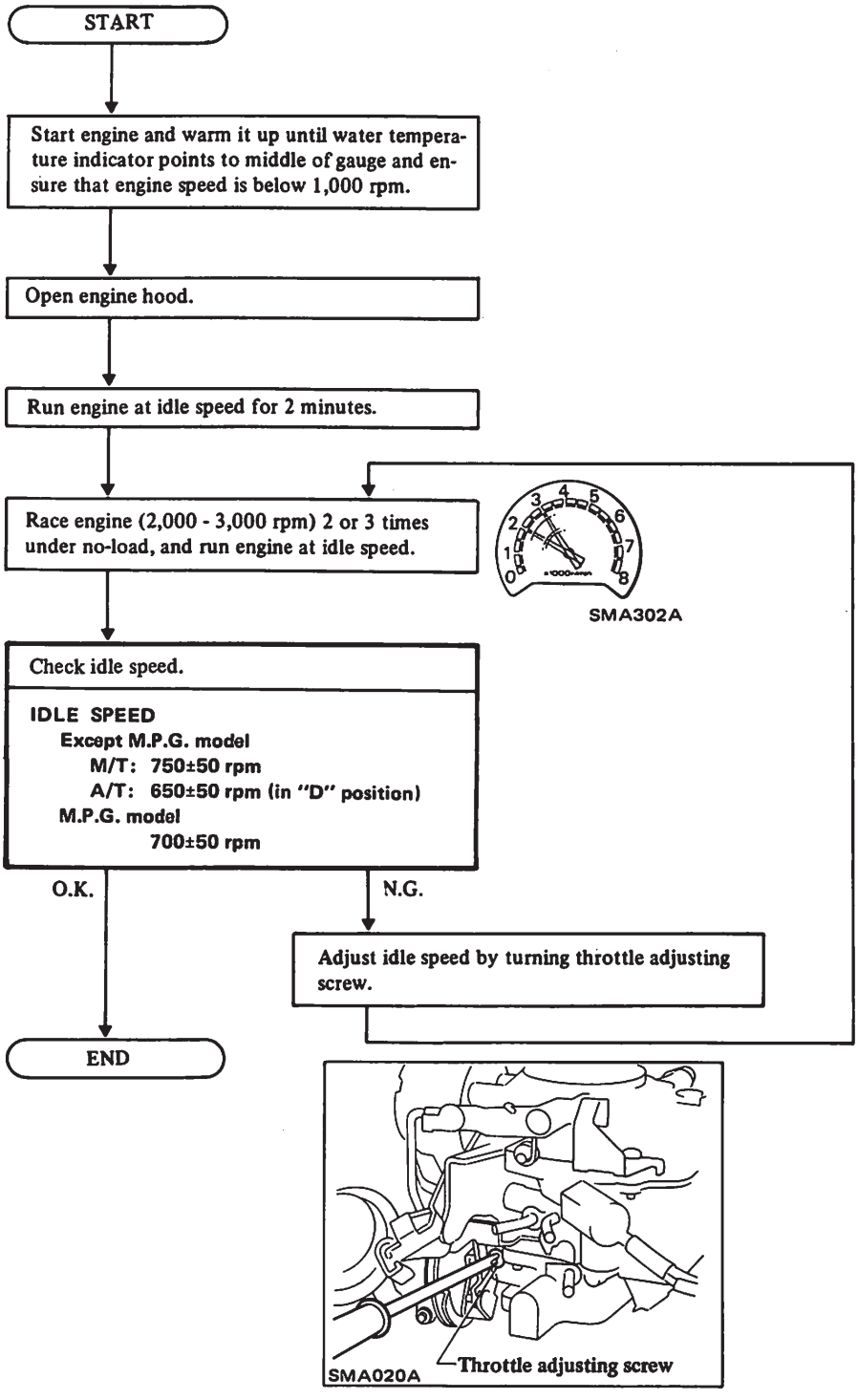
ADJUSTING IDLE RPM
(U.S.A. and Canada M.P.G. models)

Preparation

1. Connect engine tachometer in its proper position.
2. On air conditioner equipped models, the air conditioner system should be "OFF".
3. Apply parking brake and block both front and rear wheels with chocks.
4. The electrical components (lights, heater, all accessories, etc.) should be turned off so that idle speed can be inspected and/or adjusted accurately. (Refer to EF & EC section.)
5. Make the check after the radiator cooling fan has stopped. If it is operating, wait until it stops.

WARNING:
- **a. Inspections should be carried out while shift lever is in "D" position on automatic transaxle equipped models and in "Neutral" on manual transaxle equipped models.**
- **b. On automatic transaxle equipped models, racing the engine should be carried out while shift lever is in "N" or "P" position and brake pedal should be depressed.**
- **c. After adjustment has been made, shift the lever to "N" or "P" position.**

Maintenance procedure



ADJUSTING IDLE RPM, ADJUSTING IGNITION TIMING AND CHECKING MIXTURE RATIO

(Canada model except M.P.G.)

Preparation

1. Make sure that the following parts are in good order.
   - Ignition system
   - Engine oil and coolant levels
   - Valve clearance
2. Connect engine tachometer and timing light in their proper positions.
3. Insure that these switches and units are in the following positions:
   - Headlamp switch: OFF
   - Heater blower: OFF
   - Air conditioning switch: OFF (if equipped)
   - Steering: KEEP WHEELS STRAIGHT AHEAD (if equipped with power steering)
4. Make the check after the radiator cooling fan has stopped. If it is operating, wait until it stops.
5. Apply parking brake and block both front and rear wheels with chocks.
6. When measuring "CO" percentage, insert probe more than 40 cm (15.7 in) into tail pipe.

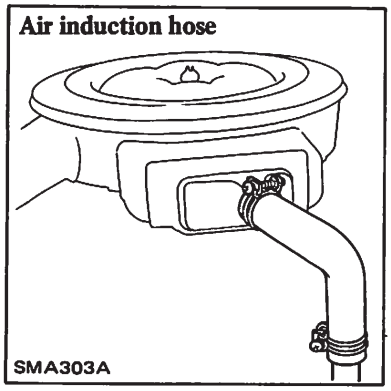
WARNING:

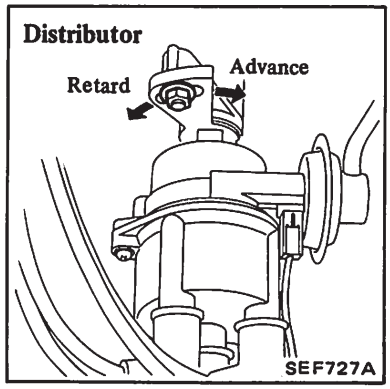
a. Inspections should be carried out while shift lever is in "D" position on automatic transaxle equipped models and in "Neutral" on manual transaxle equipped models.

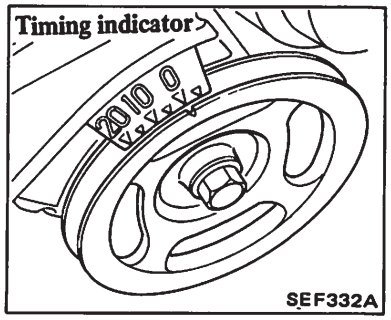
b. On automatic transaxle equipped models, racing the engine should be carried out while shift lever is in "N" or "P" position and brake pedal should be depressed.

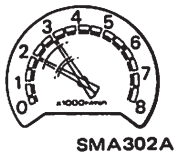
c. After adjustment has been made, shift the lever to "N" or "P" position.

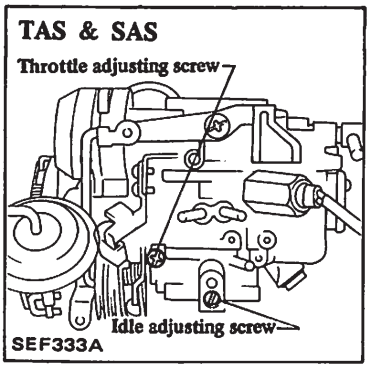
Maintenance procedure





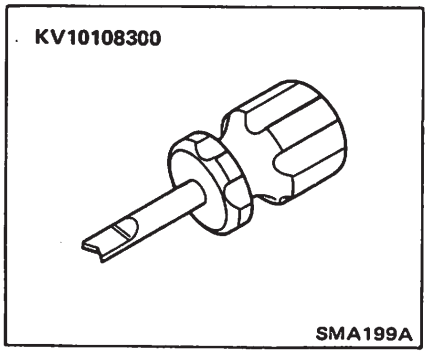






Idle limiter cap

A Metal idle limiter cap has been adopted, so adjust idle adjusting screw with idle adjusting screwdriver.



Ⓐ

Ⓑ

Connect distributor vacuum hose to distributor diaphragm.

Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load, and run engine at idle speed.


SMA302A

Check idle speed.

IDLE SPEED
M/T: 750±50 rpm
A/T: 650±50 rpm (in "D" position)

O.K.

N.G.

Adjust idle speed by turning throttle adjusting screw.

Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load, and run engine at idle speed.


SMA302A

Check idle "CO"%.

IDLE "CO"%
M/T: 2±1
A/T: 2±1 (in "D" position)

O.K.

N.G.

Adjust idle "CO"% by turning idle adjusting screw. Refer to NOTE for idle limiter cap

Turn off engine and connect air induction hose to air pipe.

Start engine.

Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load and run engine at idle speed.


SMA302A

Check idle speed.

IDLE SPEED
M/T: 750±50 rpm
A/T: 650±50 rpm (in "D" position)

O.K.

N.G.

Adjust idle speed by turning throttle adjusting screw.

END

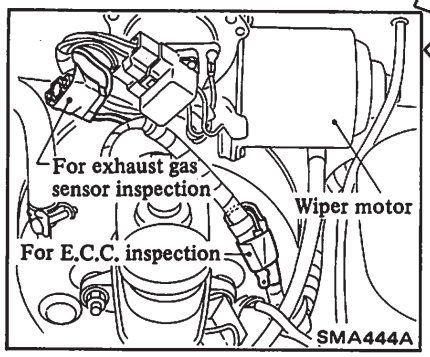
CHECKING EXHAUST GAS SENSOR
(California and M.P.G. models)

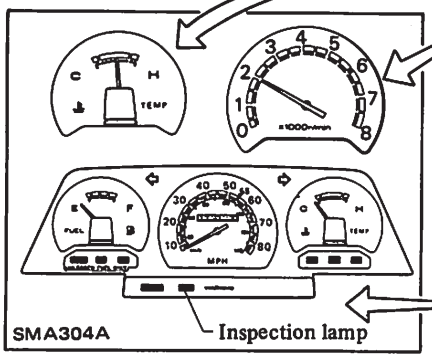
Preparation

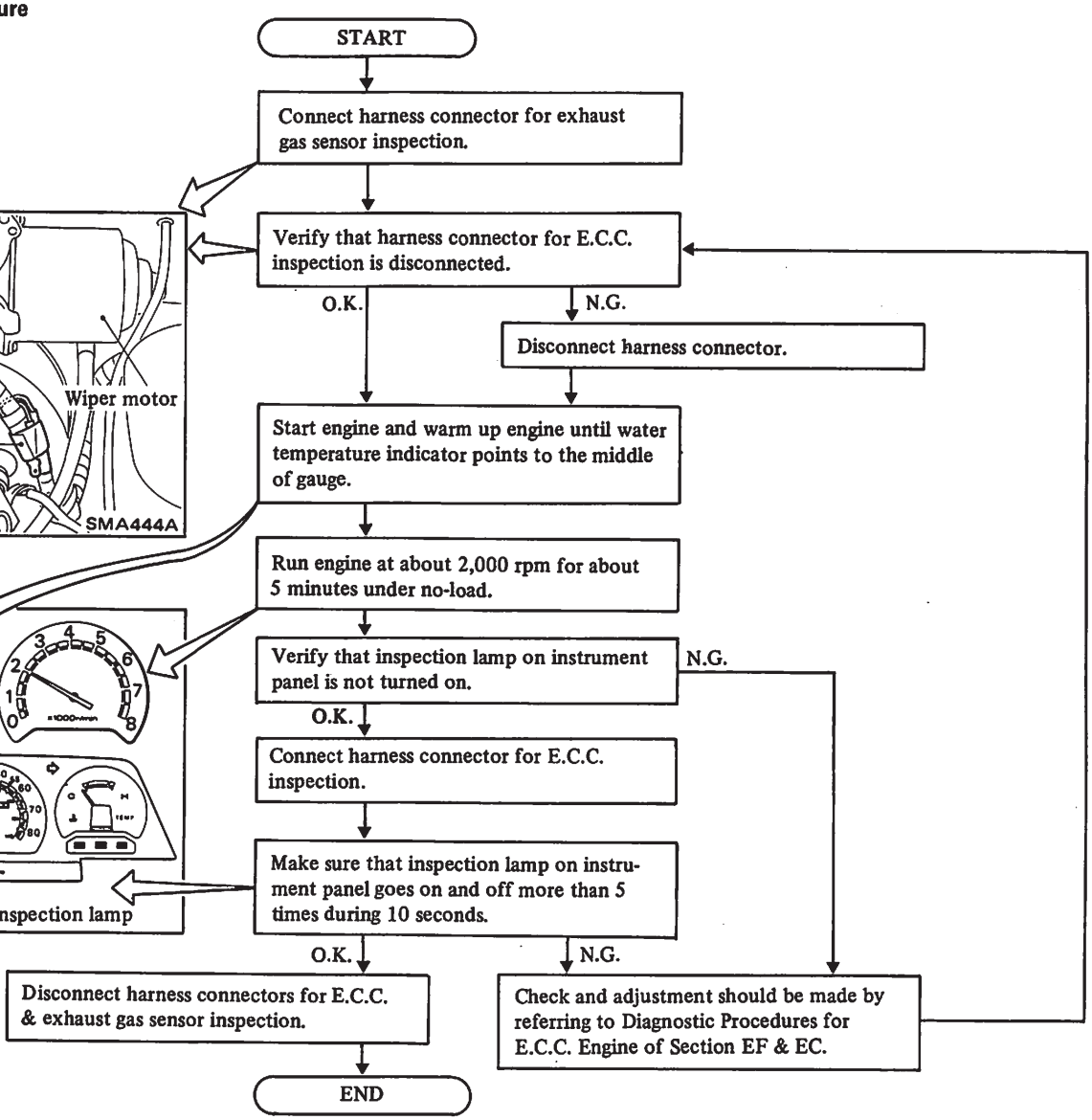
When checking exhaust gas sensor, make sure that the following parts are in good order.

- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- E.C.C. component parts
- Main harness connectors
- Hoses
- Oil filler cap and oil level gauge
- Valve clearance, engine compression

Maintenance procedure



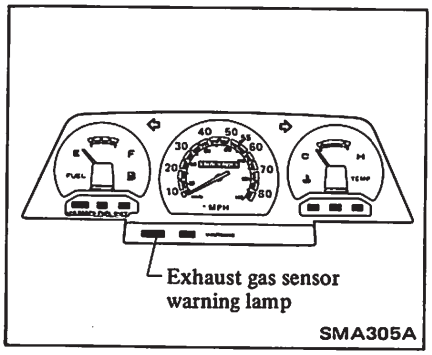




48,000 km (30,000 miles) or 24 Months Service

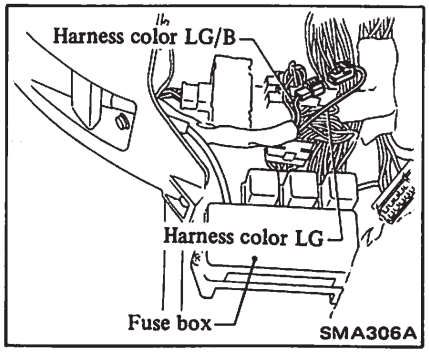
Exhaust gas sensor should be checked after 48,000 km (30,000 miles) or 24 months of operation.

After car has been operated for 48,000 km (30,000 miles), exhaust gas sensor warning lamp will come on to indicate that sensor should be inspected.



For California and U.S.A. M.P.G. models

After inspection, disconnect warning lamp harness connector so that warning lamp will not come on thereafter.



If sensor should be checked on the 24th month before 48,000 km (30,000 miles) of operation, also disconnect warning lamp harness connector.

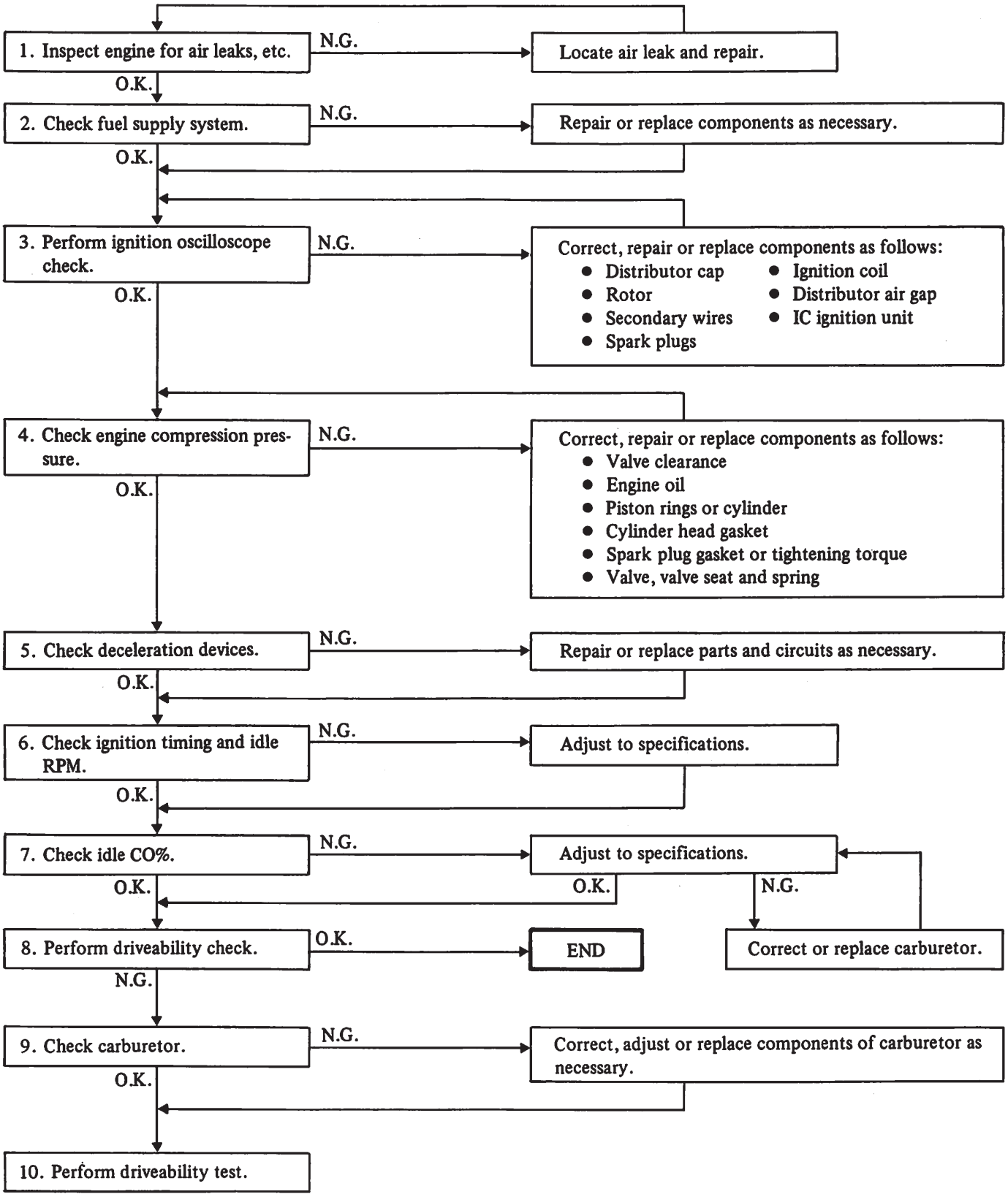
For Canada M.P.G. models

After inspection, disconnect the hold relay so that warning lamp will not come on thereafter.

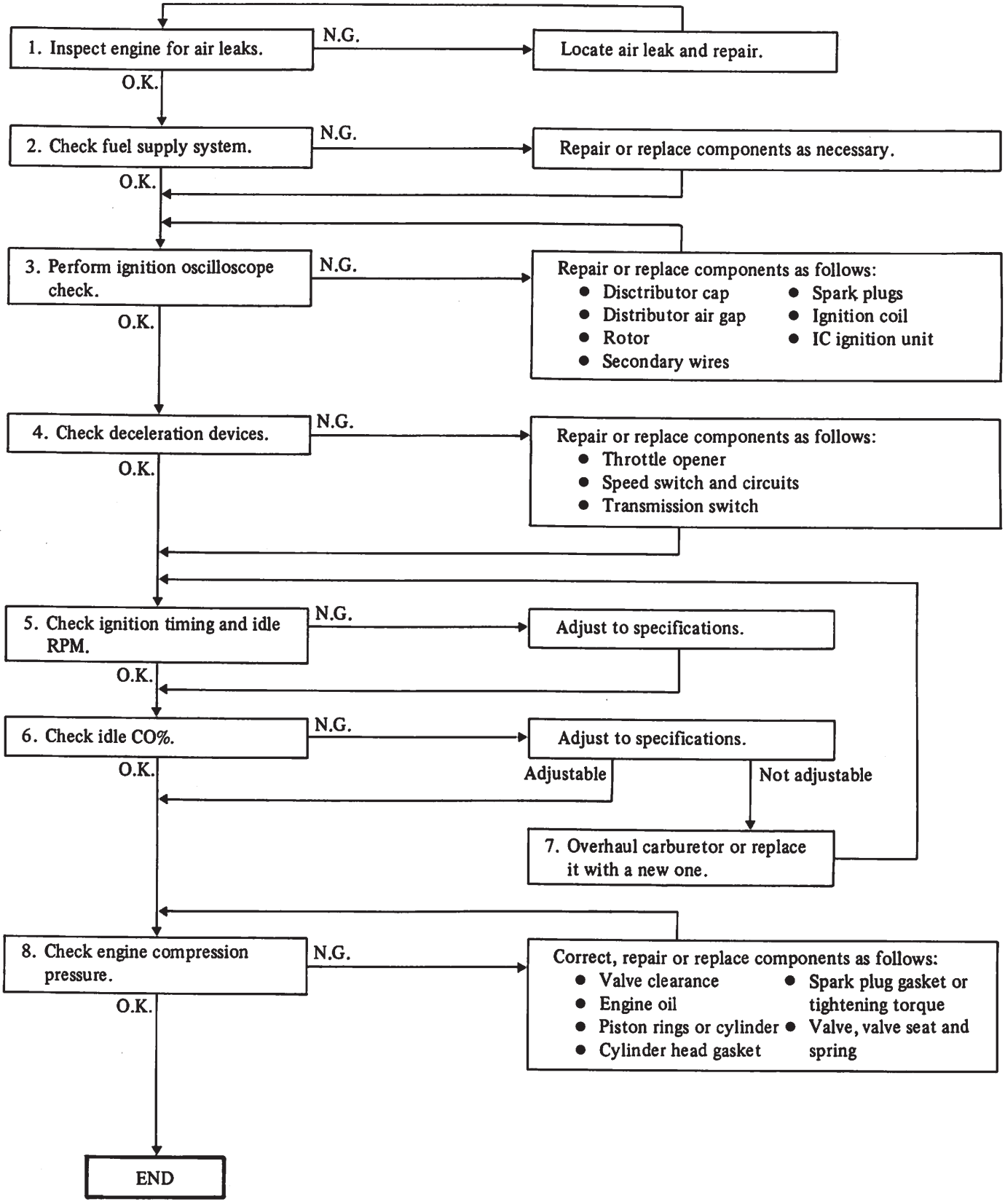
DIAGNOSTIC PROCEDURE FOR PROBLEMS

DIAGNOSTIC PROCEDURE FOR CARBURETOR ENGINES

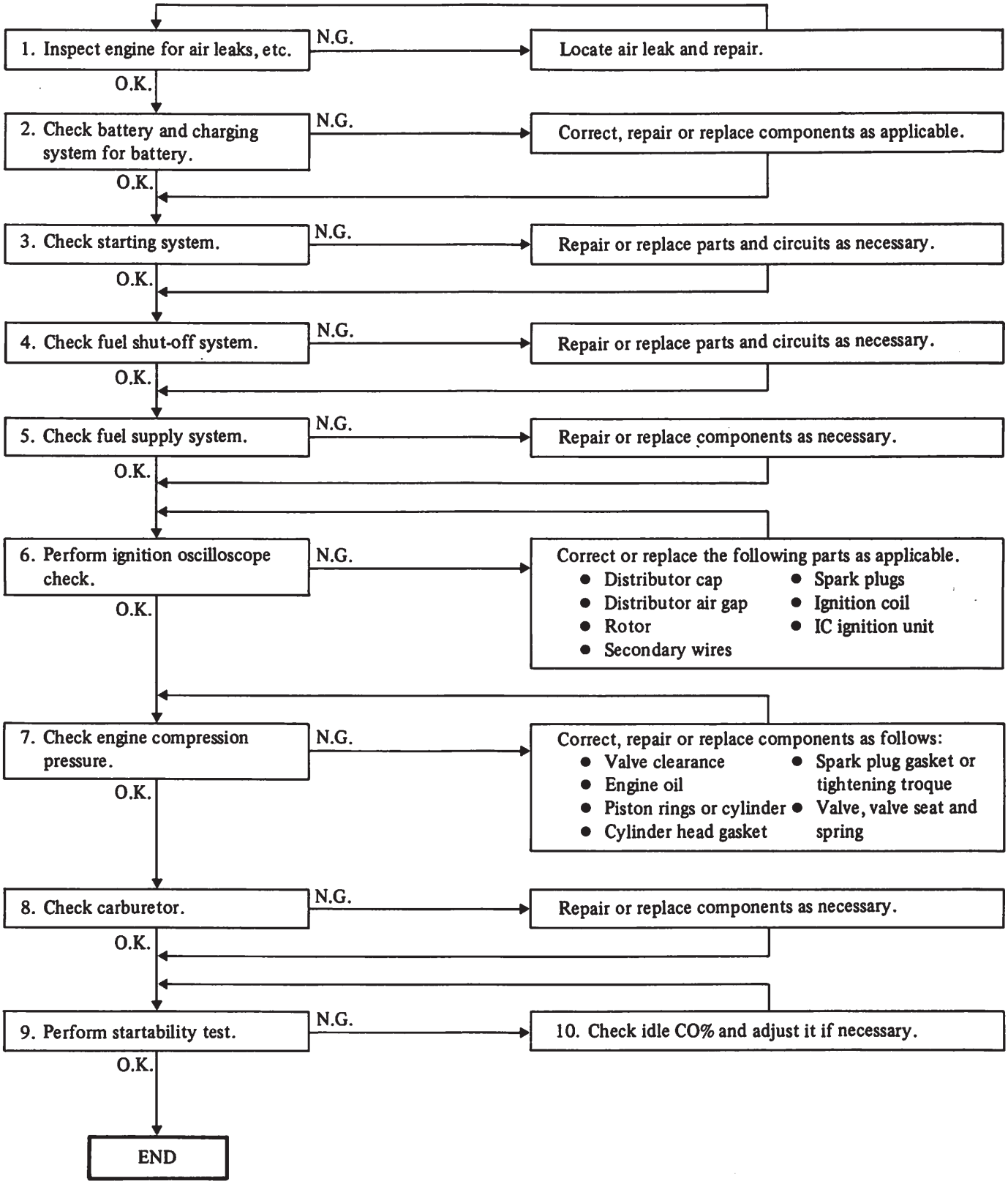
DRIVEABILITY (Hesitation, surging, flat spot, backfire, afterfire, lack of power, run-on, excessive fuel consumption, etc.)



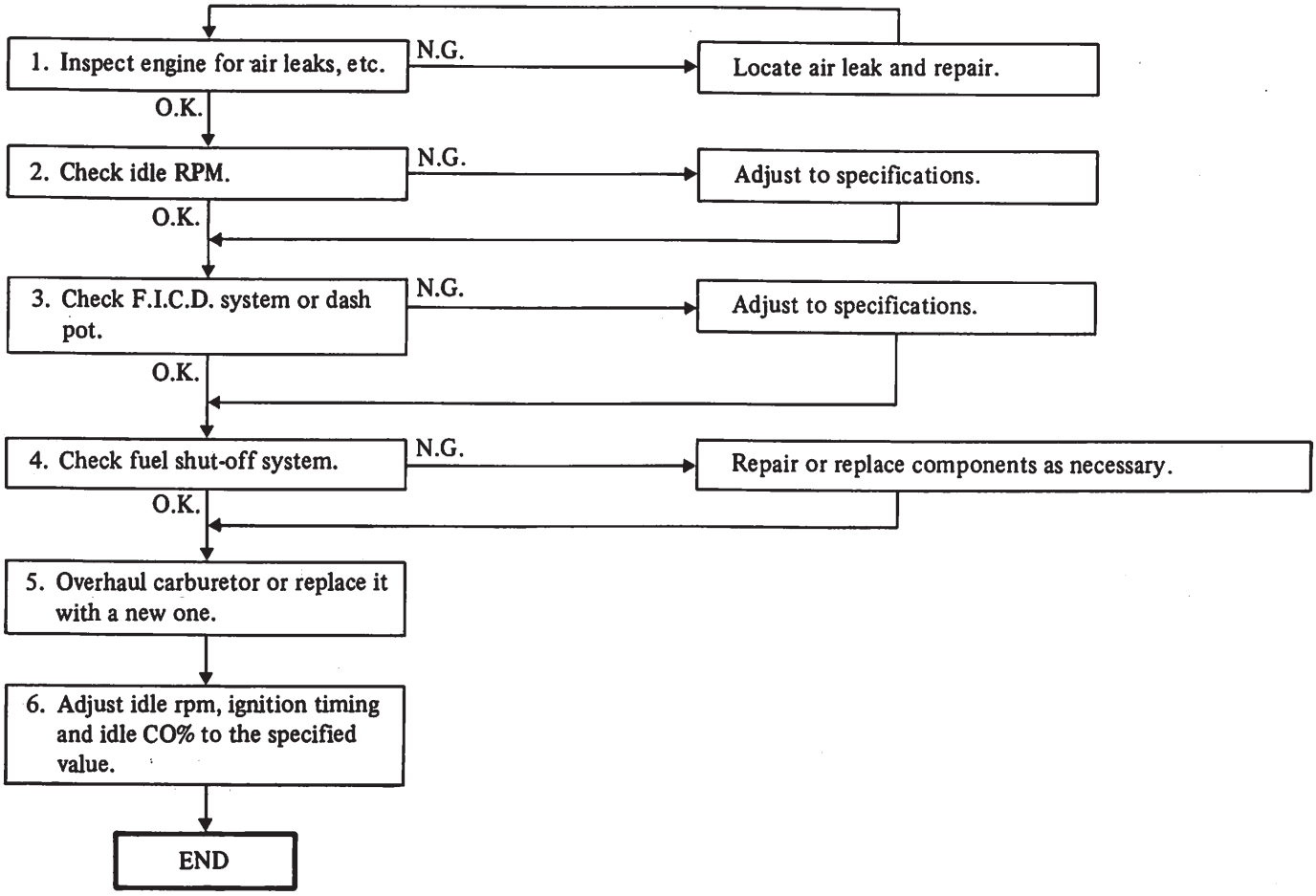
IMPROPER IDLING (Rough idle, no return to idle, high idle, etc.)



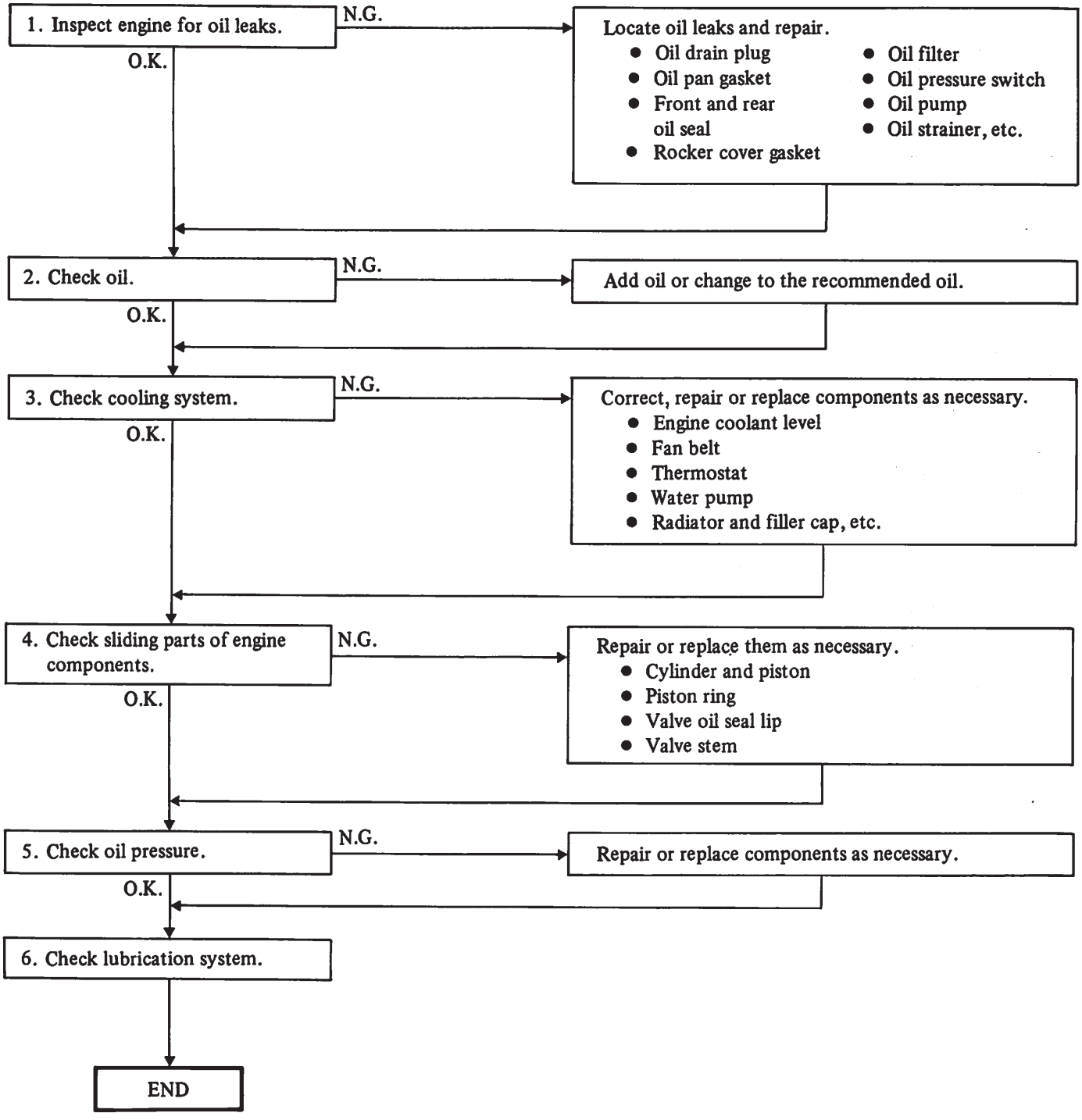
ENGINE STARTABILITY (Hard start, no start, hard restart, no restart, etc.)



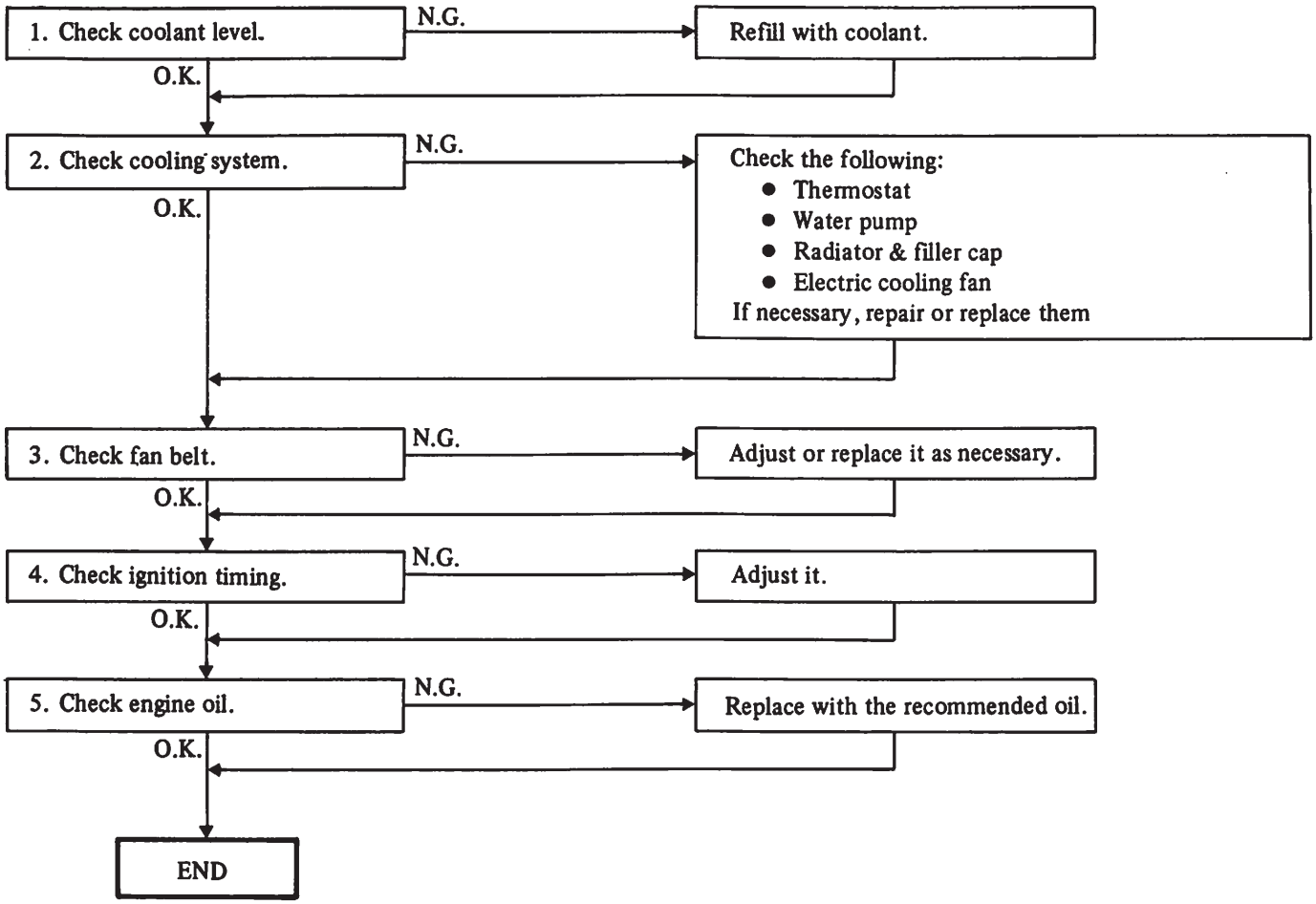
ENGINE STALL



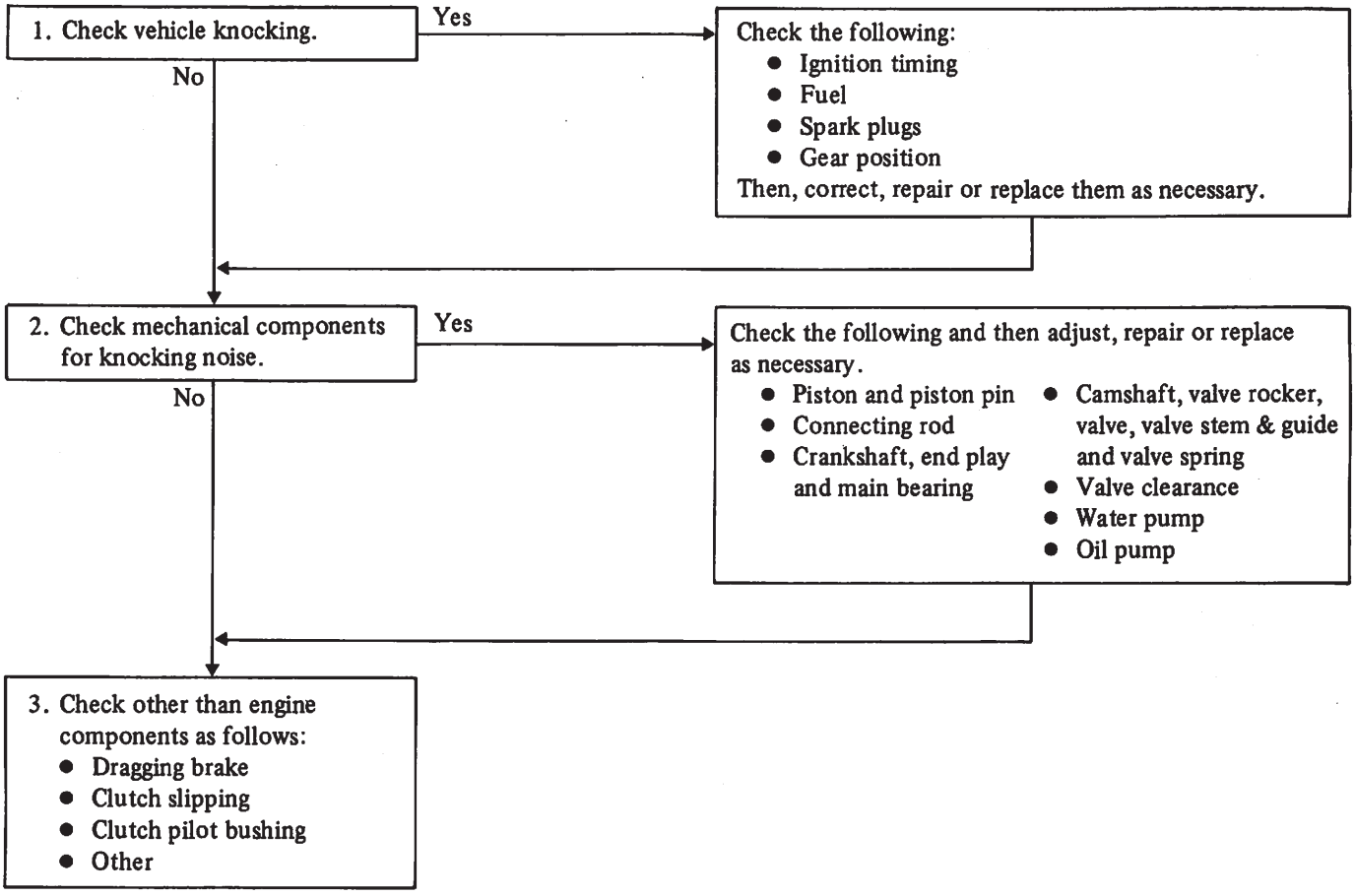
EXCESSIVE OIL CONSUMPTION



OVERHEATING



NOISY ENGINE



DIAGNOSTIC PROCEDURE FOR E.C.C. ENGINE

INTERMITTENT PROBLEM

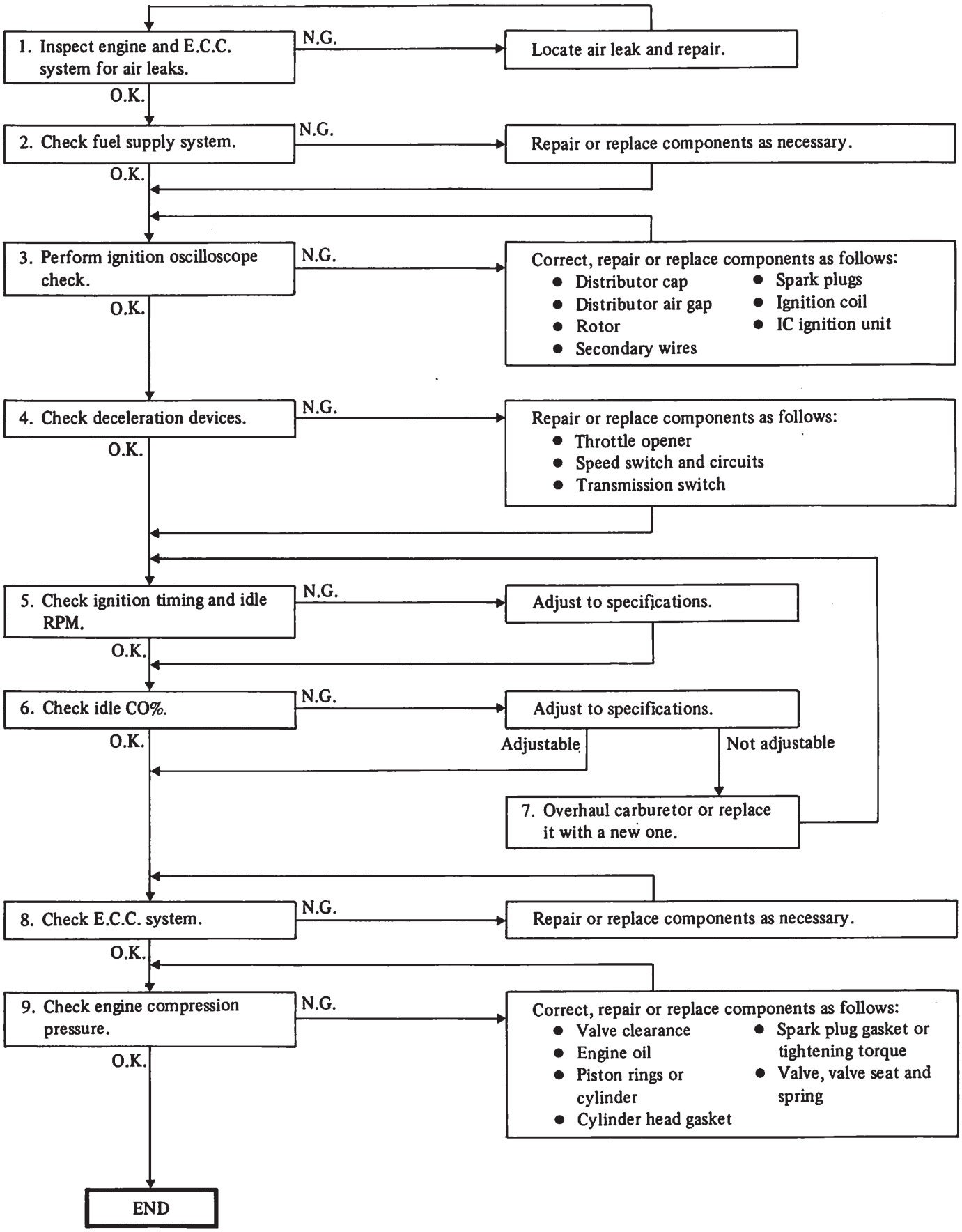
DIAGNOSTIC CHARTS CANNOT BE USED TO DIAGNOSE INTERMITTENT FAILURES. This is because many intermittent problems are caused at electrical connecitons, and if intermittent problems are not corrected, unnecessary component replacement will be indicated and the problems may remain. Therefore, DIAGNOSIS OF INTERMITTENT PROBLEMS SHOULD START WITH A VISUAL AND PHYSICAL INSPECTION OF THE CONNECTORS involved in the circuit, especially control unit, water temperature sensor and exhaust gas sensor connectors.

CAUTION:
When connecting or disconnecting E.C.C. harness connector to or from any E.C.C. unit, ensure that the ignition switch is in the "OFF" position and that the negative battery terminal is disconnected. Removing and installing these connectors with the ignition switch left in the "ON" position will damage control unit.

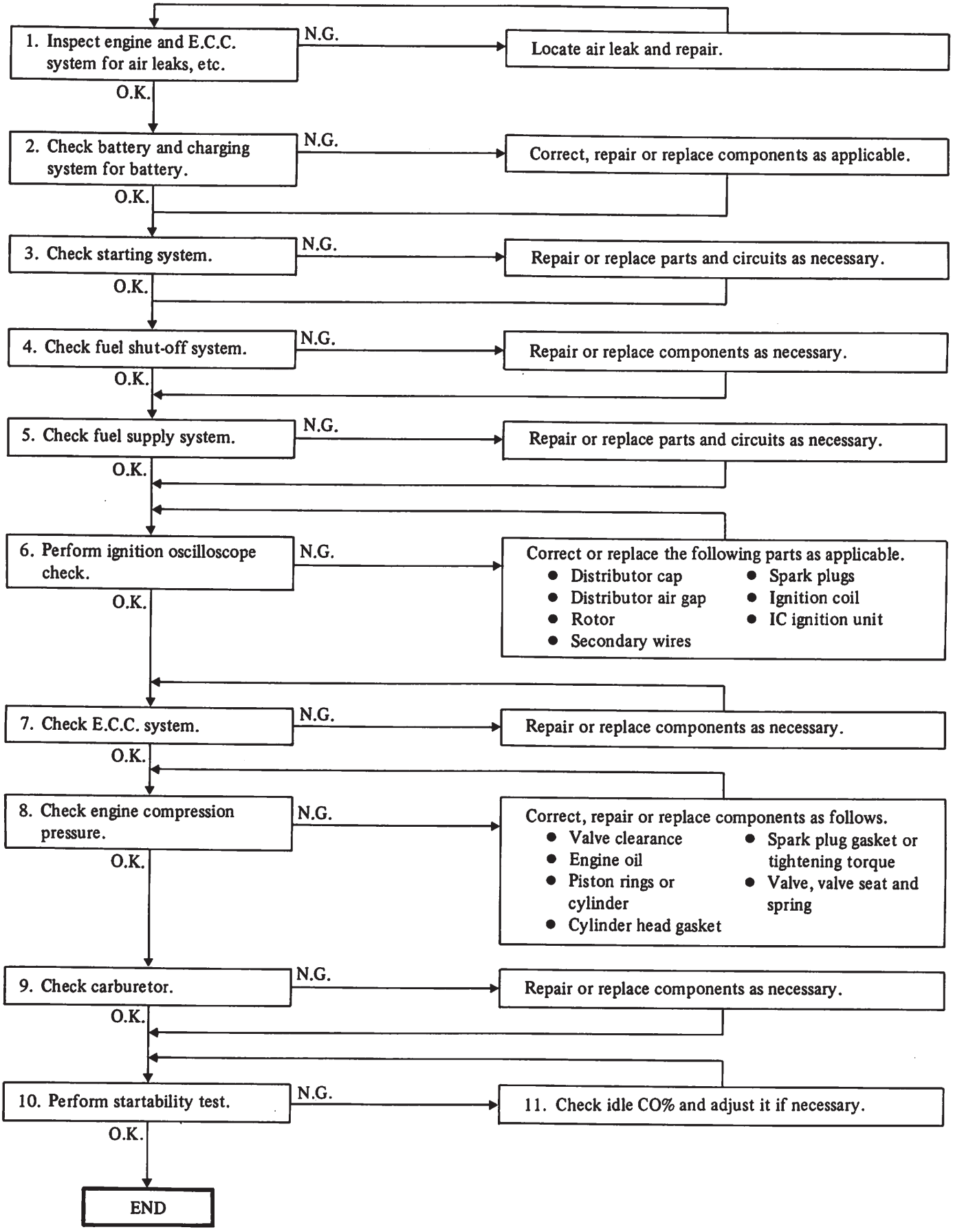
DRIVEABILITY (Hesitation, surging, flat spot, backfire, afterfire, lack of power, run-on, excessive fuel consumption, etc.)

1. Inspect engine and E.C.C. system for air leaks, etc.
   - N.G. → Locate air leak and repair.
   - O.K. ↓
2. Check fuel supply system.
   - N.G. → Repair or replace components as necessary.
   - O.K. ↓
3. Perform ignition oscilloscope check.
   - N.G. → Correct, repair or replace components as follows:
     - Distributor cap
     - Distributor air gap
     - Rotor
     - Secondary wires
     - Spark plugs
     - Ignition coil
     - IC ignition unit
   - O.K. ↓
4. Check engine compression pressure.
   - N.G. → Correct, repair or replace components as follows:
     - Valve clearance
     - Engine oil
     - Piston rings or cylinder
     - Cylinder head gasket
     - Spark plug gasket or tightening torque
     - Valve, valve seat and spring
   - O.K. ↓
5. Check deceleration devices.
   - N.G. → Repair or replace parts and circuits as necessary.
   - O.K. ↓
6. Check ignition timing, idle RPM and throttle valve switch.
   - N.G. → Adjust to specifications.
   - O.K. ↓
7. Check idle CO%.
   - N.G. → Adjust to specifications.
     - O.K. ↓
     - N.G. → Correct or replace carburetor.
   - O.K. ↓
8. Perform driveability check.
   - O.K. → END
   - N.G. ↓
9. Check carburetor.
   - N.G. → Correct, adjust or replace components of carburetor as necessary.
   - O.K. ↓
10. Check E.C.C. system.
    - N.G. → Correct, repair or replace components as necessary.
    - O.K. ↓
11. Perform driveability test.

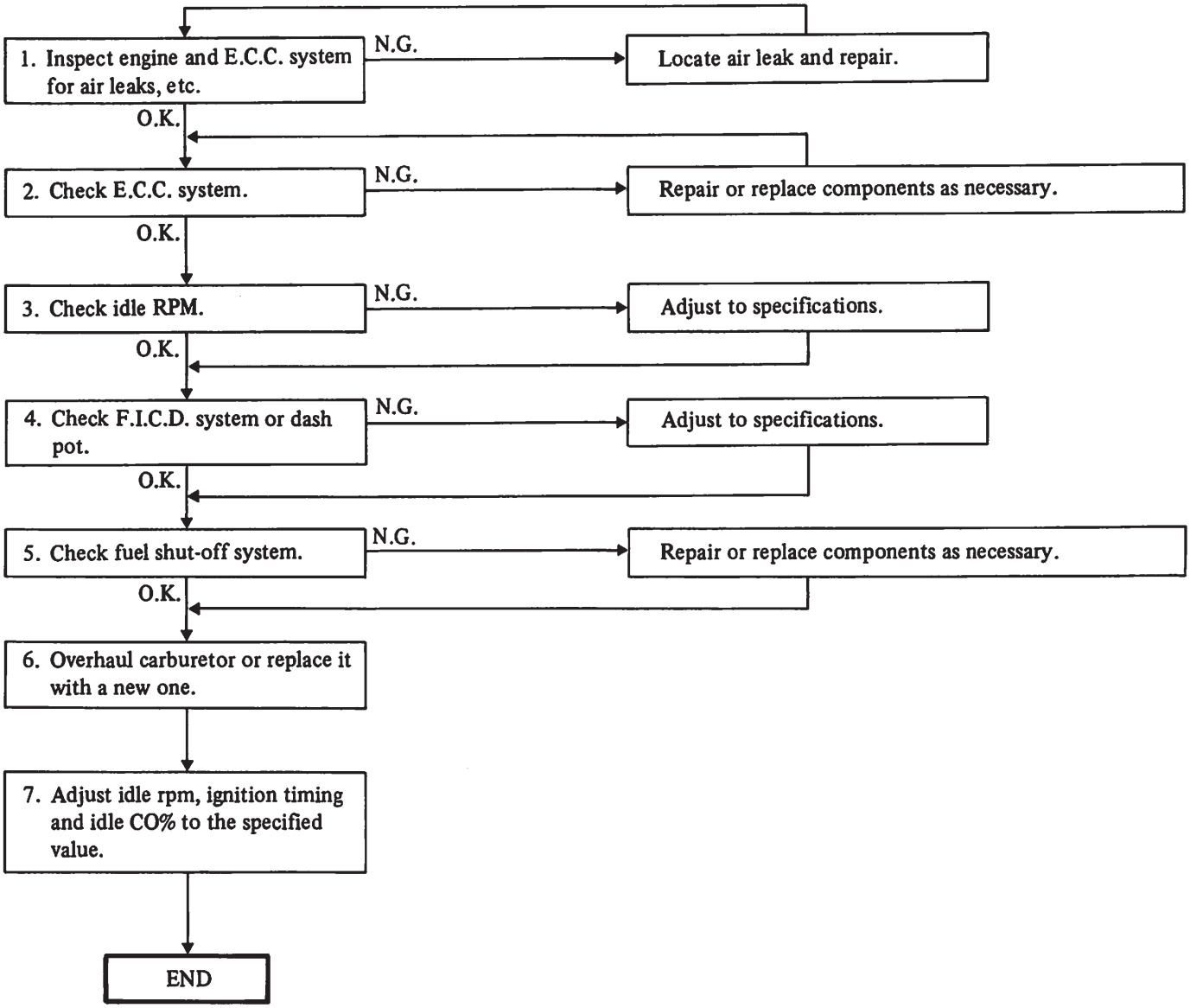
IMPROPER IDLING (Rough idle, no return to idle, high idle, etc.)



ENGINE STARTABILITY (Hard start, no start, hard restart, no restart, etc.)



ENGINE STALL



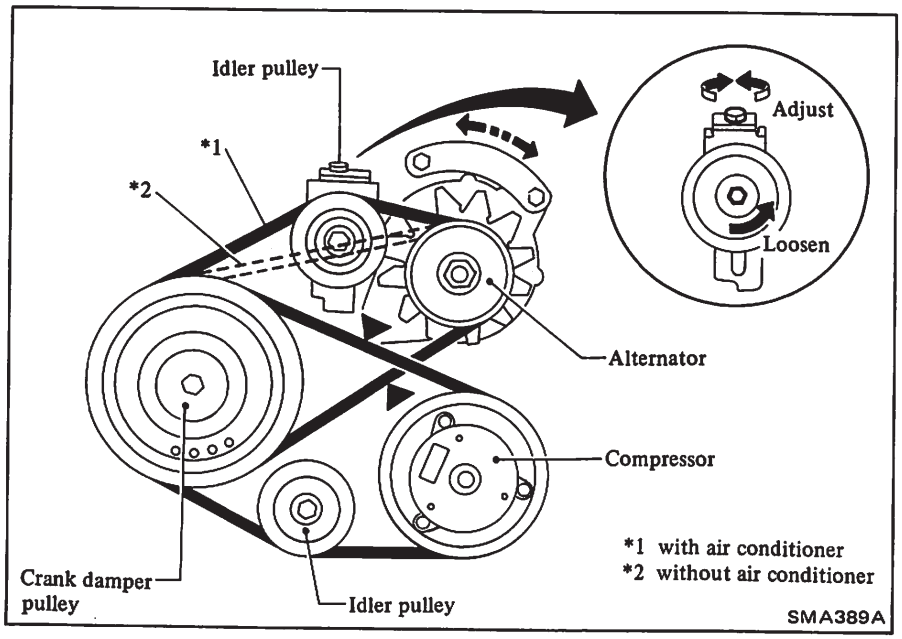
For diagnostic procedures for excessive oil consumption, overheating, noisy engine, refer to DIAGNOSTIC PROCEDURE FOR CARBURETOR ENGINES.

ENGINE MAINTENANCE (CD17)

BEFORE ENGINE START

CHECKING AND ADJUSTING DRIVE BELT

- The belts should not touch the bottom of the pulley groove.
- Check belt tension by pushing it when it is cold (30 minutes or more after engine stop).
- If alternator and compressor belts are not installed properly when replacing either or both of them, they may rub against the idler for the compressor and wear out.



Belt deflection

	Alternator	Compressor
Belt deflection mm (in) New belt	9 - 11 (0.35 - 0.43)	11 - 13 (0.43 - 0.51)
Used belt	11 - 13 (0.43 - 0.51)	12 - 14 (0.47 - 0.55)
Deflection limit	16 (0.63)	16 (0.63)
Pushing force N (kg, lb)	98 (10, 22)	

REPLACING AIR CLEANER FILTER

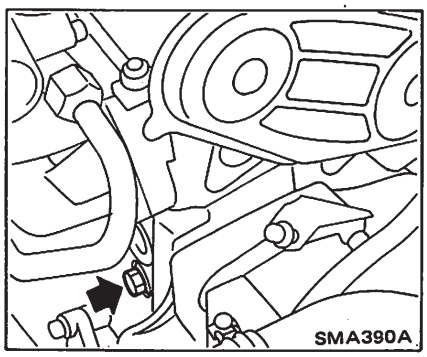
Clean inside of air cleaner housing and cover with compressed air.

CHANGING ENGINE COOLANT

WARNING:
To avoid being scalded, never attempt to change the coolant when engine is hot.

Always remove cylinder block drain plug when changing coolant.

Ⓣ : Water drain plug
54 - 74 N·m
(5.5 - 7.5 kg-m,
40 - 54 ft-lb)



When replacing engine coolant, proceed with the following procedure:

1. Set heater "TEMP" control lever to fully "HOT" position.
2. Fill radiator with coolant up to filler opening.
3. Install filler cap and fill reservoir tank with coolant up to "MAX" level.
4. Start engine and warm up engine until water temperature indicator points to the middle of gauge.
5. Stop engine and cool engine off completely.
6. Refill radiator with coolant up to filler opening if the coolant level is lower the specified level.
7. Also, refill reservoir tank with coolant up to "MAX" level.

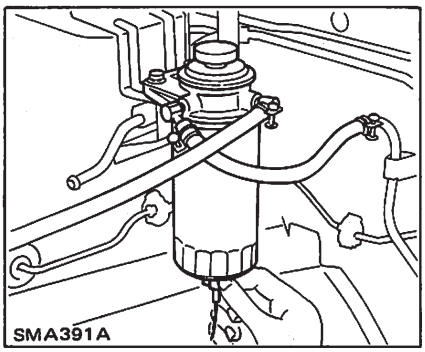
Unit: liter (US qt, Imp qt)

With heater	7.0 (7-3/8, 6-1/8)
Without heater	6.5 (6-7/8, 5-3/4)
Reservoir tank	0.7 (3/4, 5/8)

- When using anti-freeze coolant (L.L.C.), follow instruction attached to anti-freeze container for mixing ratio.

CHANGING FUEL FILTER

Install fuel filter sensor to new filter.



a Hand-tighten ONLY.
b Bleed fuel system.

DRAIN WATER

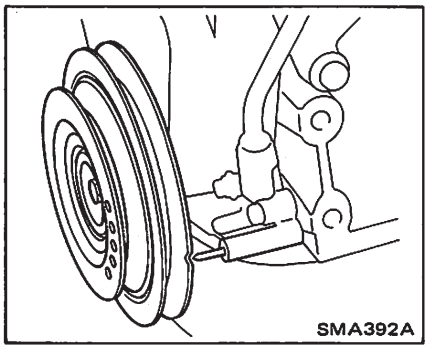
Remove fuel filter sensor and drain water.

a. Be sure to place a container or rug beneath fuel filter.
b. Pumping priming pump will quicken water draining.
c. Bleed fuel system.

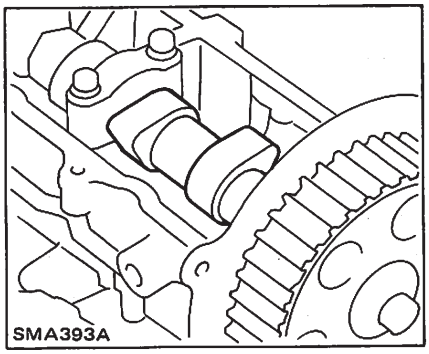
ADJUSTING INJECTION TIMING (Plunger lift)

1. Set No. 1 cylinder at Top Dead Center on its compression stroke.

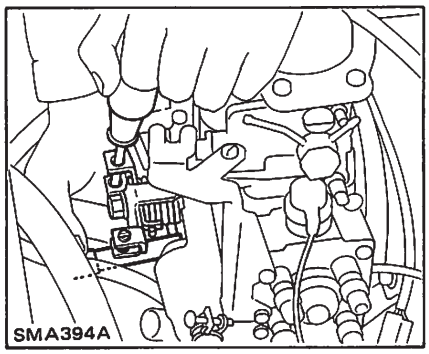
Make sure that indicator and crank damper pulley mark are aligned with each other.



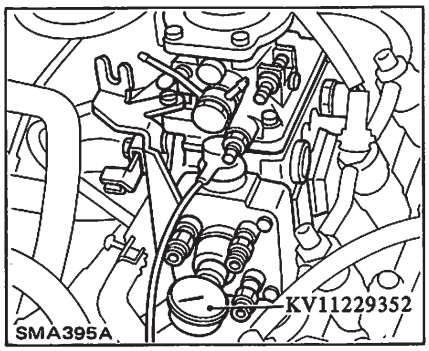
Make sure that No. 1 cam of camshaft is in the position as shown.



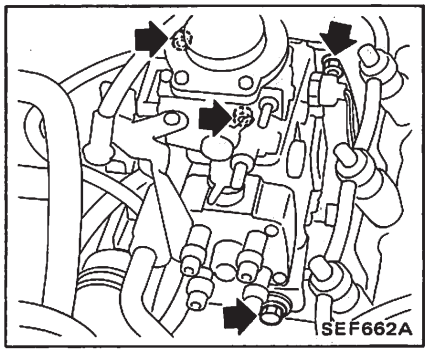
2. Remove all injection tubes.
3. Set cold start device to free.
(1) Turn cold start device linkage clockwise.
(2) Set block [length about 15 mm (0.59 in)] between cold start device and linkage.



4. Remove plug bolt from rear side of injection pump and, in its place, atatch Tool.



5. Loosen pump nuts and bracket bolt.



6. Plunger lift measurement and adjustment.
(1) Turn crankshaft counterclockwise 15 to 20 degrees from No. 1 cylinder at Top Dead Center.
(2) Find dial gauge needle rest point, then set the gauge to zero.
(3) Turn crankshaft clockwise until No. 1 cylinder is set at Top Dead Center on its compression stroke.
(4) Read dial gauge indication.

Plunger lift

For low altitudes

Unit: mm (in)

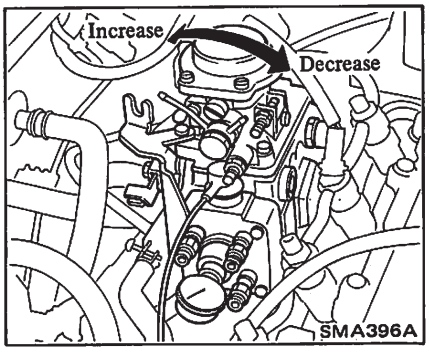
M/T	0.94±0.03 (0.0370±0.0012)
A/T	0.88±0.03 (0.0346±0.0012)

For high altitudes

Unit: mm (in)

M/T	1.00±0.03 (0.0394±0.0012)
A/T	0.94±0.03 (0.0370±0.0012)

(5) If dial gauge indication is not within the above range, turn pump body until it does.

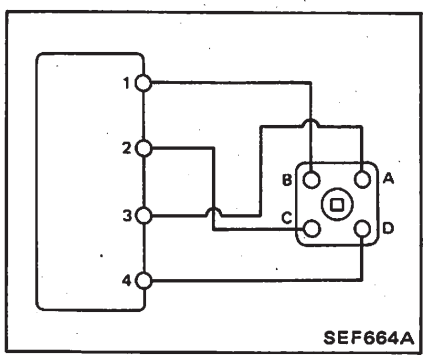


Always replace plug bolt gasket.

Ⓣ: Plug bolt
14 - 20 N·m
(1.4 - 2.0 kg-m,
10 - 14 ft-lb)
Injection pump nut
13 - 18 N·m
(1.3 - 1.8 kg-m,
9 - 13 ft-lb)
Injection pump to rear bracket
49 - 59 N·m
(5.0 - 6.0 kg-m,
36 - 43 ft-lb)

7. Connect fuel injection tube in the order of 4, 3, 2 and 1.

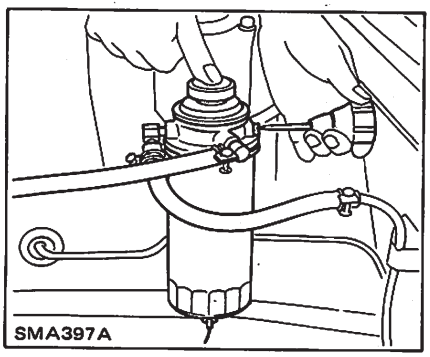
Ⓣ: Injection tube flare nut
22 - 25 N·m
(2.2 - 2.5 kg-m,
16 - 18 ft-lb)



BLEEDING FUEL SYSTEM

Air should be bled out of fuel system when injection pump is removed or fuel system is repaired.

1. Loosen priming pump vent screw and pumping. Make sure that fuel overflows at vent screw and tighten screw.



2. Disconnect fuel return hose on fuel line side.
3. Prime priming pump to make sure that fuel overflows at hose end and connect return hose.

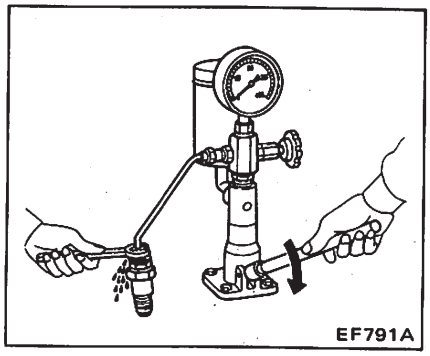
If engine will not start, loosen injection tubes at nozzle side and crank engine until fuel overflows from injection tubes.
Tighten injection tube flare nuts.

INJECTION NOZZLE

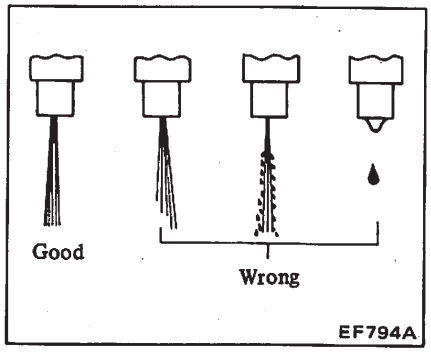
Inspection

a. Check initial injection pressure by pumping tester handle slowly (one time per second).

Initial injection pressure:
Used
12,259 - 13,239 kPa
(125 - 135 kg/cm², 1,778 - 1,920 psi)
New
13,239 - 14,024 kPa
(135 - 143 kg/cm², 1,920 - 2,033 psi)



b. A new nozzle is always used to check initial injection pressure.
b. Check spray pattern by pumping tester handle 4 to 6 times per second or more.



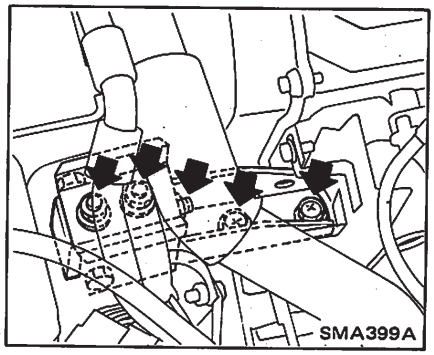
If the injection nozzle operation is not normal, correct injection nozzle.

For details, refer to INJECTION NOZZLE ASSYMBLY in EF section.

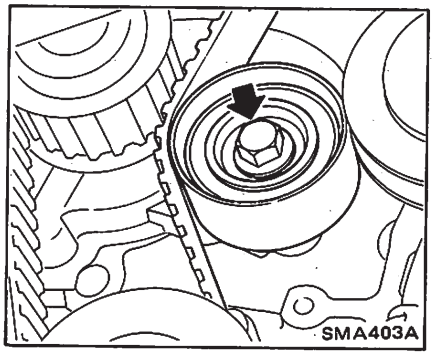
TIMING BELT REPLACEMENT

VALVE TIMING BELT

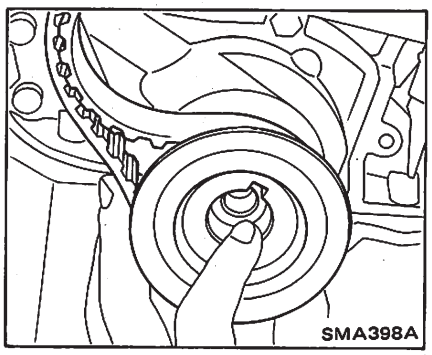
Support engine with a jack and remove right side engine mounting. Then jack up the engine to make room to work in.



1. Set No. 1 cylinder at Top Dead Center on its compression stroke.
2. Remove alternator and compressor drive belt.
3. Remove crank damper pulley.
4. Remove timing belt.
(1) Loosen tensioner pulley and set it to "free" position.
(2) Remove idler pulley.

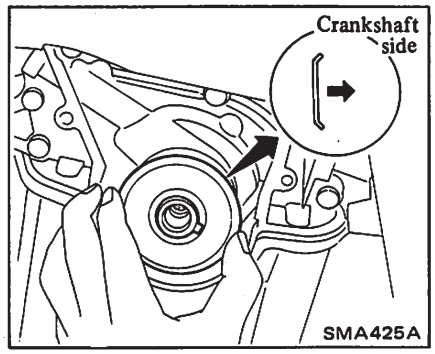


(3) Remove crankshaft pulley with timing belt.

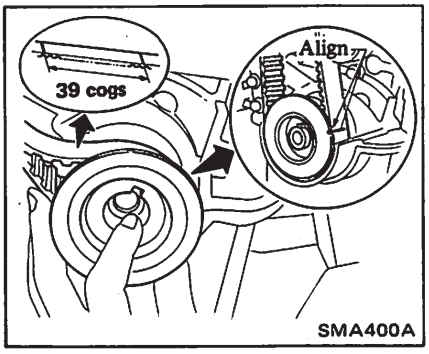


5. Install timing belt.

CAUTION:
a. Clean parts, such as pulley, tensioner, etc., which touch timing belt.
b. Ensure timing belt is clean and free from oil or dust when installing it.
c. When installing the crank pulley plate, install in the direction as follows:



(1) Put a mark on the timing belt at the 39th cog, if necessary.
(2) Align each mark and install crankshaft pulley with timing belt.

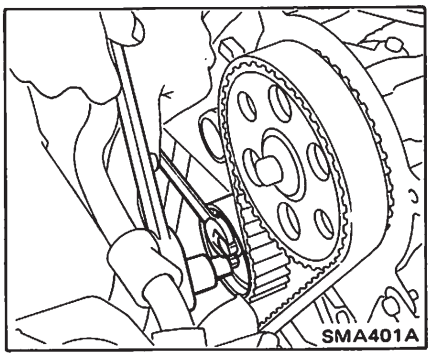


(3) Install idler pulley.
(4) Loosen tensioner bolt and turn crankshaft two times in its normal rotating direction.

Never turn crankshaft against its normal rotating direction.

(5) Tighten tensioner while holding it.

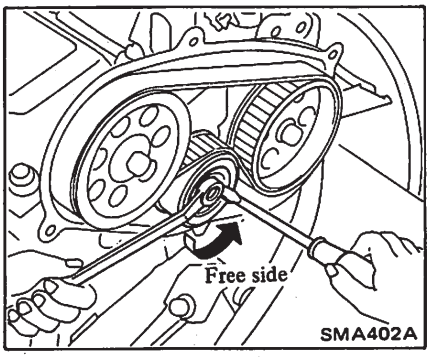
If tensioner rotates, it may cause timing belt to be overloaded, shortening its service life.



INJECTION TIMING BELT

Remove air cleaner housing with air duct.

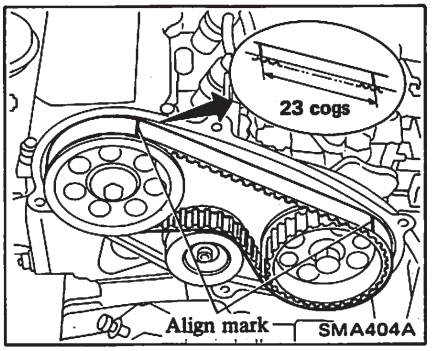
1. Set No. 1 cylinder at Top Dead Center on its compression stroke.
2. Remove timing belt.
(1) Set tensioner to free position.



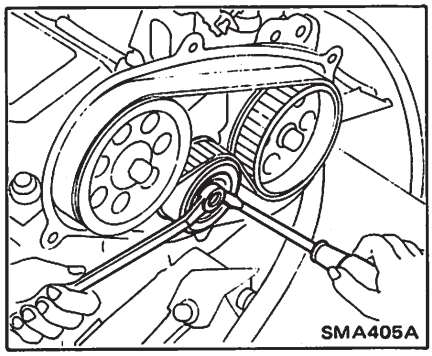
(2) Remove timing belt.
3. Install timing belt.

CAUTION:
a. Clean parts, such as pulley, tensioner, etc., which touch timing belt.
b. Ensure timing belt is clean and free from oil or dust when installing it.

(1) Put a mark on the timing belt at the 23rd cog, if necessary.
(2) Align each mark.



(3) Loosen tensioner and turn crankshaft two times in its normal rotating direction.
(4) Tighten tensioner while holding it.



AFTER ENGINE WARM-UP

ADJUSTING VALVE CLEARANCE

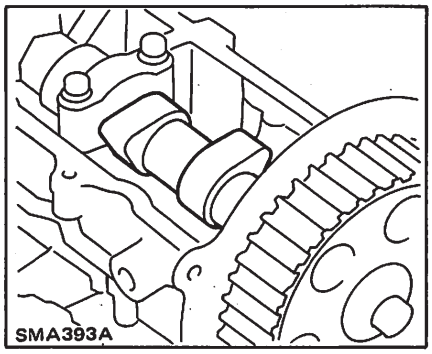
Adjustment should be made while engine is hot.

Warm up engine sufficiently.

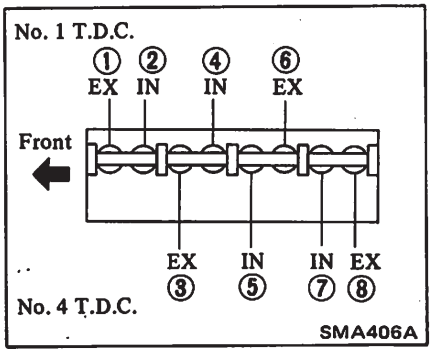
Checking valve clearance

1. Set No. 1 or No. 4 cylinder at Top Dead Center on its compression stroke.

Make sure that cam of camshaft is in the position as shown.



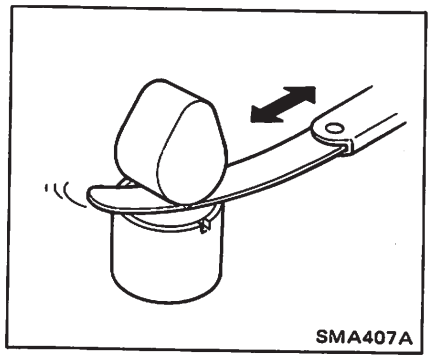
2. Adjust valve clearance as shown in the following illustration.



VALVE CLEARANCE

	Unit: mm (in)
Intake	0.20 - 0.30 (0.008 - 0.012)
Exhaust	0.40 - 0.50 (0.016 - 0.020)

Measure clearance between cam and valve lifter.

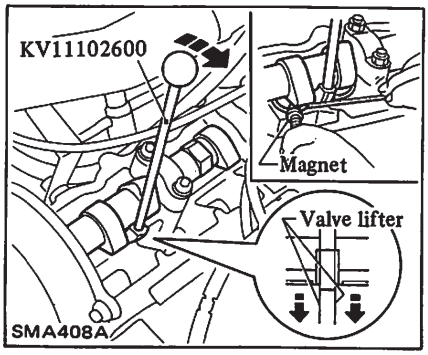


Changing lifter plate

- The valve clearance adjustment is performed to set each cylinder at Top Dead Center on its compression stroke.
- Make sure that cam of camshaft is in the same position as No. 1 cylinder at Top Dead Center.

(1) If clearance is not specified, select suitable lifter plate and change it.

Valve clearance is adjusted one cylinder at a time.



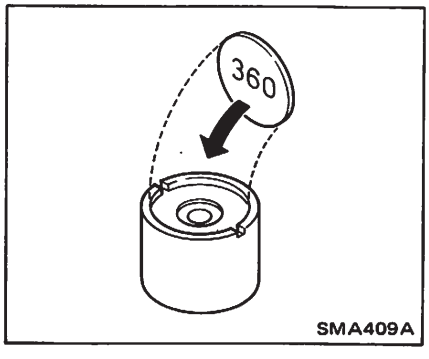
(2) Recheck valve clearance.

Example:

	Intake	Exhaust
Specified clearance	0.20 - 0.30 mm (0.008 - 0.012 in)	0.40 - 0.50 mm (0.016 - 0.020 in)
Measured clearance	0.32 mm (0.013 in)	0.36 mm (0.014 in)
Clearance	0.02 - 0.12 mm (0.001 - 0.005 in) large	0.04 - 0.14 mm (0.002 - 0.006 in) small
Thickness of plate that was used	3.60 mm (0.142 in)	3.55 mm (0.140 in)
Thickness of plate to be used	3.65 or 3.70 mm (0.144 or 0.146 in)	3.45 or 3.50 mm (0.136 or 0.138 in)

Refer to a Lifter plate in S.D.S.

Adjusting shim installation direction as follows:



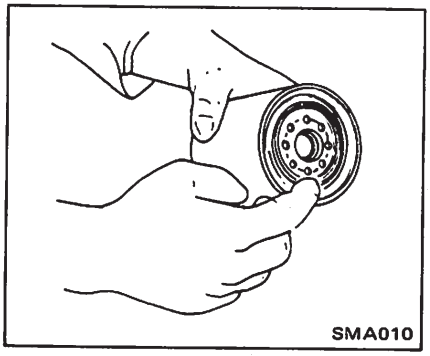
CHANGE ENGINE OIL AND OIL FILTER

WARNING:

Be careful not to burn yourself, as the engine oil may still be hot.

- **A milky oil indicates the presence of cooling water. Isolate the cause and take corrective measures.**
- **An oil with extremely low viscosity indicates the presence of diesel fuel.**

1. Smear a little engine oil on rubber lip of new oil filter.



2. Turn the oil filter until it touches the oil filter bracket.
Then turn it 1/2 turn further by hand.

If it is turned too far, oil leakage may occur.

Oil capacity: (Reference)

Unit: liter (US qt, Imp qt)

With oil filter	4.1 4-3/8, 3-5/8
Without oil filter	3.5 3-3/4, 3-1/8

CHECKING AND ADJUSTING IDLE SPEED

When checking and adjusting the idle speed, make sure to check that shift lever is Neutral (M/T model) or "D" range (A/T model).

Preparation

- Make sure that all electrical accessories are off.

WARNING:

a. When selector lever is shifted to "D" position, apply parking brake and block both front and rear wheels with chocks.

b. Depress brake pedal while accelerating engine to prevent car from surging forward.

c. After adjustment has been made, shift lever to "N" or "P" position and remove wheel chocks.

Checking

1. Srart engine and warm it up until water temperature indicator points to the middle of gauge.
2. Attach a diesel tacho tester's pick-up to No. 1 injection tube.

In order to obtain a more accurate reading of engine speed, remove clamps on No. 1 injection tube.

3. Run engine at about 2,000 rpm for two minutes under no-load.

Race engine two or three times.

Make sure that it returns to idle speed.

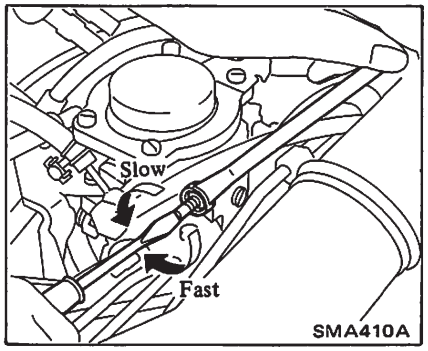
If not, check acceleration linkage for binding.

4. Run engine for one minute at idle speed.
5. Check idle speed.

Idle speed: 750 $^{+100}_{-50}$ rpm

Adjusting

Loosen idle screw lock nut and adjust idle speed.



CHECKING RUBBER HOSES
(Water, air, fuel, blow-by, oil hoses)

1. Check all hoses for leakage.
2. Tighten any loose connections and replace any damaged or deformed parts.

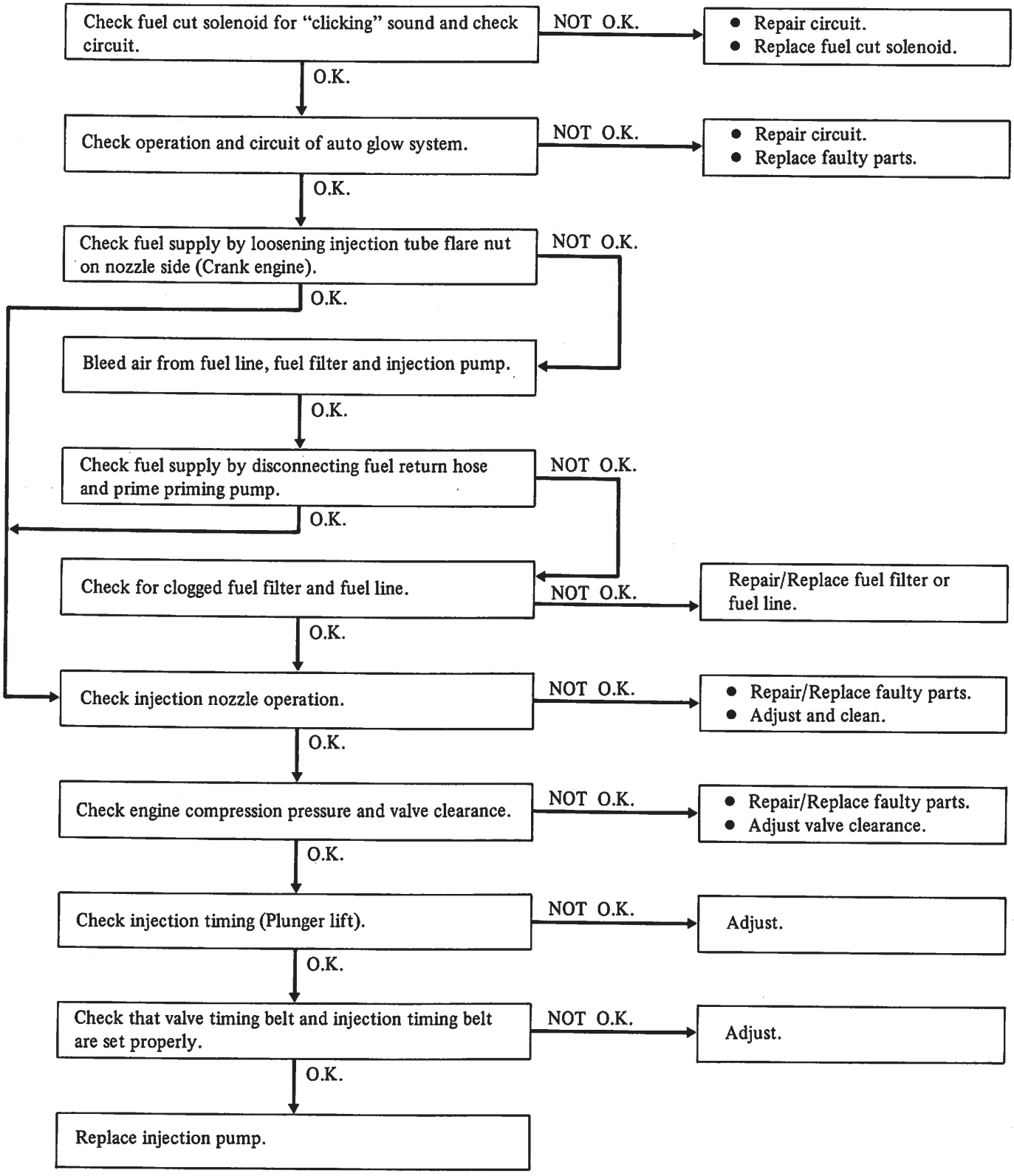
CHECKING FUEL LINES
(Hoses, piping, connections, etc.)

Check fuel lines for loose connections, cracks and deterioration. Retighten loose connections and replace any damaged or deformed parts.

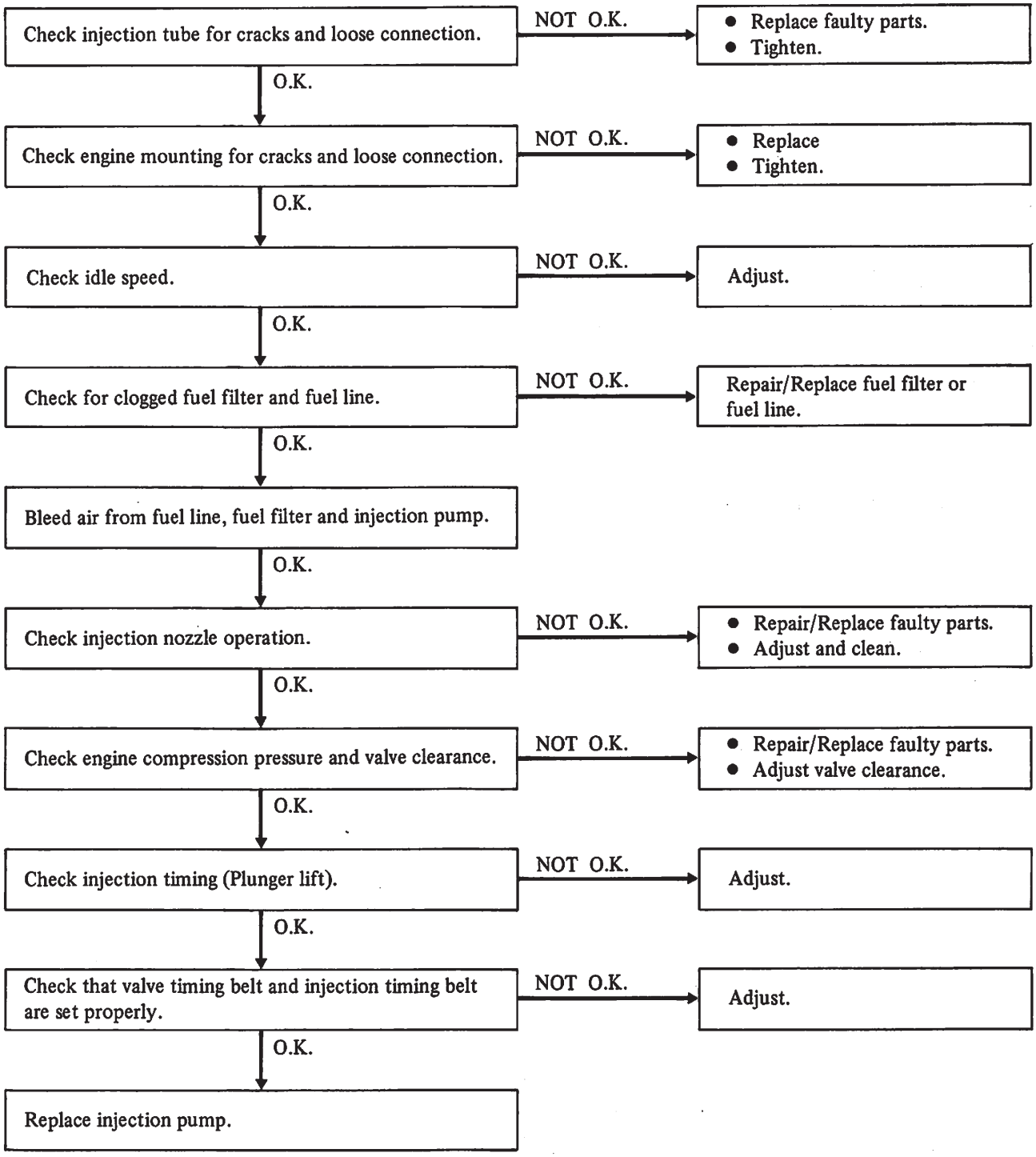
TROUBLE DIAGNOSES AND CORRECTIONS (CD17)

- Battery is fully charged.
- Fuel is in fuel tank.

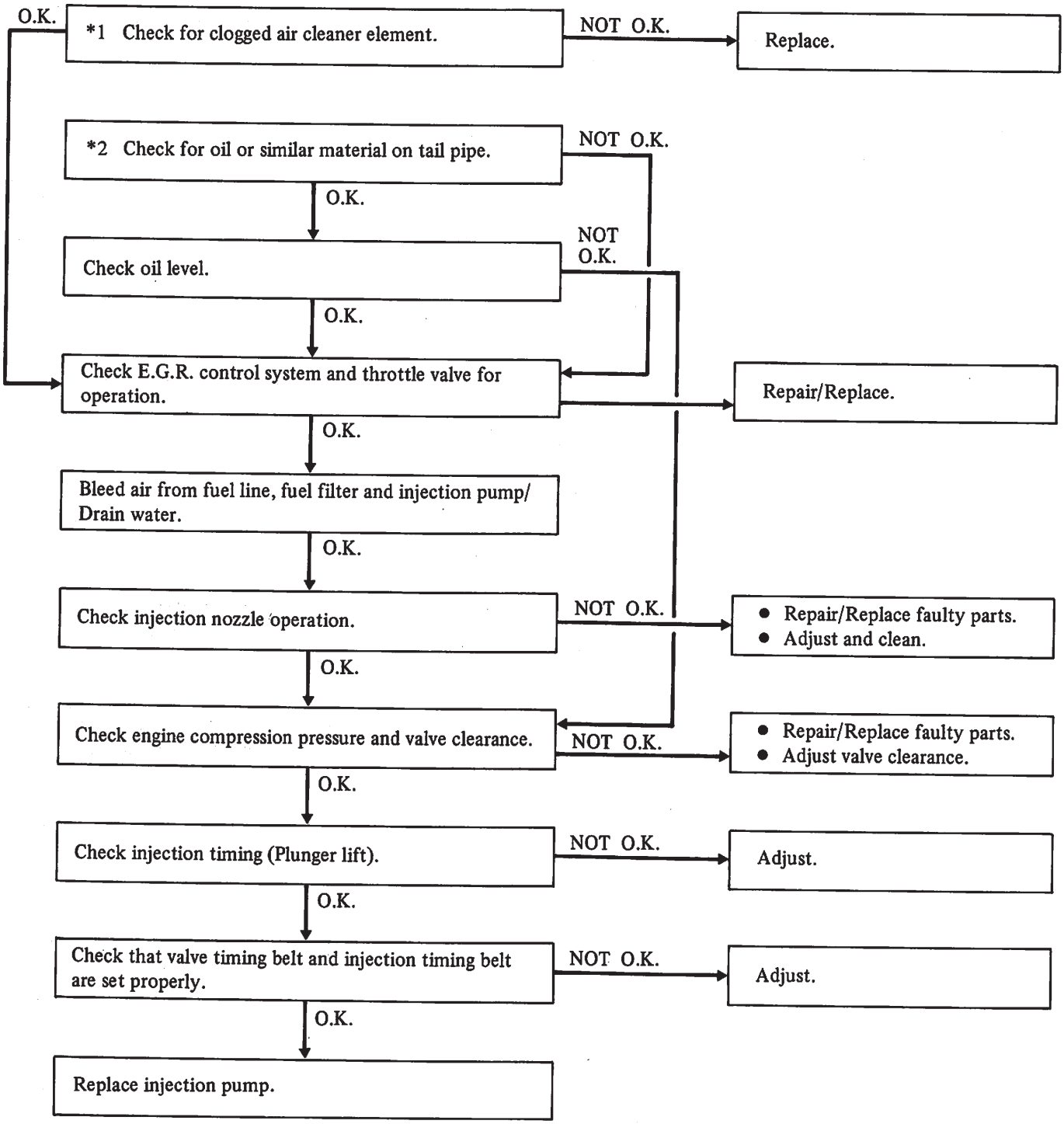
ENGINE DIFFICULT TO START OR DOES NOT START



ROUGH IDLE

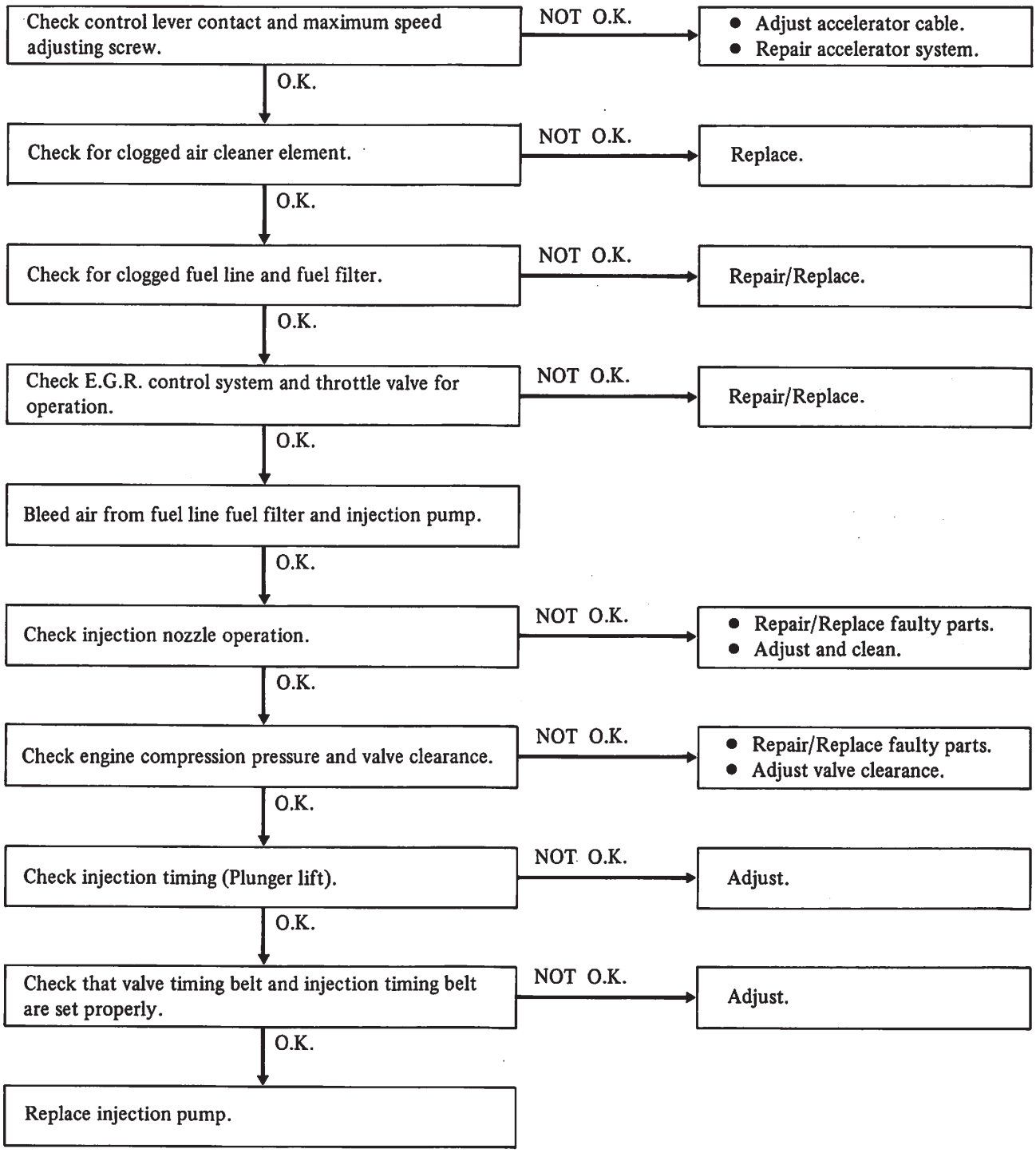

Check injection tube for cracks and loose connection.
NOT O.K.
• Replace faulty parts.
• Tighten.
O.K.
Check engine mounting for cracks and loose connection.
NOT O.K.
• Replace
• Tighten.
O.K.
Check idle speed.
NOT O.K.
Adjust.
O.K.
Check for clogged fuel filter and fuel line.
NOT O.K.
Repair/Replace fuel filter or fuel line.
O.K.
Bleed air from fuel line, fuel filter and injection pump.
O.K.
Check injection nozzle operation.
NOT O.K.
• Repair/Replace faulty parts.
• Adjust and clean.
O.K.
Check engine compression pressure and valve clearance.
NOT O.K.
• Repair/Replace faulty parts.
• Adjust valve clearance.
O.K.
Check injection timing (Plunger lift).
NOT O.K.
Adjust.
O.K.
Check that valve timing belt and injection timing belt are set properly.
NOT O.K.
Adjust.
O.K.
Replace injection pump.

EXCESSIVE WHITE OR BLACK SMOKE

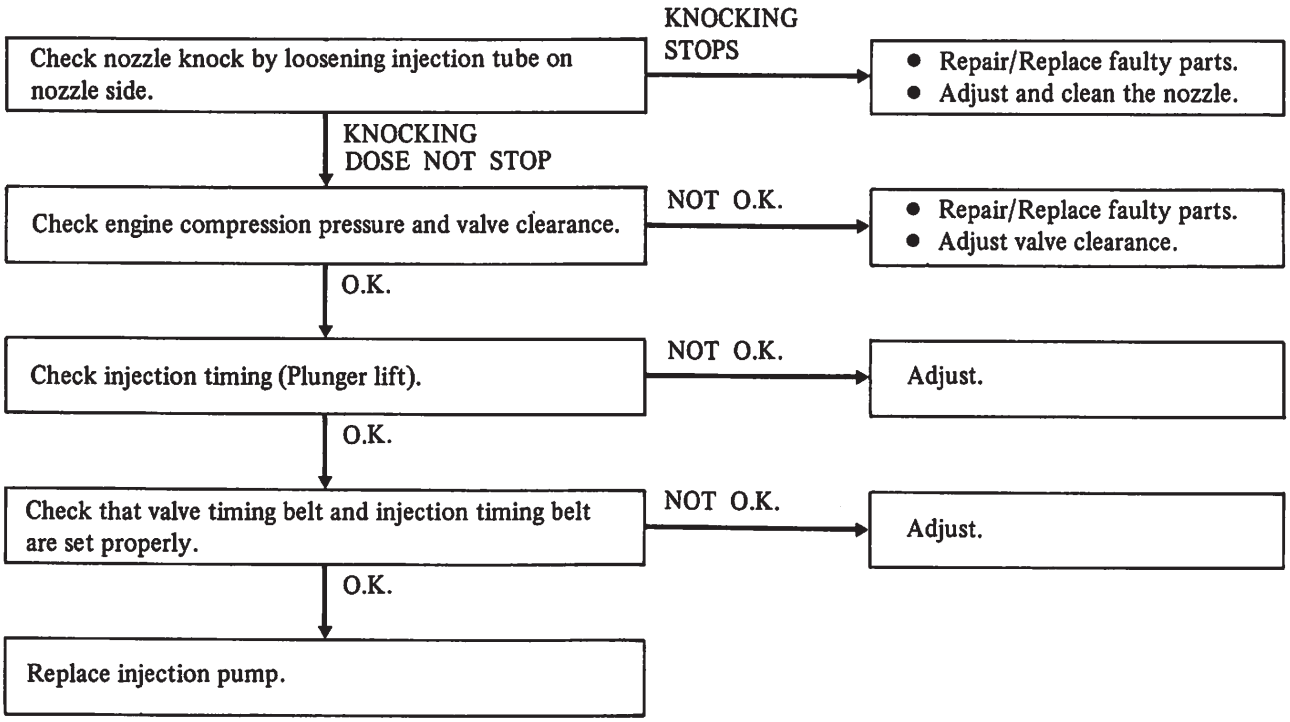


*1: If there is black smoke, start here.
*2: If there is white smoke, start here.

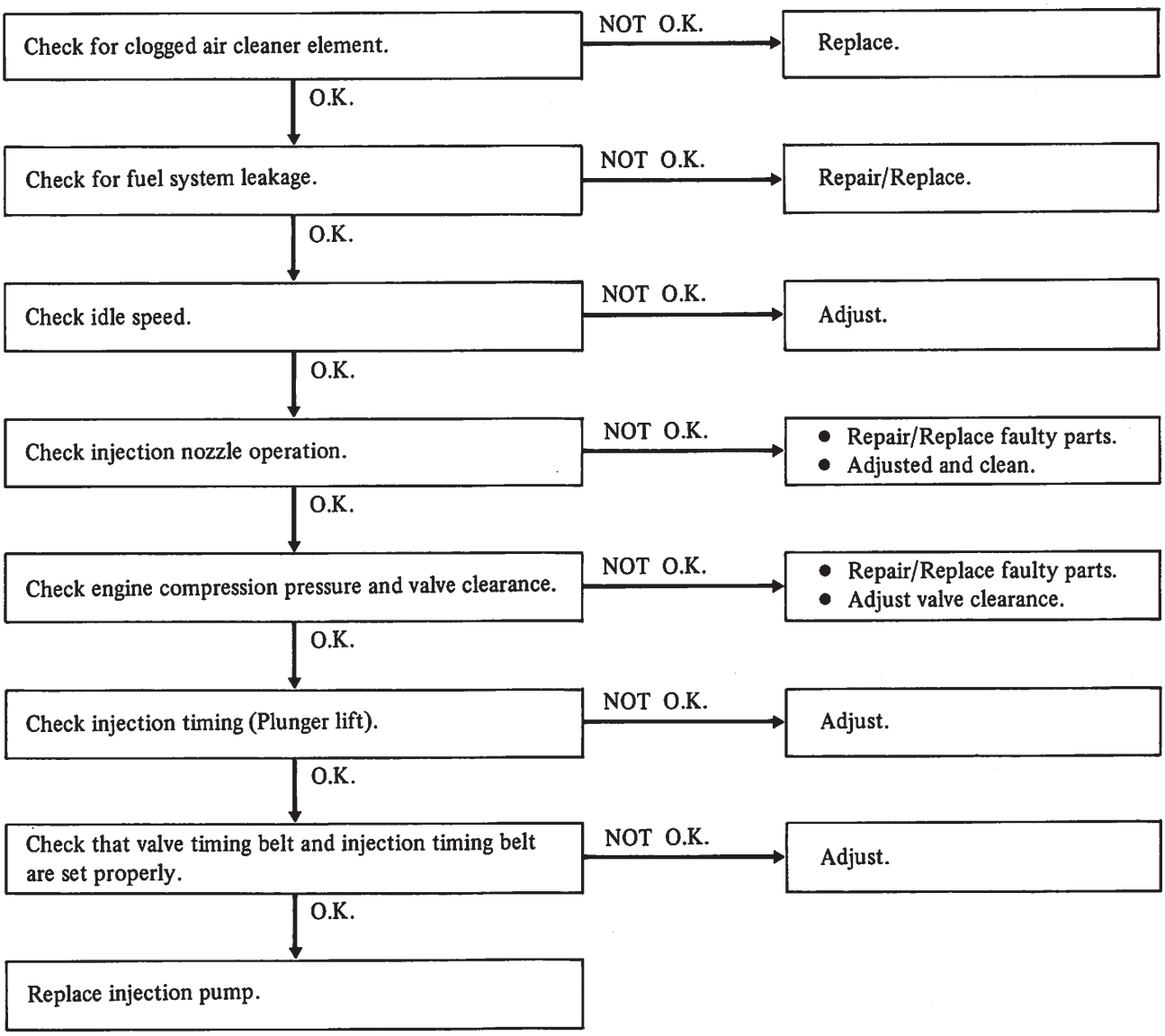
POOR OUTPUT


Check control lever contact and maximum speed adjusting screw.
NOT O.K.
• Adjust accelerator cable.
• Repair accelerator system.
O.K.
Check for clogged air cleaner element.
NOT O.K.
Replace.
O.K.
Check for clogged fuel line and fuel filter.
NOT O.K.
Repair/Replace.
O.K.
Check E.G.R. control system and throttle valve for operation.
NOT O.K.
Repair/Replace.
O.K.
Bleed air from fuel line fuel filter and injection pump.
O.K.
Check injection nozzle operation.
NOT O.K.
• Repair/Replace faulty parts.
• Adjust and clean.
O.K.
Check engine compression pressure and valve clearance.
NOT O.K.
• Repair/Replace faulty parts.
• Adjust valve clearance.
O.K.
Check injection timing (Plunger lift).
NOT O.K.
Adjust.
O.K.
Check that valve timing belt and injection timing belt are set properly.
NOT O.K.
Adjust.
O.K.
Replace injection pump.

EXCESSIVE KNOCKING



FUEL CONSUMPTION TOO HIGH

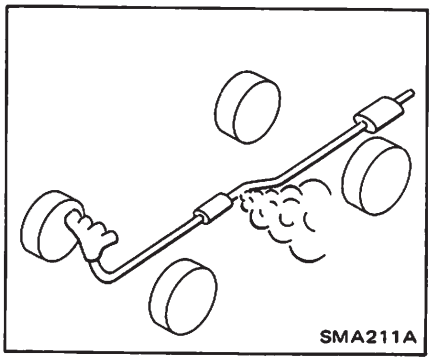


CHASSIS AND BODY MAINTENANCE

EXHAUST SYSTEMS

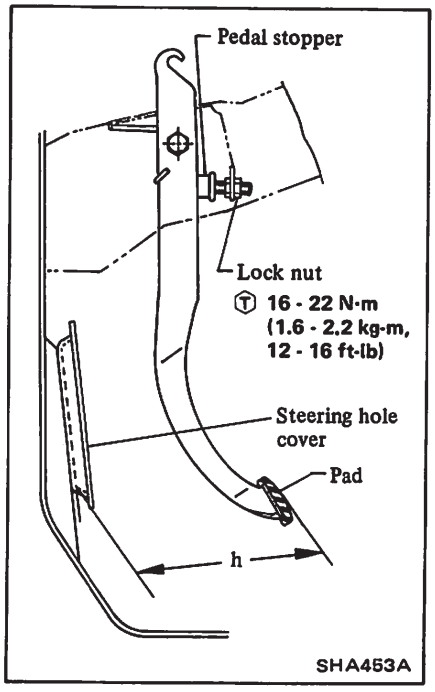
INSPECTING EXHAUST SYSTEMS

Visually check the exhaust pipes, muffler, and hangers for proper attachment, leaks, cracks, chafing, abrasion, deterioration, etc.



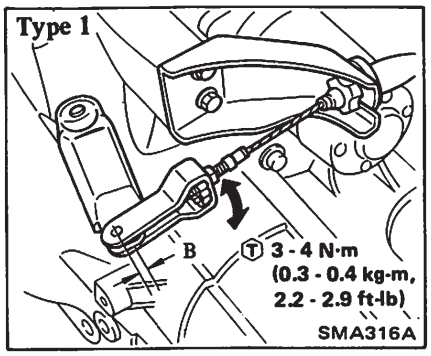
CLUTCH

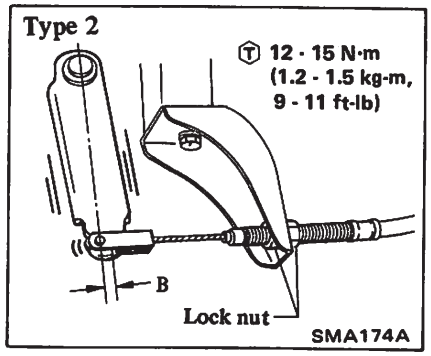
ADJUSTING CLUTCH PEDAL HEIGHT AND FREE TRAVEL



Pedal height "H"
Refer to S.D.S.
Pedal free travel "A":
11 - 21 mm (0.43 - 0.83 in)

1. Adjust pedal height with pedal stopper. Then tighten lock nut.
2. Adjust withdrawal lever play "B" with adjuster or lock nuts.





Withdrawal lever play "B":
2 - 4 mm (0.08 - 0.16 in)

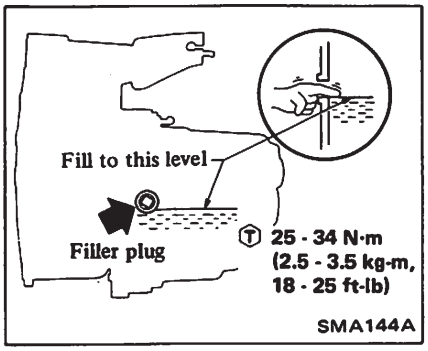
Depress and release clutch pedal over its entire stroke to ensure that the clutch linkage operates smoothly without squeak noise, interference and binding.

3. As a final check, measure pedal free travel "A" at center of pedal pad.

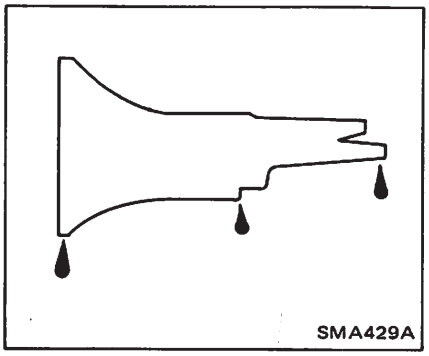
MANUAL TRANSAXLE

INSPECTING MANUAL TRANSAXLE OIL LEVEL

Never start engine while checking oil level.

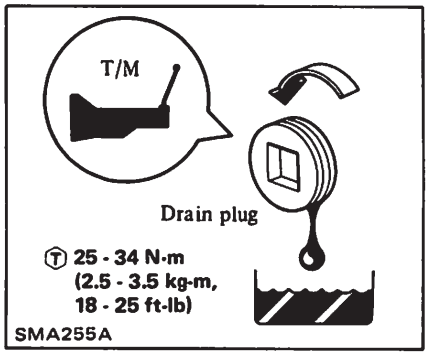


Visually inspect for signs of leakage.

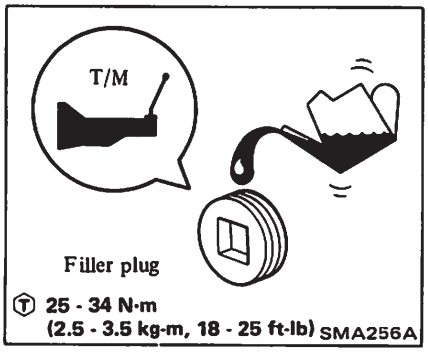


REPLACING MANUAL TRANSAXLE OIL

1. Drain oil completely.



2. Refill transaxle and check oil level.



Oil capacity:
5-speed
2.7 liters
(5-3/4 US pt, 4-3/4 Imp pt)
4-speed
2.3 liters
(4-7/8 US pt, 4 Imp pt)

AUTOMATIC TRANSAXLE

INSPECTING AUTOMATIC TRANSAXLE FLUID LEVEL

The transaxle has the proper amount of fluid if, 10 minutes after engine start and with the engine idling, the level is within the values described in the following table.

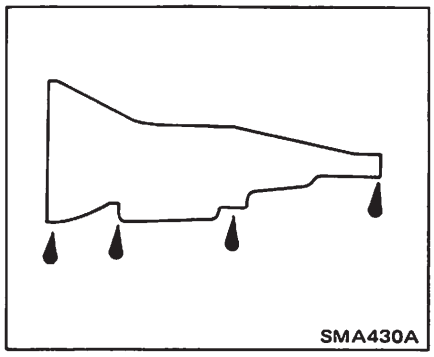
Proceed with fluid level check as follows:

1. Park the vehicle on a level surface and set the parking brake.
2. Start the engine and idle it for about 10 minutes and then move the selector lever through each gear range, ending in "P".
3. Check the fluid level with the engine idling.
4. Remove the dipstick and clean it with lint-free paper. Reinsert it into the charging pipe as far as it will go.
5. Remove the dipstick and note the reading.

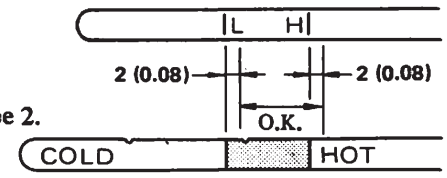
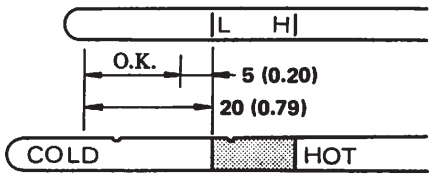
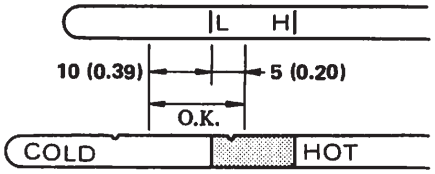
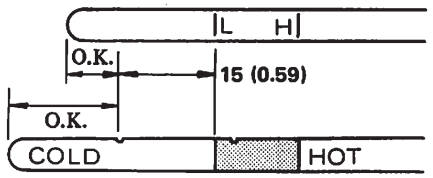
Keep the fluid at the proper level.

- **Overfilling may blow off the fluid or break the transaxle.**
- **Underfilling may cause the clutches to slip, and finally break them.**

6. Visually inspect for signs of leakage.



Unit: mm (in)

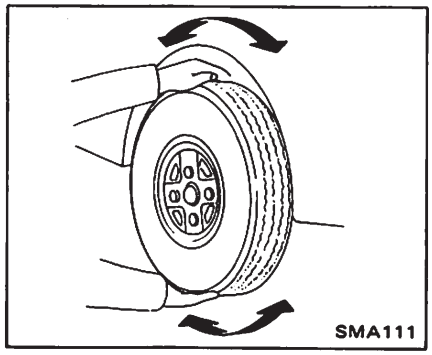
Ambient temperature	Fluid level	Ambient temperature	Fluid level
30 - 50°C (86 - 122°F)	Type 1.  Type 2.	−10 - 10°C (14 - 50°F)	
10 - 30°C (50 - 86°F)		−30 - −10°C (−22 - 14°F)	

SAT611

FRONT AXLE AND FRONT SUSPENSION

INSPECTING FRONT AXLE AND SUSPENSION PARTS

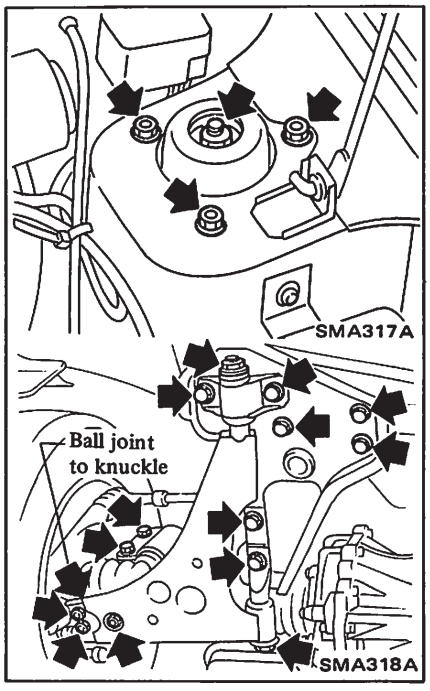
1. Block rear wheels with chocks and raise front of vehicle, and then support it with safety stand. Refer to Section GI.
2. Shake each front wheel by holding upper and lower surfaces of tires as shown.



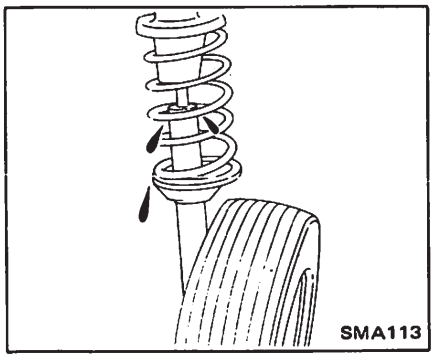
Check suspension parts for looseness, wear, or damage.

Retighten all loose nuts and bolts to the specified torque. Refer to Section FA for tightening torque.

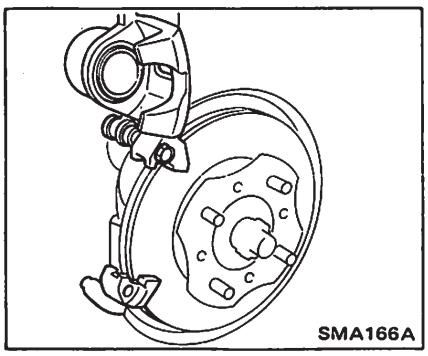
Replace all worn parts as described under Front Suspension (Section FA).



3. Check strut (Shock absorber) for oil leakage or damage.


SMA113

4. Remove wheel and tire assembly.
5. Check front axle parts for crack or damage.
   Replace worn parts.
   Refer to Front Axle (Section FA).
6. Remove brake pads.
   Refer to section BR.
7. Check wheel bearing.
   If there is any axial end play or if wheel bearing does not smoothly turn, adjust bearing to specifications.
   Replace worn or damaged bearings.
   Refer to Front Axle (Section FA).


SMA166A

CHECKING DRIVE SHAFT BOOTS

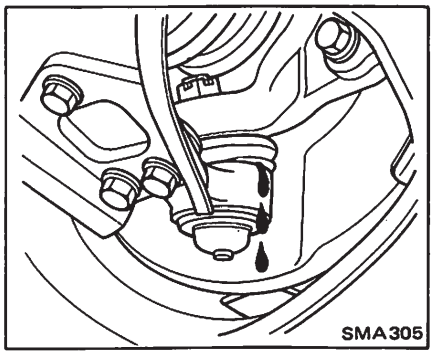
Check for damage, looseness and leakage of grease.

INSPECTING FRONT WHEEL BEARING GREASE

1. Block rear wheel with chocks and raise front of car, and then support it with safety stands. Refer to Lifting Points and Towing (Section GI).
2. Remove wheel and tire.
3. Check for grease leakage from front wheel bearing grease seals by observing the area around them. Replace worn or damaged grease seal. Refer to Front Axle (Section FA).
4. Check wheel bearing.
   If there is any axial end play or if wheel bearing does not turn smoothly, adjust bearing to specifications.
   Replace worn or damaged bearings.
   Refer to Front Axle (Section FA).

INSPECTING STEERING LINKAGE BALL JOINT & SUSPENSION BALL JOINT

Check the ball joints for damage, looseness and grease leakage.


SMA305

CHECKING WHEEL ALIGNMENT

Before checking front wheel alignment, be sure to make a preliminary inspection of all front end parts.

- **Tire pressure**
- **Wheel bearing axial play**
- **Suspension ball joint**
- **Steering gear housing looseness at frame**
- **Steering linkage and connections**
- **Shock absorber operation**
- **Tighten each front axle and suspension parts.**
- **Measure vehicle height (when not loaded)**
- **Repair or replace the damaged portion or parts.**

Camber and caster

Camber and caster are preset at factory and cannot be adjusted.

The vehicle requires only toe-in and vehicle posture adjustment.

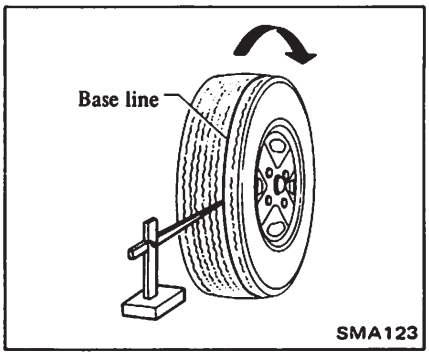
If camber or caster alignment is not within specifications, check associated parts. Repair or replace as necessary.

Camber, caster and kingpin inclination:
Refer to S.D.S.

Toe-in

Measure toe-in, and make necessary adjustment. Use the following procedure when making adjustments.

1. Raise front of vehicle and mark a base line across the tread of left and right wheels.

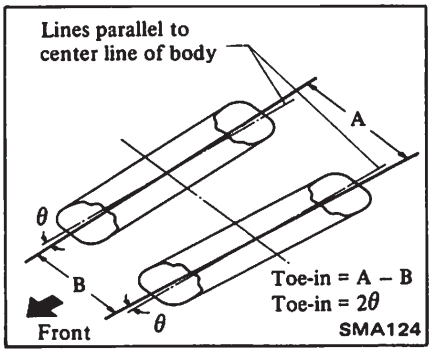


SMA123

2. Set wheels in a straight-ahead position, and then lower front of vehicle.

After lowering front of vehicle, move it up and down to eliminate friction.

3. Measure toe-in and make necessary adjustments.



SMA124

Toe-in (Unladen) and Side slip:
Refer to S.D.S.

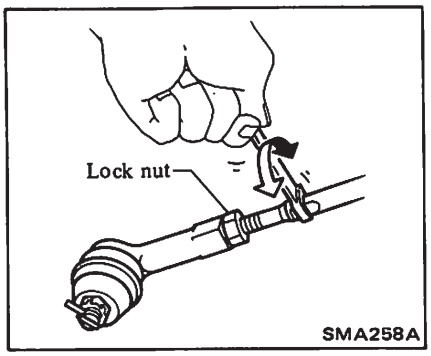
"Unladen"

- Fuel tank, radiator and engine oil tank all full.
- Spare tire, jack, hand tools, mats in position.
- All tires inflated to specified pressure.

- All accumulation of mud, dirt and road deposits removed from chassis and underbody.

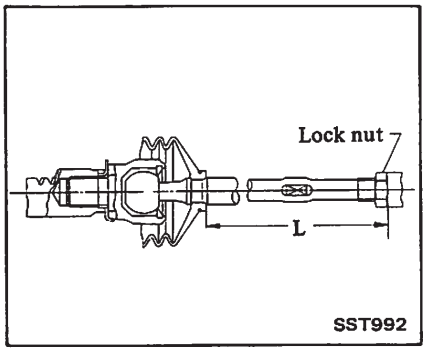
Toe-in can be adjusted by varying the length of steering tie rods.

Loosen lock nuts, and turn left and right adjusting bars equally.



If tie rods have been disassembled, set the distance between lock nuts to the specified value "L" prior to re-asembling.

"L" dimension:
R25S
175.9 mm (6.93 in)
PR25S
175.9 mm (6.93 in)

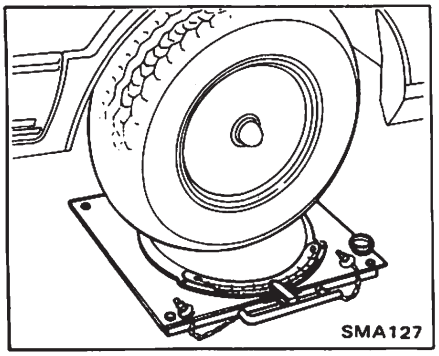


After correct toe-in has been obtained, tighten tie rod lock nuts.

Ⓣ : Tie rod outer socket lock nuts
37 - 46 N·m
(3.8 - 4.7 kg-m,
27 - 34 ft-lb)
Tie rod inner socket lock nuts
78 - 98 N·m
(8 - 10 kg-m,
58 - 72 ft-lb)

Front wheel turning angle

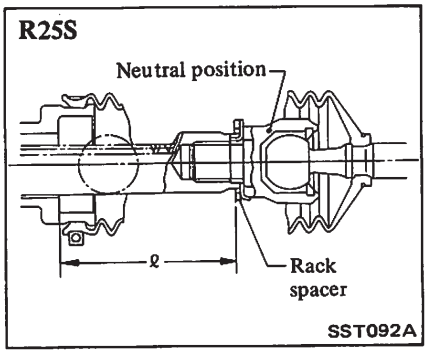
1. Set wheels in straight ahead position and then move vehicle forward until front wheels rest on turning radius gauge properly.

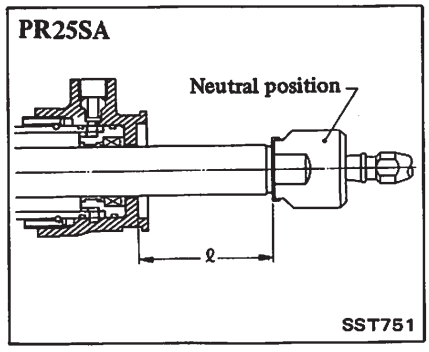


2. Rotate steering wheel all the way right and left; measure turning angle on inner wheel.

If it is not within specification, check arck stroke.

Turning angle:
Refer to S.D.S.
Rack stroke "ℓ" (both sides):
E engine equipped model
(Without rack spacer)
73.5 mm (2.894 in)
CD engine and manual transaxle equipped model
(With rack spacer)
70.0 mm (2.756 in)
CD engine and automatic transaxle equipped model
(With rack spacer)
65.5 mm (2.579 in)





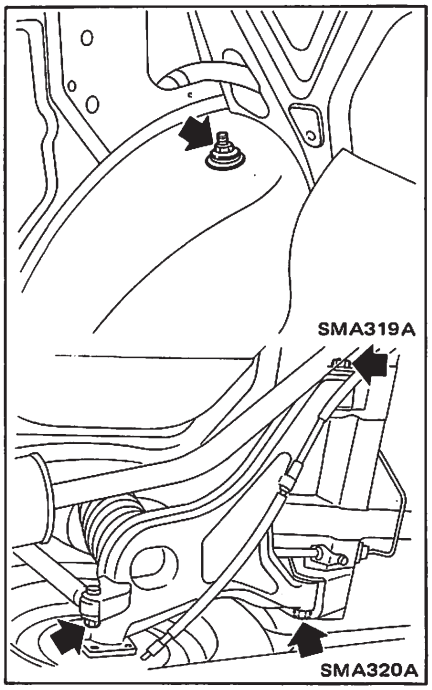
REAR AXLE AND REAR SUSPENSION

CHECKING REAR AXLE AND SUSPENSION PARTS

Check for damage looseness and leakage of oil or grease.

Retighten all loose nuts and bolts to the specified torque. Refer to Section RA for tightening torque.

Replace all worn parts as instructed under Rear Suspension (Section RA).



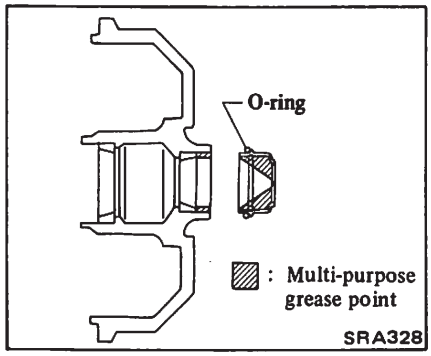
ADJUSTING WHEEL BEARING PRELOAD

After wheel bearing has been replaced or rear axle has been reassembled be sure to adjust wheel bearing preload as described below.

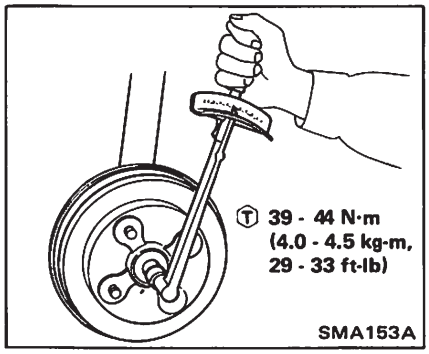
1. Before adjustment, thoroughly clean all parts to prevent possible entry of dirt.
2. Apply recommended multi-purpose grease sparingly to the following parts.

- Threaded portion of spindle.
- Contact surface between wheel bearing washer and outer wheel bearing.
- Hub cap and O-ring.

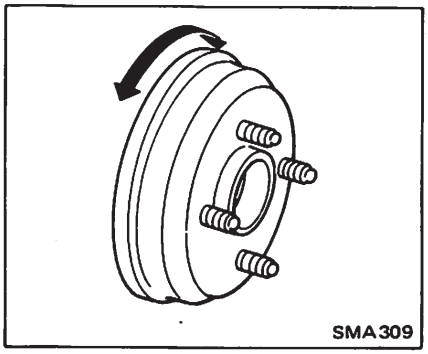
• Grease seal lip.



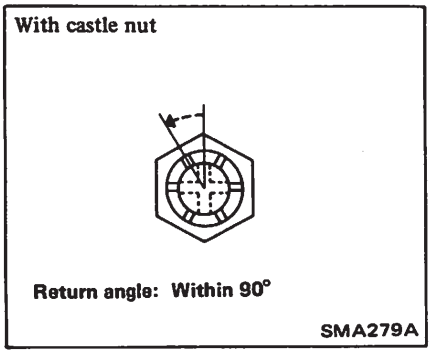
3. Tighten wheel bearing nut.



4. Turn wheel hub several times in both directions to seat wheel bearing correctly.



5. Again tighten wheel bearing nut.
6. Turn back wheel bearing nut within 90°.

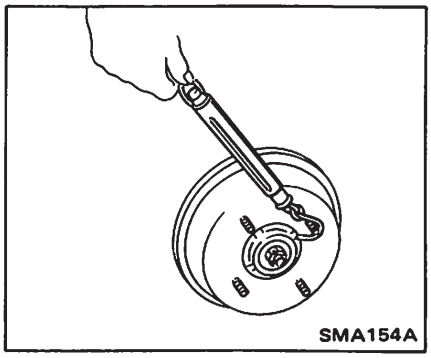


Install adjusting cap and align any of its slots with hole in spindle. If the above procedure fails to align hole and slot together, then tighten lock nut as much as 15 degrees until hole in spindle is aligned with any slot.

CAUTION:
Do not overtighten wheel bearing nuts, as this can cause wheel bearing seizure.

7. Turn hub in both directions two or three times, measuring its turning torque and axial play to see if they are within the specified ranges. If they are not, adjust.

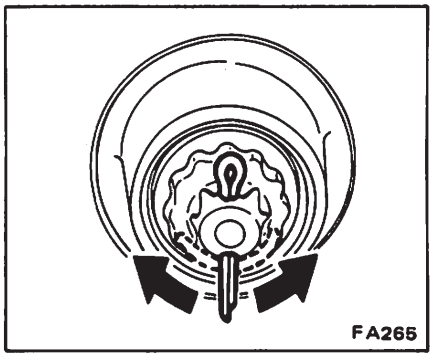
Axial play: 0 mm (0 in)
Wheel bearing starting torque:
With new grease seal
Less than
0.8 N·m (8 kg-cm, 6.9 in-lb)
As measured at wheel hub bolt
Less than
13.7 N (1.4 kg, 3.1 lb)
With used grease seal
Less than
0.4 N·m (4 kg-cm, 3.5 in-lb)
As measured at wheel hub bolt
Less than
6.9 N (0.7 kg, 1.5 lb)



Repeat above procedures until correct starting torque is obtained.

a. **Correctly measure rotation starting force toward tangential direction against hub bolt.**
b. **Above figures do not include "dragging" resistance. When measuring wheel bearing starting torque, be sure to confirm no "dragging" resistance exists.**
c. **Any slightest wheel bearing axial play cannot be tolerated.**

8. Spread cotter pin.



9. Install hub cap with new O-ring.

BRAKE SYSTEM

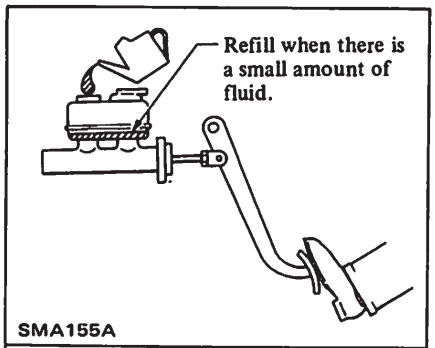
REPLACING BRAKE FLUID

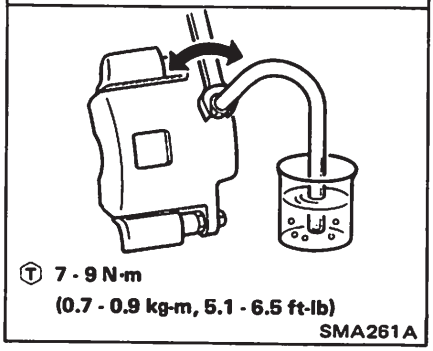
1. Change brake fluid.

Use same procedure as in air bleeding to change brake fluid in system. This operation should be done for one wheel at a time. Refer to Section BR.

CAUTION:
Never reuse brake fluid because its characteristic is changed by oxidization as well as contains the foreign material and dirt.

Recommended brake fluid specification:
DOT3 (F.M.V.S.S. No. 116)

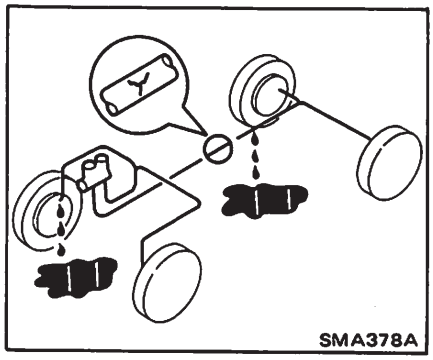


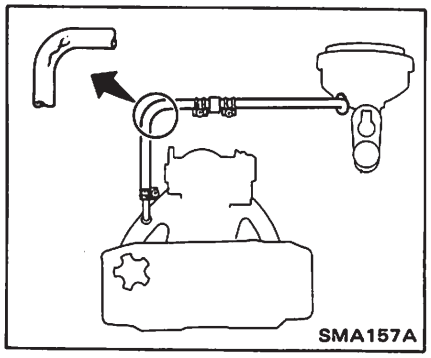


2. Check brake fluid level.
3. Check for leaks.

INSPECTING BRAKE LINES & HOSES

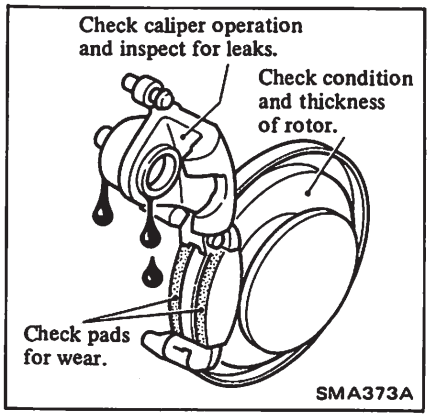
Check the brake lines and hoses (including brake booster vacuum hoses, connections & check valve) for proper attachment, leaks, cracks, chafing, abrasion, deterioration, etc.



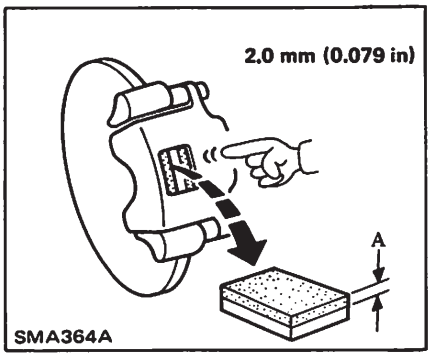


INSPECTING BRAKE PADS & DISCS

Check condition of disc brake components.

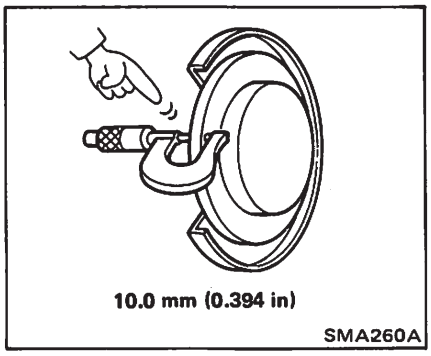


Pad wear limit



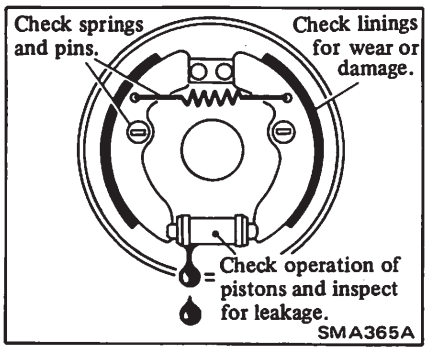
Refer to Section BR for pad replacement.

Rotor repair limit

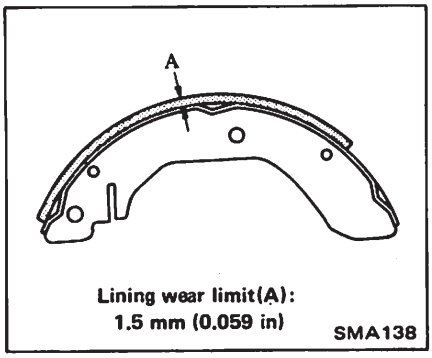


INSPECTING BRAKE DRUMS & LININGS

Check the brake lines and hoses (including brake booster vacuum hoses, connections & check valve) for proper attachment, leaks, cracks, chafing, abrasion, deterioration, etc.

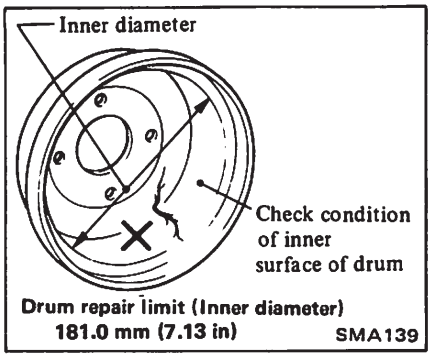


Lining wear limit



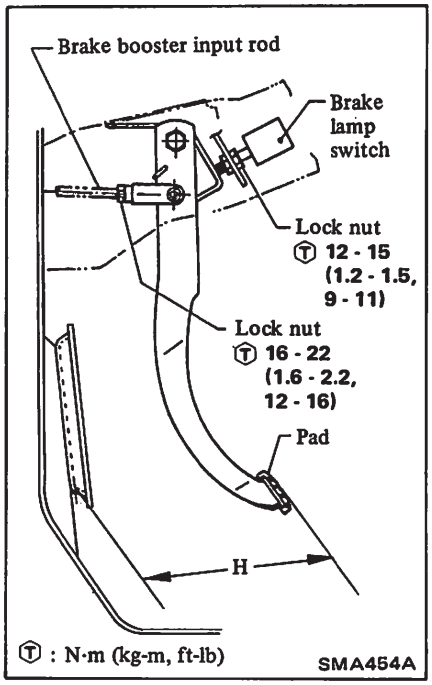
Refer to Section BR for shoe replacement.

Drum repair limit



CHECKING FOOT BRAKE

Check brake pedal free height from melt sheet.
Adjust if necessary.



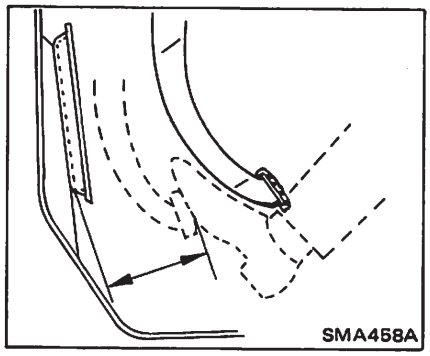
Pedal free height "h":
Refer to S.D.S.
Clearance "C" between pedal stopper rubber and threaded end of brake lamp switch:
0 - 1 mm (0 - 0.04 in)

(1) Adjust pedal free height with brake booster input rod. Then tighten lock nut.
(2) Adjust clearance "C" with brake lamp switch. Then tighten lock nut.

Make sure that no depressing force is on brake booster input rod and that brake lamp is off when pedal is released.

CHECKING BRAKE PEDAL DEPRESSED HEIGHT

Check brake pedal depressed height with engine running.



Depressed height
[Under force of 490 N (50 kg, 110 lb) with engine running]:
Refer to S.D.S.

If depressed height is below the specified value, check brake system for leaks, accumulation of air or any abnormality regarding component parts (master cylinder, adjuster, etc.), and make the necessary repairs.

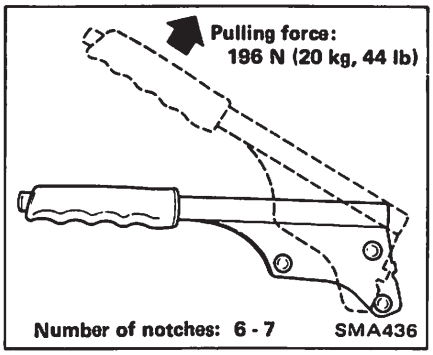
CHECKING BRAKE BOOSTER FUNCTION

Check the brake booster function in accordance with the following procedures.

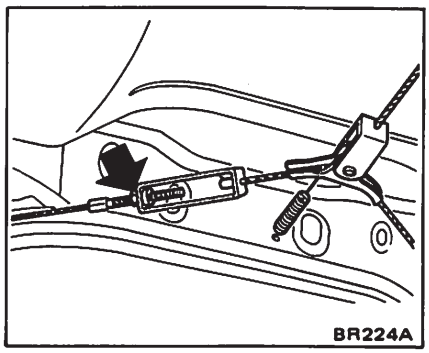
1. Park the vehicle on a level surface and set the parking brake.
2. With the engine stopped, depress the brake pedal several times to make sure that the pedal travel distance does not change. Then, while depressing the brake pedal, start the engine. At this time, the pedal should go down a little.
3. Depress the brake pedal while running the engine. With the brake pedal depressed, stop the engine. Keeping the pedal depressed for about 30 seconds, make sure that the depressed pedal height does not change.
4. Run the engine for a minute and then stop it. Depress the brake pedal several times and make sure that the pedal travel distance decreases gradually with each depression.

CHECKING PARKING BRAKE

1. Pull lever with specified amount of force.
   Measure lever stroke.



2. Use adjuster to adjust lever stroke.



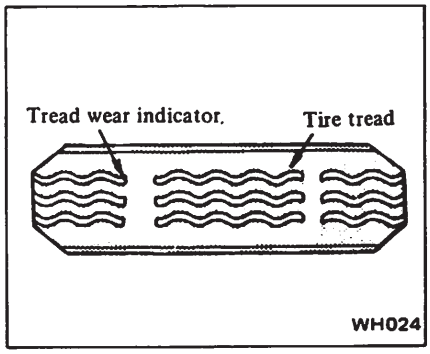
3. Bend hand brake warning lamp switch plate down so that brake warning light comes on when ratchet at hand brake lever is moved back one notch and goes out when returned to its original position.

WHEEL AND TIRE

CHECKING TIRE CONDITION

Tire condition

1. Tires are provided with "tread wear indicator" at six places around tire circumference, indicating 1.6 mm (1/16 in) tread depth. When tires wear and then marks appear, replace them with new ones.

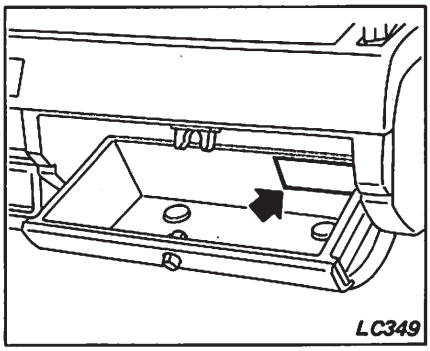


2. Remove pebbles, glass or any other foreign material embedded in tire treads.
3. Check tread and side walls for cracks, holes, separation or damage.
4. Check tire valves for air leakage.

Tire inflation

1. Check tire pressure. If necessary, adjust it to the specified value indicated in the label attached to the car, also found in S.D.S.

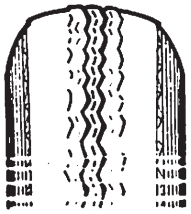
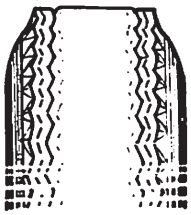
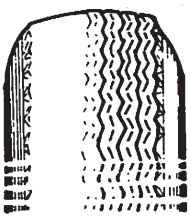
Tire pressure should be measured when tire is cold.



2. After inflating tires, valves should be checked for leakage. Whenever tire pressure is checked, be sure to tighten valve caps firmly by hand to keep dust and water out.

Abnormal tire wear

Correct abnormal tire wear according to the chart shown below.

Condition	Probable cause	Corrective action
 Shoulder wear	• Underinflation (both sides wear) • Incorrect wheel camber (one side wear) • Hard cornering • Lack of rotation	• Measure and adjust pressure. • Repair, or replace axle and suspension parts. • Reduce speed • Rotate tires.
 Center wear	• Overinflation • Lack of rotation	• Measure and adjust pressure. • Rotate tires.
Feathered edge  Toe-in or toe-out wear	• Incorrect toe	• Adjust toe-in.
 Uneven wear	• Incorrect camber or caster • Malfunctioning suspension • Unbalanced wheel • Out-of-round brake drum • Other mechanical conditions • Lack of rotation	• Repair, or replace axle and suspension parts. • Repair, replace or, if necessary, reinstall. • Balance or replace. • Correct or replace. • Correct or replace. • Rotate tires.

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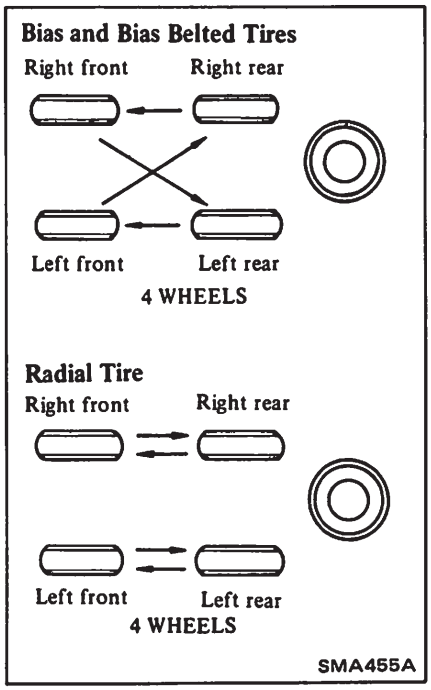
TIRE ROTATION

1. Tires tend to wear unevenly and become unbalanced after a certain running distance. Uneven tire wear often results in tire noise which is attributed to rear axle gears, bearing, etc. Front tires also tend to wear unevenly because of improperly aligned front wheels.
2. Accordingly, to equalize tire wear, it is necessary to **rotate tires periodically.**



TIRE REPLACEMENT

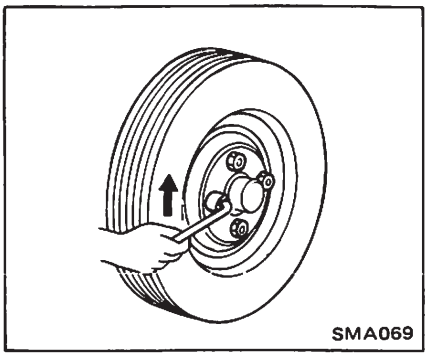
CAUTION:
Different types of tires, such as bias, bias belted and radial tires, must not be mixed under any circumstances. Mixed use of different types of tires can adversely affect vehicle handling and may cause driver to lose control.

a. When replacing a worn or damaged tire, use a replacement tire of the same size and load carrying capacity as that with which the car was equipped when manufactured. The use of different size and/or load capacity tires will not only shorten tire service life but may also result in a serious accident.
b. Do not use tires and wheels other than those recommended, and do not mix tires of different brands or tread patterns.
   The use of tires and wheels other than those recommended or the mixed use of tires of different brands or tread patterns can adversely affect the ride, braking, handling, ground clearance, body-to-tire clearance, and speedometer calibration.
c. It is recommended that new tires be installed in pairs on the same axle. When replacing only one tire, it should be paired with the most tread, to equalize braking traction.
d. When replacing original tires with those tires of an optional recommended size and of different diameter, the speedometer must be re-calibrated.
e. When tire is installed, refer to the procedure 7 described in TIRE REPAIR.

1. To replace a tire with a jack in a safe manner, refer to Lifting Points (Section GI) for jacking up.

WARNING:
Never get under vehicle while it is supported only by jack.
Always use safety stands to support side member of body construction when you must get beneath vehicle.

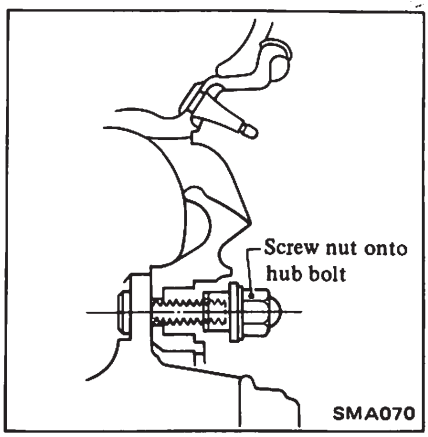
2. To install wheel, tighten wheel nuts in **criss-cross fashion.**



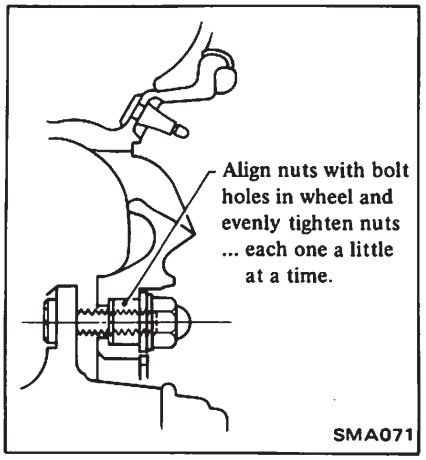
Aluminum wheel

To install an aluminum wheel, proceed as follows:

1. Snugly tighten four nuts after the wheel is positioned.



2. Slightly pull the wheel back to properly align the nuts with bolt holes in the wheel, and tighten the nuts as much as possible with your fingers.

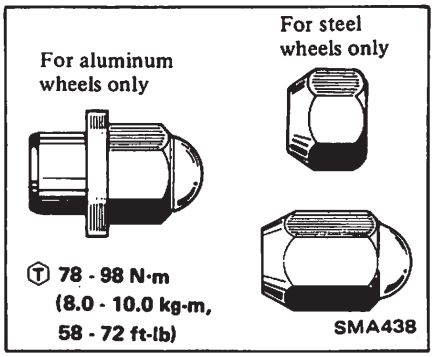


3. Tighten wheel nuts evenly with a wheel wrench in **criss-cross fashion.**

Be sure to check the wheel nuts for tightness, after the aluminum wheel has been run for the first 1,000 km (600 miles) (also in case of repairing flat tires, tire rotation, etc.).
Replace if necessary.

Wheel nut

CAUTION:
Two types of wheel nuts are used; one is designed for use with steel wheel and the other for use with aluminum wheel. Do not mix different types of wheel nuts.



Be careful not to smear threaded portion of bolt and nut, and seat of nut with oil or grease.

LIGHT WEIGHT SPARE TIRE (Size P155/80D13)

The light weight spare tire is designed for emergency use only.
The spare tire can be used repeatedly for emergency situations.

Precautions when using light weight spare tire

- **Periodically check tire inflation pressure, and always keep it at 35 psi (240 kPa).**
- **Do not drive vehicle at speed faster than 80 km/h (50 MPH).**
- **The light weight spare tire is designed only for temporary use as a spare. Dismount it and keep it as a spare as soon as the standard tire repair has been completed.**
- **Do not use tire chains on a light weight spare tire.**

- **Do not use the light weight spare tire on other vehicles.**
- **Do not make a sharp turn, or apply the brake suddenly while driving.**
- **As soon as the tread wear indicator becomes visible, replace the tire with a new one.**
- **Mounting and dismounting to and from the road wheel can be carried out in the same manner as any ordinary tire.**
- **Use of wheel balance is unnecessary.**

CAUTION:
If the vehicle is equipped with aluminum wheels, be sure to use the wheel nuts for steel wheel on the light weight spare tire wheel. Never use the wheel nuts for aluminum wheel on the spare tire wheel.
The spare tire wheel may come off the axle and cause personal injury if the wheel nuts for aluminum wheels are used on the spare tire wheel.

TIRE REPAIR

Inspect tire, following the procedure shown below. If any defect is present, repair or replace as necessary.

1. Apply soapy solution or submerge tire and wheel or tube in water after inflating it to specified pressure.
2. Inspect for leaks.
3. Specially inspect for leaks around valve or wheel rim and along tread.
4. Note bead and rim where leakage occurs. Wipe water away from any area which leaks air bubbles and then mark place with chalk.
5. Remove object which caused puncture and seal the point.

a. When repairing a puncture, use a tire repair kit furnished by any tire dealer, following instructions provided with kit.
b. If a puncture is too large or there is some damage to tire fabric, repair should be carried out by authorized tire dealer.

6. Discard when any of the following problems occurs:
- Broken or damaged bead wire.
- Ply or tread separation.
- Worn fabric damage on tubeless tire.
- Cracked or damaged side wall.
- Tires with tread wear indicator showing, etc.

CAUTION:
When replacing tire, take extra care not to damage tire bead, rim-flange and bead seat.

Do not use tire irons to force beads away from wheel rim-flange; that is, always use tire replacement device whenever tire is removed.

7. Install tire, noting the following items:

a. Install valve core and inflate to proper pressure. Check the locating rings of the tire to be sure they show around the rim flanges on both sides.
b. Check valves for leakage after inflating tires.
c. Be sure to tighten valve caps firmly by hand.

WARNING:
When, while tire is being inflated, bead snaps over safety hump, it might break. Thus, to avoid serious personal injury, never stand over tire when inflating it. Never inflate to a pressure greater than 40 psi (275 kPa). If beads fail to seat at that pressure, deflate the tire, lubricate it again, and then reinflate it. If the tire is overinflated, the bead might break possibly resulting in serious personal injury.

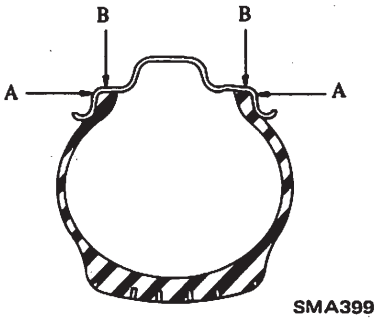
WHEEL INSPECTION

Inspect wheel, taking care of the following points, in order to ensure satisfactory steering condition as well as maximum tire life. If any defect is present, repair or replace as necessary.

1. Check wheel rim, especially rim flange and bead seat, for rust, distortion, cracks or other faults which might cause air leaks. Function of tubeless tire depends on a good seal between tire bead and wheel rim.
2. Thoroughly remove rust, dust, oxidized rubber or sand from wheel rim.

Rim bead seats should be cleaned with the following.
Steel wheel:
Wire brush, coarse steel wool, etc.
Aluminum wheel:
Neutral detergent, cloth, etc.

3. Examine wheel rim for lateral and radial runout, using dial gauge.



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Lateral runout (A) and radial runout (B):
Steel wheel ... Less than 1.0 mm (0.039 in)
Aluminum wheel ... Less then 0.5 mm (0.020 in)
Difference between right and left lateral runout:
Steel wheel ... Less than 0.5 mm (0.020 in)
Aluminum wheel ... Less than 0.2 mm (0.008 in)

4. Replace wheel when any of the following problems occurs.
- Bent, dented or heavily rusted
- Elongated bolt holes
- Excessive lateral or radial runout
- Air leaks through welds
- Wheel nuts will not stay tight

Wheel balance

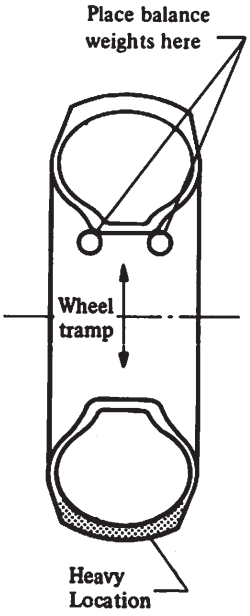
Inspect wheel and tire for wheel balance and correct it if unbalance is present, taking the following points into consideration.

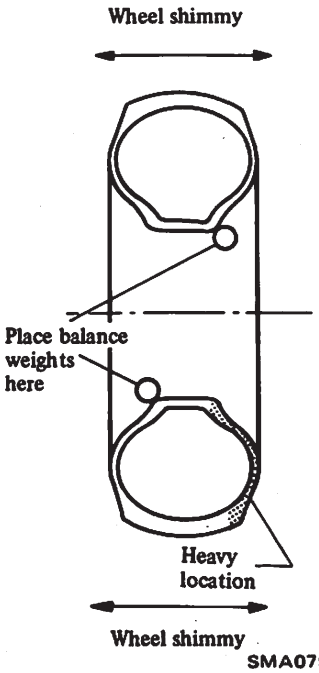
1. Correct unbalance when the symptom of unbalance appears as wheel tramps and wheel shimmy.
2. Balance wheel and tire both **statically and dynamically.**

Balancing wheels

CAUTION:
Do not spin balance front wheels on the vehicle.
Transaxle damage will result.

Cause	Wheel static unbalance	Wheel dynamic unbalance
Symptom of unbalance	Wheel tramp Wheel shimmy	Wheel shimmy
Corrective action	Balance statically	Balance dynamically





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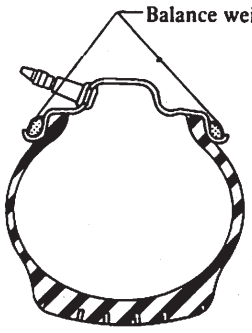

Maximum allowable unbalance at rim flange:
10 g (0.35 oz)
Balance weight:
10 - 60 g (0.35 - 2.12 oz) at 10 g (0.35 oz) interval

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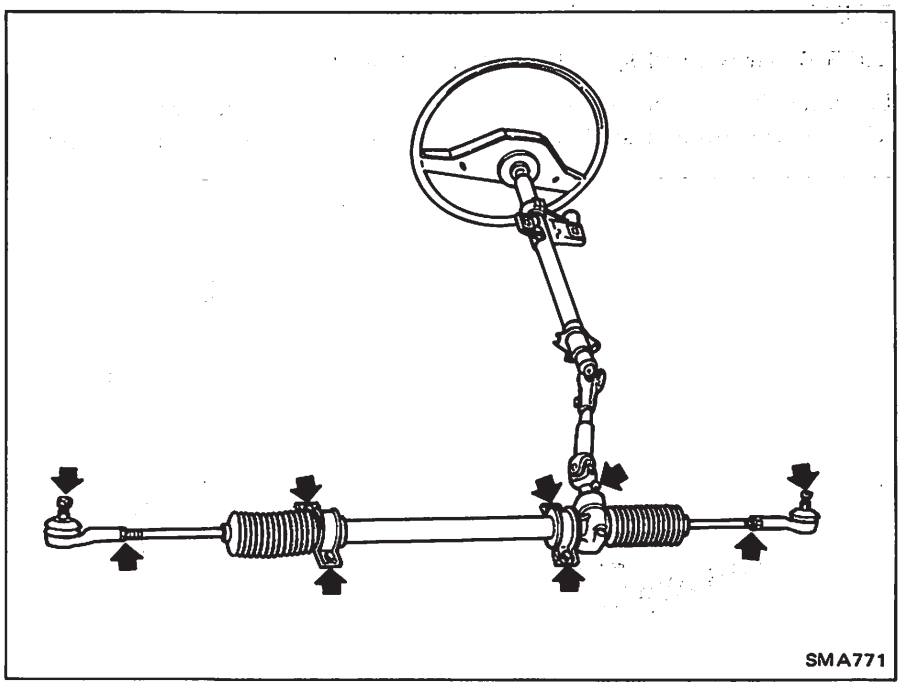
a. Be sure to place correct balance weights on inner edge of rim.
b. Do not put more than two weights on each side.
c. Two types of balance weights are used; one is designed for use with steel wheel and the other for use with aluminum wheel. Do not mix different types of balance weights.
d. Properly rebalance the wheel and tire whenever puncture is repaired.

STEERING SYSTEM

INSPECTING STEERING GEAR AND LINKAGE

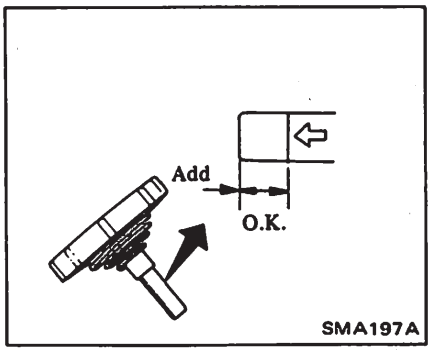
Check for damage, looseness and leakage of oil or grease.



CHECKING POWER STEERING FLUID LEVEL

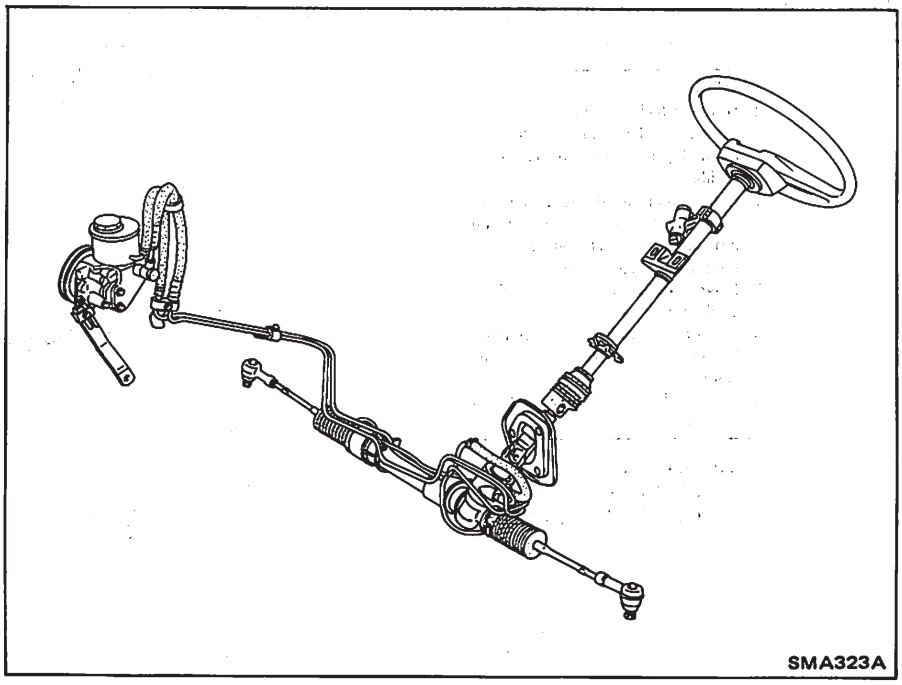
Check the fluid level in reservoir by observing the dipstick when the fluid is cold. Add fluid as necessary to bring the level into the proper range on dipstick.

CAUTION:
Do not overfill.



INSPECTING POWER STEERING LINES & HOSES

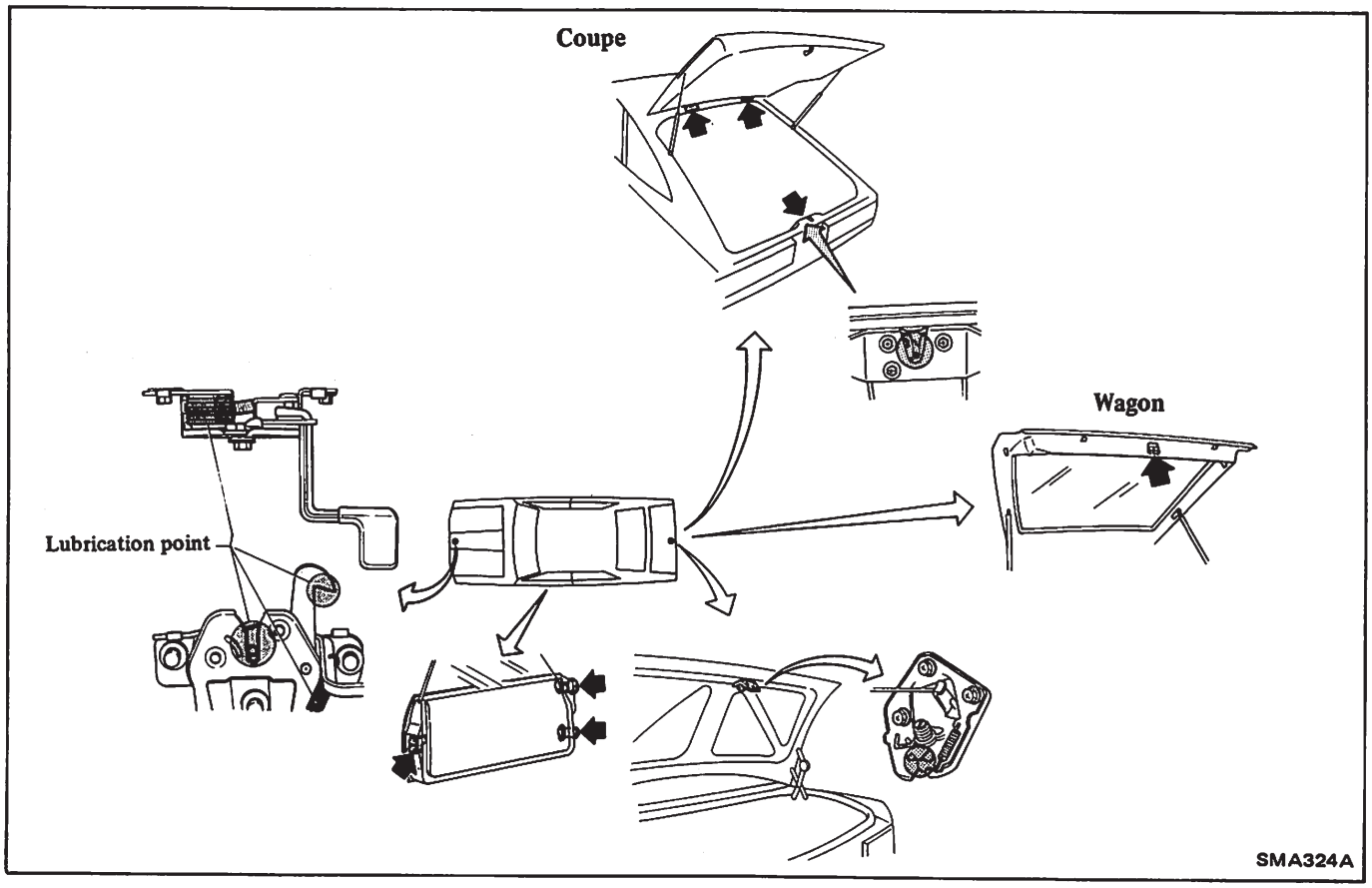
Check the lines & hoses for proper attachment, leaks, cracks, chafing, abrasion, deterioration, etc.



BODY

LUBRICATING LOCKS, HINGES AND HOOD LATCH

Lubricate all locks and hinges on all doors including trunk lid, back hatch and hood latch. When driving in areas using road salt or other corrosive materials, inspection should be performed more frequently.

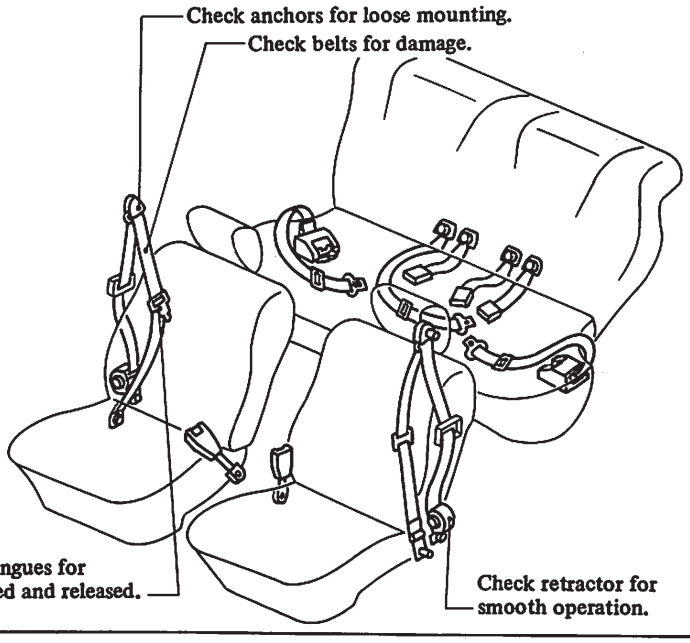


CHECKING SEAT BELTS, BUCKLES, RETRACTORS, ANCHORS AND ADJUSTER

Check for damage, deterioration, proper functioning, smooth operation and loose mounting.

CAUTION:
1. If the vehicle is collided or overturned, replace the entire belt assembly, regardless of nature of accident.
2. If the condition of any component of a seat belt is questionable, do not have seat belt repaired, but replaced as a belt assembly.
3. If webbing is cut, frayed, or damaged, replace belt assembly.
4. Do not spill drinks, oil etc. on inner lap belt buckle. Never oil tongue and buckle.
5. Use a NISSAN genuine seat belt assembly.

Ⓣ Anchor bolt
24 - 31 N·m
(2.4 - 3.2 kg-m, 17 - 23 ft-lb)



SERVICE DATA AND SPECIFICATIONS (S.D.S.)

ENGINE MAINTENANCE (E15 & E16)

INSPECTION AND ADJUSTMENT

Basic mechanical system

Valve clearance mm (in)	Hot	Intake	0.28 (0.011)
		Exhaust	0.28 (0.011)
	Cold*1	Intake	0.22 (0.009)
		Exhaust	0.22 (0.009)

Drive belt deflection (Cold)	Used*2	New*3
Alternator mm (in)	13 - 17 (0.51 - 0.67)	10 - 14 (0.39 - 0.55)
Air conditioner mm (in)	9 - 11 (0.35 - 0.43)	7 - 9 (0.28 - 0.35)
Power steering mm (in)	7 - 9 (0.28 - 0.35)	6.5 - 8.5 (0.256 - 0.335)
Pushing force N (kg, lb)	98 (10,22)	
Engine compression pressure kPa (kg/cm², psi) Standard	1,245 (12.7, 181)	
Minimum	981 (10.0, 142)	

*1 After checking valve clearance while engine is cold, also check it when engine is hot to see if it remains within the specific range. If it does not readjust it.
*2 Adjust deflection of used belt
*3 Set deflection of new belt

Ignition and fuel system

Spark plugs

Destination	Type			Gap mm (in)
	Standard	Hot	Cold	
U.S.A.	BPR5ES-11	BPR4ES-11	BPR6ES-11	1.0 - 1.1 (0.039 - 0.043)
Canada	BPR5ES	BPR4ES	BPR6ES	0.8 - 0.9 (0.031 - 0.035)
High tension cable resistance ohm	Less than 30,000			

Ignition timing, idle speed and idle "CO"% (For U.S.A.)

	Except M.P.G.		M.P.G.
	Manual	Automatic	Manual
Ignition timing/ Idle speed (A.T.D.C. degree/rpm)	*5±2° / 750±50	*5±2° / 650±50	*2±2° / 700±50
"CO"% at idle speed	Idle mixture screw is preset and sealed at factory.		

Ignition timing, idle speed and idle "CO"% (For Canada)

	Except M.P.G.		M.P.G.
	Manual	Automatic	Manual
Ignition timing/ Idle speed (A.T.D.C. degree/rpm)	*5±2° / 750±50	*5±2° / 650±50	*2±2° / 700±50
"CO"% at idle speed	2±1		Idle mixture screw is preset and sealed at factory.

* Measure with distributor vacuum hose disconnected and vacuum hose plugged up.

Emission control system

Unit: kPa (mmH_2O, inH_2O)

Vapor line leakage test	Supplied pressure	3.923 (400, 15.75)
	Pressure variation	Less than 0.245 (25, 0.98)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Valve rocker adjusting nut	16 - 21	1.6 - 2.1	12 - 15
Oil pan drain plug	35 - 47	3.6 - 4.8	26 - 35
Spark plug	20 - 29	2.0 - 3.0	14 - 22

ENGINE MAINTENANCE (CD17)

INSPECTION AND ADJUSTMENT

Valve clearance mm (in)	
Intake	0.20 - 0.30 (0.008 - 0.012)
Exhaust	0.40 - 0.50 (0.016 - 0.020)

Drive belt Deflection mm (in)	New	Used	Deflection limit
Fan	9 - 11 (0.35 - 0.43)	11 - 13 (0.43 - 0.51)	14 (0.55)
Compressor	11 - 13 (0.43 - 0.51)	12 - 14 (0.47 - 0.55)	15 (0.59)

Applied pressure force N (kg, lb)	98 (10, 22)

Lifter plate

Part number	Thickness mm (in)	Identification
13232-16A00	3.00 (0.1181)	300
13232-16A01	3.05 (0.1201)	305
13232-16A02	3.10 (0.1220)	310
13232-16A03	3.15 (0.1240)	315
13232-16A04	3.20 (0.1260)	320
13232-16A05	3.25 (0.1280)	325
13232-16A06	3.30 (0.1299)	330
13232-16A07	3.35 (0.1319)	335
13232-16A08	3.40 (0.1339)	340
13232-16A09	3.45 (0.1358)	345
13232-16A10	3.50 (0.1378)	350
13232-16A11	3.55 (0.1398)	355
13232-16A12	3.60 (0.1417)	360
13232-16A13	3.65 (0.1437)	365
13232-16A14	3.70 (0.1457)	370
13232-16A15	3.75 (0.1476)	375
13232-16A16	3.80 (0.1496)	380
13232-16A17	3.85 (0.1516)	385
13232-16A18	3.90 (0.1535)	390
13232-16A19	3.95 (0.1555)	395
13232-16A20	4.00 (0.1575)	400
13232-16A21	4.05 (0.1594)	405
13232-16A22	4.10 (0.1614)	410
13232-16A23	4.15 (0.1634)	415
13232-16A24	4.20 (0.1654)	420

Injection system

Idle speed	rpm	750^{+100}_{-50}
Plunger lift	mm (in)	
For low altitudes		
M/T		0.94±0.03 (0.0370±0.0012)
A/T		0.88±0.03 (0.0346±0.0012)
For high altitudes		
M/T		1.00±0.03 (0.0394±0.0012)
A/T		0.94±0.03 (0.0370±0.0012)
Initial injection pressure	kPa (kg/cm², psi)	
New		13,239 - 14,024 (135 - 143, 1,920 - 2,033)
Used		12,259 - 13,239 (125 - 135, 1,778 - 1,920)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Air cleaner bracket bolt	26 - 34	2.7 - 3.5	20 - 25
Alternator to bracket	49 - 59	5.0 - 6.0	36 - 43
Alternator to adjusting bar	9.1 - 11.8	0.93 - 1.2	6.7 - 8.7
Crank damper pulley bolt	123 - 132	12.5 - 13.5	90 - 98
Front dust cover	3 - 5	0.3 - 0.5	2.2 - 3.6
Idler pulley bolt	36 - 44	3.7 - 4.5	27 - 33
Injection pump nut	13 - 18	1.3 - 1.8	9 - 13
Injection pump to rear bracket	49 - 59	5.0 - 6.0	36 - 43
Injection tube flare nut	22 - 25	2.2 - 2.5	16 - 18
Oil pan drain plug	37 - 45	3.8 - 4.6	27 - 33
Plug bolt	14 - 20	1.4 - 2.0	10 - 14
Rear dust cover	1 - 3	0.1 - 0.3	0.7 - 2.2
Rocker cover	1 - 3	0.1 - 0.3	0.7 - 2.2
Front tensioner	36 - 44	3.7 - 4.5	27 - 33
Rear tensioner	16 - 21	1.6 - 2.1	12 - 15
Water drain plug	54 - 74	5.5 - 7.5	40 - 54

CHASSIS AND BODY MAINTENANCE

INSPECTION AND ADJUSTMENT

Clutch

Unit: mm (in)

Pedal height "H"	194 - 204 (7.64 - 8.03)
Pedal free play "A"	11 - 21 (0.43 - 0.83)
Withdrawal lever play	2 - 4 (0.08 - 0.16)

Front axle and front suspension

Wheel alignment (Unladen*) Camber	degree	−35′ - 1°05′
Caster	degree	45′ - 2°15′
Kingpin inclination	degree	12°10′ - 13°40′
Toe-in	mm (in)	3 - 5 (0.12 - 0.20)
Side slip (Reference data)	mm/m (in/ft)	Out 3 - In 3 (Out 0.036 - In 0.036)
Standard side rod length	mm (in)	175.9 (6.93)
Front wheel turning angle Toe-out turns (Inside/Outside)	degree	20/17°30′
Full turn (Inside/Outside)	degree	
E15		40° - 44°/31° - 35°
CD17 M/T		37° - 41°/29° - 33°
CD17 A/T		33° - 37°/27° - 31°

Rear axle and rear suspension

Axial play	mm (in)	0 (0)
Wheel bearing nut Tightening torque	N·m (kg-m, ft-lb)	39 - 44 (4.0 - 4.5, 29 - 33)
Return angle	degree	90°
Wheel bearing starting torque With new grease seal	N·m (kg-cm, in-lb)	Less than 0.8 (8, 6.9)
As measured at hub bolt	N (kg, lb)	Less than 13.7 (1.4, 3.1)
With used grease seal	N·m (kg-cm, in-lb)	Less than 0.4 (4, 3.5)
As measured at hub bolt	N (kg, lb)	Less than 6.9 (0.7, 1.5)

Brake

Unit: mm (in)

Disc brake Pad minimum thickness	2.0 (0.079)
Rotor minimum thickness	10.0 (0.394)
Drum brake Lining minimum thickness	1.5 (0.059)
Drum maximum inner dia.	181 (7.13), 203.2 (8.00)
Pedal Free height "h" MT	194 - 204 (7.64 - 8.03)
AT	197 - 207 (7.76 - 8.15)
Depressed height [Under force of 490 N (50 kg, 110 lb) with engine running]	More than 85 (3.35)
Parking brake Number of notches [at pulling force 196 N (20 kg, 44 lb)]	6 - 7 notches

Wheel and tire

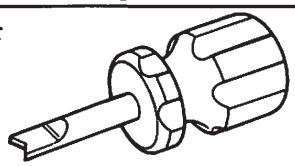
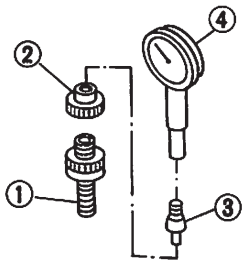
Recommended tire inflation pressure (Inflation pressure should be measured when tires are cold.) 155SR13	psi (kPa)	26 (180) 28 (200)*1
175/70SR13	psi (kPa)	26 (180)
P155/80D13 Spare tire	psi (kPa)	35 (240)
Wheel rim lateral and radial runout Steel wheel	mm (in)	Less than 1.0 (0.039)
Aluminum wheel	mm (in)	Less than 0.5 (0.020)
Difference between right and left lateral runout Steel wheel	mm (in)	Less than 0.5 (0.020)
Aluminum wheel	mm (in)	Less than 0.2 (0.008)
Wheel balance (Maximum allowable unbalance at rim flange)	gr (oz)	10 (0.35)
Tire balance weight	gr (oz)	10 - 60 (0.35 - 2.12) Spacing 10 (0.35)

*1: Only front wheels of E15 and CD17 engine equipped model.

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Clutch			
Pedal stopper lock nut	16 - 22	1.6 - 2.2	12 - 16
Cable adjuster lock nut	12 - 15	1.2 - 1.5	8.7 - 10.8
Manual transaxle			
Drain and filler plugs	25 - 34	2.5 - 3.5	18 - 25
Front axle and front suspension			
Side rod outer socket lock nut	37 - 46	3.8 - 4.7	27 - 34
Side rod inner socket lock nut	78 - 98	8 - 10	58 - 72
Brake system			
Air bleed valve	7 - 9	0.7 - 0.9	5.1 - 6.5
Brake lamp switch lock nut	16 - 22	1.6 - 2.2	12 - 16
Brake booster input rod lock nut	16 - 22	1.6 - 2.2	12 - 16
Wheel and tire			
Wheel nut	78 - 98	8.0 - 10.0	58 - 72

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name	Engine application	
		E15 & E16	CD17
ST19320000 (J25664)	Oil filter wrench 	X	–
KV10108300 (–)	Idle adjusting screwdriver 	X	–
KV11229352 (J28827) ① KV11229350 (–) ② KV11229360 (–) ③ KV11229370 (–) ④ KV11254410	Measuring device Holder Nut Pin Dial gauge 	–	X
KV11102600 (–)	Lifter plate replacer 	–	X

ENGINE MECHANICAL

SECTION EM

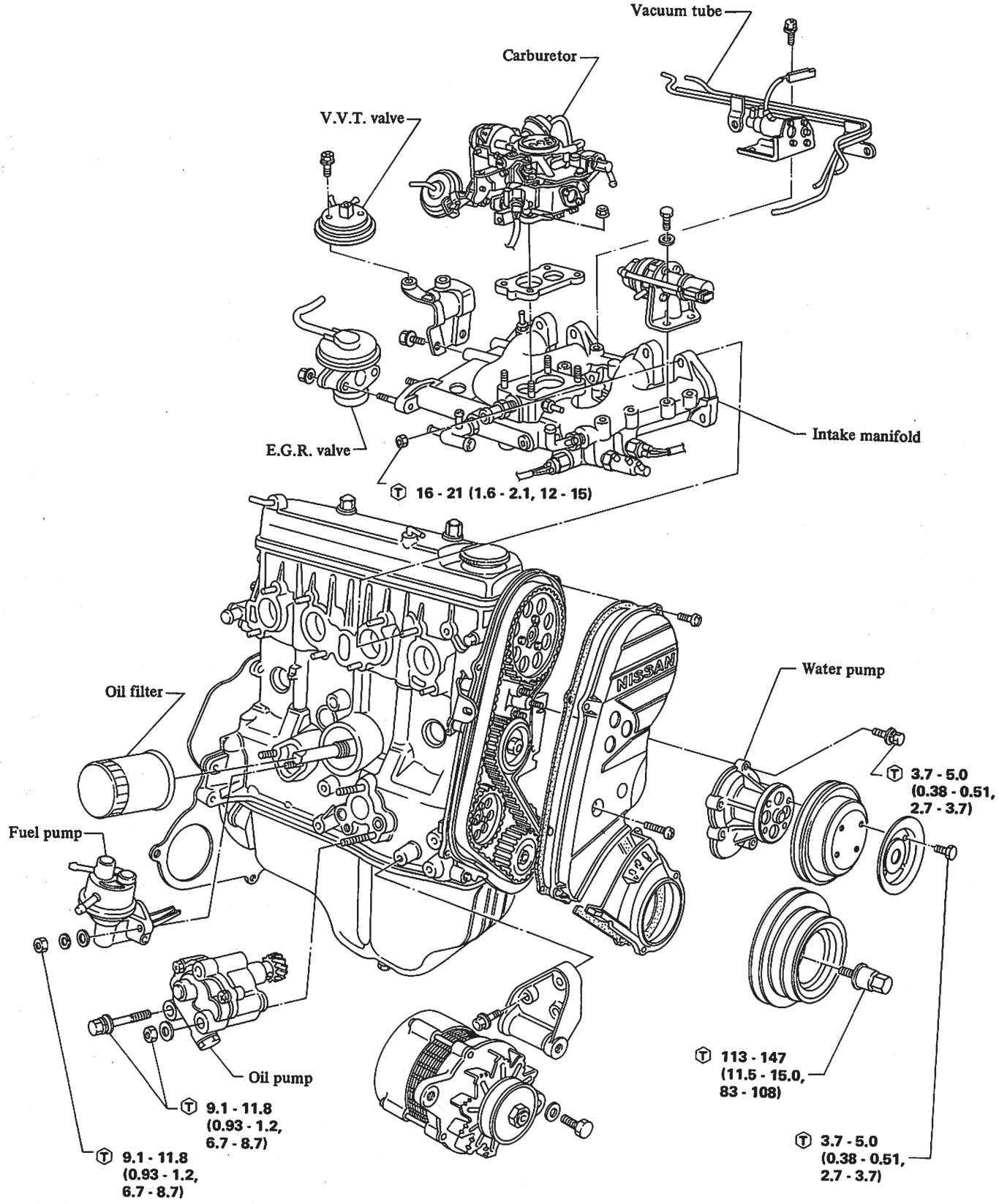
CONTENTS

E15 & E16

CD17

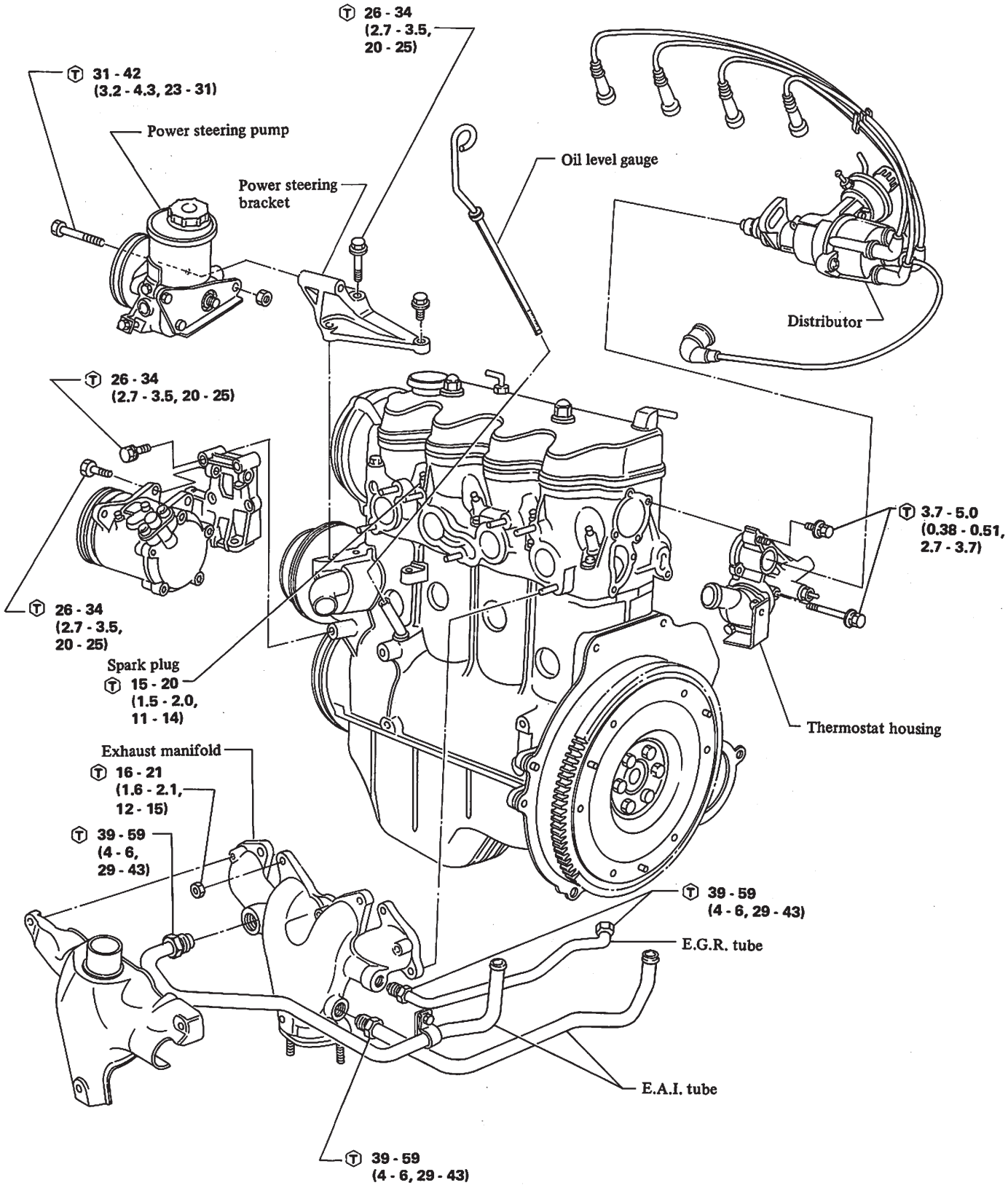
E15, E16 & CD17

ENGINE COMPONENTS (Outer parts)



Ⓣ : N·m (kg-m, ft-lb)

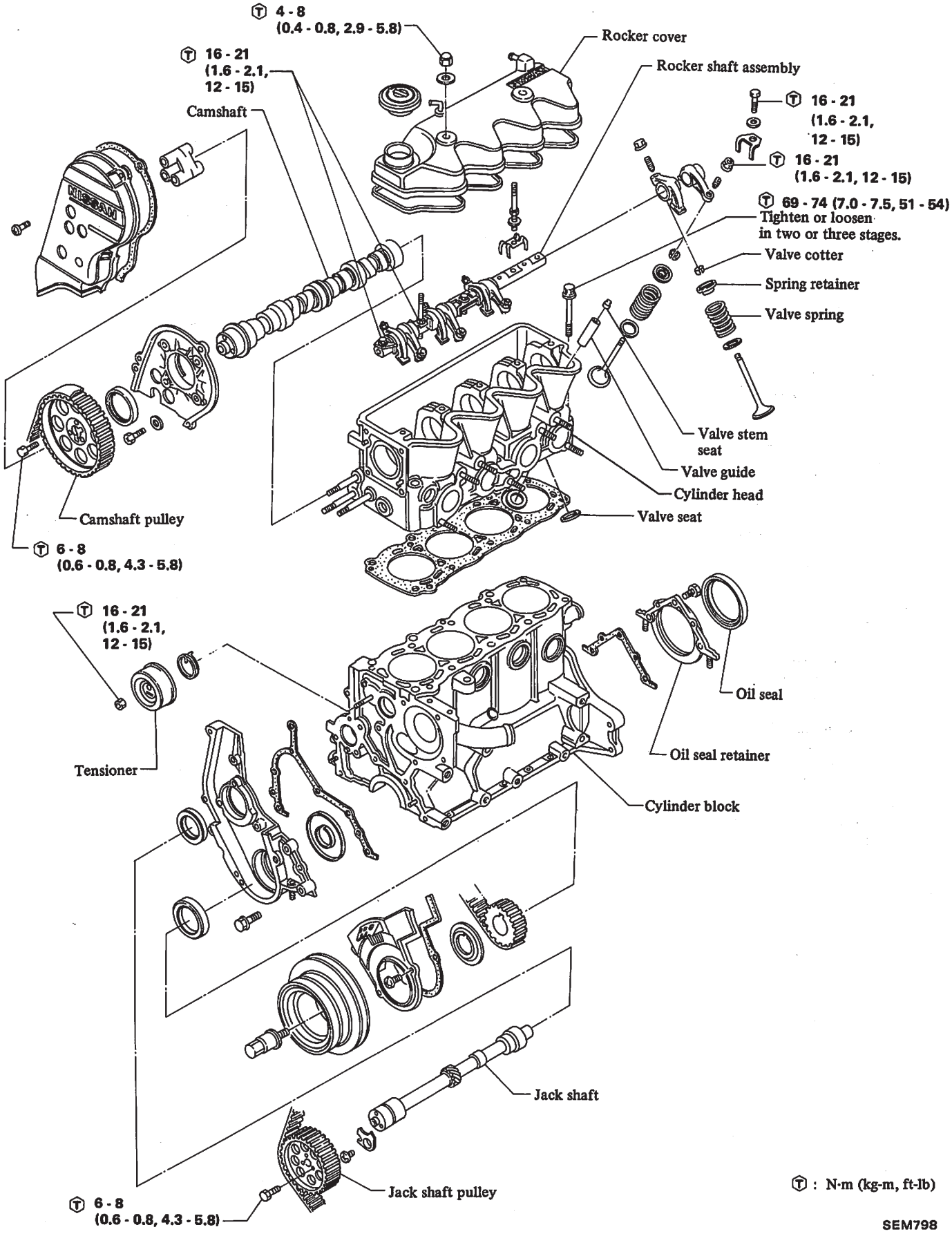
SEM796



Ⓣ : N·m (kg-m, ft-lb)

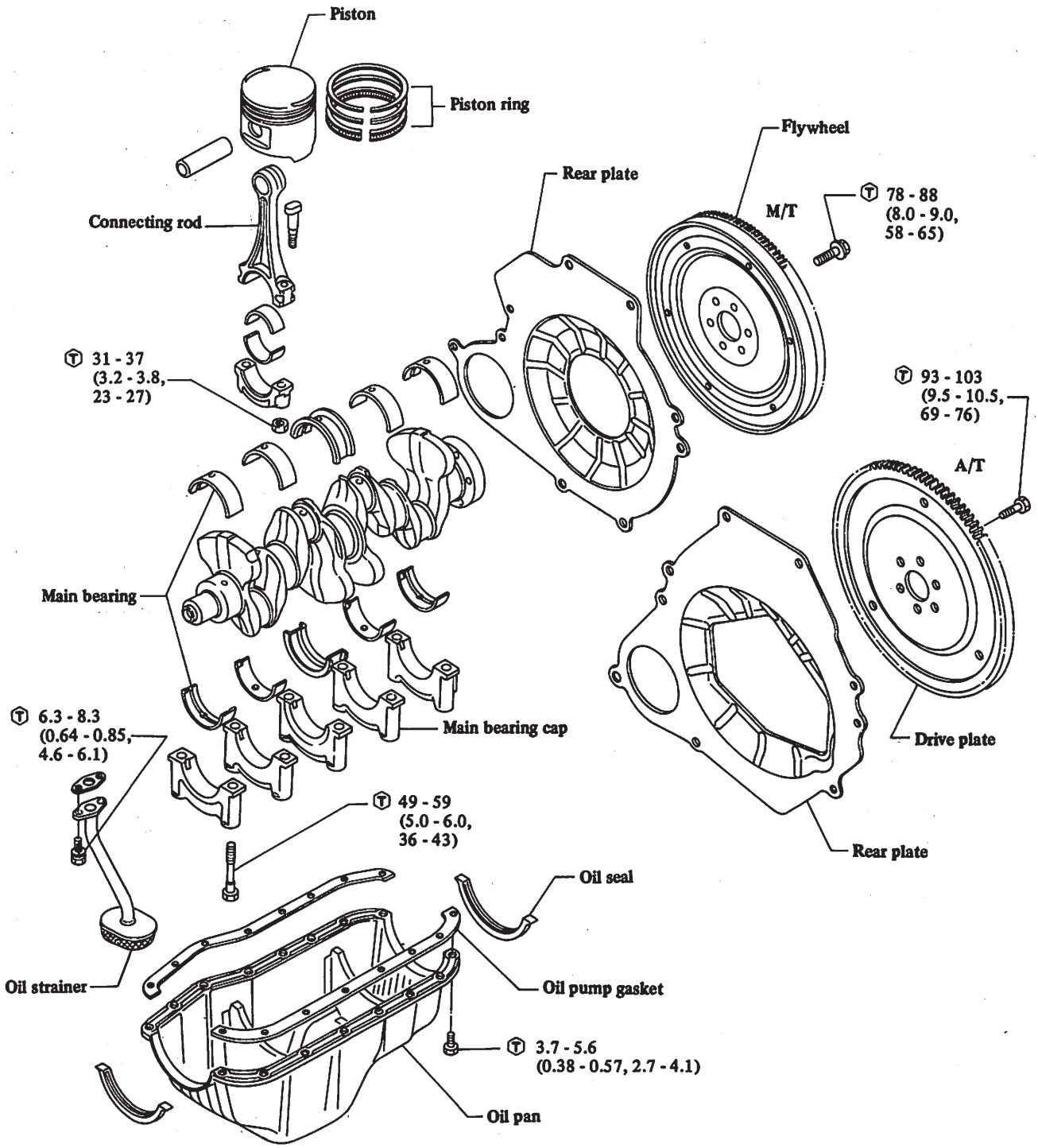
SEM797

ENGINE COMPONENTS (Internal parts)



Ⓣ : N·m (kg-m, ft-lb)

SEM798



Ⓣ : N·m (kg-m, ft-lb)

SEM728

ENGINE DISASSEMBLY

PRECAUTIONS

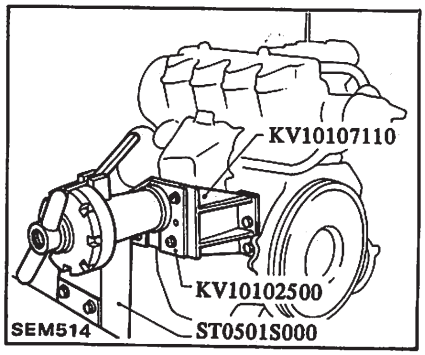
Arrange the disassembled parts on the parts stand in accordance with their assembled locations, sequence, etc., so that the parts will be reassembled in their original locations. Place mating marks on the parts if necessary.

ENGINE OVERALL

MOUNTING ENGINE ON ENGINE STAND

1. Remove parts at the rear of the engine.
- Transaxle assembly with starter motor
- Clutch unit

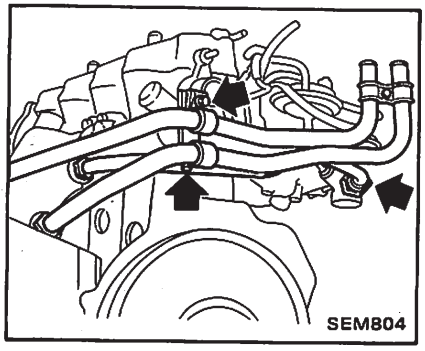
2. Install engine attachment on the engine.
3. Place engine on work stand.



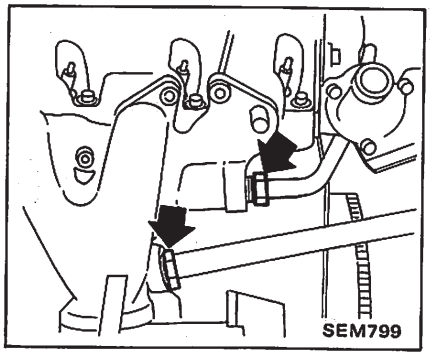
4. Drain engine oil and coolant.

OUTER PARTS

1. Parts at the rear of the engine.
(1) Remove distributor together with high tension cable.
(2) Remove E.A.I. pipes bracket and E.G.R. tube at E.G.R. valve side.

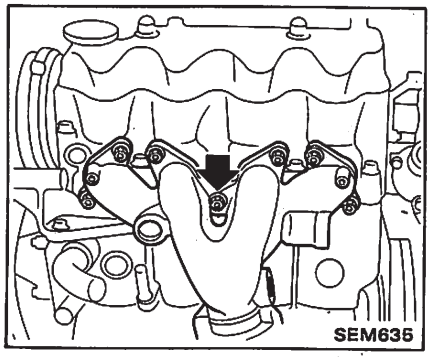


2. Parts on the left side of the engine.
(1) Disconnect E.G.R. and E.A.I. pipe.



(2) Remove exhaust manifold cover.
(3) Remove E.A.I. pipe.
(4) Remove exhaust manifold.

Exhaust manifold center nut has a different diameter from the other nut.

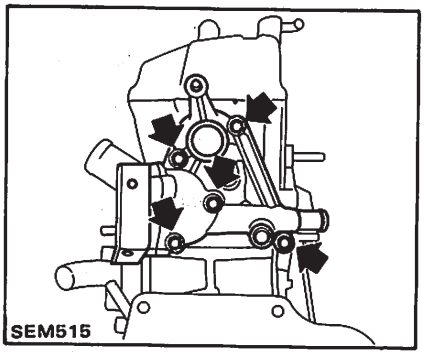


(5) Remove cooler compressor bracket and power steering pump bracket.
3. Parts on the right side of the engine.
(1) Remove intake manifold with carburetor.
(2) Loosen water pump pulley bolts.
(3) Remove alternator, alternator bracket and drive belt.
(4) Remove oil filter.
(5) Remove oil pump assembly with gasket.
(6) Remove fuel pump assembly with spacer.

INTERNAL PARTS

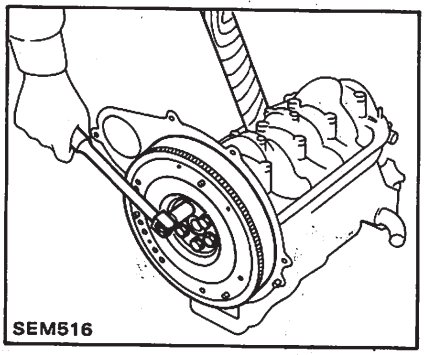
1. Bottom parts
(1) Remove oil pan, gasket and oil seal.
(2) Remove oil strainer.

2. Rear side parts
(1) Remove thermostat housing.

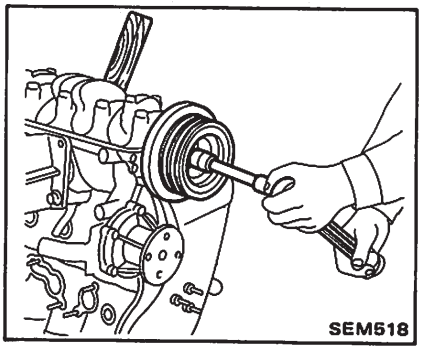


(2) Remove flywheel or drive plate, then remove rear plate.

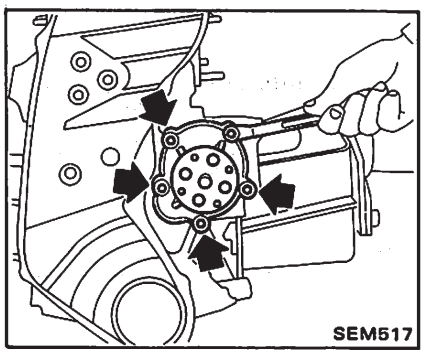
WARNING:
When removing flywheel, be careful not to drop it.



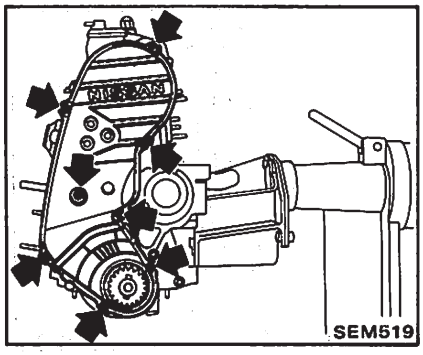
3. Front side parts
(1) Remove water pump pulley.
(2) Remove crankshaft pulley.



(3) Remove water pump assembly with gasket.



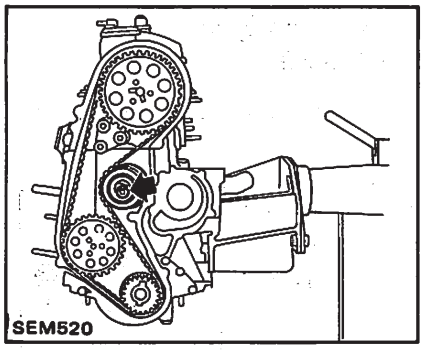
(4) Remove upper and lower dust cover.



(5) Remove tensioner pulley.
(6) Remove timing belt.

Mark rotating direction mark on timing belt.

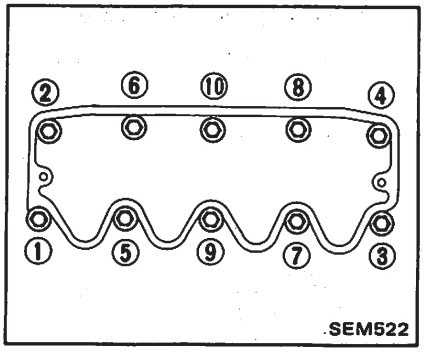
(7) Remove jack shaft pulley.



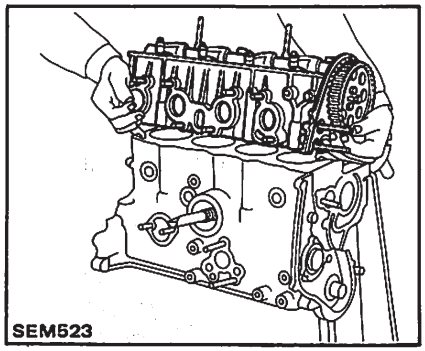
(8) Remove crankshaft timing pulley with spacer.

4. Separate cylinder head from cylinder block.
(1) Remove spark plugs.
(2) Remove valve rocker cover.
(3) Remove cylinder head bolts.

The bolts should be loosened in two or three stages.



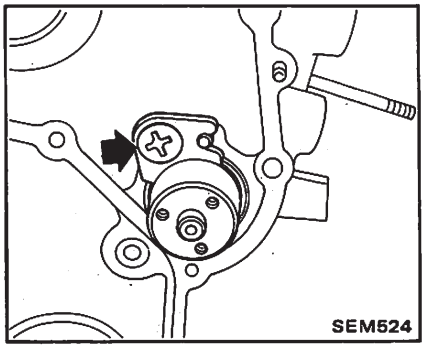
(4) Separate them.



5. Jack shaft
(1) Remove front cover.

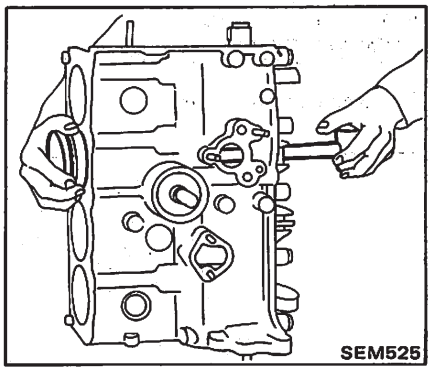
Be careful not to damage oil seal lip.

(2) Remove jack shaft locating plate.



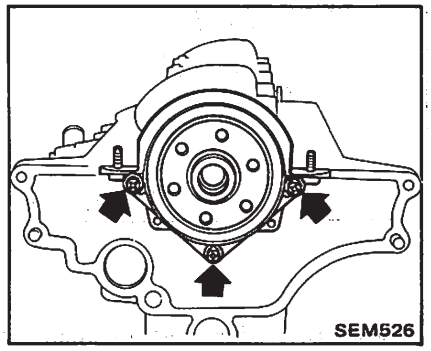
(3) Take out jack shaft.

6. Piston and connecting rod assembly.
(1) Remove connecting rod caps and bearings.
(2) Take out pistons together with connecting rods toward cylinder head side.

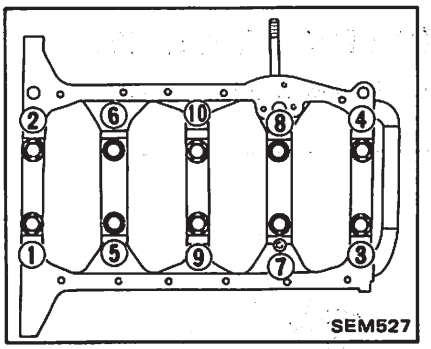


a. Piston can be easily removed by scraping carbon off top face of cylinder with a scraper.
b. Numbers are stamped on the connecting rod and cap corresponding to each cylinder. Care should be taken to avoid a wrong combination including bearing.

7. Crankshaft
(1) Remove oil seal retainer.



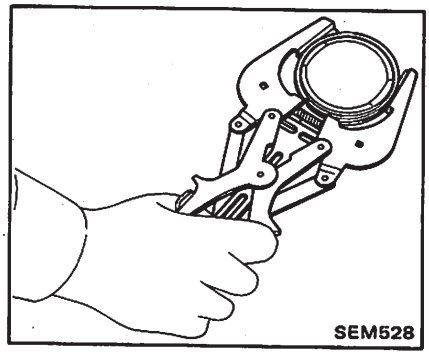
(2) Remove main bearing cap together with bearing.



(3) Remove crankshaft and bearings.

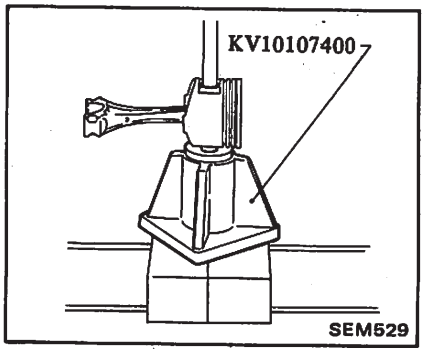
PISTON AND CONNECTING ROD

1. Remove piston rings.



Be careful not to scratch piston.

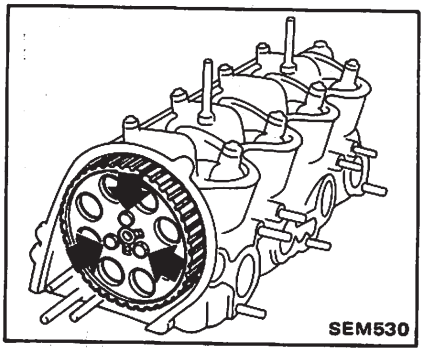
2. Press out piston pin.



Keep disassembled parts in order.

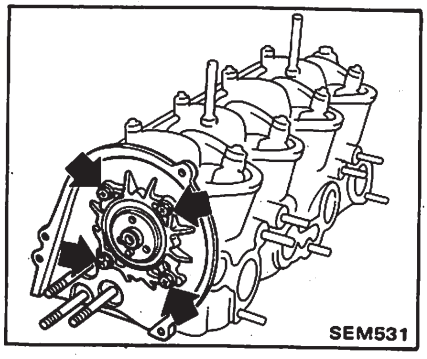
CYLINDER HEAD

1. Remove camshaft pulley.

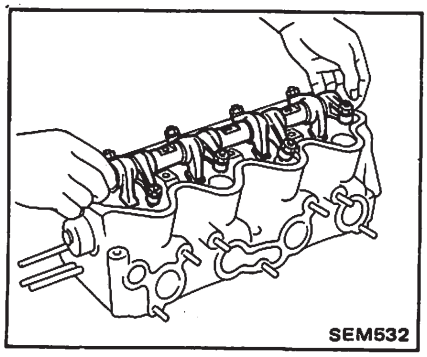


2. Remove cylinder head cover.

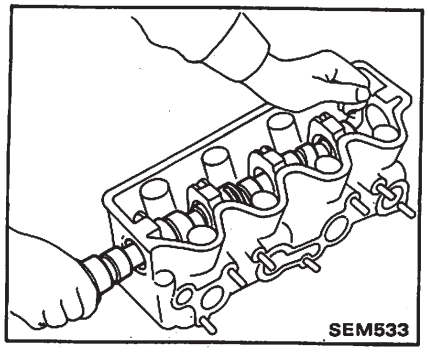
Be careful not to damage oil seal lip.



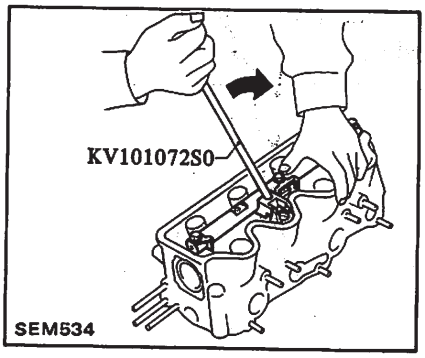
3. Remove rocker shaft assembly.



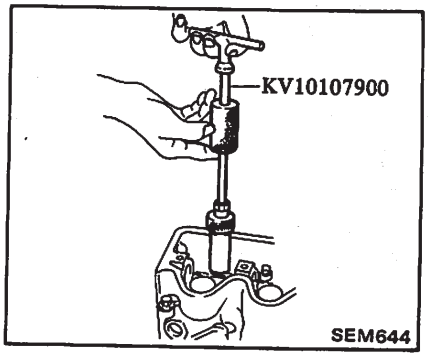
4. Take out camshaft.



5. Temporarily install rocker shaft and remove valve component parts.

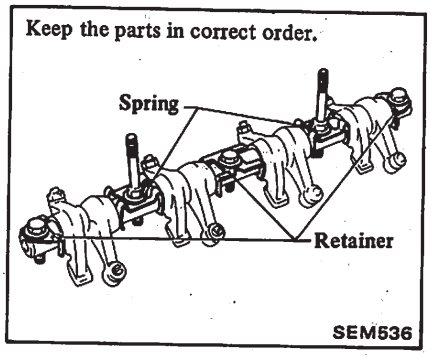


6. Remove valve oil seals.



ROCKER SHAFT ASSEMBLY

Remove rocker shaft springs and retainers.



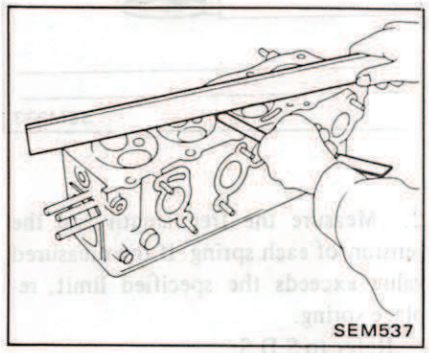
Keep them in correct order.

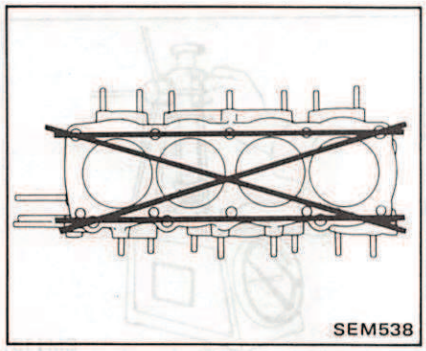
INSPECTION AND REPAIR

CYLINDER HEAD

CHECKING CYLINDER HEAD MATING FACE

1. Make a visual check for cracks and flaws.
2. Measure the surface of cylinder head (on cylinder block side) for warpage.


SEM537


SEM538

Warpage of surface:
Less than
0.1 mm (0.004 in)

If beyond the specified limit, correct with a surface grinder.

Surface grinding limit:
The grinding limit of cylinder head is determined by the cylinder block grinding in an engine.
Depth of cylinder head grinding is "A"
Depth of cylinder block grinding is "B"
The limit is as follows:
A + B = 0.2 mm (0.008 in)

VALVE GUIDE

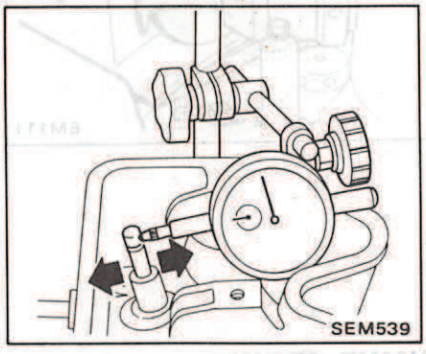
Measure the clearance between valve guide and valve stem. If the clearance exceeds the specified limit, replace the worn parts or both valve and valve guide. In this case, it is essential to determine if such a clearance has been caused by a worn or bend valve stem or by a worn valve guide.

Determining clearance

1. Precise method:
(1) Measure the diameter of valve stem with a micrometer in three places; top, center and bottom.
(2) Measure valve guide bore at center using telescope hole gauge.
(3) Subtract the highest reading of valve stem diameter from valve guide bore to obtain the stem to guide clearance.

Stem to guide clearance:
Maximum Limit
0.10 mm (0.0039 in)

2. Expedient method
Pry the valve in a lateral direction, and measure the deflection as stem tip with dial gauge.

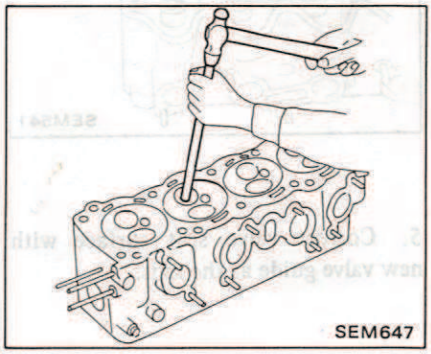

SEM539

Max. allowable deflection:
(Dial indicator reading)
0.2 mm (0.008 in)

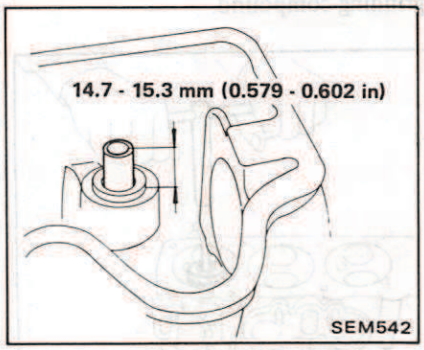
Valve should be moved in parallel with rocker arm. (Generally, a large amount of wear occurs in this direction.)

Replacement of valve guide

To remove old guides, use a press [under a 20 kN (2 t, 2.2 US ton, 2.0 Imp ton) pressure] or a hammer, and suitable tool.
1. Drive them out toward rocker cover side using suitable tool. Heating the cylinder head will facilitate the operation.


SEM647

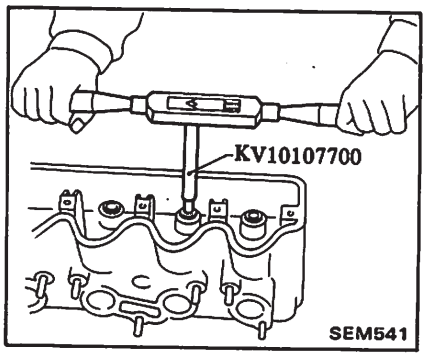
2. Ream cylinder head valve guide hole using Reamer ST11081000 [12.2 mm (0.480 in) dia.] at room temperature.
3. Install a service valve guide on cylinder head so that it protrudes about 15 mm (0.59 in) above the cylinder head surface. Heat cylinder head to 150 to 160°C (302 to 320°F) and press the guide onto cylinder head.



SEM542

4. Ream the bore using Tool KV10107700.

Reaming bore:
7.005 - 7.020 mm
(0.2758 - 0.2764 in)

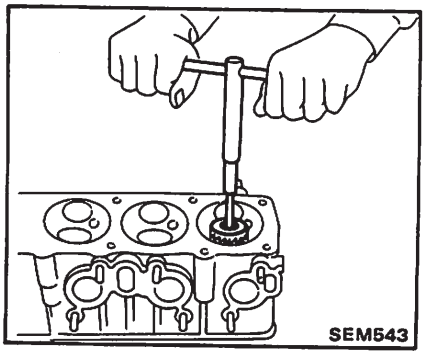


5. Correct valve seat surface with new valve guide as the axis.

VALVE SEAT INSERTS

Check valve seat inserts for any evidence of pitting at valve contact surface, and reseat or replace if worn out excessively.

Correct valve seat surface with suitable cutter or grinder and grind with a grinding compound.



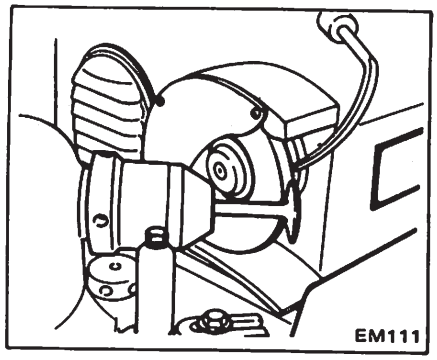
a. When repairing valve seat, check valve and valve guide for wear beforehand. If worn, replace them. Then correct valve seat.
b. The cutting should be done with both hands for uniform cutting.

VALVE

1. Check each of the intake and exhaust valves for worn, damaged or deformed valve head or stem. Correct or replace the valve that is faulty.
2. Valve face or valve stem end surface should be refaced by using a valve grinder.

When valve head has been worn down to 0.5 mm (0.020 in) in-margin-thickness, replace the valve.

Grinding allowance for valve stem end surface is 0.2 mm (0.008 in) or less.

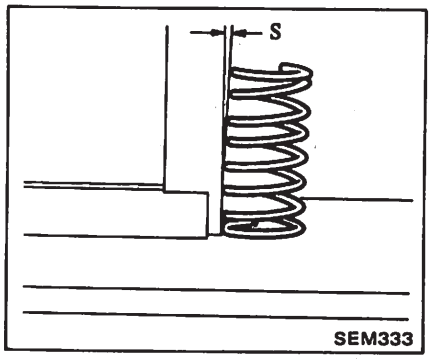


VALVE SPRING

1. Check valve spring for squareness using a steel square and surface plate.

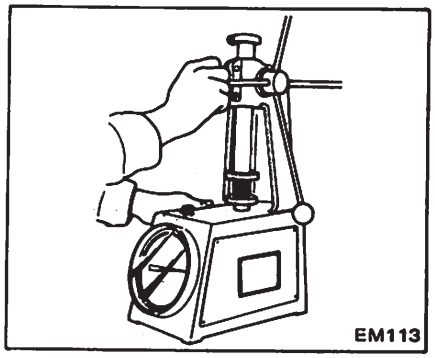
If spring is out of square "S" more than specified limit, replace with new ones.

Squareness limit:
2.0 mm (0.079 in)



2. Measure the free length and the tension of each spring. If the measured value exceeds the specified limit, replace spring.

Refer to S.D.S.



VALVE ROCKER ARM AND SHAFT

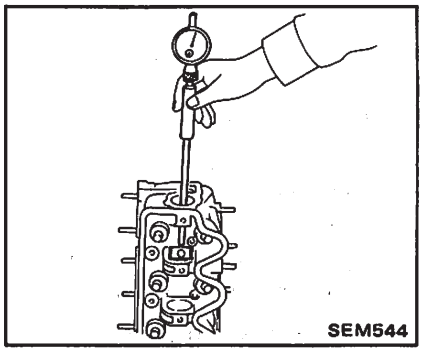
1. Check rocker arm bore and shaft for scores or scuffs.
2. Check valve end contact surface of rocker arm for abnormal wear or scuffs.

CAMSHAFT AND CAMSHAFT BEARING

CAMSHAFT BEARING CLEARANCE

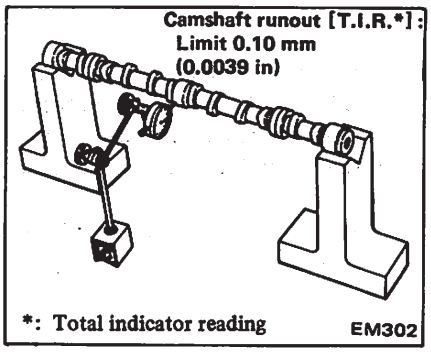
Measure the inside diameter of camshaft bearing with an inside dial gauge and the outside diameter of camshaft journal with a micrometer. If any malfunction is found, replace camshaft or cylinder head assembly.

Max. tolerance of camshaft bearing clearance:
No. 1, 3, 5
0.15 mm (0.0059 in)
No. 2, 4
0.20 mm (0.0079 in)



CAMSHAFT RUNOUT

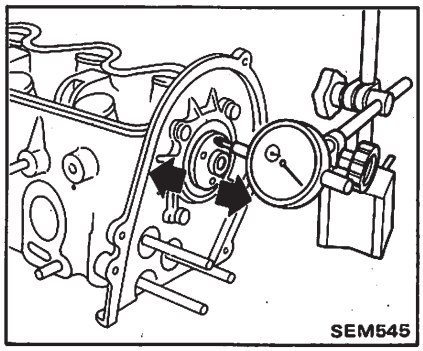
1. Check camshaft, camshaft journal and cam surface for bend, wear or damage. If beyond specified limits, replace them.
2. Camshaft can be checked for bend by placing it on V-blocks and using a dial gauge with its indicating finger resting on center journal.



3. Measure camshaft cam height. If beyond the specified limit, replace camshaft.

Wear limit of cam height:
0.20 mm (0.0079 in)

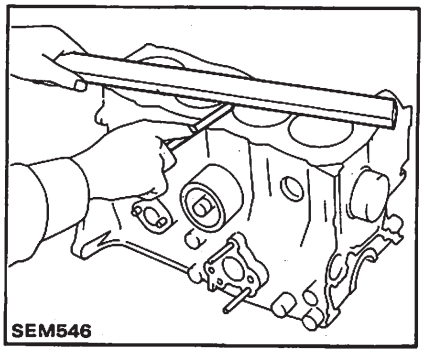
4. Measure camshaft end play. If beyond the specified limit, check camshaft contact surface part and replace faulty parts.

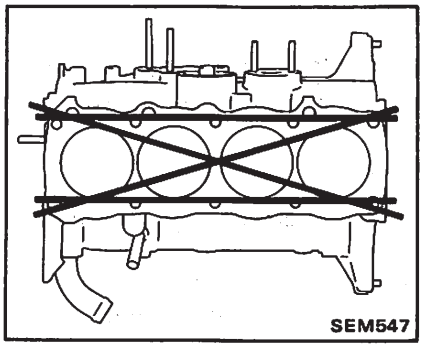


End play limit:
0.4 mm (0.016 in)

CYLINDER BLOCK

1. Visually check cylinder block for cracks or flaws.
2. Measure the top of cylinder block (cylinder head mating face) for warpage. If warpage exceeds the specified limit, correct with a grinder.





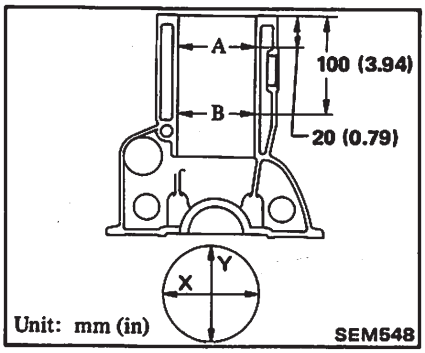
Warpage of surface:
Less than
0.1 mm (0.004 in)

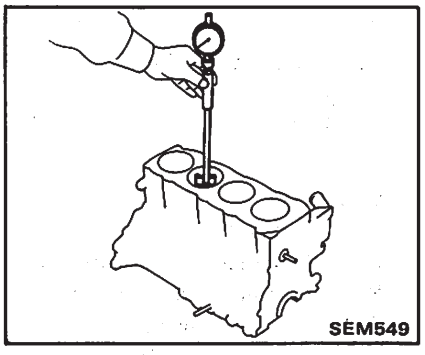
Surface grinding limit;
The grinding limit of cylinder block is determined by the cylinder head grinding in an engine.
Depth of cylinder head grinding is "A"
Depth of cylinder block grinding is "B"
The limit is as follows:
A + B = 0.2 mm (0.008 in)

3. Using a bore gauge, measure cylinder bore for wear, out-of-round or taper. If they are excessive, rebore the cylinder walls with a boring machine. Measurement should be taken along bores for taper and around bores for out-of-round.

Refer to S.D.S.

Out-of-round ..... **X-Y**
Taper ..... **A-B**





4. When wear, taper or out-of-round is minor and within the limit, remove the step at the topmost portion of cylinder using a ridge reamer or other similar tool.

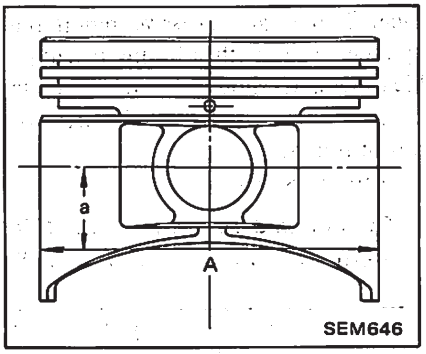
When installing service cylinder liner, interference fit of cylinder liner in cylinder block should be 0.080 to 0.090 mm (0.0031 to 0.0035 in).

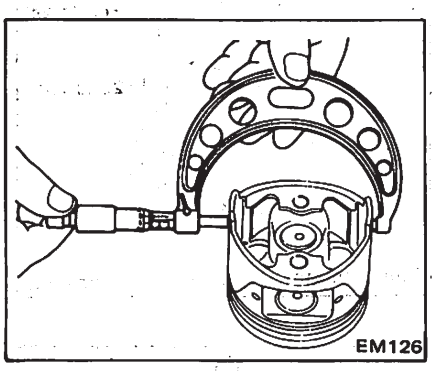
CYLINDER BORING

When any cylinder needs boring, all other cylinders must also be bored at the same time.

Determining bore size

1. Determine piston oversize according to amount of cylinder wear.
Refer to S.D.S.
2. The size to which cylinders must be honed is determined by adding piston-to-cylinder clearance to the piston skirt diameter.





Rebored size calculation
D = A + B – C = A + [0.005 to 0.025 mm (0.0002 to 0.0010 in)]

where,
- **D : Honed diameter**
- **A : Skirt diameter as measured**
- **B : Piston-to-wall clearance**
- **C : Honing allowance 0.02 mm (0.0008 in)**

Boring

1. Install main bearing caps in place, and tighten to the specified torque to prevent distortion of the cylinder bores in final assembly.
2. Cut cylinder bores.

- **Do not cut too much out of the cylinder bore at a time. Cut only 0.05 mm (0.0020 in) or so in diameter at a time.**
- **Bore the cylinders in the order of 2-4-1-3 to prevent heat strain due to cutting.**

3. Hone the cylinders to the required size referring to S.D.S.

- **Use clean sharp stones of proper grade.**
- **Cross-hatch pattern should be approximately 45°.**

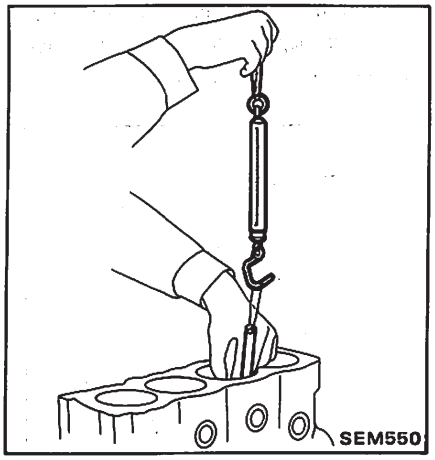
4. Measure the finished cylinder bore for out-of-round and taper.

Measuring piston-to-cylinder clearance

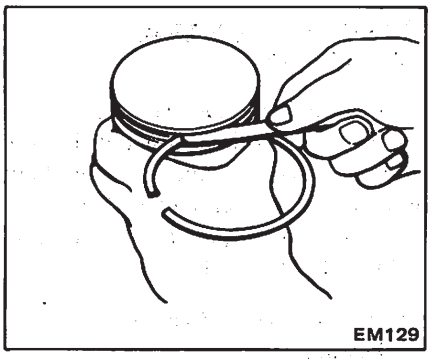
Measure the extracting force, and pull feeler gauge straight upward.

It is recommended that piston and cylinder be heated to 20°C (68°F).

Feeler gauge thickness:
0.04 mm (0.0016 in)
Extracting force:
4.9 - 14.7 N
(0.5 - 1.5 kg, 1.1 - 3.3 lb)



Max. tolerance of side clearance:
0.2 mm (0.008 in)



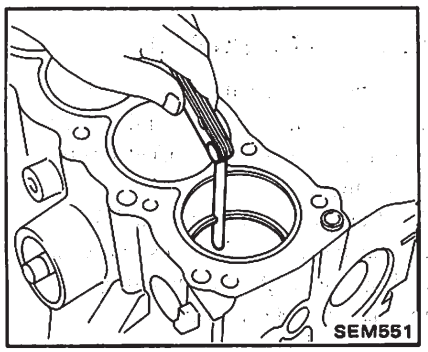
If side clearance exceeds the specified limit, replace piston together with piston ring.

PISTON RING

Measure ring gap with a feeler gauge, placing ring squarely in cylinder using piston.

Ring should be placed to diameter at upper or lower limit of ring travel.

Max. tolerance of ring gap:
1.0 mm (0.039 in)



- **a. When piston ring only is to be replaced, without cylinder bore being corrected, measure the gap at the bottom of cylinder where the wear is minor.**
- **b. Oversize piston rings are available for service.**

PISTON, PISTON PIN AND PISTON RING

PISTON

1. Scrape carbon off piston and ring grooves with a carbon scraper and a curved steel wire. Clean out oil slots in bottom land of oil ring groove.
2. Check for damage, scratches and wear. Replace if such a fault is detected.
3. Measure the side clearance of rings in ring grooves as each ring is installed.

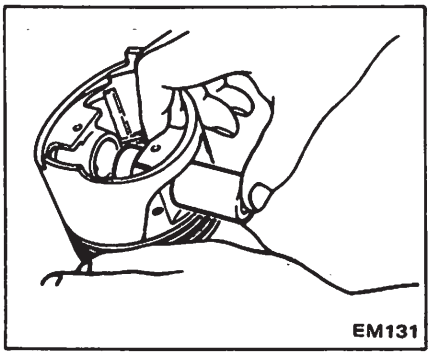
PISTON PIN

1. Check piston pin and piston pin hole for signs of sticking and other abnormalities.

2. Measure piston pin hole in relation to the outer diameter of pin. If wear exceeds the limit, replace such piston pin together with piston on which it is installed.

Piston pin to piston clearance:
0.008 - 0.012 mm
(0.0003 - 0.0005 in)

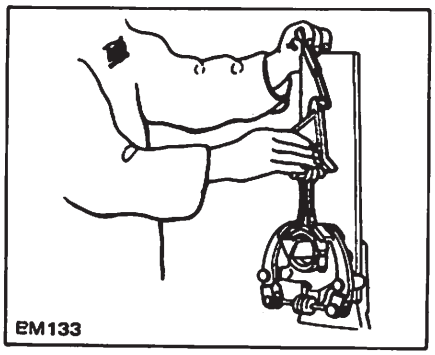
Determine the fitting of piston pin into piston pin hole to such an extent that it can be pressed smoothly by finger at room temperature.


EM131

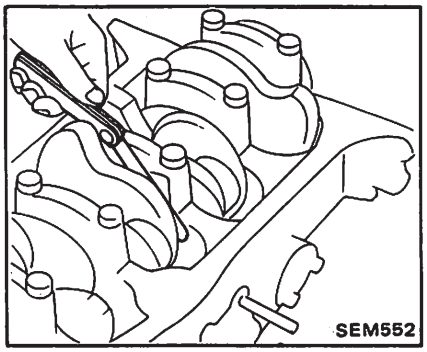
CONNECTING ROD

1. If a connecting rod has any flaw on both sides of the thrust face and the large end, correct or replace it.
2. Check connecting rod for bend or torsion using a connecting rod aligner. If bend or torsion exceeds the limit, correct or replace.

Bend and torsion
[per 100 mm (3.94 in) length]:
Less than
0.05 mm (0.0020 in)


EM133

3. Install connecting rods with bearings on to corresponding crank pins and measure the thrust clearance. If the measured value exceeds the limit, replace such connecting rod.


SEM552

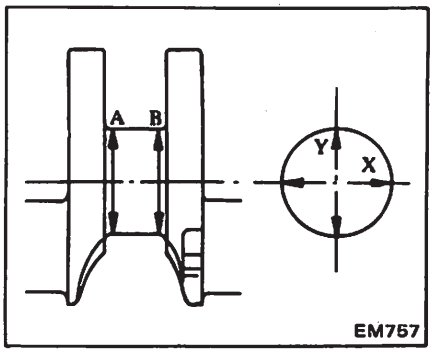
CRANKSHAFT

CRANK JOURNAL AND PIN

1. Repair or replace as required. If faults are minor, correct with fine crocus cloth.
2. Check journals and crank pins with a micrometer for taper and out-of-round. Measurement should be taken along journals for taper and around journals for out-of-round.

If out-of-round or taper exceeds the specified limit, replace or repair.

Out-of-round (X-Y) and
Taper (A-B):
Less than 0.01 mm (0.0004 in)

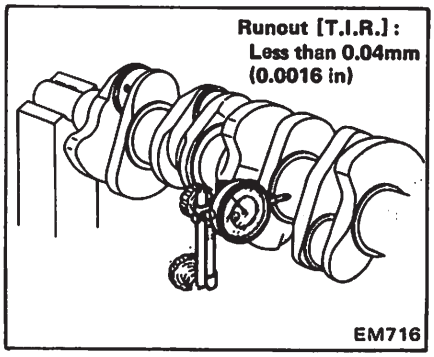


EM757

3. After regrinding crankshaft, finish it to the necessary size indicated in the chart under S.D.S. by using an adequate undersize bearing according to the extent of required repair.

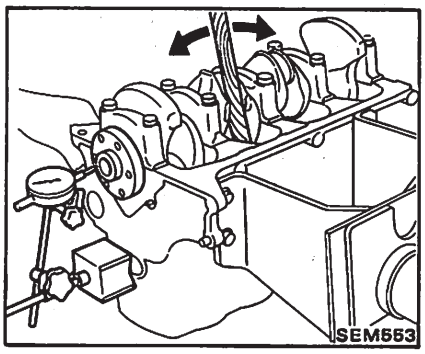
RUNOUT AND END PLAY

1. Crankshaft can be checked for runout by placing it on V-blocks and using a dial gauge with its indicating finger resting on the center journal.
Runout value is half of the gauge reading obtained when crankshaft is turned one full revolution.
If bend exceeds the specified limit, replace or repair.



EM716

2. Install crankshaft in cylinder block and measure cranksahft free end play at the center bearing.


SEM553

MAIN BEARING AND CONNECTING ROD BEARING

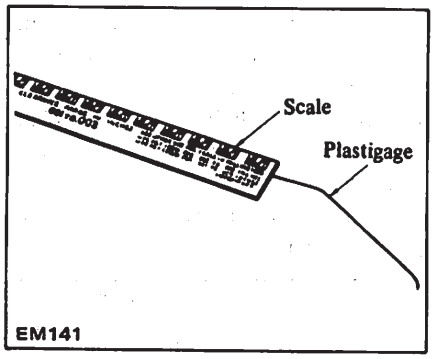
MAIN BEARING

1. Thoroughly clean all bearings and check for scratches, melt, score or wear.

Replace bearings, if any fault is detected.

2. Measure bearing clearance as follows:

(1) Cut a plastigage to the width of bearing and place it in parallel with crank journal, getting clear of the oil hole.



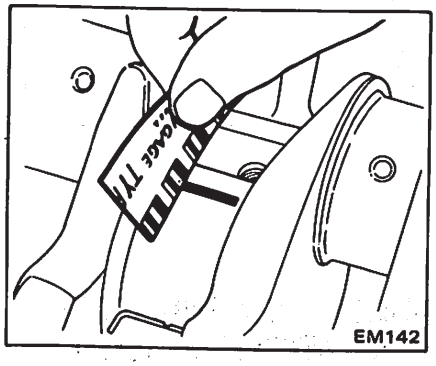
(2) Install crankshaft, bearings and bearing cap, with the bolts tightened to the specified torque.

Ⓣ : Main bearing cap
49 - 59 N·m
(5.0 - 6.0 kg-m,
36 - 43 ft-lb)

Do not turn crankshaft while the plastigage is being inserted.

(3) Remove cap, and compare width of the plastigage at its widest part with the scale printed in the plastigage envelope.

Max. tolerance of main bearing clearance:
0.10 mm (0.0039 in)



3. If clearance exceeds the specified value, replace bearing with an undersize bearing and grind crankshaft journal adequately.

Refer to S.D.S.

CONNECTING ROD BEARING

1. Measure connecting rod bearing clearance in the same manner as above.

Ⓣ : Connecting rod bearing cap
31 - 37 N·m
(3.2 - 3.8 kg-m,
23 - 27 ft-lb)
Max. tolerance of connecting rod bearing clearance:
0.10 mm (0.0039 in)

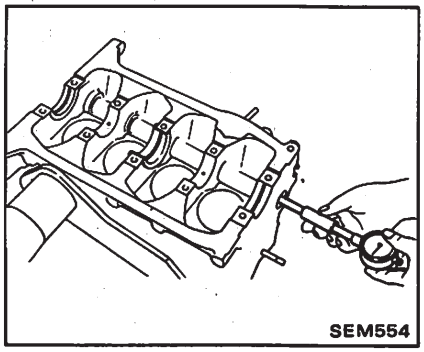
2. If clearance exceeds the specified value, replace bearing with an undersize bearing and grind the crankshaft journal adequately.

Refer to S.D.S.

JACK SHAFT AND JACK SHAFT BUSHING

JACK SHAFT BEARING CLEARANCE

Journal diameters should be checked with a micrometer, and bearings with an inside dial gauge. Measurements should then be compared to determine whether bearings are worn.

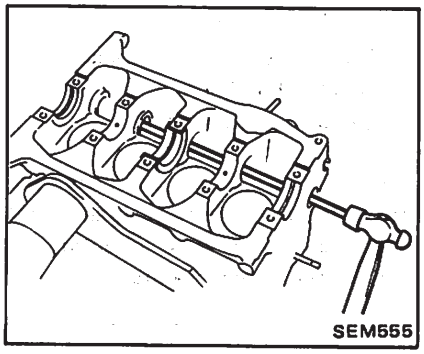


Max. tolerance of jack shaft bearing clearance:
0.15 mm (0.0059 in)

Replacing jack shaft bushing

1. Remove jack shaft bushings with suitable tool.
2. Install new bushings with suitable tool.

a. Align cylinder block oil hole and bushing oil hole.
b. Check bushing clearance.
c. Install welch plug into cylinder block, applying sealant.



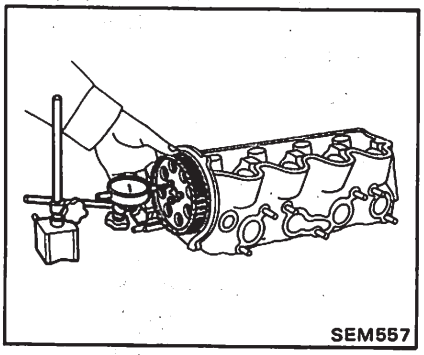
MISCELLANEOUS COMPONENTS

CAMSHAFT PULLEY

1. Check tooth surface for flaws or wear. Replace pulley if any fault is found.
2. Install camshaft pulley in position and check for runout.

If runout exceeds the specified limit, replace camshaft pulley.

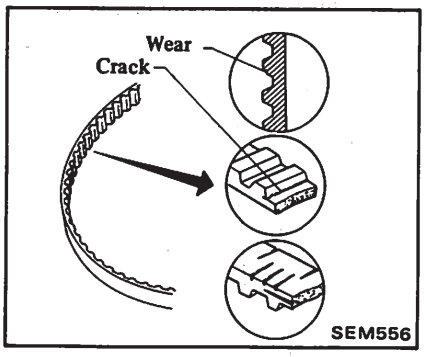
Runout:
(Total indicator reading)
Less than 0.1 mm (0.004 in)



TIMING BELT

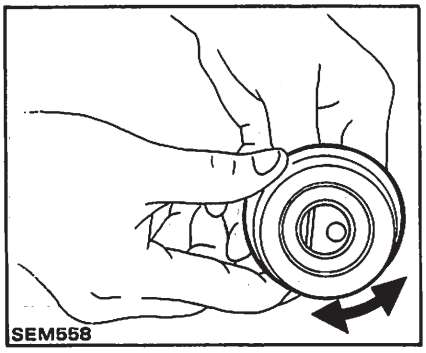
1. Check for oil or water. If soaked with oil or water, replace it.
2. Check for cracks and wear. If necessary, replace it.

3. If grooves of timing belt are damaged, replace it.



TENSIONER

1. Check to see that it turns smoothly. If it binds, replace assembly.



2. Check tensioner surface. If necessary, clean it.

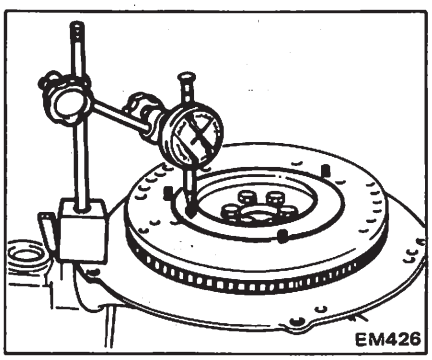
Do not use oil or grease.

3. Check for spring wear. If worn, replace it.

FLYWHEEL

1. Check the clutch disc contact surface on flywheel for damage or wear. Repair or replace if necessary.
2. Measure runout of the clutch disc contact surface with a dial gauge. If it exceeds the specified limit, replace it.

Runout:
(Total indicator reading)
Less than 0.15 mm (0.0059 in)



3. Check tooth surfaces of ring gear for flaws or wear.

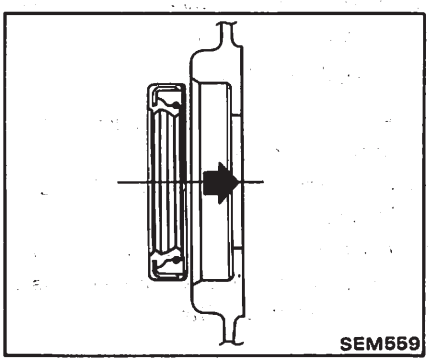
Replace if necessary.

Install ring gear on fly wheel, heating ring gear to about 180 to 220°C (356 to 428°F)

OIL SEAL

Check front, and rear oil seals for worn or folded over sealing lip and oil leakage. If necessary, replace with a new seal. When installing a new front or rear seal, pay attention to its mounting direction.

It is good practice to renew oil seal whenever engine is overhauled.



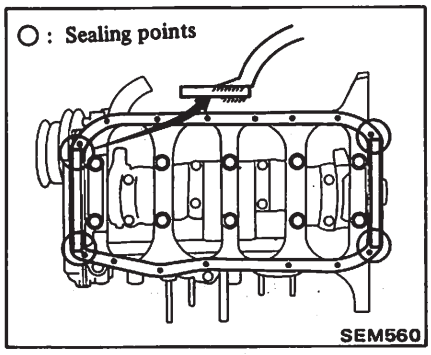
ENGINE ASSEMBLY

PRECAUTIONS

1. When installing sliding parts such as bearings, be sure to apply engine oil on the sliding surfaces.
2. Use new packings and oil seals.
3. Be sure to follow the specified order and tightening torque.
4. Applying sealant

Use sealant to eliminate water and oil leaks. **Do not apply too much sealant. Part requiring sealant is:**

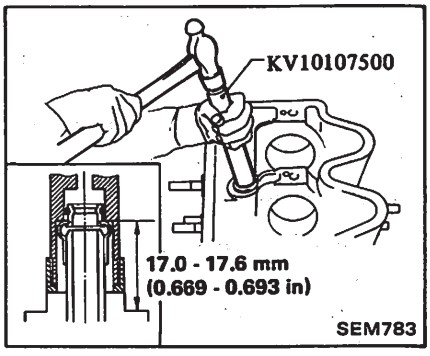
Mating surface of oil pan gasket and oil seals.



CYLINDER HEAD

CYLINDER HEAD

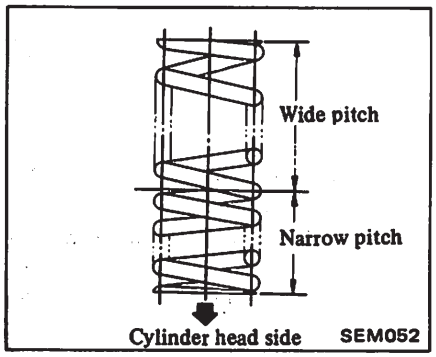
1. Install valve oil seal.



2. Install valve component parts.

a. When installing valve, apply engine oil to the valve stem and lip of valve oil seal.

b. Install valve spring (uneven pitch type) with its narrow pitch side toward cylinder head side.



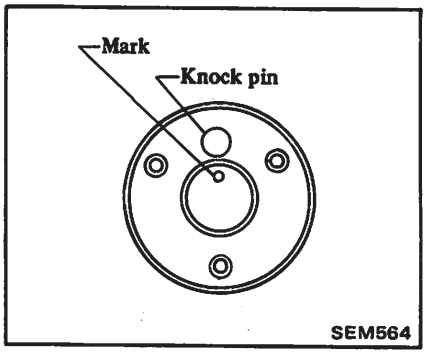
c. Make sure the valve face is free from foreign matter.

3. Install camshaft assembly.

a. Apply engine oil to camshaft and bearing interior.

b. Be careful not to damage the bearing interior.

c. When No. 1 cylinder is set at its compression stroke, the camshaft front face is as follows.



4. Install valve rocker shaft assembly.

5. Install cylinder head cover.

a. Be careful not to damage oil seal lip.

b. Apply engine oil to camshaft surface and oil seal lip.

6. Install camshaft pulley.

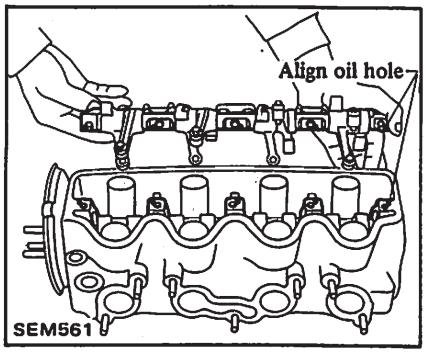
Ⓣ : Camshaft pulley bolt
6 - 8 N·m
(0.6 - 0.8 kg-m,
4.3 - 5.8 ft-lb)

ROCKER SHAFT

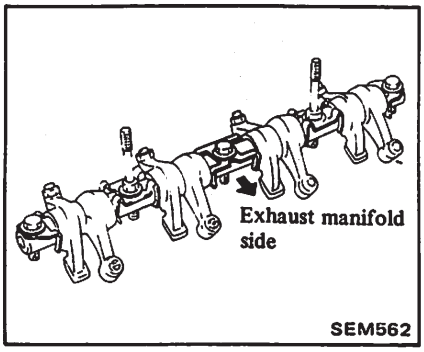
Assemble rocker shaft in the reverse order of removal, noting the following:

1. Apply engine oil to rocker shaft and interior of valve rocker.

2. Ensure that oil hole in rocker shaft faces downward when rocker shaft is installed.



3. Also ensure that cutout in center retainer of rocker shaft faces toward exhaust manifold.



Ⓣ : Rocker shaft bolt
16 - 21 N·m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)

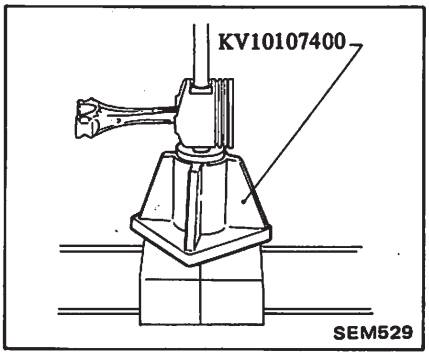
PISTON AND CONNECTING ROD

1. Assemble pistons, piston pins and connecting rods of the designated cylinders.

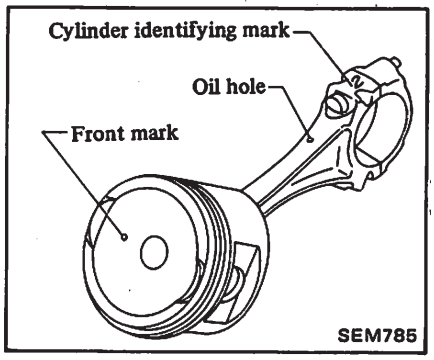
a. Piston pin is pressed into connecting rod, and fitting force should be within the specified limit.

Piston pin fitting force:
4.9 - 14.7 kN
(0.5 - 1.5 t, 0.6 - 1.7 US ton,
0.49 - 1.48 Imp ton)

When pressing piston pin in connecting rod, apply engine oil to pin and small end of connecting rod.



b. Arrange so that oil hole of connecting rod big end is directed toward the right side of cylinder block.

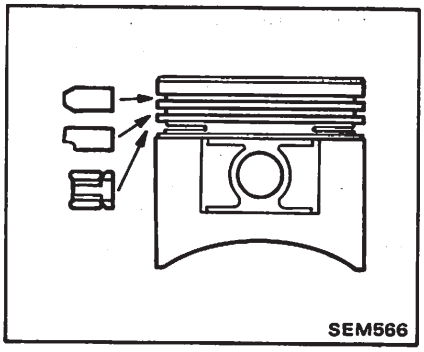


c. Connecting rods are marked at side of big end for identifying the designated cylinder.

d. Connecting rod with same weight tolerance is available only as a set of four.

2. Install piston rings.

Install so that stamped mark on ring faces upward.



ENGINE OVERALL

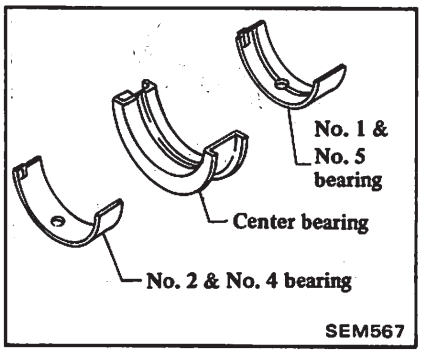
INTERNAL PARTS

First, mount cylinder block on engine stand (refer to Engine Disassembly).

1. Crankshaft

(1) Set upper main bearings at the proper portion of cylinder block.

a. Only center bearing (No. 3) is a flange type.
b. Front bearing (No. 1) is also the same type as rear bearing (No. 5).
c. Other inter bearings, except center bearing, are the same type.

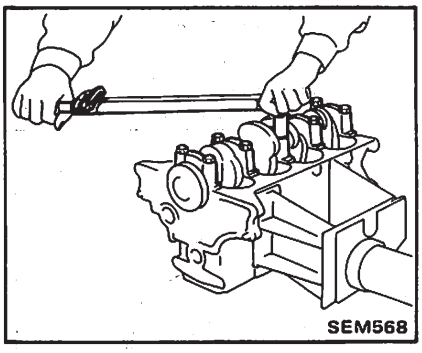


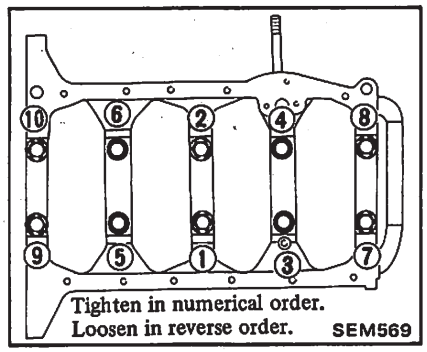
(2) Apply engine oil to main bearing surfaces on both sides of cylinder block and cap.

(3) Install crankshaft.

(4) Install main bearing cap and tighten bolts to specified torque.

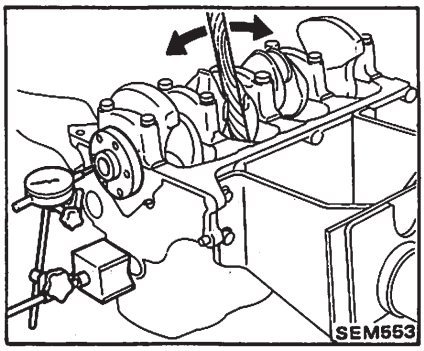
Ⓣ : Main bearing cap bolts
49 - 59 N·m
(5.0 - 6.0 kg-m,
36 - 43 ft-lb)



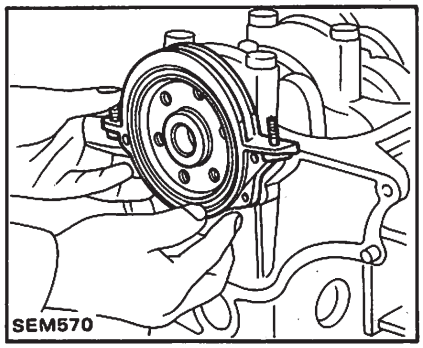


a. Arrange the parts so that the figure on bearing cap faces toward the water pump.
b. Prior to tightening bearing cap bolts, place bearing cap in proper position by shifting crankshaft in the axial direction.
c. Tighten bearing cap bolts gradually in separating two to three stages and in sequence outwardly from center bearing.
d. After securing bearing cap bolts, ascertain that crankshaft turns smoothly by hand.

(5) Make sure that there exists proper end play at crankshaft.



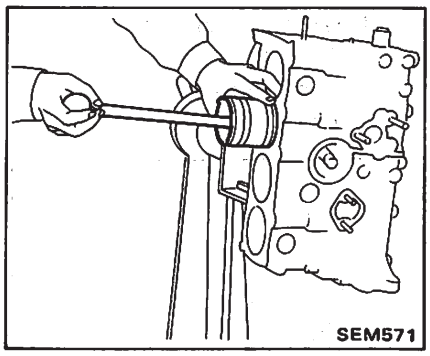
(6) Install oil seal retainer.



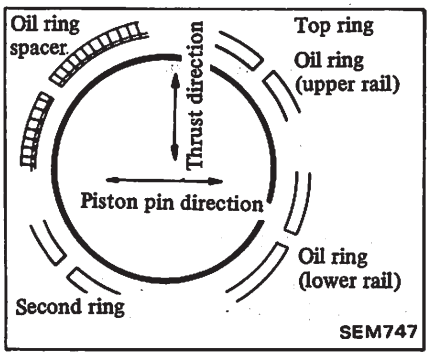
a. When installing oil seal retainer, give coating of engine oil to mating shaft to prevent scratches and folded lip. Also apply coating of oil to periphery of oil seal.
b. Install oil seal in the direction that dust seal lip faces to the outside of crankcase.

2. Piston with connecting rod.

(1) Install them into corresponding cylinders.

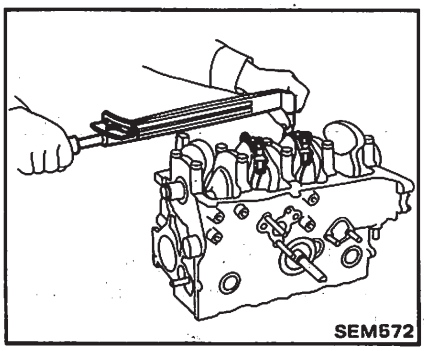


a. Apply engine oil to sliding parts.
b. Arrange so that the front mark on piston head faces to the front of engine.
c. Set piston rings as shown below.



(2) Install connecting rod caps.

Ⓣ : Connecting rod cap nuts
31 - 37 N·m
(3.2 - 3.8 kg-m,
23 - 27 ft-lb)

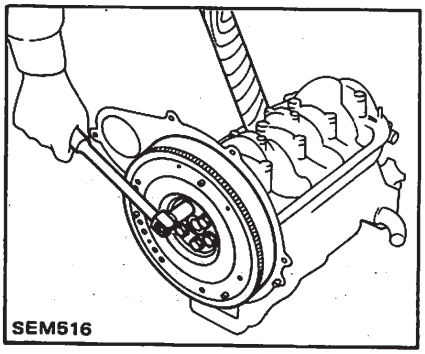


Arrange connecting rods and connecting rod caps so that the cylinder numbers face in the same direction.

(3) Make sure that there exists proper end play at connecting rod big end. Refer to Inspection and Repair.

3. Rear plate and flywheel or drive plate.

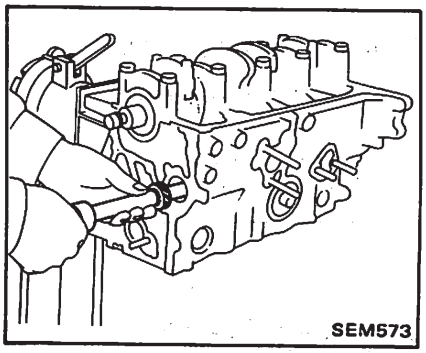
Ⓣ : **Flywheel fixing bolts**
78 - 88 N·m
(8.0 - 9.0 kg-m,
58 - 65 ft-lb)
Drive plate fixing bolts
93 - 103 N·m
(9.5 - 10.5 kg-m,
69 - 76 ft-lb)


SEM516

Do not lock at ring gear.

4. Install jack shaft.

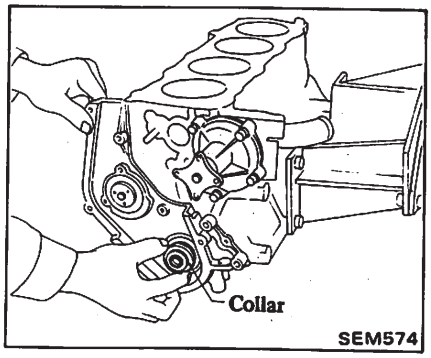
Be careful not to damage the inner surface of jack shaft bushing.


SEM573

5. Install jack shaft locating plate.
6. Install water pump assembly with new gasket.

7. Install crank oil thrower, then install cylinder block cover together with oil seal collar.

Be careful not to damage the oil seal lip.



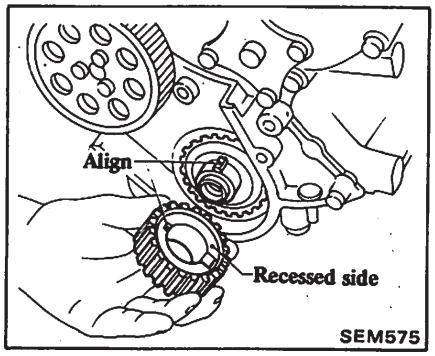
SEM574

8. Install jack shaft pulley.

Tighten jack shaft pulley bolt by holding pulley with hand.

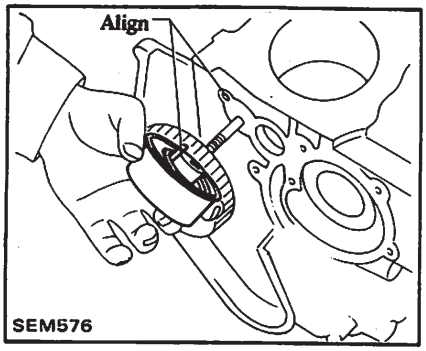
Ⓣ : **Jack shaft pulley fixing bolt**
6 - 8 N·m
(0.6 - 0.8 kg-m,
4.3 - 5.8 ft-lb)

9. Install crankshaft timing pulley.



SEM575

10. Temporarily install tensioner.



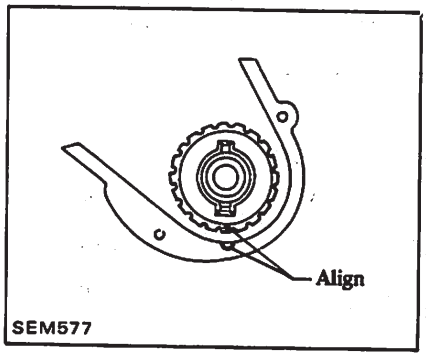
SEM576

11. Cylinder head assembly. Install it through gasket by accommodating knock pin of cylinder block as follows:

(1) Thoroughly clean cylinder block and head surface.

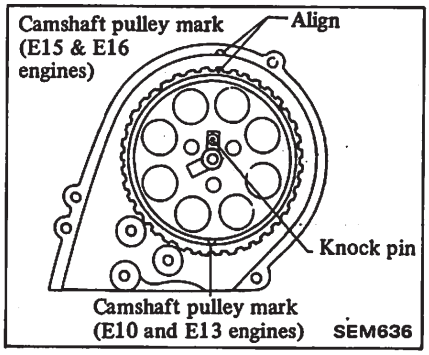
Do not apply sealant to any other part of cylinder block and head surface.

(2) Turn crankshaft and set No. 1 cylinder at top dead center on its compression stroke. This causes crankshaft timing pulley mark to be aligned with cylinder block cover mark.

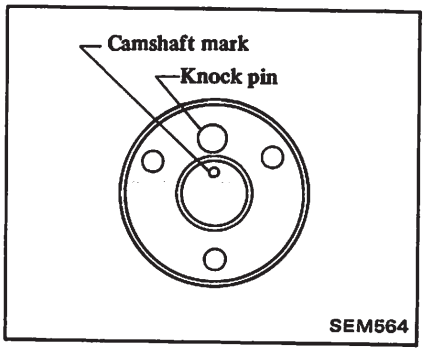


SEM577

(3) Align camshaft pulley mark with cylinder head cover mark. This causes valves for No. 1 cylinder to position at top dead center on compression stroke.



SEM636

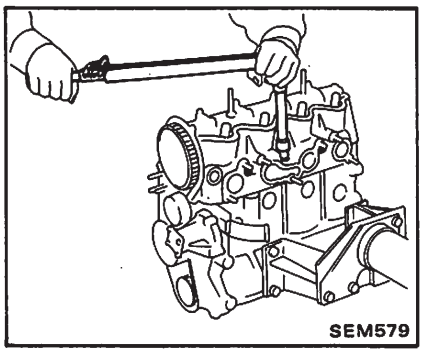


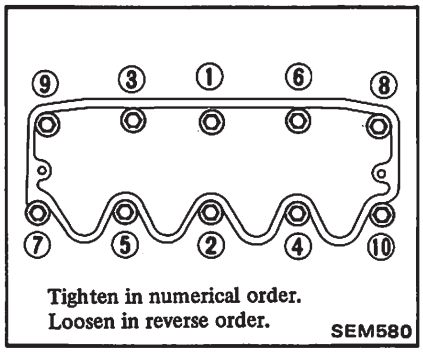
SEM564

(4) Install cylinder gasket and cylinder head assembly.
(5) Tighten cylinder head bolts.

Ⓣ : **Cylinder head bolt**
1st
39 - 44 N·m
(4.0 - 4.5 kg-m,
29 - 33 ft-lb)
2nd
69 - 74 N·m
(7.0 - 7.5 kg-m,
51 - 54 ft-lb)

Retighten head bolts after engine has been warmed up.


SEM579



Tighten in numerical order.
Loosen in reverse order.
SEM580

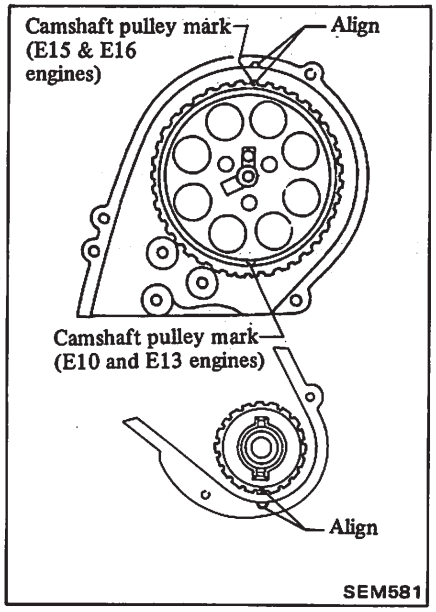
a. Do not rotate crankshaft and camshaft separately, because valves will hit piston heads.
b. Always use new cylinder head gasket.
c. There are three kinds of cylinder head bolts with different lengths.

(6) Install spark plugs.

Ⓣ : **15 - 20 N·m**
(1.5 - 2.0 kg-m,
11 - 14 ft-lb)

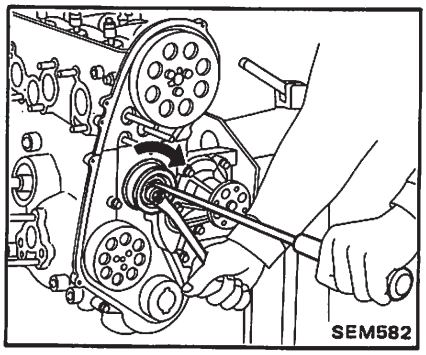
TIMING BELT

1. Ensure that marks on camshaft pulley and cylinder head cover and marks on crankshaft timing pulley and cylinder block cover are properly aligned.



SEM581

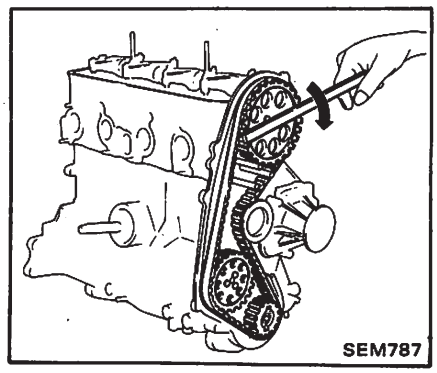
2. Rotate tensioner clockwise about 70 to 80° and temporarily tighten lock nut.


SEM582

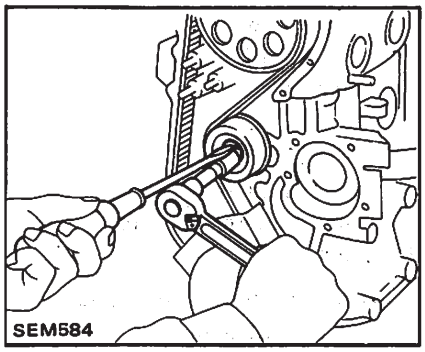
3. Place timing belt on pulleys.

a. When using used belt, be sure to install it with rotating direction mark facing engine rotating direction.
b. Ensure that belt is not loose around jack shaft and camshaft pulleys.

4. Loosen tensioner lock nut so that tensioner pushes on timing belt.
5. Turn camshaft pulley about 20° (2 cogs) clockwise.


SEM787

6. Tighten nut while preventing tensioner from turning in "free" direction.


SEM584

Ⓣ : **Tensioner lock nut**
16 - 21 N·m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)

FRONT SIDE PARTS

1. Install water pump pulley.
2. Install spacer and upper and lower dust cover.
3. Install crankshaft pulley.

Ⓣ : **Crankshaft pulley bolt**
113 - 147 N·m
(11.5 - 15.0 kg-m,
83 - 108 ft-lb)

LEFT SIDE PARTS

1. Install exhaust manifold.

Ⓣ : **Exhaust manifold fixing nut**
16 - 21 N·m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)

2. Install cooler compressor bracket and power steering bracket.

RIGHT SIDE PARTS

1. Install oil pump assembly with new gasket.

Ⓣ : **Oil pump bolt & nuts**
9.1 - 11.8 N·m
(0.93 - 1.2 kg-m,
6.7 - 8.7 ft-lb)

2. Install fuel pump assembly with insulator.

Ⓣ : **Fuel pump nuts**
9.1 - 11.8 N·m
(0.93 - 1.2 kg-m,
6.7 - 8.7 ft-lb)

Always replace gaskets.

3. Install oil filter.
4. Install alternator bracket and alternator.

Ⓣ : **Alternator bracket fixing bolt**
9.1 - 11.8 N·m
(0.93 - 1.2 kg-m,
6.7 - 8.7 ft-lb)

Alternator to bracket bolt
43 - 58 N·m
4.4 - 5.9 kg-m,
32 - 43 ft-lb)

5. Install intake manifold with carburetor.

Ⓣ : **Intake manifold fixing nuts**
16 - 21 N·m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)

REAR SIDE PARTS

1. Install thermostat housing with distributor.

Ⓣ : **Thermostat housing fixing bolt**
3.7 - 5.0 N·m
(0.38 - 0.51 kg-m,
2.7 - 3.7 ft-lb)

2. Install clutch unit using Tool KV30100900.

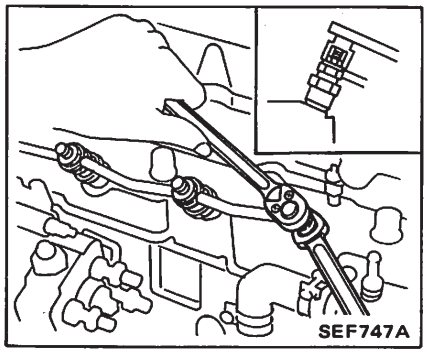
Ⓣ : **Clutch unit fixing bolt**
7 - 10 N·m
(0.7 - 1.0 kg-m,
5.1 - 7.2 ft-lb)

ENGINE SERVICE (On vehicle)

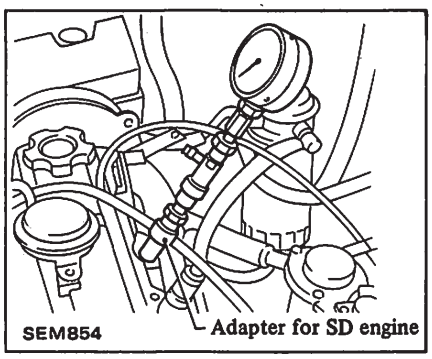
COMPRESSION PRESSURE

1. Warm up engine sufficiently.
2. Remove spill tube assembly.

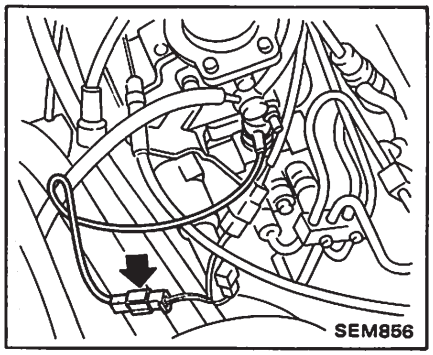
To prevent spill tube from breaking, remove it by gripping nozzle holder.



3. Remove injection nozzles and nozzle gaskets.
4. Fit compression gauge adapter to cylinder head.



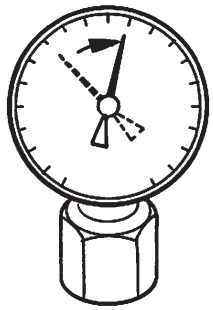
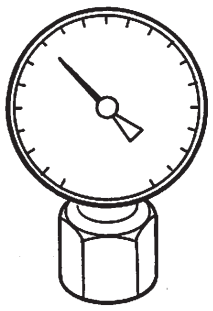
5. Disconnect fuel cut solenoid wire.



6. Crank engine and read gauge indication.

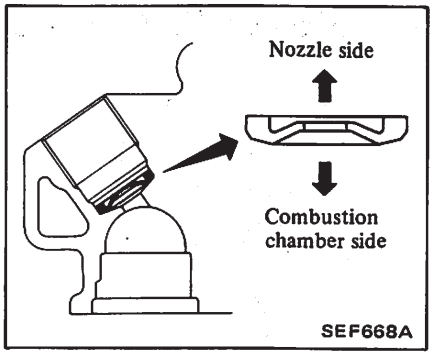
Crank speed:
200 rpm
Compression pressure:
Standard
2,942 - 3,236 kPa
(30 - 33 kg/cm^2, 427 - 469 psi)
Limit
1,961 kPa
(20 kg/cm^2, 284 psi)
Differential limit between cylinders:
490 kPa
(5 kg/cm^2, 71 psi)

7. If the pressure is low, pour about 3 mℓ (0.10 US fl oz, 0.11 Imp fl oz) of engine oil into cylinders through the nozzle hole and test again.

Gauge indication	Condition	Trouble points
 SEM857	Increased reading	• Piston rings are worn or damaged.
 SEM858	Same reading maintained	• Two adjacent cylinders are low, gasket is damaged. • Valve is sticking. • Valve seat or valve contact surface is incorrected.

8. Install nozzle gaskets and injection nozzles.

New nozzle gasket installation direction is as follows:

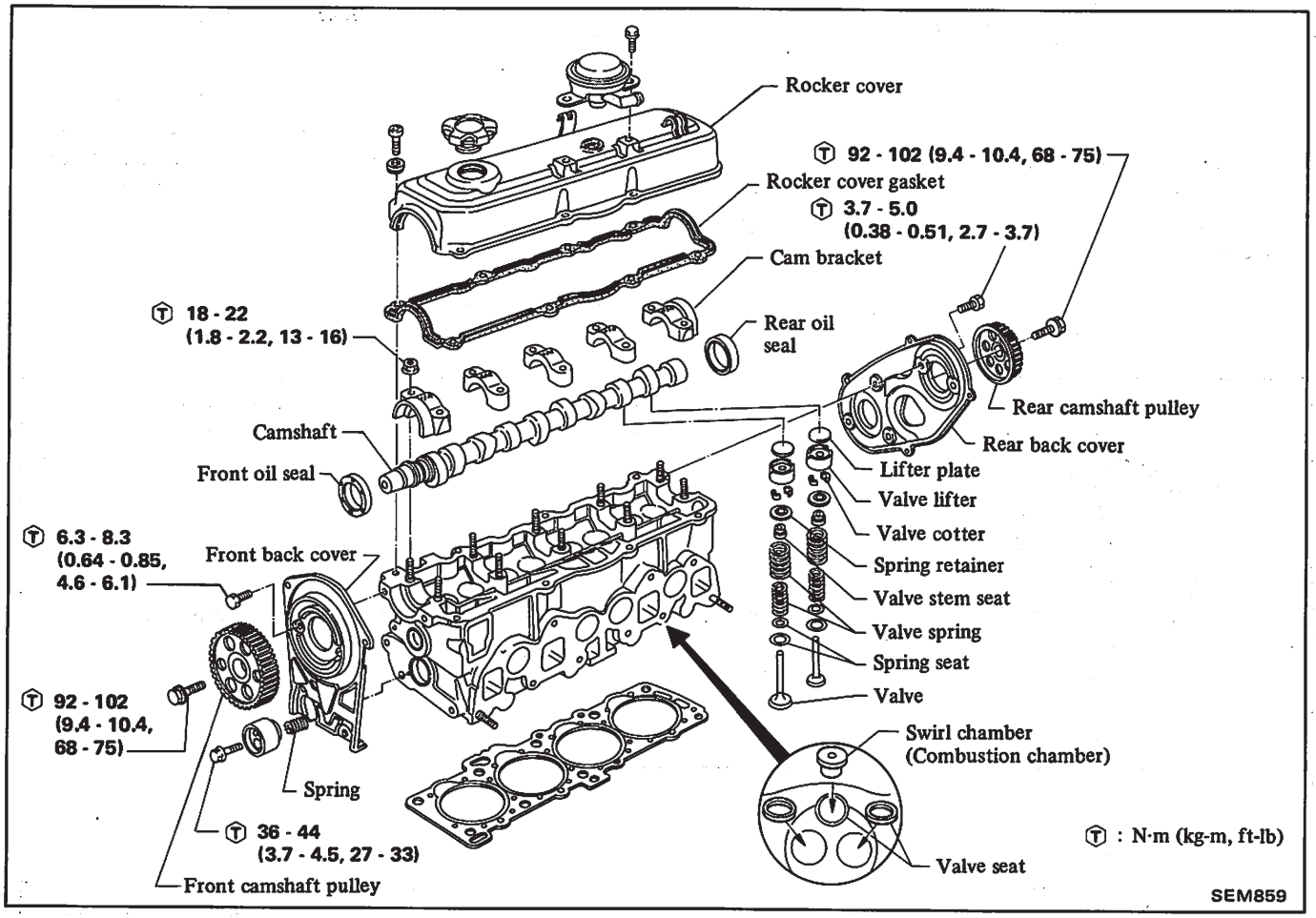


Ⓣ : Nozzle to cylinder head
59 - 69 N·m
(6.0 - 7.0 kg-m,
43 - 51 ft-lb)

9. Install spill tube by holding nozzle holder.

Ⓣ : Spill tube nut
39 - 49 N·m,
(4 - 5 kg-m,
29 - 36 ft-lb)

CYLINDER HEAD



REMOVAL

1. Drain coolant and disconnect water hose.
2. Disconnect exhaust tube.
3. Set No. 1 cylinder at Top Dead Center on its compression stroke.
4. Remove valve timing belt on camshaft pulley side.
5. Remove injection timing belt.

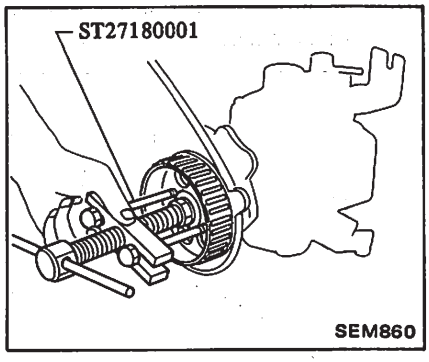
Refer to section MA for timing belt replacement.

Refer to section EM for timing belt inspection.

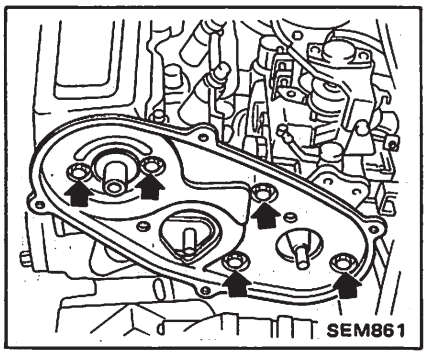
a. Ensure timing belt is clean and free from oil or water when installing it. Do not bend it.

b. Timing belt removed from camshaft pulley should not be rotated from the removed position.

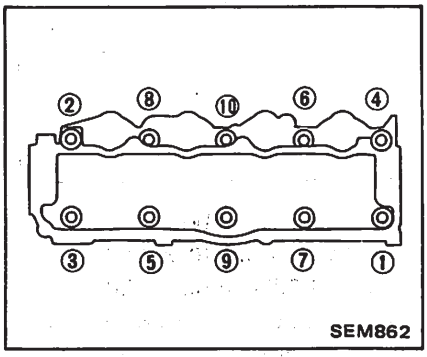
6. Loosen pump pulley nut and remove the pulley.



7. Remove back cover.



8. Remove all injection tubes.
9. Remove cylinder head.

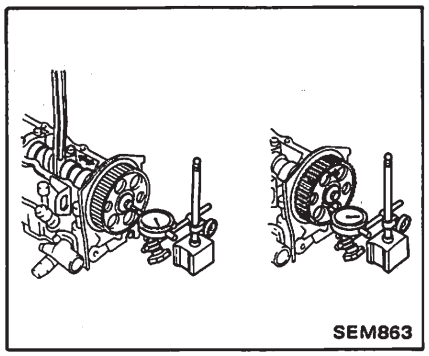


DISASSEMBLY

1. Measure camshaft end play and camshaft pulley runout.

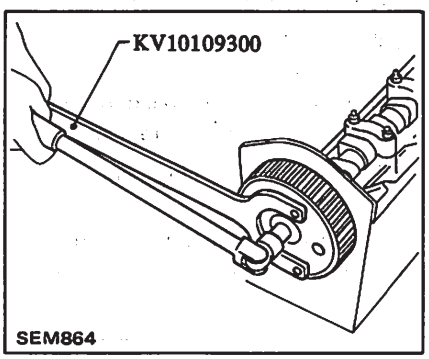
If the end play is not within specifications, replace camshaft or bracket caps.

If the runout is not within specifications, replace camshaft pulley.

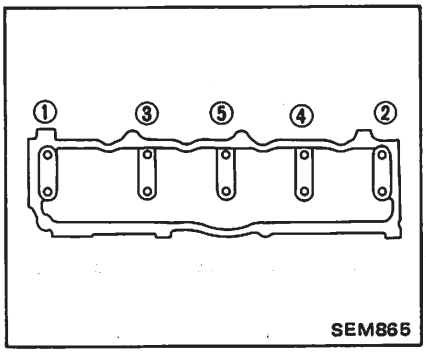


End play limit:
0.17 mm (0.0067 in)
Runout limit:
0.1 mm (0.004 in)

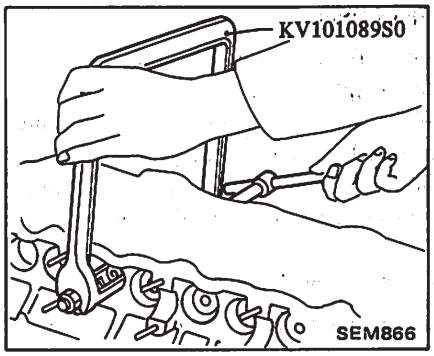
2. Remove intake and exhaust manifold.
3. Remove camshaft pulleys.



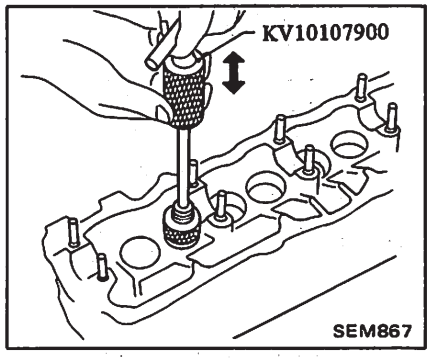
4. Remove camshaft bracket caps.



5. Remove camshaft and oil seals.
6. Take out valve lifter together with lifter plate.
7. Remove valve retaining parts, valve spring and valves.



8. Remove valve lip seals.



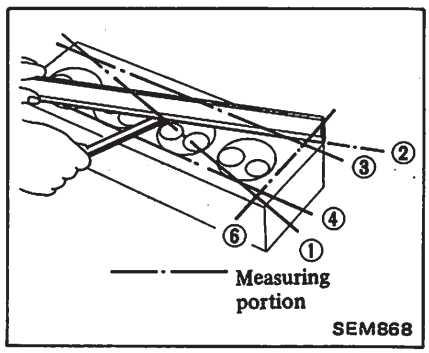
INSPECTION AND REPAIR

Mating face

1. Make a visual check for cracks and flaws.
2. Measure the surface of cylinder head (on cylinder block side) for warpage.

If beyond the specified limit, correct with a surface plate and grinding compound.

Warpage:
Limit 0.1 mm (0.004 in)



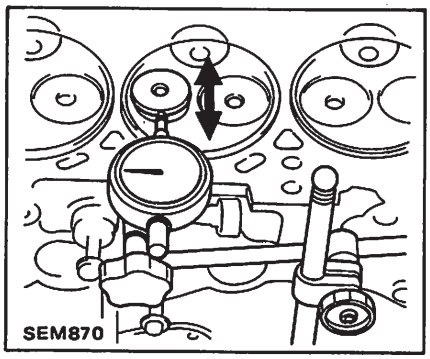
Correct amount limit (Including cylinder block side correct amount):
0.1 mm (0.004 in)

Valve guide

Insert the valve stem and move it back, forth and slide it.
If valve stem makes a clatter and moves back and forth excessively out of line, or if it does not slide well, replace valve or valve guide, or both.

Determining clearance

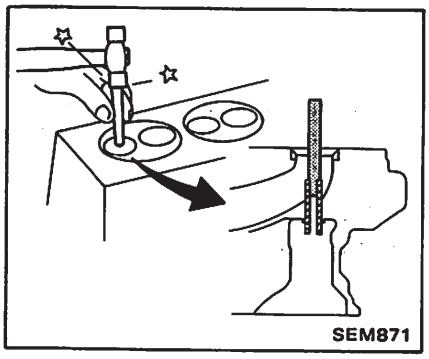
1. Install valve into the valve guide.
2. Measure the deflection.



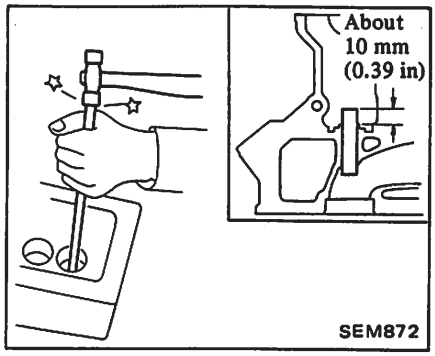
Stem to guide clearance limit:
0.1 mm (0.004 in)

Replacing valve guide

1. Heat cylinder head 150 to 160°C (302 to 320°F) in oil.
2. Remove the guide with suitable tool.



3. Drive in the new guide until it projects out 10 mm (0.39 in)



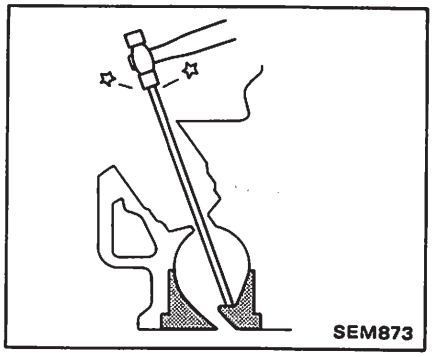
4. Ream the bore using suitable tool.

Reaming bore:
7.000 - 7.015 mm
(0.2756 - 0.2762 in)

Combustion chamber replacement

Usually combustion chamber should not be removed.
However, if there are cracks or extensive damage, it should be replaced.

1. Remove glow plug connecting plate and glow plugs.
2. Remove combustion chamber so that cylinder head will not be damaged.

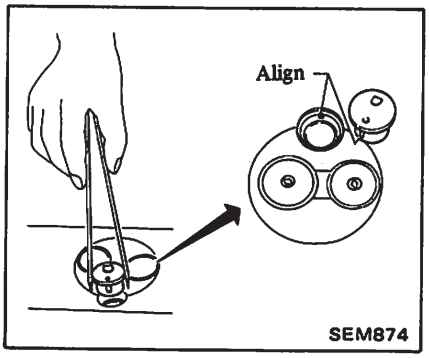


Be careful not to scratch inside of nozzle hole.

3. Install combustion chamber.
(1) Cool combustion chamber with dry ice for approximately 5 to 10 minutes.

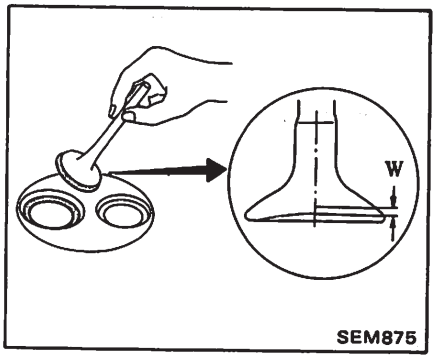
WARNING:
Do not touch cooled combustion chamber with bare hands.

(2) Align combustion chamber knock pin with cylinder head notch, and install it into cylinder head using a plastic-tip hammer.



Valve seat inserts

1. Check valve and valve seat inserts for contact.
Coat the valve face with prussian red lead. If contact is wrong, correct valve seat. If the valve red lead appears 360° around face, the valve stem and face are concentric. If not, repair or replace valve.



Valve seat contact W:
Intake 1.7 mm (0.067 in)
Exhaust 1.8 mm (0.071 in)

2. Check valve seat inserts for any evidence of pitting on valve contact surface, and reseat or replace if worn out excessively.
Correct valve seat surface.

When repairing valve seat, check valve and valve guide for wear beforehand. If worn, replace them. Then correct valve seat.

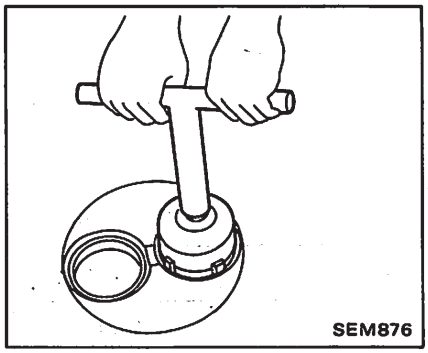
Replacement

1. Old insert can be removed by boring it out until it collapses. The machine depth stop should be set so that boring cannot continue beyond the bottom face of the insert recess in the cylinder head.
2. Select a suitable valve seat insert and check its outside diameter.
3. Machine the cylinder head recess in concentric circles which center on the valve guide.
4. Ream the cylinder head recess at room temperature.
5. Cool valve seat with dry ice for approximately 5 to 10 minutes.
6. Fit insert, ensuring that it bends on the bottom face of its recess, and caulk more than 4 points.

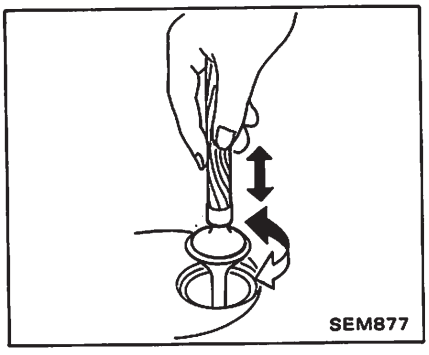
Resurfacing

1. Resurface the valve seat. Refer to S.D.S.

The cutting should be done with both hands for uniform cutting.

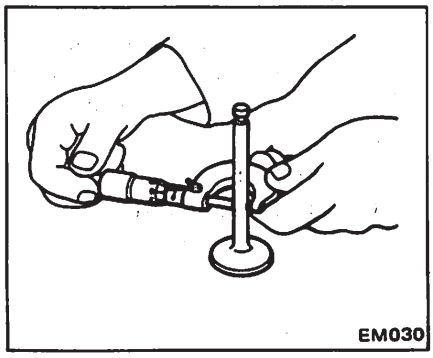


2. Apply small amount of fine grinding compound to valve contacting face and put valve into guide.
Lap valve against its seat until proper valve seating is obtained. Remove valve and then clean valve and valve seat.



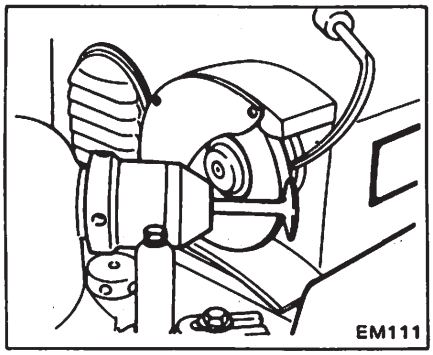
Valve

1. Check valve head diameter, stem diameter and seat angle. Repair or replace foulty parts.



2. Check each of the intake and exhaust valves for worn, damaged or deformed valve head or stem.
Correct or replace any valve that is faulty.
3. Valve face or valve stem end surface should be refaced by using a valve grinder.

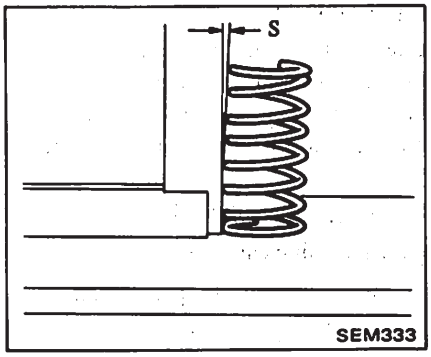
When valve head has been worn down to 0.5 mm (0.020 in) in-margin-thickness, replace the valve.
Grinding allowance for valve stem end surface is 0.5 mm (0.020 in) or less.



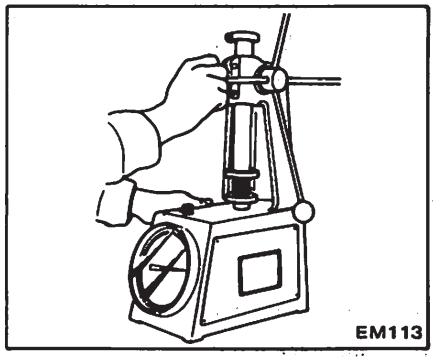
Valve spring

1. Check valve spring for squareness using a steel square and surface plate.
If spring is out of square "S" more than specified limit, replace with new one.

Out of square:
Outer 2.1 mm (0.083 in)
Inner 1.9 mm (0.075 in)

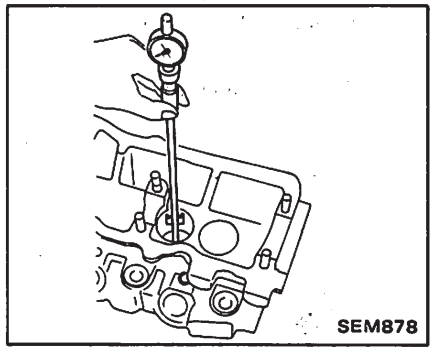


2. Measure the free length and the tension of each spring. If the measured value exceeds the specified limit, replace spring. Refer to S.D.S.



Valve lifter

1. Check valve lifter for scratches and excessive deformation.
2. Measure outside diameter of the lifter and inside diameter of valve lifter hole.



Valve lifter clearance limit:
0.1 mm (0.004 in)

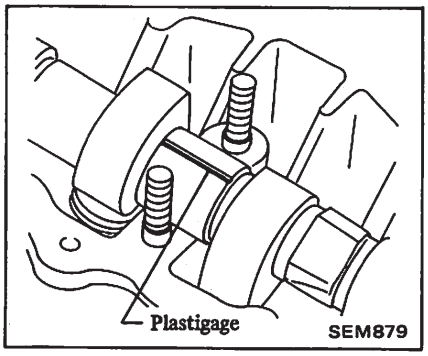
Lifter plate

Check plate surface (cam lobe contacting surface) for uneven wear and burrs. If worn unevenly, replace. If burred, smoothen with oil stone, etc.

Camshaft and cam bracket

Camshaft oil clearance

1. Wipe off oil from camshaft journal and bracket caps.
2. Set camshaft and lay the plastigage on each camshaft journal.



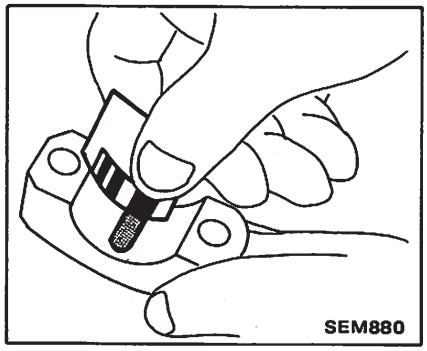
3. Tighten cam bracket caps.

Ⓣ : **Cam bracket nut**
18 - 22 N-m
(1.8 - 2.2 kg-m,
13 - 16 ft-lb)

Do not turn the camshaft.

4. Remove the cam bracket caps and measure the width of the Plastigage at its widest point.

Oil clearance:
Standard
0.02 - 0.06 mm
(0.0008 - 0.0024 in)
Limit
0.1 mm (0.004 in)

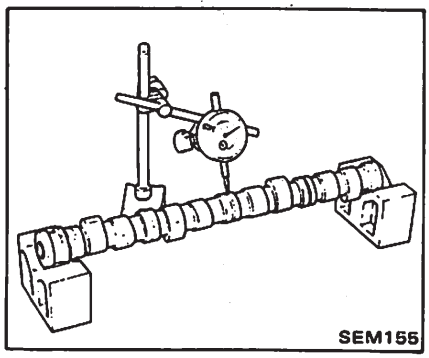


5. If clearance exceeds the limit, replace cam bracket caps, camshaft or cylinder head.

Camshaft alignment

1. Check camshaft, camshaft journal and cam surface for bend, wear or damage. If beyond the specified limits, replace the parts.

Camshaft bend:
Limit 0.05 mm (0.0020 in)



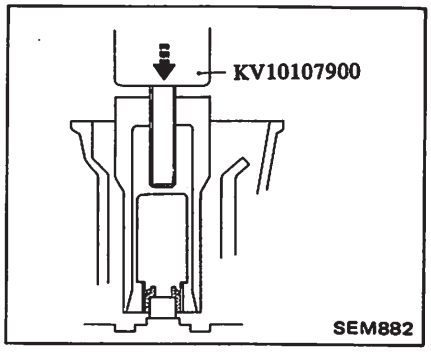
2. Measure camshaft cam height. If beyond the specified limit, replace camshaft.

Wear limit of cam height:
Intake
44.295 mm (1.7439 in)
Exhaust
45.295 mm (1.7833 in)

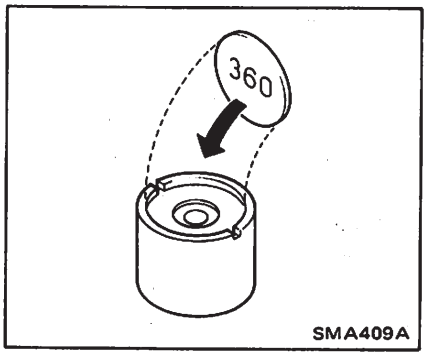
ASSEMBLY

Assemble cylinder head in reverse order of disassembly. Note the following.

1. Drive in valve stem seal until it contacts guide.

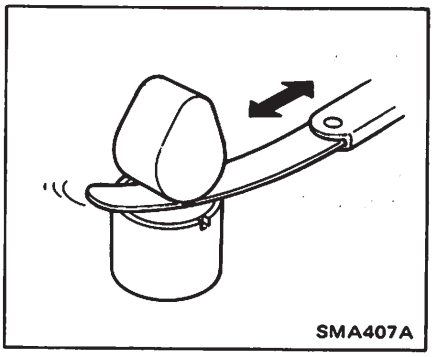


2. Set valve lifter plate so that mark faces the valve lifter side.



Make sure that the valve lifter rotates smoothly by hand.

3. Set camshaft and adjust valve clearance.
(1) Measure valve clearance.



Cold

Unit: mm (in)

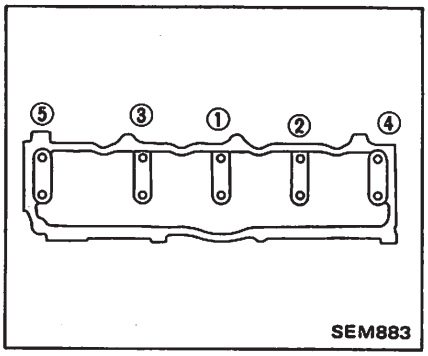
Intake	0.18 (0.0071)
Exhaust	0.4 (0.016)

(2) If out of specification, remove camshaft and replace lifter plate.

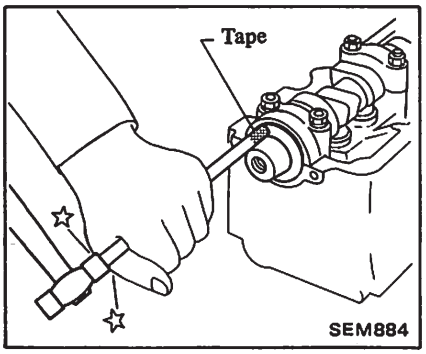
a. Use thick plate when clearance is large.
b. Use thin plate when clearance is small.

4. Install cam bracket caps.

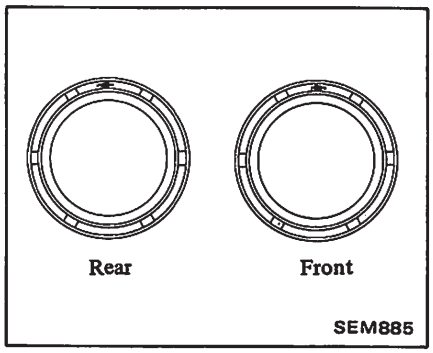
Ⓣ : **Cam bracket nut**
18 - 22 N·m
(1.8 - 2.2 kg-m,
13 - 16 ft-lb)



5. Apply engine oil to new oil seal and install them.



Be sure to use proper oil seal for front and rear as there is a different diameter for front and rear.
Install oil seal so that an arrow mark on oil seal surface is as shown below.



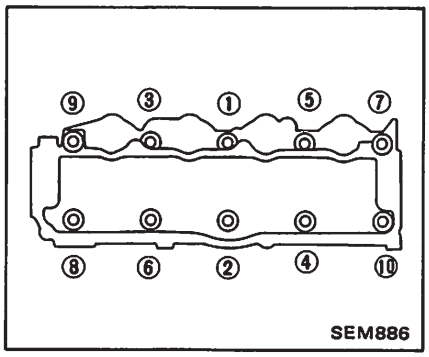
INSTALLATION

Install cylinder head in reverse order of removal. Note the following:

1. Install cylinder head with new gasket.

The new gasket should be the same as the one which was removed.

Ⓣ : **Cylinder head bolt**
1st
59 - 69 N·m
(6.0 - 7.0 kg-m,
43 - 51 ft-lb)
2nd
98 - 108 N·m
(10.0 - 11.0 kg-m,
72 - 80 ft-lb)



2. Install valve timing belt.
3. Install injection timing belt.

Refer to section MA for timing belt replacement.

Ensure timing belt is clean and free from oil or water when installing it. Do not bend it.

CAMSHAFT AND CAMSHAFT OIL SEAL REPLACEMENT

1. Remove timing belts.

Refer to section MA for timing belt replacement.

2. Remove front and rear camshaft pulleys.
3. Remove front and rear back covers.

When removing front back cover, loosen tensioner to remove the bolt at back of tensioner.

4.

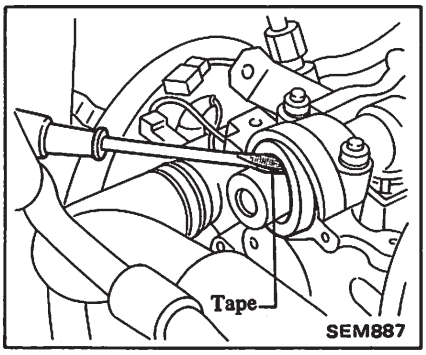
- Camshaft

(1) Remove cam bracket caps.
(2) Remove camshaft and oil seals.

- Camshaft oil seal

Do not remove camshaft.

(1) Remove oil seals.

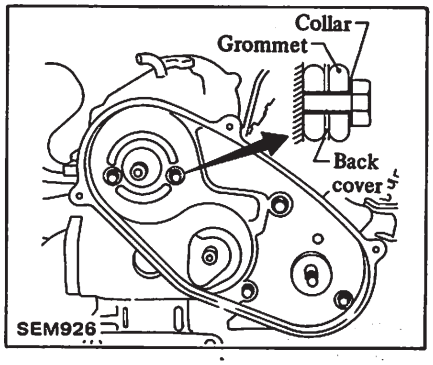


(2) Install oil seals.

Refer to cylinder head for assembly.

5. Install front and rear back covers.

Set tensioner to free side (turn counterclockside) after installing front back cover.



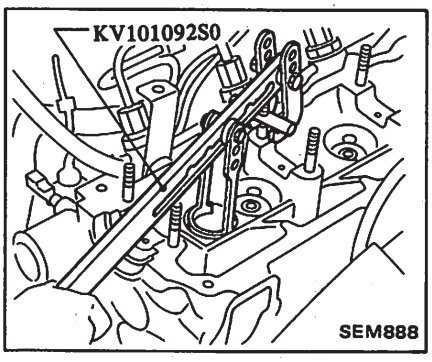
Ⓣ : **Front back cover**
6.3 - 8.3 N·m
(0.64 - 0.85 kg-m,
4.6 - 6.1 ft-lb)
Rear back cover
3.7 - 5.0 N·m
(0.38 - 0.51 kg-m,
2.7 - 3.7 ft-lb)

6. Install cylinder head. Refer to cylinder head for installation.
7. Install timing belts. Refer to section MA for timing belt replacement.

Ensure timing belt is clean and free from oil or water when installing it. Do not bend it.

VALVE STEM SEAL REPLACEMENT

1. Remove camshaft. Refer to CAMSHAFT AND CAMSHAFT OIL SEAL REPLACEMENT.
2. Remove valve spring retainer parts.

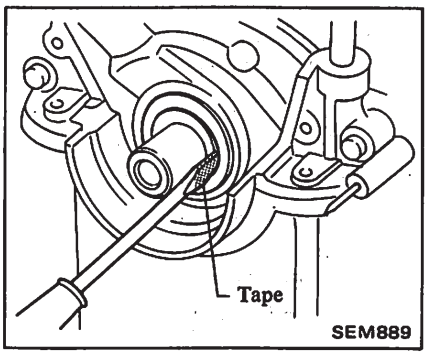


3. Replace valve stem seals.
Refer to cylinder head for assembly.
4. Install cam shaft. Refer to CAMSHAFT AND CAMSHAFT OIL SEAL REPLACEMENT.

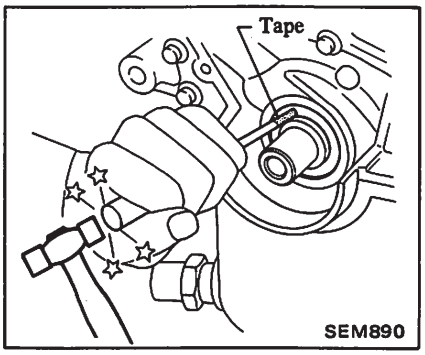
CRANKSHAFT OIL SEAL REPLACEMENT

FRONT OIL SEAL

1. Remove valve timing belt.
Refer to section MA.
2. Remove oil seal.



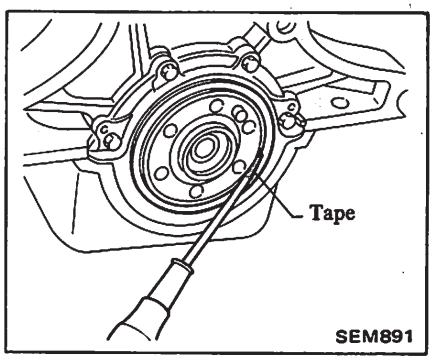
3. Coat new oil seal with engine oil and install it.



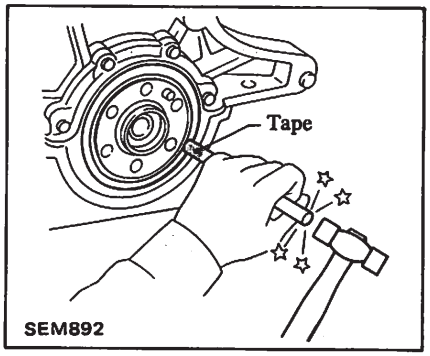
4. Installation is the reverse order of disassembly. Refer to section LC.

REAR OIL SEAL

1. Remove transmission assembly.
Refer to setion MT/AT.
2. Remove flywheel.
3. Remove oil seal.



4. Coat new oil seal with engine oil and install it.



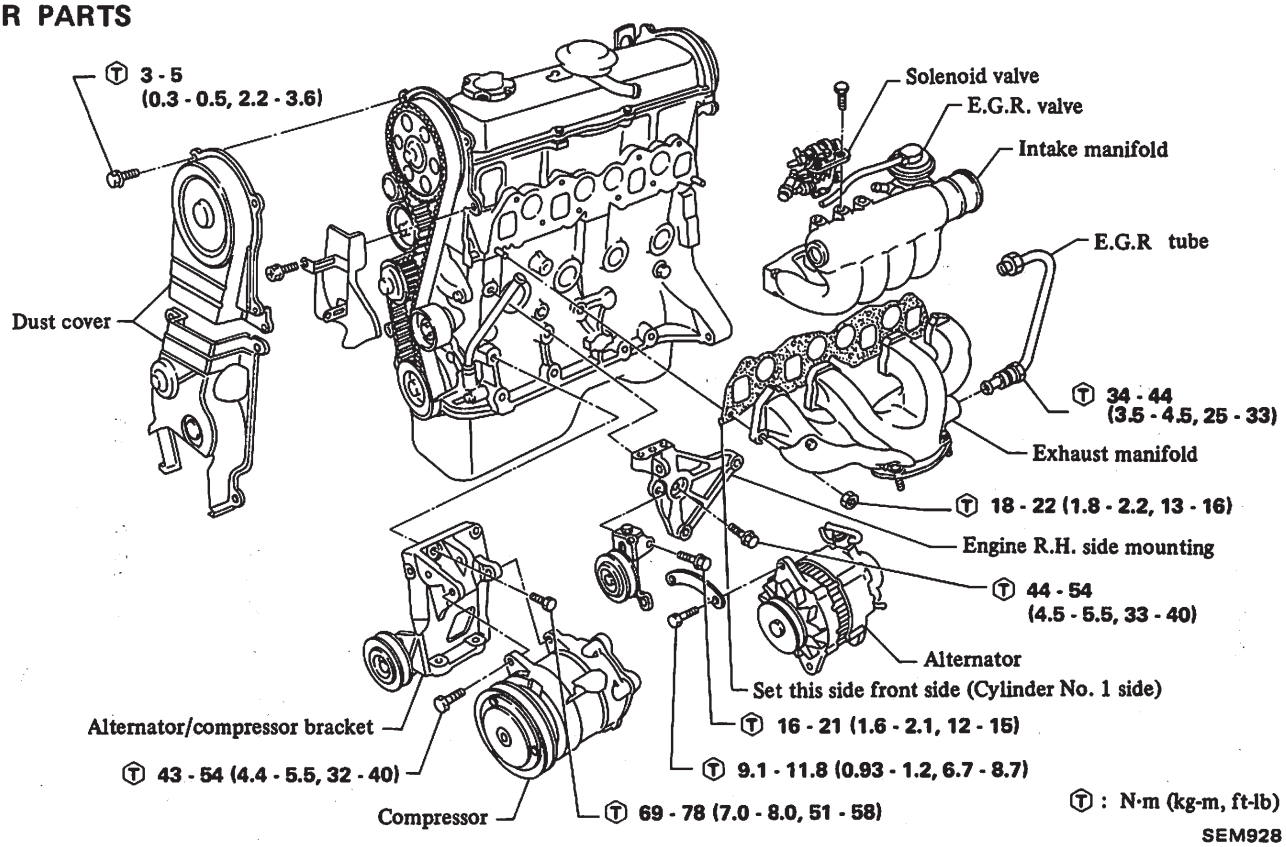
5. Install flywheel.

Ⓣ : **98 - 108 N-m (10.0 - 11.0 kg-m, 72 - 80 ft-lb)**

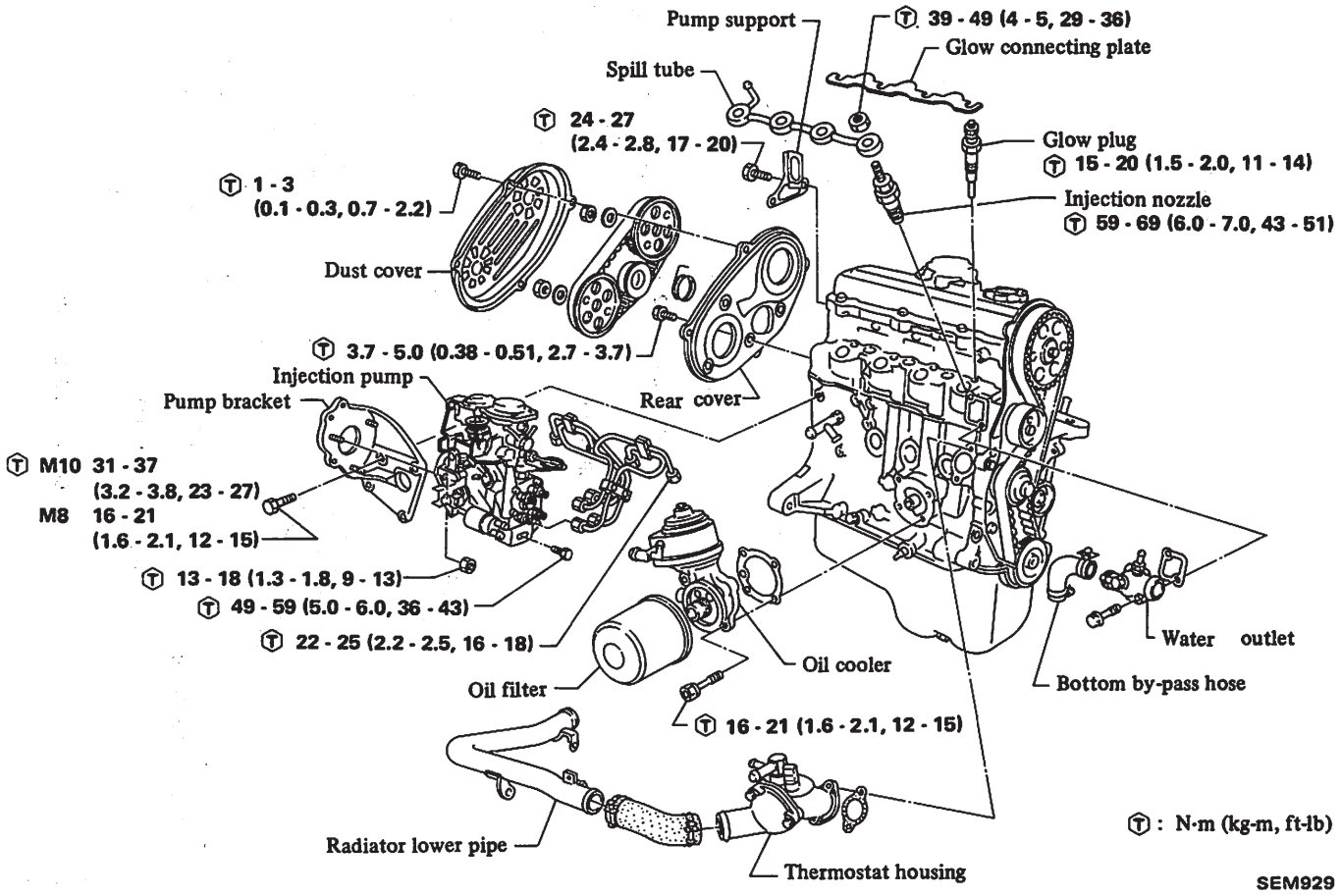
6. Install transmission.
Refer to section MT/AT.

ENGINE COMPONENTS

OUTER PARTS

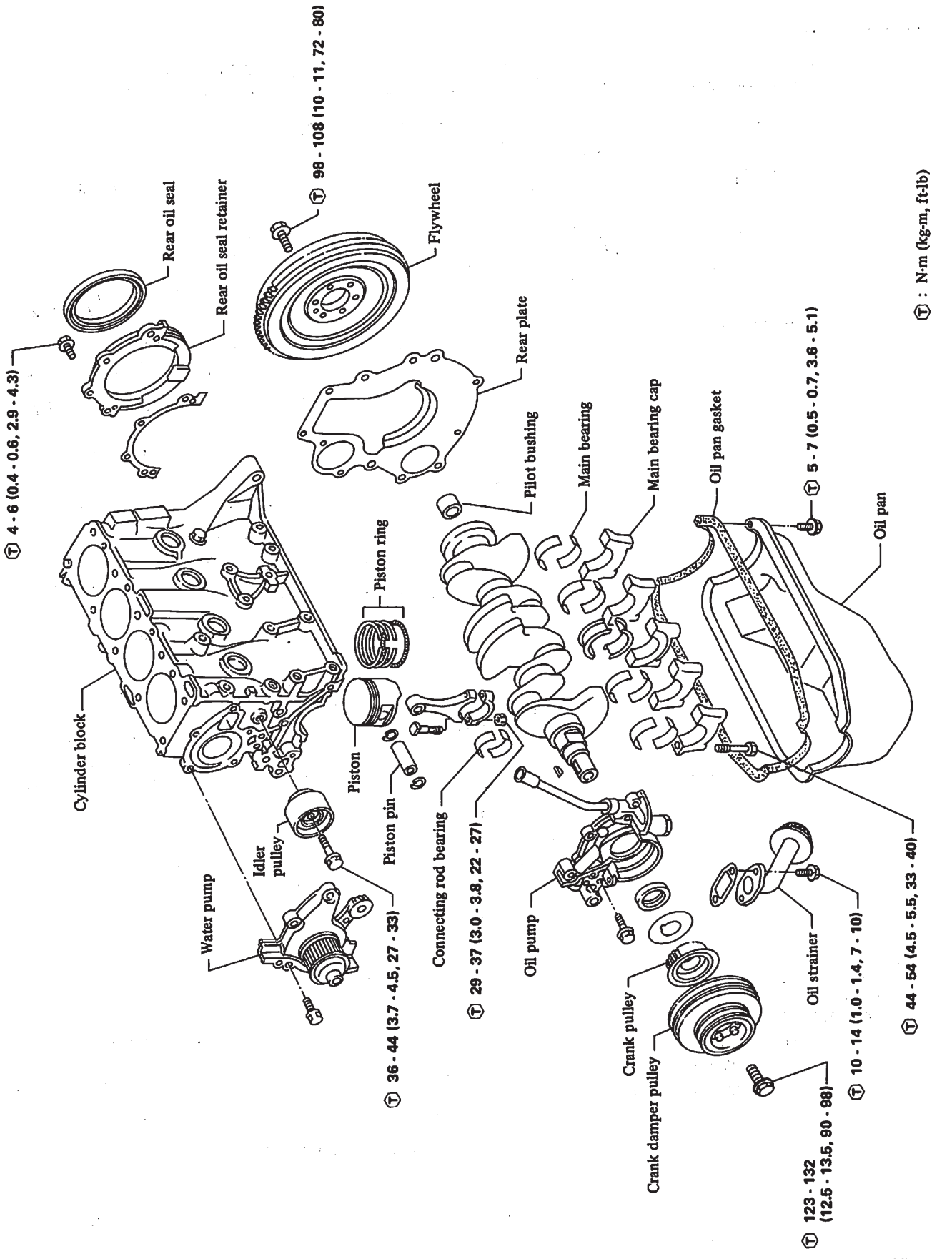


SEM928



SEM929

INTERNAL PARTS

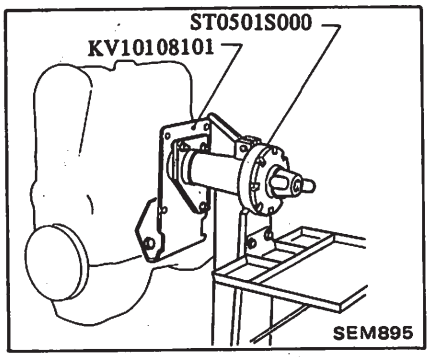


SEM930

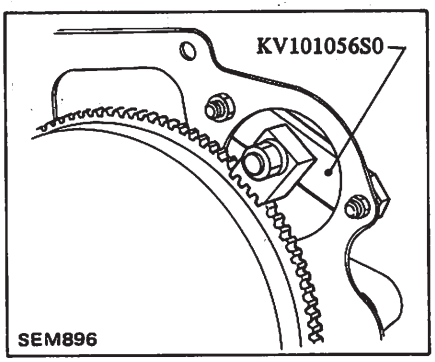
ENGINE DISASSEMBLY

MOUNTING ENGINE ON WORK STAND

1. Remove outer parts.
2. Install engine attachment and mount it on work stand.



3. Drain out engine oil and coolant.
4. Install flywheel stopper.



ENGINE OVERALL

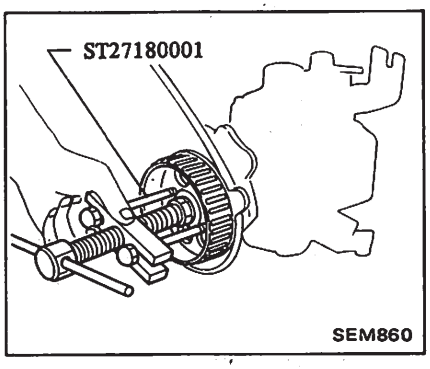
1. Remove front side parts.
2. Remove valve timing belt.

Refer to TIMING BELT REPLACEMENT in section MA.

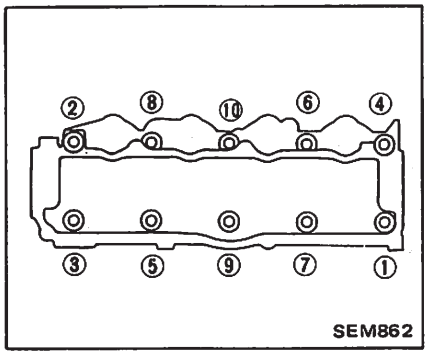
3. Remove rear side parts.
4. Remove injection timing belt.

Refer to TIMING BELT REPLACEMENT in section MA.

5. Loosen nut and remove injection pump pulley.



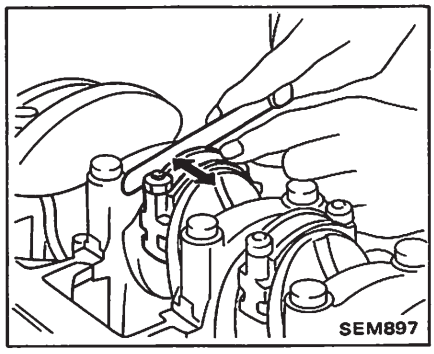
6. Remove injection pump.
7. Remove oil pan and oil pump.
8. Remove cylinder head.



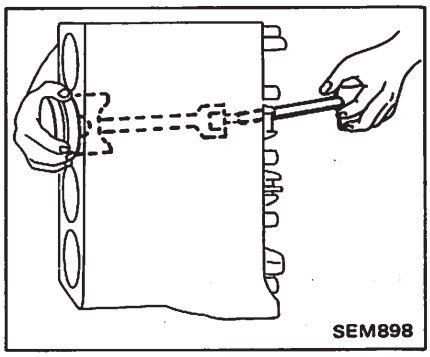
9. Remove piston & connecting rod.

(1) Measure connecting rod end play. If it exceeds the limit, replace connecting rod.

End play limit:
0.3 mm (0.012 in)

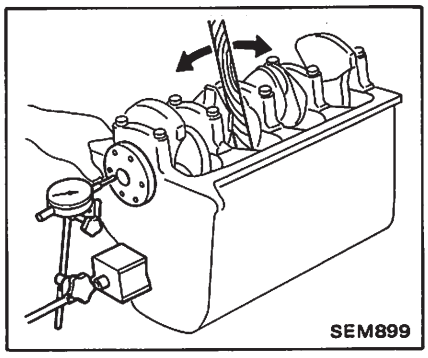


(2) Remove connecting rod caps and bearings.
(3) Push them out toward cylinder head side.



10. Remove crankshaft.

(1) Measure crankshaft end play. If the end play is not within specifications, replace main bearings as a set.



End play limit:
0.3 mm (0.012 in)

(2) Remove main bearing caps and bearings.

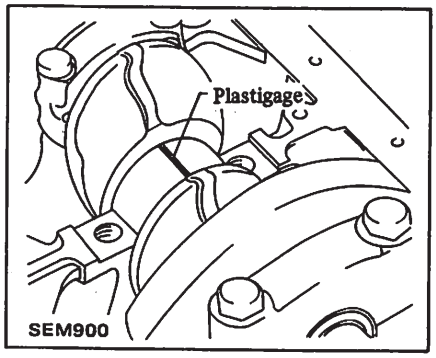
Do not mix the main bearings.

(3) Remove oil seal retainer together with oil seal.
(4) Remove crankshaft.

11. Check oil clearance.

(1) Clean crankshaft journals, main bearings and cap.

(2) Set plastigage on each journal pin and install bearing caps.

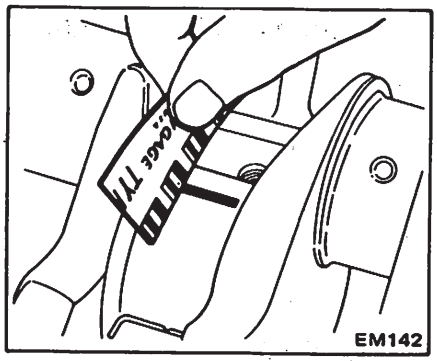


Do not turn the crankshaft.

Ⓣ : Main bearing cap bolt
44 - 54 N·m
(4.5 - 5.5 kg-m,
33 - 40 ft-lb)

Ⓣ : Connecting rod cap nut
31 - 37 N·m
(3.2 - 3.8 kg-m,
23 - 27 ft-lb)

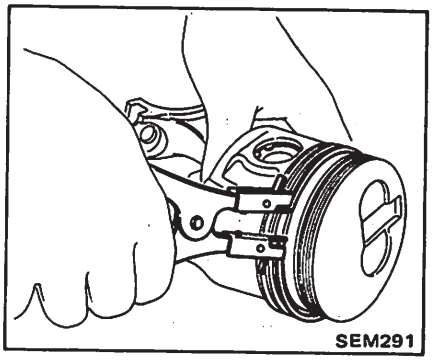
(3) Measure oil clearance.



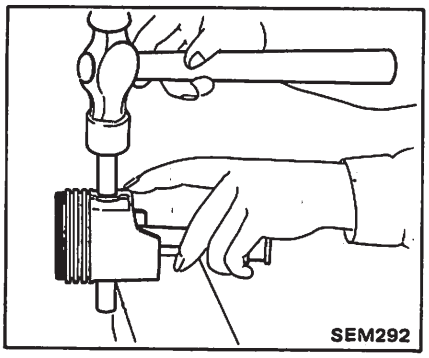
Oil clearance limit:
Crank journal
0.12 mm (0.0047 in)
Connecting rod
0.12 mm (0.0047 in)

PISTON AND CONNECTING ROD

1. Remove piston rings with ring expander.



2. Heat piston to between 60 and 70°C (140 and 158°F) using oil heater or hot water and take out piston pin with hand or suitable tool.

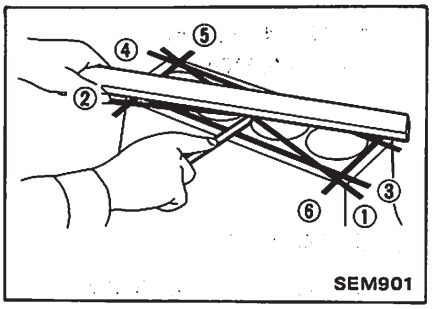


INSPECTION AND REPAIR

CYLINDER BLOCK

1. Visually check cylinder block for cracks or flaws.
2. Measure the top of cylinder block (cylinder head mating face) for warpage. If it exceeds the specified limit, correct with surface plate and grinding compound.

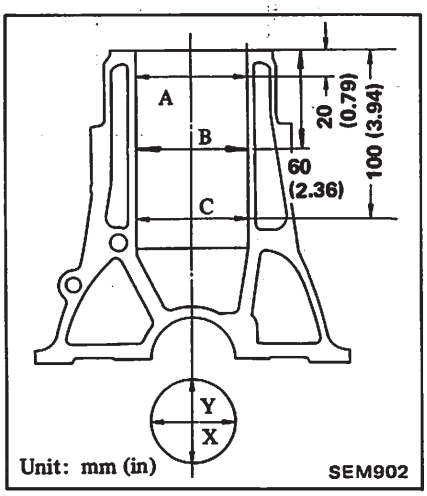
Warpage of surface:
Limit 0.1 mm (0.004 in)

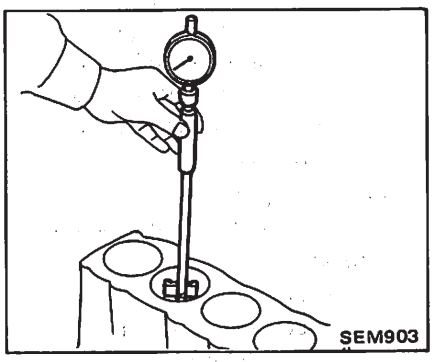


Correct amount limit (Including cylinder head side correct amount):
0.1 mm (0.004 in)

3. Using a bore gauge, measure cylinder bore for wear, out-of-round or taper. If, those are excessive, rebore the cylinder walls by means of a boring machine. Measurement should be taken along bores for taper and around bores for out-of-round.

Out-of-round:
X-Y
0.20 mm (0.0079 in)
Taper:
A-B-C
0.20 mm (0.0079 in)





4. When wear, taper or out-of-round is minor and within the limit, remove the step at the topmost portion of cylinder using a ridge reamer or other similar tool.

CYLINDER BORING

CAUTION:
a. To prevent strain due to cutting heat, bore the cylinders in the order of 2-4-1-3.
b. Before boring any cylinder, install main bearing caps in place and tighten to the specification so that the crankshaft bearing bores will not become distorted from the boring operation.
c. All cylinders should be bored at the same time.
d. The amount cut at one time should be 0.05 mm (0.0020 in).
e. Check piston and cylinder clearance.
f. Check cylinder bore for out-of-round and taper.

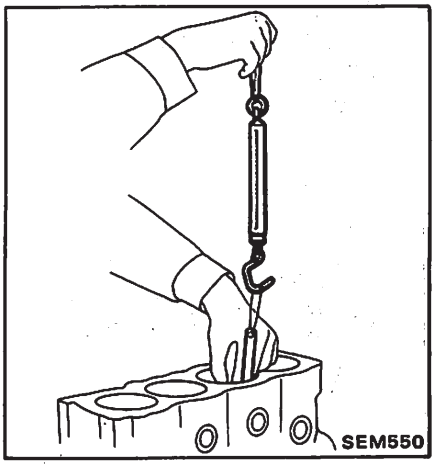
Refer to S.D.S.

Measuring piston-to-cylinder clearance

Check piston and cylinder clearance.

Feeler gauge used:
0.05 - 0.07 mm
(0.0020 - 0.0028 in)
Extracting force:
14.7 - 17.7 N
(1.5 - 1.8 kg, 3.3 - 4.0 lb)

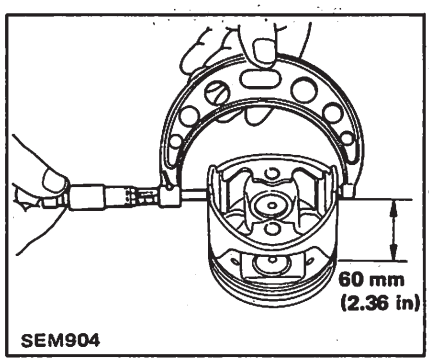
When measuring clearance, slowly pull feeler gauge straight upward.



PISTON, PISTON PIN AND PISTON RING

PISTON

1. Scrape carbon off piston and ring grooves with a carbon scraper and a curved steel wire. The wire will be useful in cleaning bottom land of ring groove. Clean out oil slots in bottom land of oil ring groove.
2. Check for damage, scratches and wear. Replace if such a fault is detected.
3. Check for wear.

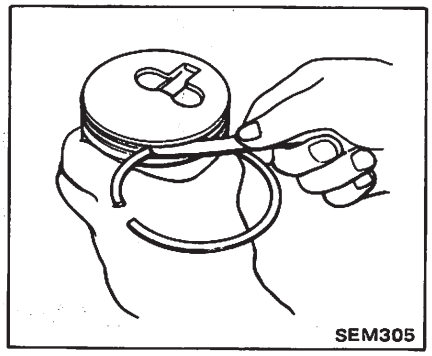


Standard:
79.94 - 79.99 mm
(3.1472 - 3.1492 in)

PISTON RING

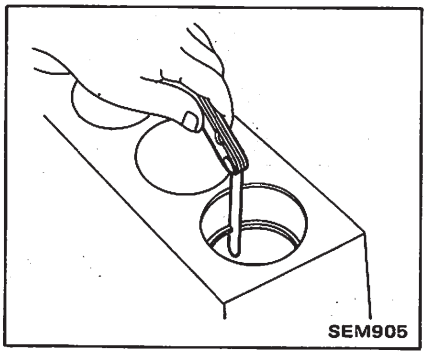
1. Measure the side clearance of rings in ring grooves as each ring is installed. If side clearance exceeds the specified limit, replace piston together with piston ring.

Side clearance:
Top ring
0.20 mm (0.0079 in)
Second ring
0.15 mm (0.0059 in)
Oil ring
0.10 mm (0.0039 in)



2. Measure ring gap with a feeler gauge, placing ring squarely in cylinder using piston.
Ring should be placed to diameter at upper or lower limit of ring travel.
If ring gap exceeds the specified limit, replace ring.

Ring gap:
Top ring
1.0 mm (0.039 in)
Second ring
0.7 mm (0.028 in)
Oil ring
0.6 mm (0.024 in)



When piston ring only is to be replaced, without cylinder bore being corrected, measure the gap at the bottom of cylinder where the wear is minor.

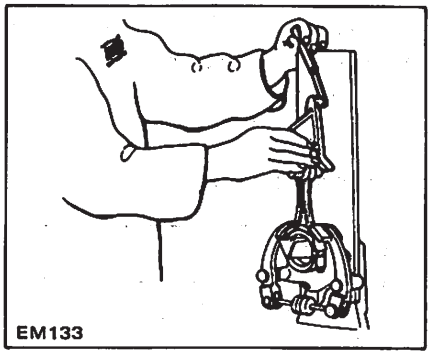
PISTON PIN

Check piston pin and piston pin hole for signs of sticking and other abnormalities.

CONNECTING ROD

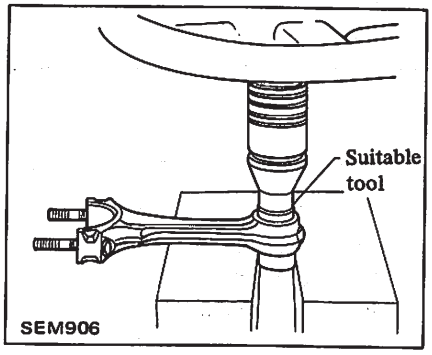
1. If a connecting rod has any flaw on both sides of the thrust face and the large end, correct or replace it.
2. Check connecting rod for bend or torsion using a connecting rod aligner.
If bend or torsion exceeds the limit, correct or replace.

Bend and torsion
[per 100 mm (3.94 in) length]:
Standard
Bend
Less than 0.15 mm
(0.0059 in)
Torsion
Less than 0.30 mm
(0.0118 in)

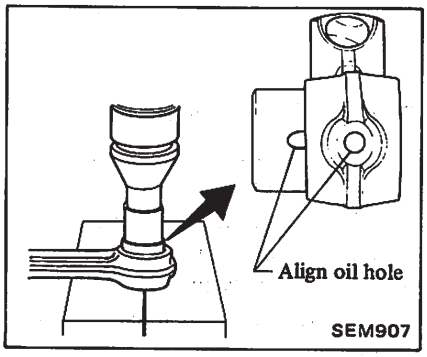


CONNECTING ROD BEARING REPLACEMENT

1. Replace bearing with suitable tool and press.



a. Coat new bearing with engine oil.
b. Align oil hole.



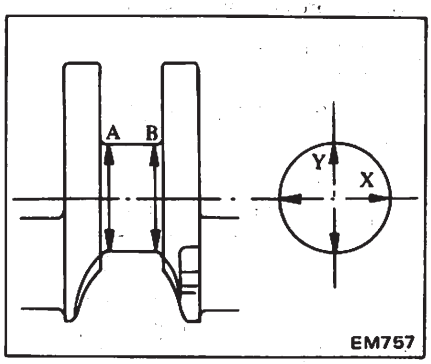
2. Grind the bore.
24.025 - 24.038 mm
(0.9459 - 0.9464 in)

CRANKSHAFT

CRANK JOURNAL AND PIN

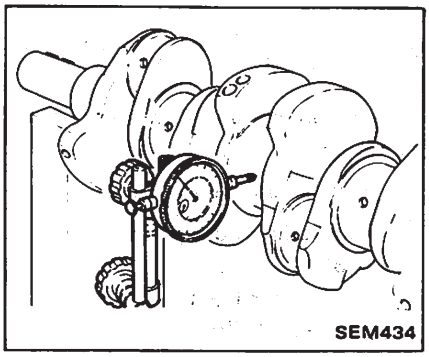
1. Repair or replace as required. If faults are minor, correct with fine crocus cloth.
2. Check journals and crank pins for taper and out-of-round.
If out-of-round or taper exceeds the specified limit, replace.

Out-of-round (X-Y):
Limit 0.03 mm (0.0012 in)
Taper (A-B):
Limit 0.03 mm (0.0012 in)



3. Check crankshaft for runout.
If bend exceeds the specified limit, replace.

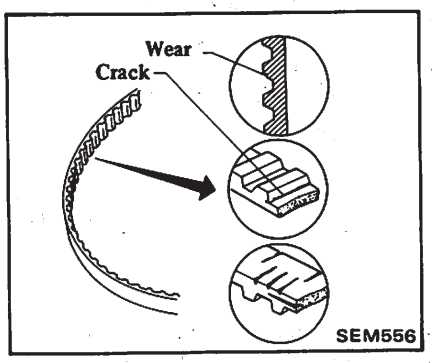
Runout:
Limit 0.05 mm (0.0020 in)



MISCELLANEOUS COMPONENTS

TIMING BELT

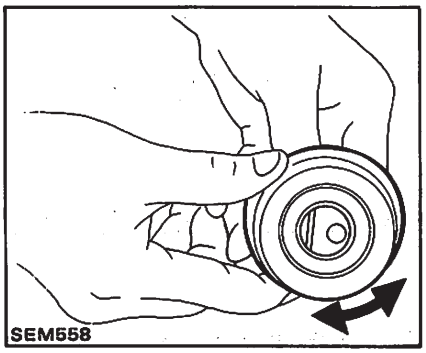
CAUTION:
a. Do not bend, twist or turn the belt inside out.
b. Ensure timing belt is clean and free from oil or water when installing it.



1. Check for oil or water. If soaked with oil or water, replace it.
2. Check for cracks and wear on the belt face. If there is noticeable cracks or wear, check the tensioner pulley. If necessary, replace it.
3. Check for cracks and damage on the cog face. If there is noticeable cracks or damage, check if any pulleys are locked.

TENSIONER

1. Check to see that it turns smoothly. If it binds, replace assembly.



2. Check tensioner surface. If necessary, clean it.

Do not use oil or grease.

3. Check for spring wear. If worn, replace it.

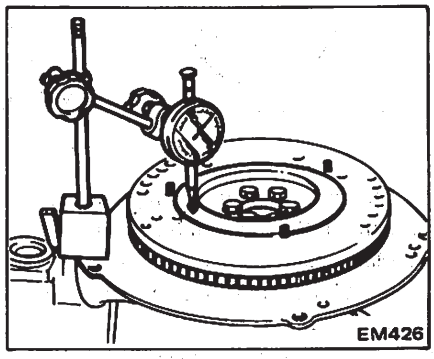
PULLEY

1. Remove oil and clean.
2. Check for harmful burrs. If burred, smoothen with oil stone, etc.

FLYWHEEL

1. Check the clutch disc contact surface on flywheel for damage or wear. Repair or replace if necessary.
2. Measure runout of the clutch disc contact surface with a dial gauge. If it exceeds the specified limit, replace it.

Runout:
(Total indicator reading)
Limit 0.15 mm (0.0059 in)



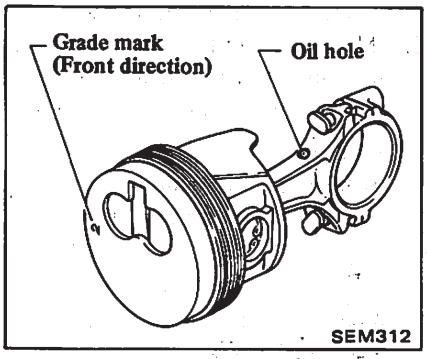
3. Check tooth surfaces of ring gear for flaws or wear.
Replace if necessary.

Replace ring gear at about 180 to 220°C (356 to 428°F).

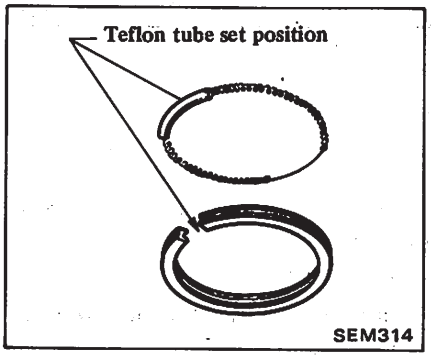
ENGINE ASSEMBLY

PISTON AND CONNECTING ROD

a. Ensure connecting rod oil hole and piston leaf are in the same direction.



b. Ensure mark side of ring faces up.
c. Align teflon tube and ring gap.
d. Make sure that the expander coil joint is at opposite side of ring gap.



1. Heat piston to between 60 and 70°C (140 and 158°F) using oil heater or hot water and install the pin.
2. Install the snap rings.
3. Install piston rings.

ENGINE OVERALL

1. Install crankshaft.

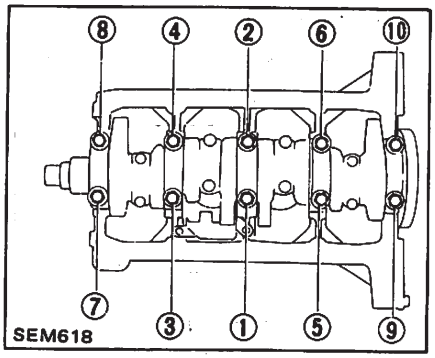
(1) Set main bearings on block.

a. Do not coat block side and back of the bearings with oil.

b. The block side bearing has an oil hole and oil groove but cap side does not.

(2) Install crankshaft.
(3) Install main bearings and caps.

Ⓣ : **Main bearing cap bolt**
44 - 54 N·m
(4.5 - 5.5 kg-m,
33 - 40 ft-lb)



Make sure that crankshaft rotates smoothly by hand.

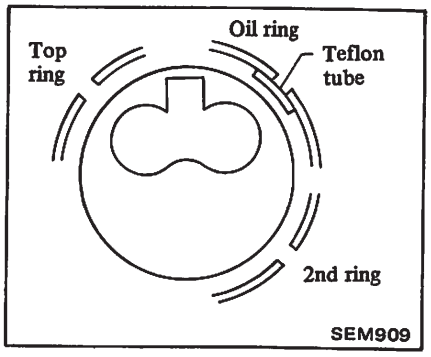
(4) Install rear oil seal retainer.

Ⓣ : **Oil seal retainer**
6.3 - 8.3 N·m
(0.64 - 0.85 kg-m,
4.6 - 6.1 ft-lb)

(5) Measure the end play.

2. Install piston and connecting rod.

(1) Set piston rings as shown below.



(2) Install piston into corresponding cylinders.

Ensure number on piston head faces front side.

(3) Install connecting rod caps.

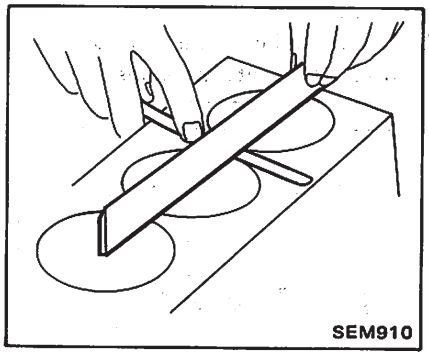
Ⓣ : **Connecting rod cap nut**
31 - 37 N·m
(3.2 - 3.8 kg-m,
23 - 27 ft-lb)

- **Apply engine oil to thread and seat.**
- **Ensure connecting rod numbers are aligned.**

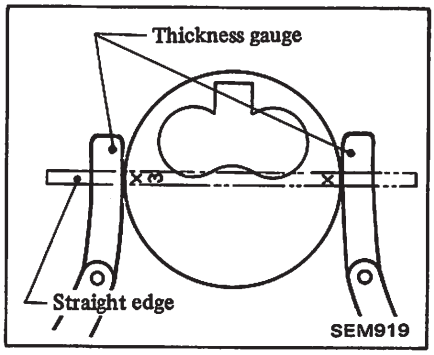
(4) Measure the end play.

3. Select cylinder head gasket.

(1) Clean cylinder block surface.
(2) Measure all piston projections.



Be sure to measure the projection at two points for every cylinder.

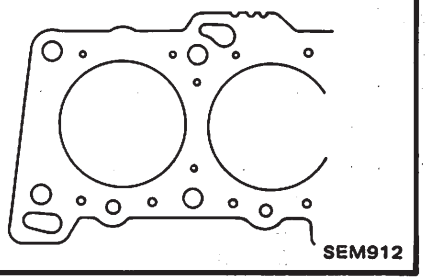


(3) Obtain average values of all piston projections and then determine gaskets to be used.

Relation between piston projection and cylinder head gasket

Unit: mm (in)

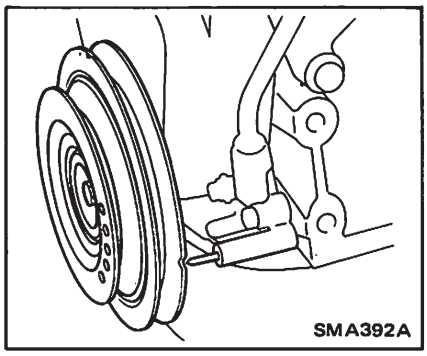
Grade	Average values piston projections	Gasket thickness	Number of cutouts
A	Less than 0.52 (0.0205)	1.15 (0.0453)	1
B	0.52 - 0.57 (0.0205 - 0.0224)	1.20 (0.0472)	2
C	More than 0.57 (0.0224)	1.25 (0.0492)	3


SEM912

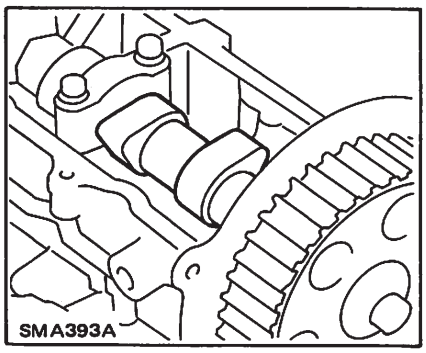
When maximum value of piston projection is larger by 0.050 mm (0.0020 in) than the average values of piston projections in each grade, use a gasket which is 1 grade thicker.

4. Install cylinder head.

(1) Make sure that No. 1 cylinder is at Top Dead Center.


SMA392A

(2) Make sure that No. 1 cam of camshaft is in the position as shown.


SMA393A

(3) Tighten cylinder head bolts in the order shown.

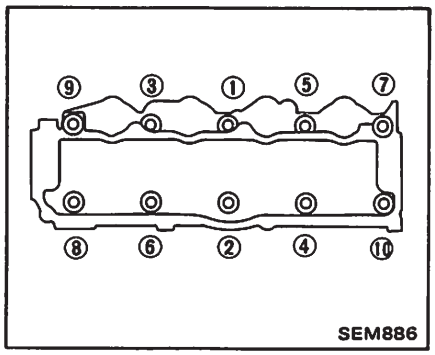
Ⓣ : **Cylinder head bolt**

1st

59 - 69 N·m
(6.0 - 7.0 kg-m,
43 - 51 ft-lb)

2nd

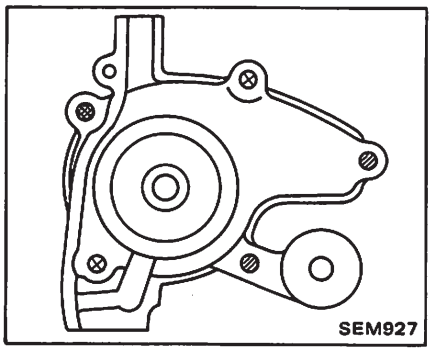
98 - 108 N·m
(10.0 - 11.0 kg-m,
72 - 80 ft-lb)



SEM886

INSTALLING VALVE TIMING BELT

1. Install water pump.


SEM927

Ⓣ : **Water pump to cylinder block**

- **16 - 20 N·m**
  (1.6 - 2.0 kg-m,
  12 - 14 ft-lb)
- **16 - 21 N·m**
  (1.6 - 2.1 kg-m,
  12 - 15 ft-lb)

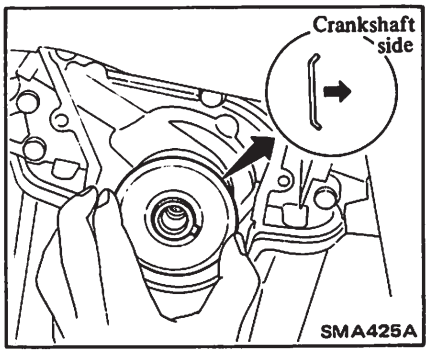
2. Install camshaft pulley.

Ⓣ : **Camshaft pulley bolt**

92 - 102 N·m
(9.4 - 10.4 kg-m,
68 - 75 ft-lb)

3. Install oil pump and oil pan.
Refer to section LC.

4. Install crank pulley plate.



SMA425A

5. Install valve timing belt.
Refer to TIMING BELT REPLACEMENT in section MA.

Ⓣ : **Dust cover**

3 - 5 N·m
(0.3 - 0.5 kg-m,
2.2 - 3.6 ft-lb)

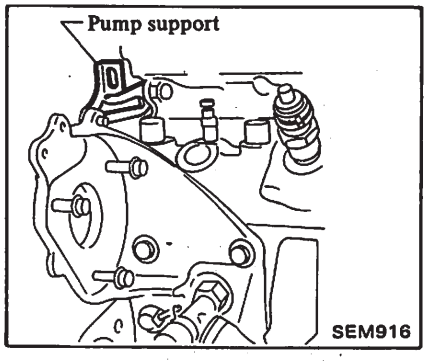
6. Install crank damper pulley.

Ⓣ : **Crank damper pulley bolt**
123 - 132 N·m
(12.5 - 13.5 kg-m,
90 - 98 ft-lb)

INSTALLING INECTION TIMING BELT

1. Install water pipe.
2. Set pump support before installing back cover.

Ⓣ : **Injection pump bracket support**
24 - 27 N·m
(2.4 - 2.8 kg-m,
17 - 20 ft-lb)



3. Install camshaft pulley.

Ⓣ : **Camshaft pulley bolt**
92 - 102 N·m
(9.4 - 10.4 kg-m,
68 - 75 ft-lb)

4. Install injection nozzles, glow plugs and glow connecting plate.

Ⓣ : **Glow plug to cylinder head**
15 - 20 N·m
(1.5 - 2.0 kg-m,
11 - 14 ft-lb)
Nozzle to cylinder head
59 - 69 N·m
(6.0 - 7.0 kg-m,
43 - 51 ft-lb)

5. Install injection pump bracket and injection pump temporarily.

6. Adjust injection timing.
Refer to ADJUSTING INJECTION TIMING in section MA.

Ⓣ : **Pump bracket bolt**
M10
31 - 37 N·m
(3.2 - 3.8 kg-m,
23 - 27 ft-lb)
M8
16 - 21 N·m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)

7. Install injection pump pulley.

Ⓣ : **Injection pump pulley**
59 - 69 N·m
(6.0 - 7.0 kg-m,
43 - 51 ft-lb)

8. Install injection timing belt.
Refer to TIMING BELT REPLACEMENT in section MA.

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

E15 & E16

INSPECTION AND ADJUSTMENT

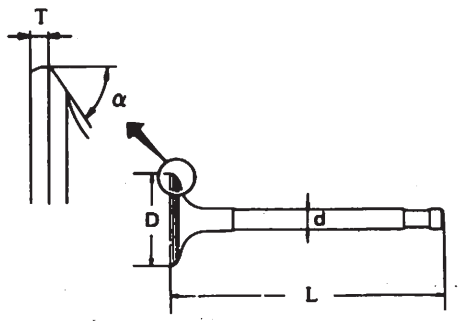
CYLINDER HEAD

Unit: mm (in)

	Standard	Limit
Head surface flatness	Less than 0.05 (0.0020)	0.1 (0.004)

VALVE

Unit: mm (in)



SEM188

Valve head diameter "D"	Intake	37.0 (1.457)	
	Exhaust	30.0 (1.181)	
		E15	E16
Valve length "L"	Intake	118.4 - 119.0 (4.66 - 4.69)	116.4 - 117.0 (4.58 - 4.61)
	Exhaust	117.75 - 118.35 (4.64 - 4.66)	115.75 - 116.35 (4.56 - 4.58)
Valve stem diameter "d"	Intake	6.970 - 6.985 (0.2744 - 0.2750)	
	Exhaust	6.945 - 6.960 (0.2734 - 0.2740)	
Valve face angle "α"		45°15' - 45°45'	
Valve margin "T" Limit		0.5 (0.020)	
Valve stem end surface grinding limit		0.2 (0.008)	

Valve spring

Free height mm (in)	46.70 (1.8386)
Assembled height mm/N (mm/kg, in/lb)	39.2/229.78 (39.2/23.43, 1.543/51.66)
Out of square "S" mm (in)	2.0 (0.079)

Valve guide

Unit: mm (in)

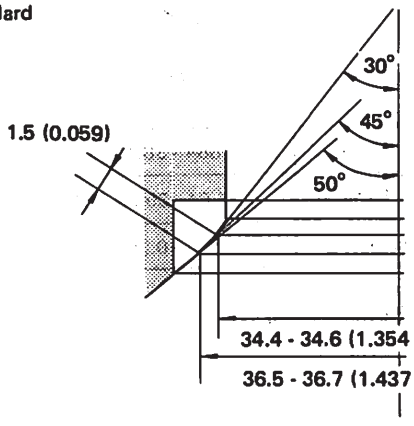
		Standard	Service
Valve guide Outer diameter		12.033 - 12.044 (0.4737 - 0.4742)	12.256 - 12.274 (0.4825 - 0.4832)
Valve guide Inner diameter [Finished size]		7.005 - 7.020 (0.2758 - 0.2764)	
Cylinder head valve guide hole diameter		11.970 - 11.988 (0.4713 - 0.4720)	12.200 - 12.211 (0.4803 - 0.4807)
Interference fit of valve guide		0.045 - 0.074 (0.0018 - 0.0029)	
		Standard	Max. tolerance
Stem to guide clearance	Intake	0.02 - 0.05 (0.0008 - 0.0020)	0.1 (0.004)
	Exhaust	0.045 - 0.075 (0.0018 - 0.0030)	
Valve deflection limit		0.2 (0.008)	

Valve seat

Unit: mm (in)

INTAKE

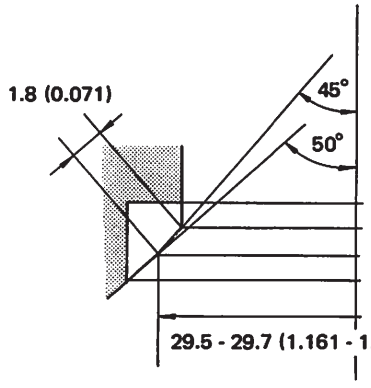
Standard



SEM375

EXHAUST

Standard

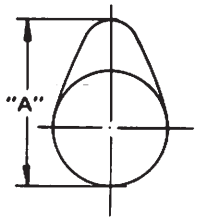


SEM376

CAMSHAFT AND CAMSHAFT BEARING

Unit: mm (in)

		Standard	Max. tolerance
Camshaft journal to bearing clearance	No. 1,3,5	0.035 - 0.076 (0.0014 - 0.0030)	0.15 (0.0059)
	No. 2, 4	0.078 - 0.119 (0.0031 - 0.0047)	0.20 (0.0079)
Inner diameter of camshaft bearing		42.000 - 42.025 (1.6535 - 1.6545)	–
Outer diameter of camshaft journal	No. 1,3,5	41.949 - 41.965 (1.6515 - 1.6522)	–
	No. 2, 4	41.906 - 41.922 (1.6498 - 1.6505)	
Camshaft bend [T.I.R*]		Less than 0.02 (0.0008)	0.1 (0.004)
Camshaft end play		0.15 - 0.29 (0.0059 - 0.0114)	0.4 (0.016)



EM671

Cam height "A"	Intake	35.884 - 36.134 (1.4128 - 1.4226)
	Exhaust	35.64 - 35.89 (1.4031 - 1.4130)
Wear limit of cam height		0.20 (0.0079)

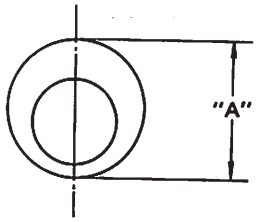
* Total indicator reading

JACK SHAFT AND JACK SHAFT BUSHING

Unit: mm (in)

		Standard	Max. tolerance
Jack shaft journal to bushing clearance	FR	0.020 - 0.098 (0.0008 - 0.0039)	0.15 (0.0059)
	RR		
Inner diameter of jack shaft bushing	FR	32.020 - 32.085 (1.2606 - 1.2632)	
	RR	28.620 - 28.685 (1.1268 - 1.1293)	
Outer diameter of jack shaft journal	FR	31.987 - 32.000 (1.2593 - 1.2598)	
	RR	28.587 - 28.600 (1.1255 - 1.1260)	
Jack shaft end play		0.045 - 0.105 (0.0018 - 0.0041)	

Fuel pump cam



SEM734

Cam height "A"	27.8 - 27.9 (1.094 - 1.098)	–

CYLINDER BLOCK

Unit: mm (in)

		Standard	Wear limit
Surface flatness		Less than 0.05 (0.0020)	0.10 (0.0039)
Cylinder bore	Inner diameter	76.00 - 76.05 (2.9921 - 2.9941)	76.20 (3.0000)
	Out-of-round (X-Y)	Less than 0.015 (0.0006)	–
	Taper (A-B)	Less than 0.02 (0.0008)	–
Difference in inner diameter between cylinders		Less than 0.05 (0.0020)	–
Piston clearance to cylinder block		0.023 - 0.043 (0.0009 - 0.0017)	–

PISTON, PISTON RING AND PISTON PIN

Piston

Unit: mm (in)

Piston skirt diameter "A"	Standard		75.967 - 76.017 (2.9908 - 2.9928)
	Oversize	0.02 (0.0008)	75.987 - 76.037 (2.9916 - 2.9936)
		0.50 (0.0197)	76.467 - 76.517 (3.0105 - 3.0125)
"a" dimension			17.5 (0.689)
Piston pin hole diameter			19.003 - 19.012 (0.7481 - 0.7485)

Piston ring

Unit: mm (in)

		Standard	Limit
Side clearance	Top	0.040 - 0.073 (0.0016 - 0.0029)	0.2 (0.008)
	2nd	0.030 - 0.063 (0.0012 - 0.0025)	
	Oil	0.050 - 0.145 (0.0020 - 0.0057)	—
Ring gap	Top	0.20 - 0.35 (0.0079 - 0.0138)	1.0 (0.039)
	2nd	0.15 - 0.30 (0.0059 - 0.0118)	
	Oil (rail ring)	0.30 - 0.90 (0.0118 - 0.0354)	

Piston pin

Unit: mm (in)

Piston pin outer diameter	18.995 - 19.000 (0.7478 - 0.7480)
Piston pin to piston clearance	0.008 - 0.012 (0.0003 - 0.0005)
Interference fit of piston pin to connecting rod	0.017 - 0.038 (0.0007 - 0.0015)

CONNECTING ROD

Unit: mm (in)

Bend, torsion [per 100 mm (3.94 in)]	Limit	0.05 (0.0020)
Piston pin bore dia.		18.962 - 18.978 (0.7465 - 0.7472)
Big end play	Standard	0.1 - 0.37 (0.004 - 0.0146)
	Limit	0.5 (0.020)

CRANKSHAFT

Unit: mm (in)

Main journal dia. "Dm"		49.943 - 49.964 (1.9663 - 1.9671)
Pin journal dia. "Dp"		39.954 - 39.974 (1.5730 - 1.5738)
Out-of-round (X-Y) and taper (A-B)	Standard	Less than 0.01 (0.0004)
	Limit	0.03 (0.0012)
Bend [T.I.R.]	Standard	Less than 0.05 (0.0020)
	Limit	0.10 (0.0039)
Free end play	Standard	0.05 - 0.18 (0.0020 - 0.0071)
	Limit	0.30 (0.0118)

BEARING

Bearing clearance

Except M.P.G. model

Unit: mm (in)

	Standard	Limit
Main bearing clearance Nos. 1 and 5	0.031 - 0.076 (0.0012 - 0.0030)	0.10 (0.0039)
Nos. 2, 3 and 4	0.031 - 0.092 (0.0012 - 0.0036)	
Connecting rod bearing clearance	0.030 - 0.060 (0.0012 - 0.0024)	0.10 (0.0039)

M.P.G. model

Unit: mm (in)

	Standard	Limit
Main bearing clearance Nos. 1, 3 and 5	0.047 - 0.076 (0.0019 - 0.0030)	0.10 (0.0039)
Nos. 2 and 4	0.031 - 0.092 (0.0012 - 0.0036)	0.10 (0.0039)
Connecting rod bearing clearance	0.030 - 0.060 (0.0012 - 0.0024)	0.10 (0.0039)

Main bearing undersize

Unit: mm (in)

		Crank main journal diameter "Dm"
Standard		49.943 - 49.964 (1.9663 - 1.9671)
Undersize	0.25 (0.0098)	49.701 - 49.714 (1.9567 - 1.9572)
	0.50 (0.0197)	49.451 - 49.464 (1.9469 - 1.9474)
	0.75 (0.0295)	49.201 - 49.214 (1.9370 - 1.9376)

Connecting rod bearing undersize

Unit: mm (in)

		Crank pin journal diameter "Dp"
Standard		39.954 - 39.974 (1.5730 - 1.5738)
Undersize	0.08 (0.0031)	39.874 - 39.894 (1.5698 - 1.5706)
	0.25 (0.0098)	39.704 - 39.724 (1.5631 - 1.5639)
	0.50 (0.0197)	39.454 - 39.474 (1.5533 - 1.5541)
	0.75 (0.0295)	39.204 - 39.224 (1.5435 - 1.5442)

MISCELLANEOUS COMPONENTS

Unit: mm (in)

Camshaft pulley Runout [T.I.R.]	Less than 0.1 (0.004)
Flywheel Runout [T.I.R.]	Less than 0.15 (0.0059)

TIGHTENING TORQUE

Engine outer parts

Unit	N·m	kg-m	ft-lb
Alternator bracket bolt	9.1 - 11.8	0.93 - 1.2	6.7 - 8.7
Alternator to adjusting bar bolt	16 - 21	1.6 - 2.1	12 - 15
Clutch cover fixing bolt	7 - 10	0.7 - 1.0	5.1 - 7.2
Engine mounting bracket to cylinder block	29 - 39	3.0 - 4.0	22 - 29
Engine mounting bracket to cylinder head	16 - 21	1.6 - 2.1	12 - 15
Fuel pump attaching nut	9.1 - 11.8	0.93 - 1.2	6.7 - 8.7
Intake & exhaust manifold nut	16 - 21	1.6 - 2.1	12 - 15
Oil pump securing nut	9.1 - 11.8	0.93 - 1.2	6.7 - 8.7
Oil pump securing bolt	9.1 - 11.8	0.93 - 1.2	6.7 - 8.7
Power steering pump bracket	26 - 34	2.7 - 3.5	20 - 25
Power steering pump fixing bolt	31 - 42	3.2 - 4.3	23 - 31
Spark plug	15 - 20	1.5 - 2.0	11 - 14
Water pump pulley bolt	3.7 - 5.0	0.38 - 0.51	2.7 - 3.7
Water pump bolt	9 - 14	0.9 - 1.4	6.5 - 10.1
Compressor bracket bolt	26 - 34	2.7 - 3.5	20 - 25
Compressor to bracket	26 - 34	2.7 - 3.5	20 - 25
Crank pulley bolt	113 - 147	11.5 - 15.0	83 - 108
Dust cover screw	3.7 - 5.0	0.38 - 0.51	2.7 - 3.7
E.G.R. valve to E.G.R. tube	39 - 59	4 - 6	29 - 43
E.A.I. tube nut	39 - 59	4 - 6	29 - 43
Thermostat housing bolt	3.7 - 5.0	0.38 - 0.51	2.7 - 3.7

Engine internal parts

Unit	N·m	kg-m	ft-lb
Camshaft pulley bolt	6 - 8	0.6 - 0.8	4.3 - 5.8
Connecting rod nut	31 - 37	3.2 - 3.8	23 - 27
Cylinder head bolt 1st	39 - 44	4.0 - 4.5	29 - 33
Cylinder head bolt 2nd	69 - 74	7.0 - 7.5	51 - 54
Cylinder head front cover	3.7 - 5.0	0.38 - 0.51	2.7 - 3.7
Flywheel bolt	78 - 88	8.0 - 9.0	58 - 65
Drive plate bolt	93 - 103	9.5 - 10.5	69 - 76
Front cover bolt	3.7 - 5.0	0.38 - 0.51	2.7 - 3.7
Jack shaft pulley bolt	6 - 8	0.6 - 0.8	4.3 - 5.8
Main bearing cap bolt	49 - 59	5.0 - 6.0	36 - 43
Oil pan bolt & nut	3.7 - 5.0	0.38 - 0.51	2.7 - 3.7
Oil pan drain plug	35 - 47	3.6 - 4.8	26 - 35
Oil strainer bolt	6.3 - 8.3	0.64 - 0.85	4.6 - 6.1
Rocker shaft bolt	16 - 21	1.6 - 2.1	12 - 15
Tensioner lock nut	16 - 21	1.6 - 2.1	12 - 15
Rocker cover nut	4 - 8	0.4 - 0.8	2.9 - 5.8
Rocker arm lock nut	16 - 21	1.6 - 2.1	12 - 15

CD17

INSPECTION AND ADJUSTMENT

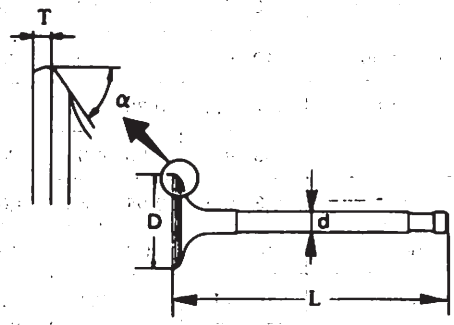
CYLINDER HEAD

Unit: mm (in)

Head surface flatness	
Standard	Less than 0.05 (0.0020)
Limit	0.1 (0.004)

VALVE

Unit: mm (in)



SEM188

Valve head diameter "D"	
Intake	36.00 (1.4173)
Exhaust	31.00 (1.2205)
Valve length "L"	
Intake	100.45 - 100.750 (3.9547 - 3.9665)
Exhaust	100.25 - 100.550 (3.9468 - 3.9587)
Valve stem diameter "d"	
Intake	6.965 - 6.980 (0.2742 - 0.2748)
Exhaust	6.945 - 6.960 (0.2734 - 0.2740)
Valve seat angle "α"	45°30'
Valve margin "T" Limit	0.5 (0.020)
Valve stem end surface grinding limit	0.5 (0.020)

Valve spring

Free height mm (in)	
Outer	46.40 (1.8268)
Inner	43.20 (1.7008)
Assembled height mm/N (mm/kg, in/lb)	
Outer	39.5/150.0 (39.5/15.3, 1.555/33.7)
Inner	36.0/85.3 (36.0/8.7, 1.417/19.2)
Out of square ("S") mm (in)	
Outer	2.1 (0.083)
Inner	1.9 (0.075)

Valve guide

Unit: mm (in)

	Standard	Service
Valve guide Outer diameter	11.023 - 11.034 (0.4340 - 0.4344)	
Valve guide Inner diameter [Finished size]	7.000 - 7.018 (0.2756 - 0.2763)	
Cylinder head valve guide hole diameter	10.975 - 10.996 (0.4321 - 0.4329)	
Interference fit of valve guide	0.027 - 0.059 (0.0011 - 0.0023)	

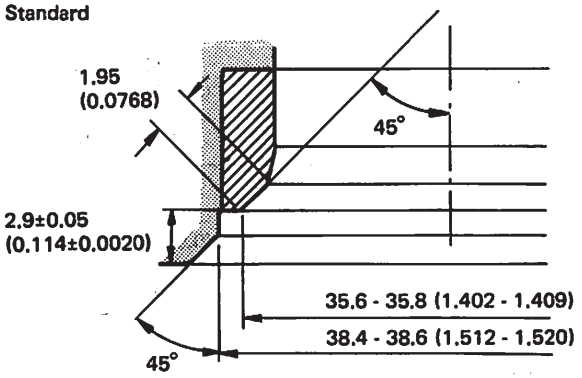
	Standard	Max. tolerance
Stem to guide clearance		
Intake	0.020 - 0.053 (0.0008 - 0.0021)	0.1 (0.04)
Exhaust	0.040 - 0.073 (0.0016 - 0.0029)	0.1 (0.04)
Valve deflection limit		0.2 (0.008)

Valve seat resurfacing

Unit: mm (in)

Intake

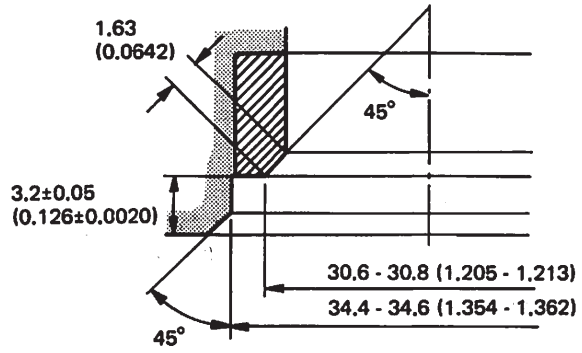
Standard



SEM917

Exhaust

Standard



SEM918

VALVE LIFTER

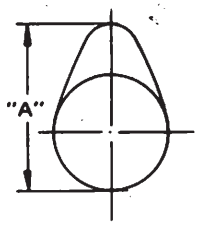
Unit: mm (in)

Valve lifter outer diameter	
Standard	34.959 - 34.975 (1.3763 - 1.3770)
Cylinder head valve lifter hole diameter	34.988 - 35.013 (1.3775 - 1.3785)
Clearance	
Standard	0.013 - 0.054 (0.0005 - 0.0021)
Limit	0.1 (0.004)

CAMSHAFT AND CAMSHAFT BEARING

Unit: mm (in)

	Standard	Max. tolerance
Camshaft journal to bearing clearance	0.02 - 0.06 (0.0008 - 0.0024)	0.1 (0.004)
Inner diameter of camshaft bearing	30.000 - 30.021 (1.1811 - 1.1819)	–
Outer diameter of camshaft journal	29.960 - 29.980 (1.1795 - 1.1803)	–
Camshaft bend	Less than 0.02 (0.0008)	0.05 (0.0020)
Camshaft end play		0.17 (0.0067)



EM671

Cam height "A"	
Intake	44.495 - 44.500 (1.7518 - 1.7520)
Exhaust	45.495 - 45.500 (1.7911 - 1.7913)
Wear limit of cam height	0.15 (0.0059)

CYLINDER BLOCK

Unit: mm (in)

Surface flatness	
Wear limit	0.1 (0.004)
Cylinder bore	
Inner diameter	
Standard	80.000 - 80.050 (3.1496 - 3.1516)
Wear limit	0.2 (0.008)
Out-of-round (X-Y)	
Wear limit	0.2 (0.008)
Taper (A-B)	
Wear limit	0.2 (0.008)
Difference in inner diameter between cylinders	
Standard	Less than 0.05 (0.0020)
Wear limit	0.2 (0.008)
Piston to cylinder clearance	
Standard	0.05 - 0.07 (0.0020 - 0.0028)
Feeler gauge extracting force [with gauge thickness 0.06 mm (0.0024 in)] N (kg, lb)	7.8 - 14.7 (0.8 - 1.5, 1.8 - 3.3)

Cylinder boring

Unit: mm (in)

Piston size	Cylinder hone diameter
0.5 (0.020) O/S	80.500 - 80.550 (3.1693 - 3.1713)
1.0 (0.039) O/S	81.000 - 81.050 (3.1890 - 3.1909)

PISTON, PISTON RING AND PISTON PIN

Piston

Unit: mm (in)

Piston skirt diameter	
Standard	79.94 - 79.99 (3.1472 - 3.1492)
Oversize	0.5 (0.020) 1.0 (0.039)
Measure position (From top)	60 (2.36)
Piston pin hole diameter	23.991 - 23.999 (0.9445 - 0.9448)

Piston ring

Unit: mm (in)

Side clearance	
Top	
Standard	0.060 - 0.10 (0.0024 - 0.0039)
Limit	0.2 (0.008)
2nd	
Standard	0.040 - 0.080 (0.0016 - 0.0031)
Limit	0.15 (0.0059)
Oil	
Standard	0.03 - 0.07 (0.0012 - 0.0028)
Limit	0.1 (0.004)
Ring gap	
Top	
Standard	0.20 - 0.35 (0.0079 - 0.0138)
Limit	1.0 (0.039)
2nd	
Standard	0.20 - 0.35 (0.0079 - 0.0138)
Limit	0.7 (0.028)
Oil (Rail ring)	
Standard	0.30 - 0.45 (0.0118 - 0.0177)
Limit	0.6 (0.024)

Piston pin

Unit: mm (in)

Piston pin outer diameter	23.994 - 24.000 (0.9446 - 0.9449)
Piston pin to piston clearance	0 - 0.004 (0 - 0.0002)
Interference fit of piston pin to connecting rod	0.025 - 0.044 (0.0010 - 0.0017)

CONNECTING ROD

Unit: mm (in)

Bend [per 100 mm (3.94 in)]	
Standard	Less than 0.15 (0.0059)
Torsion	
Standard	Less than 0.30 (0.0118)
Piston pin bore dia.	24.025 - 24.038 (0.9459 - 0.9464)
Big end play	
Limit	0.3 (0.012)

CRANKSHAFT

Unit: mm (in)

Main journal dia.	52.951 - 52.964 (2.0847 - 2.0852)
Pin journal dia.	44.961 - 44.974 (1.7701 - 1.7706)
Out-of-round (X-Y) and taper (A-B)	
Standard	Less than 0.01 (0.0004)
Limit	0.03 (0.0012)
Bend	
Standard	Less than 0.025 (0.0010)
Limit	0.05 (0.0020)
Free end play	
Standard	0.05 - 0.18 (0.0020 - 0.0071)
Limit	0.3 (0.012)

BEARING

Bearing clearance

Unit: mm (in)

Main bearing clearance	
Standard	0.039 - 0.066 (0.0015 - 0.0026)
Limit	0.12 (0.0047)
Connecting rod bearing clearance	
Standard	0.024 - 0.066 (0.0009 - 0.0026)
Limit	0.12 (0.0047)

MISCELLANEOUS COMPONENTS

Unit: mm (in)

Camshaft sprocket Runout [T.I.R.]	Less than 0.1 (0.004)
Flywheel Runout [T.I.R.]	Less than 0.15 (0.0059)

TIGHTENING TORQUE

ENGINE OUTER PARTS

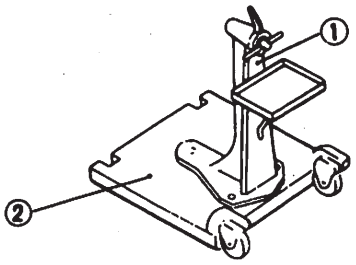
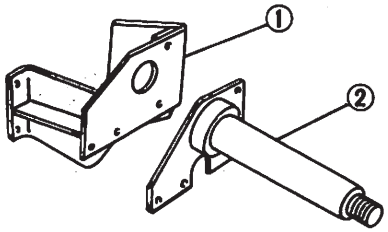
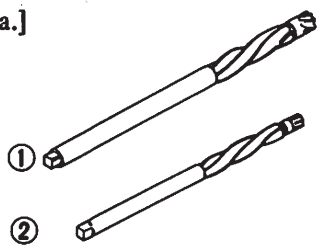
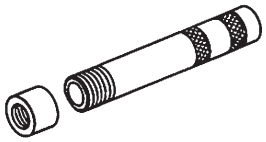
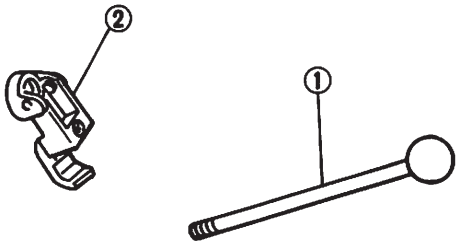
Unit	N·m	kg-m	ft-lb
Adjusting bar to engine mounting	16 - 21	1.6 - 2.1	12 - 15
Alternator bracket	43 - 58	4.4 - 5.9	32 - 43
Alternator to bracket	49 - 59	5.0 - 6.0	36 - 43
Alternator to adjusting bar	9.1 - 11.8	0.93 - 1.2	6.7 - 8.7
Compressor bracket	69 - 78	7.0 - 8.0	51 - 58
Compressor to bracket	43 - 54	4.4 - 5.5	32 - 40
Crank damper pulley bolt	123 - 132	12.5 - 13.5	90 - 98
Front dust cover	3 - 5	0.3 - 0.5	2.2 - 3.6
Engine mounting bracket	44 - 54	4.5 - 5.5	33 - 40
Engine slinger	30 - 40	3.1 - 4.1	22 - 30
Glow plug to cylinder head	15 - 20	1.5 - 2.0	11 - 14
Idler pulley bracket	16 - 21	1.6 - 2.1	12 - 15
Idler pulley nut	19 - 25	1.9 - 2.6	14 - 19
Injection pump nut	13 - 18	1.3 - 1.8	9 - 13
Injection pump bracket			
M10	31 - 37	3.2 - 3.8	23 - 27
M8	16 - 21	1.6 - 2.1	12 - 15
Injection pump rear bracket	24 - 27	2.4 - 2.8	17 - 20
Injection pump to rear bracket	49 - 59	5.0 - 6.0	36 - 43
Injection pump bracket support	24 - 27	2.4 - 2.8	17 - 20
Injection pump pulley nut	59 - 69	6.0 - 7.0	43 - 51
Injection tube flare nut	22 - 25	2.2 - 2.5	16 - 18
Nozzle to cylinder head	59 - 69	6.0 - 7.0	43 - 51
Manifold	18 - 22	1.8 - 2.2	13 - 16
Oil filter bracket	16 - 21	1.6 - 2.1	12 - 15
Rear dust cover	1 - 3	0.1 - 0.3	0.7 - 2.2
E.G.R. valve	18 - 23	1.8 - 2.3	13 - 17
E.G.R. tube flare nut	34 - 44	3.5 - 4.5	25 - 33

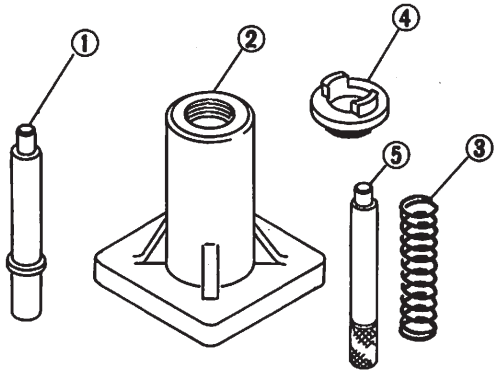
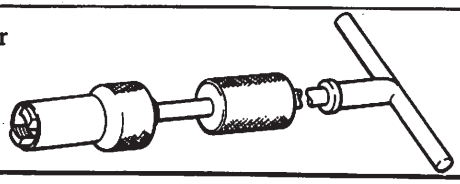
ENGINE BODY PART

Unit	N·m	kg-m	ft-lb
Cam bracket nut	18 - 22	1.8 - 2.2	13 - 16
Camshaft pulley bolt	92 - 102	9.4 - 10.4	68 - 75
Connecting rod cap nut	31 - 37	3.2 - 3.8	23 - 27
Cylinder head bolt			
1st	59 - 69	6.0 - 7.0	43 - 51
2nd	98 - 108	10.0 - 11.0	72 - 80
Front back cover	6.3 - 8.3	0.64 - 0.85	4.6 - 6.1
Front tensioner	36 - 44	3.7 - 4.5	27 - 33
Flywheel	98 - 108	10.0 - 11.0	72 - 80
Idler pulley bolt	36 - 44	3.7 - 4.5	27 - 33
Main bearing cap bolt	44 - 54	4.5 - 5.5	33 - 40
Oil pan	5 - 7	0.5 - 0.7	3.6 - 5.1
Oil pan drain plug	37 - 45	3.8 - 4.6	27 - 33
Oil pump to cylinder block	12 - 16	1.2 - 1.6	9 - 12
Oil strainer	10 - 14	1.0 - 1.4	7 - 10
Oil seal retainer	6.3 - 8.3	0.64 - 0.85	4.6 - 6.1
Rear back cover	3.7 - 5.0	0.38 - 0.51	2.7 - 3.7
Rear tensioner	16 - 21	1.6 - 2.1	12 - 15
Rocker cover	1 - 3	0.1 - 0.3	0.7 - 2.2
Water pump to cylinder block	16 - 20 16 - 21	1.6 - 2.0 1.6 - 2.1	12 - 14 12 - 15
Water drain plug	54 - 74	5.5 - 7.5	40 - 54

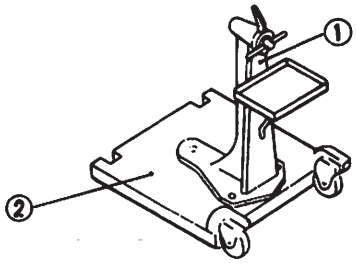
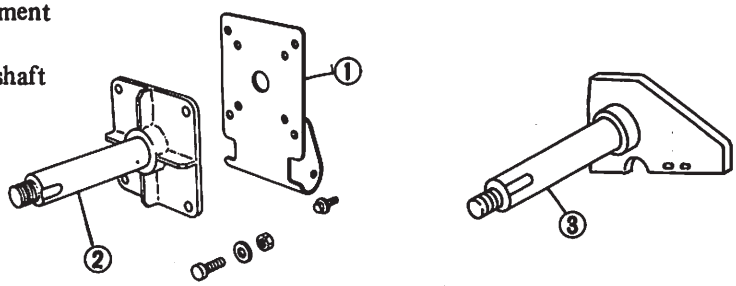
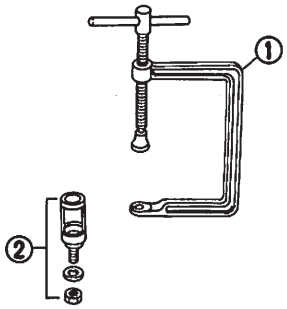
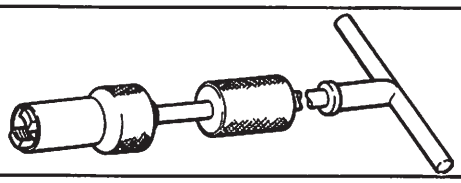
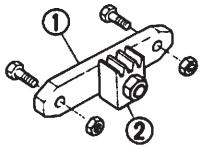
SPECIAL SERVICE TOOLS

E15 & E16

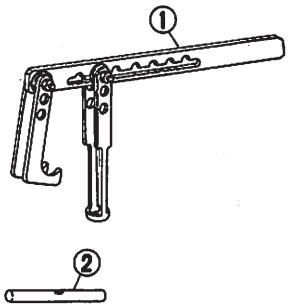
Tool number (Kent-Moore No.)	Tool name
ST0501S000 (J26023) ① ST05011000 (J26023-2) ② ST05012000 (J26023-1)	Engine stand assembly Engine stand Base 
① KV10107110 (–) ② KV10102500 (J26097)	Engine attachment assembly Engine attachment Sub attachment 
① ST11081000 (J25618-3) ② KV10107700 (J25618-2)	Reamer [12.2 mm (0.480 in) dia.] [7 mm (0.28 in) dia.] 
KV10107500 (–)	Valve lip seal drift 
KV101072S0 (–) ① KV10107210 (–) ② KV10107220 (–)	Valve spring compressor Handle Head 

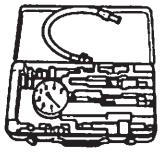
Tool number (Kent-Moore No.)	Tool name
KV10107400 (–) ① KV10107310 (–) ② ST13040020 (–) ③ ST13040030 (–) ④ KV10107320 (–) ⑤ ST13040050 (–)	Piston pin press stand Center shaft Stand Spring Cap Drift 
KV30101000 (–)	Clutch aligning bar 
KV10107900 (–)	Valve lip seal puller 

CD17

Tool number (Kent-Moore No.)	Tool name
ST0501S000 (J26023) ① ST05011000 (J26023-2) ② ST05012000 (J26023-1)	Engine stand assembly Engine stand Base 
① KV10108101 (–) ② KV10106500 (–) or ③ KV10102500 (J26097)	Engine attachment Engine stand shaft 
KV101089S0 (–) ① KV10108910 (–) ② KV10108920 (–)	Valve lifter Body Head 
KV10107900 (–)	Valve lip seal puller 
KV101056S0 (–) ① KV10105610 (–) ② KV10105630 (–)	Engine stopper 

Tool number (Kent-Moore No.)	Tool name
KV101092S0 (–)	Valve spring compressor
① KV10109210 (–)	Compressor
② KV10109220 (–)	Adapter
KV10109300 (–)	Pulley holder
ED19600000 (–)	Compression gauge set
KV11100300 (–)	Nozzle holder socket





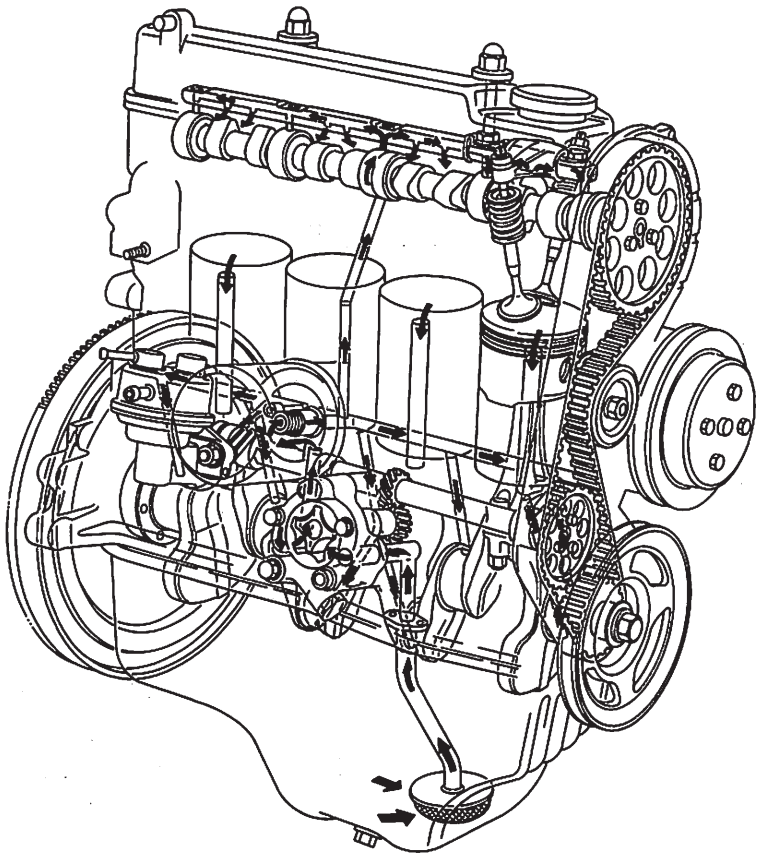
ENGINE LUBRICATION & COOLING SYSTEMS

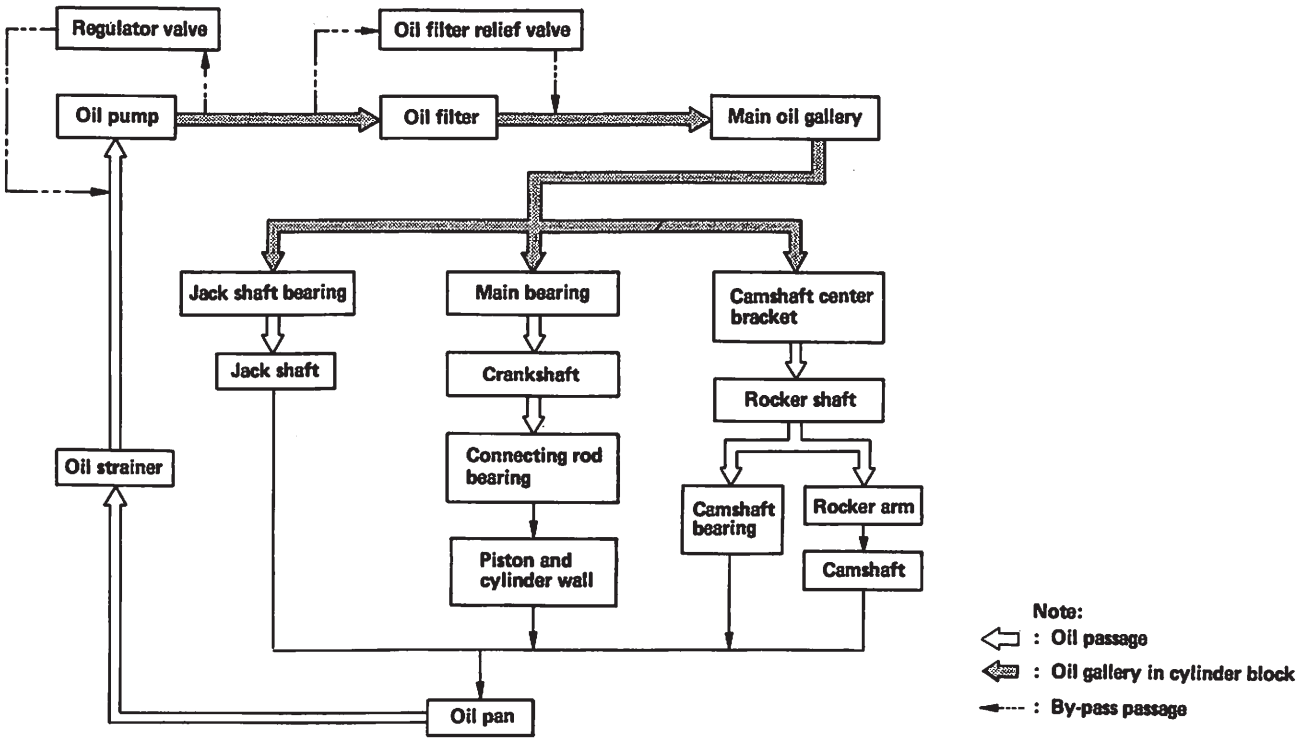
SECTION LC

CONTENTS

ENGINE LUBRICATION SYSTEM

LUBRICATION CIRCUIT



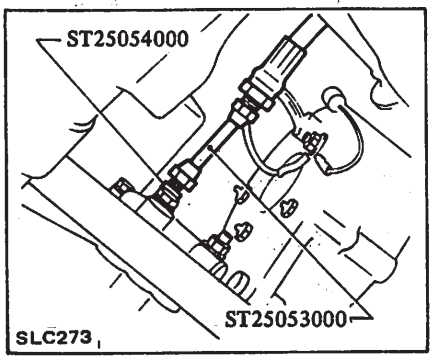


SLC265

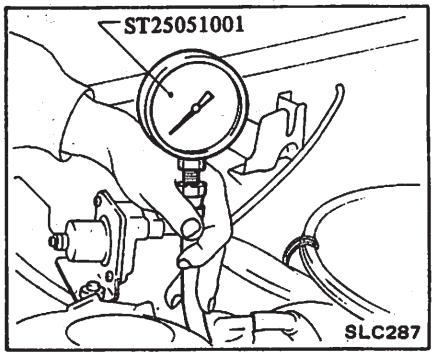
OIL PUMP

OIL PRESSURE CHECK

1. Warm up engine.
2. Remove oil pressure switch.
3. Install pressure gauge and gauge adapter to oil pressure switch hole.



4. Start engine and check oil pressure.



Engine rpm	Discharge pressure kPa (kg/cm², psi)
1,050	196 (2, 28)
1,700	294 (3, 43)
5,150	392 (4, 57)

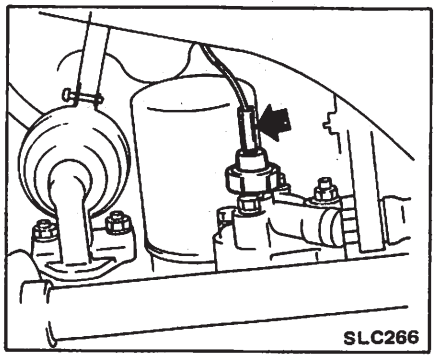
The above table shows data tested when SEA 20W-20 oil is used and oil temperature is between 73 and 83°C (163 and 181°F). Slight difference will be found because of oil grade or oil temperature. If difference is extreme, check oil passage, oil pump, and for oil leaks.

5. Remove pressure gauge and gauge adapter.
6. Install oil pressure switch.

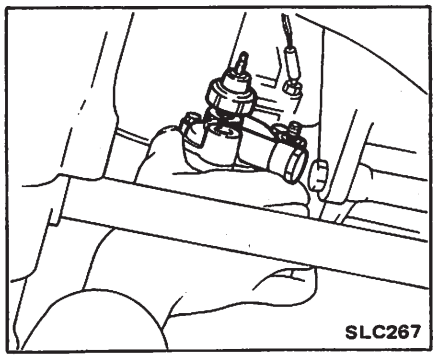
If oil pressure is outside the specifications, check pump for clogged oil passage, leaks, etc.

REMOVAL

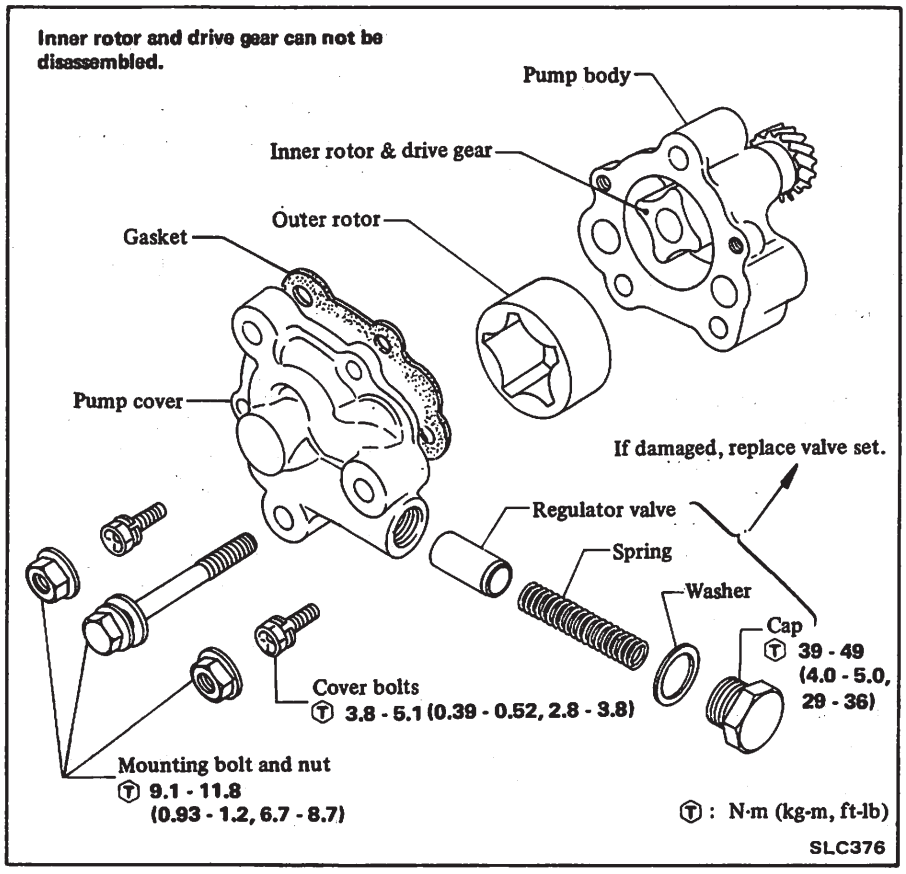
1. Loosen alternator lower bolts.
2. Remove alternator belt and adjusting bar bolt. Move alternator aside so there is ample room to work.
3. Disconnect oil pressure gauge harness.



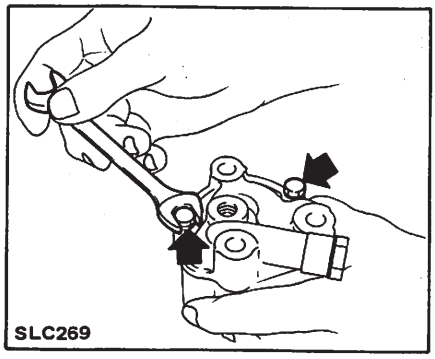
4. Remove oil pump assembly.



DISASSEMBLY AND ASSEMBLY



1. Remove pump cover bolts.

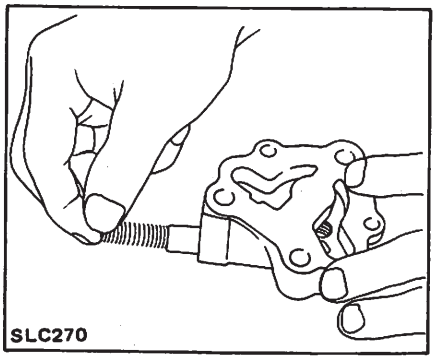


2. Take out outer rotor.

Inner rotor and drive gear cannot be disassembled.

3. Remove regulator valve.

When placing oil pump in a vise, use extreme care not to distort pump body and cover in the jaws.



4. Assemble oil pump in the reverse order of removal.

Use new gasket.

Ⓣ : Regulator valve cap nut:
39 - 49 N·m
(4.0 - 5.0 kg-m,
29 - 36 ft-lb)
Oil pump cover bolt:
3.8 - 5.1 N·m
(0.39 - 0.52 kg-m,
2.8 - 3.8 ft-lb)

INSPECTION

1. Inspect pump body and cover for cracks or excessive wear.
2. Inspect pump rotors for excessive wear.
3. Check inner rotor shaft for looseness in pump body.

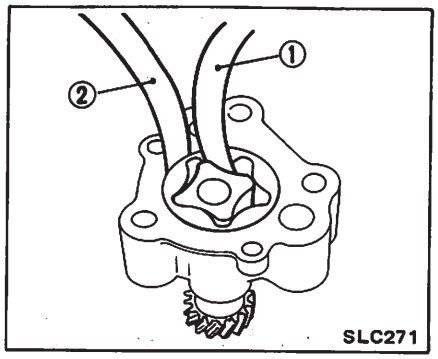
If pump rotors or body are damaged or worn, replacement of the entire oil pump assembly is necessary.

4. Check oil pressure regulator valve sliding surface and vlave spring.

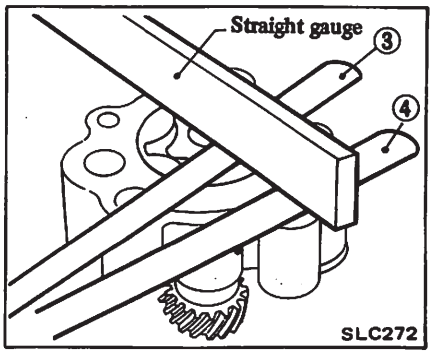
If damaged, replace valve set.

5. Using a feeler gauge, check the following clearances.

Rotor tip clearance ①:
Less than
0.12 mm (0.0047 in)
Outer rotor to body clearance ②:
0.15 - 0.21 mm
(0.0059 - 0.0083 in)



Rotor to straight edge ③:
Less than
0.05 mm (0.0020 in)
Oil pump body to straight edge ④:
Less than
0.02 mm (0.0008 in)



INSTALLATION

1. Apply engine oil to pump drive gear and shaft.
2. Charge engine oil into pump and turn pump drive gear several times.
3. Using a new gasket, install oil pump assembly.

Ⓣ : Oil pump mounting bolt & nuts
9.1 - 11.8 N·m
(0.93 - 1.2 kg-m,
6.7 - 8.7 ft-lb)

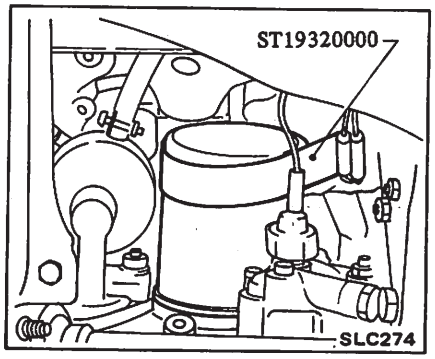
4. Refill engine with oil.

After installation, run engine for a few minutes, and check for leaks.

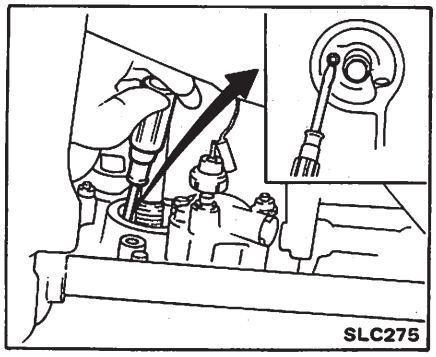
OIL FILTER

REPLACEMENT

1. Remove oil filter.



2. Check oil pressure relief valve for a cracked or broken valve. If necessary remove valve by prying it out with a screwdriver. Install a new valve by tapping it in place.



3. Install oil filter.

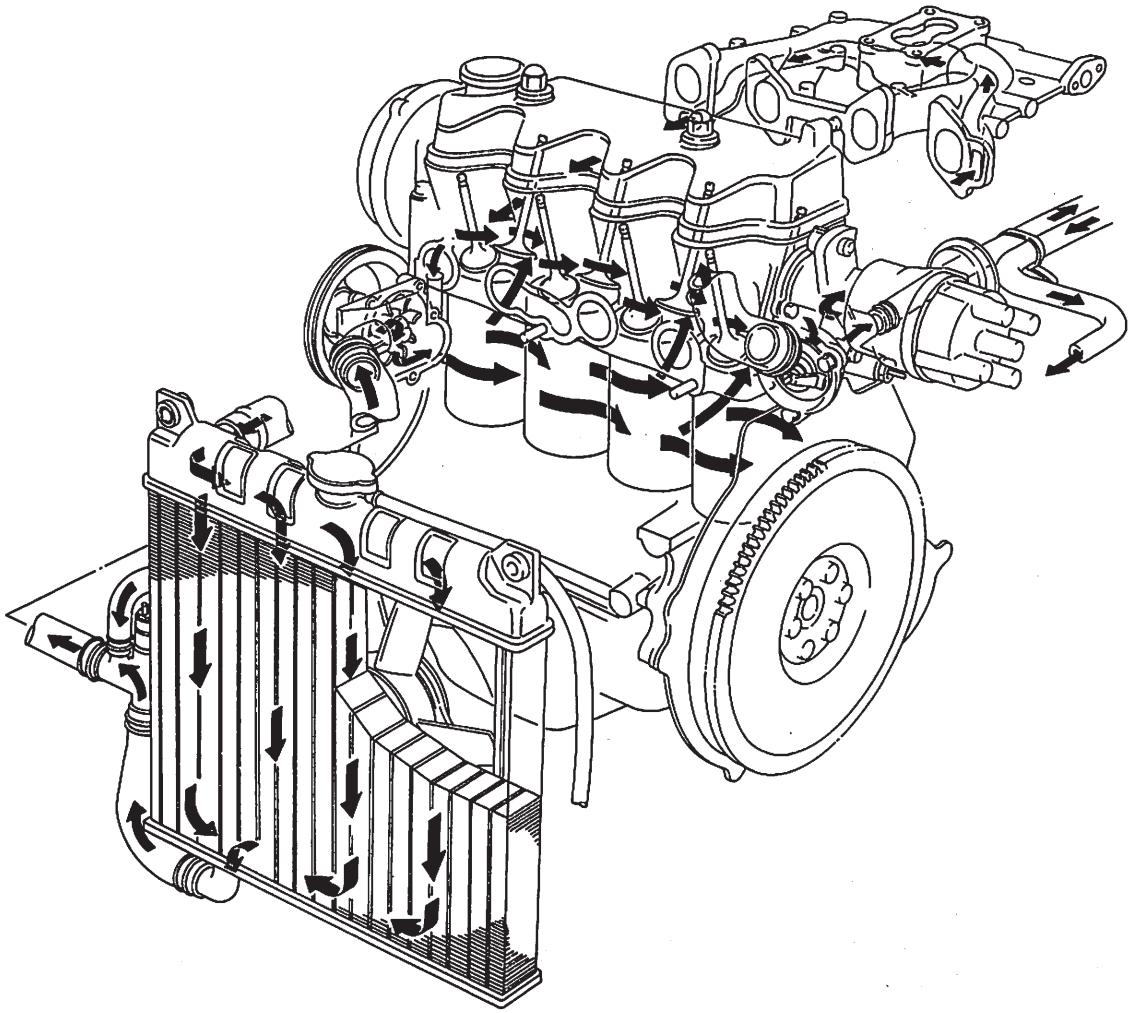
Hand-tighten only.
Do not use a wrench to tighten the filter.

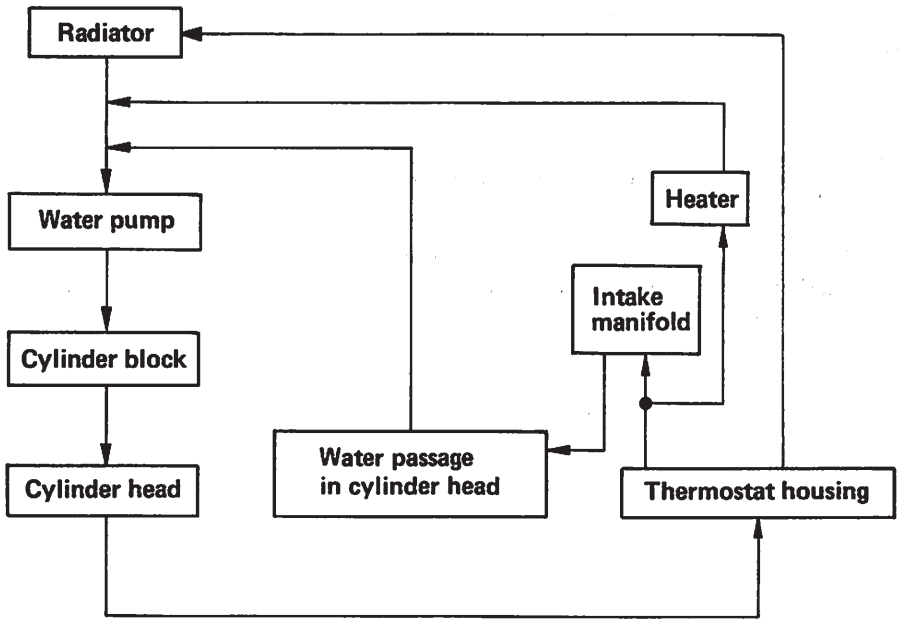
4. Refill with the specified quantity of engine oil.

After installation, run engine for a few minutes, and check for leaks.

COOLING SYSTEM

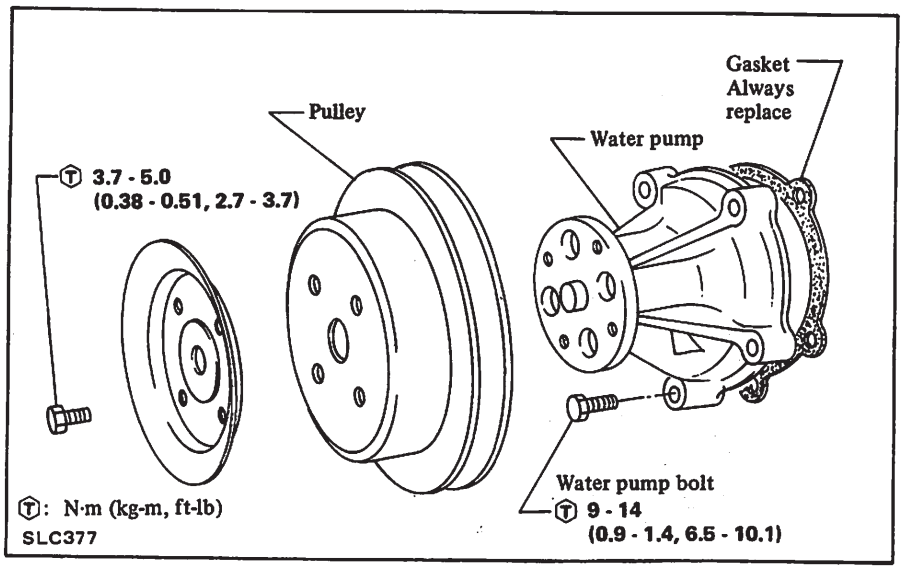
COOLING CIRCUIT





SLC276

WATER PUMP



REMOVAL

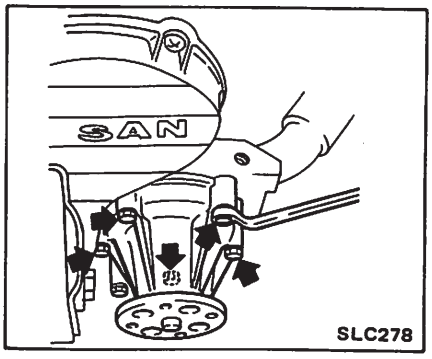
1. Open radiator drain cock and radiator cap, and drain coolant.

WARNING:
To avoid the danger of being scalded, never attempt to drain the coolant when the engine is hot.

2. Remove power steering drive belt.
3. Remove power steering oil pump.

Do not drain power steering oil.

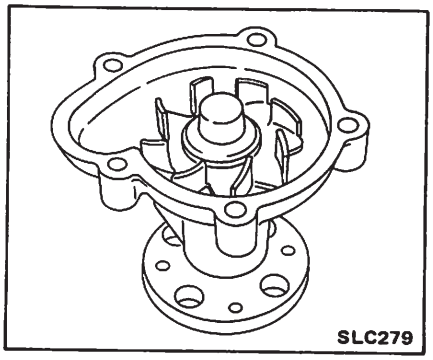
4. Remove water pump (alternator) drive belt.
(1) Loosen alternator securing bolts.
(2) Move alternator toward the engine.
5. Remove water pump pulley.
6. Remove water pump with gasket.



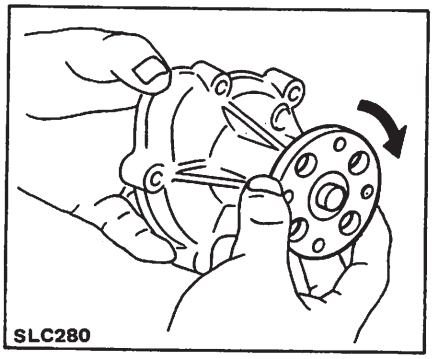
INSPECTION

The water pump cannot be disassembled and should be replaced as a unit.

1. Inspect water pump body and vane for rust or corrosion.



2. Inspect water pump bearing.
Check for excessive end play or rough operation.



INSTALLATION

1. Install water pump, alternator, power steering oil pump and drive belts in the reverse order of removal.

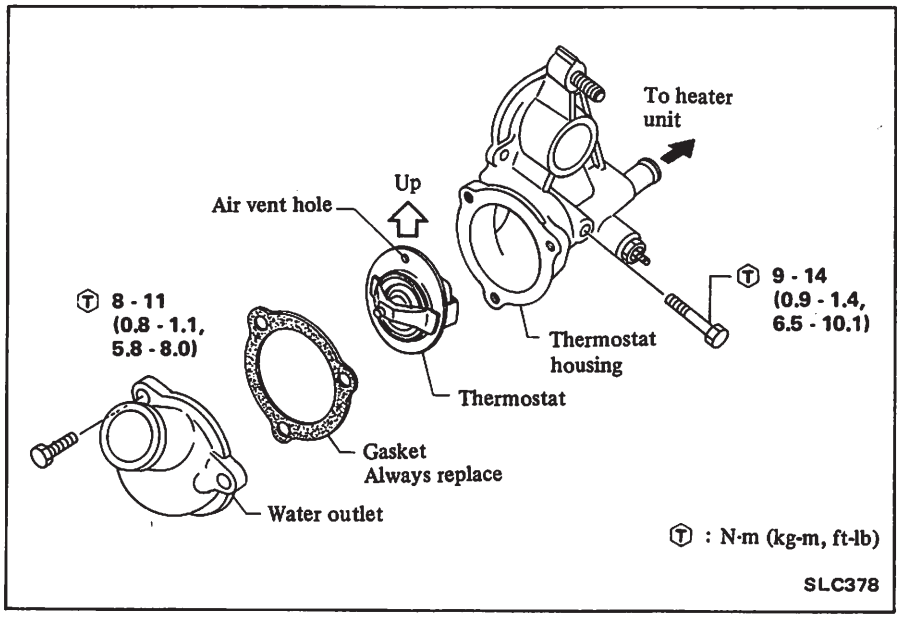
Always use new gasket.

Ⓣ : Water pump bolt
9 - 14 N·m
(0.9 - 1.4 kg-m,
6.5 - 10.1 ft-lb)

2. Adjust drive belt deflection.
Refer to Section MA for drive belt deflection.
3. Fill radiator with coolant.

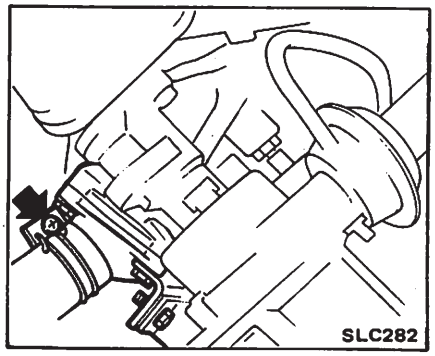
After installation, run engine for a few minutes, and check for leaks.

THERMOSTAT

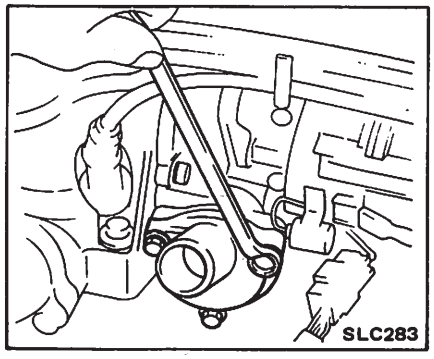


REMOVAL

1. Drain coolant so that its level is below the thermostat housing.
2. Disconnect radiator upper hose on water outlet side.



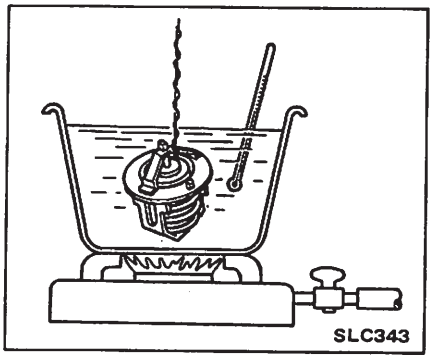
3. Remove E.A.I. tube clamp bolts.
4. Remove water outlet, then remove thermostat with gasket.



INSPECTION

Inspect thermostat for the following and replace if necessary.

1. Valve seating condition at ordinary temperature. It should seat tightly.
2. Valve opening temperature and maximum valve lift. (Refer to S.D.S.)

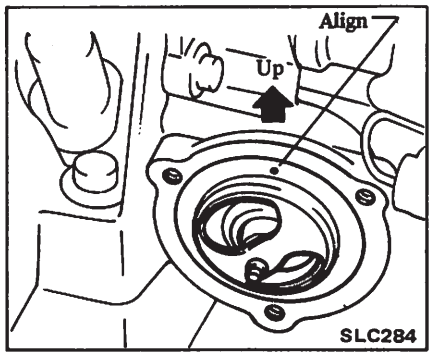


3. Then check if valve closes at 5°C (9°F) below valve opening temperature.

It is necessary to check the new thermostat before installing it.

INSTALLATION

1. Install thermostat to thermostat housing with jiggle valve or air vent facing upward.



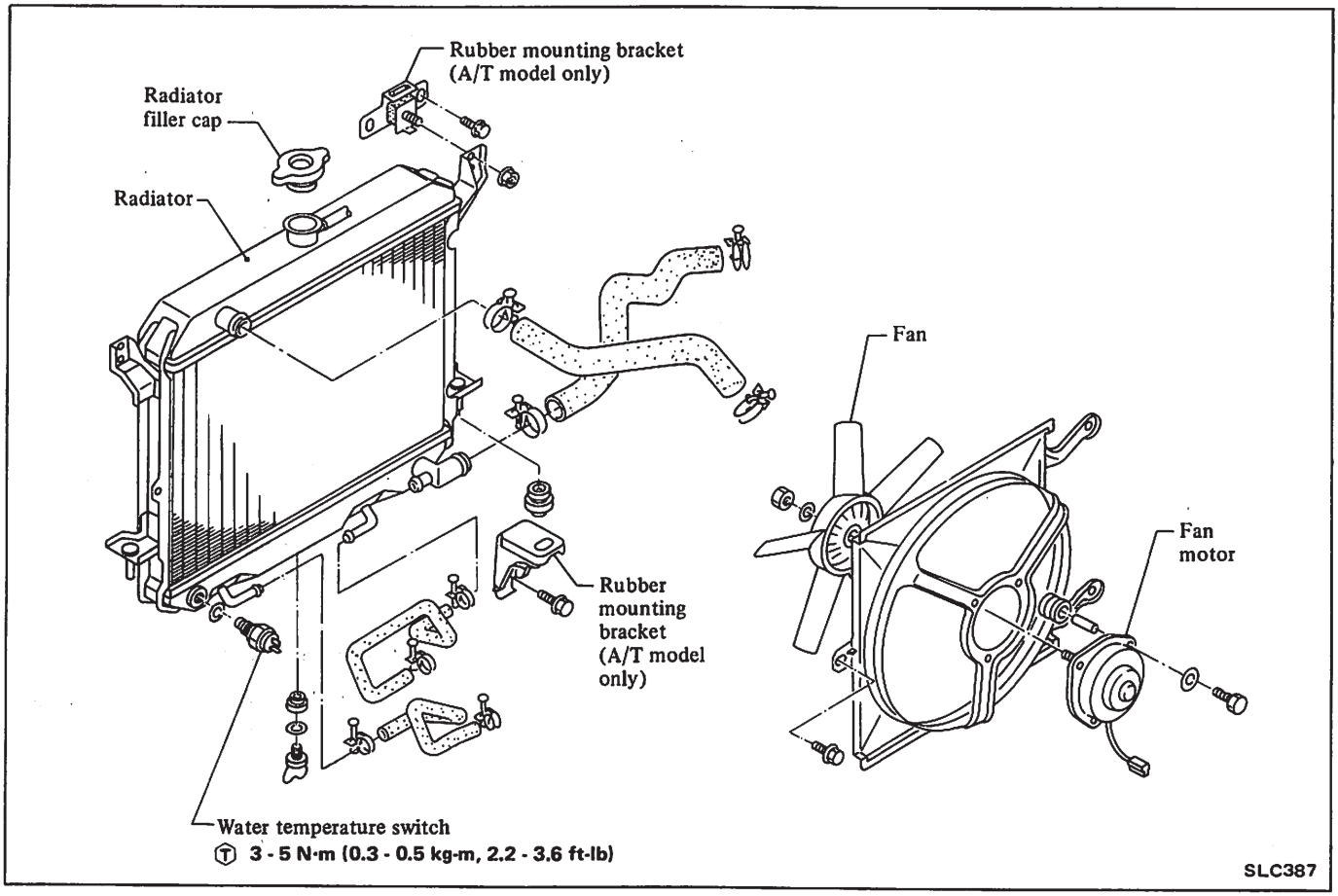
2. Install water outlet together with new gasket.

Ⓣ : Attaching bolt
8 - 11 N·m
(0.8 - 1.1 kg-m,
5.8 - 8.0 ft-lb)

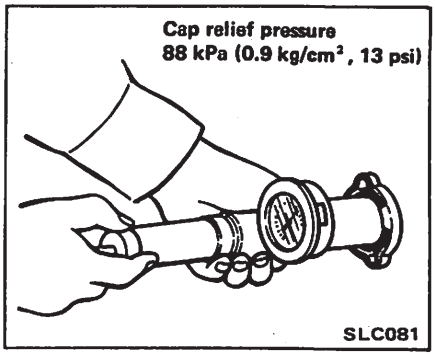
3. Connect radiator upper hose.
4. Fill radiator with coolant.

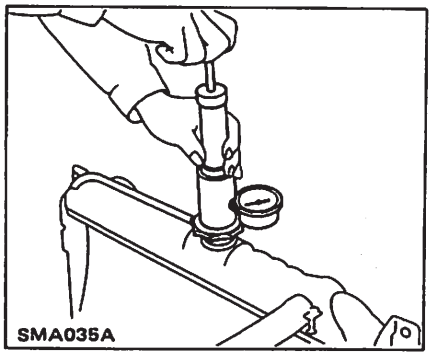
After installation, run engine for a few minutes, and check for leaks.

RADIATOR AND COOLING FAN



WARNING:
Never remove the radiator cap when the engine is hot; serious burns could be caused by high pressure fluid escaping from the radiator.
Wrap a thick cloth around cap and carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape and then turn the cap all the way off.





INSPECTION

Checking radiator cap

Using cap tester, check the radiator cap relief pressure.

If the pressure gauge drops rapidly and excessively, replace the radiator cap.

Checking cooling system for leaks

Attach pressure tester. Then pump the tester to the specified pressure.

Check for drop in pressure.

If the pressure drops, check for leaks from hoses, radiator, or water pump.

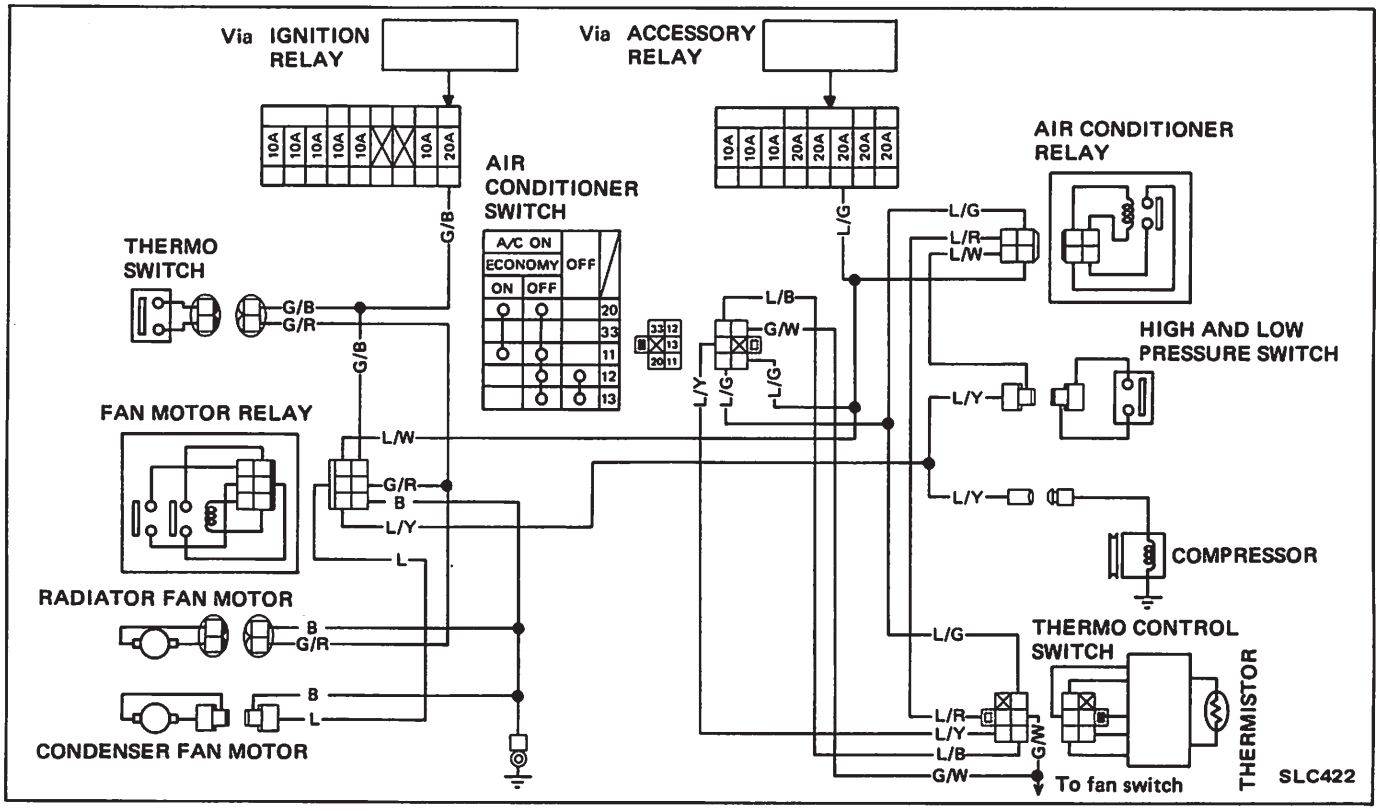
If no external leaks are found, check heater core, block and head.

Operation

Water temperature °C (°F)	Air conditioner compressor	Fan motor
Below 90 (194)	Does not operate	Does not operate
	Operates	Operates
Above 90 (194)	Does not operate	
	Operates	

On models not equipped with air conditioner, a fan motor does not operate below a water temperature of 90°C (194°F).

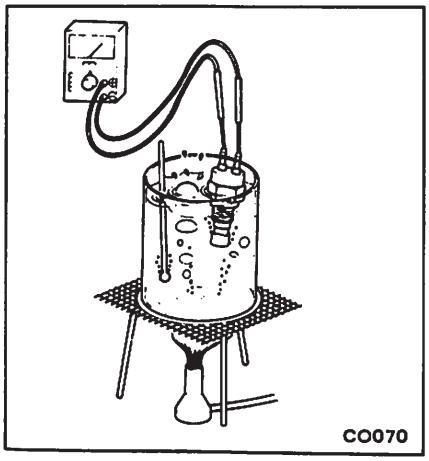
ELECTRIC CIRCUIT



INSPECTION

1. Disconnect fan motor connector, thermo switch, and high and low pressure switch. Then, check voltage between their harness terminals to see if it is 12 volts.
2. If it is not, check switch and relay harnesses for loose connections. If necessary, retighten loose connections.
3. If connections are not tight and secure, check condition of the following switches and relay.

- Thermo switch
  Check water temperature sensing switch for proper operation. If switch does not operate properly at specified temperature, replace it.



- High and low pressure switch
- Air conditioner switch
- Fan switch

} Refer to HA section.

- Motor relay
- Air conditioner relay

} Refer to EL section.

REMOVAL AND INSTALLATION

1. Open radiator drain cock and allow to drain coolant into a suitable container.

WARNING:
To avoid the danger of being scalded, never attempt to drain the coolant when the engine is hot.

2. Disconnect radiator upper hose and lower hose.
3. Remove lower hose adapter.

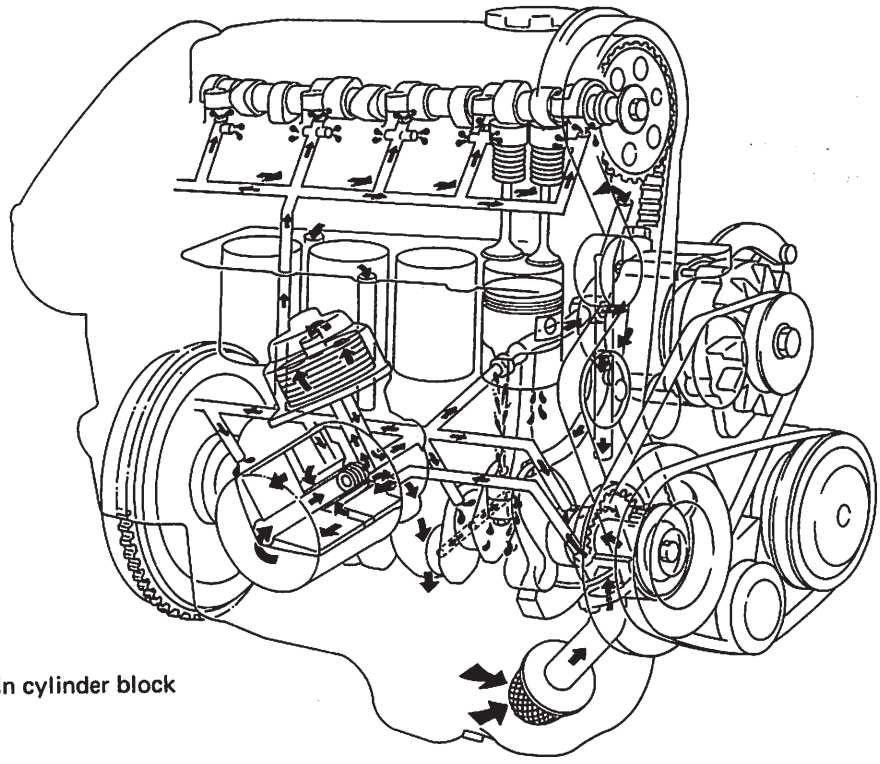
On a car with automatic transaxle, disconnect cooler inlet and outlet hoses from radiator.

4. Disconnect fan motor wire and water temperature switch wire and remove radiator.
5. Install radiator in the reverse order of removal.
6. Fill radiator with the specified quantity of coolant.

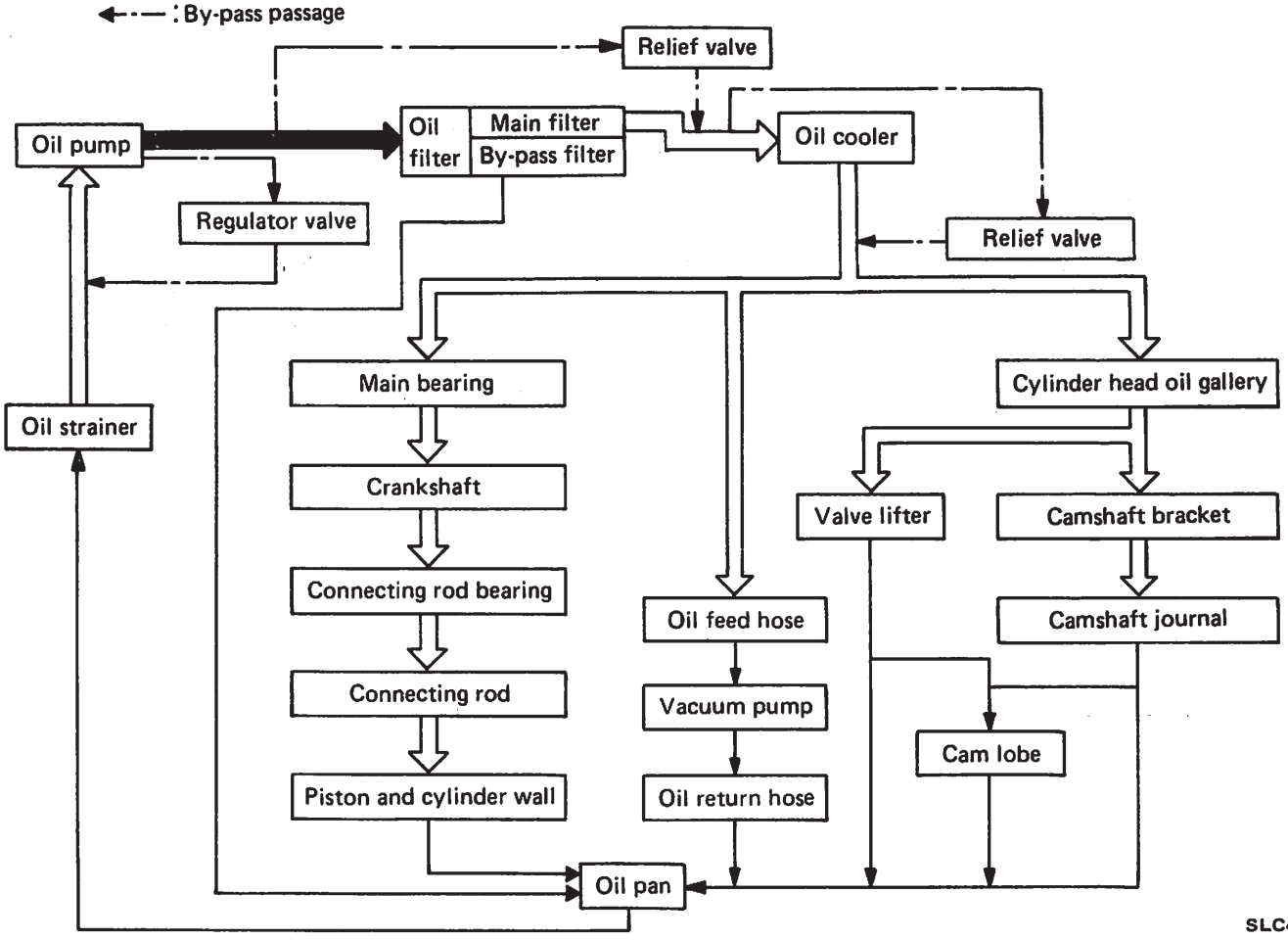
After installation, run engine for a few minutes, and check for leaks.

LUBRICATION SYSTEM

LUBRICATION CIRCUIT



Note: : Oil gallery in cylinder block
: Oil passage
: By-pass passage



SLC410

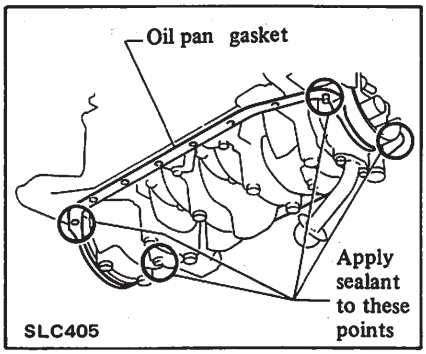
OIL PUMP

REMOVAL AND INSTALLATION

1. Remove valve timing belt.
Refer to section MA for TIMING BELT REPLACEMENT.
2. Drain oil and remove oil pan.
3. Remove oil pump.

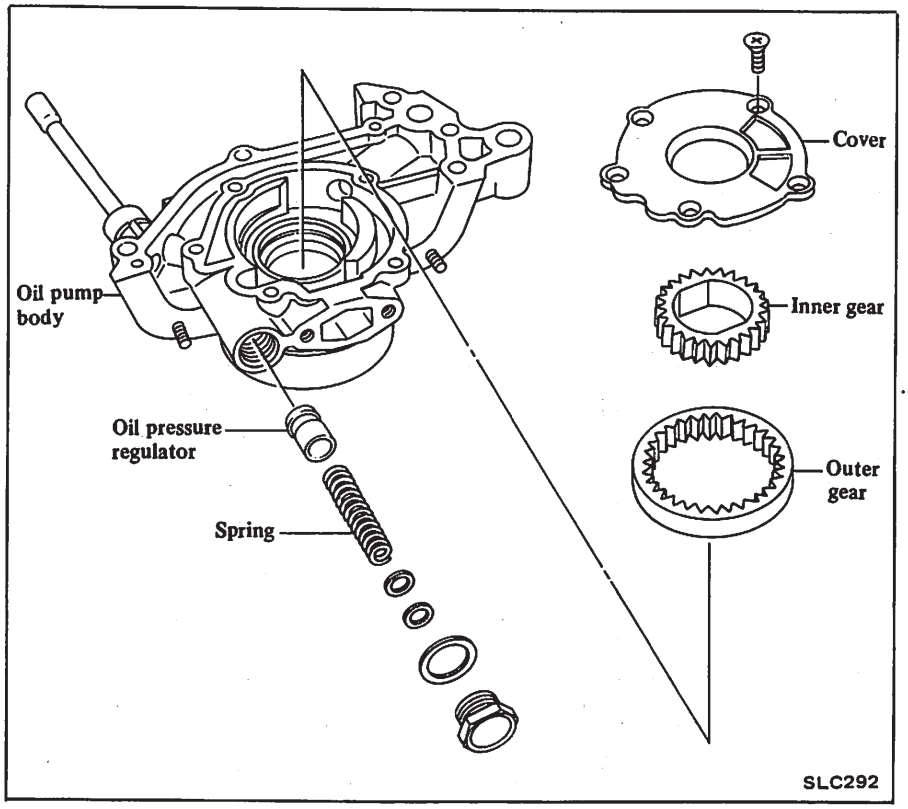
To prevent oil seal from damaging, remove crankshaft key.

4. Install oil pump in the reverse order of removal, noting the following.
(1) Align locating notches and install oil pump.
(2) Apply sealant to new oil pan gasket as follows. Do not apply too much sealant.
(3) Never reuse oil pump gasket.



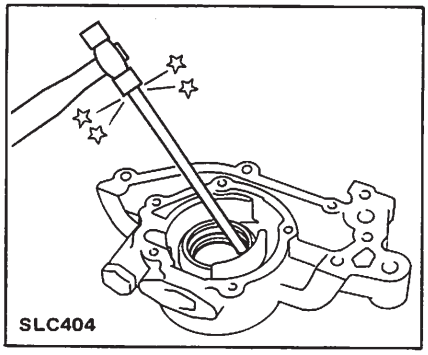
Ⓣ : **Oil pump to cylinder block**
12 - 16 N·m
(1.2 - 1.6 kg-m, 9 - 12 ft-lb)
Oil pan
5 - 7 N·m
(0.5 - 0.7 kg-m, 3.6 - 5.1 ft-lb)

DISASSEMBLY AND ASSEMBLY

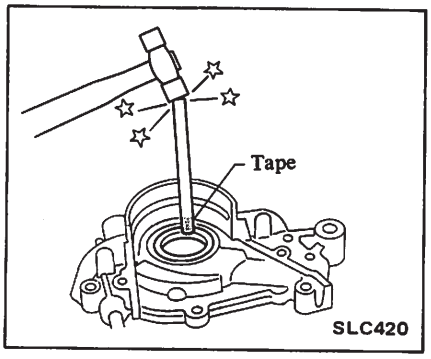


OIL SEAL REPLACEMENT

1. Remove oil seal.



2. Coat with engine oil and install the seal.

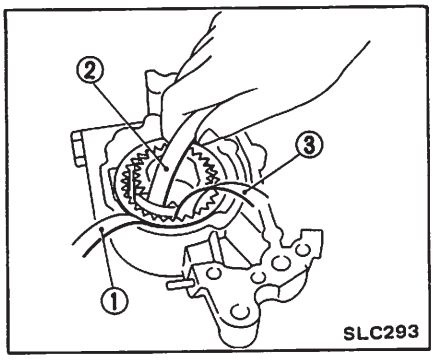


INSPECTION

1. Inspect the following for wear or damage.
- Pump body and cover

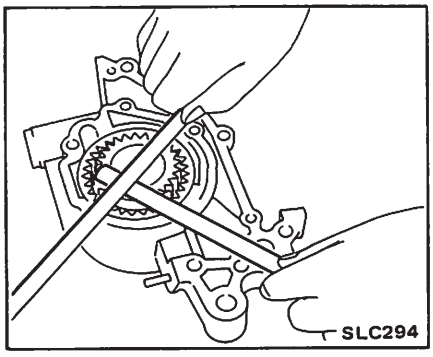
2. Using a feeler gauge, check the following clearances.

Body to outer gear clearance ① :
0.11 - 0.2 mm
(0.0043 - 0.0079 in)
Inner gear to crescent clearance ② :
0.12 - 0.23 mm
(0.0047 - 0.0091 in)
Outer gear to crescent clearance ③ :
0.21 - 0.32 mm
(0.0083 - 0.0126 in)



3. Using a feeler gauge and a straight edge, check the following gap.

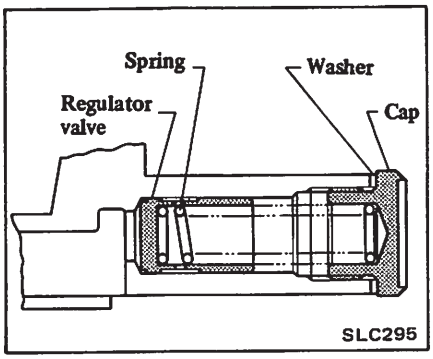
Housing to gear clearance:
0.05 - 0.10 mm
(0.0020 - 0.0039 in)



OIL PRESSURE REGULATOR VALVE

INSPECTION

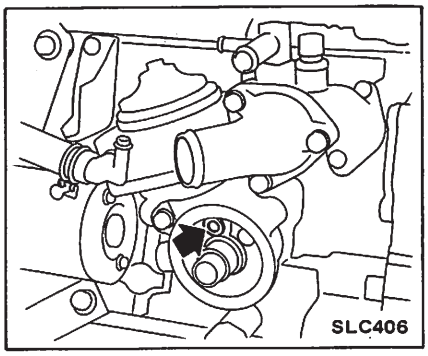
Check valve sliding surface and valve spring, and replace entire valve assembly if necessary.



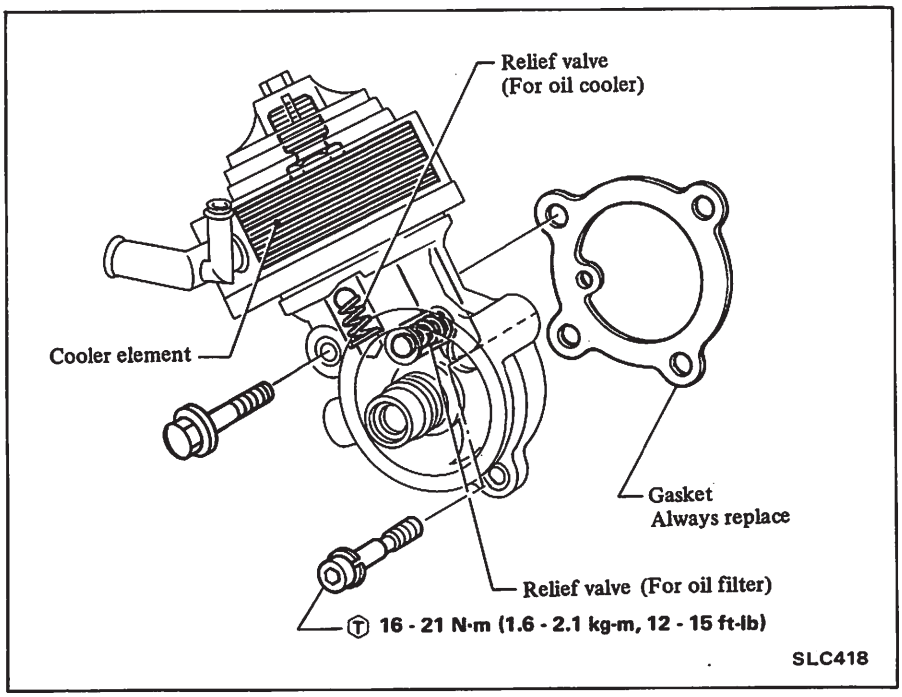
OIL PRESSURE RELIEF VALVE

INSPECTION

With oil filter removed, check the condition of the valve unit. Inspect for a cracked or broken valve.
If replacement is necessary, remove valve by prying it out with a screwdriver. Install a new valve in place by tapping it.

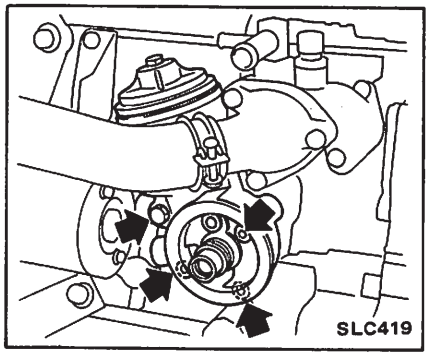


OIL COOLER

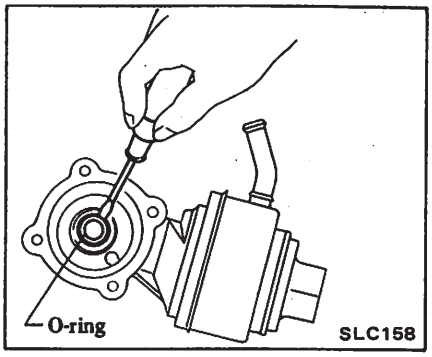


REMOVAL

1. Drain coolant.
2. Remove coolant hoses.
3. Remove oil filter.
4. Remove oil cooler attaching bolts.



5. Remove O-ring from bracket.



INSTALLATION

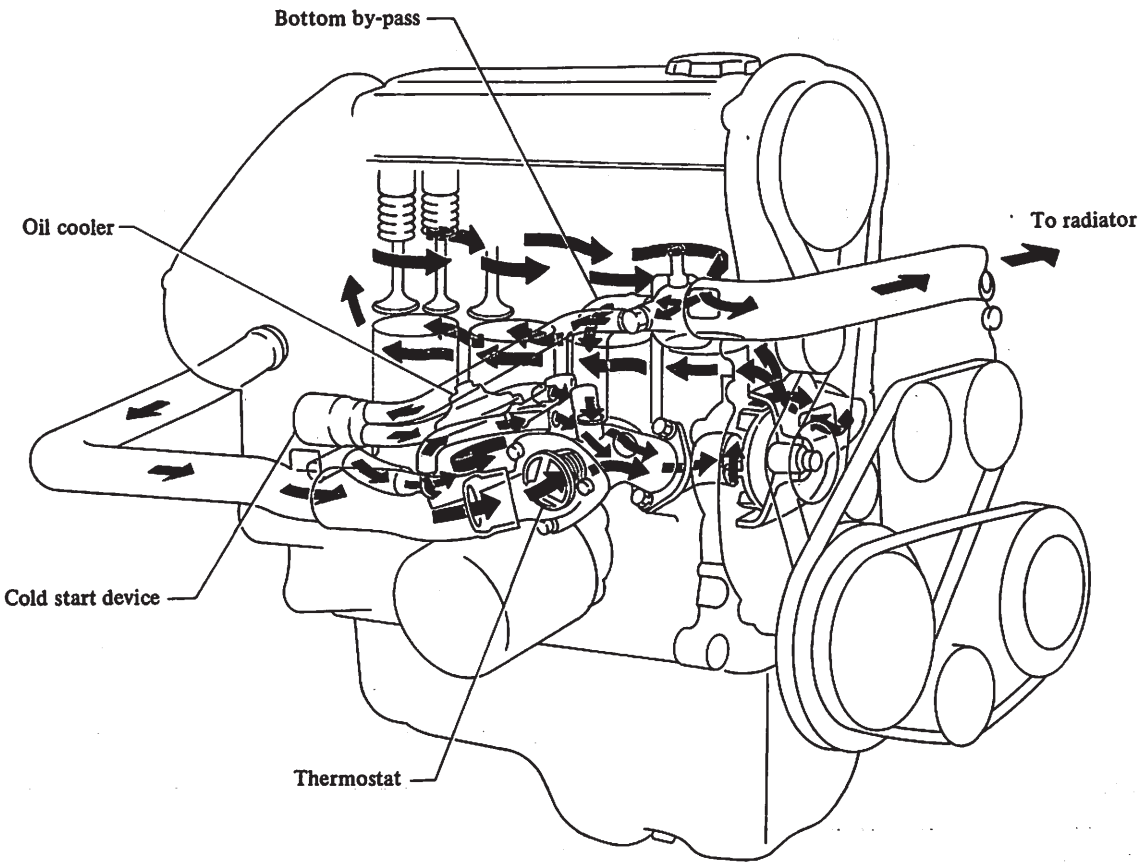
Install oil cooler in the reverse order of removal.

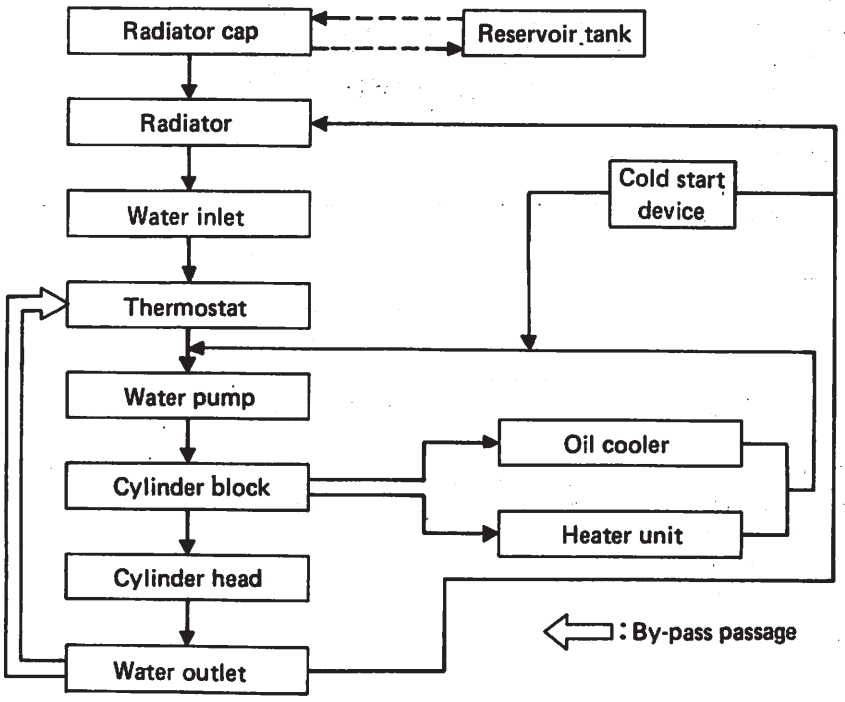
Ⓣ : **Oil cooler fixing bolt**
16 - 21 N·m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)

a. **Install oil filter referring to section MA.**
b. **After installing, run engine for a few minutes, and check for leaks.**

COOLING SYSTEM

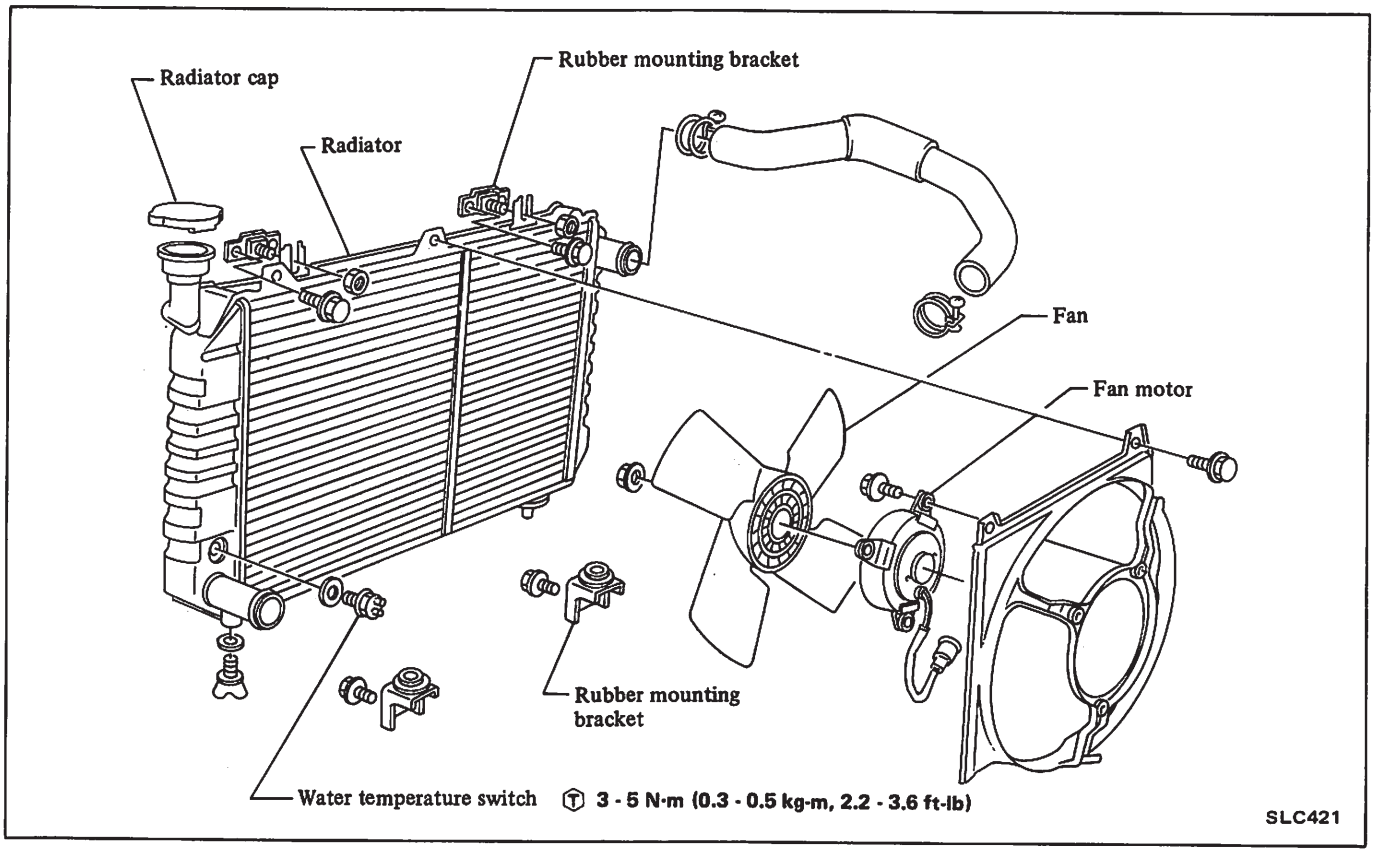
COOLING CIRCUIT





SLC407

RADIATOR AND ELECTRIC COOLING FAN



RADIATOR

WARNING:
To avoid serious personal injury, never remove radiator cap quickly when engine is hot. Sudden release of cooling system pressure is very dangerous.
If it is necessary to remove radiator cap when radiator is hot, turn cap slowly counterclockwise to the first stop. After all pressure in the cooling system is released, turn cap passing the stop and remove it.

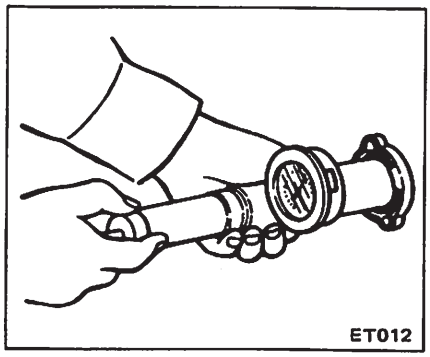
Inspection

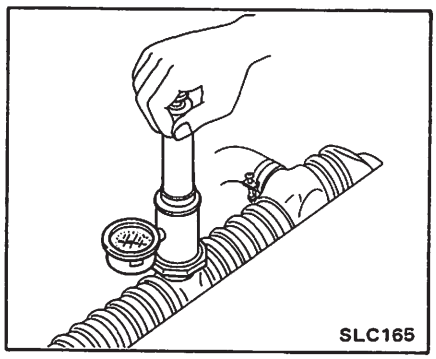
Inspect radiator cap and water leakage using cap tester.

1. Inspection of radiator cap.

First, check rubber seal on cap for tears, cracks or deterioration after cleaning it. Then, install radiator cap on a tester. If cap does not hold or will not release at the specified pressure, replace cap.

Cap relief pressure:
88 kPa (0.9 kg/cm^2, 13 psi)





2. Inspection of water leakage.

With radiator cap removed, apply test pressure to radiator on the vehicle.
If leakage is detected, repair or replace radiator.

Leakage test pressure:
157 kPa (1.6 kg/cm^2, 23 psi)

ELECTRICAL COOLING FAN

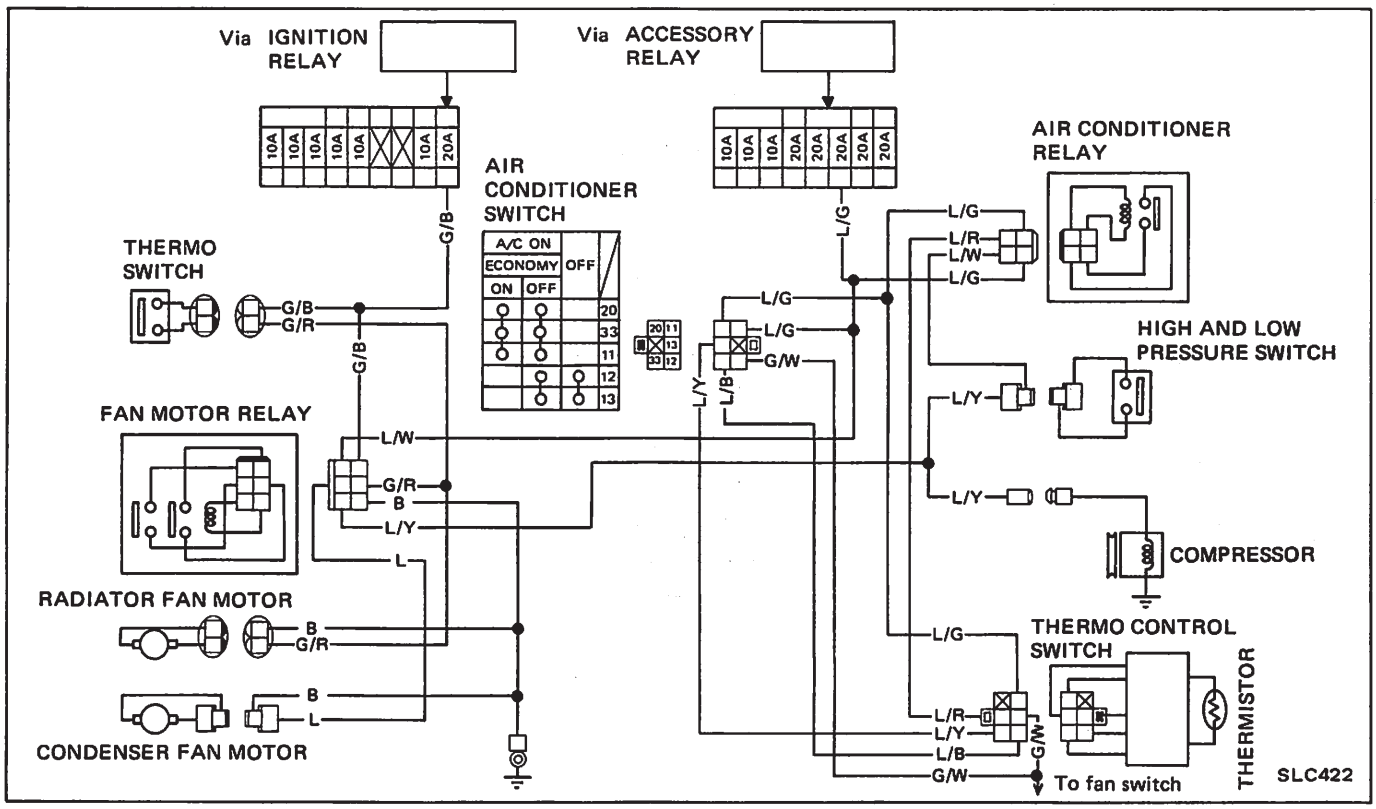
The cooling fan is driven by an electric fan motor which monitors the temperature of coolant and the operating of air conditioner compressor.

Operation

Water temperature °C (°F)	Air conditioner compressor	Fan motor
Below 90 (194)	Does not operate	Does not operate
	Operates	Operates
Above 90 (194)	Does not operate	
	Operates	

On models not equipped with air conditioner, a fan motor does not operate below a water temperature of 90°C (194°F).

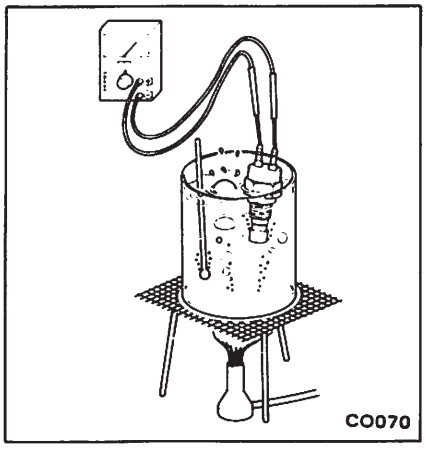
ELECTRIC CIRCUIT



INSPECTION

1. Disconnect fan motor connector, thermo switch, and high and low pressure switch. Then, check voltage between their harness terminals to see if it is 12 volts.
2. If it is not, check switch and relay harnesses for loose connections. If necessary, retighten loose connections.
3. If connections are not tight and secure, check condition of the following switches and relay.

- Thermo switch
  Check water temperature sensing switch for proper operation. If switch does not operate properly at specified temperature, replace it.



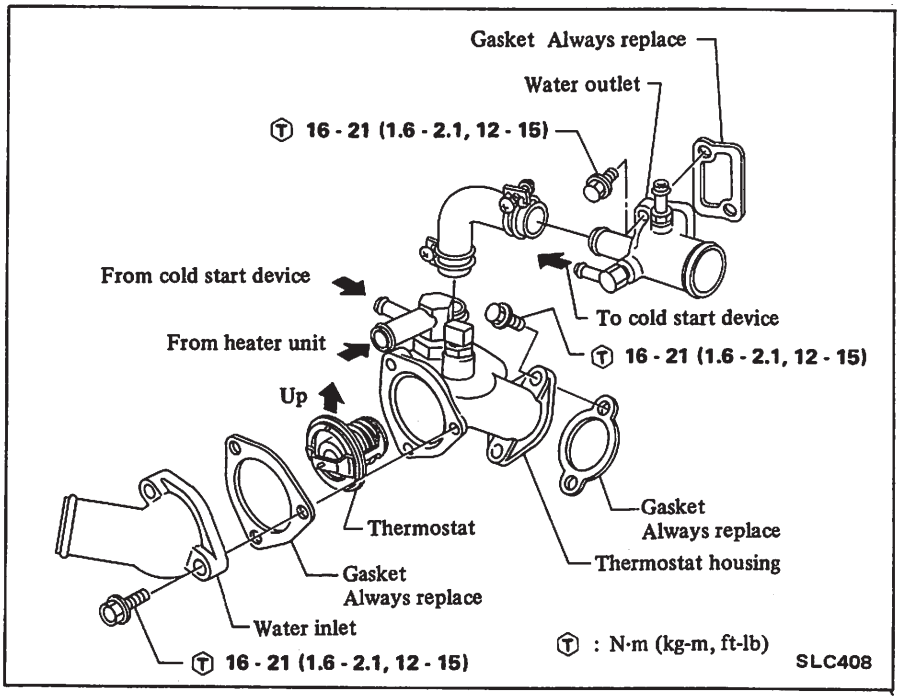
- High and low pressure switch
- Air conditioner switch
- Fan switch

Refer to HA section.

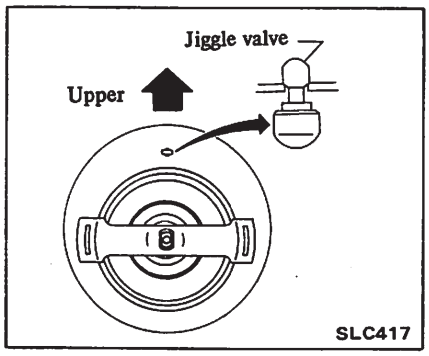
- Motor relay
- Air conditioner relay

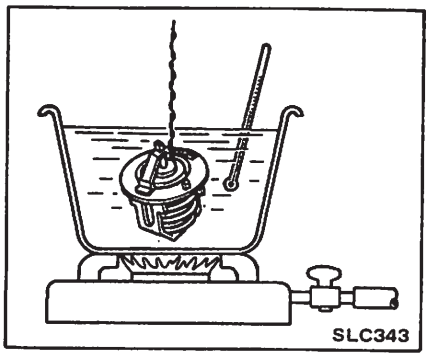
Refer to EL section.

THERMOSTAT



Ensure that thermostat is positioned with jiggle valve facing upward when it is installed.





3. Then check if valve closes at 5°C (9°F) below valve opening temperature.

INSPECTION

Inspect thermostat for the following and replace if necessary.

1. Valve seating condition at ordinary temperature. It should seat tightly.
2. Valve opening temperature and maximum valve lift. (Refer to S.D.S.)

WATER PUMP

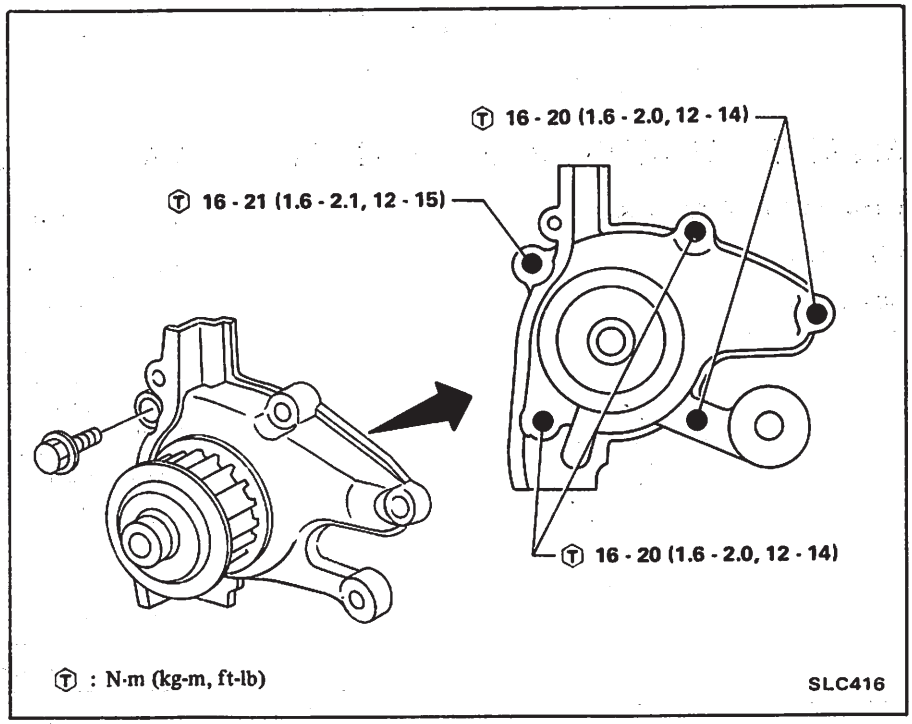
Water pump should not be disassembled. Only replace as an assembly.

INSPECTION

Inspect pump assembly for the following conditions and replace if necessary.

1. Badly rusted or corroded body assembly and vane.
2. Excessive end play or roughness of bearings in operation.

If excessive mechanical seal squeak occurs when engine is running, use suitable water pump seal lubricant to prevent squeak.



SERVICE DATA AND SPECIFICATIONS (S.D.S.)

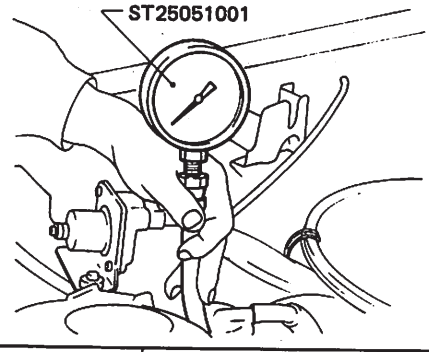
E15 & E16

ENGINE LUBRICATION SYSTEM

INSPECTION AND ADJUSTMENT

Oil pump

Oil pressure



SLC287

Engine rpm	Discharge pressure kPa (kg/cm², psi)
1,050	196 (2, 28)
1,700	294 (3, 43)
5,150	392 (4, 57)

Pump unit

Unit: mm (in)

Outer rotor to body clearance ①	Less than 0.12 (0.0047)
Rotor tip clearance ②	0.15 - 0.21 (0.0059 - 0.0083)
Gap between outer rotor and inner rotor ③	Less than 0.05 (0.0020)
Gap between rotor and body ④	Less than 0.02 (0.0008)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Oil pump securing bolt & nuts	9.1 - 11.8	0.93 - 1.2	6.7 - 8.7
Oil pump cover bolt	3.8 - 5.1	0.39 - 0.52	2.8 - 3.8
Regulator valve cap nut	39 - 49	4.0 - 5.0	29 - 36

ENGINE COOLING SYSTEM

INSPECTION AND ADJUSTMENT

Thermostat

	Frigid type	Standard type	Tropical type
Valve opening temperature °C (°F)	88 (190)	82 (180)	76.5 (170)
Max. valve lift mm/°C (in/°F)	8/100 (0.31/212)	8/95 (0.31/203)	8/90 (0.31/194)

Radiator

Cap relief pressure	kPa (kg/cm², psi)	88 (0.9, 13)
Leakage test pressure	kPa (kg/cm², psi)	157 (1.6, 23)

Water temperature switch

Operating temperature OFF → ON °C (°F)	90 (194)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Water pump securing bolt	9 - 14	0.9 - 1.4	6.5 - 10.1
Water outlet securing bolt	8 - 11	0.8 - 1.1	5.8 - 8.0

CD17

INSPECTION AND ADJUSTMENT

OIL PUMP

Unit: mm (in)

Body to outer gear clearance	0.11 - 0.2 (0.0043 - 0.0079)
Inner gear to crescent clearance	0.12 - 0.23 (0.0047 - 0.0091)
Outer gear to crescent clearance	0.21 - 0.32 (0.0083 - 0.0126)

RADIATOR

Unit: kPa (kg/cm², psi)

Cap relief pressure	88 (0.9, 13)
Leakage test pressure	157 (1.6, 23)

THERMOSTAT

	Standard	Frigid type
Valve opening temperature °C (°F)	82 (180)	88 (190)
Max. valve lift mm/°C (in/°F)	8/95 (0.31/203)	8/100 (0.31/212)

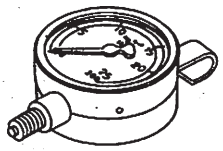
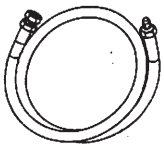
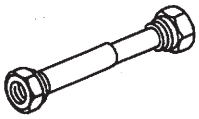
WATER PUMP

Alternator belt deflection mm (in)/N (kg, lb)	9 - 15 (0.35 - 0.59)/ 98 (10, 22)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Oil pump mounting bolt	12 - 16	1.2 - 1.6	9 - 12
Oil pump cover bolt	4 - 5	0.4 - 0.5	2.9 - 3.6
Oil pan	5 - 7	0.5 - 0.7	3.6 - 5.1
Oil cooler fixing bolt	16 - 21	1.6 - 2.1	12 - 15
Regulator valve cap	39 - 49	4 - 5	29 - 36
Water pump securing bolt	16 - 20 16 - 21	1.6 - 2.0 1.6 - 2.1	12 - 14 12 - 15

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name
ST25051001 (J25695-1)	Oil pressure gauge 
ST25052000 (J25695-2)	Hose 
ST25053000 (J25695-3)	Joint pipe 
ST25054000 (J25695-4) or 11025-61501 (Part No.)	Adapter 

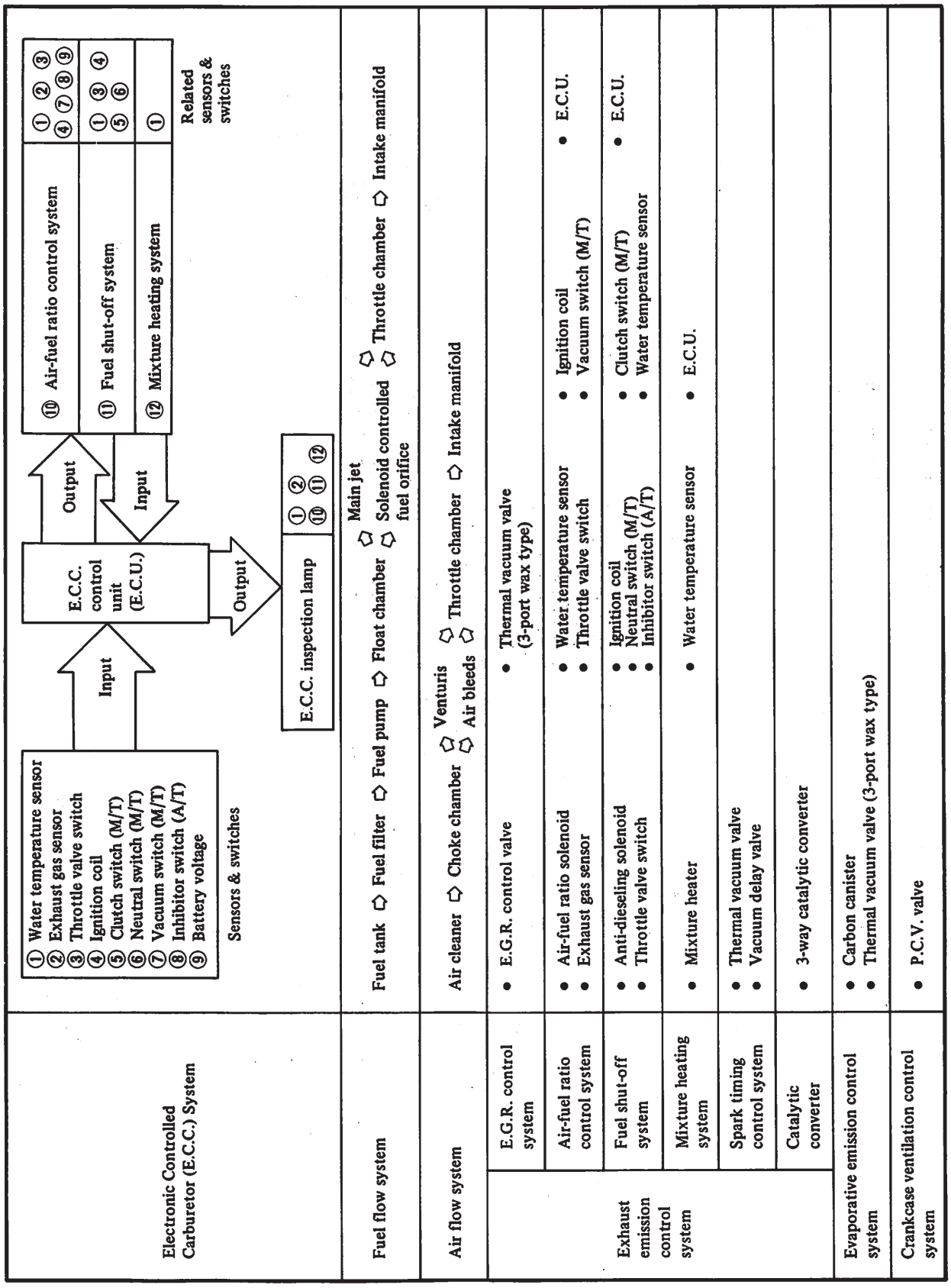
ENGINE FUEL & EMISSION CONTROL SYSTEM

SECTION EF & EC

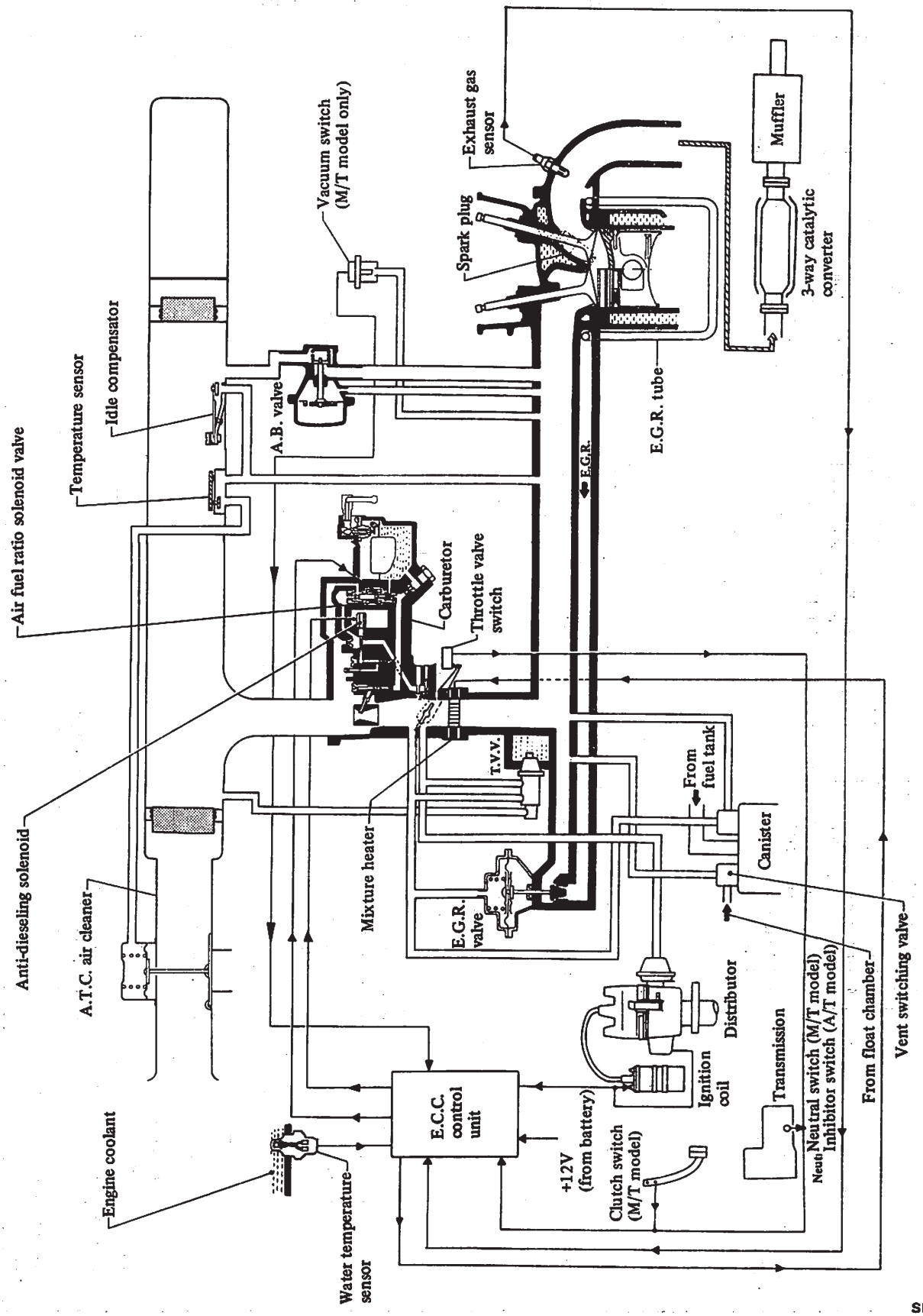
CONTENTS

CONTENTS

ENGINE AND EMISSION CONTROL SYSTEM CHART OF ELECTRONIC CONTROLLED CARBURETOR (E16 E.C.C.) ENGINE FOR CALIFORNIA

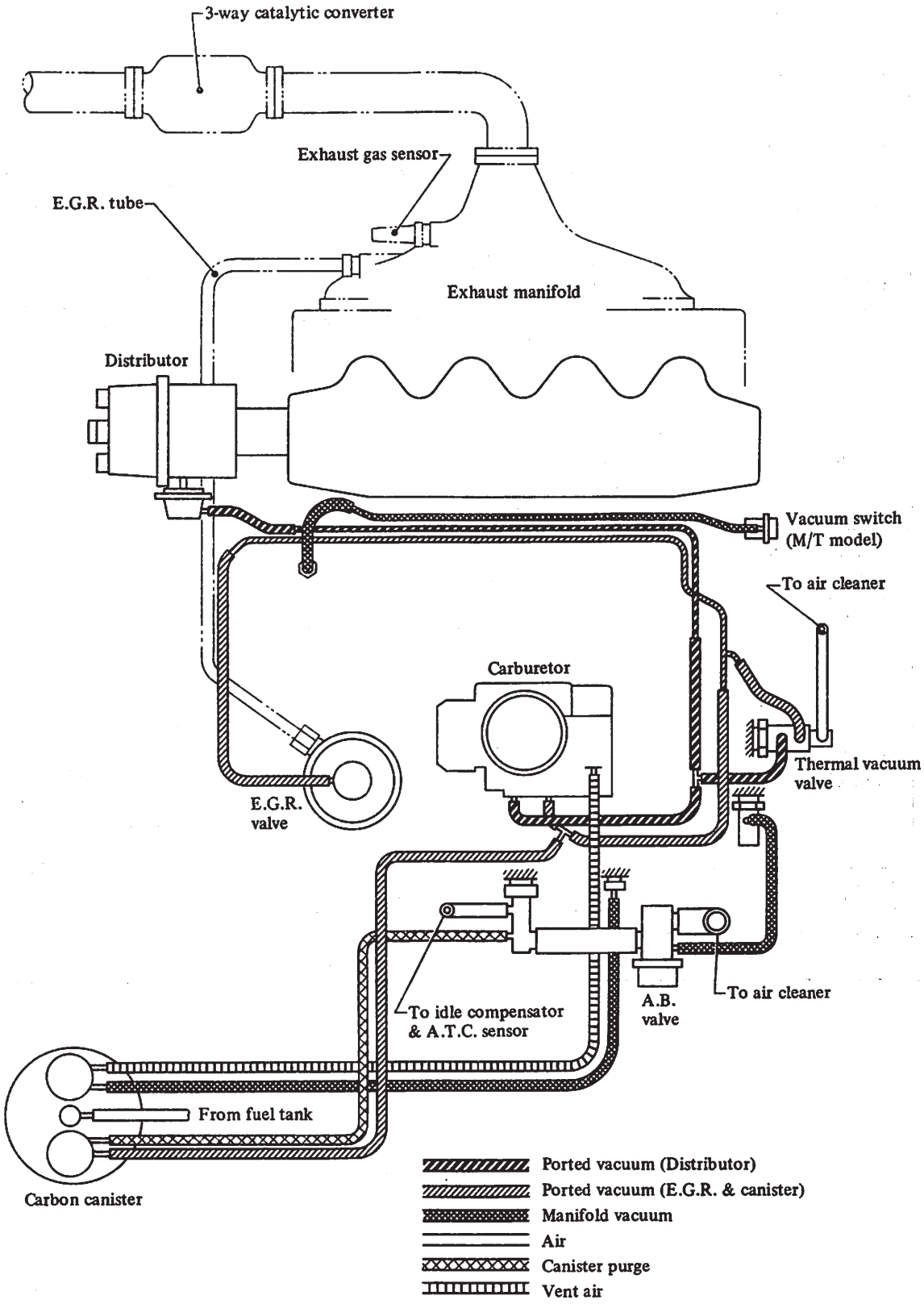


ENGINE AND EMISSION CONTROL SYSTEM DIAGRAM A OF E16 E.C.C. ENGINE FOR CALIFORNIA



SEF715A

ENGINE AND EMISSION CONTROL SYSTEM DIAGRAM B OF E16 E.C.C. ENGINE FOR CALIFORNIA

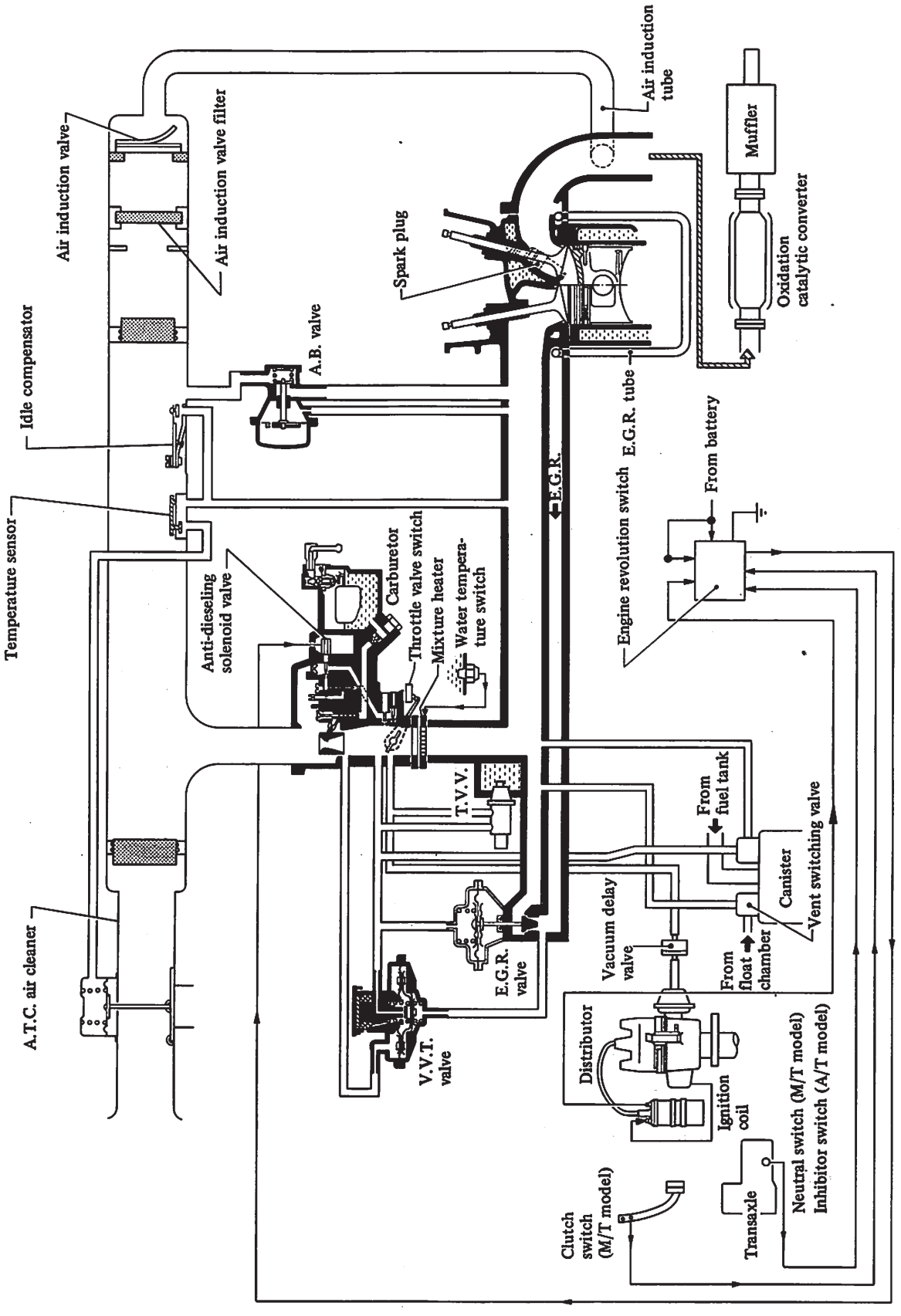


SEF717A

ENGINE AND EMISSION CONTROL SYSTEM TABLE OF CARBURETOR ENGINES FOR NON-CALIFORNIA

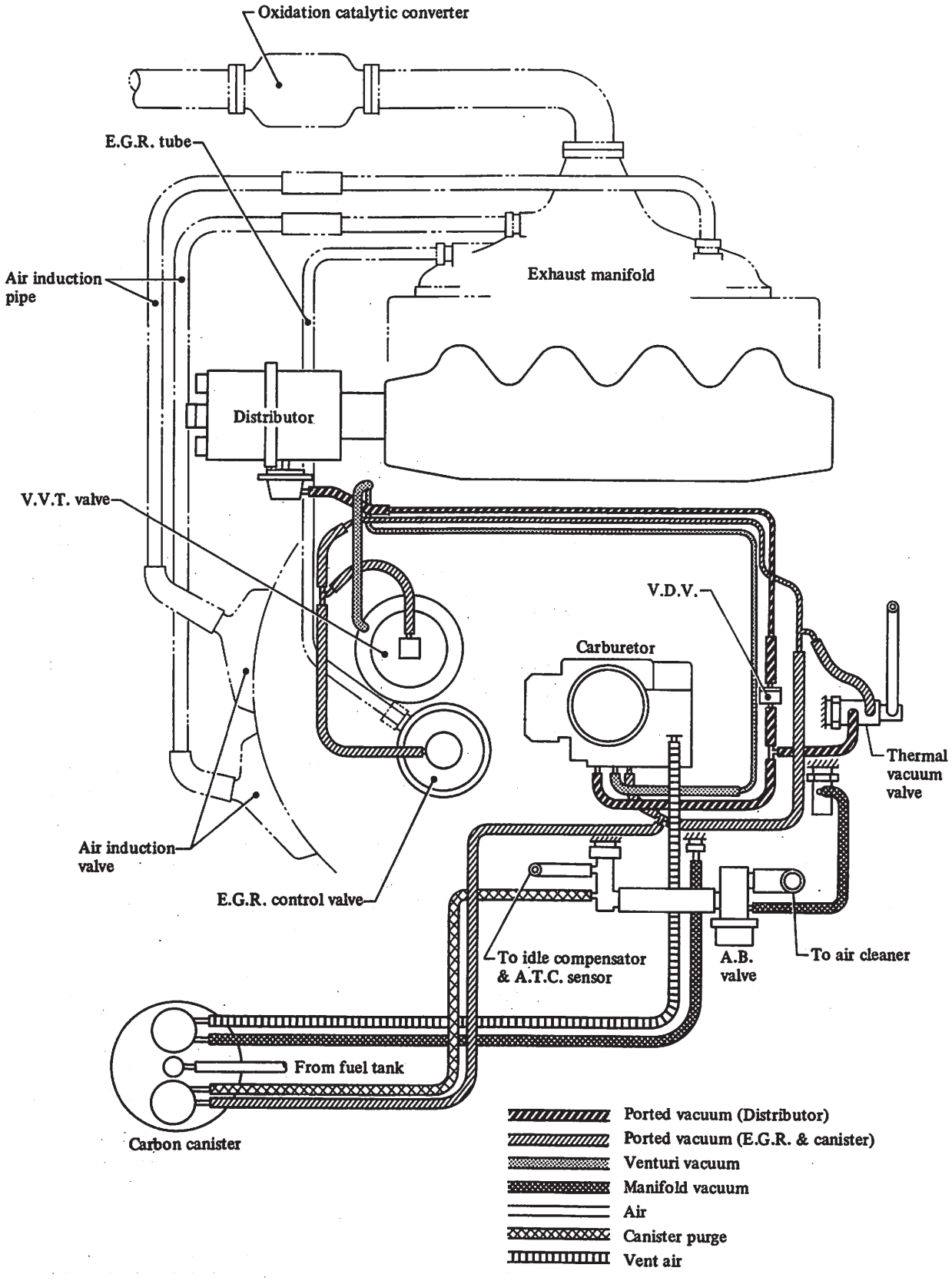
Item \ Car model		U.S.A. Non-California	Canada
Crankcase emission control system		• P.C.V. valve	
Exhaust emission control system	Air induction system (A.I.S.)	• Air induction valve (2 valves) • Air induction pipe (2 pipes) • A.B. valve	• Air induction valve (1 valve) • Air induction pipe (1 pipe) • A.B. valve
	E.G.R. control system	• E.G.R. control valve • V.V.T. valve • Thermal vacuum valve (3-port wax type) [50°C (122°F)]	• E.G.R. control valve • Thermal vacuum valve (2-port bimetal type)
	Fuel shut-off system	• Anti-dieseling solenoid valve • Engine revolution switch • Throttle valve switch • Inhibitor switch (A/T) • Neutral switch (M/T) • Clutch switch (M/T) • Ignition coil	–
	Mixture heating system	• Mixture heater • Water temperature switch	
	Spark timing control system	• Thermal vacuum valve (3-port wax type) • Vacuum delay valve	–
	Throttle opener control system	–	• Throttle opener servo diaphragm • Throttle opener solenoid valve • Vacuum control valve • Speed detecting switch and amplifier (M/T) • Inhibitor switch (A/T)
	Catalyzer	• Oxidation catalytic converter	–
Evaporative emission control system		• Carbon canister • Thermal vacuum valve (3-port wax type)	• Carbon canister

ENGINE AND EMISSION CONTROL SYSTEM DIAGRAM A FOR NON-CALIFORNIA



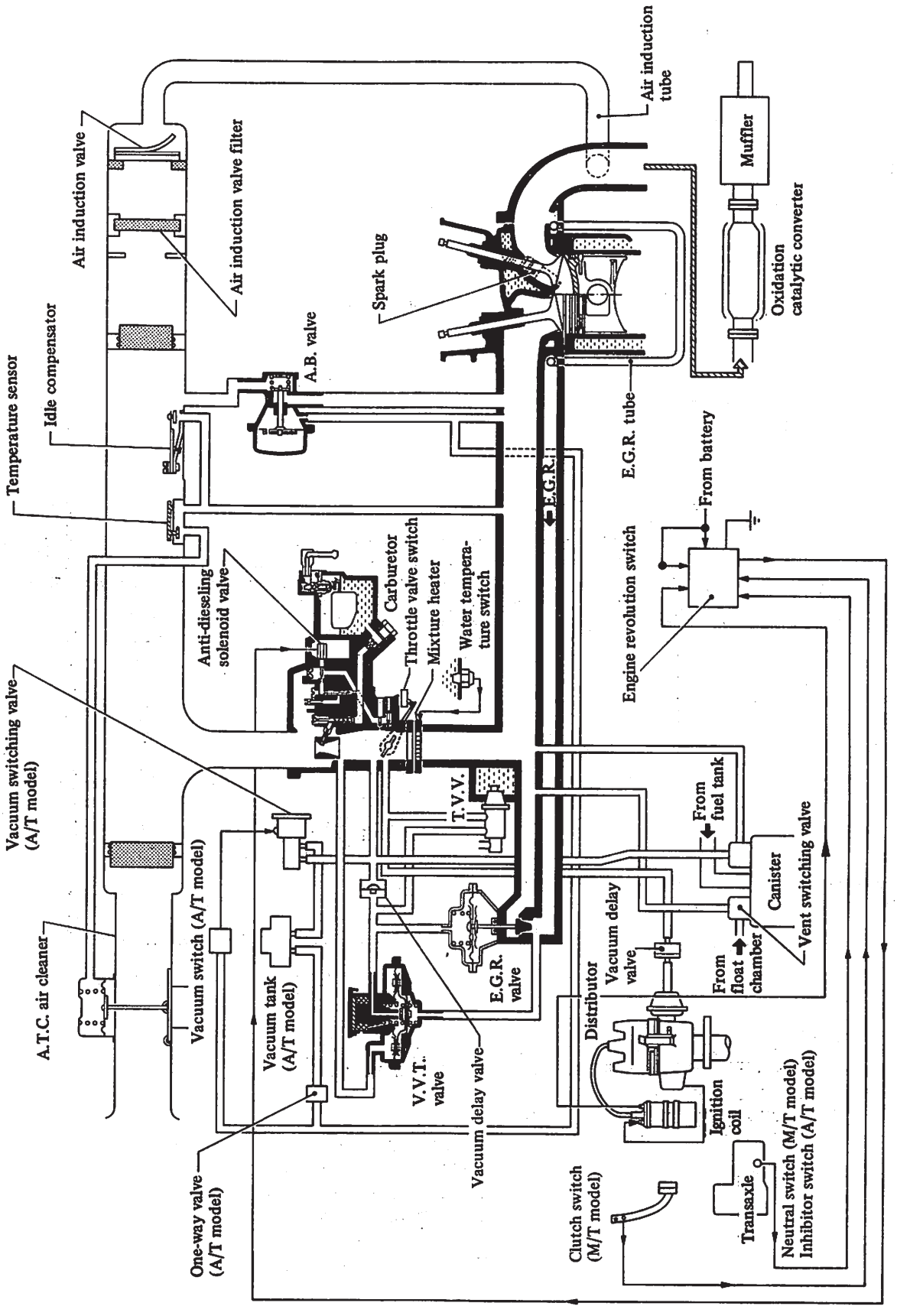
SEF718A

ENGINE AND EMISSION CONTROL SYSTEM DIAGRAM B FOR NON-CALIFORNIA



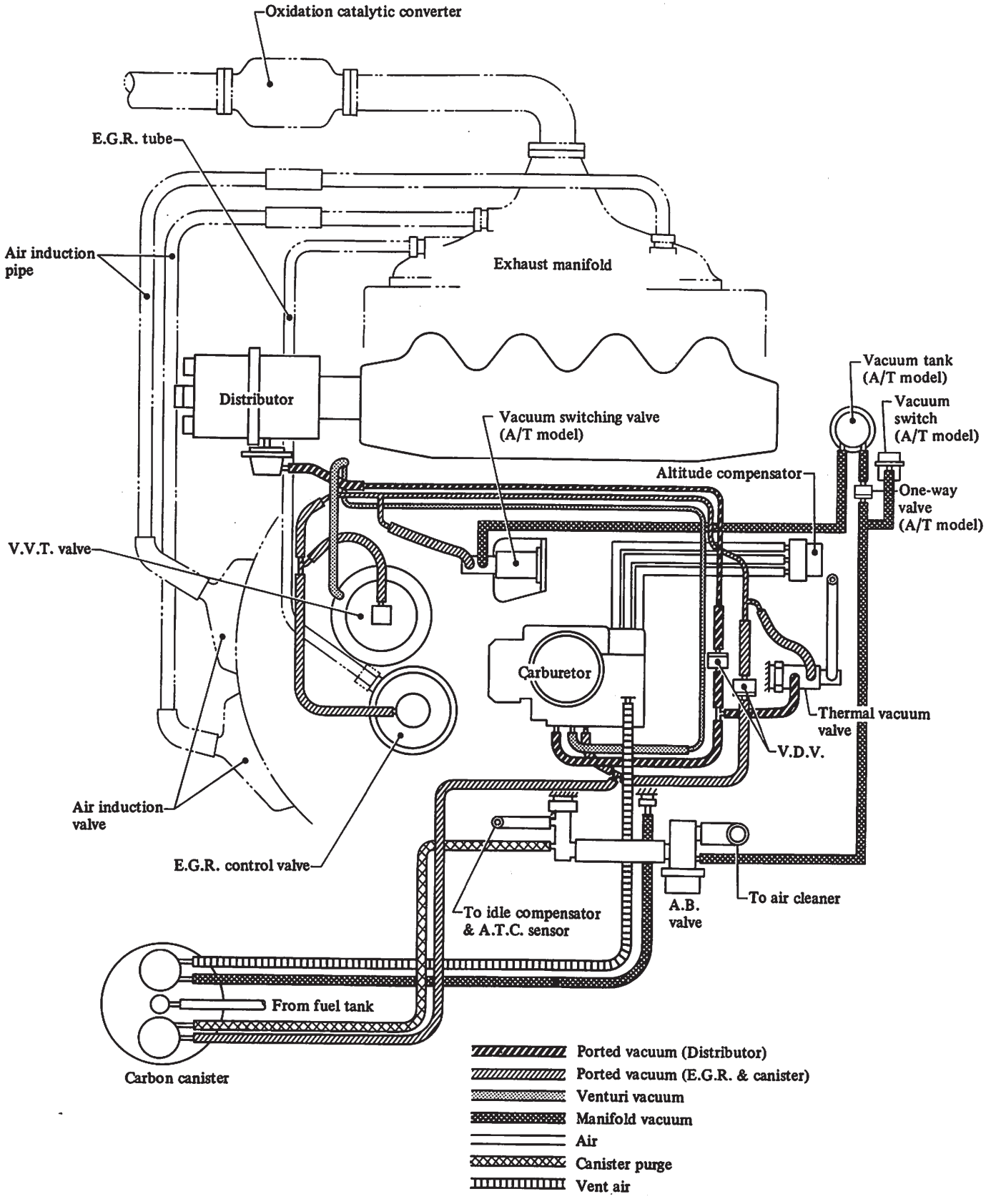
SEF719A

ENGINE AND EMISSION CONTROL SYSTEM DIAGRAM A FOR NON-CALIFORNIA OF HIGH ALTITUDES



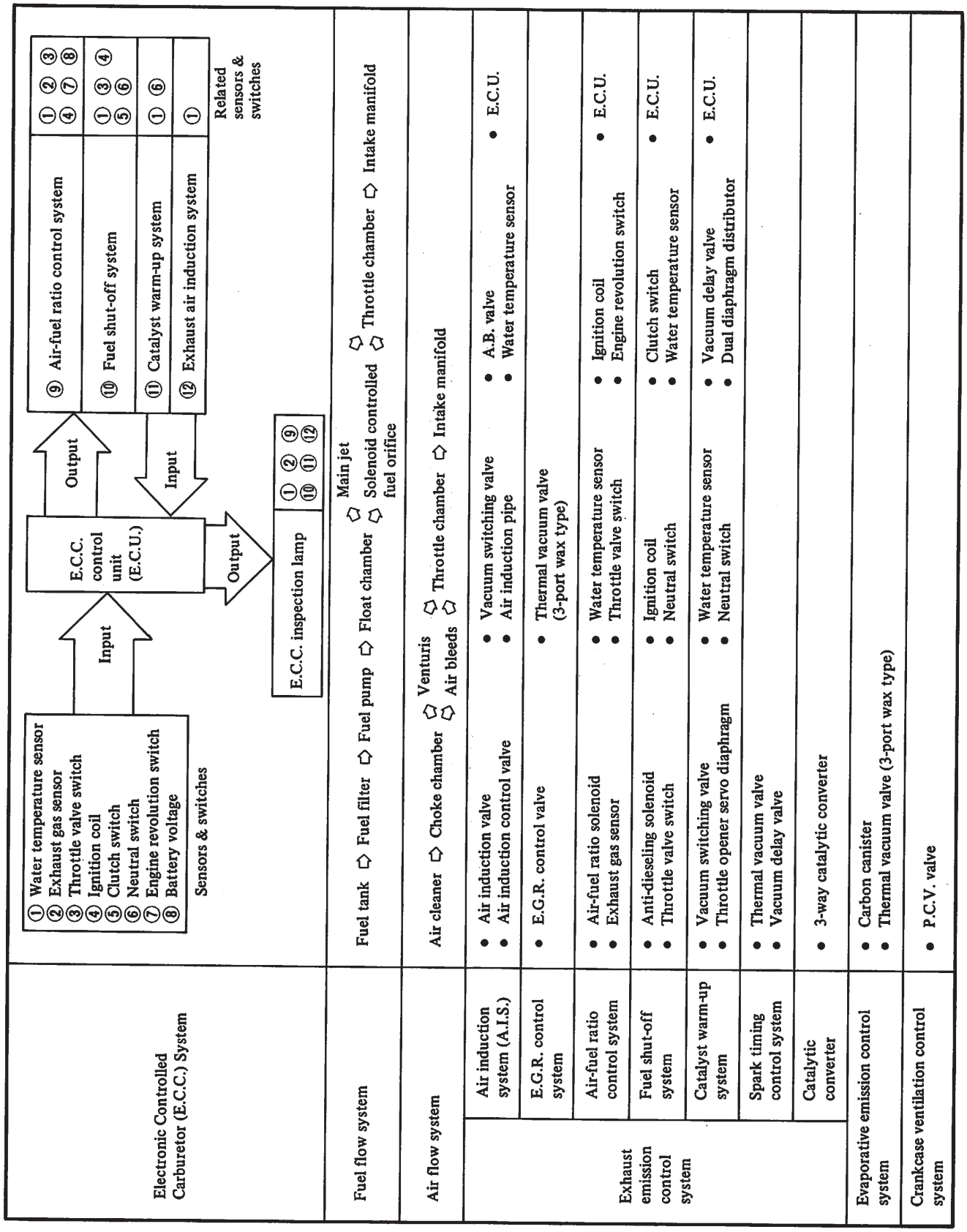
SEF739A

ENGINE AND EMISSION CONTROL SYSTEM DIAGRAM B FOR NON-CALIFORNIA OF HIGH ALTITUDES

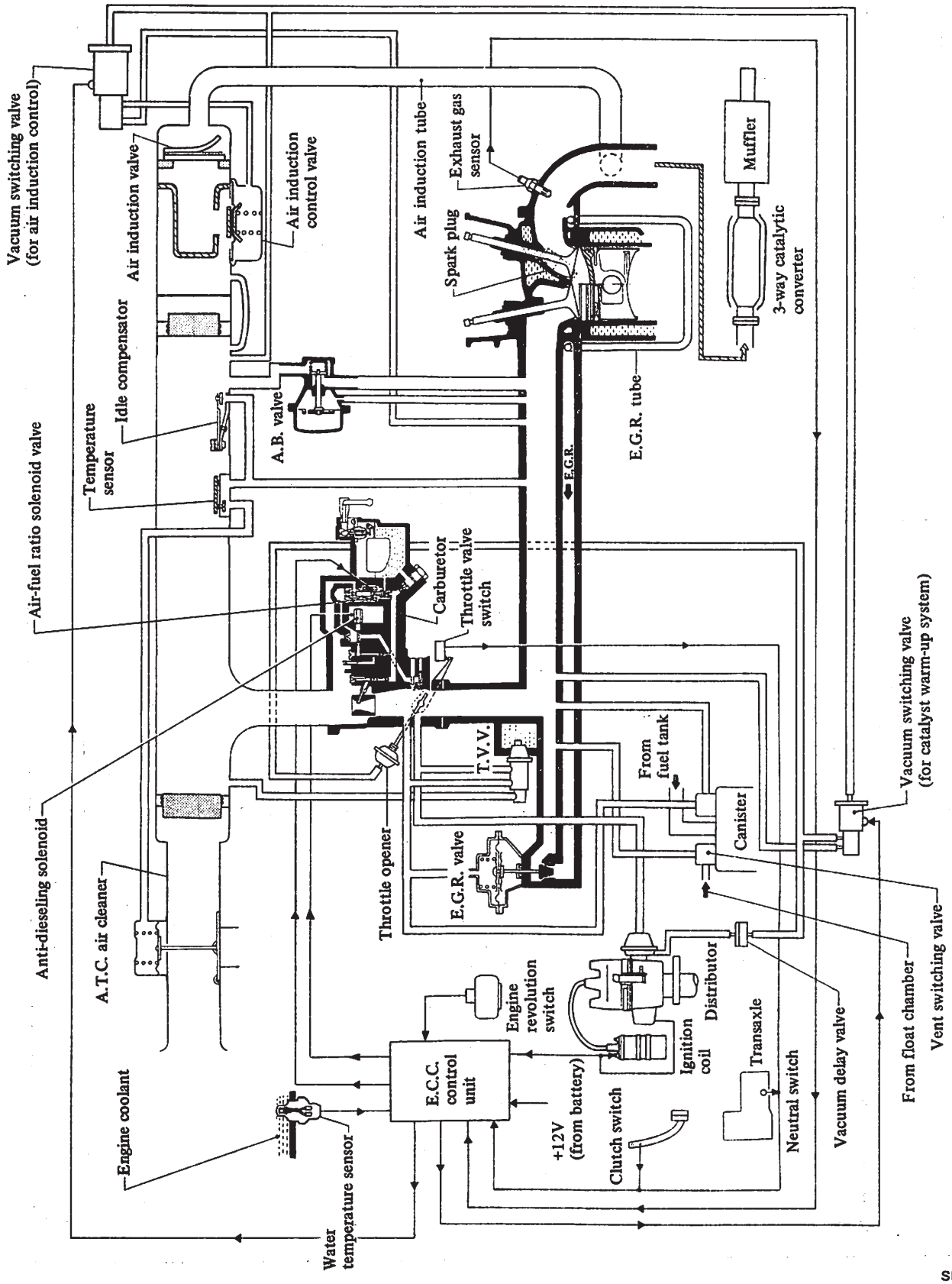


SEF742A

ENGINE AND EMISSION CONTROL SYSTEM CHART OF ELECTRONIC CONTROLLED CARBURETOR (E.C.C.) ENGINE FOR M.P.G.

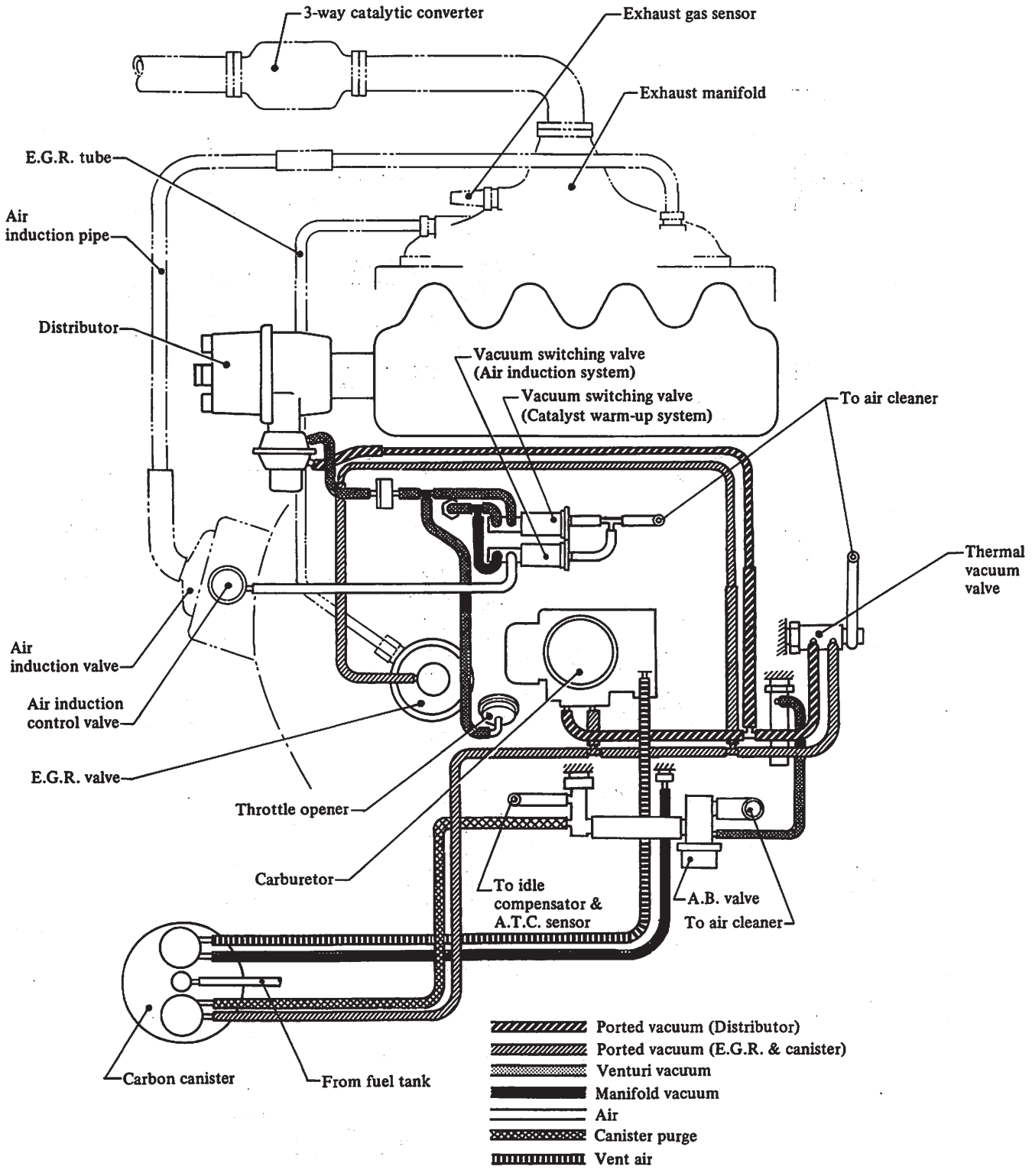


ENGINE AND EMISSION CONTROL SYSTEM DIAGRAM A OF E.C.C. ENGINE FOR M.P.G.



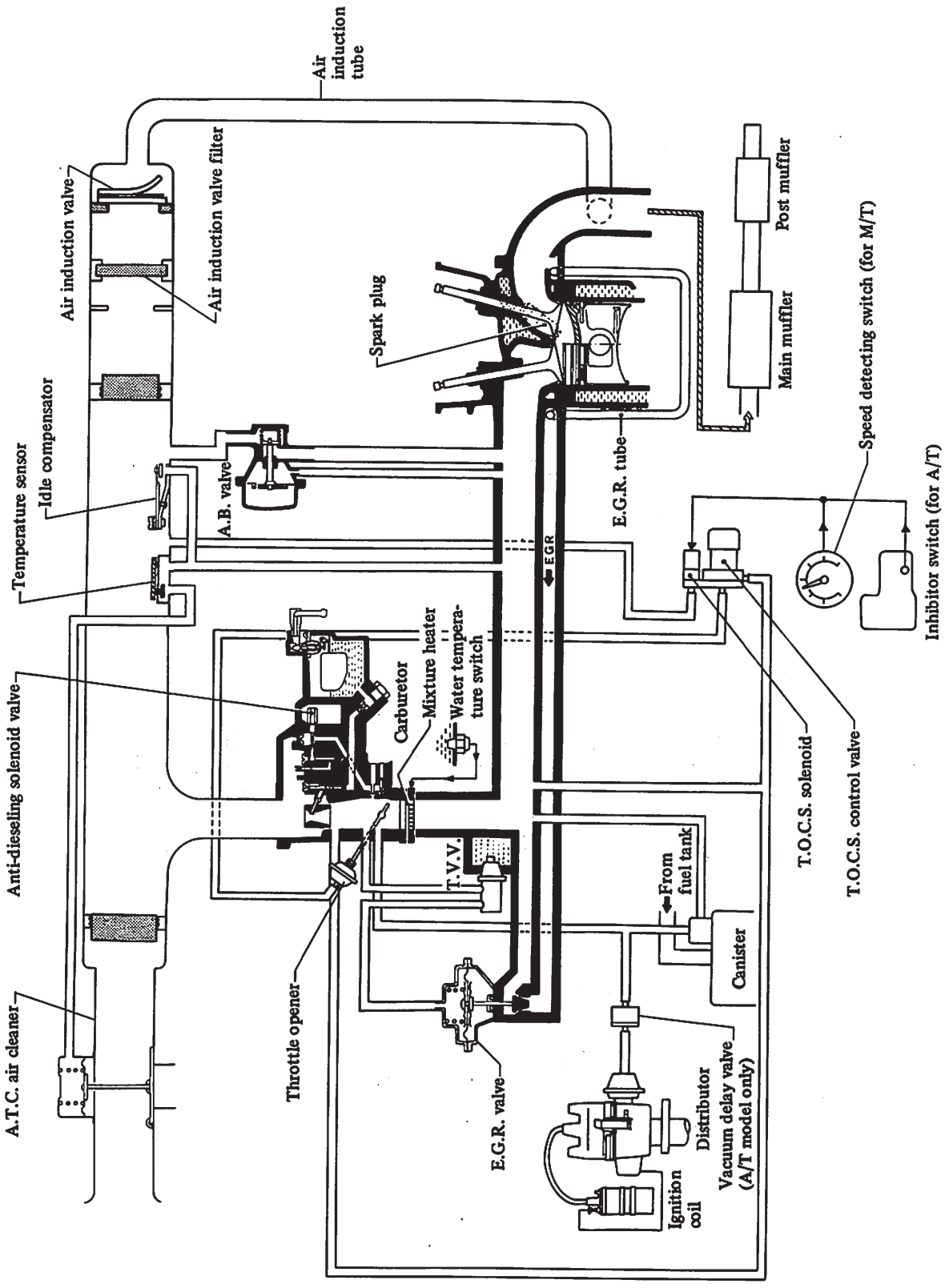
SEF579A

ENGINE AND EMISSION CONTROL SYSTEM DIAGRAM B OF E.C.C. ENGINE FOR M.P.G.



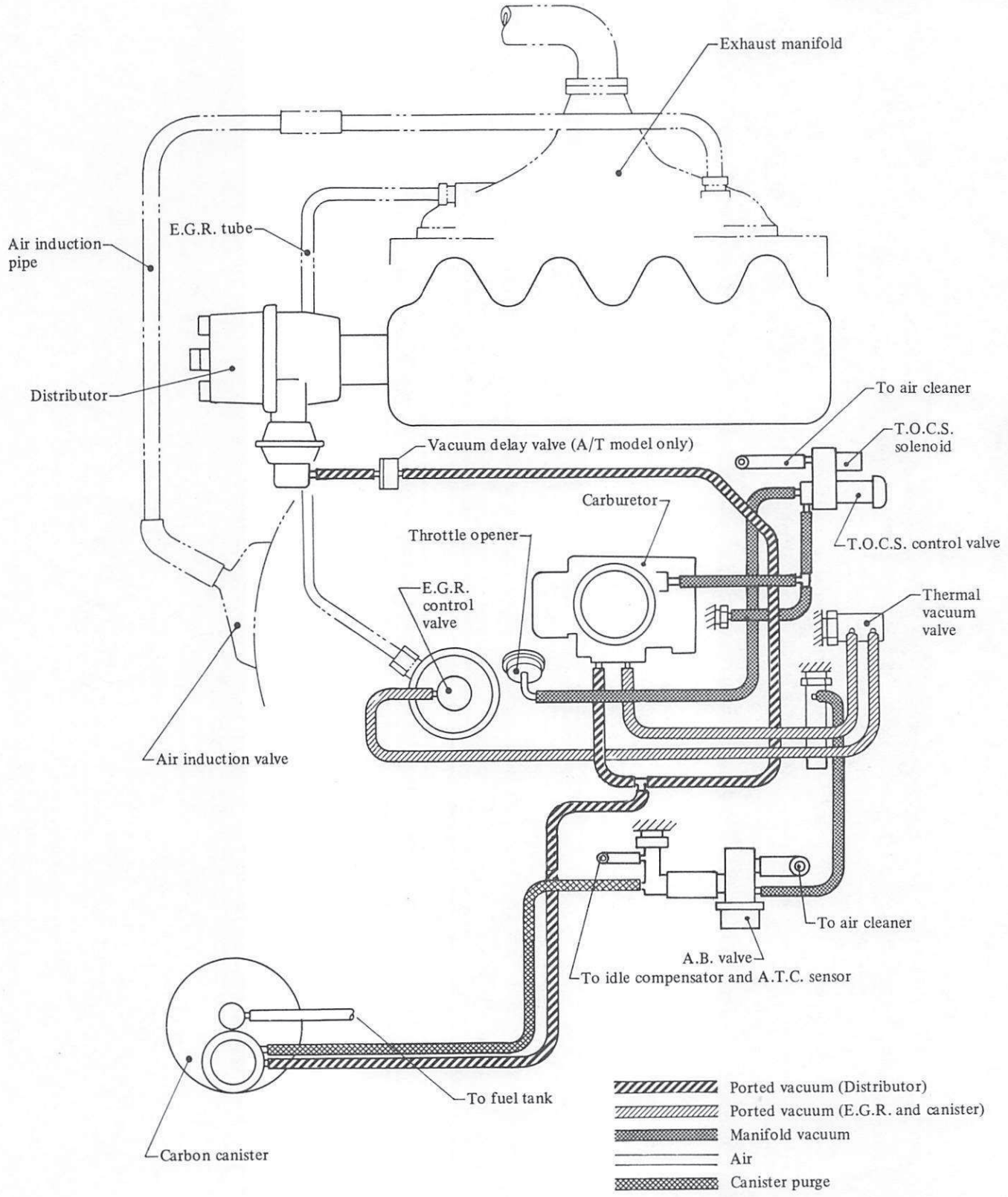
SEC962

ENGINE AND EMISSION CONTROL SYSTEM DIAGRAM A FOR CANADA



SEF720A

ENGINE AND EMISSION CONTROL SYSTEM DIAGRAM B FOR CANADA



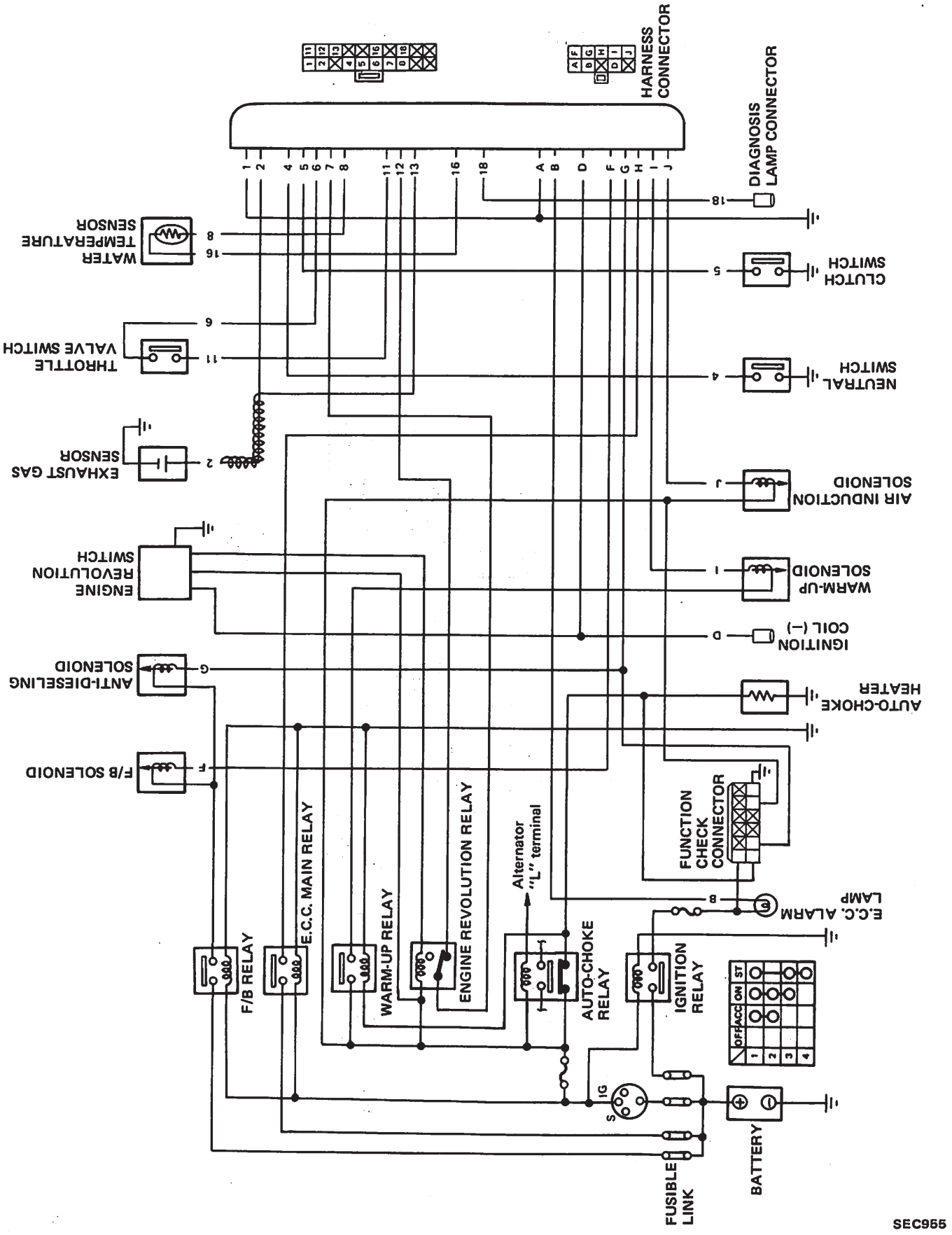
SEF721A

ELECTRICAL CIRCUIT DIAGRAM

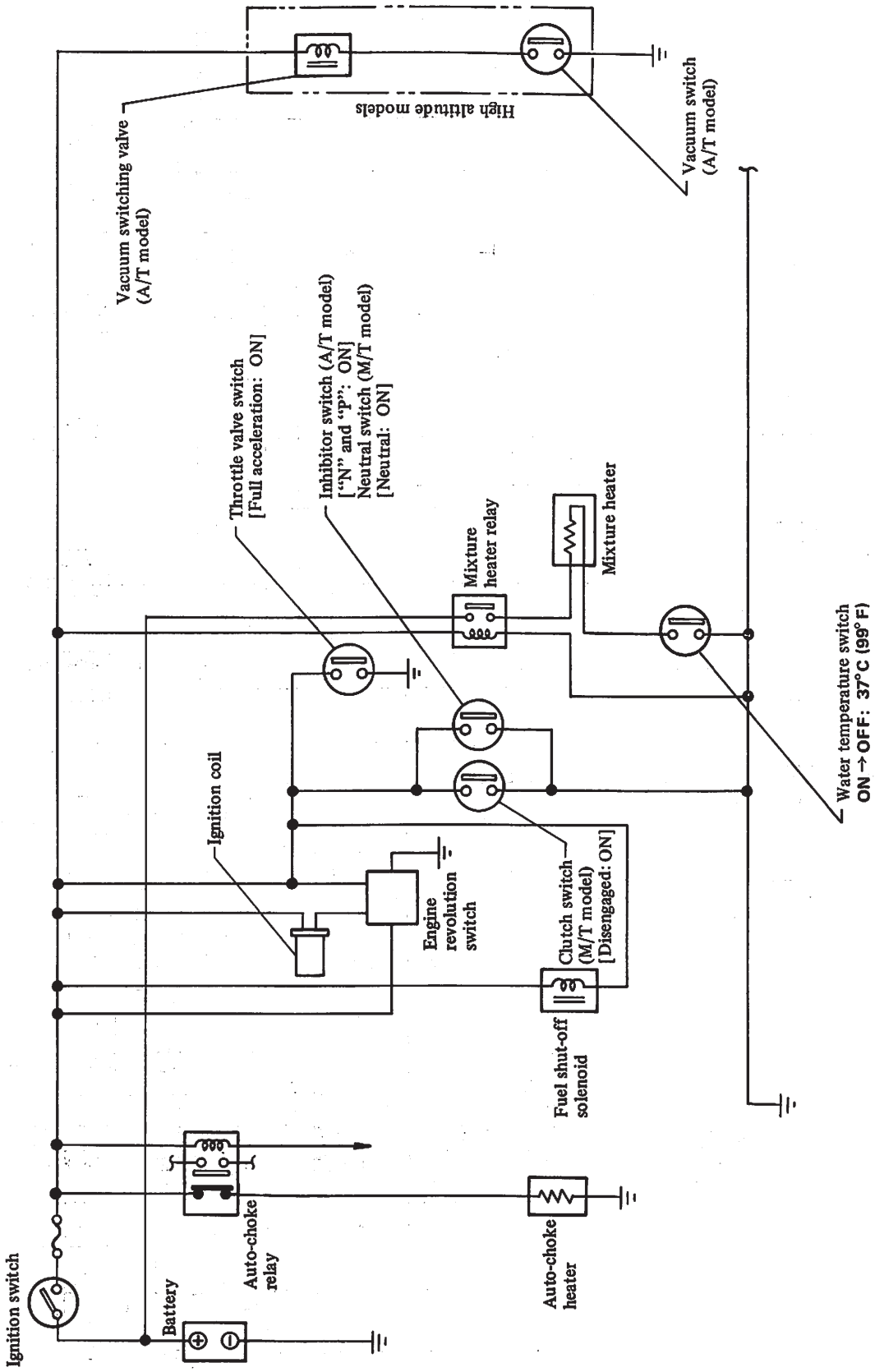
E.C.C. CIRCUIT DIAGRAM (California)

Refer to Harness Diagram.

E.C.C. CIRCUIT DIAGRAM (M.P.G.)

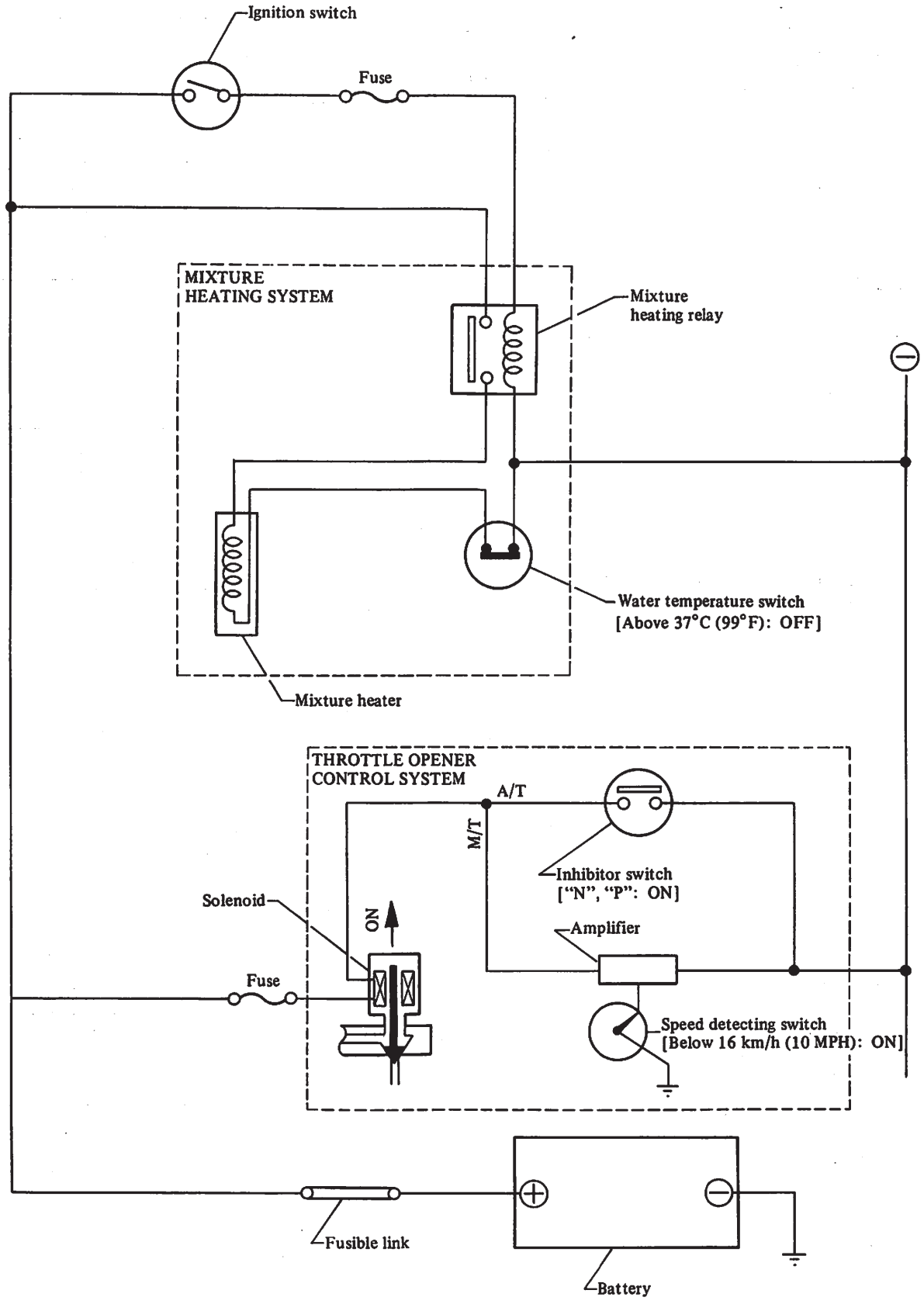


ELECTRICAL CIRCUIT OF EMISSION CONTROL SYSTEMS (Non-California)



SEF723A

ELECTRICAL CIRCUIT OF EMISSION CONTROL SYSTEMS (Canada)



SEF724A

DIAGNOSTIC PROCEDURE FOR PROBLEMS

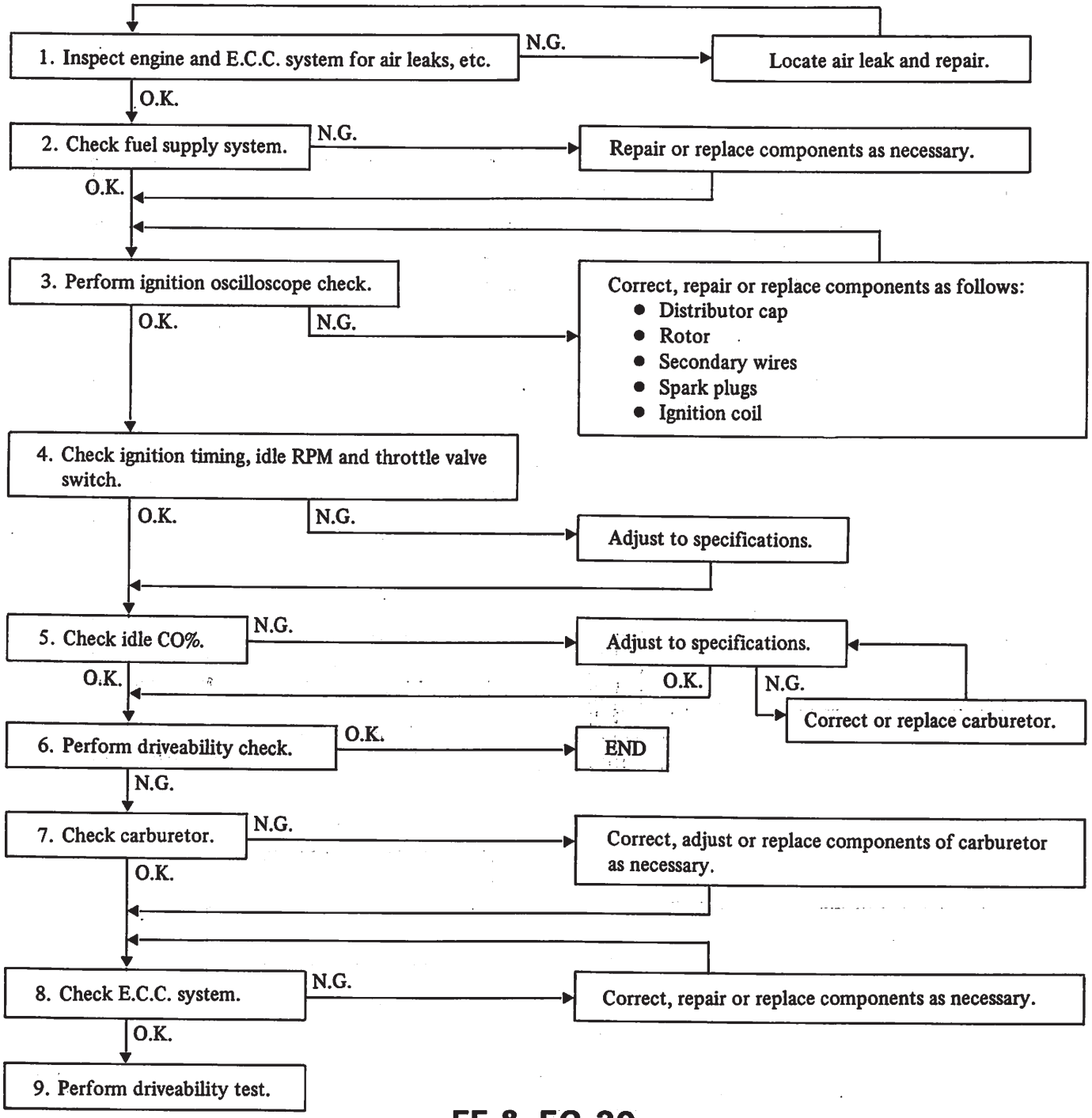
DIAGNOSTIC PROCEDURE FOR E.C.C. ENGINE

INTERMITTENT PROBLEM

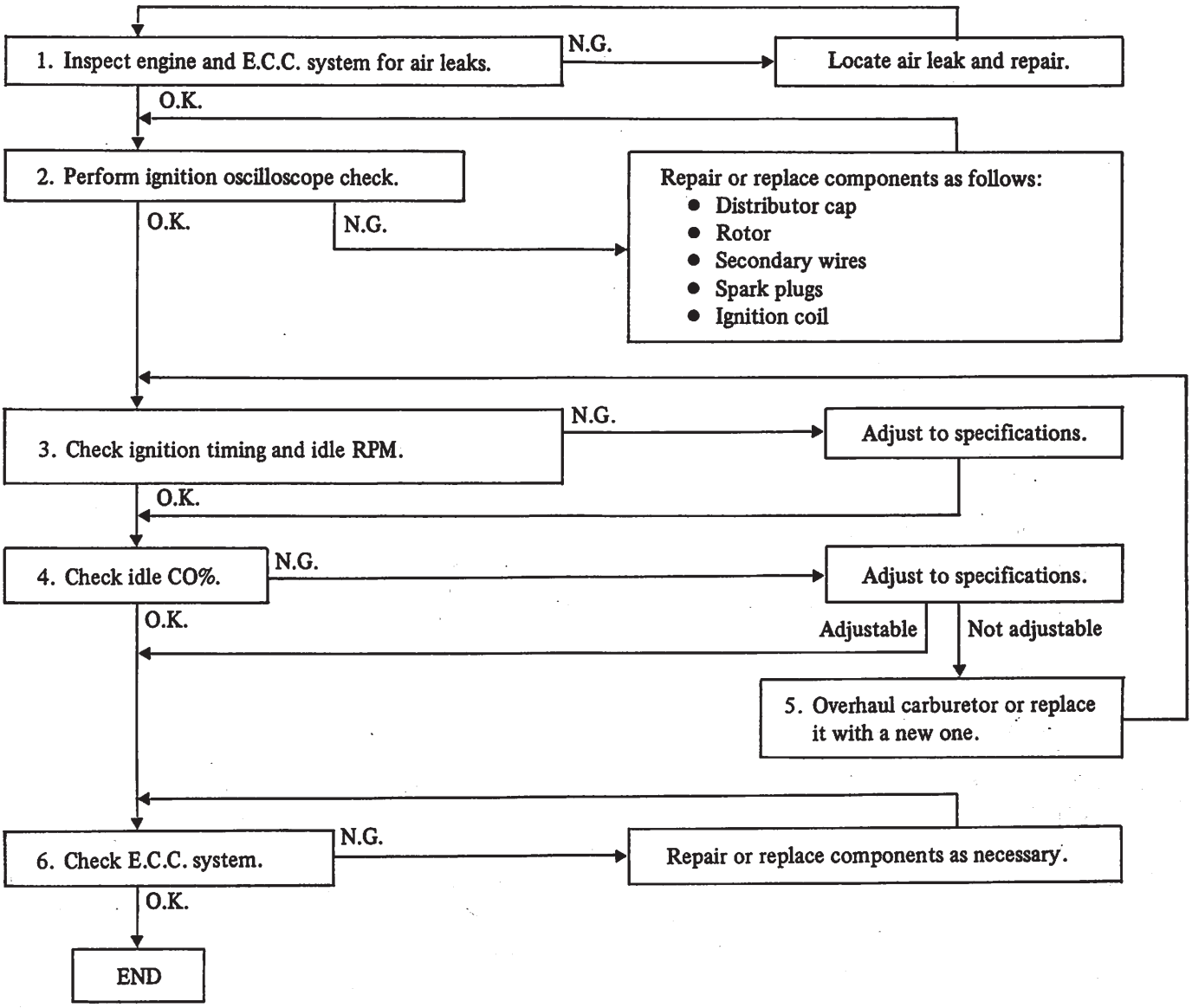
DIAGNOSTIC CHARTS CANNOT BE USED TO DIAGNOSE INTERMITTENT FAILURES. This is because many intermittent problems are caused at electrical connections, and if intermittent problems are not corrected, unnecessary component replacement will be indicated and the problems may remain. Therefore, DIAGNOSIS OF INTERMITTENT PROBLEMS SHOULD START WITH A VISUAL AND PHYSICAL INSPECTION OF THE CONNECTORS involved in the circuit, especially control unit, water temperature sensor and exhaust gas sensor connectors.

CAUTION:
When connecting or disconnecting E.C.C. harness connector to or from any E.C.C. unit, ensure that the ignition switch is in the "OFF" position and that the negative battery terminal is disconnected. Removing and installing these connectors with the ignition switch left in the "ON" position will damage control unit.

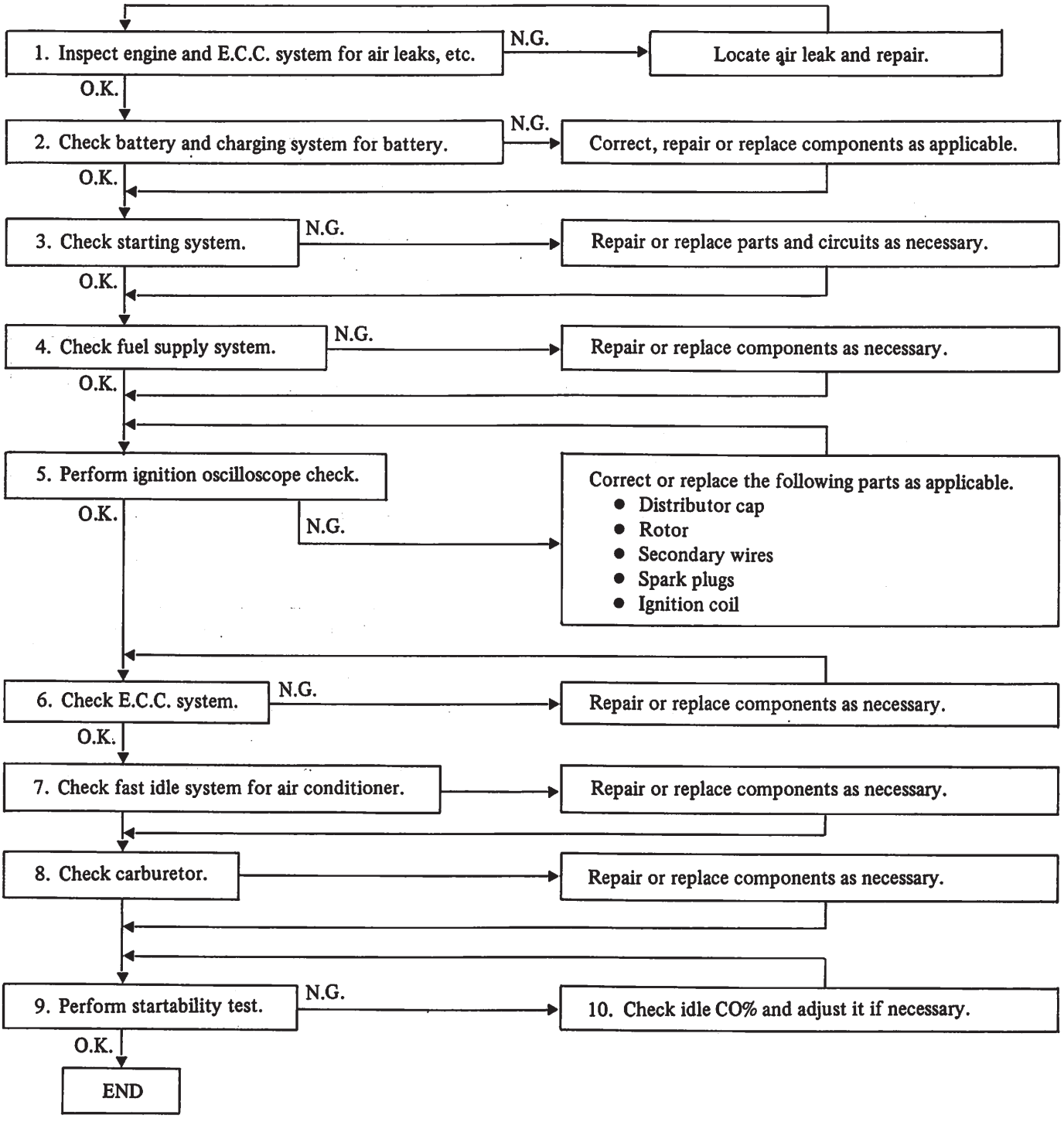
DRIVEABILITY



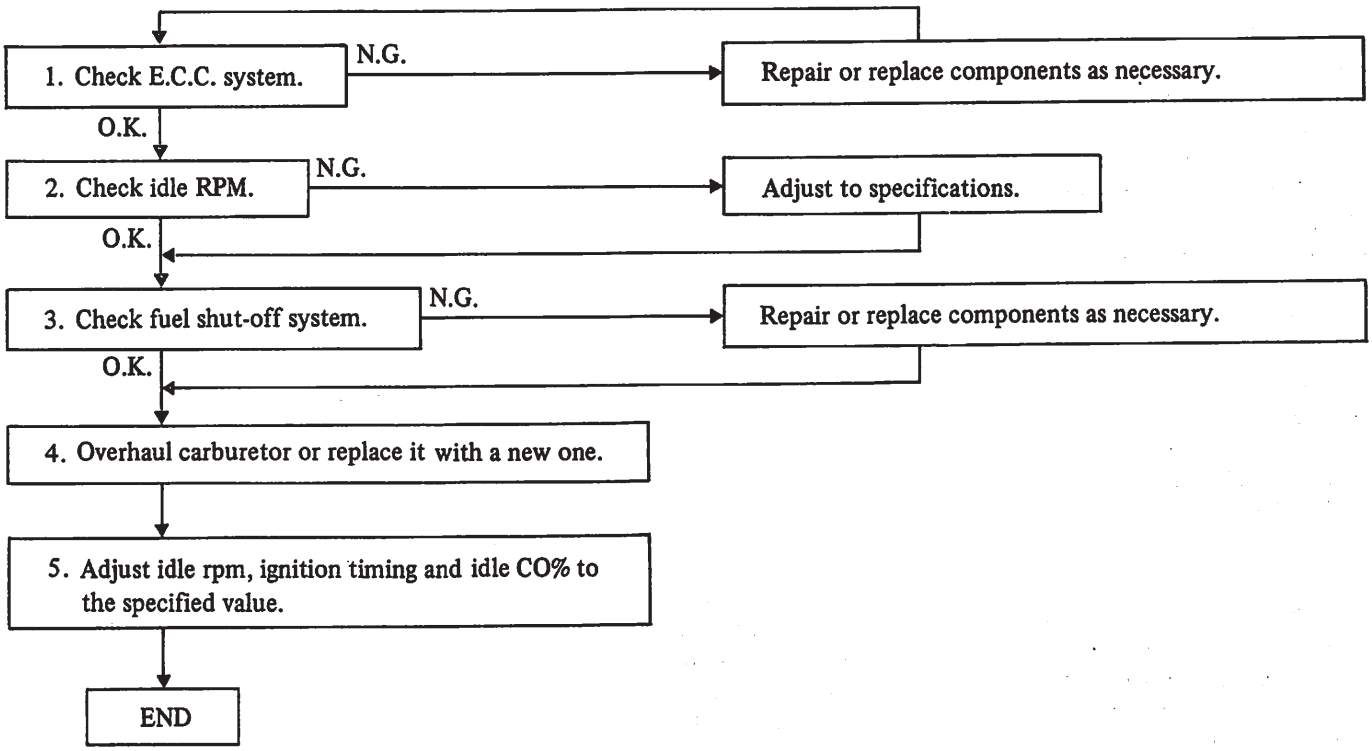
IMPROPER IDLING



ENGINE STARTABILITY



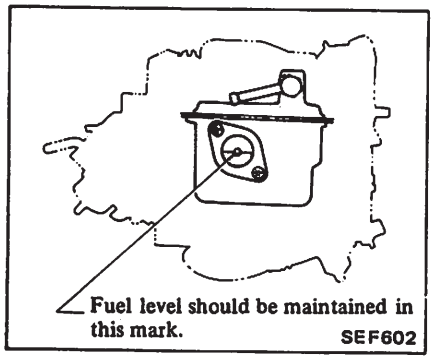
ENGINE STALL



DIAGNOSTIC STEPS FOR DRIVEABILITY

1. Inspect engine and E.C.C. system for leaks.
(1) Check clamps at all air intake components.
(2) Check vacuum hoses for leakage.
(3) Check air cleaner filter for clogging.
(4) Visually inspect for leaks at the following:
- Dipstick
- A.B. valve hose
- Air induction hose (M.P.G. only)
- Intake manifold gasket
- Valve rocker cover
- E.G.R. valve gasket
- Oil filler cap

(5) Check E.G.R. valve seat and operation.
(6) Check air induction control valve operation. (M.P.G. only)
(7) Check A.B. valve operation.
2. Check fuel supply system
(1) Make sure proper fuel is used.
(2) Visually check fuel filter for clogging.
(3) Visually check fuel lines for leaks.
(4) With engine idling, visually check fuel level.

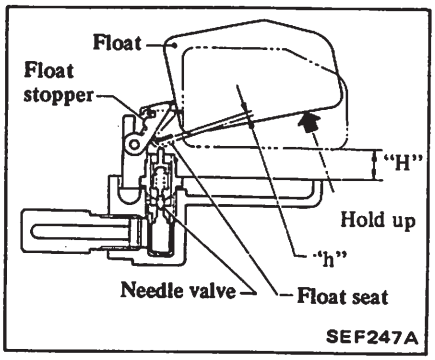


If not correct, adjust as follows.
a) Turn off engine and remove choke chamber.
b) Turn down choke chamber and adjust "H" by bending float seat.

"H":
approximately 12 mm (0.47 in)

c) Adjust "h" by bending float stopper as required.

"h":
1.3 - 1.7 mm (0.051 - 0.067 in)



d) Install choke chamber and recheck fuel level with engine idling.
3. Perform ignition oscilloscope test.
(1) Warm engine to operating temperature.
(2) Check ignition system for unusually high or low firing voltage.
(3) If firing voltage is abnormal, determine cause and repair.
4. Check ignition timing, idle rpm and throttle valve switch.
(1) Checking and adjusting ignition timing and idle rpm.

Checks and adjustments are made with the air conditioning compressor "OFF".

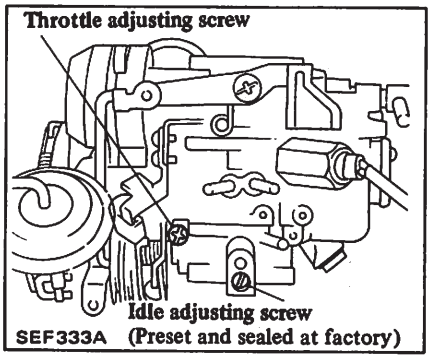
a) Disconnect air induction hose and install proper cap on air induction pipe. (M.P.G. only)
b) Verify that the engine is still at operating temperature.
c) Rev the engine to 2,000 to 3,000 rpm two or three times under no-load, then allow it to run at idle speed for one minute.
d) Disconnect distributor vacuum hose from distributor vacuum controller, and plug hose with proper plug. Then, check ignition timing with a timing light.

E15 (M.P.G.)
2°±2° A.T.D.C.
E16
5°±2° A.T.D.C.

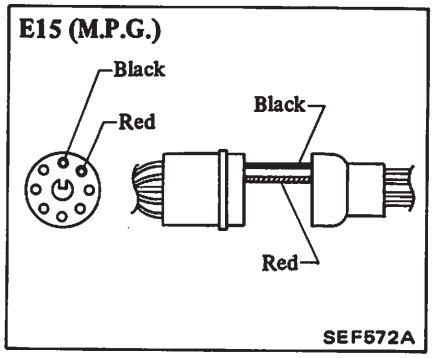
Adjust as necessary.
e) Connect distributor vacuum hose and check idle speed.

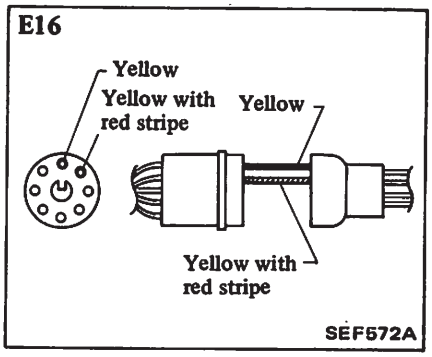
E15 (M.P.G.)
700±100 rpm
E16
MT 750±100 rpm
AT 650±100 rpm
(in "D" position)

If necessary, adjust to the specified rpm by turning the idle speed adjusting screw.

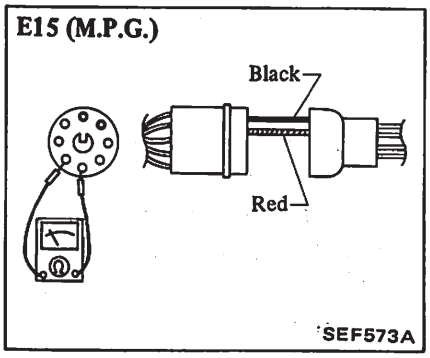


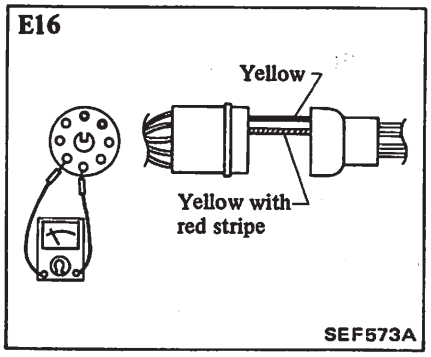
(2) Check throttle valve switch adjustment.
a) Turn off engine and disconnect harness connector on carburetor.
b) Connect proper wires between the anti-dieseling solenoid harness terminals.





c) Verify that continuity does not exist between the throttle valve switch harness terminals.



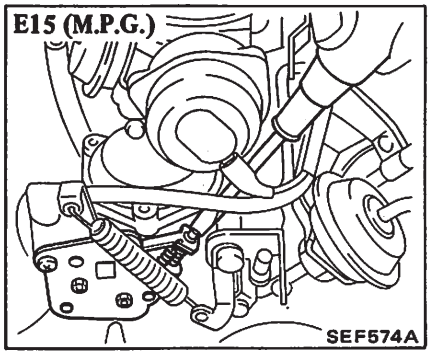


d) Start engine and increase engine speed to about 2,000 rpm.
e) At this time, verify that continuity exists between the throttle valve harness terminals.
f) Then, decrease engine speed gradually to 1,200±50 rpm, and at that point the circuit should break and cause the ohmmeter to indicate an open circuit. If incorrect, adjust as follows:

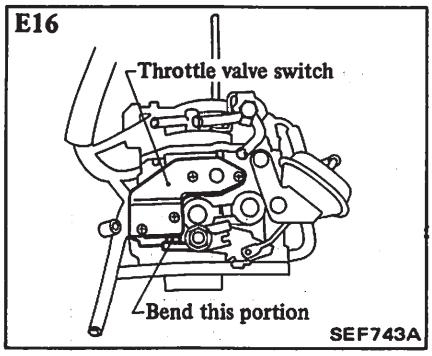
1) Hold engine speed at 1,200 rpm by manually opening the throttle.

Important: Do not use the idle speed screw.

2) E15 (M.P.G.):
Slowly rotate the adjusting screw counterclockwise or clockwise until the ohmmeter indicates an open circuit.



E16:
Bend plate until the ohmmeter indicates an open circuit.

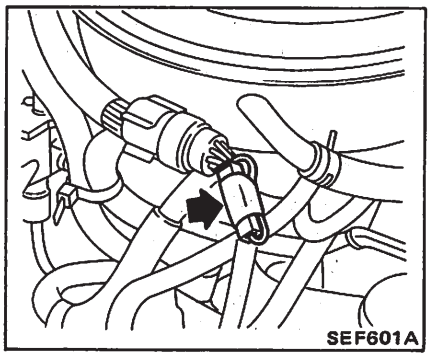


3) Recheck the adjustment.
4) Reset idle speed if necessary.
g) Connect carburetor harness connector.

5. Check idle CO%.

The checking or adjustment of idle CO% requires the use of a CO meter. It is essential that the meter be fully warmed up and calibrated before any adjustment is made.

(1) Make sure that air induction hose is disconnected.
(2) Verify that the engine is at operating temperature.
(3) With the hood open, run the engine at 2,000 rpm for 2 minutes at no-load to stabilize its condition.
(4) Turn the ignition switch to the "OFF" position.
(5) Disconnect air-fuel ratio solenoid harness connector.



(6) Rev the engine to 2,000 to 3,000 rpm 2 or 3 times under no-load, finally, allow it to run at idle speed for one minute.
(7) Reset idle speed to the specified speed.
(8) Check CO% as per Table A, Column 1 and if necessary, adjust to the specified point as per Table A, Column 2. The CO% adjustment is made by turning the idle mixture screw.

Table A

Engine	Transaxle	Check idle CO% Column 1	Adjust idle CO% Column 2
E15	M/T	4.0±2.0%	4.0±1.0%
E16	M/T	3.0±2.0%	3.0±1.0%
	A/T		

(9) Stop engine, and reconnect air-fuel ratio solenoid harness connector.
(10) Check the idle speed. Readjust to the specified speed.
(11) Connect air induction hose. (M.P.G. only)

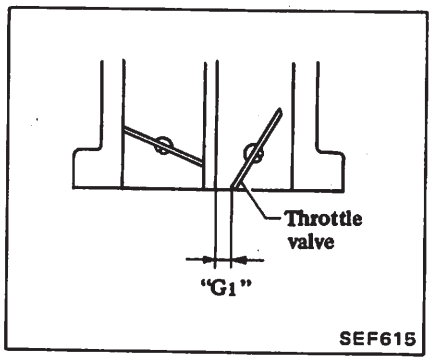
6. Perform driveability test.
(1) Evaluate effectiveness of adjustments by driving vehicle.
(2) If unsatisfactory, proceed to step 7.

7. Check carburetor.
(1) With engine stopped, check each linkage and throttle valve for smooth operation. At the same time, make sure fuel is injected smoothly through the accelerating injection nozzle.

(2) Check choke valve opening.
a) Ensure that choke valve is fully open when engine is at operating temperature.
b) If not, turn off engine and check choke heater circuit.
c) If circuit is O.K., replace choke chamber assembly.

(3) Check interlock opening of primary and secondary throttle valves.
a) Remove carburetor from engine.
b) Turn throttle arm until adjusting plate comes in contact with lock lever at point Ⓐ and check clearance "G_1".

Clearance "G_1":
E16
6.28±0.60 mm
(0.2472±0.024 in)
E15 (M.P.G.)
5.83±0.50 mm
(0.2295±0.0197 in)



c) If out of specification, adjust by bending tongue of throttle arm.

(4) Clean jets, emulsion tubes and passages.

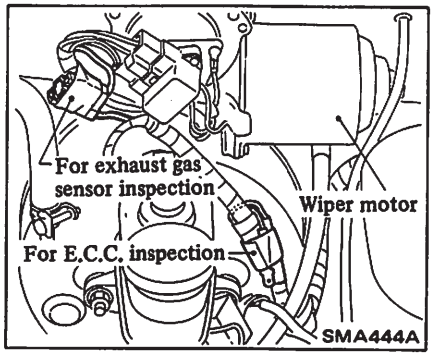
CAUTION:
a. Be sure to use a screwdriver of proper size.
b. Be careful not to scratch or nick jet.
c. To clean jet, use solvent and compressed air.

a) Remove choke chamber and verify that the numbers stamped on the jets are correct.
b) Remove jets and emulsion tubes carefully, and clean them. If necessary, clean passages.
c) Replace faulty jets and emulsion tubes.
d) Install in the reverse order of removal using a new packing.
e) Install carburetor to engine.

(5) Check idle CO%, following the procedure in step 5.

8. Check E.C.C. system.

(1) Verify that harness connector for E.C.C. inspection is disconnected.



(2) Connect harness connector for exhaust gas sensor inspection.

(3) Turn ignition switch "ON" and check E.C.C. inspection lamp on instrument panel.

"ON": Proceed to operation (4).
"OFF": Replace bulb of inspection lamp.

(4) Start engine and warm to operating temperature.

When engine speed increases to more than 200 rpm, inspection lamp turns "OFF".

(5) After warming up engine, run it at 2,000 rpm for about 5 minutes.
(6) Then, recheck inspection lamp.

"OFF": No trouble exists. Proceed to step 9.
"ON": Perform operation (7).

(7) Turn off engine and connect harness connector for E.C.C. inspection and check inspection lamp for lighting interval.

	Lighting interval	Faulty part or circuit	Next step
Case 1	ON / OFF	• Air-fuel ratio solenoid • Anti-dieseling solenoid • Vacuum switching solenoid (for catalyst warm-up, E15 engine only) • Vacuum switching solenoid (for air induction control, E15 engine only)	Proceed to step (8)
Case 2	ON / OFF	• Exhaust gas sensor • Water temperature sensor	Proceed to step (9)

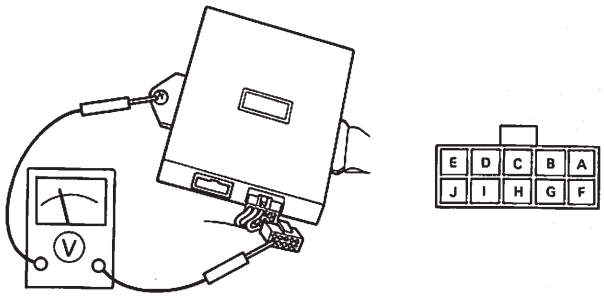
(8) Case 1: Check each solenoid.
a) Turn ignition switch "OFF".
b) Verify that each harness connector is connected securely. If not, correct and return to operation (4).
c) Disconnect each harness connector.
d) Measure the resistance of each solenoid. If out of specification, replace solenoid and return to operation (4).

Solenoid	Resistance (Ω)
Air-fuel ratio solenoid	30 - 50
Anti-dieseling solenoid	25 - 45
Vacuum switching solenoid (for catalyst warm-up, E15 engine only)	
Vacuum switching solenoid (for air induction control, E15 engine only)	

e) Reconnect harness connectors.
f) Disconnect E.C.C. 10-pin connector from control unit.
g) Turn ignition switch "ON".
h) Measure the voltage between each terminal and ground.

N.G.: Repair or replace harness.
O.K.: Replace control unit and return to operation (1).

Solenoid	Check terminals		Voltage [V]
Air-fuel ratio solenoid	F	Body ground	12 - 14
Anti-dieseling solenoid	G		
Vacuum switching solenoid (for catalyst warm-up, E15 engine only)	I		
Vacuum switching solenoid (for air induction control, E15 engine only)	J		



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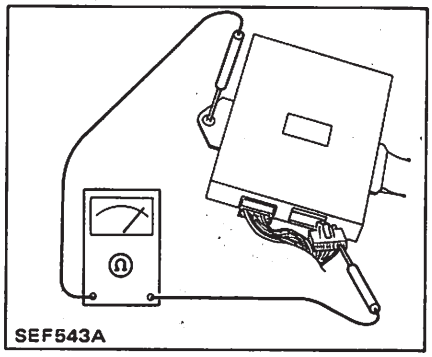
e) Check for continuity between terminal No. 2 of E.C.C. 20-pin connector and ground metal on car body.



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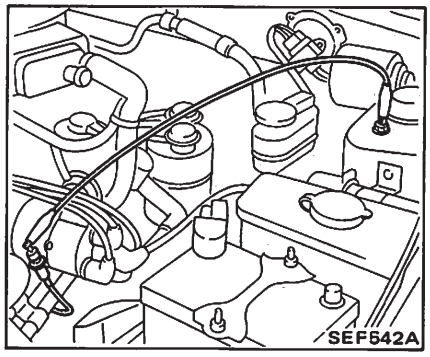
Continuity exists:
Replace exhaust gas sensor.
Continuity does not exist:
Repair or replace E.C.C. harness.

(9) Case 2: Check each sensor.
a) Turn ignition switch "OFF".
b) Verify that each harness connector is connected securely. If not, correct and return to operation (4).
c) Disconnect E.C.C. 20-pin connector from control unit.
d) Disconnect exhaust gas sensor harness connector and connect terminal for exhaust gas sensor to ground with a jumper wire.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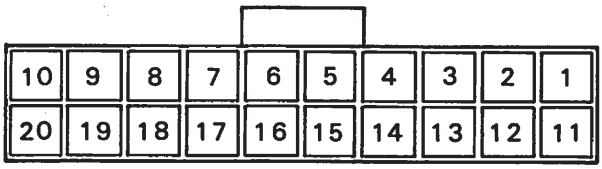
f) If alarm lamp still indicates lighting interval of case 2 during operation (6), proceed to g).
g) Measure the water temperature sensor resistance between terminal No. 8 and No. 16 of E.C.C. 20-pin connector.

Circuit tester	Check terminals		Condition	Standard value
	+	–		
Ω	8	16	20°C (68°F) or above	Below 2.9 kΩ
			Below 20°C (68°F)	2.1 kΩ or above



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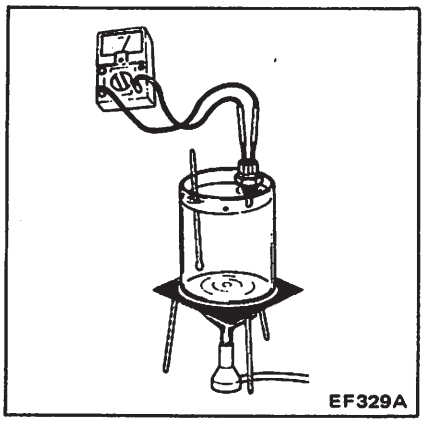
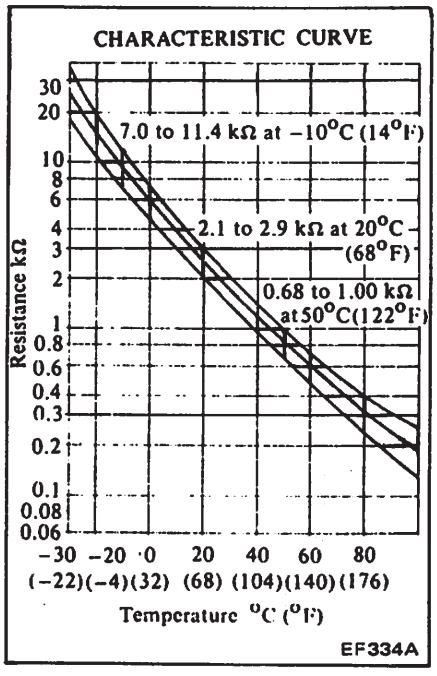
O.K.: Replace control unit and return to operation (1).

N.G.: Perform water temperature sensor check as follows.

h) Dip the water temperature sensor into water maintained at a temperature of 20°C (68°F), 80°C (176°F), etc., and read its resistance.





O.K.: Correct or replace E.C.C. harness.

N.G.: Replace water temperature sensor.

Then, return to operation (1).

9. Perform driveability test. Re-evaluate vehicle performance.

DIAGNOSTIC STEPS FOR IMPROPER IDLING

1. Inspect engine and E.C.C. system for leaks.
2. Perform ignition oscilloscope test.
3. Check ignition timing and idle rpm.
4. Check idle CO%.
5. Overhaul carburetor or replace it with a new one.
6. Check E.C.C. system.

Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY on the inspection procedure of each item.

ENGINE STARTABILITY

1. Inspect engine and E.C.C. system for leaks.

Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.

2. Check battery and charging system for battery.

(1) Check battery voltage.

(2) If poor battery voltage, check charging system for battery.

- Alternator
- Voltage regulator
- Others

Refer to EL section.

3. Check starting system.

(1) Check starter operation.

(2) If it does not operate, check the following:

- Starter
- Ignition relay
- Ignition switch
- Others

Refer to EL section.

4. Check fuel supply system.

Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.

5. Perform ignition oscilloscope test.

Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.

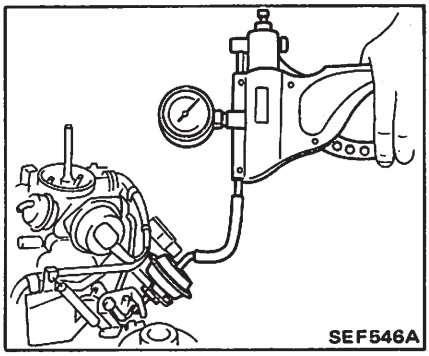
6. Check E.C.C. system.

Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.

7. Check catalyst warm-up or fast idle system for air conditioner.

(1) Disconnect vacuum hose at throttle opener.

(2) Check throttle opener operation using a vacuum handy pump. Replace if faulty.



8. Check carburetor.

(1) With engine cold, visually check that choke valve is fully closed.

(2) In this condition, check vacuum break diaphragm operation using a vacuum handy pump.

Clearance "R":

E16

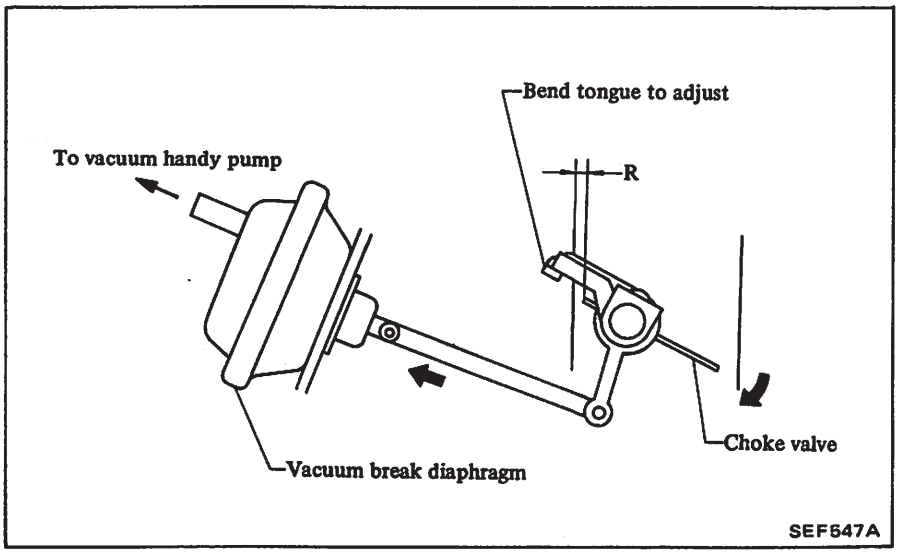
2.60±0.09 mm

(0.1024±0.0035 in)

E15 (M.P.G.)

1.53±0.09 mm

(0.0602±0.0035 in)

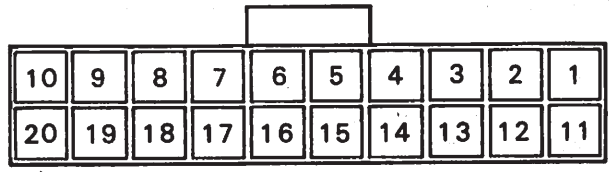


(3) If out of specification, adjust clearance by bending adjusting tongue.
9. Perform startability test.
(1) Start engine with the recommended starting procedure.
(2) If engine does not start, proceed to step 10.
10. Check and adjust idle CO%.
Check idle CO%. Follow the procedure from step 5, operations (1) through (8) in DIAGNOSTIC STEP FOR DRIVEABILITY.

ENGINE STALL

1. Check E.C.C. system.
Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.
2. Check idle rpm.
Check idle rpm. Follow the procedure from step 4-(1), operations a) through c) in DIAGNOSTIC STEP FOR DRIVEABILITY.
3. Check fuel shut-off system.
(1) Check clutch switch and neutral switch circuits for continuity.
a) Turn ignition switch "OFF".
b) Disconnect E.C.C. 20-pin connector.
c) Check for continuity.

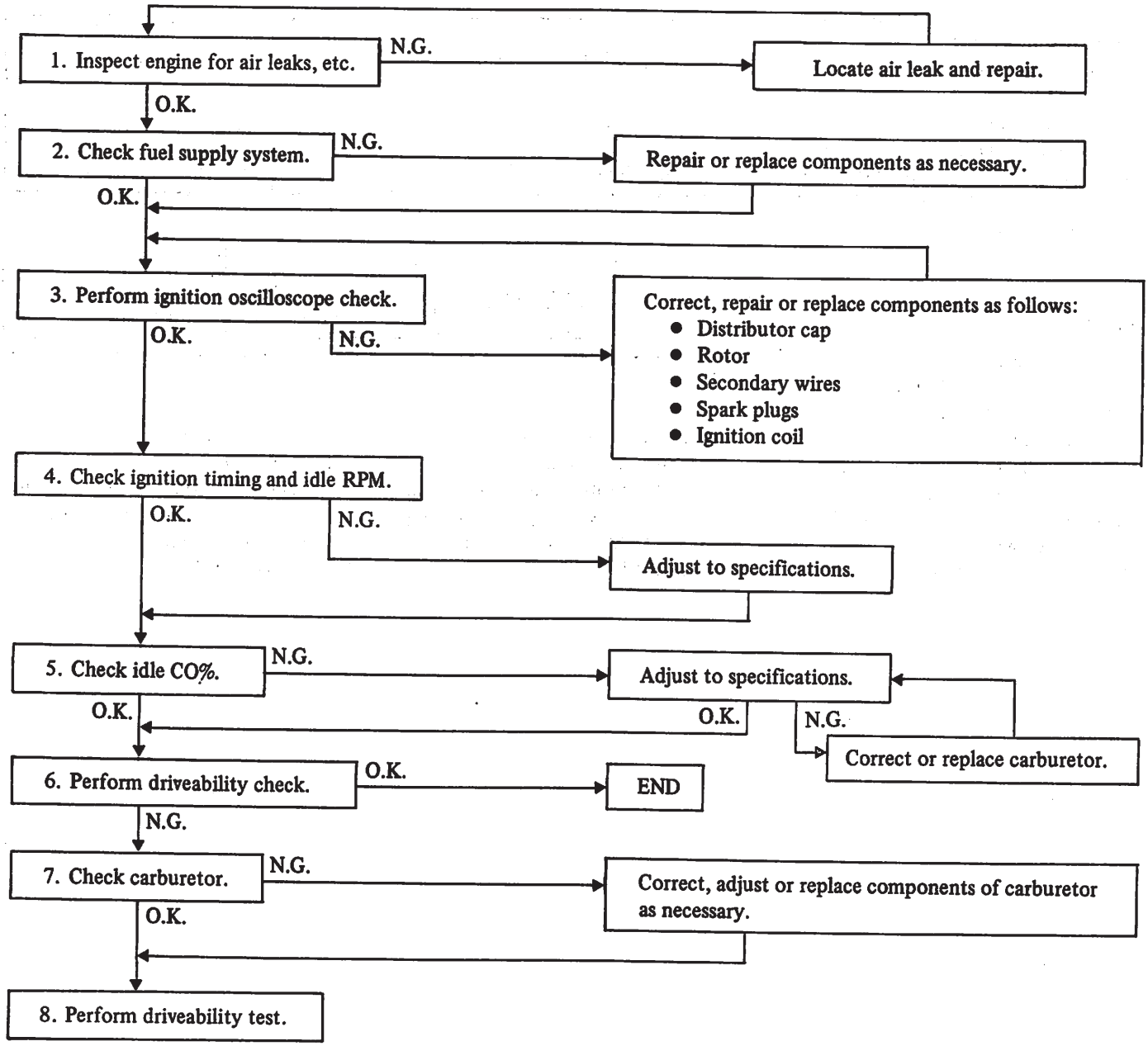
Check circuit	Check terminals		Note
	+	–	
Clutch switch	5	Body ground	With clutch disengaged
Neutral switch	4		In neutral position



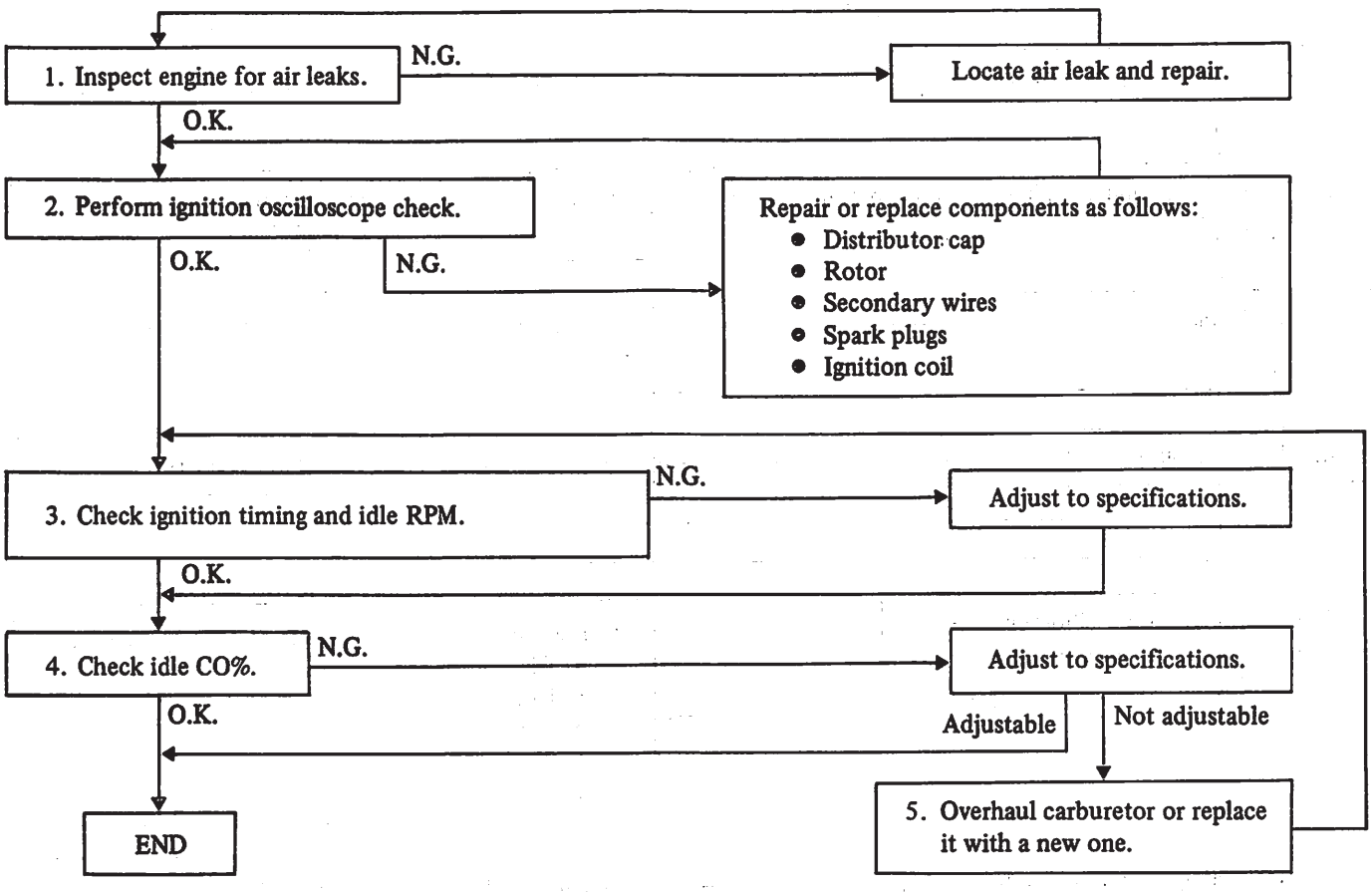
d) If continuity does not exist, check harness or component.
(2) Check throttle valve switch adjustment. Follow the procedure step 4-(2) in DIAGNOSTIC STEP FOR DRIVEABILITY.
4. Overhaul carburetor or replace it with a new one.
5. Adjust idle rpm, ignition timing and idle CO% to the specified values.
Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.

DIAGNOSTIC PROCEDURE FOR CARBURETOR ENGINE

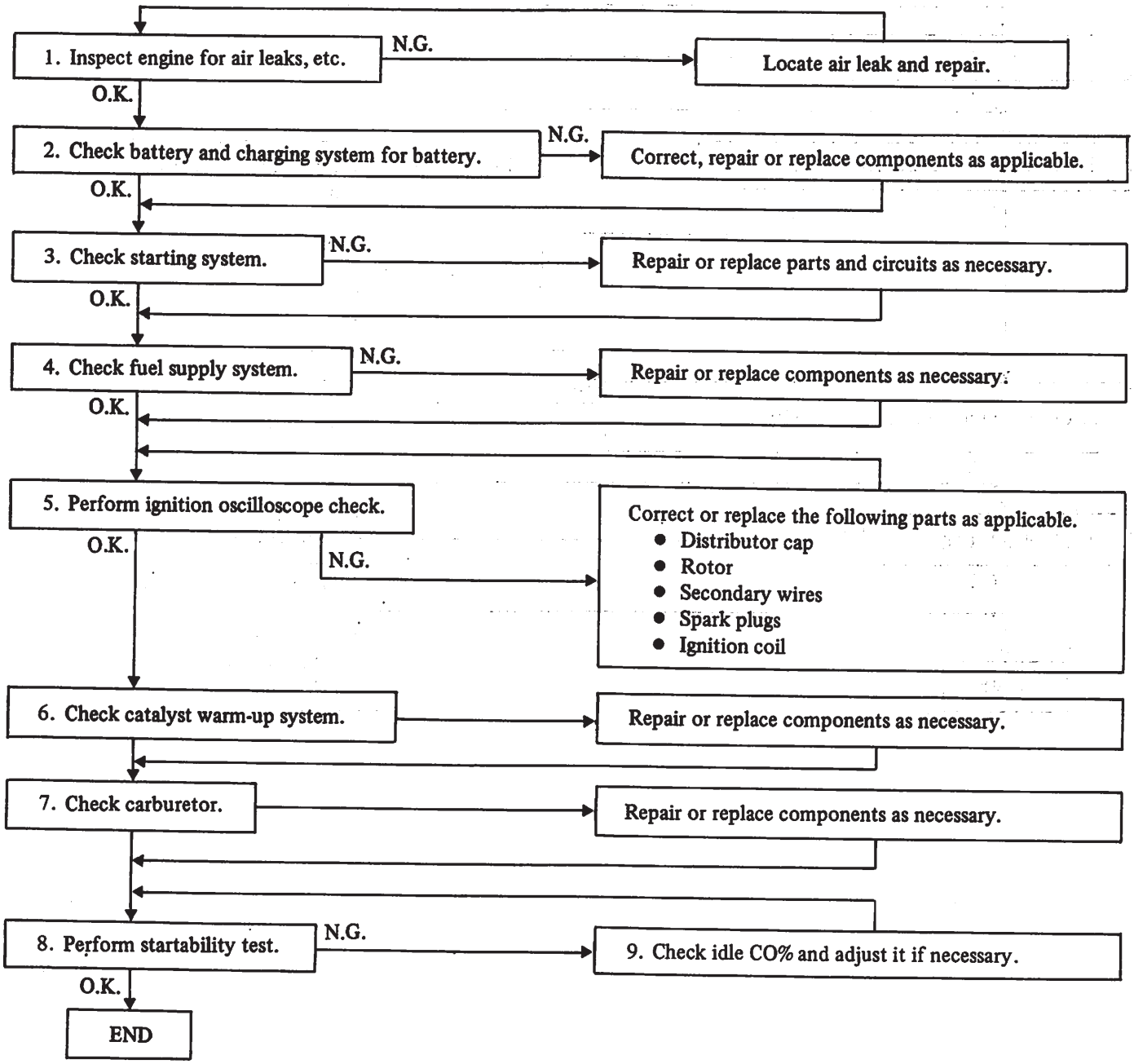
DRIVEABILITY



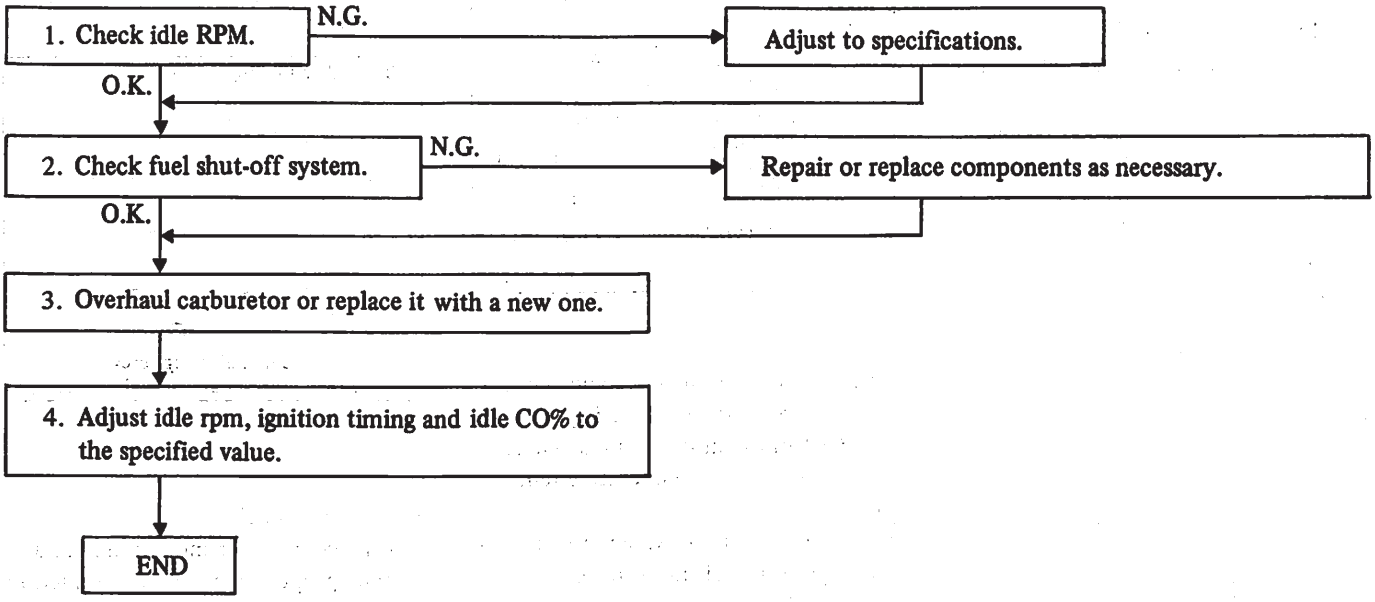
IMPROPER IDLING



ENGINE STARTABILITY



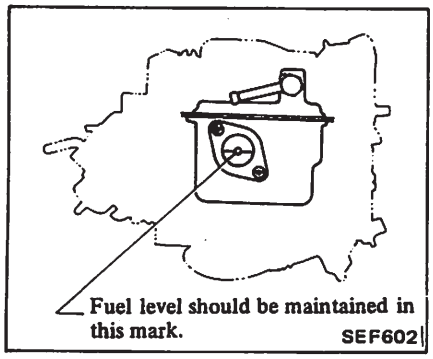
ENGINE STALL



DIAGNOSTIC STEPS FOR DRIVEABILITY

1. Inspect engine for leaks.
(1) Check clamps at all air intake components.
(2) Check vacuum hoses for leakage.
(3) Check air cleaner filter for clogging.
(4) Visually inspect for leaks at the following:
- Dipstick
- A.B. valve hose
- Air induction hose
- Intake manifold gasket
- Valve rocker cover
- E.G.R. valve gasket
- Oil filler cap

(5) Check E.G.R. valve seat and operation.
(6) Check A.B. valve operation.
2. Check fuel supply system
(1) Make sure proper fuel is used.
(2) Visually check fuel filter for clogging.
(3) Visually check fuel lines for leaks.
(4) With engine idling, visually check fuel level.

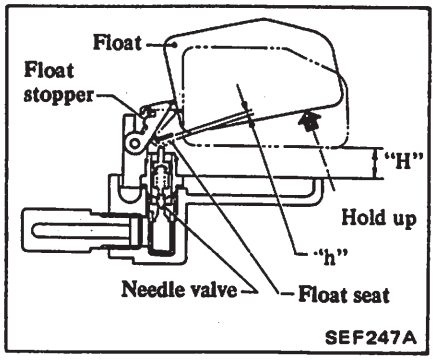


If not correct, adjust as follows.
a) Turn off engine and remove choke chamber.
b) Turn down choke chamber and adjust "H" by bending float seat.

"H":
Approximately 12 mm (0.47 in)

c) Adjust "h" by bending float stopper as required.

"h":
1.3 - 1.7 mm (0.051 - 0.067 in)



d) Install choke chamber and recheck fuel level with engine idling.
3. Perform ignition oscilloscope test.
(1) Warm engine to operating temperature.
(2) Check ignition system for unusually high or low firing voltage.
(3) If firing voltage is abnormal, determine cause and repair.
4. Check ignition timing and idle rpm.

Checks and adjustments are made with the air conditioning compressor "OFF".

- Non-California models

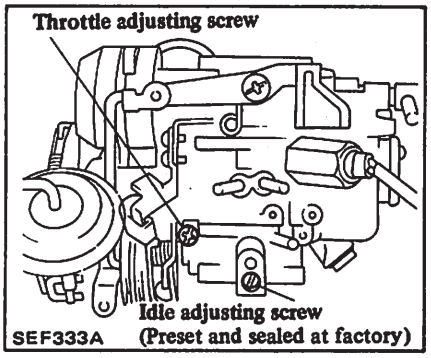
(1) Disconnect air induction hoses and install proper caps on air induction pipes.
(2) Verify that the engine is still at operating temperature.
(3) Rev the engine to 2,000 to 3,000 rpm two or three times under no-load, then allow it to run at idle speed for one minute.
(4) Disconnect distributor vacuum hose from distributor vacuum controller, and plug hose with proper plug. Then, check ignition timing with a timing light.

M/T:
5°±2° A.T.D.C.
A/T:
5°±2° A.T.D.C.
(in "D" position)

Adjust as necessary.
(5) Connect distributor vacuum hose and check idle speed.

M/T:
750±100 rpm
A/T:
650±100 rpm
(in D position)

If necessary, adjust to the specified rpm by turning the idle speed adjusting screw.



- Canada models

(1) Disconnect air induction hose and install proper cap on air induction pipe.
(2) Verify that the engine is still at operating temperature.
(3) Rev the engine to 2,000 to 3,000 rpm two or three times under no-load, then allow it to run at idle speed for one minute.
(4) Disconnect distributor vacuum hose from distributor vacuum controller, and plug hose with proper plug. Then, check ignition timing with a timing light.

M/T:
5°±2° A.T.D.C.
A/T:
5°±2° A.T.D.C.
(in "D" position)

Adjust as necessary. (Refer to section MA.)
(5) Connect distributor vacuum hose and check idle speed.

M/T:
750±100 rpm
A/T:
650±100 rpm (in D position)

If necessary, adjust to the specified rpm by turning the idle speed adjusting screw.

5. Check idle CO%.

The checking or adjustment of idle CO% requires the use of a CO meter. It is essential that the meter be fully warmed up and calibrated before any adjustment is made.

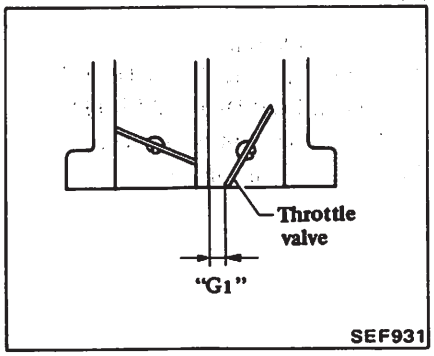
(1) Make sure that air induction hose is disconnected.
(2) Verify that the engine is at operating temperature.
(3) With the hood open, run the engine at 2,000 rpm for 2 minutes at no-load to stabilize its condition.
(4) Rev the engine to 2,000 to 3,000 rpm 2 or 3 times under no-load, finally, allow it to run at idle speed for one minute.
(5) Reset idle speed to the specified speed.
(6) Check CO% as per Table A, Column 1 and if necessary, adjust to the specified point as per Table A, Column 2. The CO% adjustment is made by turning the idle mixture screw.

Table A

Vehicle model	Trans-axle	Check idle CO% Column 1	Adjust idle CO% Column 2
U.S.A.	M/T	Less than 4%	1.5 $^{+1.0}_{-0.7}$%
	A/T	Less than 4% (in "D" range)	1.5 $^{+1.0}_{-0.7}$% (in "D" range)
Canada	M/T	2±1%	
	A/T	2±1% (in "D" range)	

(7) Check the idle speed. Readjust to the specified speed.
(8) Connect air induction hose.
6. Perform driveability test.
(1) Evaluate effectiveness of adjustments by driving vehicle.
(2) If unsatisfactory, proceed to step 7.
7. Check carburetor.
(1) With engine stopped, check each linkage and throttle valve for smooth operation. At the same time, make sure fuel is injected smoothly through the accelerating injection nozzle.
(2) Check choke valve opening.
a) Ensure that choke valve is fully open when engine is at operating temperature.
b) If not, turn off engine and check choke heater circuit.
c) If circuit is O.K., replace choke chamber assembly.
(3) Check interlock opening of primary and secondary throttle valves.
a) Remove carburetor from engine.
b) Turn throttle arm until adjusting plate comes in contact with lock lever at point Ⓐ and check clearance "G_1".

Clearance "G_1":
6.28±0.6 mm
(0.2472±0.024 in)



c) If out of specification, adjust by bending tongue of throttle arm.
(4) Clean jets, emulsion tubes and passages.

CAUTION:
a. Be sure to use a screwdriver of proper size.
b. Be careful not to scratch or nick jet.
c. To clean jet, use solvent and compressed air.

a) Remove choke chamber and verify that the numbers stamped on the jets are correct.
b) Remove jets and emulsion tubes carefully, and clean them. If necessary, clean passages.
c) Replace faulty jets and emulsion tubes.
d) Install in the reverse order of removal using a new packing.
e) Install carburetor to engine.
(5) Check idle CO%, following the procedure in step 5.
8. Perform driveability test. Re-evaluate vehicle performance.

DIAGNOSTIC STEPS FOR IMPROPER IDLING

1. Inspect engine for leaks.
2. Perform ignition oscilloscope test.
3. Check ignition timing and idle rpm.
4. Check idle CO%.
5. Overhaul carburetor or replace it with a new one.

Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY on the inspection procedure of each item.

ENGINE STARTABILITY

1. Inspect engine for leaks.

Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.

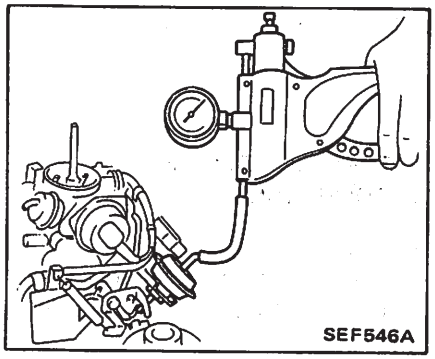
2. Check battery and charging system for battery.
(1) Check battery voltage.
(2) If poor battery voltage, check charging system for battery.
- Alternator
- Voltage regulator
- Others

Refer to EL section.

3. Check starting system.
(1) Check starter operation.
(2) If it does not operate, check the following:
- Starter
- Ignition relay
- Ignition switch
- Others

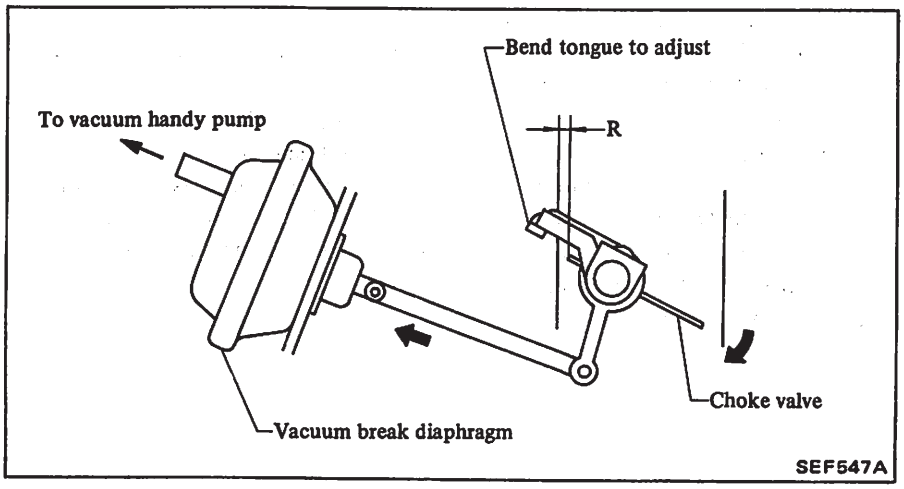
Refer to EL section.

4. Check fuel supply system.
Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.
5. Perform ignition oscilloscope test.
Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.
6. Check fast idle system. (Air conditioner equipped model)
(1) Disconnect vacuum hose at throttle opener.
(2) Check throttle opener operation using a vacuum handy pump. Replace if faulty.


SEF546A

7. Check carburetor.
(1) With engine cold, visually check that choke valve is fully closed.
(2) In this condition, check vacuum break diaphragm operation using a vacuum handy pump.

Clearance "R":
Non-California
2.60±0.09 mm
(0.1024±0.0035 in)
Canada
2.06±0.09 mm
(0.0811±0.0035 in)

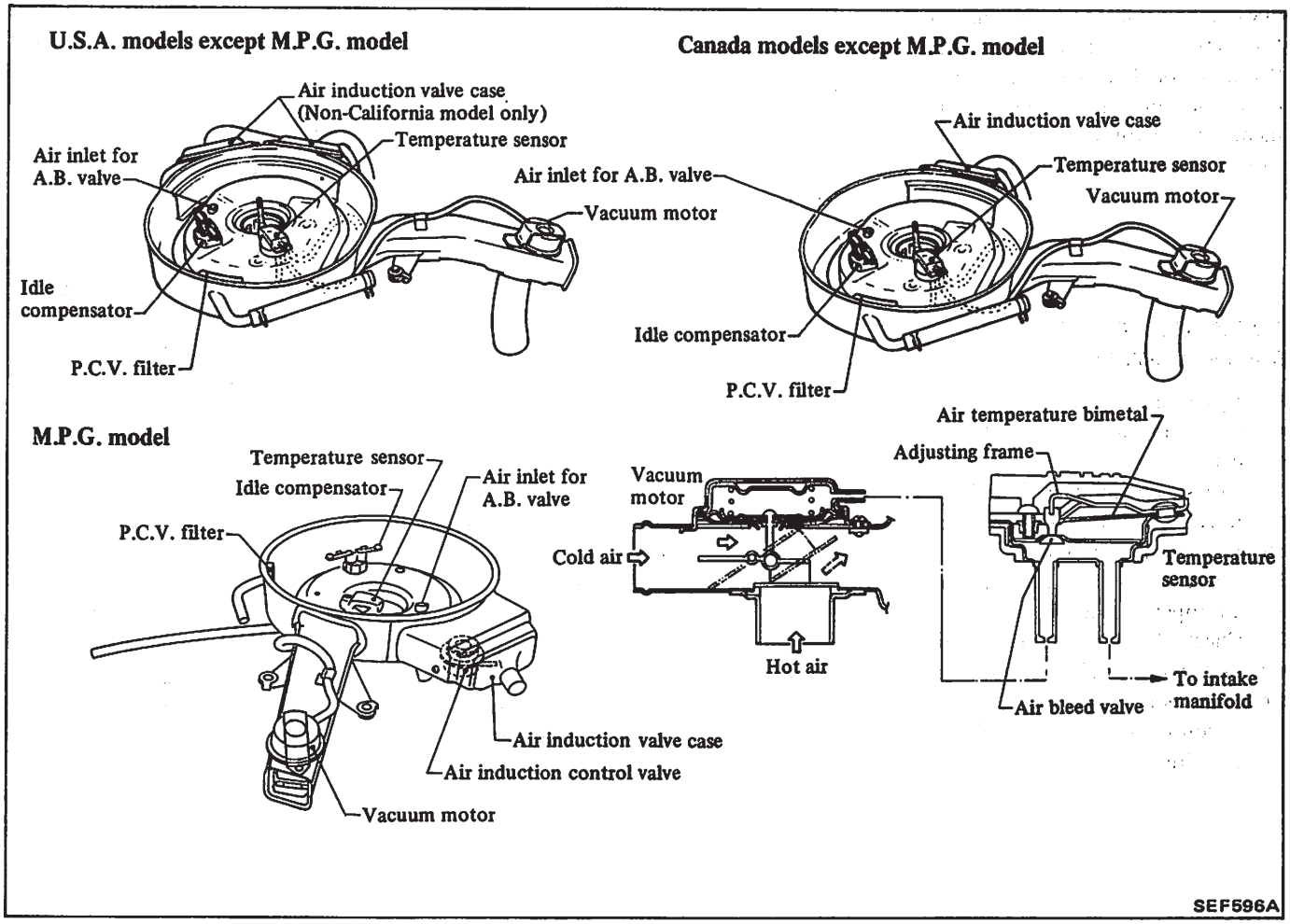


(3) If out of specification, adjust clearance by bending adjusting tongue.
8. Perform startability test.
(1) Start engine with the recommended starting procedure.
(2) If engine does not start, proceed to step 9.
9. Check and adjust idle CO%.
Check idle CO%. Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.

ENGINE STALL

1. Check idle rpm.
Check idle rpm. Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.
2. Check fuel shut-off system.
(1) Non-California models
a) Turn ignition switch "ON" and run engine under no-load. Increase and decrease engine rpm to check operating sound of anti-dieseling solenoid valve.
b) if N.G., repair or replace solenoid valve or harness.
(2) Canada models
a) Turn ignition switch "ON" and check operating sound of anti-dieseling solenoid valve.
b) If N.G., repair or replace solenoid valve or harness.
3. Overhaul carburetor or replace it with a new one.
4. Adjust idle rpm, ignition timing and idle CO% to the specified values.
Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.

AUTOMATIC TEMPERATURE CONTROL (A.T.C.) AIR CLEANER



OPERATION

The automatic temperature control system of the air cleaner is controlled by the inlet air temperature and the load condition of the engine. The inlet air temperature is detected by the sensor, and the vacuum motor is actuated by the engine intake vacuum.

Temperature sensor		Vacuum motor		Inlet air
Ambient temperature around sensor °C (°F)	Operation	Intake manifold vacuum kPa (mmHg, inHg)	Operation	
Below 38 (100)	Close	Above 21.3 (160, 6.30)	Raise	Hot
		5.3 - 21.3 (40 - 160, 1.57 - 6.30)	Partially raise	Cold + Hot
		Below 5.3 (40, 1.57)	Down	Cold
Above 53 (127)	Open	Any value	Down	

The temperature sensor partially opens between 38°C and 53°C (100°F and 127°F) so that the intake manifold vacuum will be reduced. This causes the motor to activate, which in turn opens the cold air passage wide, for cold air to be taken in.

INSPECTION

AIR CLEANER FILTER

Viscous paper type air cleaner filter does not require any cleaning operation until it is replaced periodically. Brushing or blasting operation will cause clogging and result in enrichment of carburetor mixture, and should never be conducted.

AUTOMATIC TEMPERATURE CONTROL SYSTEM

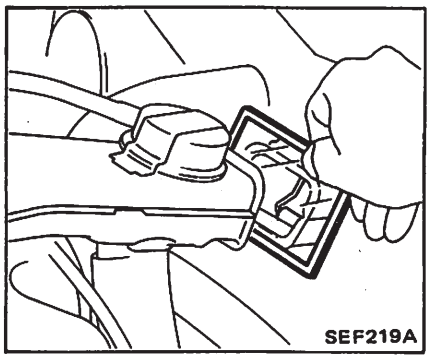
- Engine stall or hesitation
- Increase in fuel consumption
- Lack of power

If these phenomena should occur, check A.T.C. system before carrying out inspection of carburetor.

1. Check hoses for cracks, distortion and improper position.
2. Check A.T.C. system for proper function, while engine is cold. Check air control valve position.

Air control valve is correct if it is in lower position.

3. Start engine and immediately check air control valve position. If it rises, it is correct.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4. Make sure that air control valve rises and lowers when engine speed is quickly increased and decreased.
5. Make sure that air control valve partially rises when engine warm-up advances.

If the above test reveals any problem in the operation of air control valve, carry out the following test:

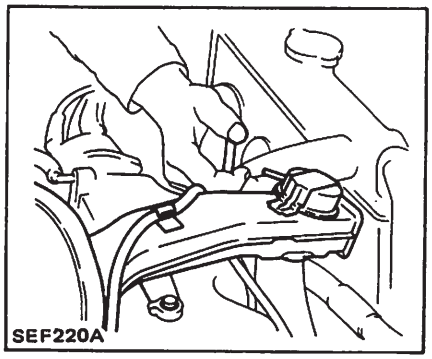
VACUUM MOTOR

Disconnect vacuum motor inlet vacuum hose, and connect another hose to the inlet to apply vacuum to vacuum motor. Then, confirm that the air control valve moves.

TEMPERATURE SENSOR

While engine is cold and idling, disconnect vacuum motor inlet vacuum hose and make sure that intake vacuums is present at end of vacuum hose.

If vacuum is weak or is not present at all, check vacuum hoses for leakage. Replace temperature sensor if vacuum hoses are in good order.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IDLE COMPENSATOR

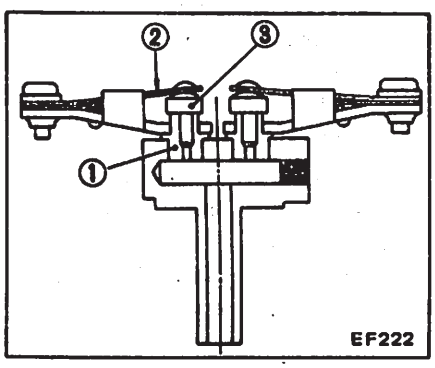
DESCRIPTION

The idle compensator is basically a thermostatic valve which functions to introduce the air directly from the air cleaner to the intake manifold to compensate for abnormal enrichment of mixture in high idle temperature.

The bi-metal attached to the idle compensator detects the temperature of intake air, and opens or closes the valve. Two idle compensators having different temperature characteristics are installed.

Idle compensator opening temperature

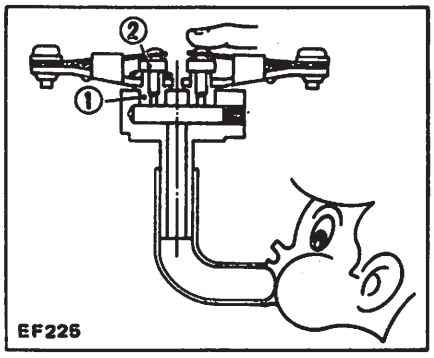
No. 1	60 - 70°C (140 - 158°F)
No. 2	70 - 80°C (158 - 176°F)



1 Orifice
2 Bimetal
3 Rubber valve

INSPECTION

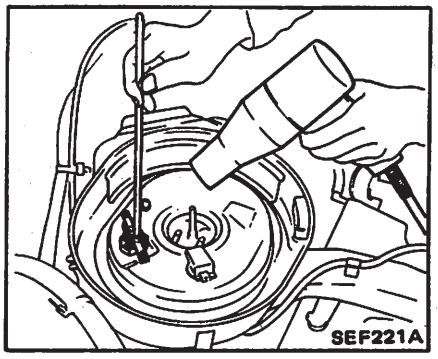
1. Check that valve is in closed position when bimetal temperature is lower than operating temperature. To check, breathe air into tube or suck air. If excessive air leakage is found at the valve, replace idle compensator as an assembly. Note that two idle compensators are mounted to air cleaner, and that it is necessary to plug the valve of one of these idle compensators so as to prevent air leak while checking the other one.



1 Orifice
2 Rubber valve

2. Warm up engine completely.
3. Open engine hood and remove air cleaner cover.
4. Direct warm air to idle compensator with a heat gun.

And measure operating temperature of idle compensator.



Place thermometer as close as possible to idle compensator sensor.

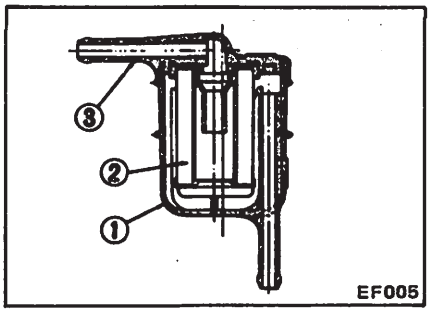
5. Idle compensator is in good order if a "hissing" sound is heard when its temperature reaches operating temperature.

If not, replace idle compensator.

FUEL FILTER

DESCRIPTION

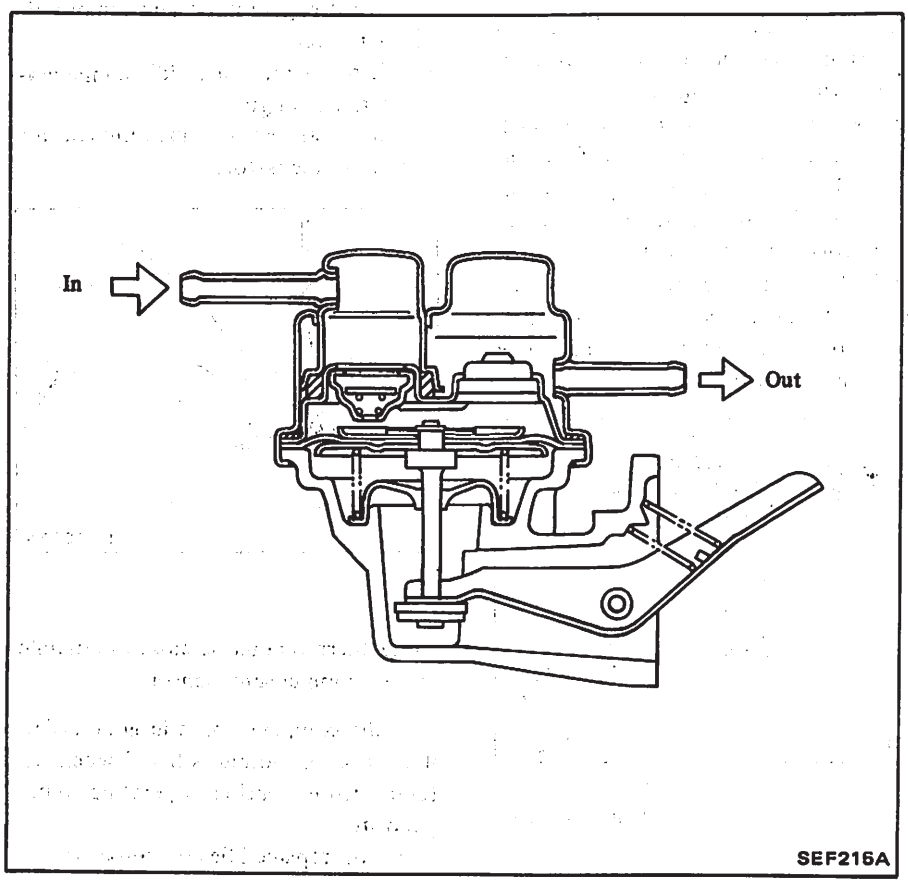
The fuel filter is a cartridge type. It uses a paper element.



1 Body
2 Paper element
3 Cover

FUEL PUMP

The fuel pump can not be disassembled.



When disconnecting fuel hoses, use a container to receive fuel remaining in fuel hoses.

OPERATING TEST

STATIC PRESSURE TEST

1. Disconnect fuel hose between carburetor and fuel pump.
2. Connect a rubber hose to each open end of a T-connector, and connect this connector-hose assembly between carburetor and fuel pump.

Locate this T-connector as close to carburetor as possible.

3. Connect a suitable pressure gauge to the opening of T-connector, and fasten the hose between carburetor and T-connector securely with a clip.
4. Start and run the engine at various speeds.
5. The pressure gauge indicates static fuel pressure in the line. The gauge reading should be within the specified value.

Fuel pump pressure:
21.6 - 26.5 kPa
(0.22 - 0.27 kg/cm², 3.1 - 3.8 psi)

If pressure is not within the specified limit, remove pump as an assembly.

CAPACITY TEST

The capacity test is conducted only when static pressure is within the specification. To conduct this test, proceed as follows:

1. Disconnect pressure gauge from T-connector and, in its vacant place, install a suitable container as a fuel sump.
2. Start engine and run at 750 rpm.
3. Pump should deliver the specified amount of fuel.

If little or no fuel flows from open end of pipe, it is an indication that fuel line is clogged or pump is malfunctioning.

Fuel pump capacity:
More than 1,300 mℓ
(44.0 US fl oz, 45.8 Imp fl oz)/min
at 600 rpm

If the fuel in the carburetor float chamber has run out and engine has stopped, remove clip and pour fuel into carburetor. Fasten clip securely and repeat static pressure test.

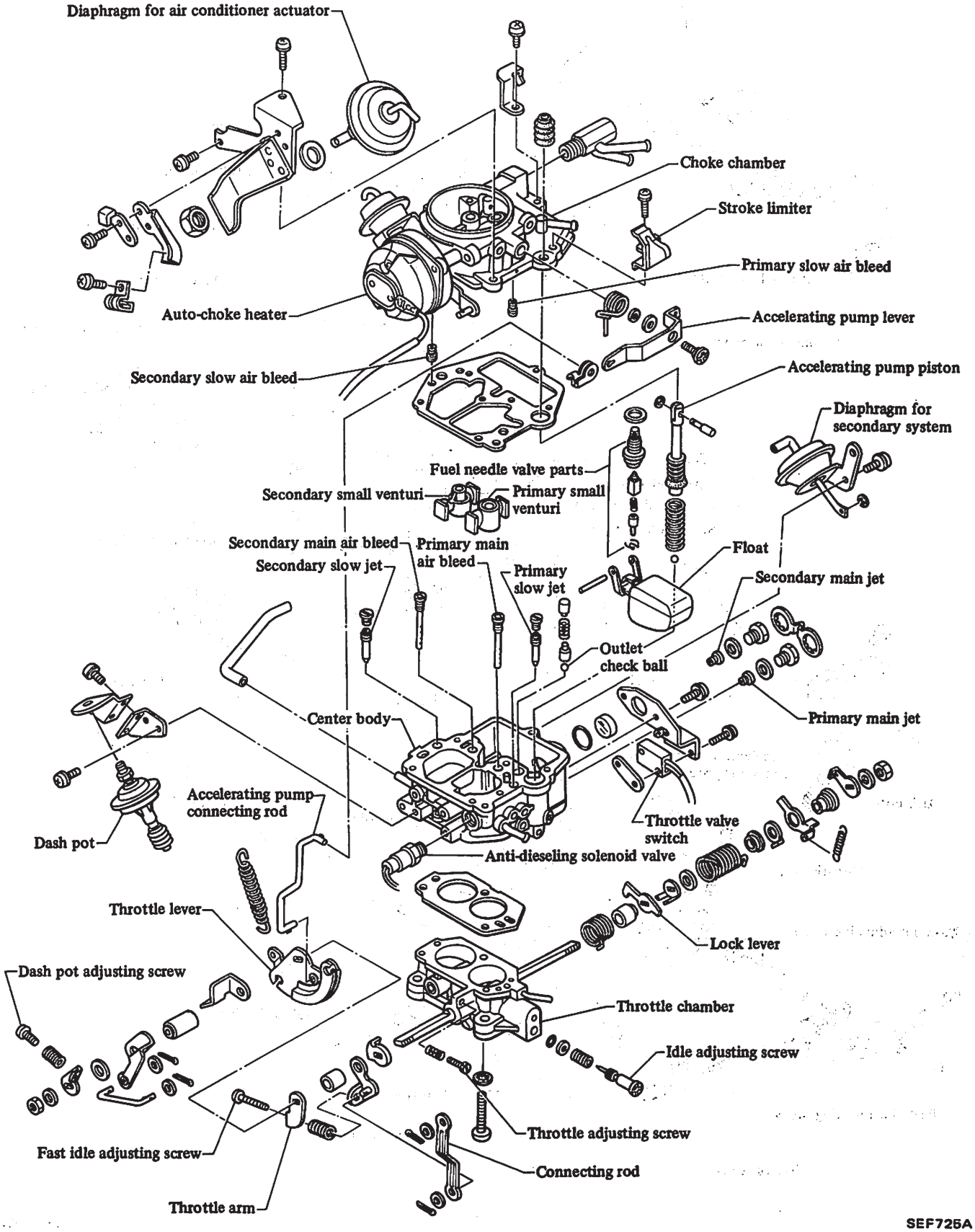
INSPECTION

Test the function as follows.

1. Position fuel pump assembly about 1 meter (3.3 ft) above fuel level of fuel strainer and connect a pipe from strainer to fuel pump.
2. Operate rocker arm by hand. If fuel is drawn up soon after rocker arm is released, fuel pump is functioning properly.

CARBURETOR

Except California and M.P.G. models



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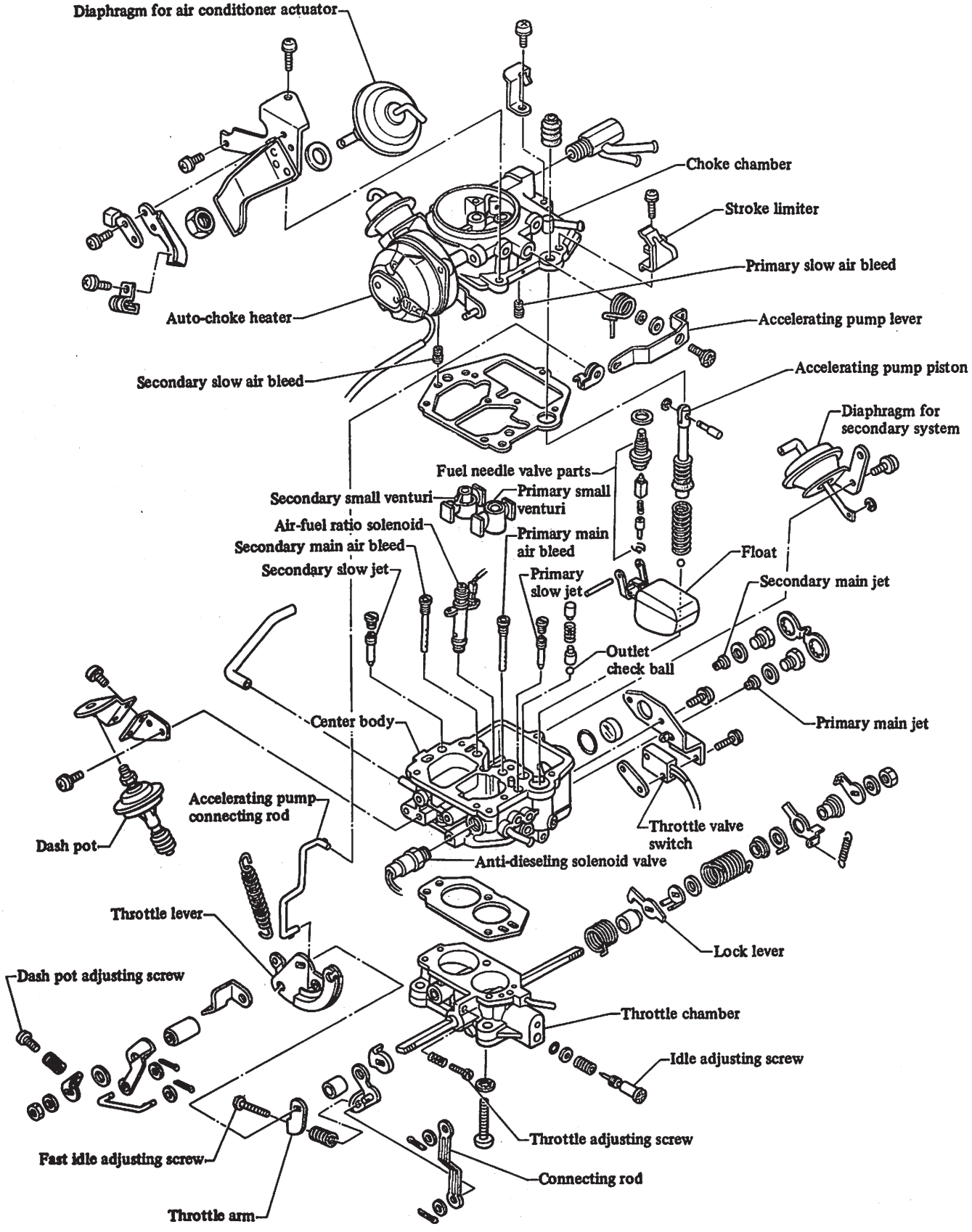
California models



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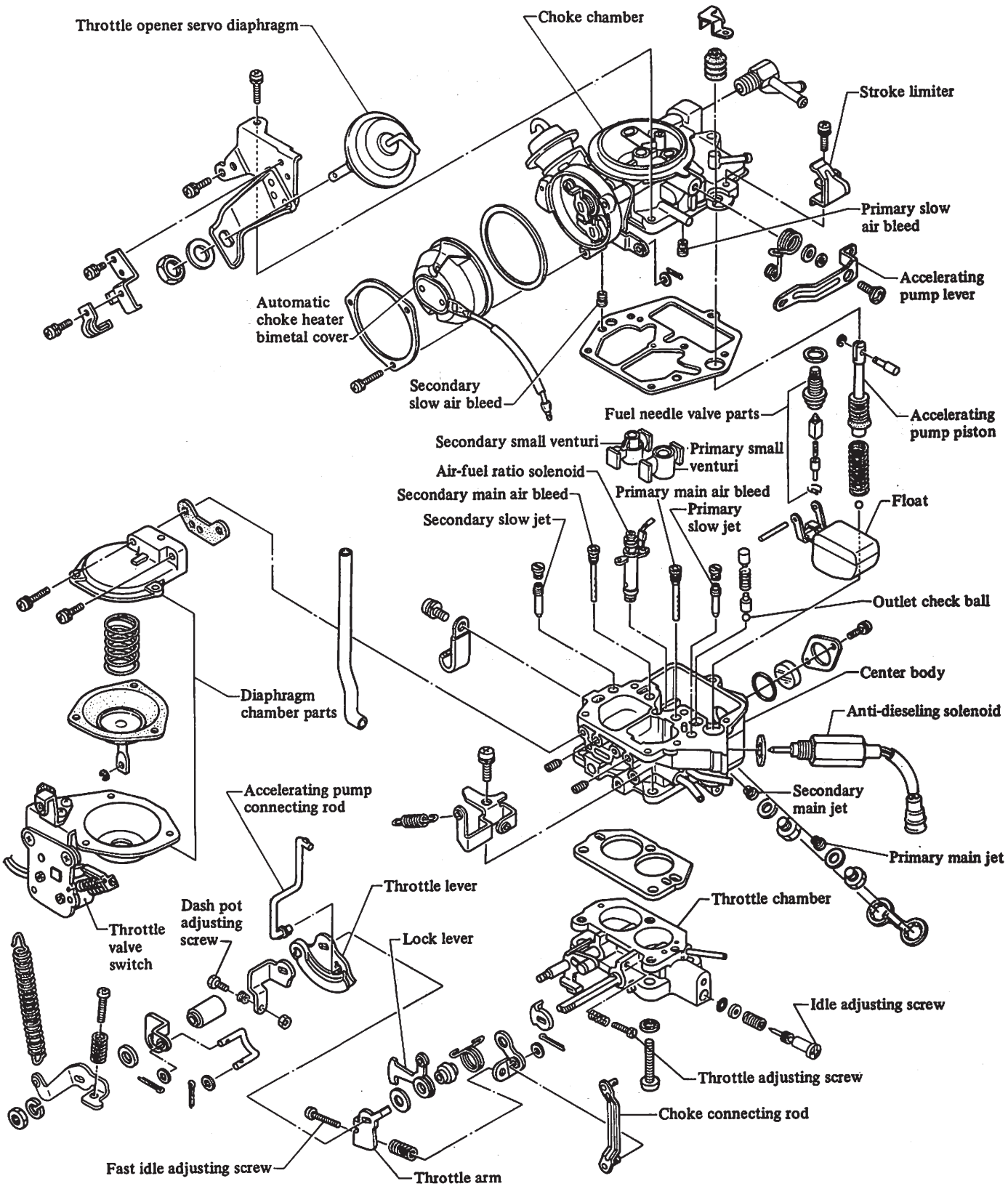
M.P.G. models



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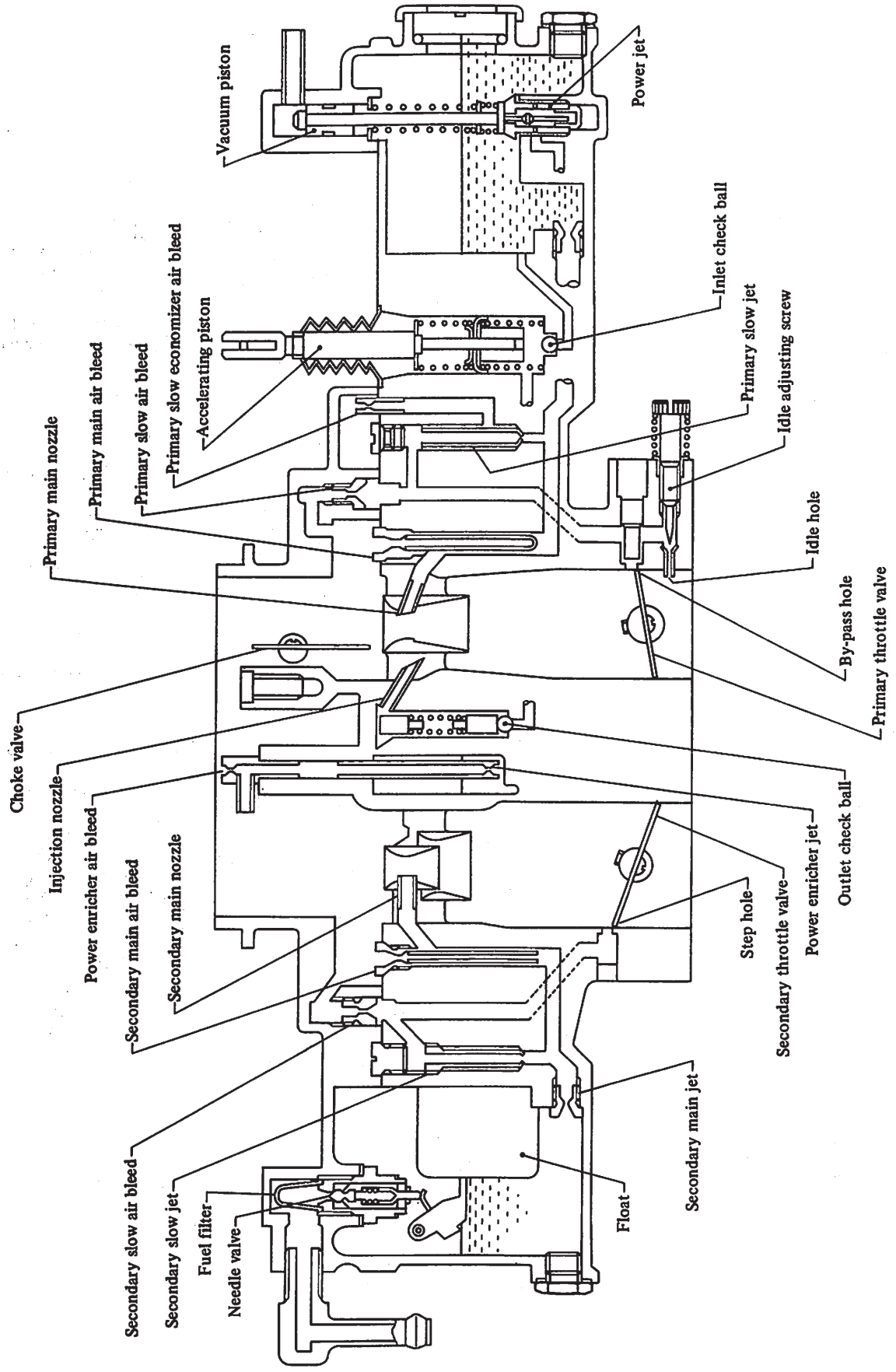
Except California and M.P.G. models



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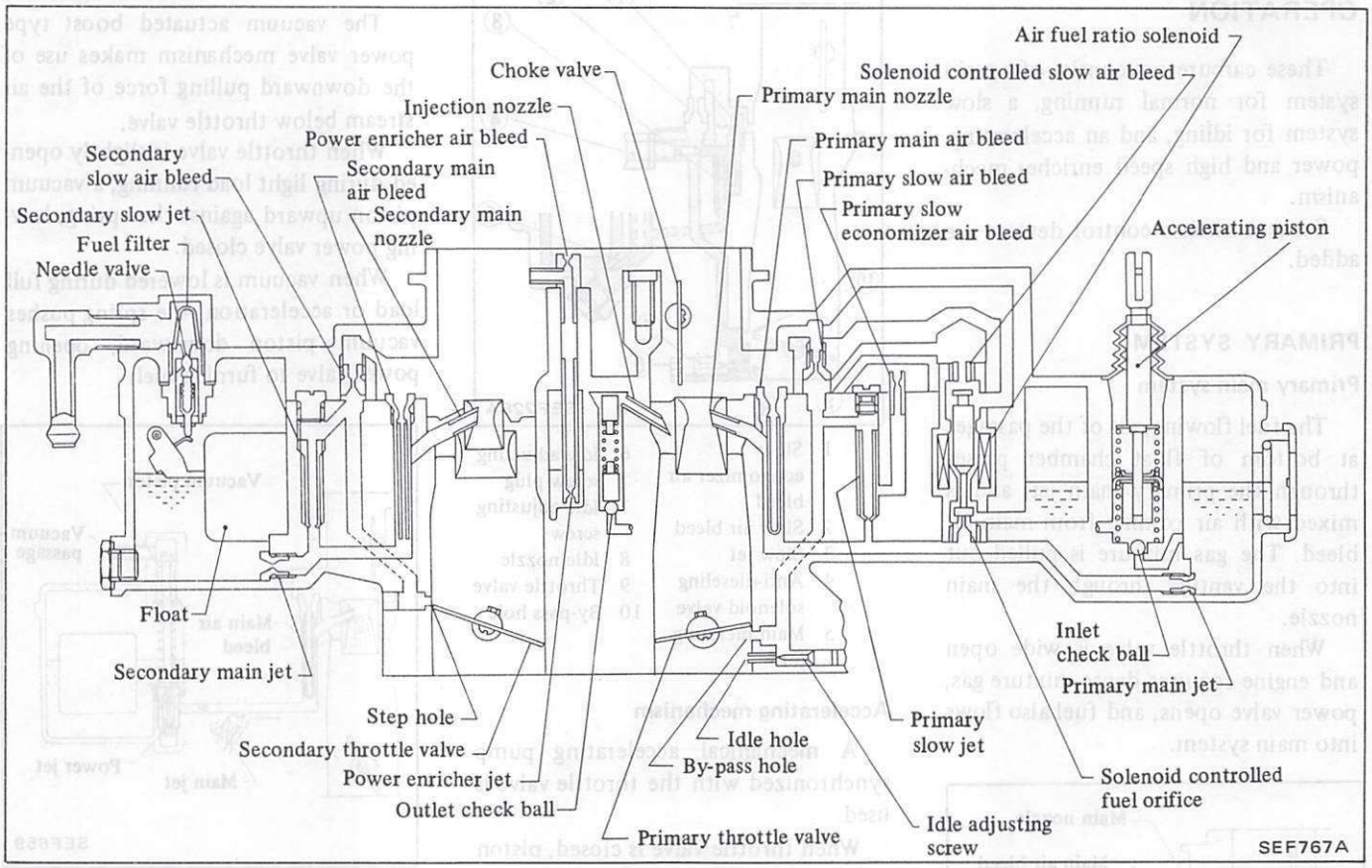
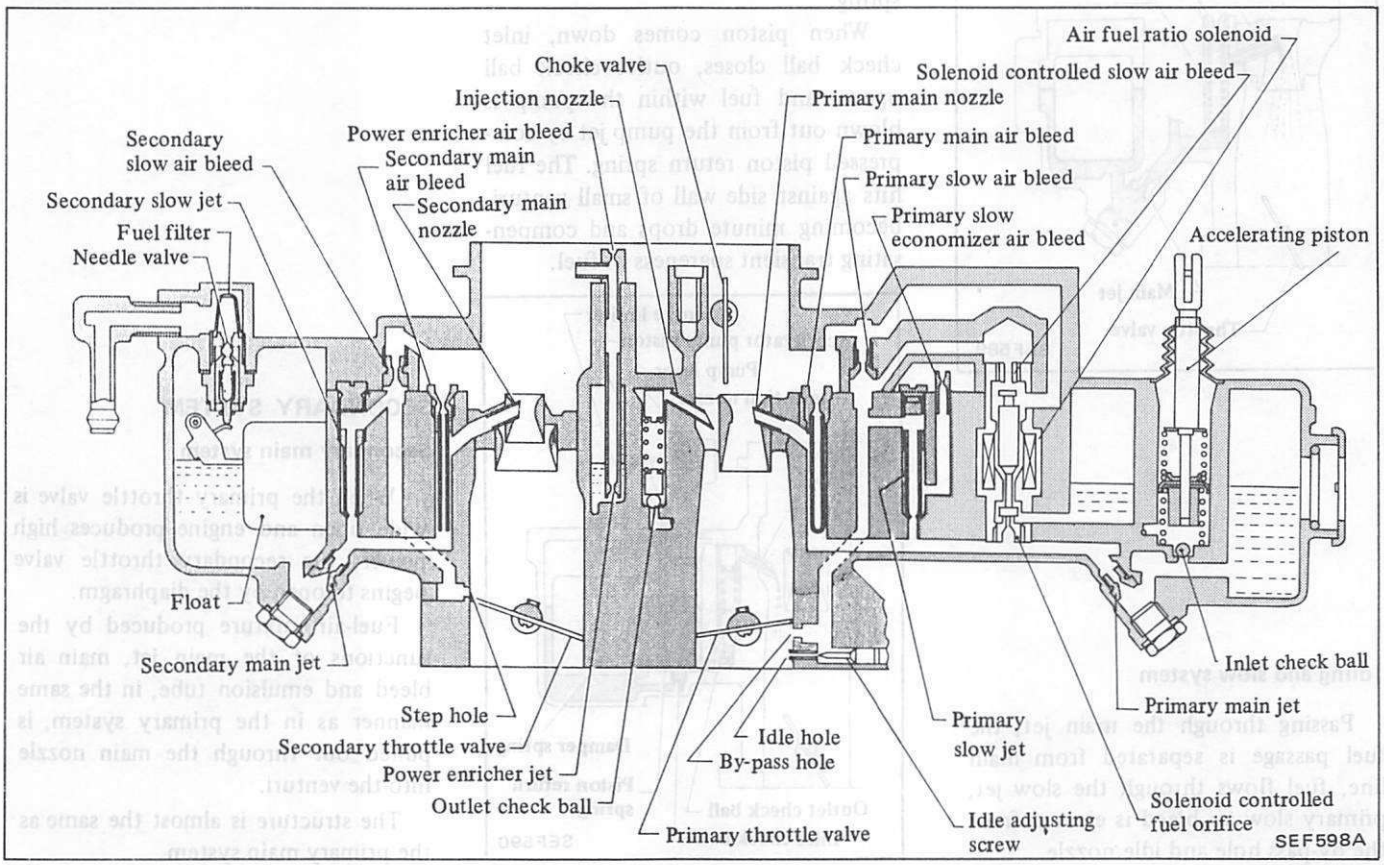
California models



M.P.G. models



STRUCTURE AND OPERATION

These carburetors consist of a main system for normal running, a slow system for idling, and an accelerating, power and high speed enricher mechanism.

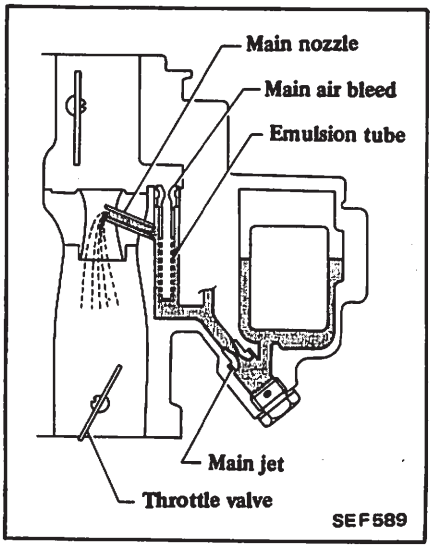
Some emission control devices are added.

PRIMARY SYSTEM

Primary main system

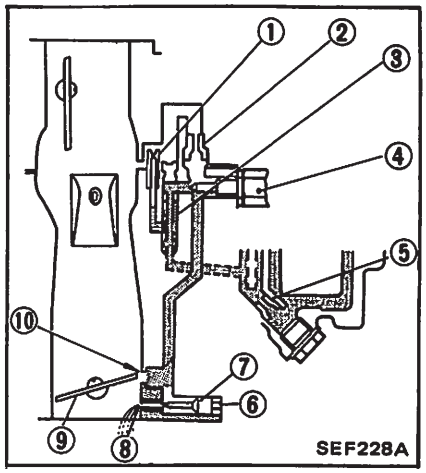
The fuel flowing out of the passages at bottom of float chamber passes through the primary main jet, and is mixed with air coming from main air bleed. The gas mixture is pulled out into the venturi through the main nozzle.

When throttle valve is wide open and engine requires dense mixture gas, power valve opens, and fuel also flows into main system.



Idling and slow system

Passing through the main jet, the fuel passage is separated from main line, fuel flows through the slow jet, primary slow air bleed is ejected from the by-pass hole and idle nozzle.



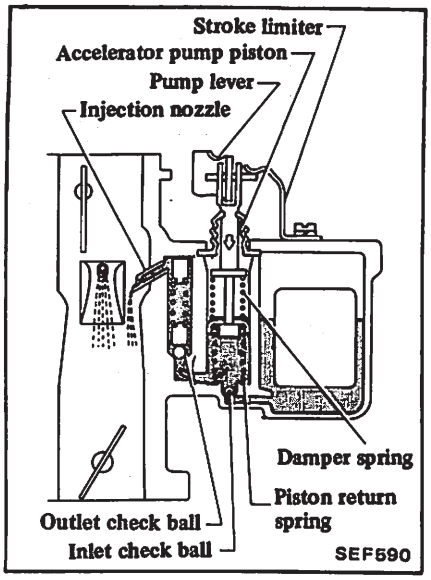
1 Slow economizer air bleed
2 Slow air bleed
3 Slow jet
4 Anti-dieseling solenoid valve
5 Main metering jet
6 Idle adjusting screw plug
7 Idle adjusting screw
8 Idle nozzle
9 Throttle valve
10 By-pass hole

Accelerating mechanism

A mechanical accelerating pump synchronized with the throttle valve is used.

When throttle valve is closed, piston rod is pushed up with linkage, which pushes up piston through piston return spring.

When piston comes down, inlet check ball closes, outlet check ball opens, and fuel within the pump is blown out from the pump jet by compressed piston return spring. The fuel hits against side wall of small venturi, becoming minute drops and compensating transient spareness of fuel.

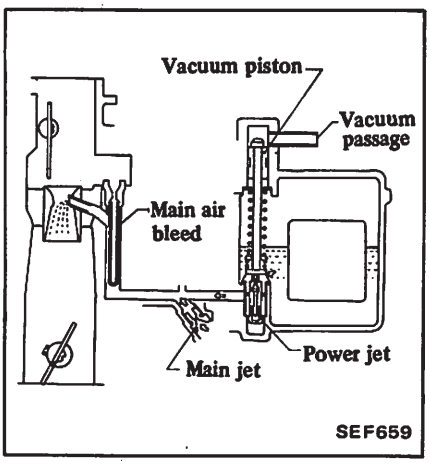


Power valve mechanism

The vacuum actuated boost type power valve mechanism makes use of the downward pulling force of the air stream below throttle valve.

When throttle valve is slightly opened during light load running, a vacuum piston upward against the spring, leaving power valve closed.

When vacuum is lowered during full load or acceleration, the spring pushes vacuum piston downward, opening power valve to furnish fuel.



SECONDARY SYSTEM

Secondary main system

When the primary throttle valve is wide open and engine produces high power, the secondary throttle valve begins to open by the diaphragm.

Fuel-air mixture produced by the functions of the main jet, main air bleed and emulsion tube, in the same manner as in the primary system, is pulled out through the main nozzle into the venturi.

The structure is almost the same as the primary main system.

Secondary switchover mechanism

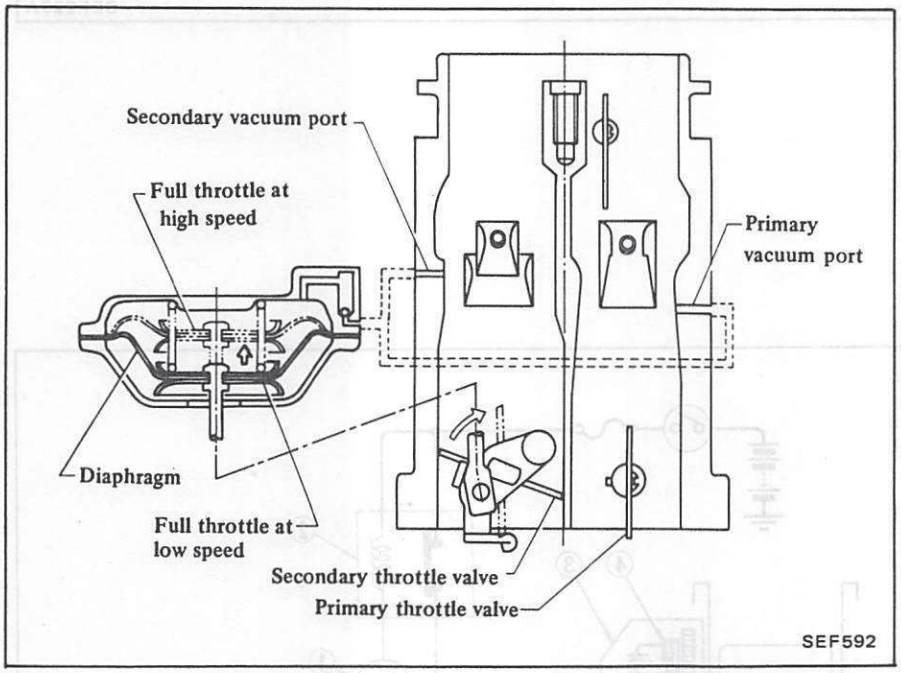
The secondary throttle valve is linked to the diaphragm which is actuated by the vacuum created in the venturi. A vacuum port is provided at each of the primary and secondary venturis, and the composite vacuum of these ports actuates the diaphragm.

As the linkage causes the secondary throttle valve to close until the primary throttle valve opening reaches approximately 48°, fuel consumption during normal operation is not excessive.

During high speed running, as the vacuum at the venturi is increased, the diaphragm is pulled against the diaphragm spring force, and then secondary throttle valve is opened.

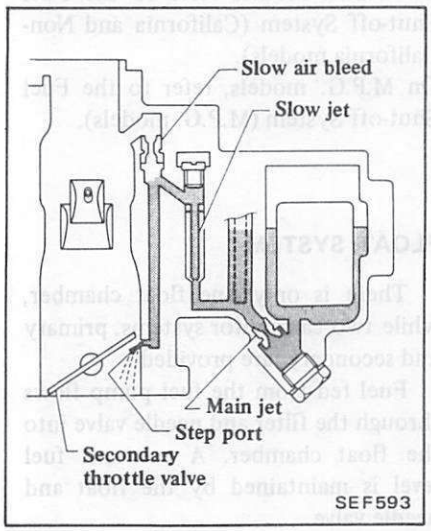
The other side, during low speed running (as the primary throttle valve opening does not reach 48°), the secondary throttle valve is locked to close completely by the locking arm which is interlocked with primary throttle arm by linkage.

When the primary throttle valve opening reaches wider position than 48°, the secondary throttle valve is ready to open, because the locking arm revolves and leaves from the secondary throttle arm.



Secondary slow system (Step system)

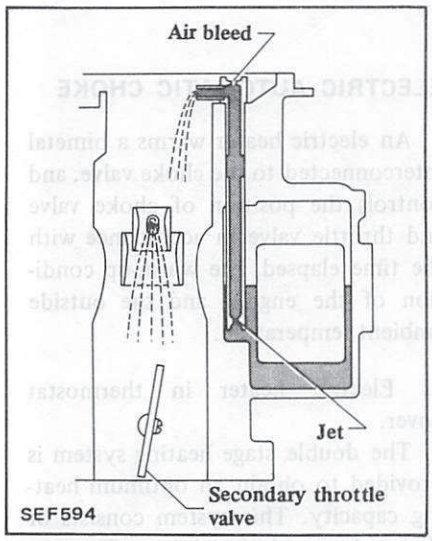
This system aims at the power filling up of the gap when fuel supply is transferred from the primary system to the secondary system.



High speed enricher

The high speed enricher improves high engine output performance during high speed driving.

When the velocity of suction air flowing through the carburetor secondary bore increases, additional fuel is drawn out of the enricher nozzle.

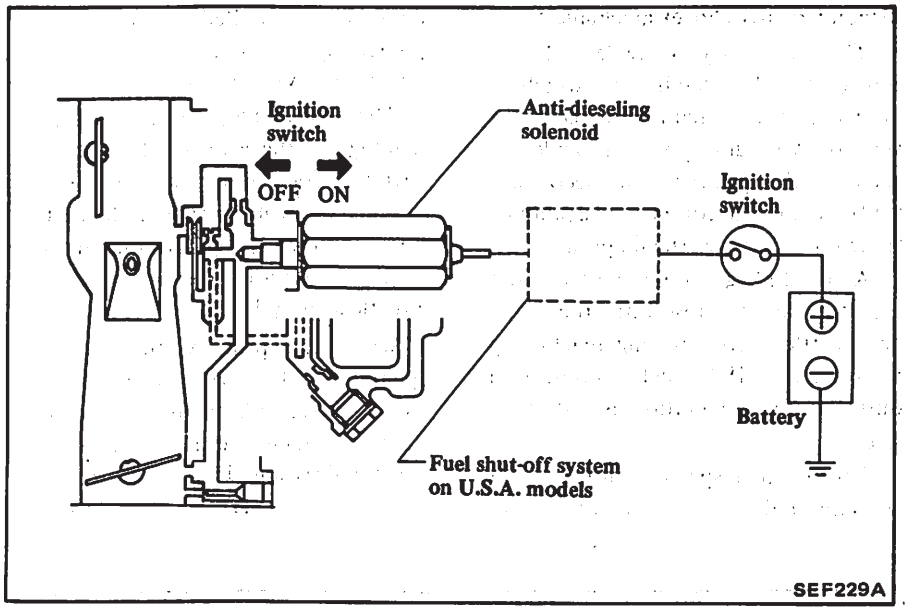


ANTI-DIESELING SYSTEM

As the ignition switch turned off, the valve is brought into operation, shutting off the supply of fuel to the slow circuit.

On U.S.A. models refer to the Fuel Shut-off System (California and Non-California models).

On M.P.G. models, refer to the Fuel Shut-off System (M.P.G. models).



FLOAT SYSTEM

There is only one float chamber, while two carburetor systems, primary and secondary, are provided.

Fuel fed from the fuel pump flows through the filter and needle valve into the float chamber. A constant fuel level is maintained by the float and needle valve.

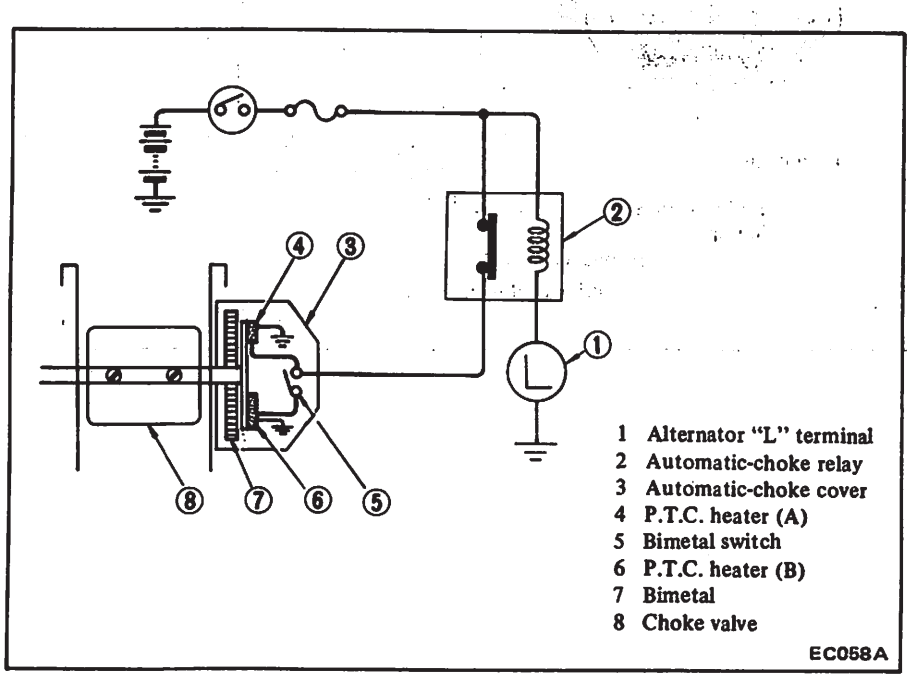
Because of the inner air vent type float chamber ventilation, fuel consumption is not affected by dirt accumulated in the air cleaner.

The needle valve includes special hard steel ball and will not wear for all its considerably long use.

Besides, the insertion of a spring will prevent the flooding at rough road running.

ELECTRIC AUTOMATIC CHOKE

An electric heater warms a bimetal interconnected to the choke valve, and controls the position of choke valve and throttle valve in accordance with the time elapsed, the warm-up condition of the engine, and the outside ambient temperature.



1. Electric heater in thermostat cover.

The double stage heating system is provided to obtain an optimum heating capacity. This system consists of first and second stage heater. The first stage heater (A) always operates to heat the bimetal during the time when electric current flows through the auto-choke circuit, and in addition to the first stage operation, the second stage heater (B) begins to operate when the bimetal temperature reaches to the level of about 15°C (59°F) so that the choke valve opens more early. This operation of the second stage heater is controlled by a thermo switch attached to the bimetal.

2. Bimetal

Electric current flows through the heater as the engine starts, and warms the bimetal. The deflection of the bimetal is transmitted to the choke valve through the choke valve lever.

3. Fast idle cam

The fast idle cam determines the opening of the throttle valve so that the proper amount of mixture corresponding to the opening of the choke valve will be obtained. The opening of the choke valve is dependent upon the warm-up condition of the engine.

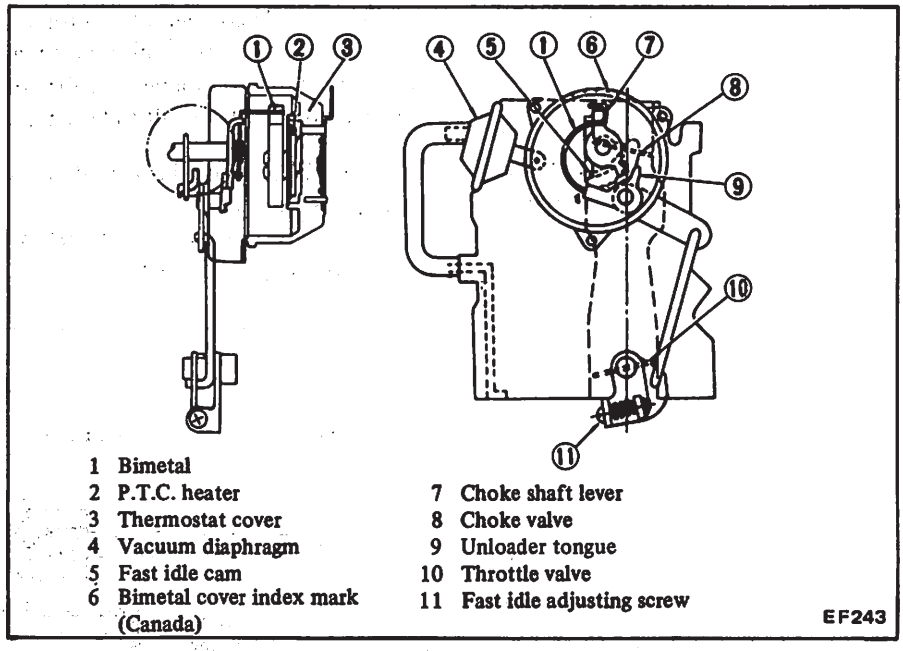
4. Choke unloader

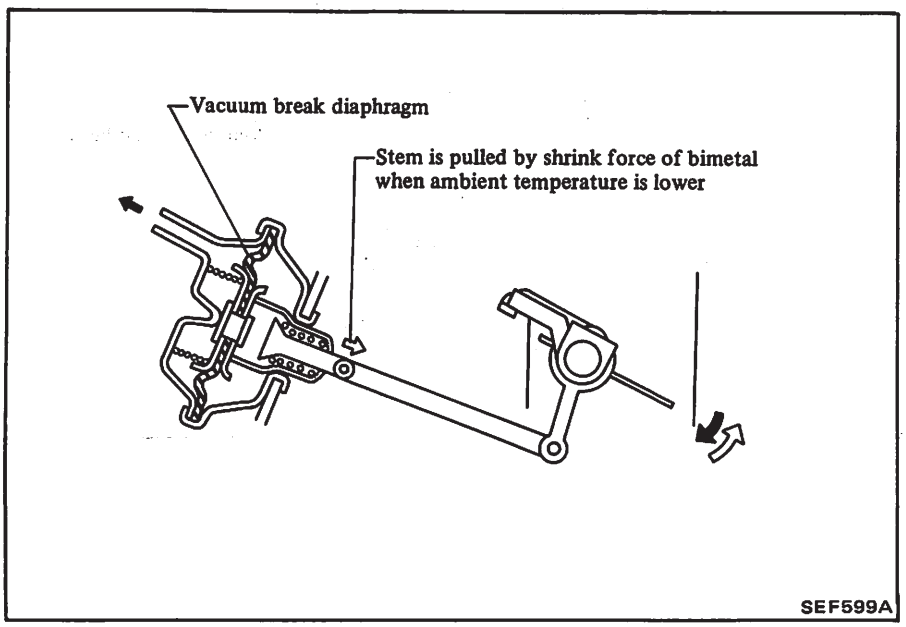
When accelerating the engine during the warm-up period, that is, before the choke valve opens sufficiently, this unloader forces the choke valve open a little so as to obtain an adequate air-fuel mixture.

5. Vacuum break diaphragm

After the engine has been started by cranking, this diaphragm forces the choke valve open to the predetermined extent so as to provide the proper air-fuel ratio.

A two stage-acting type vacuum diaphragm is employed.





DASH POT SYSTEM (Canada)

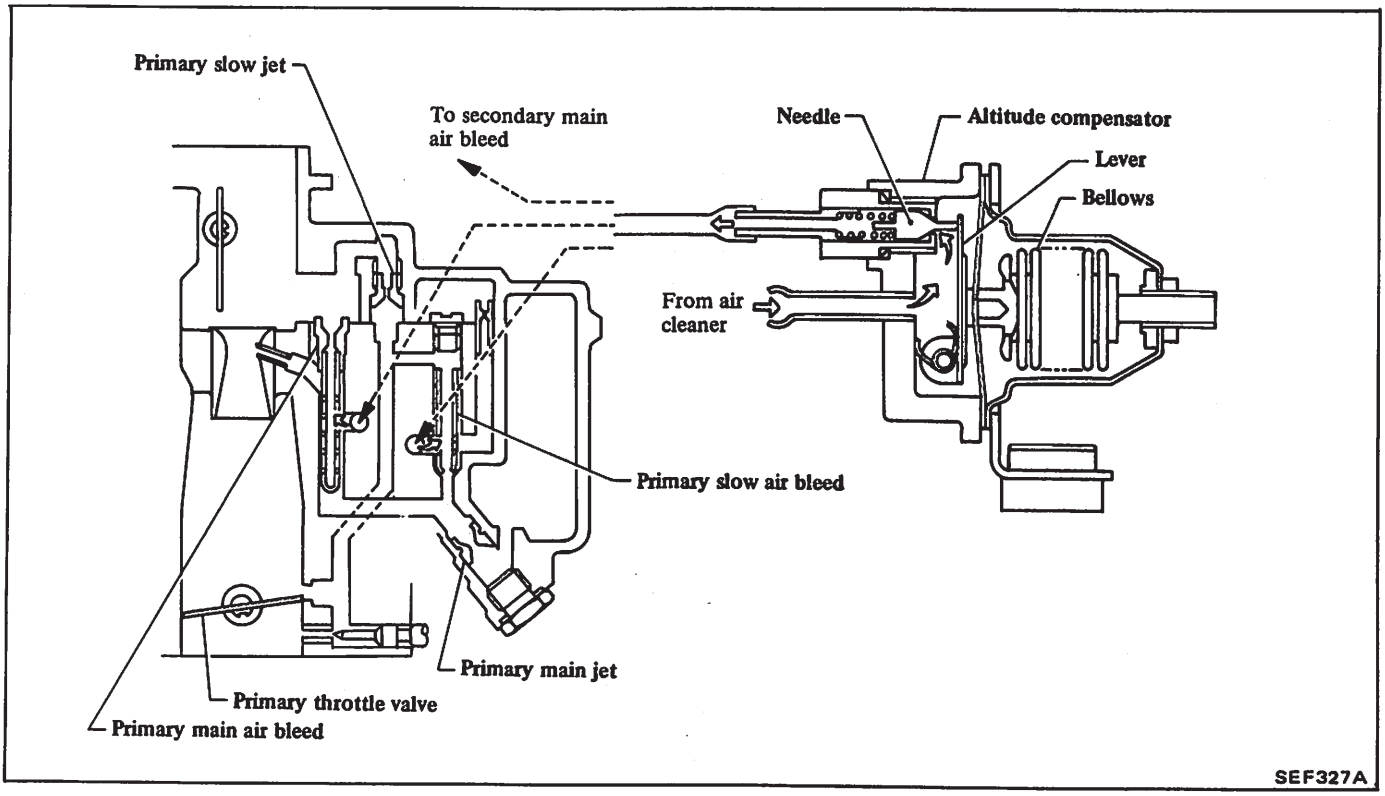
In automatic transmission models, a dash pot prevents engine stall resulting from quick application of the brake or from quick release of the accelerator pedal after it has been tread upon slightly.

ALTITUDE COMPENSATOR
(Non-California high altitude models)

The higher the altitude is, the thinner the density of air becomes. At a higher altitude, therefore, the carburetor produces too rich air-fuel mixture.

The altitude compensator automatically corrects air-fuel mixture to an optimum ratio. It operates in the following sequence when altitude is high.

1. The bellows in the altitude compensator extends.
2. The lever attached to the bellows then pushes up the needle.
3. When the needle is pushed up, the air passage becomes wider, allowing larger amount of air to flow from altitude compensator to the carburetor. As a result, the fuel becomes thinner.
4. With this additional air in the carburetor, air-fuel mixture becomes thin to a proper ratio.



INSPECTION AND ADJUSTMENT

CARBURETOR IDLE-RPM AND MIXTURE RATIO (U.S.A. models)

The idle mixture adjusting screw which has been preset at the factory should be adjusted only in the event of a major carburetor overhaul, throttle body replacement or to lower exhaust emissions as directed by official inspections.

The plug which seals this screw should not be removed during routine maintenance.

Adjusting mixture using other than the method below may violate Federal, or other state and Provincial laws.

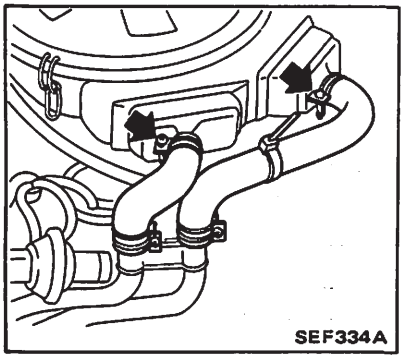
Preparation

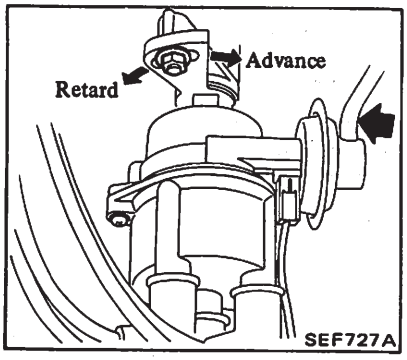
1. Make sure that the following parts are in good order.
- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- E.C.C. component parts
- Main harness connector
- Hoses
- Oil filler cap and oil level gauge
- Valve clearance

2. Connect engine techometer and timing light in their proper positions.
3. On air conditioner equipped models, the air conditioner system should be "OFF".
4. Apply parking brake and block both front and rear wheels with chocks.
5. Insure that these switches and units are in the following positions:
- Headlamp switch: OFF
- Heater blower: OFF
- Air conditioning switch: OFF (if equipped)
- Steering: KEEP WHEELS STRAIGHT AHEAD (if equipped with power steering)

6. Make the check after the radiator cooling fan has stopped. If it is operating, wait until it stops.
7. When measuring "CO" percentage, insert probe more than 40 cm (15.7 in) into tail pipe.

Checking and adjusting procedure for Non-California


SEF334A



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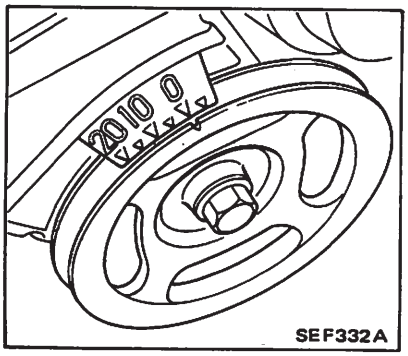

SEF332A


SMA302A

START

Open engine hood and disconnect air induction hoses from air pipes and install caps on air pipes.

Close engine hood and start engine and warm it up until water temperature indicator points to middle of gauge. Ensure that engine speed is below 1,000 rpm.

Open engine hood.

Run engine at idle speed for 2 minutes.

Disconnect distributor vacuum hoses at distributor diaphragm side and install blind plugs to hoses.

Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load and run engine at idle speed.

Check ignition timing.

IGNITION TIMING (A.T.D.C.)
M/T 5°±2°
A/T 5°±2° (in "D" position)

O.K.

N.G.

Adjust ignition timing by turning distributor, loosening distributor securing bolt.

Connect distributor vacuum hoses to distributor diaphragm.

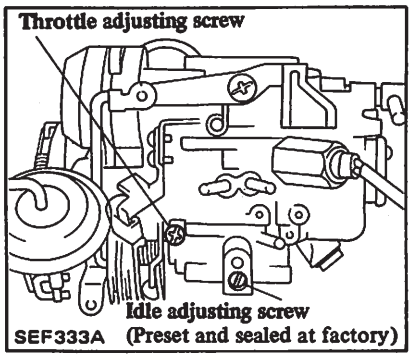
Ⓐ

WARNING:

a. Inspections should be carried out while shift lever is in "D" position on automatic transaxle equipped models and in "Neutral" on manual transaxle equipped models.

b. On automatic transaxle equipped models, racing the engine should be carried out while shift lever is in "N" or "P" position and brake pedal should be depressed.

c. After adjustment has been made, shift the lever to "N" or "P" position.



SEF333A

*a. This check or adjustment should be performed under the following conditions:
- Headlamp switch: OFF
- Heater blower: OFF
- Air conditioning switch: OFF (if equipped)
- Steering: KEEP WHEELS STRAIGHT AHEAD (if equipped with power steering)

b. Make the check after the radiator cooling fan has stopped. If it is operating, wait until it stops.

Ⓐ

Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load and run engine at idle speed.


SMA302A

* Check idle speed.

IDLE SPEED
M/T 750±100 rpm
A/T 650±100 rpm (in "D" position)

O.K. — N.G.

* Adjust idle speed by turning throttle adjusting screw. (Refer to Section MA.)

Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load and run engine at idle speed.


SMA302A

* Check idle "CO" %.

IDLE "CO"%
M/T Less than 4%
A/T Less than 4% (in "D" position)

O.K. — N.G.

Does engine turn smoothly?

YES. — NO.

Check the following.
- Vacuum hoses for proper connections
- Air leaks at carburetor mounting and intake manifold

O.K. — N.G.

Correct or replace malfunctioning parts.

* Adjust idle mixture ratio until idle "CO" $1.5^{+1.0}_{-0.7}$% is obtained and install idle mixture seal plug. (Refer to IDLE MIXTURE ADJUSTING PROCEDURE.)

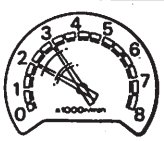
O.K. — N.G.

Correct or replace carburetor.

Turn off engine and connect air induction hoses to air pipes.

Start engine.

Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load, and run engine at idle speed.


SMA302A

* Check idle speed.

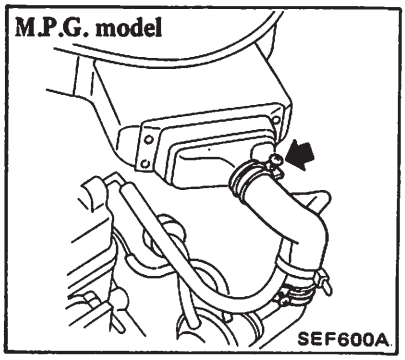
IDLE SPEED
M/T 750±100 rpm
A/T 650±100 rpm (in "D" position)

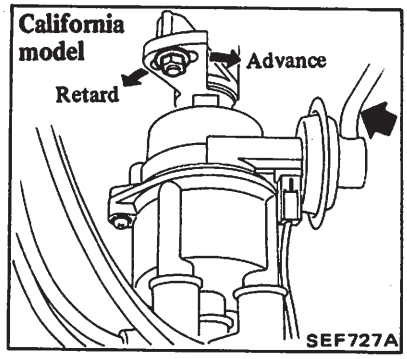
O.K. — N.G.

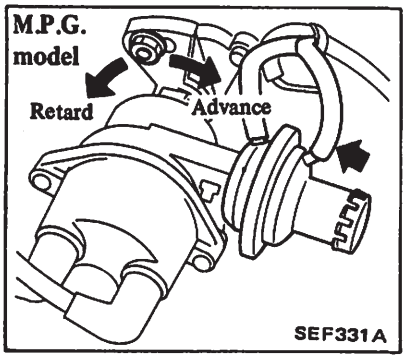
Adjust idle speed by turning throttle adjusting screw. (Refer to Section MA.)

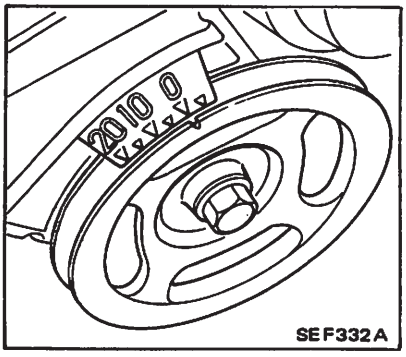
END

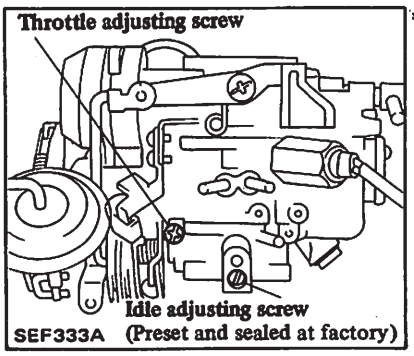
Checking and adjusting procedure for California and M.P.G. models











START

Open engine hood and disconnect air induction hoses from air pipes and install caps on air pipes (M.P.G. model only)

Close engine hood and start engine and warm it up until water temperature indicator points to middle of gauge. Ensure that engine speed is below 1,000 rpm.

Open engine hood.

Run engine at idle speed for 2 minutes.

Disconnect distributor vacuum hoses at distributor diaphragm side and install blind plugs to hoses.

Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load and run engine at idle speed.

Check ignition timing.

IGNITION TIMING (A.T.D.C.)
E15 (M.P.G.) 2° ±2°
E16 MT 5° ±2°
AT 5° ±2° (in "D" position)

O.K.

N.G.

Adjust ignition timing by turning distributor, loosening distributor securing bolt.

Connect distributor vacuum hoses to distributor diaphragm.

Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load and run engine at idle speed.

* Check idle speed.

IDLE SPEED:
E15 (M.P.G.) 700±100 rpm
E16 MT 750±100 rpm
AT 650±100 rpm (in "D" position)

O.K.

N.G.

* Adjust idle speed by turning throttle adjusting screw. (Refer to Section MA.)

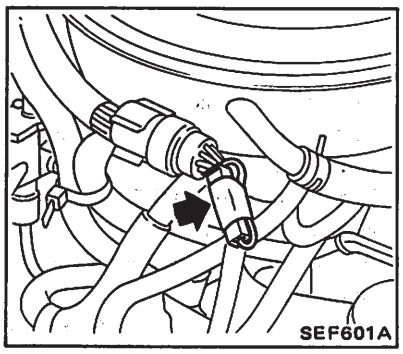
Ⓐ

Ⓑ

***a. This check or adjustment should be performed under the following conditions:**

- **Headlamp switch: OFF**
- **Heater blower: OFF**
- **Air conditioning switch: OFF (if equipped)**
- **Steering: KEEP WHEELS STRAIGHT AHEAD (if equipped with power steering)**

b. Make the check after the radiator cooling fan has stopped. If it is operating, wait until it stops.


SEF601A


SMA302A

*a. This check or adjustment should be performed under the following conditions:
- Headlamp switch: OFF
- Heater blower: OFF
- Air conditioning switch: OFF (if equipped)
- Steering: KEEP WHEELS STRAIGHT AHEAD (if equipped with power steering)

b. Make the check after the radiator cooling fan has stopped. If it is operating, wait until it stops.

Ⓐ

Turn off engine and disconnect air-fuel ratio solenoid harness connector.

Start engine.

Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load and run engine at idle speed.

* Check idle "CO" %.

IDLE "CO"%	
E15 (M.P.G.)	2 - 6%
E16	1 - 5%

O.K. / N.G.

Does engine turn smoothly?

YES. / NO.

Check the following.
- Vacuum hoses for proper connections
- Air leaks at carburetor mounting and intake manifold

O.K. / N.G.

Correct or replace malfunctioning parts.

* Adjust idle mixture ratio until idle "CO" 4.0±1.0% (E15 M.P.G.) or 3.0±1.0% (E16) is obtained and install idle mixture seal plug. (Refer to IDLE MIXTURE ADJUSTING PROCEDURE.)

O.K. / N.G.

Correct or replace carburetor.

Turn off engine and connect air induction hoses to air pipes (M.P.G. model only).

Connect air-fuel ratio solenoid harness connector.

Start engine.

Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load, and run engine at idle speed.


SMA302A

* Check idle speed.

IDLE SPEED		
E15 (M.P.G.)		700±100 rpm
E16	MT	750±100 rpm
	AT	650±100 rpm (in "D" position)

O.K. / N.G.

Adjust idle speed by turning throttle adjusting screw. (Refer to section MA.)

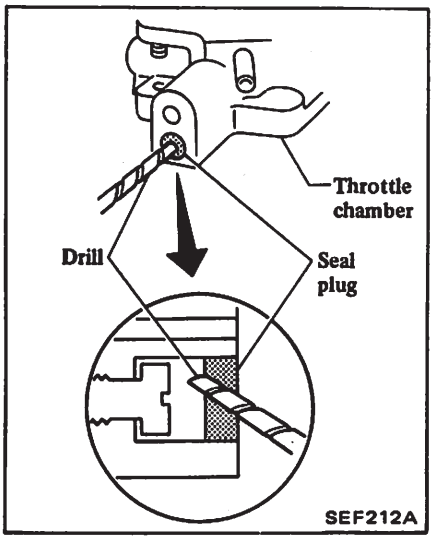
END

Ⓑ

IDLE MIXTURE ADJUSTING PROCEDURE (U.S.A. and M.P.G. models)

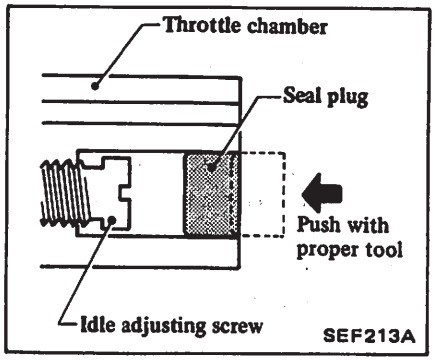
CAUTION:
a. Removal of idle adjusting screw seal plug should be performed only when idle mixture adjustment or carburetor overhaul is necessary.
b. When installing carburetor, be sure to tighten nuts to specified torque.

1. Remove carburetor from engine.
2. Carefully drill idle adjusting screw seal plug and remove it from plug hole with suitable tool.



a. Be careful to prevent metal chips from entering carburetor, and be sure that sliding surface of link and shaft are not scratched.
b. When drilling seal plug, be carefull not to damage head of idle adjusting screw.

3. After performing step 2, mount carburetor on engine.
4. Start engine, adjust idle RPM (Refer to Section MA) and adjust idle CO% by turning idle adjusting screw.
5. If proper idle CO% is not obtained by adjustment, turn off engine and overhaul carburetor or replace it with a new one. Then adjust idle CO% by turning idle adjusting screw.
6. After adjusting carburetor idle-rpm and mixture ratio, turn off engine and install new seal plug on carburetor.



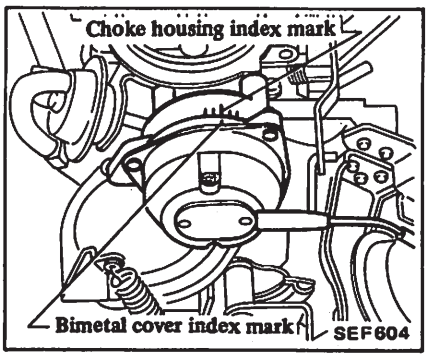
7. Finally, check idle CO% again. If idle CO% becomes abnormal, readjust it by starting from step 4.

AUTOMATIC CHOKE

Automatic choke mechanism

1. Before starting engine, fully open throttle valve and ensure that choke valve closes properly.
2. Push choke valve with a finger, and check for smooth rotation.
3. Check to be sure that bimetal cover index mark is set at the center of choke housing index mark.

On Canada models, when bimetal cover is replaced, set bimetal cover index mark at the center of choke housing index mark.



4. Check automatic choke heater source wiring for proper connection, then start engine.
5. After warming up the engine, ensure that choke valve is fully open.
6. If automatic choke heater source wiring is normal and choke valve does not operate after warm-up, check choke heater circuit, choke heater and choke relay.

Automatic choke heater circuit

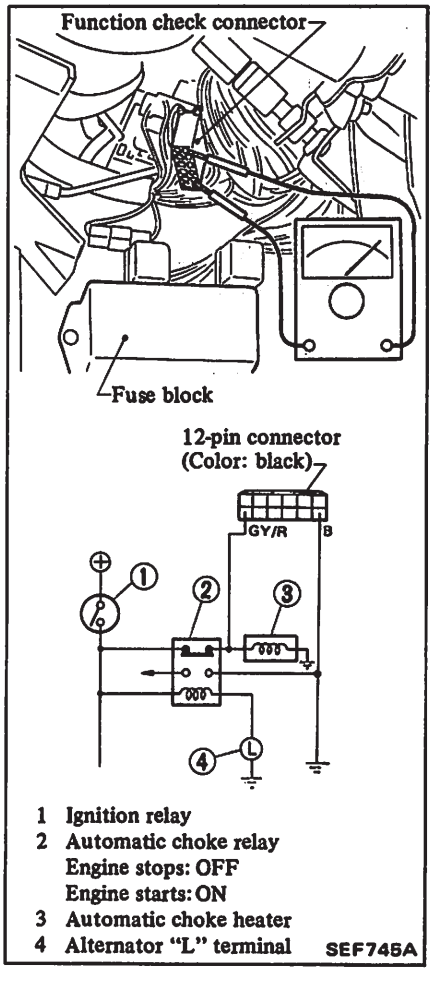
Checking heater circuit with function connector

CAUTION:
Do not attach test leads of a circuit tester to those other than designated.

1. With engine not running, check for continuity between GY/R and B.
- If continuity exists, heater is functioning properly.
- If continuity does not exist, check for disconnected connector or open P.T.C. heater circuit.

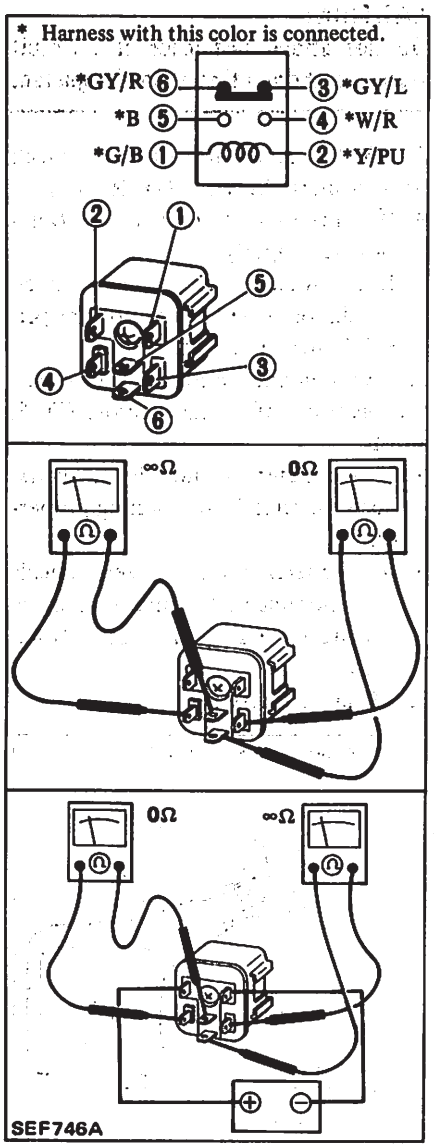
2. With engine running at idle, check for presence of voltage across GY/R and B.
- If voltmeter reading is 12 volts, heater circuit is functioning properly.
- If voltmeter reading is zero, check for disconnected connector, open circuit, or faulty automatic choke relay.

3. Replace faulty parts.



Automatic choke relay

The automatic choke relay is located in the relay box in the engine compartment.



FAST IDLE

1. Warm up engine sufficiently and set fast idle arm on 2nd step of fast idle cam.

a. On Canada models, remove bimetal cover and then set fast idle arm.

b. On U.S.A. models, manually operate throttle valve and choke valve, and set fast idle arm.

2. Read engine speed.

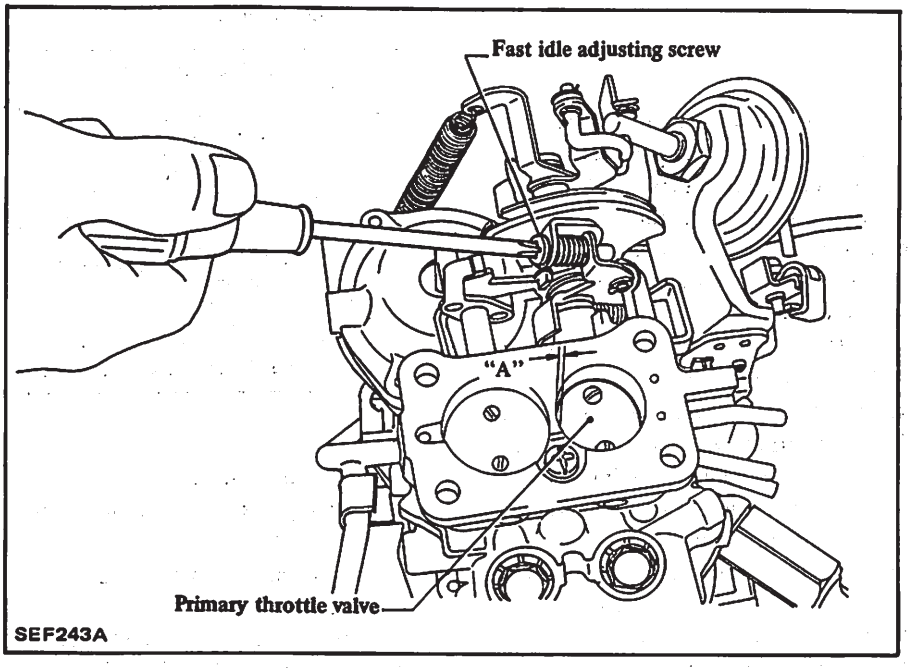
Fast idle speed (at 2nd cam step):
E16
California
2,600 - 3,400 rpm (M/T)
2,900 - 3,700 rpm (A/T)
Non-California
2,400 - 3,200 rpm (M/T)
2,700 - 3,500 rpm (A/T)
Canada
1,900 - 2,700 rpm (M/T)
2,400 - 3,200 rpm (A/T)
E15 (M.P.G.)
2,400 - 3,200 rpm

3. If out of specifications, adjust it by turning fast idle adjusting screw.

4. If necessary, remove carburetor from engine and make fast idle adjustments as follows.
(1) Place fast idle arm on 2nd step of fast idle cam, in the same manner as in step 1 above.
(2) Adjust clearance "A" between primary throttle valve and inner carburetor wall by turning fast idle adjusting screw.

Clearance "A":
E16
U.S.A. model
0.86±0.07 mm (M/T)
(0.0339±0.0028 in)
1.15±0.07 mm (A/T)
(0.0453±0.0028 in)
Canada model
0.72±0.07 mm (M/T)
(0.0283±0.0028 in)
1.00±0.07 mm (A/T)
(0.0394±0.0028 in)
E15 (M.P.G.)
0.80±0.07 mm
(0.0315±0.0028 in)

5. After adjusting clearance "A", install carburetor on engine and check engine speed.
6. Install automatic heater bimetal cover (Canada model).



CHOKE UNLOADER

1. With engine in cold condition, close choke valve completely.
2. Turn throttle lever until primary throttle valve completely opens.

Make sure that throttle valve opens fully when carburetor is mounted on car.

If throttle valve fails to open fully, unloader becomes inoperative, resulting in poor acceleration after engine is started.

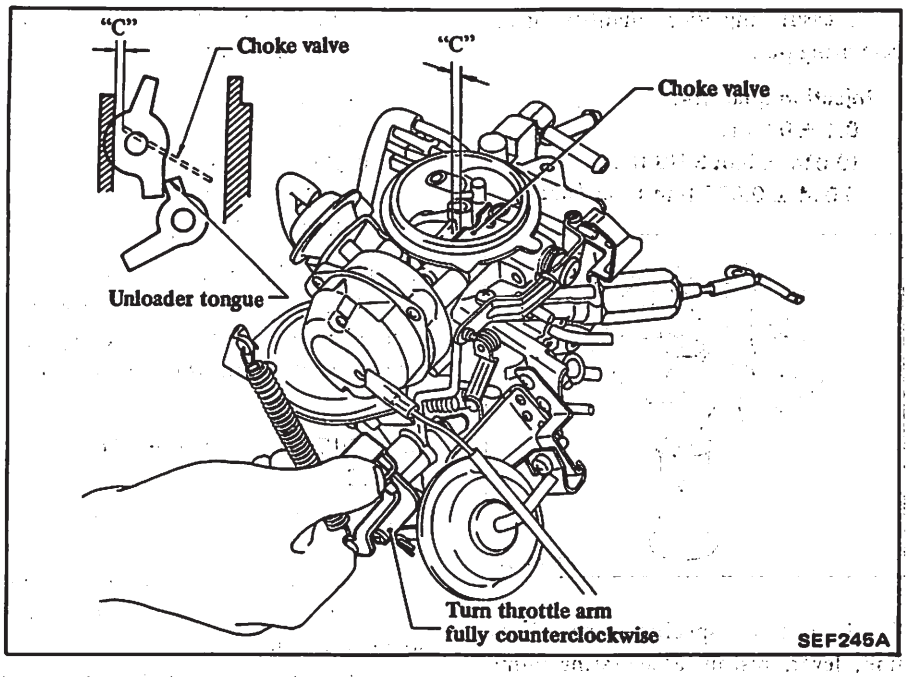
3. In this condition, check clearance "C" between choke valve and carburetor body.

Clearance "C":
E15 (M.P.G.)
2.36 mm (0.0929 in)
E16
2.96 mm (0.1165 in)

4. If out of specifications, make adjustments as follows:

(1) On Canada models, after removing bimetal cover and adjust it by bending unloader tongue.

(2) On U.S.A. models, replace choke chamber assembly.



ACCELERATING PUMP

1. With engine stopped, turn the throttle lever and ensure that the fuel is injected smoothly through the injector located in primary port.

A pump stroke limiter is used on the U.S.A. models and serves to inject fuel slightly right after throttle lever movement.

2. If accelerating pump is out of order, check link, lever pump piston, limiter etc.

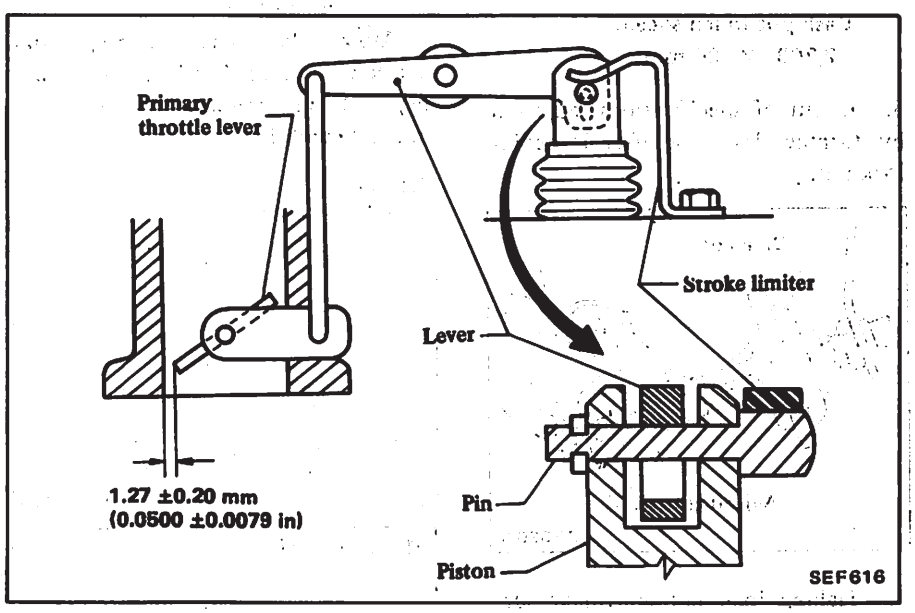
Do not bend stroke limiter.

3. If necessary, check the injection quantity and the pump stroke limiter (if so equipped) as follows:

(1) Remove carburetor from engine.

(2) Check the gap between primary throttle valve and inner carburetor wall when pump lever comes in contact with piston pin.

Stroke limiter gap:
1.27 ± 0.20 mm
(0.0500 ± 0.0079 in)



(3) If out of specifications, adjust it by bending stroke limiter.

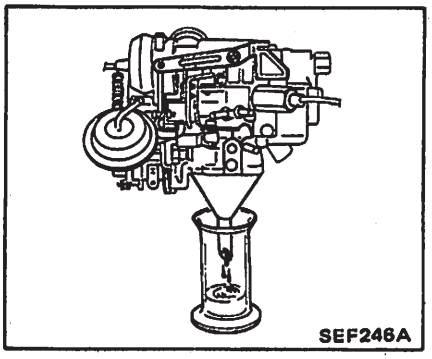
4. Pour gasoline into fuel float chamber.

5. Fully open choke valve.

6. Slowly turn throttle lever about 10 times, from fully closed position to fully open position, keeping throttle lever fully open at least 3 seconds per stroke.

7. Measure injection quantity of accelerating pump.

Injection quantity:
0.4 ± 0.1 mℓ
(0.014 ± 0.003 US fl oz,
0.014 ± 0.004 Imp fl oz)/stroke



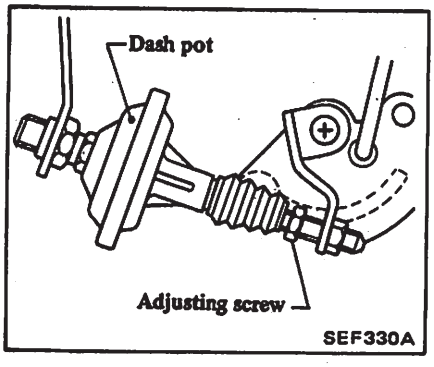
8. If out of specifications, check link, lever, piston, accelerating pump fuel line, etc.

DASH POT (Canada)

1. Idle speed of engine and mixture must be well tuned up and engine sufficiently warm.
2. Turn throttle valve by hand, and read engine speed when dash pot just touches stopper lever.

Dash pot touch speed:
2,300 - 2,500 rpm

3. If out of specifications, adjust it by turning dash pot after loosening lock nut.



4. Tighten lock nut and make sure that engine speed drops smoothly from 2,000 to 1,000 rpm in approximately three seconds.
5. If it becomes necessary to remove carburetor for dash pot adjustment, proceed as follows:
(1) Adjust gap between primary throttle valve and inner carburetor wall when dash pot stem comes in contact with throttle arm.

Dash pot gap:
0.72±0.10 mm (M/T)
(0.0283±0.0039 in)
0.56±0.10 mm (A/T)
(0.0220±0.0039 in)

(2) Tighten dash pot lock nut.
(3) After reinstalling carburetor on engine, ensure dash pot touching engine speed is within the specifications.

ANTI-DIESELING SOLENOID VALVE

Start the engine and keep at idle speed.

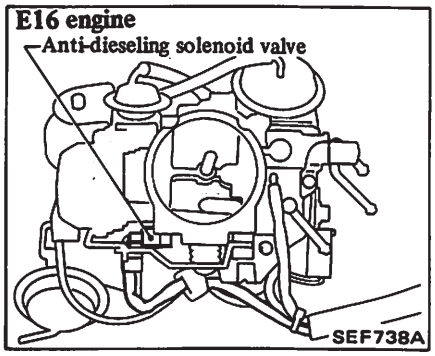
If the engine does not stop when the lead wire is disconnected, the solenoid is stuck.

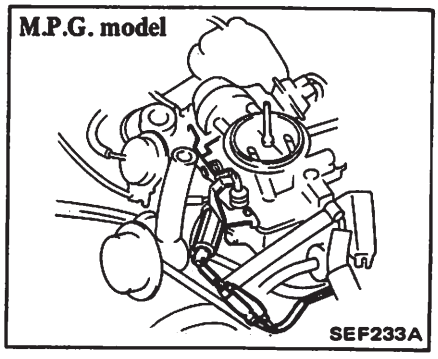
If the engine does not stop when the ignition switch is turned off, this indicates that the striking solenoid valve is stuck or short-circuited.

If the harness is in good condition, replace the solenoid valve as a unit.

Ⓣ : Anti-dieseling solenoid
18 - 22 N·m
(1.8 - 2.2 kg-m,
13 - 16 ft-lb)

After replacement, start engine and check to be sure that fuel is not leaking, and that anti-dieseling solenoid is in good condition.





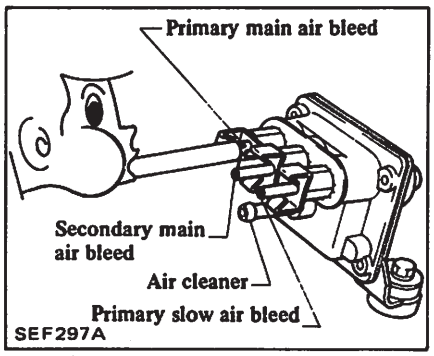
ALTITUDE COMPENSATOR
(California models and Non-California high altitude models)

a. The altitude compensator is set to operate above an altitude of approximately 500 m (1,641 ft). It should be carefully checked.
b. When making this check, ensure that all other parts are working properly.
c. The altitude compensator cannot be adjusted; if it is found to be functioning unsatisfactorily, it must be replaced as an assembly.
d. The hoses are color-coded. When connecting them, be sure to align them with the proper color marks on the unit.

Compensator at low altitudes

If the compensator should be operating at low altitudes, any of the following four symptoms may result:
1. Hesitation (a) and stumble (b) when engine is started.
2. Surge (c) when cruising at approximately 80 km/h (50 MPH).
3. Stumble (b) when accelerating in the 80 to 112 km/h (50 to 70 MPH) range.
4. Poor acceleration at full throttle (it takes too long to attain full acceleration).

When the compensator is malfunctioning, check it by sucking or blowing air through the inlet and outlet hoses. If air flows through smoothly, replace the unit as an assembly.



Compensator at high altitudes

If the compensator should not be operating at high altitudes, any of the following four symptoms may result:

1. Engine speed does not increase in proper response to accelerator depression under no-load condition.
2. Hesitation (a) and stumble (b) when engine is started.
3. Poor acceleration at full throttle (it takes too long to attain full acceleration).
4. Smooth running at partial throttle begins to depends upon altitude.

When the compensator is malfunctioning, check it by sucking or blowing air through the inlet and outlet hoses. If air does not flow through smoothly replace the unit as an assembly.

a. **Hesitation:**
   A temporary lack of initial response in acceleration rate.
b. **Stumble:**
   A short, sharp reduction in acceleration rate.
c. **Surge:**
   A continued condition of short, sharp fluctuations in power. These may be cyclic or random, and can occur at any speed and/or load. Surge is usually caused by excessively lean carburetor mixtures.

MAJOR SERVICE OPERATION

The perfectly adjusted carburetor delivers the proper fuel and air ratios at all speeds for the particular engine for which it was designed. By completely disassembling at regular intervals, which will allow cleaning of all parts and passages, the carburetor can be maintained in its original condition and will continue to deliver the proper ratios.

To maintain accurate carburetion of passages and discharge holes, extreme care must be taken in cleaning.

Use only carburetor solvent and compressed air to clean all passages and discharge holes. Never use wire or other pointed instrument to clean or carburetor calibration will be affected.

REMOVAL

Remove carburetor from engine, taking sufficient care to the following:

PRECAUTIONS:

a. When disconnecting fuel lines, do not spill fuel from fuel pipe.
b: When removing carburetor, do not drop any nut or bolt into intake manifold.
c. Be careful not to bend or scratch any part.

CLEANING AND INSPECTION

Dirt, gum, water or carbon contamination in or on exterior moving parts of a carburetor are often responsible for unsatisfactory performance. For this reason, efficient carburetion depends upon careful cleaning and inspection while servicing.

1. Blow all passages and castings with compressed air and blow off all parts until dry.

Do not pass drills or wires through calibrated jets or passages as this may enlarge orifice and seriously affect carburetor calibration.

2. Check all parts for wear. If wear is noted, damaged parts must be replaced. Note especially the following:
(1) Check float needle and seat for wear. If wear is noted, assembly must be replaced.
(2) Check throttle and choke shaft bores in throttle chamber and choke chamber for wear or out-of-roundness.
(3) Inspect idle adjusting needle for burrs or ridges. Such a condition requires replacement.
3. Inspect gaskets to see if they appear hard or brittle or if edges are torn or distorted. If any such condition is noted, they must be replaced.
4. Check filter screen for dirt or lint. Clean, and if screen is distorted or remains plugged, replace.
5. Check linkage for operating condition.
6. Inspect operation of accelerating pump. Pour fuel into float chamber and make throttle lever operate. Check condition of fuel injection from the accelerating nozzle.
7. Push connecting rod of diaphragm chamber and block passage of vacuum with finger. When connecting rod becomes free, check for leakage of air or damage to diaphragm.

Jets

Carburetor performance depends on jets and air bleeds. That is why these components must be fabricated with utmost care. To clean them, use cleaning solvent and blow air on them. Larger inner numbers stamped on the jets indicate larger diameters. Accordingly, main and slow jets with larger numbers provide richer mixture; the smaller numbers the leaner mixture. Conversely, the main and slow air bleeds, through which air to passes, make the fuel leaner if they bear larger numbers; the smaller numbers the richer fuel.

ASSEMBLY

1. Thoroughly wash all the parts before assembling.
2. Inspect gaskets to see if they appear hard or brittle or if edges are torn or distorted.

If any of such undesirable conditions is noted, they must be replaced.

3. Install jet and air bleed having the same size number as that of original one.
4. After reassembling carburetor, check each rotating portion or sliding portion for smooth operation.

CRANKCASE EMISSION CONTROL SYSTEM

DESCRIPTION

This system returns blow-by gas to both the intake manifold and carburetor air cleaner.

The positive crankcase ventilation (P.C.V.) valve is provided to conduct crankcase blow-by gas to the intake manifold.

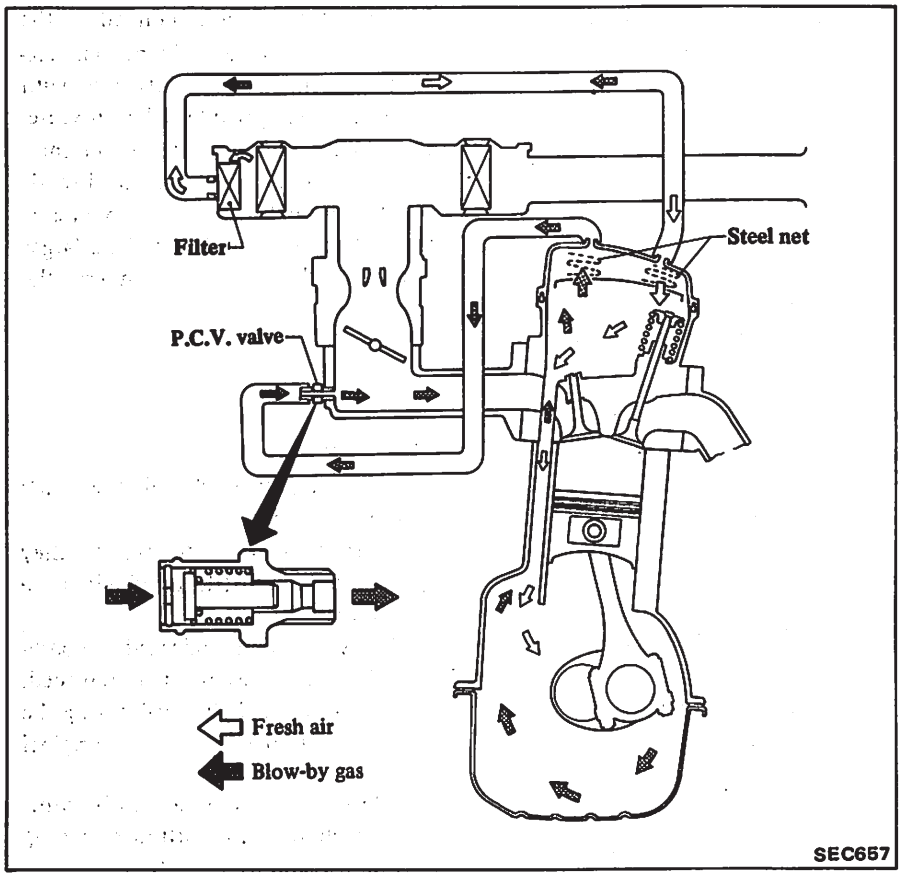
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the P.C.V. valve.

Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.

The ventilating air is then drawn from the carburetor air cleaner, through the hose connecting carburetor air cleaner to rocker cover, into the crankcase.

Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve, and its flow goes through the hose connection in the reverse direction.

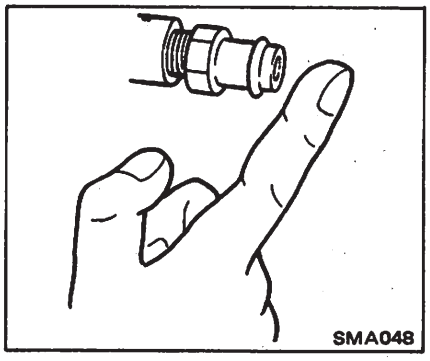
On cars with an excessively high blow-by some of the flow will go through the hose connection to the carburetor air cleaner under all conditions.



INSPECTION

P.C.V. VALVE AND FILTER

With engine idling, remove the ventilator hose from P.C.V. valve. If the valve is working, a hissing noise will be heard as air passes through the valve and a strong vacuum should be felt immediately when a finger is placed over valve inlet.



VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air.

If any hose cannot be freed of obstructions, replace.

EXHAUST EMISSION CONTROL SYSTEM

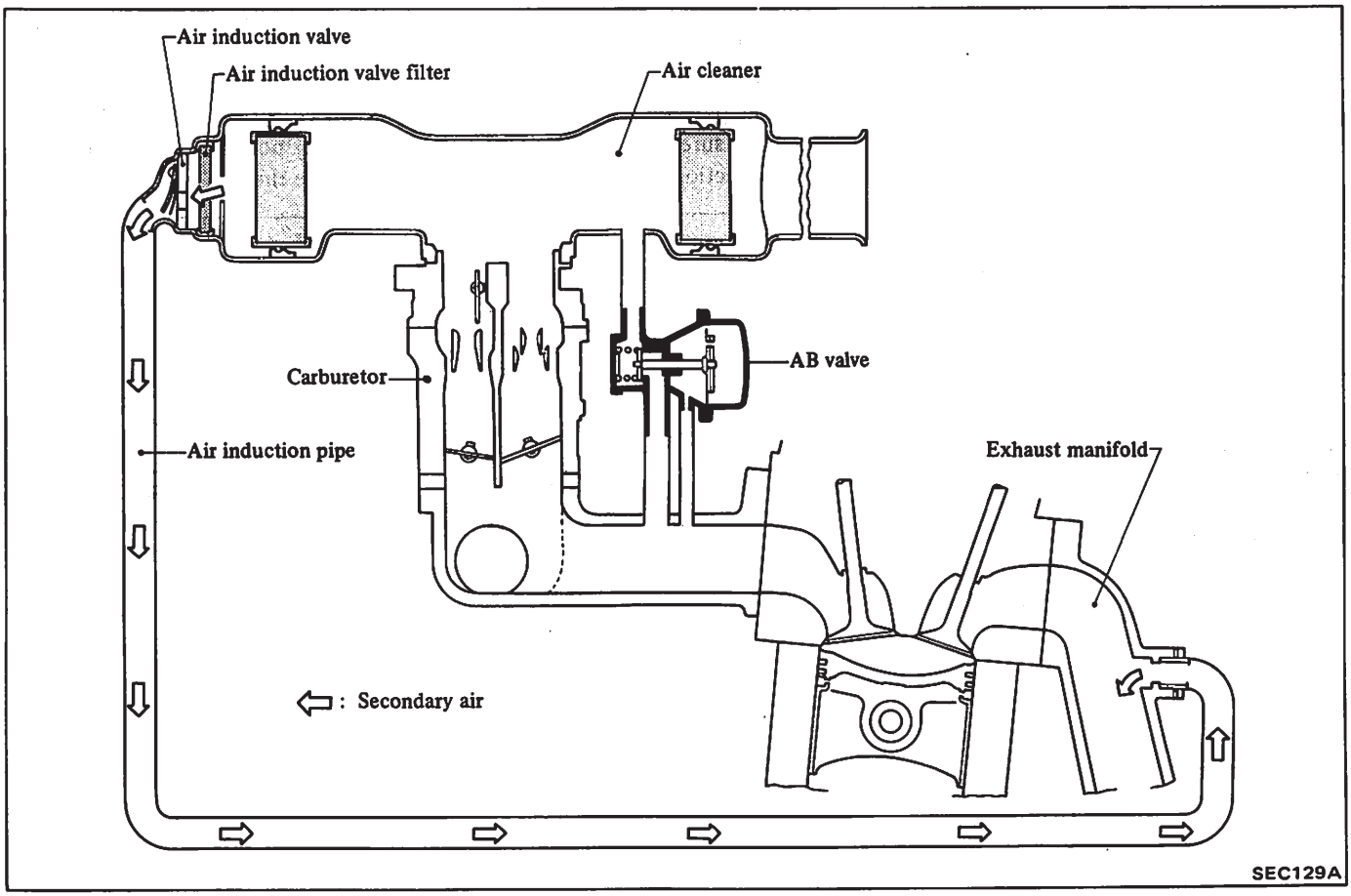
AIR INDUCTION SYSTEM (Non-California models)

The air induction system (A.I.S.) is designed to send secondary air to the exhaust manifold, utilizing a vacuum caused by exhaust pulsation in the exhaust manifold.

The exhaust pressure in the exhaust manifold usually pulsates in response to the opening and closing of the exhaust valve and it decreases below atmospheric pressure periodically.

If a secondary air intake is opened to the atmosphere under vacuum conditions, secondary air can be drawn into the exhaust manifold in proportion to the vacuum.

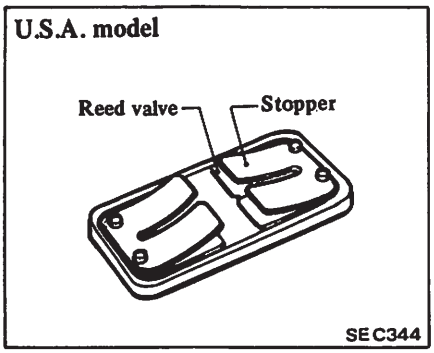
Therefore, the air induction system (A.I.S.) reduces CO and HC emissions in exhaust gases.

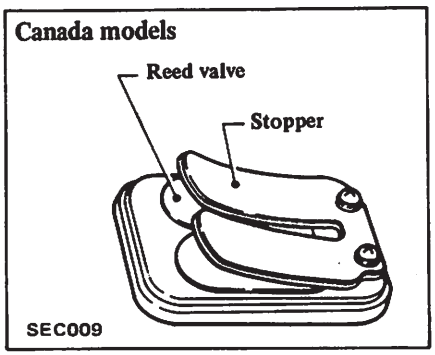


Air induction valve

When the exhaust pressure is below atmospheric pressure (negative pressure), secondary air is sent to the exhaust manifold.

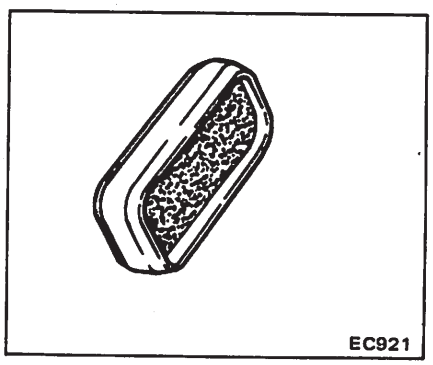
When the exhaust pressure is above atmospheric pressure, the reed valve prevents secondary air from being sent back to the air cleaner.





Air induction valve filter

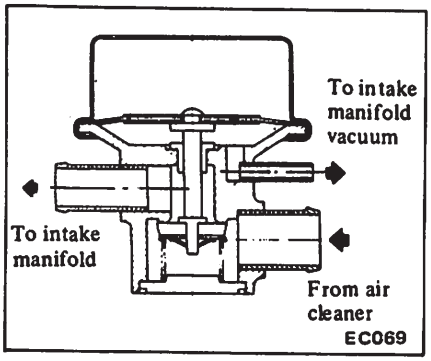
The air induction valve filter purifies secondary air to be sent to the exhaust manifold. The filter element should be replaced periodically in accordance with the Maintenance Schedule.


EC921

A.B. valve

This valve is actuated by intake manifold vacuum to prevent after burning in the exhaust system at the initial period of deceleration.

At this period, the mixture in the intake manifold becomes too rich to ignite and burn in the combustion chamber and burns easily in the exhaust system with injected air in the exhaust manifold.



EC069

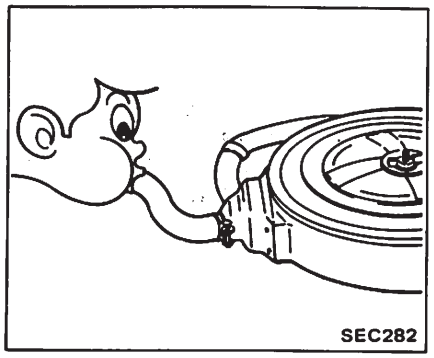
INSPECTION

Preliminary inspection

Check hose for looseness, flatting, damage or faulty connections, and each part for proper installation. If necessary, replace.

Air induction valve and filter

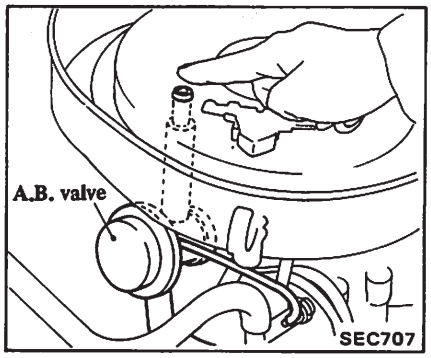
1. Disconnect air induction hose at air induction pipe side. Suck or blow hose to make sure that air flows only on the air induction pipe side.


SEC282

2. Check air induction valve for binding or damage. At the same time, check filter for damage or plugging. If necessary, replace.

A.B. valve

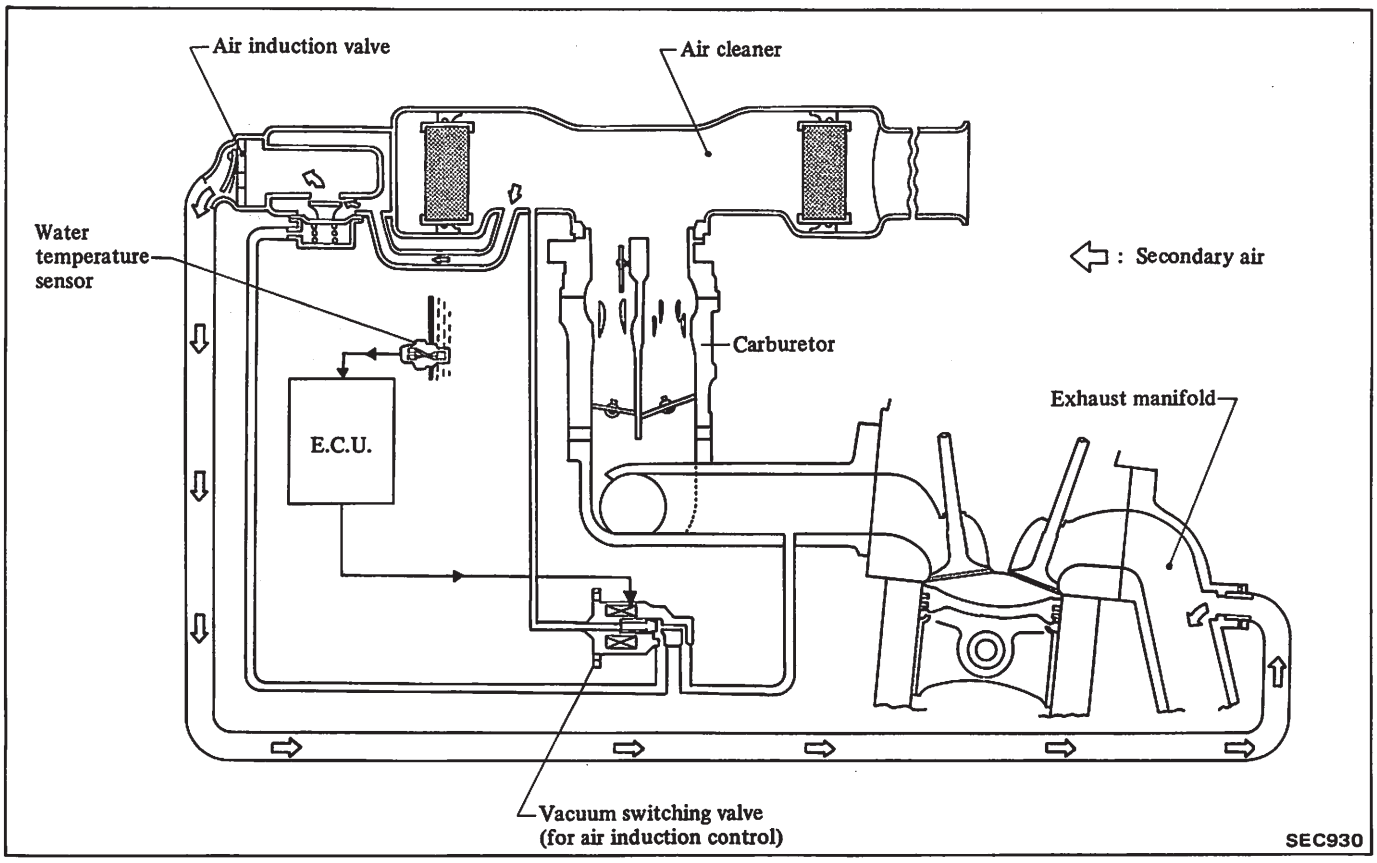
1. Warm up engine thoroughly.
2. Disconnect hose from air cleaner, and place a finger near the outlet.
3. Run engine at about 3,000 rpm under no load, then quickly return it to idling. If you feel a pull or suction force on your finger, the A.B. valve is functioning normally. If no suction is felt, replace the A.B. valve.



SEC707

AIR INDUCTION SYSTEM (M.P.G. models)

The air induction system for M.P.G. models is designed to send secondary air to the exhaust manifold, utilizing a vacuum caused by exhaust pulsation in the exhaust manifold.
However, it is not necessary to operate this system under normal engine conditions because a 3-way catalytic converter is adopted.
Therefore, this sytem is designed to send secondary air to the exhaust manifold when engine is cold.



Operation

Water temperature °C (°F)	Vacuum switching valve for air induction control	Air induction control valve	Air induction control system
Below 50 (122)	ON	Open	Operated
Above 50 (122)	OFF	Closed	Not operated

INSPECTION

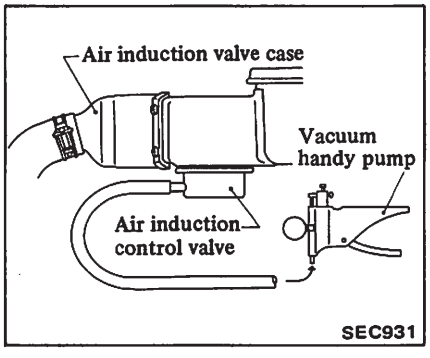
Entire system

Refer to Diagnostic Procedure for E.C.C. Engine.

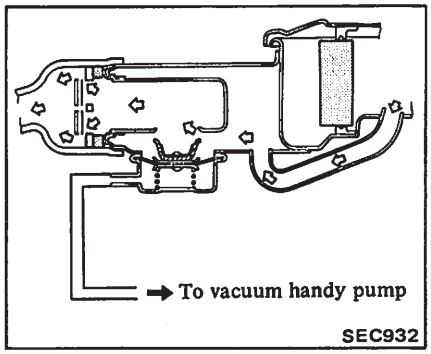
Air induction valve and air induction control valve

1. Disconnect air induction hose at air induction pipe side. Suck or blow hose to make sure that air flow does not exist.

2. Set a vacuum handy pump to the air induction control valve.



3. Suck or blow air induction hose to make sure that air flows only on the air induction pipe side while control valve is operated.



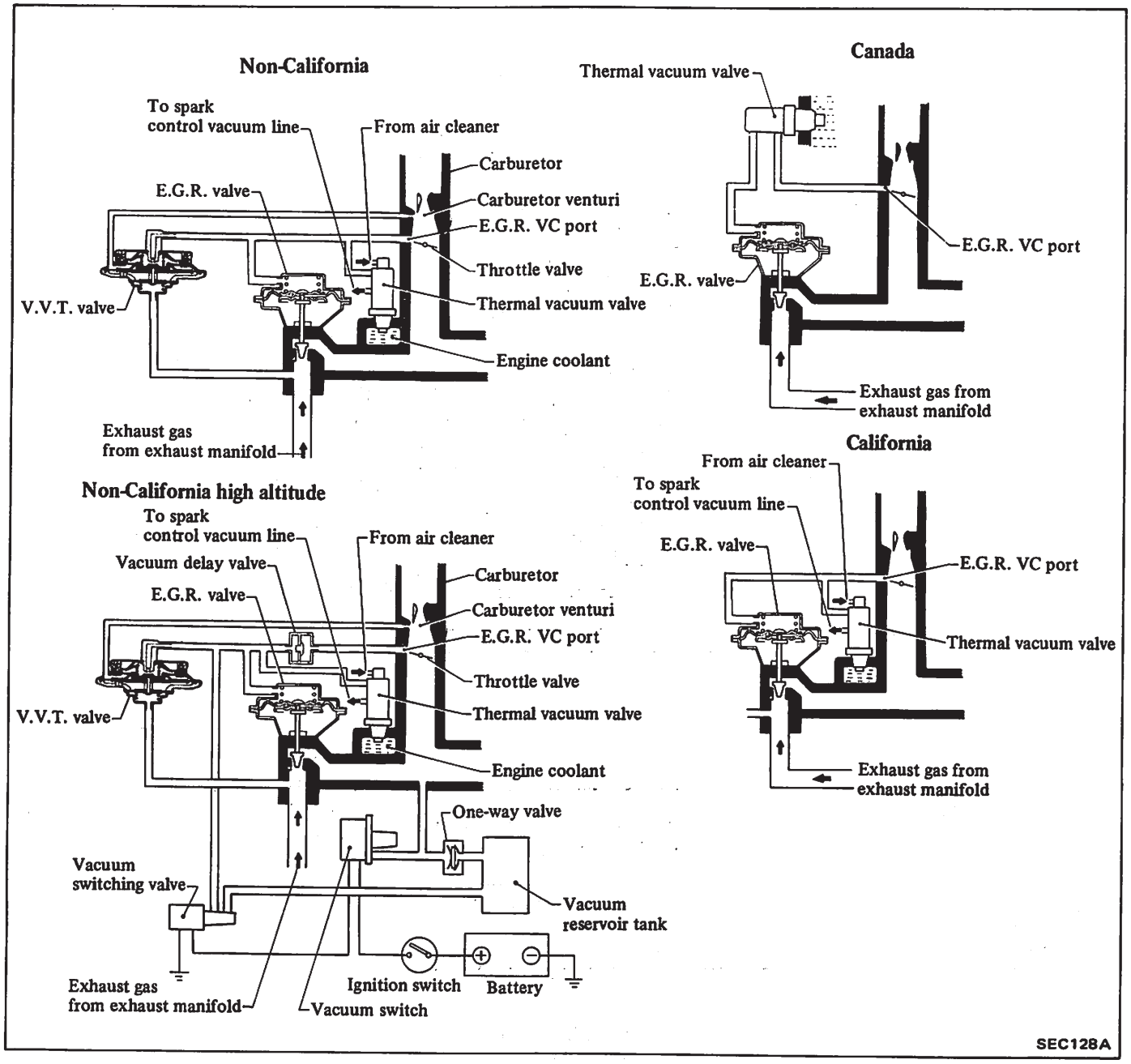
4. Check air induction valve and air induction control valve for binding or damage. If necessary, replace.

A.B. valve

Refer to Air Induction System (Except M.P.G. models).

EXHAUST GAS RECIRCULATION (E.G.R.) CONTROL SYSTEM

In the exhaust gas recirculation system, a part of the exhaust gas is returned to the combustion chamber to lower the spark flame temperature during combustion. This results in a reduction of nitrogen oxide (NOx) content in the exhaust gas.



Non-California

Thermal vacuum valve		V.V.T. valve			E.G.R. system
Water temp. °C (°F)	Operation	Venturi vacuum	Exhaust gas pressure	Operation	
Below 50 (122)	Open *1	Any conditions			Not actuated
Above 50 (122)	Closed *1	High	High	Closed *2	Actuated
			Low		
		Low	High		
			Low	Open *2	Not actuated

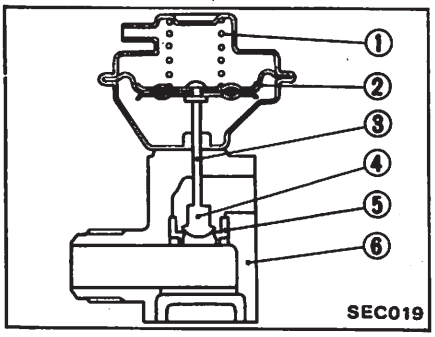
*1: To atmospheric pressure
*2: For E.G.R. valve vacuum line

California, M.P.G. and Canada

Thermal vacuum valve			E.G.R. system
Water temperature °C [°F]	Operation		
	Canada (2-port type)	California and M.P.G. (3-port type)	
Below 50 (122)	Closed	Open	Not actuated
Above 50 (122)	Open	Closed	Actuated

E.G.R. control valve

The E.G.R. control valve controls the quantity of exhaust gas to be led to the intake manifold through vertical movement of the valve connected to the diaphragm, to which vacuum is applied in response to the opening of the carburetor throttle valve.

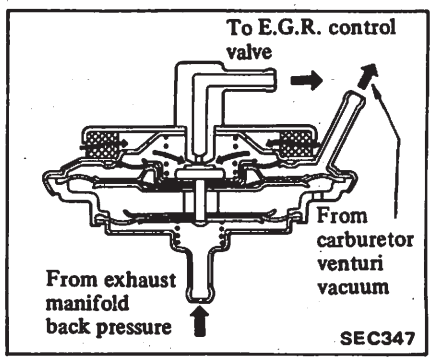


1 Diaphragm spring
2 Diaphragm
3 Valve shaft
4 Valve
5 Valve seat
6 Valve chamber

V.V.T. valve

The venturi vacuum transducer (V.V.T.) valve, monitors exhaust pressure and venturi vacuum in order to activate the diaphragm, controlling carburetor throttle vacuum applied to the E.G.R. control valve.

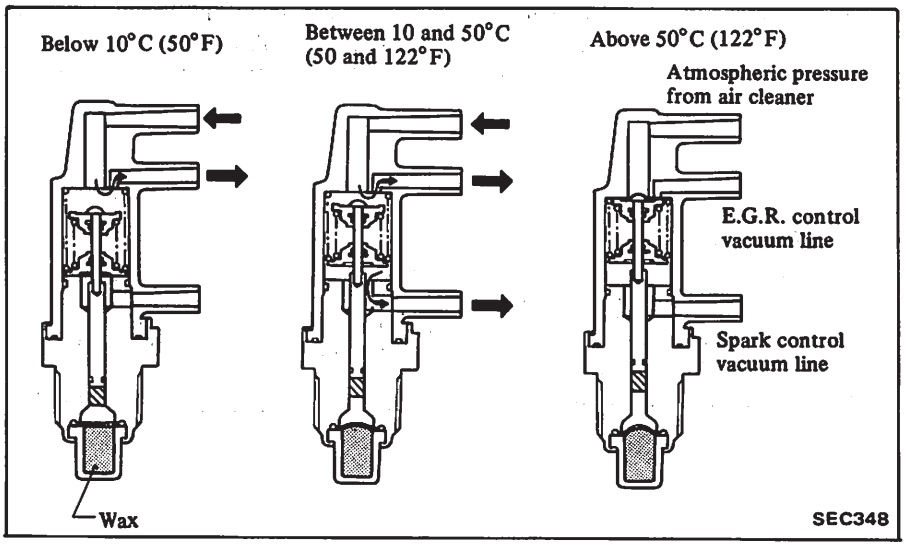
In other words, the amount of recirculated exhaust gas varies with the position of the E.G.R. valve regulated by the operating condition of the engine.



Thermal vacuum valve (3-port wax type)

It detects engine coolant temperature by means of wax expansion and opens or closes the air passage from the air cleaner.

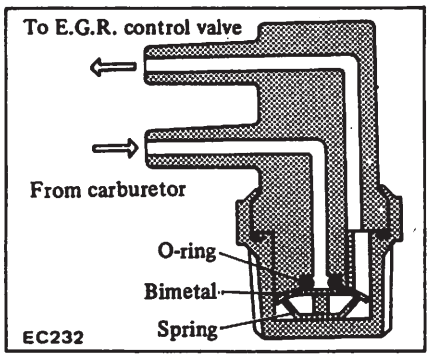
When the air passage is closed, the carburetor vacuum signal is applied to the diaphragm of the E.G.R. control valve to actuate the taper valve connected to the diaphragm. This valve is also co-used as a component for the Catalyst Warm-up System & Evaporative Emission Control System.



Thermal vacuum valve (2-port bimetal type)

This thermal vacuum valve is mounted on the front side of the intake manifold. It detects engine coolant temperature by means of a built-in bimetal, and opens or closes the vacuum passage in the thermal vacuum valve.

When the vacuum passage is open, the carburetor vacuum signal is applied to the diaphragm of the E.G.R. control valve to actuate the taper valve connected to the diaphragm.



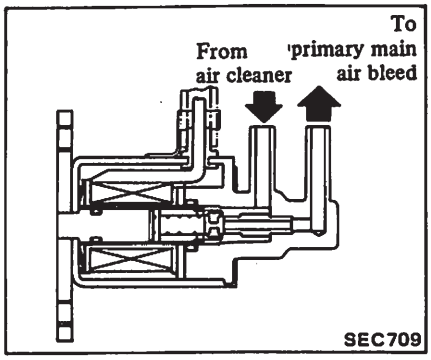
Vacuum delay valve

The vacuum delay valve is utilized for the purpose of reducing NOx emissions emitted during rapid acceleration. This valve, installed in the vacuum control line to the E.G.R. valve, restricts the air flow in the line to reduce the rate of vacuum change when the throttle valve is opened rapidly. Reduced rate of vacuum change provides the E.G.R. vacuum control unit with some delay time.

When the vacuum of the vacuum source decreases, the E.G.R. vacuum control unit responds normally because a one way function is provided to the valve.

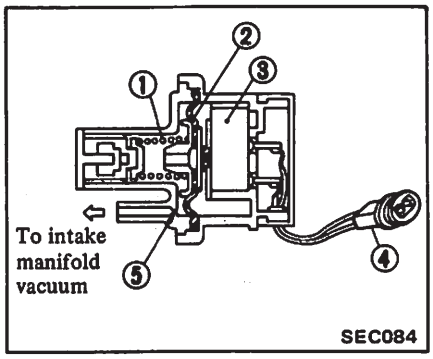
Vacuum switching valve

The vacuum switching valve is controlled by current flowing from the vacuum switch. Its purpose is to supply vacuum from the vacuum reservoir tank to the E.G.R. control valve.



Vacuum switch

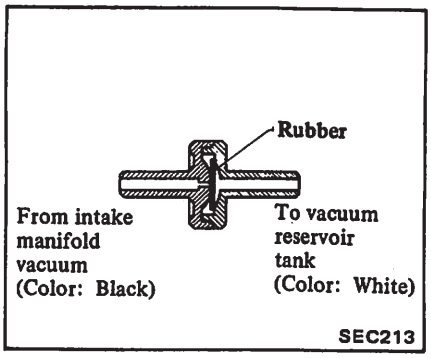
When the intake manifold vacuum increases during deceleration, this switch is activated, thereby interrupting the electrical signal which is sent to the vacuum switching valve.



1 Spring
2 Diaphragm
3 Micro switch
4 Connector
5 Orifice

One-way valve

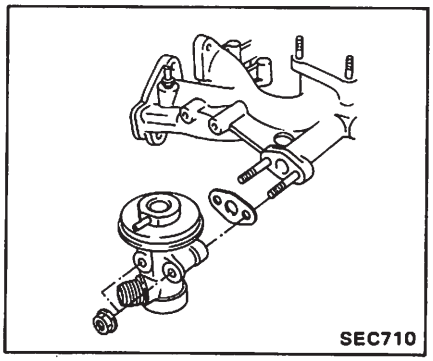
The one-way valve is used to maintain intake manifold vacuum in the vacuum reservoir tank.



REMOVAL AND INSTALLATION

E.G.R. control valve

Disconnect vacuum hose and remove nuts securing E.G.R. control valve to E.G.R. passage. The E.G.R. control valve can then be taken out.



Thermal vacuum valve

The thermal vacuum valve is made of plastic. Consequently take care not to damage it.

1. Drain engine coolant about one liter (1-1/8 US qt, 7/8 Imp qt).
2. Disconnect vacuum hoses and unscrew the thermal vacuum valve. The valve can then be taken out.
3. Install thermal vacuum valve in the reverse order of removal.

Be sure to apply sealer to threads of the valve prior to installing new valve.

Ⓣ : Thermal vacuum valve
Less than
22 N·m
(2.2 kg-m, 16 ft-lb)

INSPECTION

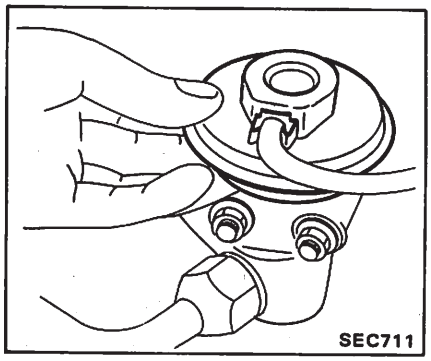
Entire system

1. Make a thorough visual check of E.G.R. control system. If necessary, wipe away oil to facilitate inspection. If any hoses are cracked or broken, replace.
2. With engine stopped, inspect E.G.R. control valve for any indication of binding or sticking by moving diaphragm of control valve upwards with a finger.

3. With engine running, inspect E.G.R. control valve and thermal vacuum valve for normal operation.
(1) When engine coolant temperature is low:

Make sure that E.G.R. control valve does not operate when engine speed is increased from idling to 3,000 to 3,500 rpm.

Place a finger on the diaphragm of E.G.R. control valve to check for valve operation.



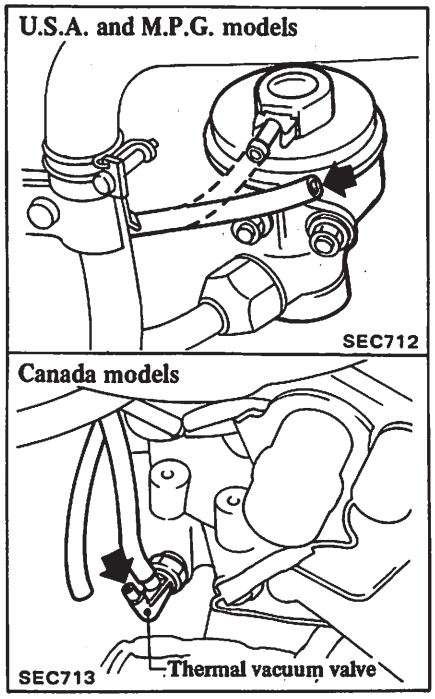
(2) When engine coolant temperature is high:

Make sure that E.G.R. control valve operates when engine speed is increased from idling to 3,000 to 3,500 rpm. Place fingers on the diaphragm of E.G.R. control valve to check for valve operation.

If E.G.R. control valve does not operate, check as follows:

- Disconnect one end (E.G.R. control valve side) of vacuum hose connecting thermal vacuum valve to E.G.R. control valve (California , M.P.G. and Canada models) or V.V.T. valve (Non-California models).
- Increase engine speed from idling to 3,000 to 3,500 rpm.
- Make sure that thermal vacuum valve is open (2-port type), or closed (3-port type) and that carburetor vacuum is present at the end (E.G.R. control valve side) of vacuum hose.

  If vacuum is weak or nonexistent, replace thermal vacuum valve. If vacuum is present, check E.G.R. control valve or V.V.T. valve.

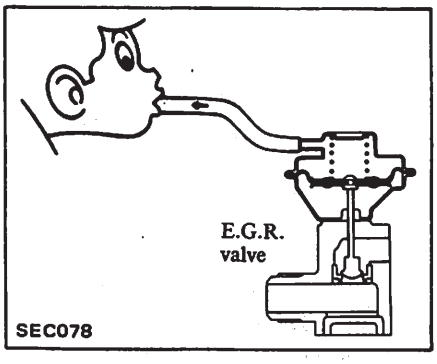


If any difficulty is encountered in judging the condition of any component during above inspection, check the questionable component independently as follows:

E.G.R. control valve

1. Apply vacuum to E.G.R. control valve, referring to the following figure. If the valve moves to full position, it is normal.

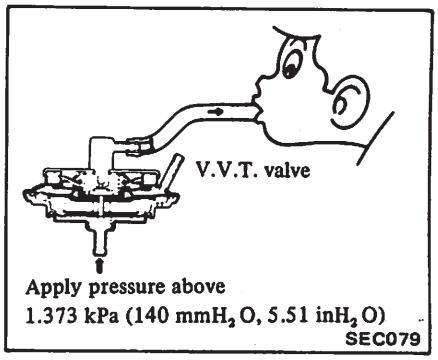
E.G.R. control valve will remain open for more than 30 seconds after vacuum has cut off.



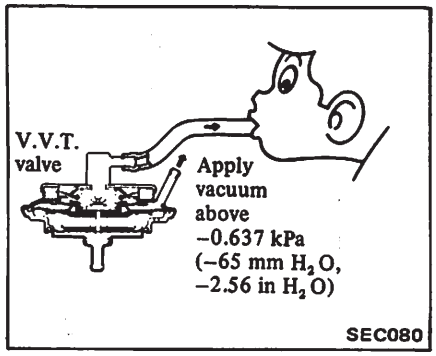
2. Visually check E.G.R. control valve for damage, wrinkle or deformation.

V.V.T. valve

1. Apply a pressure above 1.373 kPa (140 mmH_2O, 5.51 inH_2O) to V.V.T. valve and check it for leakage as shown below. If a leak is discovered, replace valve.



2. Apply vacuum pressure above 0.637 kPa (65 mmH_2O, 2.56 inH_2O) to V.V.T. valve and check it for leakage as shown below. If a leak is discovered, replace valve.



Thermal vacuum valve

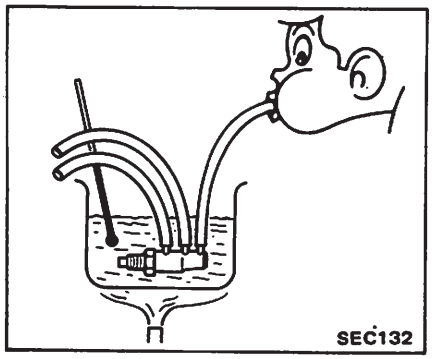
Remove thermal vacuum valve from engine. Inhale air from port of E.G.R. system and check to be sure that thermal vacuum valve opens or closes in response to its temperature.

Before dismounting, drain engine coolant about one liter (1-1/8 US qt, 7/8 Imp qt).

CAUTION:
Do not allow water to get inside the thermal vacuum valve.

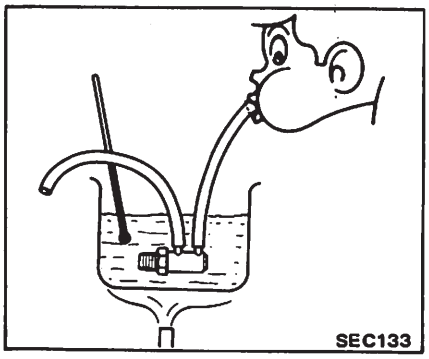
3-port wax type

Water temperature °C (°F)	Valve
Below 50 (122)	Open
Above 50 (122)	Closed



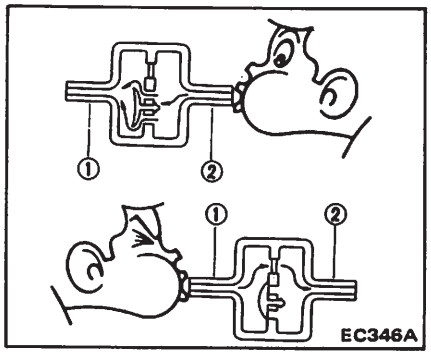
2-port bimetal type

Water temperature °C (°F)	Valve
Above 50 (122)	Open
Below 50 (122)	Closed



Vacuum delay valve

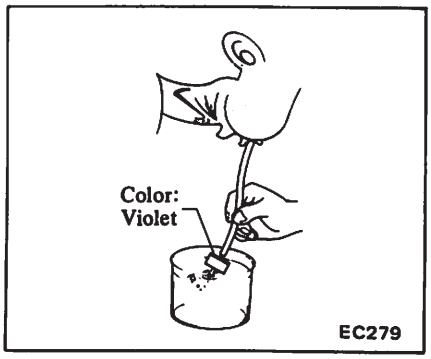
1. Blow air from the port of the E.G.R. control valve side. The valve is in good condition if the air flows through the valve.
2. Try again from the opposite side of the valve. The valve is in good condition if the air flow resistance is greater than the step 1 above.



1 Thermal vacuum valve side
2 V.V.T. valve side

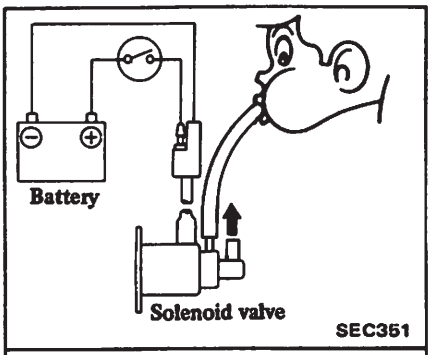
3. If the condition of vacuum delay valve is questionable, dip port into a cup filled with water. Blow air from violet face side. Small air bubbles should appear.

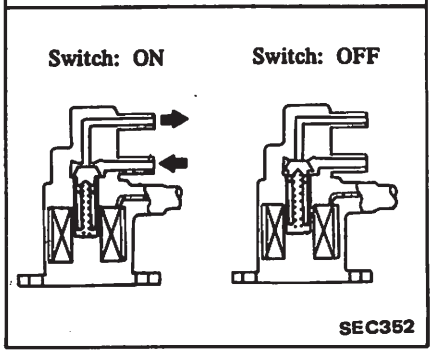
CAUTION:
Be careful to avoid entry of oil or dirt into valve.



Vacuum switching valve

1. Remove both hoses and harness. Remove screws which secure the solenoid valve, and detach the valve.
2. Operate the solenoid valve using the battery to determine if air flows through the valve properly.



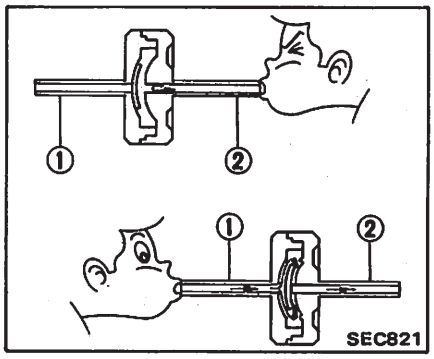


Vacuum switch

Intake manifold vacuum kPa (mmHg, inHg)	Switch
Above 6.3 - 7.7 (47 - 58, 1.85 - 2.28)	ON
Below 6.3 - 7.7 (47 - 58, 1.85 - 2.28)	OFF

One-way valve

1. Blow air from the port of the intake manifold side. The one-way valve is in good condition if the air does not flow through the valve.
2. Try again from the opposite side (White face side) of the valve. The valve is in good condition if the air flow resistance is greater.



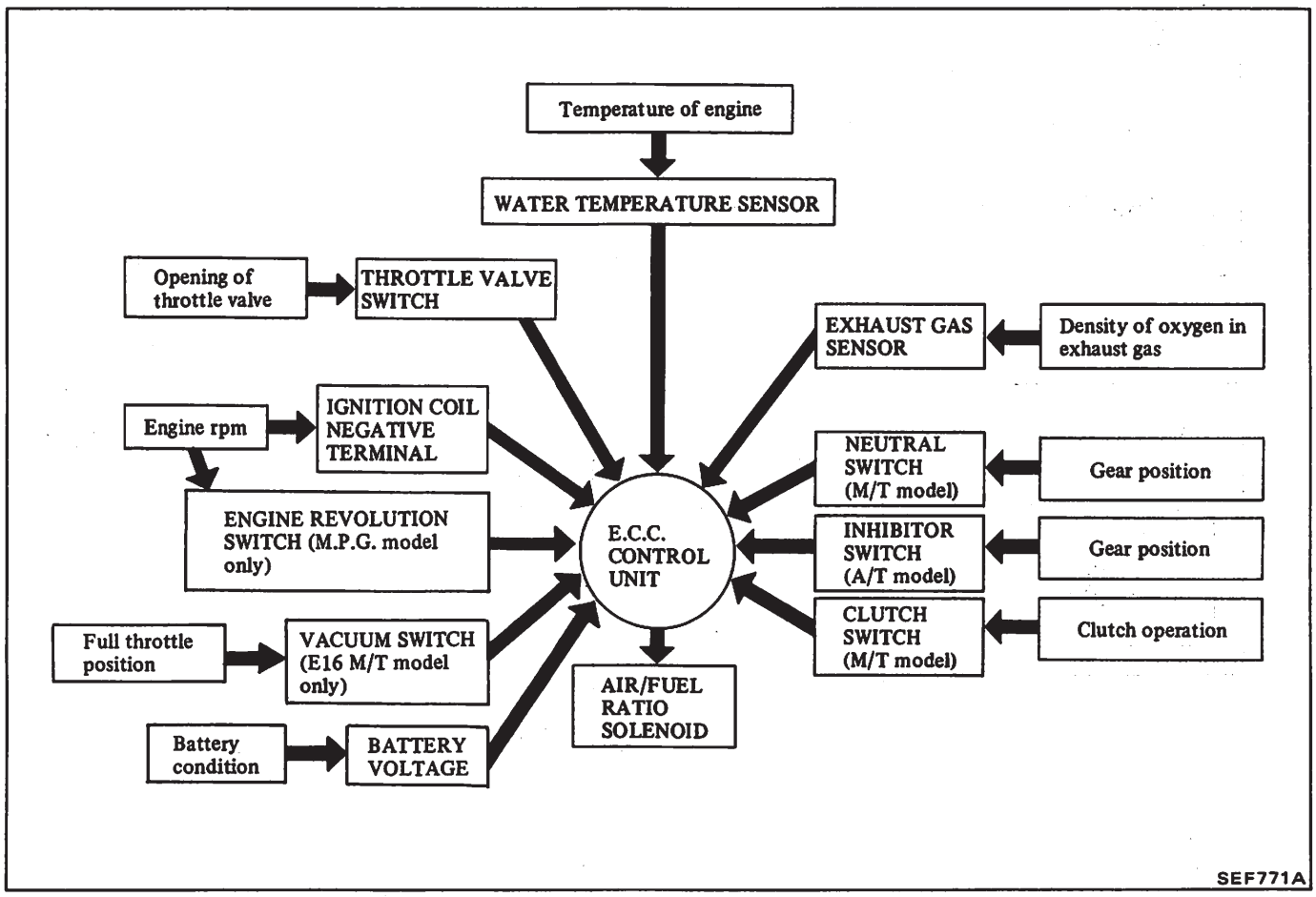
1 Vacuum tank side
2 Intake manifold side

3. If the condition of the one-way valve is questionable, dip port (On intake manifold side) into a cup filled with water. Blow air from white face side. Air bubbles should not appear.

CAUTION:
Be careful to avoid entry of oil or dirt into valve.

AIR-FUEL RATIO CONTROL SYSTEM

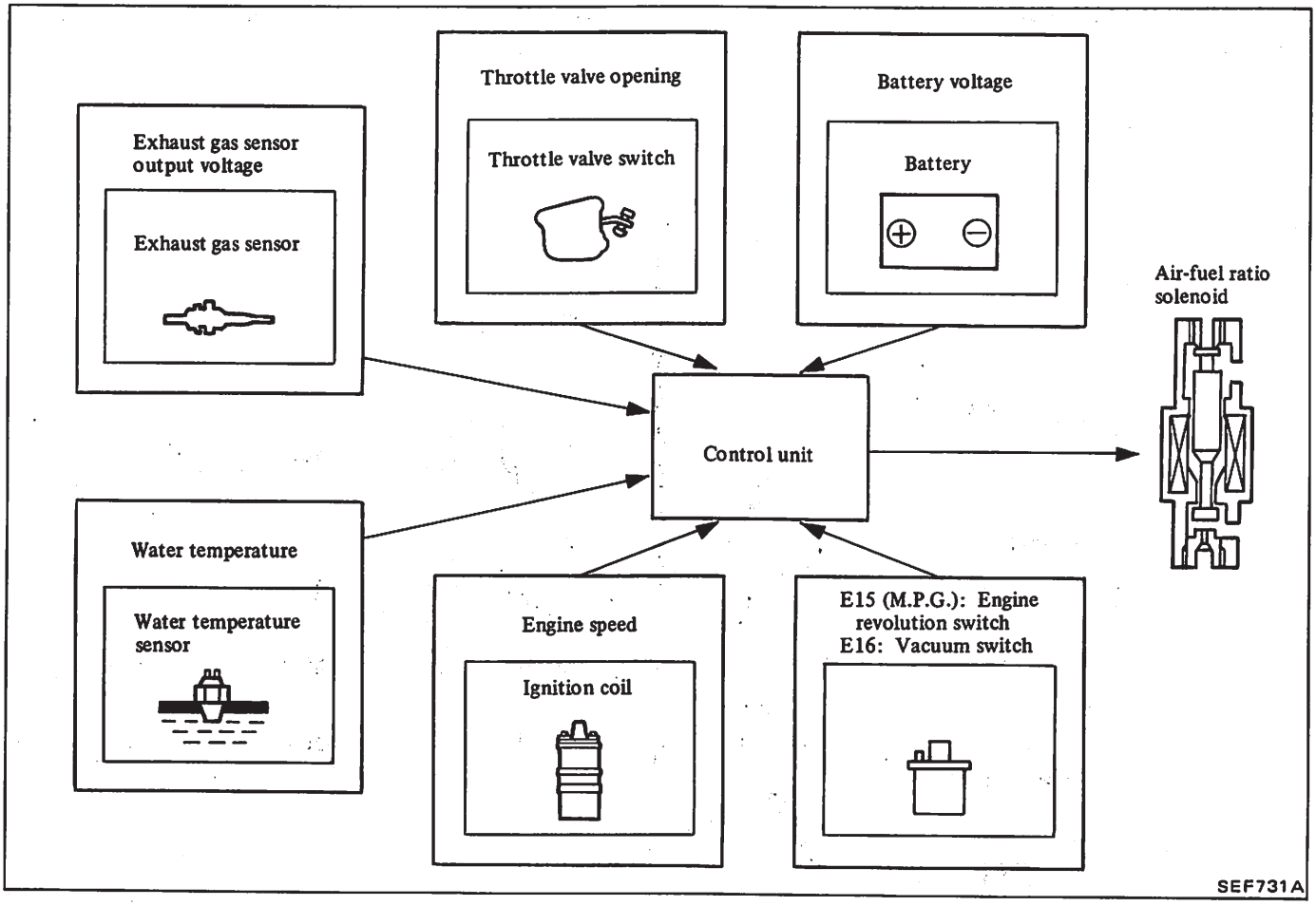
There are two ways to control air-fuel ratio: closed-loop control and open-loop control. Which one is used depends on water temperature, engine rpm, exhaust gas sensor, etc.



OPEN-LOOP CONTROL

For improved driveability, air-fuel ratio solenoid is controlled by open-loop control under the following conditions:

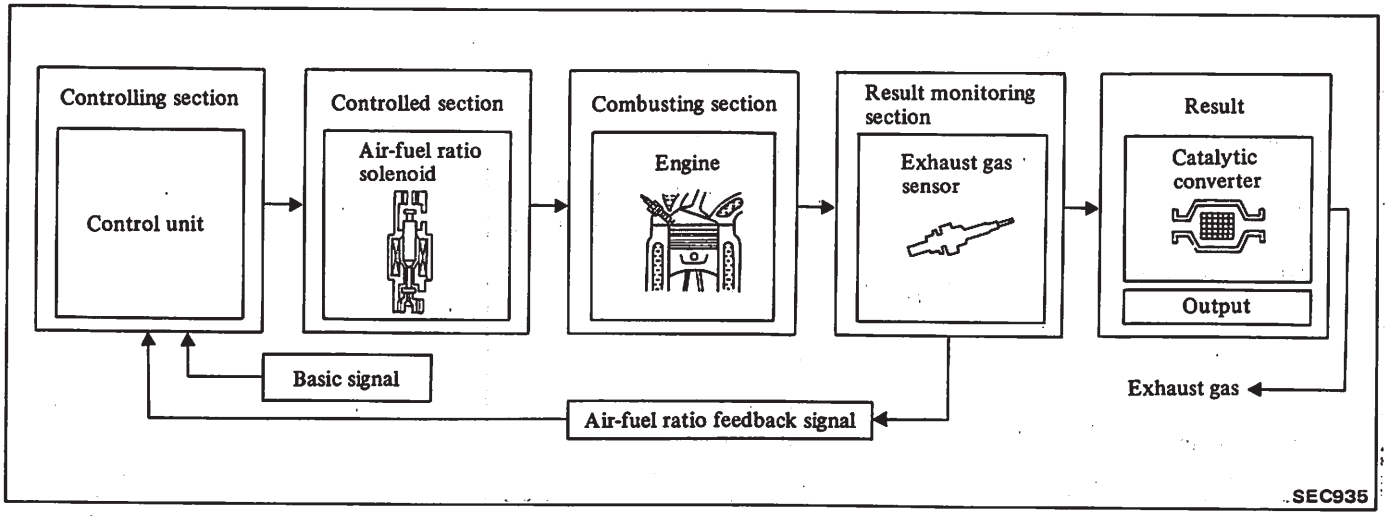
a	When battery voltage is too low	Battery voltage $\leqq$ 10 [V]
b	When starting engine	Engine speed $<$ 400 rpm
c	When engine is cold	Water temperature $<$ M/T 50°C (122°F) $<$ A/T 60°C (140°F)
d	When exhaust gas sensor is not activated	Output voltage $<$ 250±50 [mV]
e	During deceleration	Fuel shut-off system is in operation
f	When driving at high speeds	M.P.G.: Engine speed (Engine revolution switch: OFF) $\geqq$ 3,600 rpm E16: Engine speed $\geqq$ 3,425 rpm



With open-loop control, the air-fuel ratio is determined by the E.C.C. control unit.

CLOSED-LOOP CONTROL
(Air-fuel ratio feedback control)

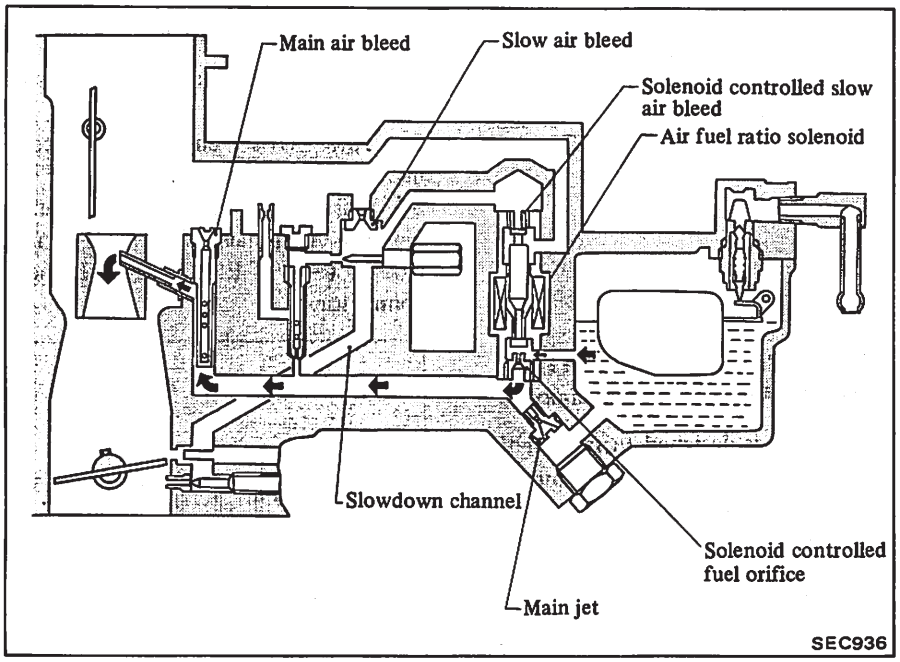
This system is designed to control the air-fuel ratio precisely to the stoichiometric point so that the three-way catalyst can minimize CO, HC and NOx emissions simultaneously. The system uses the exhaust gas sensor located in the exhaust manifold to give an indication of whether the air-fuel ratio is richer or leaner than the stoichiometric point. The sensor transmits a nonlinear voltage to the E.C.C. control unit. The control unit adjusts the feedback pulse width according to the sensor voltage so the mixture ratio will be within the narrow window of the three-way catalyst. During engine warm-up period, however, this system becomes open until the sensor reaches the operating temperature.



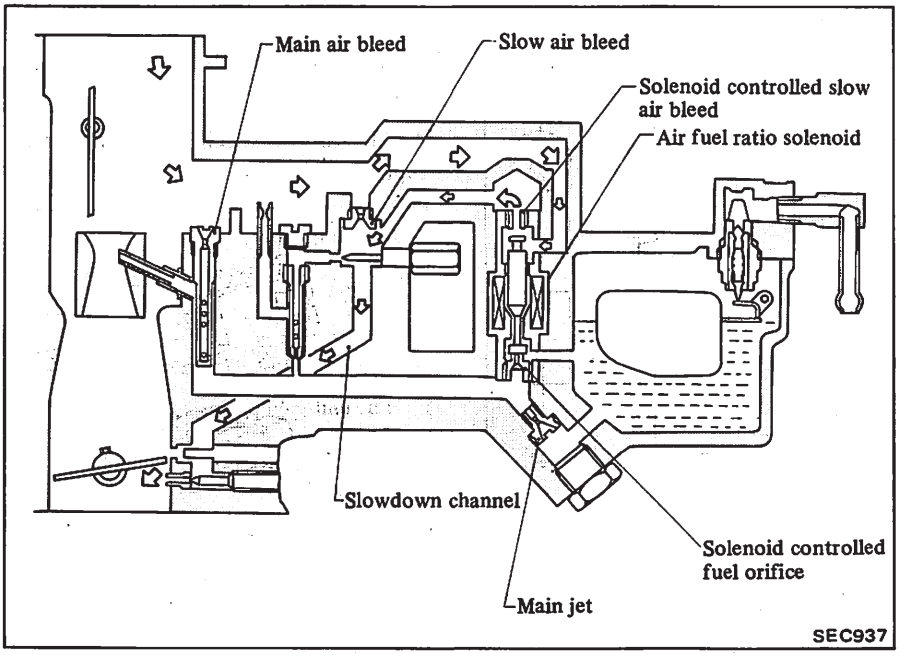
AIR-FUEL RATIO CONTROL SOLENOID VALVE

This solenoid valve is operated repeatedly by the signal from E.C.C. control unit.

OFF:



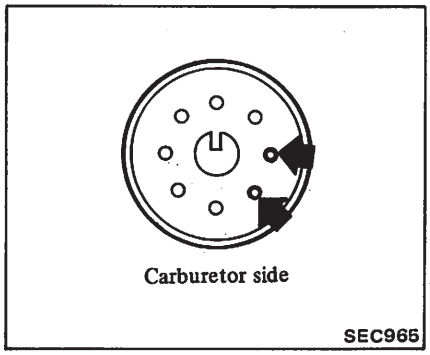
ON:



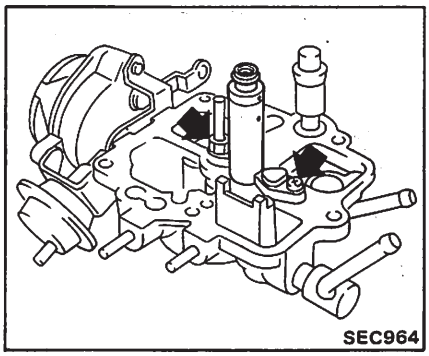
Removal and installation

Air-fuel ratio solenoid valve should be replaced only in the event of a major carburetor overhaul or when diagnosed as faulty in Diagnostic Procedure For E.C.C. Engine.

1. Disconnect carburetor harness connector.
2. Remove carburetor from engine.
3. Remove air-fuel ratio solenoid harness pin from carburetor harness connector.



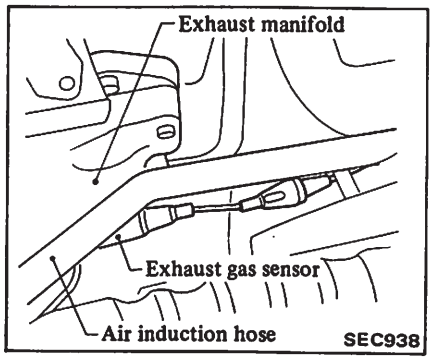
4. Remove choke chamber and turn it up.
5. Remove richer jet and screw.

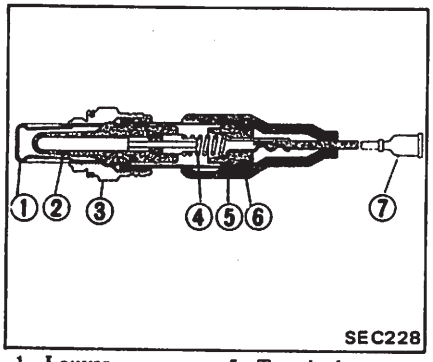


6. Remove air-fuel ratio solenoid valve.
7. To install, reverse the order of removal.

EXHAUST GAS SENSOR

The exhaust gas sensor, which is built into the exhaust manifold, monitors the density of oxygen in the exhaust gas. It consists of a closed-end tube made of ceramic zirconia and other components. Porous platinum electrodes cover the tubes inner and outer surfaces. The closed-end of the tube is exposed to the exhaust gas in the exhaust manifold. The tubes outer surface contacts the exhaust gas while the inner surface contacts the air.

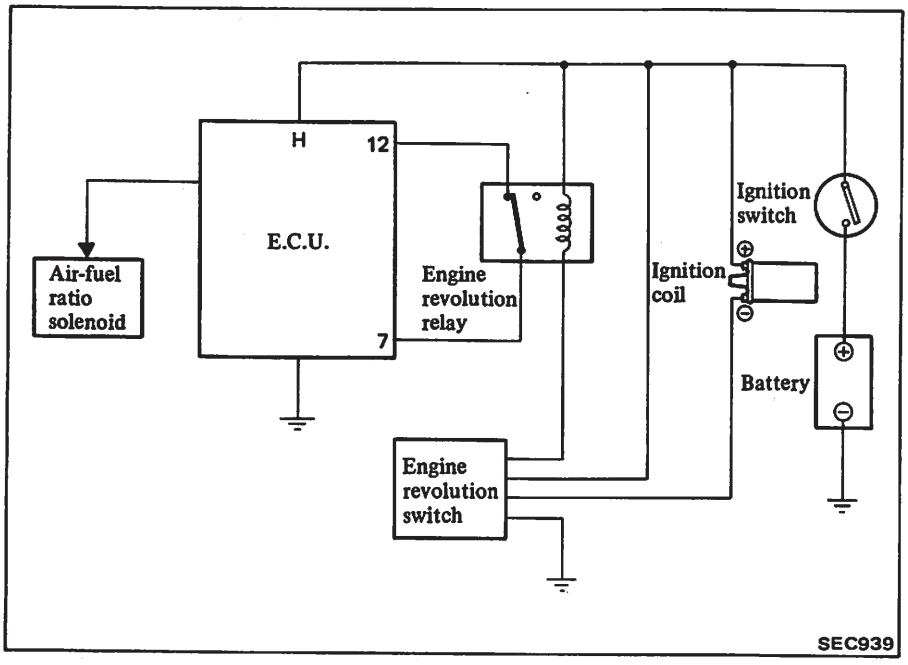




1 Louver
2 Zirconia tube
3 Holder
4 Spring
5 Terminal support
6 Boots
7 Connector

ENGINE REVOLUTION SWITCH AND RELAY (M.P.G. model only)

This system is designed to protect the 3-way catalytic converter from extremely high temperatures at high engine speeds.
Engine revolution switch is mounted on junction block.
Relay is mounted above fuse block (Refer to EL section).



Operation

Engine speed rpm	Engine revolution switch	Engine revolution relay	E.C.C. control
Below 3,600	ON	OFF	Closed-loop control
Above 3,600	OFF	ON	Open-loop control

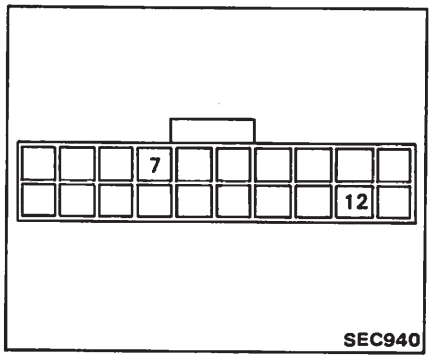
INSPECTION

Entire system

Refer to Diagnostic procedure for E.C.C. Engine.

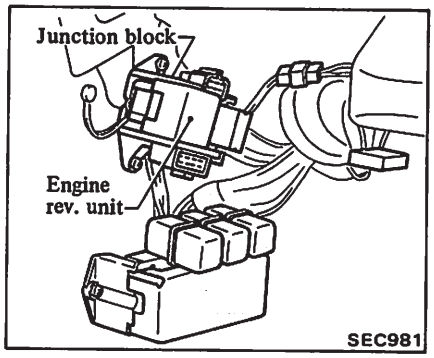
Engine revolution switch and relay

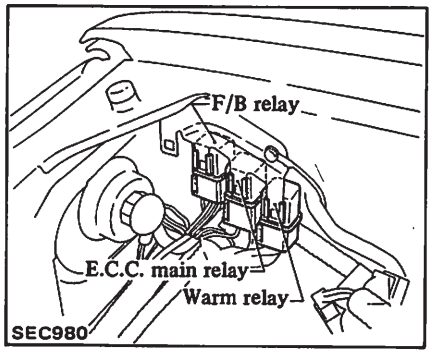
1. Warm engine to operating temperature.
2. Turn "OFF" engine and disconnect E.C.C. 20-pin connector.
3. Start engine and check continuity between terminals No. 7 (⊕) and No. 12 (⊖) of E.C.C. 20-pin harness connector.



Below about 3,600 rpm: continuity does not exist.
Above about 3,600 rpm: continuity exists.

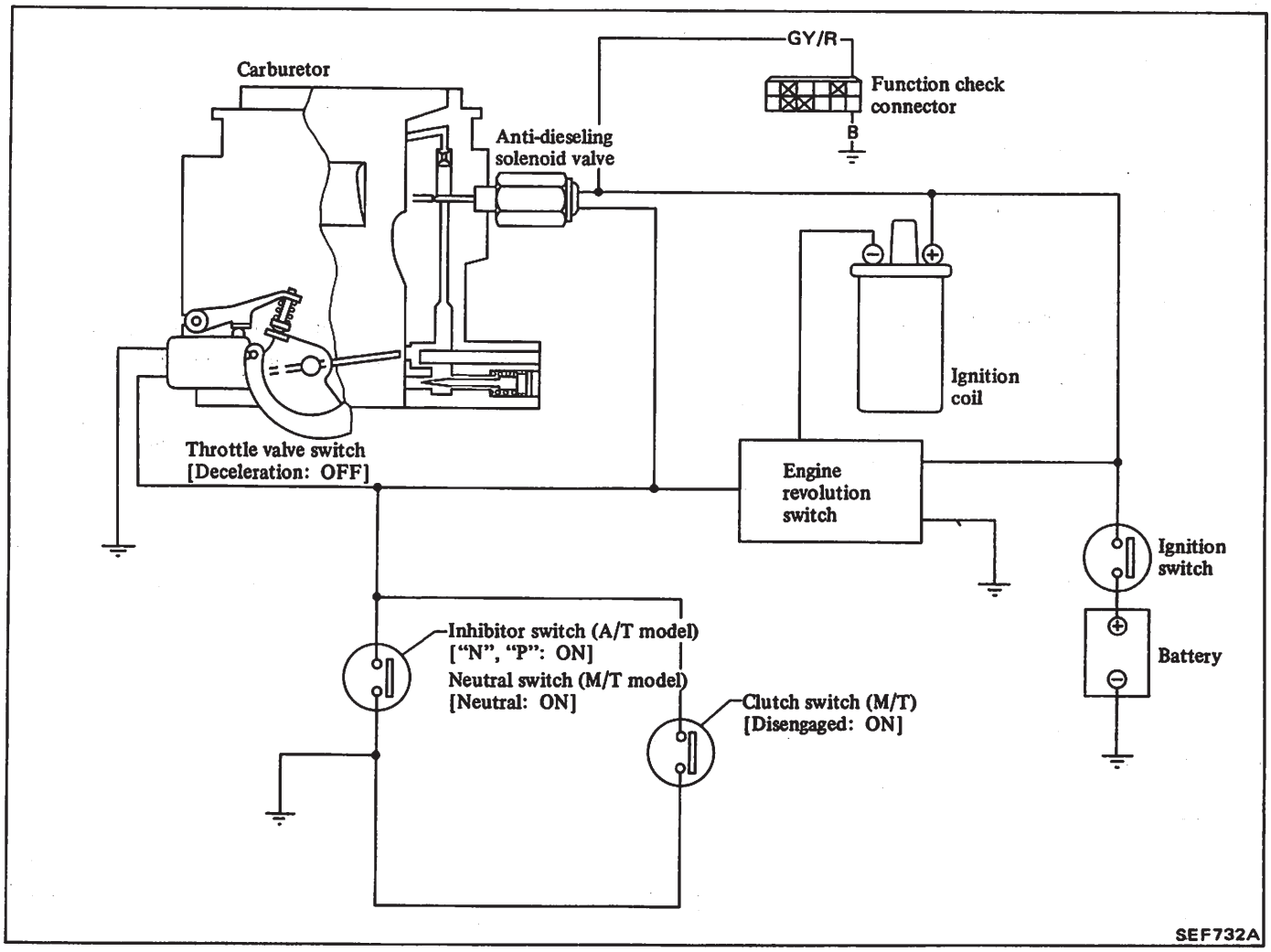
4. If out of specification, repair or replace.





FUEL SHUT-OFF SYSTEM (Non-California models)

The fuel shut-off system cuts off fuel during deceleration at high speeds when the manifold vacuum increases to a very high level. The purpose of this system is to improve fuel economy.

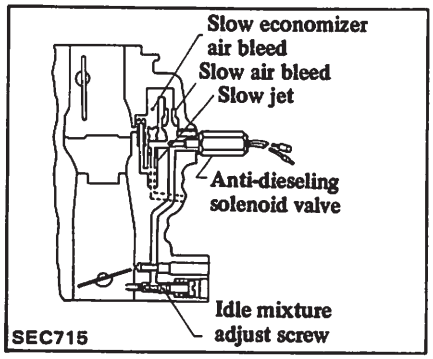


OPERATION

Ignition key	Engine speed	Switch operation						Fuel shut-off system
		Engine revolution switch	Throttle valve switch	Neutral switch (M/T)	Clutch switch (M/T)	Inhibitor switch (A/T)	Anti-dieseling solenoid	
OFF	Any condition							Not operated
ON	Higher than 1,650 rpm	OFF	OFF	ON	–		ON	Not operated
				OFF	ON		ON	Not operated
					OFF		OFF	Operated
						ON	ON	Not operated
						OFF	OFF	Operated
			ON	–	–	–	ON	Not operated
	Lower than 1,650 rpm	–	–	–	–	–	ON	Not operated

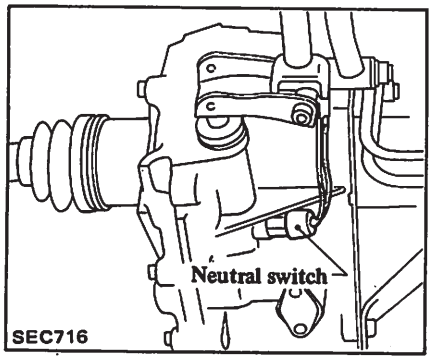
Anti-dieseling solenoid valve

The anti-dieseling solenoid valve is attached to the carburetor with its needle valve facing the fuel passage of the primary slow system. When current flows through the anti-dieseling solenoid valve, the needle valve retracts, allowing the current to flow through the primary slow system. When current does not flow through this system, the fuel will be shut off:



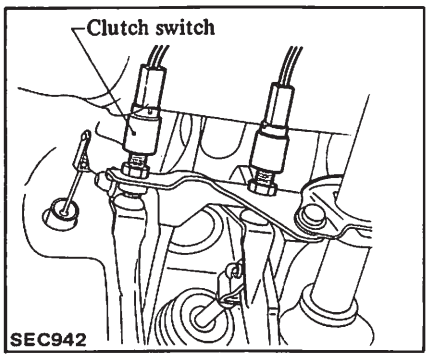
Neutral switch

When transaxle gears are in Neutral, this switch causes an electric current to flow through the vacuum switch.



Clutch switch

The clutch switch is attached to the clutch bracket. When the clutch is disengaged, this switch causes an electric current to flow through the vacuum switch.



Engine revolution switch

This switch is designed to detect the engine rpm when the fuel shut-off system is operated. It is mounted on junction block.

INSPECTION

Entire system

1. Visually check fuel shut-off system. If any switches are broken, replace.

CAUTION:

a. Before checking, make sure engine is warmed up and choke valve is fully open.

b. Keep clutch pedal held down with your foot while depressing accelerator pedal when shift lever is in any position other than neutral. Otherwise car will surge forward abruptly.

Do not attach test leads of a circuit tester to terminals other than those designated.

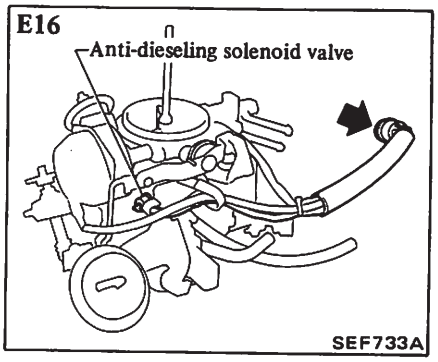
2. Connect circuit tester to the function check connector.
3. Turn the ignition switch to "ON" position.
4. Check for presence of voltage across G/B and B.

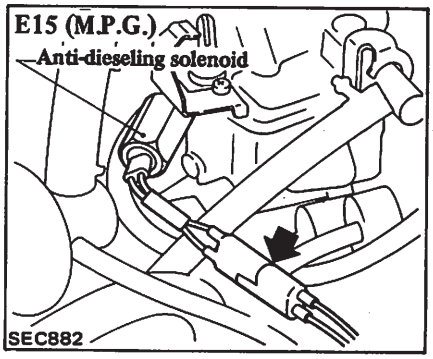
Clutch	Voltage
Disengaged (Pedal pressed)	12V
Engaged (Pedal free)	0V

Gear position	Voltage
Neutral	12V
Others	0V

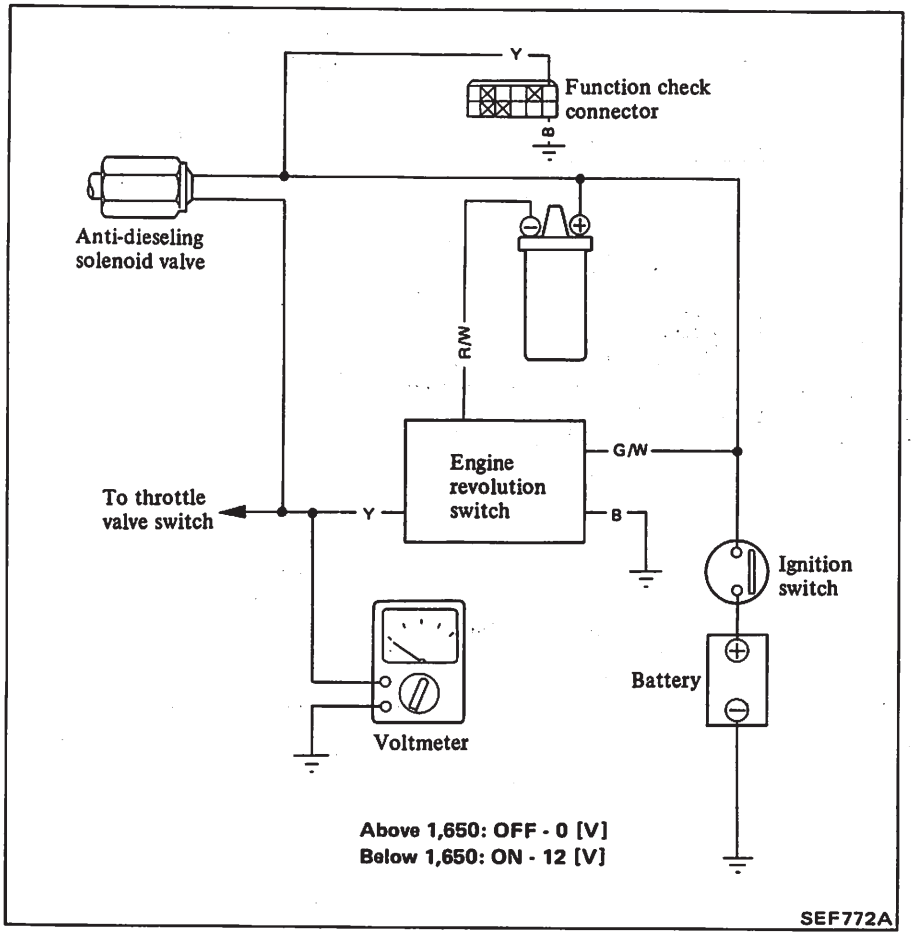
Connect vacuum hose and connector.

5. Start engine and warm it up.
6. Disconnect anti-dieseling solenoid valve connector or vacuum switch connector and make sure that engine does not keep idling. If it does, replace anti-dieseling solenoid valve assembly.





7. Set voltage meter as shown below.



8. Set control lever in "N" position and run engine under no load. Increase engine rpm to check engine rev unit condition. If voltmeter indicates zero V when engine rpm is above 1,650 rpm, engine rev switch is correct. If not, replace it.

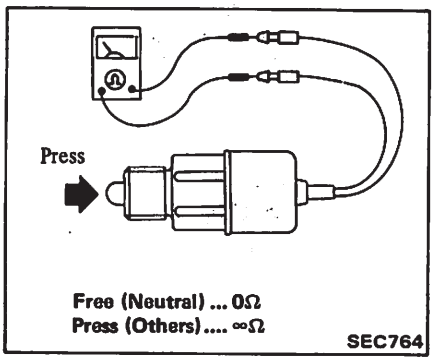
9. Check for presence of voltage across Br and B.

Vehicle speed km/h (MPH)	Voltage
Below 65 (40)	12V
Above 65 (40)	0V

Be sure that speedometer reading does not exceed 89 km/h (55 MPH).

Neutral switch

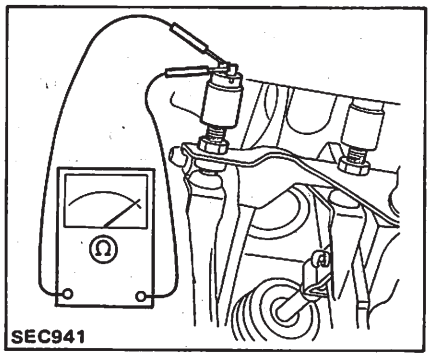
For ON-OFF characteristics, see schematic diagram. If operation is questionable, remove switches.



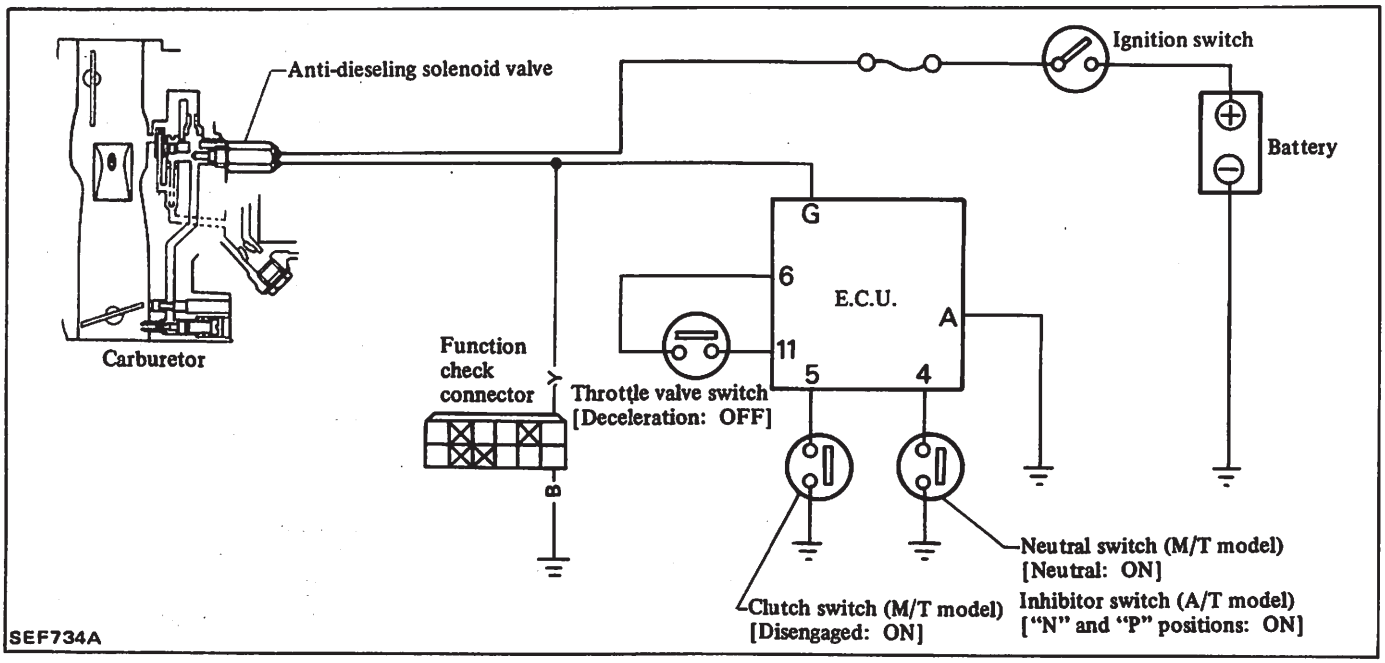
Ⓣ : **20 - 29 N-m (2.0 - 3.0 kg-m, 14 - 22 ft-lb) With locking sealant**

Clutch switch

Clutch	Continuity
Disengaged	0Ω
Engaged	∞Ω



FUEL SHUT-OFF SYSTEM (California models)

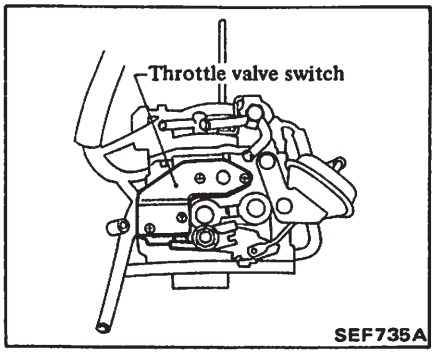


OPERATION

Water temperature °C (°F)	Engine speed rpm	Throttle valve	Transaxle		Fuel shut-off system
			Gear position	Clutch	
M/T: Below 50 (122) A/T: Below 60 (140)	Any conditions				Not operated
M/T: Above 50 (122) A/T: Above 60 (140)	Any conditions			Disengaged	
			Neutral		
		Open	Any conditions		
	Below 2,000				
	Above 2,000	Closed	Others	Engaged	Operated

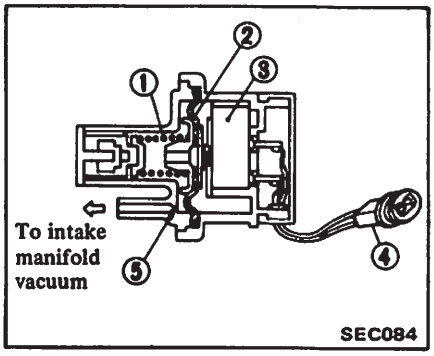
Throttle valve switch

The throttle valve switch is attached to the E.C.C. and actuates in response to the throttle valve movement.



Vacuum switch

When the intake manifold vacuum increases during deceleration, this switch is activated, thereby interrupting the electrical signal which is sent to the vacuum switching valve.



1 Spring
2 Diaphragm
3 Micro switch
4 Connector
5 Orifice

INSPECTION

Entire system

Refer to Diagnostic Procedure for E.C.C. Engine.

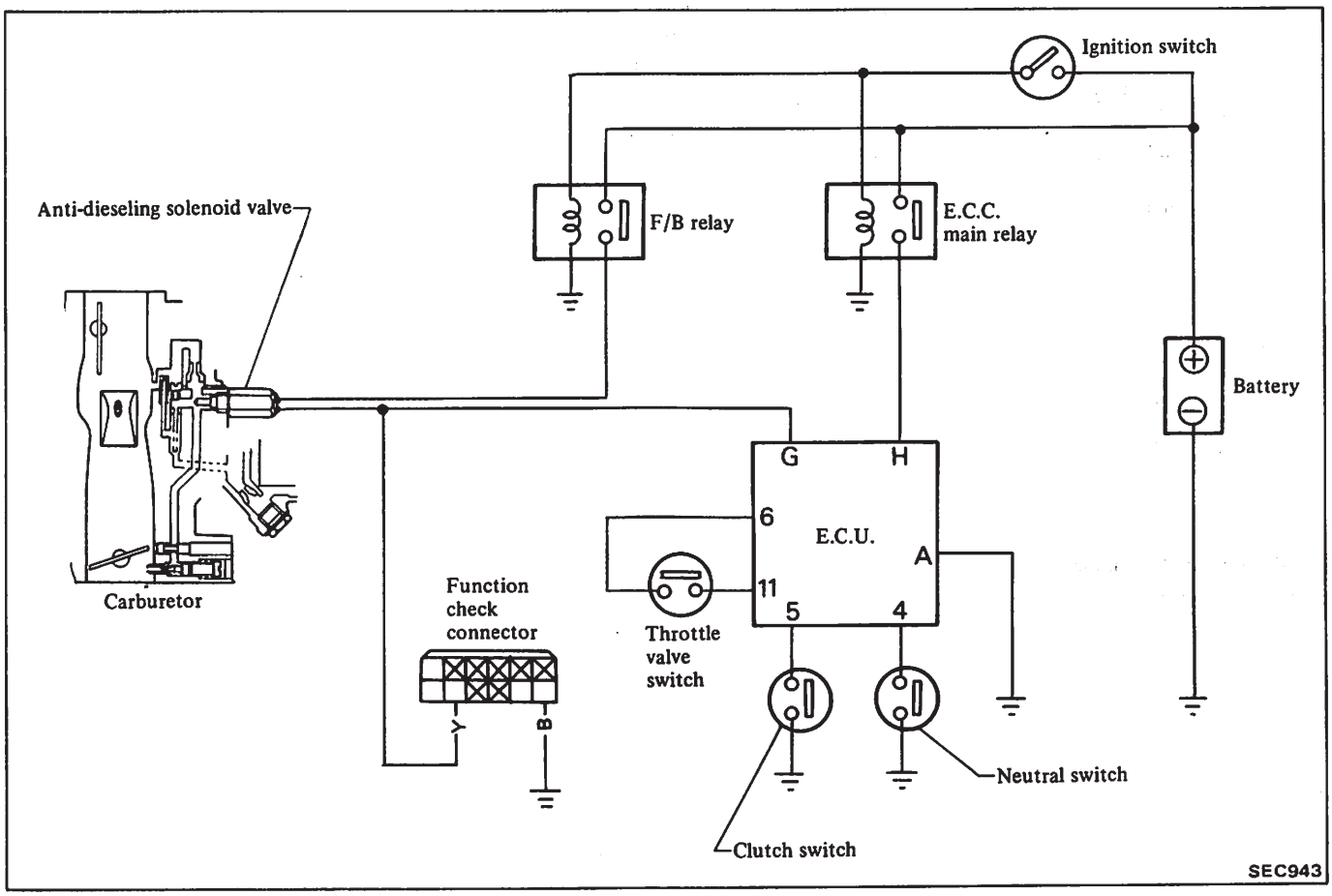
Vacuum switch

Intake manifold vacuum kPa (mmHg, inHg)	Switch
Above 10.7 - 11.7 (80 - 88, 3.15 - 3.46)	ON
Below 8.9 - 11.1 (67 - 83, 2.64 - 3.27)	OFF

FUEL SHUT-OFF SYSTEM (M.P.G. models)

This system does not operate under cold engine conditions or no-load conditions to prevent engine from stalling.

In addition, the recovery system from fuel shut-off is also operated when engine speed is below 2,000 rpm.

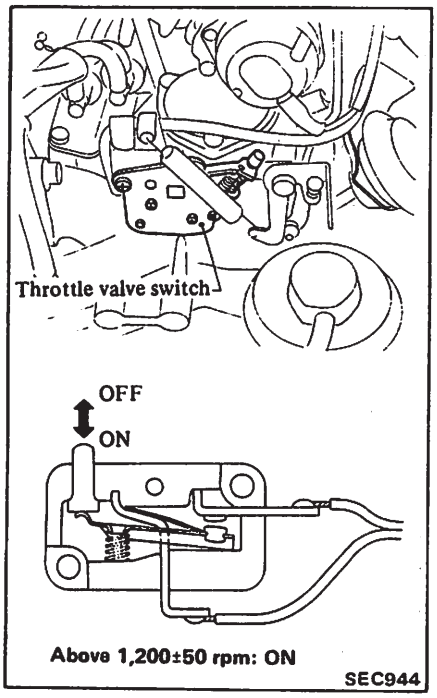


OPERATION

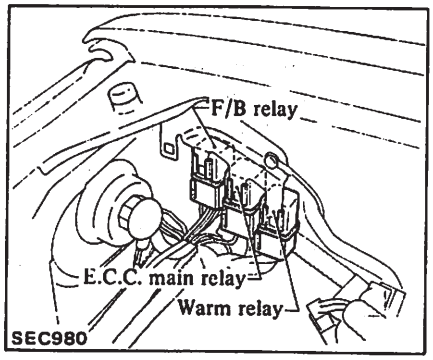
Water temperature °C (°F)	Engine speed rpm	Throttle valve	Transaxle		Fuel shut-off system
			Gear position	Clutch	
Below 50 (122)	Any conditions				Not operated
Above 50 (122)				Disengaged	
			Neutral		
		Open	Any conditions		
	Below 2,150				
	Above 2,150	Closed	Others	Engaged	Operated

Throttle valve switch

The throttle valve switch is attached to the E.C.C. and actuates in response to the throttle valve movement.



Relays

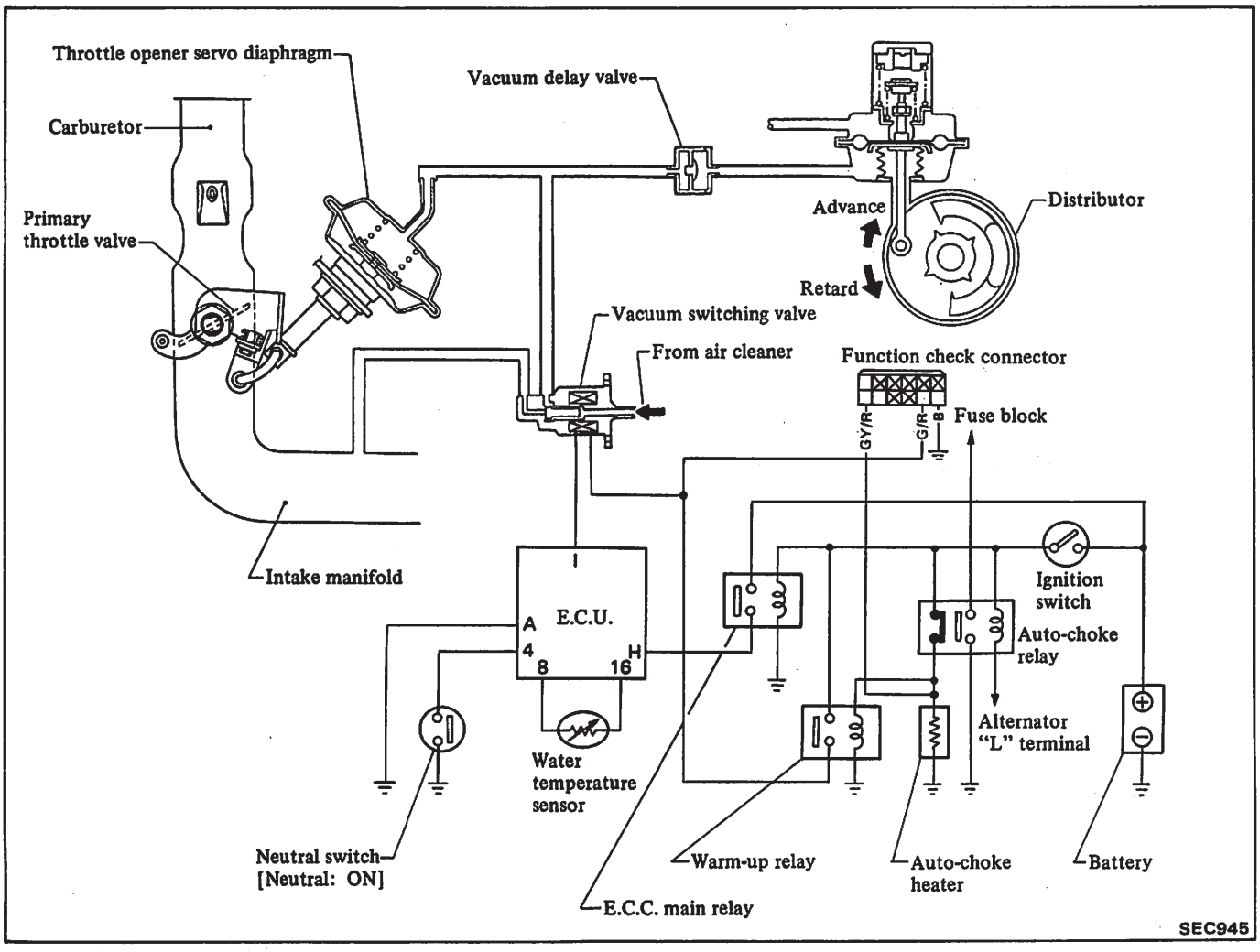


INSPECTION

Entire system

Refer to Diagnostic Procedure for E.C.C. Engine.

CATALYST WARM-UP SYSTEM (M.P.G. models)



OPERATION

Water temperature sensor °C (°F)	Transaxle gear position	Vacuum switching valve	Throttle opener	Spark timing
Below 17 (63)	Any position	Closed	Not operated	Advance
17 - 35 (63 - 95)	Neutral	Open	Operated	Retard
	Others	Closed	Not operated	Advance
Above 35 (95)	Any position			

INSPECTION

Entire system

Refer to Diagnostic Procedure for E.C.C. Engine.

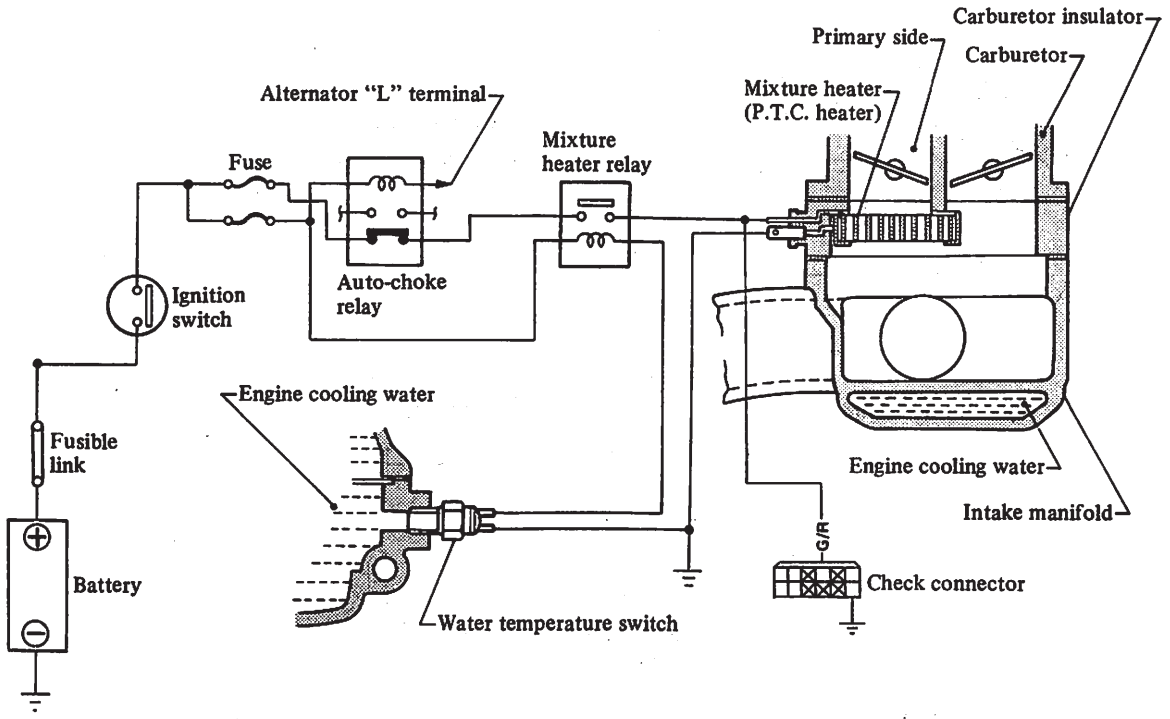
MIXTURE HEATING SYSTEM (Non-California and Canada models)

In order to reduce emissions and improve driveability during engine warm-up, the positive temperature coefficient (P.T.C.) heater is installed between carburetor and intake manifold.

When engine starts, P.T.C. heater is electrically energized and the air-fuel mixture which passes through this heater is heated.

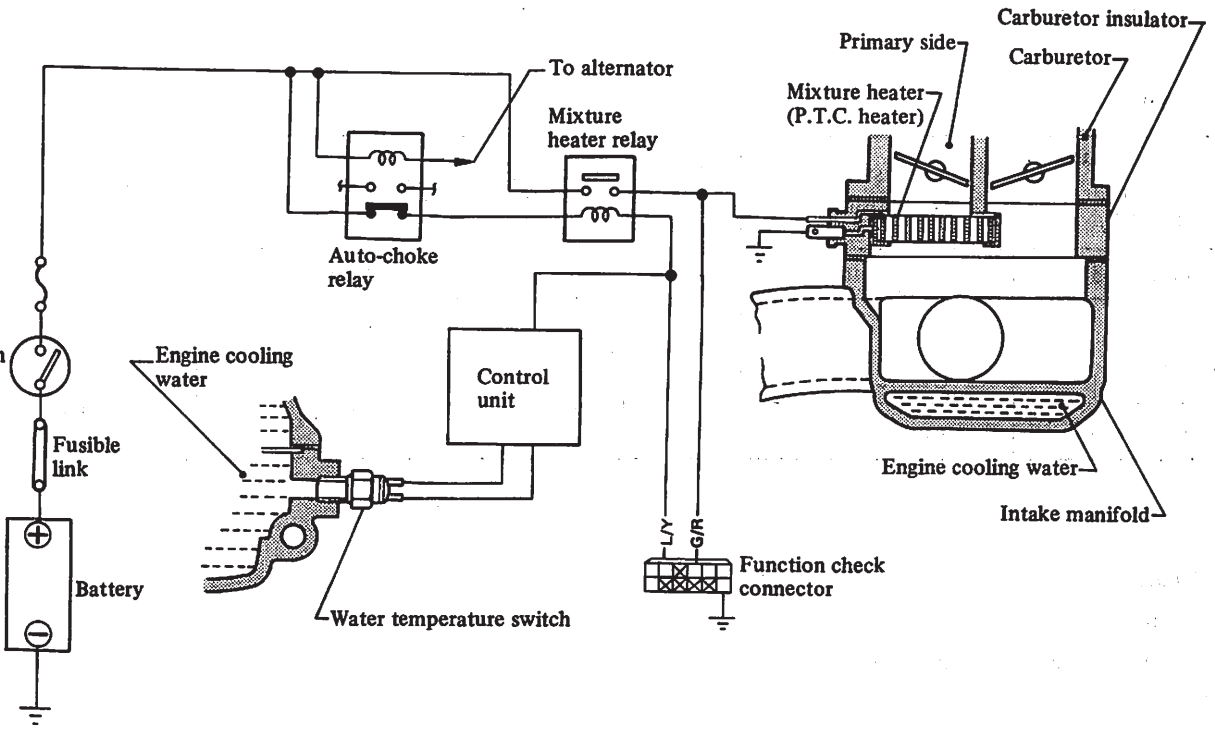
When engine warm-up is completed, the heater current is cut off by the water temperature switch.

Non-California and Canada models



SEC131A

California model



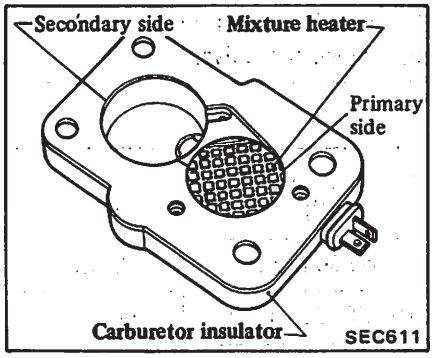
SEC130A

OPERATION

The operation of the system is as follows:

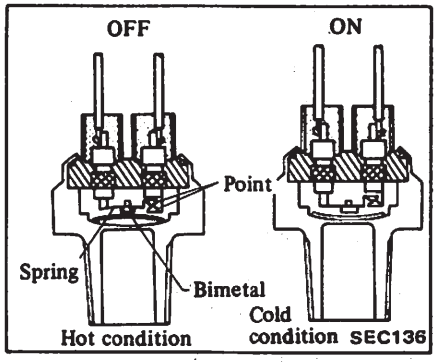
Water temperature °C (°F)	Mixture heating system
Below 37 (99)	Activated
Above 37 (99)	Deactivated

Mixture heater



The mixture heater uses a honeycomb P.T.C. heater design and is situated in the primary side of the carburetor insulator. With this design, resistance to current flow increases as the temperature increases, and vice versa. As a result, the current flow is maintained constant.

Water temperature switch

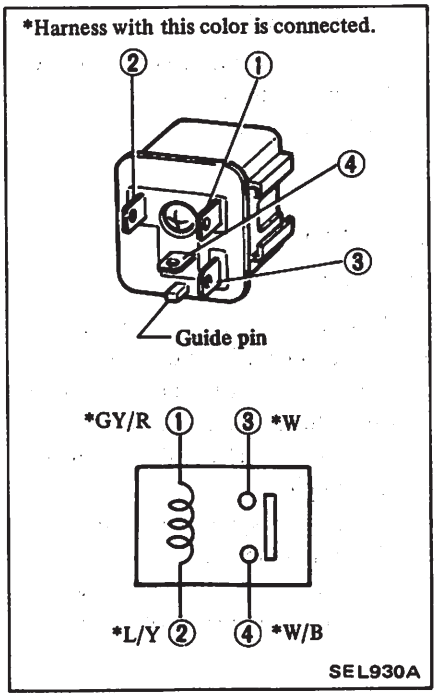


Water temperature switch is installed on thermostat housing.

Mixture heater relay

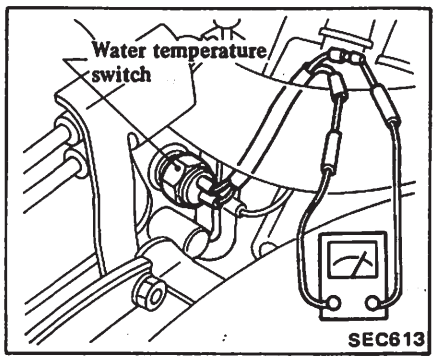
This unit is located in the relay bracket (Except M.P.G. model) or junction block near fuse box (M.P.G. model).

Mixture heater relay is "1M" type standardized relay.



INSPECTION

1. Check continuity between terminals of mixture heater. If resistance is too large, replace carburetor insulator.
2. When ignition switch is turned "ON" while engine is "OFF", confirm the presence of battery voltage at mixture heater harness connector. If no battery voltage is present, check water temperature switch and mixture heater relay.
3. Check continuity between terminals of water temperature switch at connector.



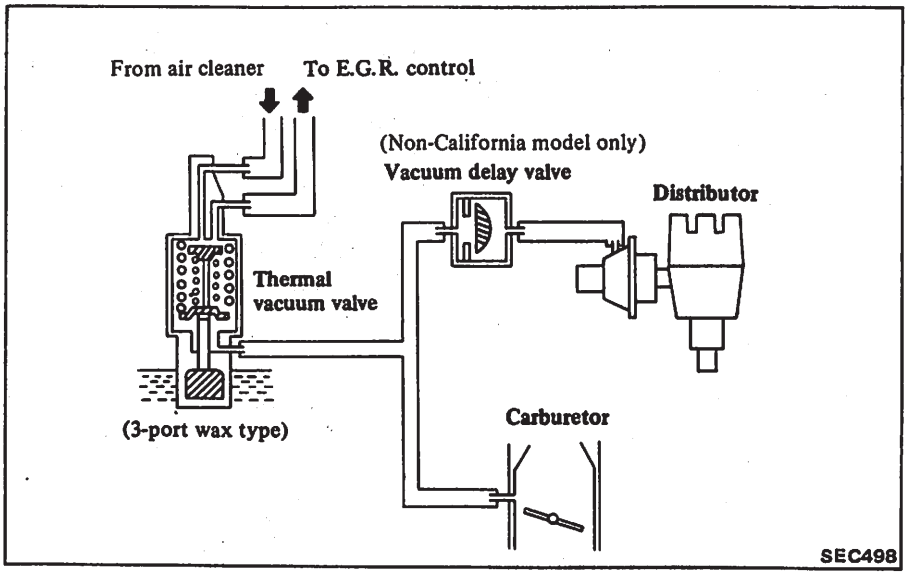
4. Check mixture heater relay.

If necessary, check wiring harness and automatic choke relay which is "1M·1B" standardized relay.

Refer to Idle Mixture Adjusting Procedure for automatic choke relay.

SPARK TIMING CONTROL SYSTEM

The spark timing control system is designed to control the distributor vacuum advance under varying driving conditions so as to reduce HC and NOx emissions.



OPERATION

Water temperature °C (°F)	Thermal vacuum valve	Spark timing control system
Below 10 (50)	Closed	Actuated
10 - 50 (50 - 122)	Open	Not actuated
Above 50 (122)	Closed	Actuated

Thermal vacuum valve

Refer to "Thermal Vacuum Valve" of E.G.R. control system for description.

Vacuum delay valve

Refer to Vacuum Delay Valve of catalyst warm-up system for description and inspection.

INSPECTION

Entire system

1. Ensure that vacuum hoses are properly connected in position.
2. Ensure that distributor vacuum controller functions properly.
3. Set timing light and start engine when it is cold.
4. Check the spark timing referring to "Operation table".
5. If the spark timing does not change, check thermal vacuum valve.

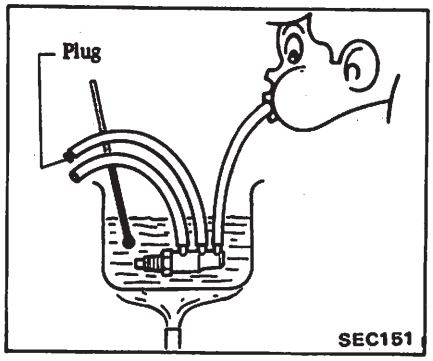
Thermal vacuum valve

Remove thermal vacuum valve from engine. Inhale air from port of spark timing control system and check to be sure that thermal vacuum valve opens or closes in response to its temperature.

Before removing valve, drain engine coolant about one liter (1-1/8 US qt, 7/8 Imp qt).

CAUTION:
Do not allow water to get inside the thermal vacuum valve.

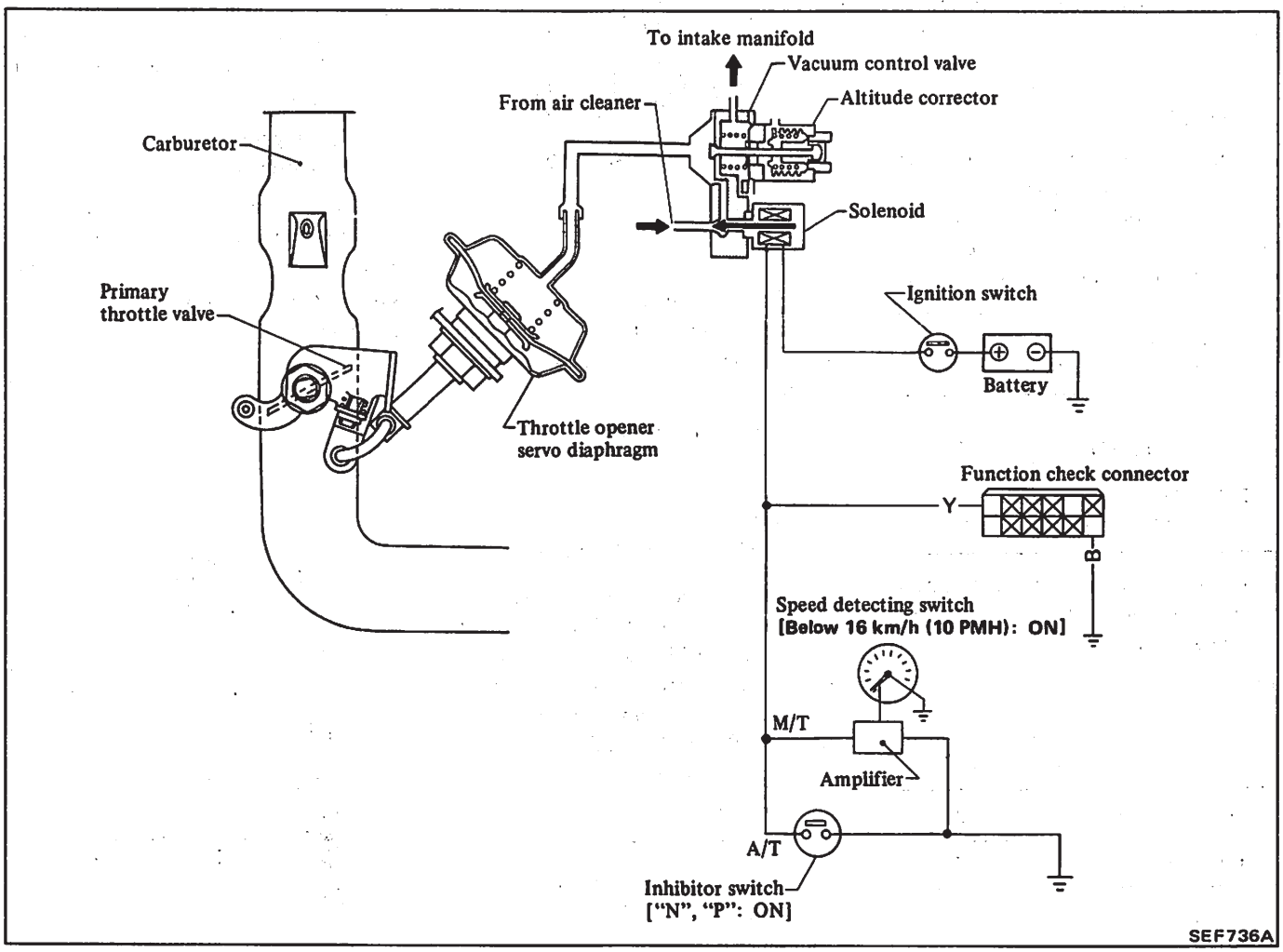
Water temperature °C (°F)	Valve
Above 50 (122)	Closed
10 - 50 (50 - 122)	Open
Below 10 (50)	Closed



THROTTLE OPENER CONTROL SYSTEM (T.O.C.S.) FOR CANADA

The function of the throttle opener is to open the throttle valve of the carburetor slightly while the car decelerating. During deceleration, the manifold vacuum rises and the quantity of mixture in the engine is not sufficient for normal combustion to continue; consequently, a great amount of unburned HC is emitted.

Carburetors equipped with the throttle opener supply the engine with an adequate charge of combustible mixture to maintain proper combustion during deceleration, resulting in a dramatic reduction in HC emission.



OPERATION

Transaxle	Gear position	Vehicle speed km/h (MPH)	T.O.C.S. operation
Manual	Any position	Below 16 (10)	Operated
		Above 16 (10)	Not operated
Automatic	"N" or "P"	Any speed	Operated
	Others		Not operated

INSPECTION AND ADJUSTMENT

Entire system

When idling speed is too high and does not drop to idling speed, the throttle opener control system should be checked.

1. Check for continuity between "G/R" and "B" terminals specified in function check connector with ignition switch OFF.

If continuity does not exist, solenoid may be faulty. Replace throttle opener control valve assembly.

2. Turn on ignition switch and check voltage across terminals "G/R" and "B".

M/T models

Remove speedometer cable from combination meter. Then spin speedometer in combination meter with fingers and confirm that the speedometer pointer indicates more than 16 km/h (10 MPH) temporarily. Voltage between "G/R" and "B" terminals should be changed as follows:

Above 16 km/h (10 MPH)	0V
Below 16 km/h (10 MPH)	12V

If not, amplifier or speed detecting switch may be faulty; replace parts with new ones.

A/T models

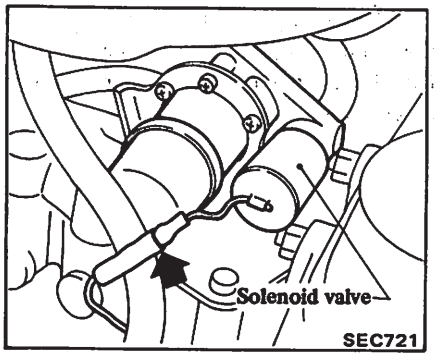
Voltage between two terminals should be changed as follows:

"N" or "P" position	12V
Other position	0V

If not, replace inhibitor switch.

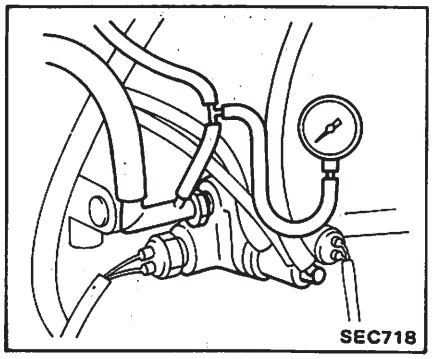
Throttle opener operating pressure

1. Remove harness of solenoid valve.



2. Connect rubber hose between vacuum gauge and intake manifold.

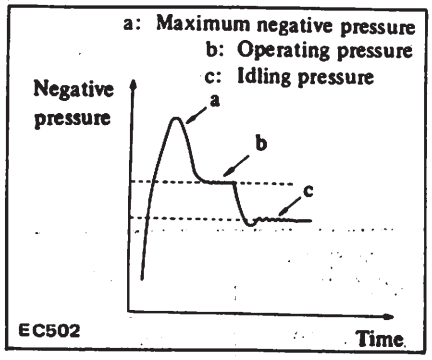
A quick-response type boost gauge such as Bourdon's type is recommended; a mercury-type manometer should not be used.



3. Warm up engine until it reaches operating temperature. Then confirm that engine idling speed is specified value.

Engine idling speed:
M/T:
750 rpm
A/T:
650 rpm (in "D" position)

4. Run engine under no load. Increase engine speed to 3,000 or 3,500 rpm, then quickly close throttle valve.
5. At that time, manifold vacuum pressure increase abruptly to –80.0 kPa (–600 mmHg, –23.62 inHg) or above and then decreases to the level set at idling.



6. Check that the T.O.C.S. operating pressure is within the specified pressure.

Specified pressure [0 m (0 ft), sea level and 101.3 kPa (760 mmHg, 29.92 inHg), atmospheric pressure]:

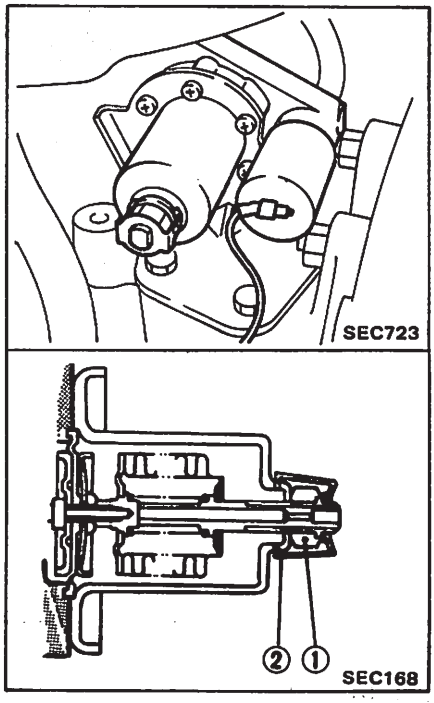
–69.3 ± 2.7 kPa
(–520 ± 20 mmHg,
–20.47 ± 0.79 inHg)

7.
(1) If it is lower than the specified level, turn the adjusting screw or nut in the following direction until correct adjustment is made.
Adjusting nut:
Clockwise

(2) If it is higher than the specified level, turn the adjusting screw or nut in the following direction until correct adjustment is made.

Adjusting nut:
Counterclockwise

When adjusting T.O.C.S., turn adjusting nut in or out with lock spring in place. Always set lock spring properly to prevent changes in set pressure.



1 Adjusting nut
2 Lock spring

The operating pressure varies in proportion to altitude.

a. When atmospheric pressure is known, operating pressure will be found by tracing the arrow line "A". When altitude is known, operating pressure will be found by tracing the arrow line "B".

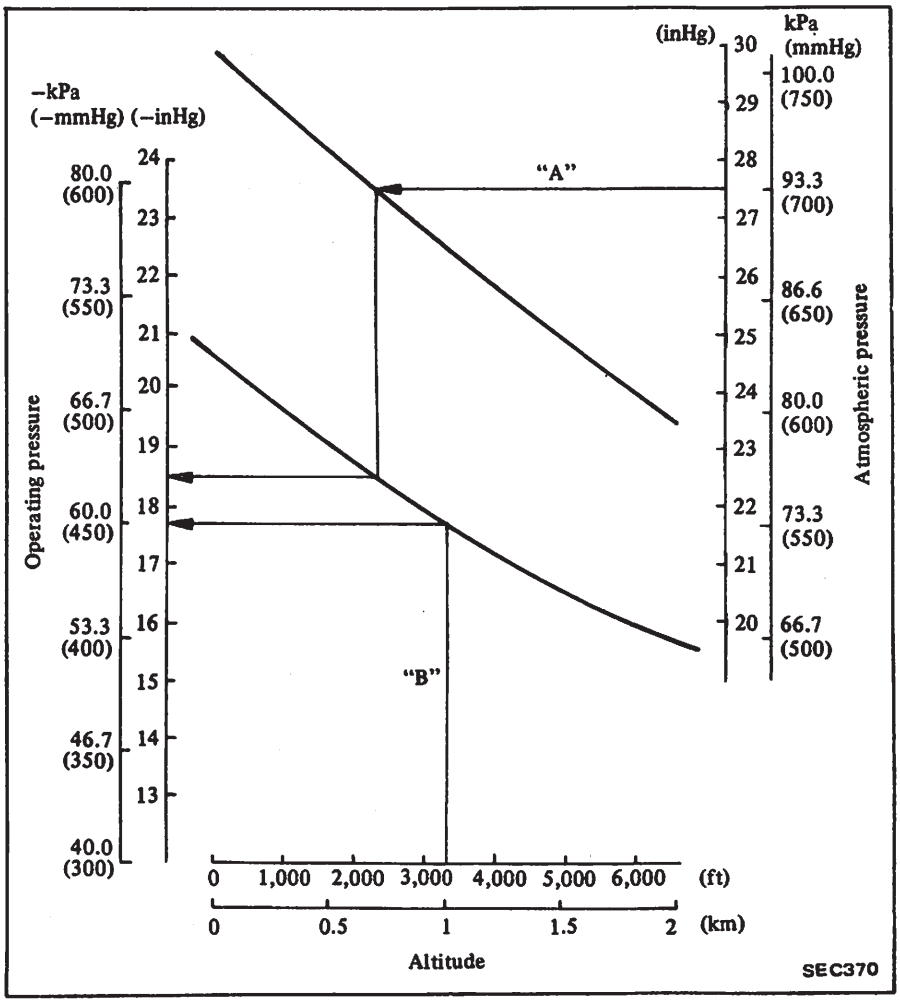
b. When checking T.O.C.S. operating pressure, note atmospheric pressure and elevation in which check is to be made, and determine set pressure by the information furnished.

For example, if above sea level is 1,000 m (3,280 ft), operating pressure will then be –63.3 kPa (–475 mm Hg, –18.70 inHg).
In other words, T.O.C.S. operates at –63.3 kPa (–475 mmHg, –18.70 inHg).

8. Race engine and check for adjustment.
9. If engine speed does not drop to idling speed when checking throttle opener operating pressure, proceed as follows:

(1) Turn adjusting screw counterclockwise so that throttle opener operating pressure is on high vacuum side, 3.3 kPa (25 mmHg, 0.98 inHg) above the specified value.
(2) Turn adjusting screw 1/4 of a turn clockwise so that throttle opener operating pressure drops by 3.3 kPa (25 mmHg, 0.98 inHg).
10. If throttle opener operating pressure cannot be observed clearly even in step 9, proceed as follows.
(1) Turn adjusting screw counterclockwise so that throttle opener operating pressure is on high vacuum side 6.7 kPa (50 mmHg, 1.97 inHg) above the mid-point of the specified range.
(2) Turn adjusting screw ½ of a turn clockwise.

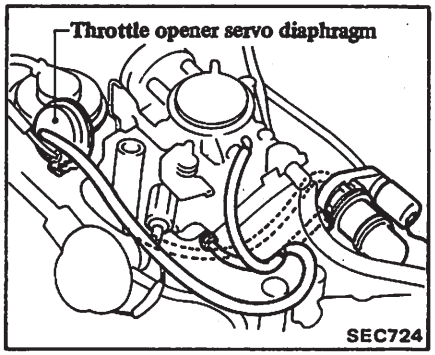
The throttle opener operating pressure should be correctly set within the specified range after the above adjustments, even if the engine speed cannot be decreased to idling.



Servo diaphragm stroke

1. Connect engine tachometer.
2. Warm up engine until it reaches operating temperature.
3. Disconnect rubber hose between servo-diaphragm and vacuum control valve.

Then, connect rubber hose to intake manifold.

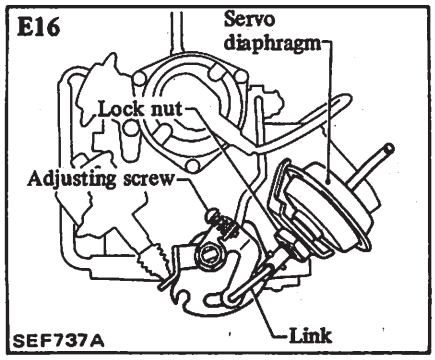


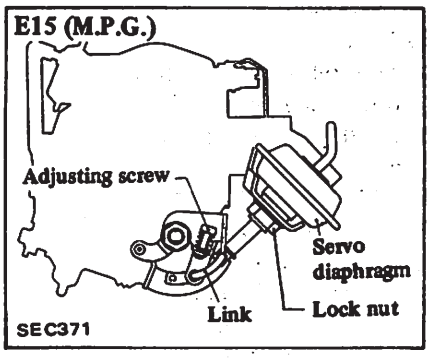
4. Servo-diaphragm is functioning properly, if engine speed comes into the specified range.

Specified engine speed:
1,650 - 1,850 rpm

5. If necessary, adjust engine speed until it is in the specified range, using servo-diaphragm adjusting screw.

When engine speed is lower than the prescribed range:
Turn adjusting screw clockwise.
When engine speed is higher than the prescribed range:
Turn adjusting screw counterclockwise.



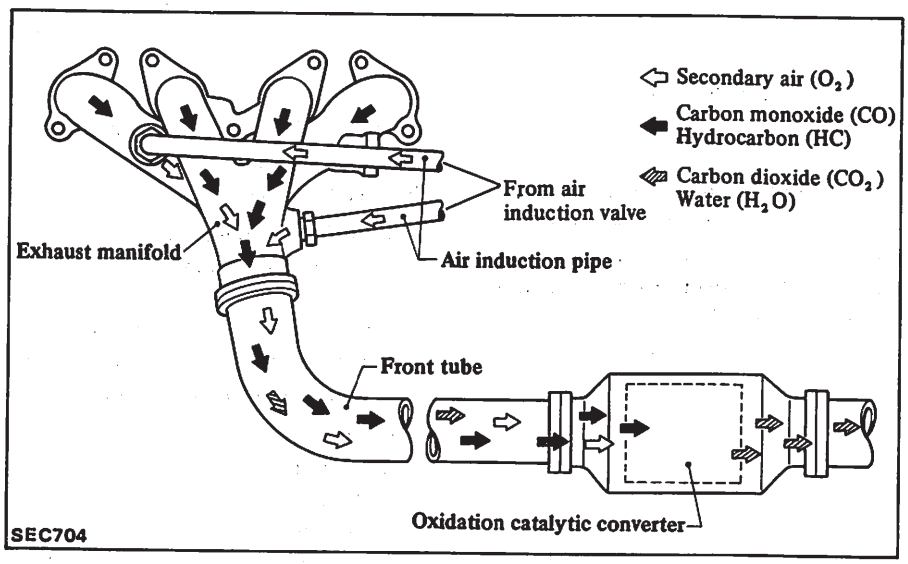


CATALYTIC CONVERTER

Exhaust gas emitted from the engine contains some harmful gases due to incomplete combustion in the combustion chamber.

The air induction system (A.I.S.) is designed to reduce the content of such gases in the exhaust gas.

The catalytic converter further cleans engine exhaust gas. Through catalytic action, it changes residual hydrocarbons (HC) and carbon monoxide (CO) contained in exhaust gas into water (H_2O) and carbon dioxide (CO_2) before exhaust gas is discharged to the atmosphere.



REMOVAL AND INSTALLATION

1. Jack up the car.

Apply parking brake and place wheel chocks.

2. Remove screws securing lower shelter of catalytic converter.

Loosen flange bolts connecting catalytic converter to front and rear exhaust tubes.

Catalytic converter assembly can then be taken out.

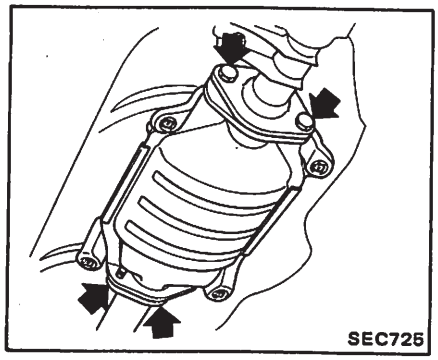
3. Installation is in the reverse order of removal.

CAUTION:

a. Be careful not to damage catalytic converter when handling.

b. Never wet catalyzer with water, oil, etc.

Ⓣ : **Catalytic converter bolts**
31 - 42 N·m
(3.2 - 4.3 kg-m,
23 - 31 ft-lb)
Lower shelter bolts
6.3 - 8.3 N·m
(0.64 - 0.85 kg-m,
4.6 - 6.1 ft-lb)



INSPECTION

Preliminary inspection

Visually check condition of all component parts including hoses, tubes and wires. Replace if necessary.

Refer to Air Induction System for inspection.

Catalytic converter

Whether catalytic converter is normal or not can be checked by observing variation in CO percentage. The checking procedure is as follows:

Apply parking brake. Shift gears into "Neutral" position.

1. Visually check catalytic converter for damage or cracks.
2. Adjust engine idling speed. Refer to Adjusting Idle RPM for adjustment. (Section MA).
3. Race engine (2,000 to 3,000 rpm) two or three times under no load.
4. If idling speed increases, readjust it to specified speed with throttle adjusting screw.
5. Warm up engine for about four minutes at 2,000 rpm under no load.
6. Measure CO percentage at idling speed. After step 5 has been completed, wait for one minute before making CO percentage measurement.
7. If CO percentage measured in step 6 is less than 0.3%, the catalytic converter is normal.
8. If CO percentage measured in step 6 is over 0.3%, check A.I.S. and replace air induction valve. Then, perform inspection steps 5 and 6.
9. If CO percentage is still over 0.3% in step 8, catalytic converter is malfunctioning. Replace catalytic converter.

VACUUM HOSES OF EMISSION CONTROL SYSTEMS

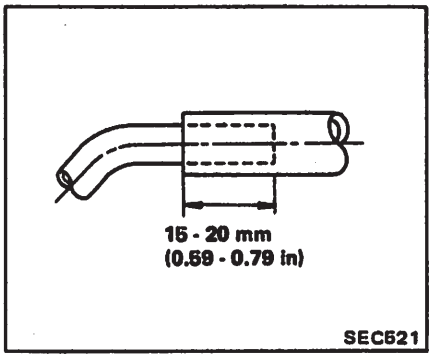
The following show the various conditions for connecting emission control vacuum hoses and air hoses. Pay careful attention to the remarks below.

1. Hoses are colored according to their function and purpose as shown below.

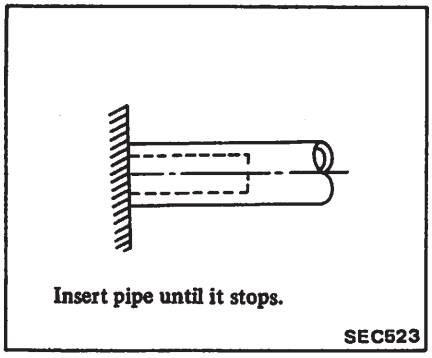
Yellow: Vacuum line to distributor
White: Vacuum line for E.G.R. system
Green: Manifold vacuum line
Pink: Atmospheric pressure
Blue: Venturi vacuum line to V.V.T. valve

2. Insert hose into pipe as shown below.

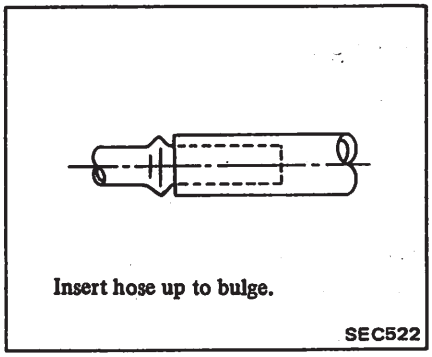
a. When inserting tolerance is not limited.



b. When stopper is equipped.
If connector length is under 20 mm (0.79 in).



c. When pipe has a bulge.



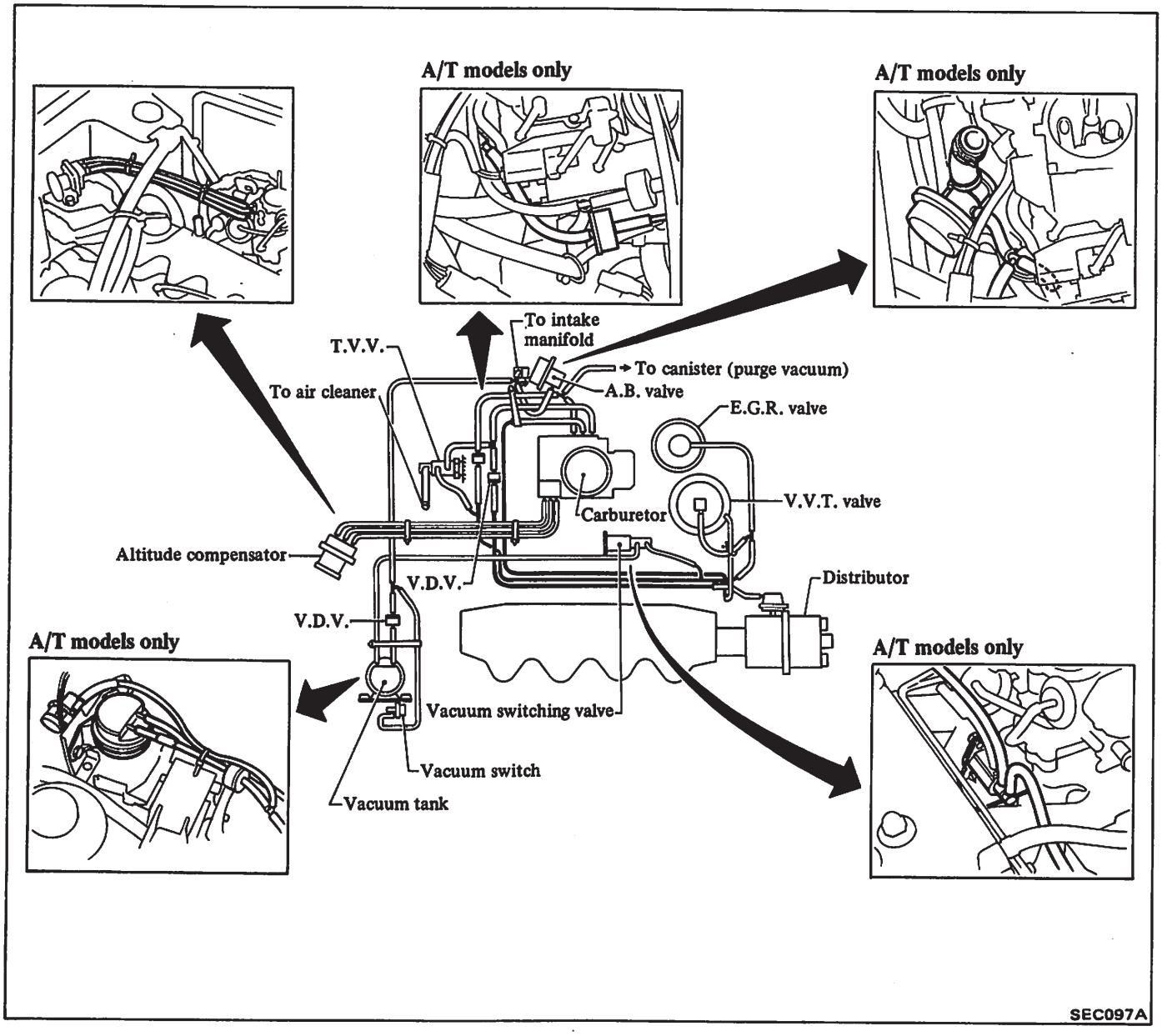
HIGH ALTITUDE EMISSION CONTROL SYSTEM

DESCRIPTION

In vehicles operated at high altitudes, where the air is thinner, mixture ratio and intake manifold boost vary, and exhaust emission increases. In order to decrease exhaust emission, certain devices have to be added/changed.
The following devices have to be added.
1. Altitude compensator ... For control of mixture ratio.
2. Additional E.G.R. control system ... For modification of E.G.R. control system. (A/T models only)

Control devices and system charts are as follows:

	Parts
Modification of mixture ratio	Altitude compensator with bracket
	Vacuum hoses
Additional E.G.R. control system (A/T models)	Vacuum tank with bracket
	Vacuum delay valve (2 pieces)
	Vacuum switching valve with bracket
	Vacuum switch
	Vacuum hoses and connectors



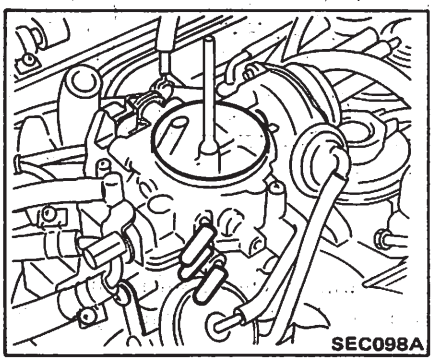
To install devices, refer to procedures in INSTALLATION AND MODIFICATION PROCEDURE.

INSTALLATION AND MODIFICATION PROCEDURE

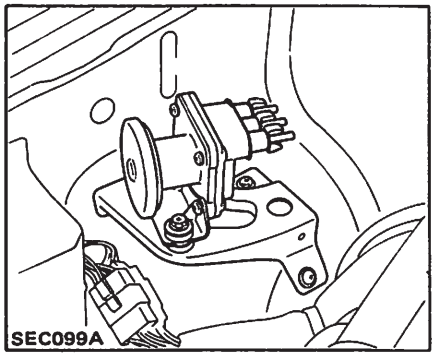
Before installation or modification, assemble applicable components into subassemblies if necessary.

ALTITUDE COMPENSATOR

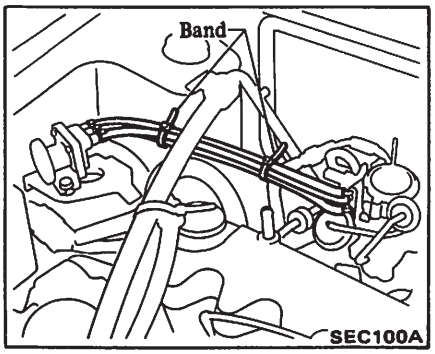
1. Remove air cleaner from engine.
2. Remove blind caps attached to altitude compensation pipes of carburetor.



3. Install an altitude compensator on the vehicle.

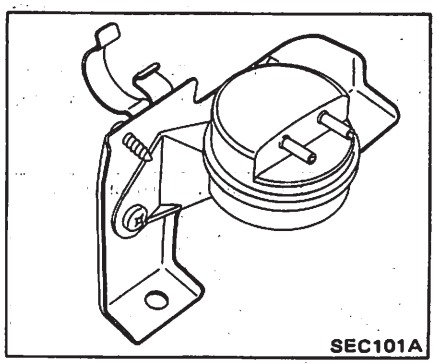


4. Then, connect vacuum hoses between carburetor and altitude compensator.

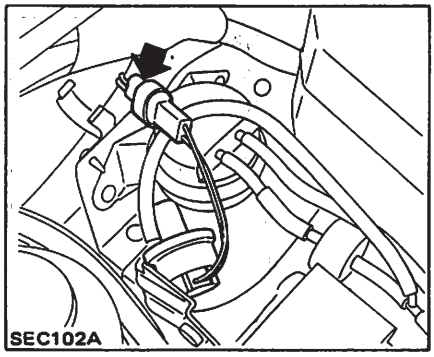


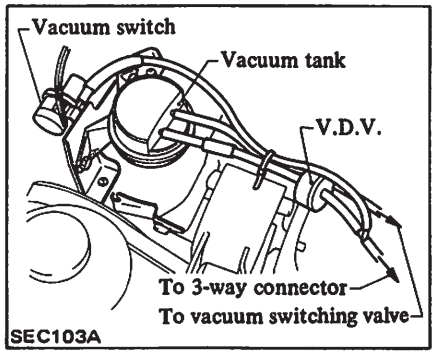
ADDITIONAL E.G.R. CONTROL SYSTEM (A/T models)

1. Assemble vacuum tank and brackets into subassembly.

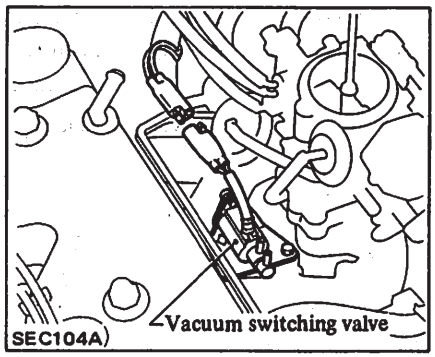


2. Install the subassembly on the vehicle, and connect vacuum switch harness connector to engine room harness connector.
Then, connect vacuum hoses.

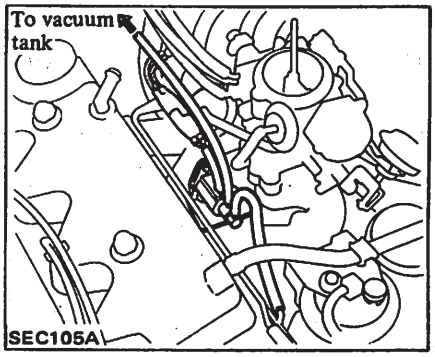




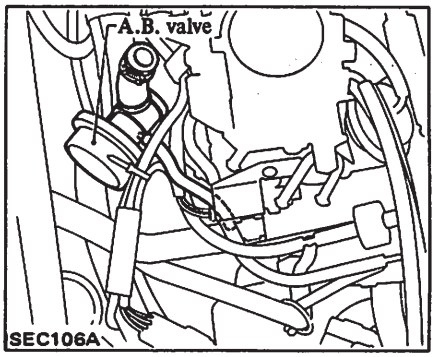
3. Install a vacuum switching valve with bracket on the vehicle, and connect the connector to engine room harness connector.



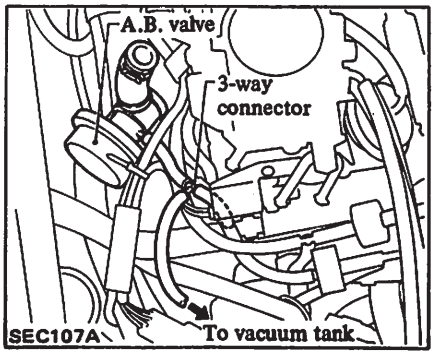
Then, connect vacuum hoses.



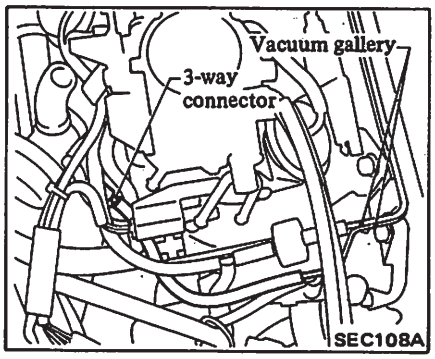
4. Disconnect vacuum hose between A.B. valve and intake manifold.



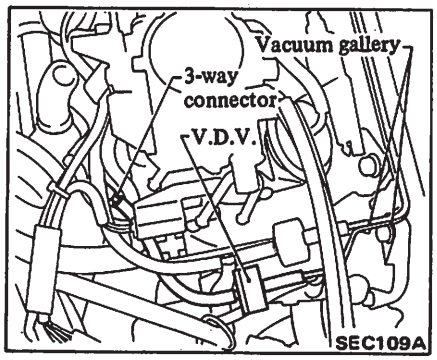
Then, connect vacuum hoses and 3-way connector.



5. Disconnect vacuum hose between vacuum gallery and 3-way connector.



Then, connect vacuum hoses with V.D.V.

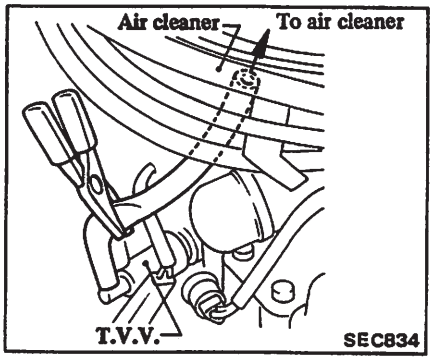


6. Install air cleaner.

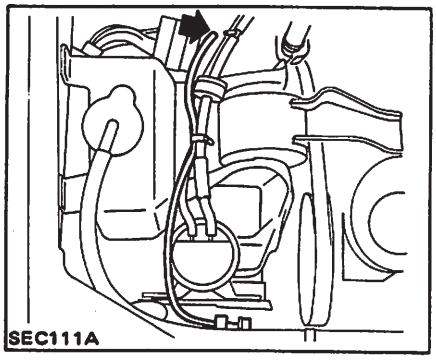
INSPECTION

1. Start the engine, and check air and vacuum lines for leaks, particularly around new connections.
2. Check new E.G.R. system as follows:

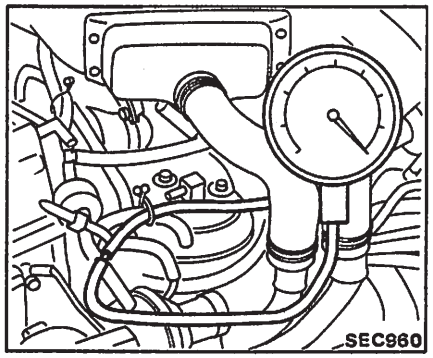
(1) Shut off the air passage between T.V.V. and air cleaner with a proper tool.



(2) At this time, also disconnect vacuum hose from vacuum switch.



(3) Then, connect vacuum gauge to check for proper functioning of new E.G.R. system. If the vacuum gauge indicates weak vacuum, the system is O.K. If the intake manifold vacuum is not present, recheck air and vacuum lines, especially around new connections.

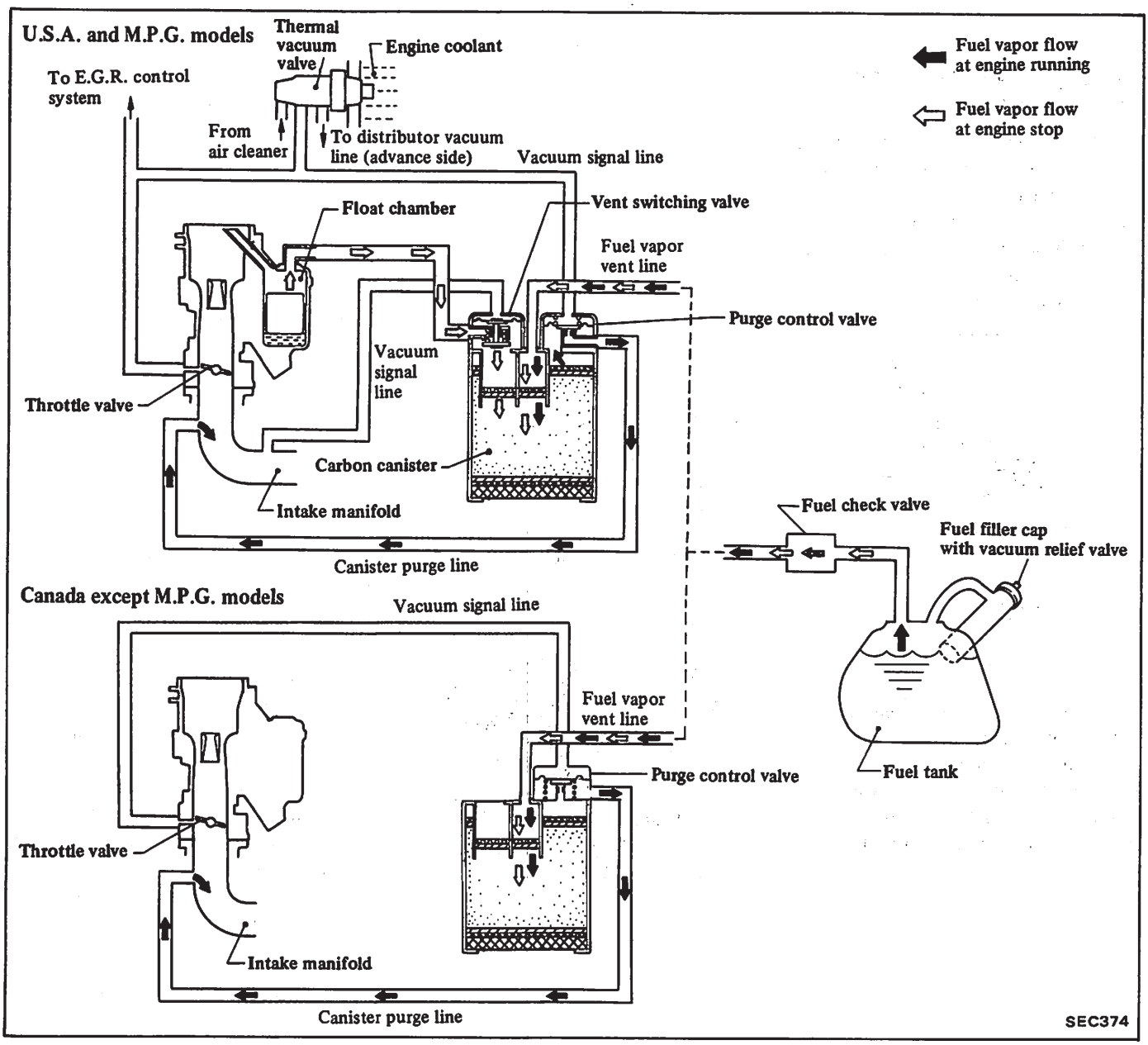


3. Warm up engine sufficiently, and then check idle speed and adjust it if necessary.

EVAPORATIVE EMISSION CONTROL SYSTEM

DESCRIPTION

The evaporative emission control system is used to reduce hydrocarbons emitted to the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.



OPERATION

At engine stop

Fuel vapor from the sealed fuel tank is led into the carbon canister which is filled with activated carbon and stroke there.

On U.S.A. and MPG models, the vapor in the carburetor float chamber is also led into the canister through the outer vent pipe because the vent switching valve is normally open.

During engine operation

The canister retains the vapor until the canister is cleaned by air drawn through the purge line to the intake manifold.

As engine speed increases, the ported vacuum rises and purge control valve opens the orifice allowing the vapor to travel through the purge line to the intake manifold.

On U.S.A. and MPG models, when the engine coolant temperature is lower than 60°C (140°F), the purge control valve closes by the movement of the thermal vacuum valve. This prevents vapor from flowing into the intake manifold.

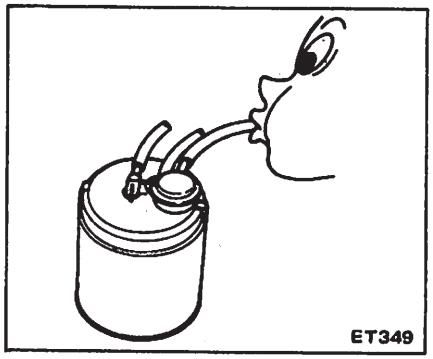
INSPECTION

FUEL TANK AND VAPOR VENT LINE

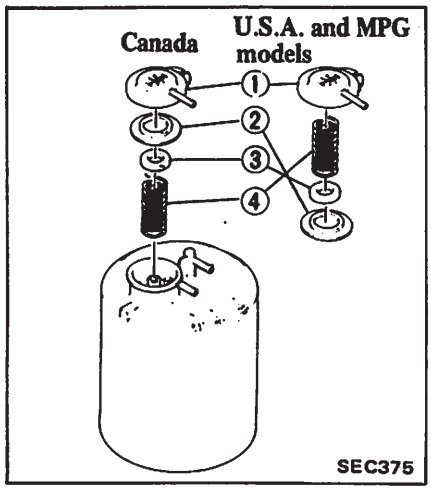
Refer to MA section for inspection of fuel tank and vapor vent line.

CARBON CANISTER PURGE CONTROL VALVE

1. Disconnect rubber hose, in the line, between T-connector and carbon canister at T-connector.
2. Inhale air from the opening of the rubber hose running to the vacuum hole in the carbon canister and ensure that there is no leak.



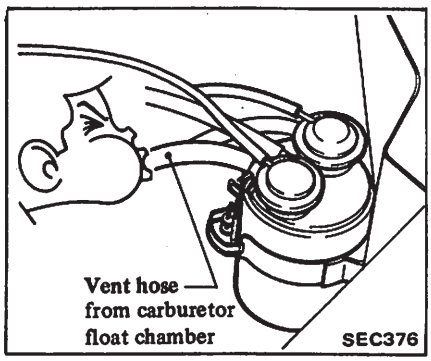
3. If there is a leak, remove top cover from purge control vavle and check for dislocated or cracked diaphragm. If necessary, replace diaphragm kit (which is made up of a retainer, diaphragm and spring).



1 Cover
2 Diaphragm
3 Retainer
4 Diaphragm spring

VENT SWITCHING VALVE

1. Disconnect vent line hose from carburetor float chamber.
2. With engine running, inhale on the vent line of the carbon canister and ensure there is no leak.



3. With engine off, make sure there is a leak.

THERMAL VACUUM VALVE

The thermal vacuum valve is used with the E.G.R. control system. Inspection procedures are the same for both valves.

FUEL CHECK VALVE

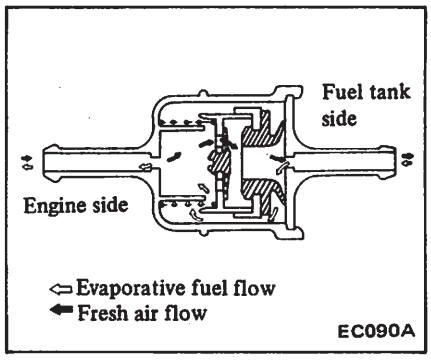
1. Blow air through connector on fuel tank side.

A considerable resistance should be felt at the mouth and a portion of air flow be directed toward the engine.

2. Blow air through connector on engine side.

Air flow should be smoothly directed toward fuel tank.

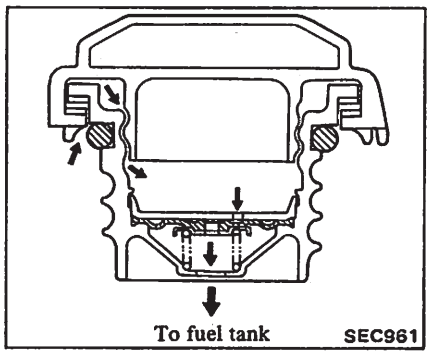
3. If fuel check valve is suspected of not being properly functioning in steps 1 and 2 above, replace.



FUEL TANK VACUUM RELIEF VALVE

Remove fuel filler cap and see it functions properly.

1. Wipe clean valve housing and have it in your mouth.
2. Inhale air. A slight resistance accompanied by valve indicates that valve is in good mechanical condition. Note also that, by further inhaling air, the resistance should be disappeared with valve clicks.
3. If valve is clogged, or if no resistance is felt, replace cap as an assembled unit.



INJECTION SYSTEM

CAUTION:

a. Disassembling, assembling or adjusting this VE-type pump may be done only in service shops authorized by the pump manufacturer.

b. Under no circumstances should screws sealed with wire or paint be tampered with by anyone other than peronnel in authorized service shops.

c. In case of pump failure or damage, the pump must be replaced as an assembly, except for certain simple parts on the outside of the pump.

INJECTION PUMP

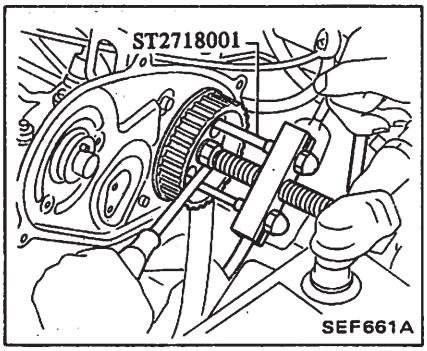
REMOVAL

1. Disconnect battery ground cable.
2. Drain coolant.
3. Disconnect wires and hoses.
- Accelerators wire
- Overflow hose (at spill tube side)
- Fuel cut solenoid connector
- Fuel return hose
- Potentiometer connector
- Engine speed sensor connector
- Cold start device water hoses

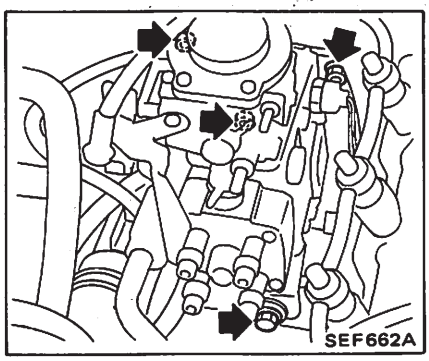
4. Remove injection timing belt.

Refer to section MA for replacement of timing belt.

5. Loosen nut and remove injection pump pulley.



6. Remove all injection tubes.
7. Remove injection pump fixing nuts and bracket bolt.



8. Take out injection pump.

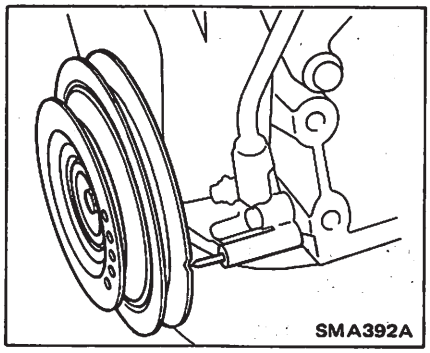
INSPECTION

For inspection of injection timing belt, tensioner pulley, tensioner spring and pulley, refer to instructions under "Inspection and Repair" in section EM.

INSTALLATION

Install injection pump assembly in the reverse order of removal, observing the following.

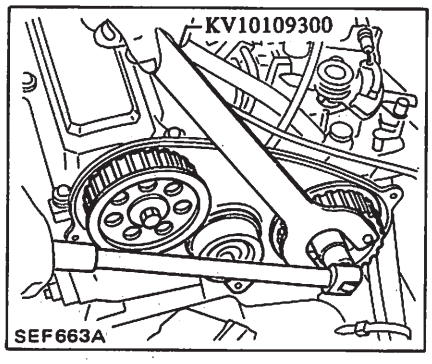
Make sure that No. 1 cylinder is at T.D.C. on its compression stroke.



1. Install injection pump.

Temporarily tighten fuel injection pump.

2. Install pump pulley.



Ⓣ : Pump pulley nut
59 - 69 N·m
(6.0 - 7.0 kg-m, 43 - 51 ft-lb)

3. Install drive belt.

Refer to section MA for replacement of timing belt.

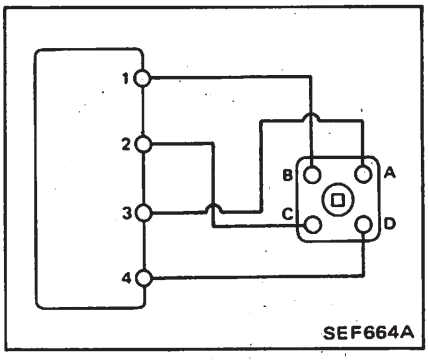
4. Adjust injection timing.

Refer to "Adjusting Injection Timing" in section MA.

5. Tighten injection pump securely.

Ⓣ : Injection pump nut
13 - 18 N·m
(1.3 - 1.8 kg-m, 9 - 13 ft-lb)
Injection pump to rear bracket
45 - 60 N·m
(4.6 - 6.1 kg-m, 33 - 44 ft-lb)

6. Connect injection tubes in the order of 4, 3, 2 and 1.



Ⓣ : Injection tube flare nut
22 - 25 N·m
(2.2 - 2.5 kg-m, 16 - 18 ft-lb)

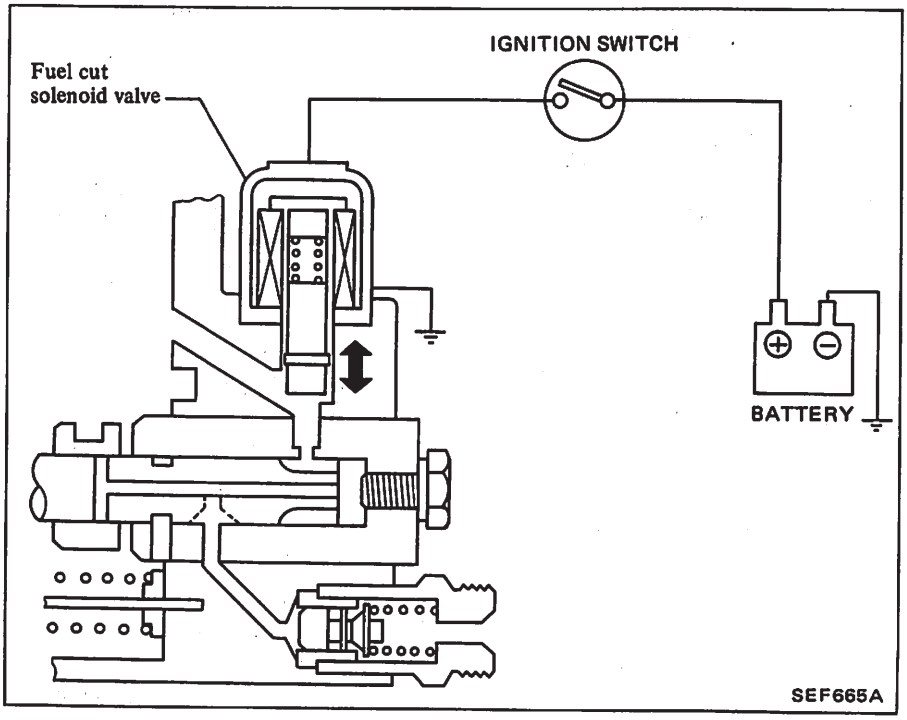
7. Install dust cover.

Ⓣ : 3 - 5 N·m
(0.3 - 0.5 kg-m, 2.2 - 3.6 ft-lb)

8. Bleed air.

Refer to "Bleeding Fuel System" in section MA.

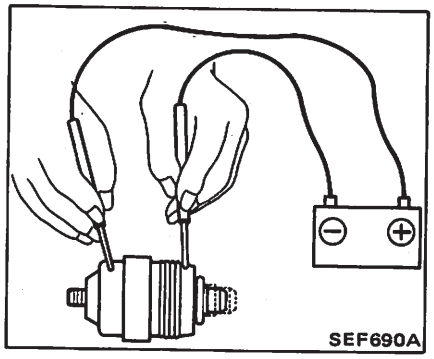
FUEL SUPPLY CONTROL SYSTEM



INSPECTION

Fuel cut solenoid valve

1. Turn ignition switch "ON" and listen for "clicking" sound. If not "clicking" sound is heard, check fuel cut solenoid valve.
2. Apply battery charge to fuel cut solenoid valve to test plunger. If it does not move, check for dust particles, etc.



Be careful of plunger being sprung out when battery charge is removed.

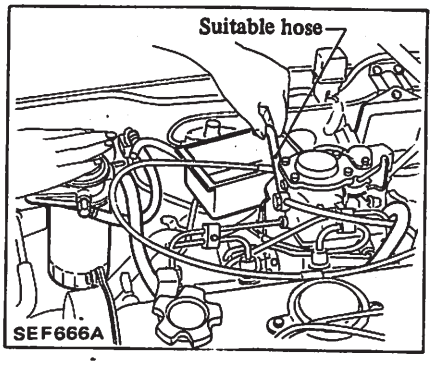
3. If fuel cut solenoid valve is in good order, check condition of power supply.

CHECKING PRIMING PUMP

1. Disconnect fuel return hose and install suitable hose on it.

Place a container or jug beneath hose end.

2. Prime priming pump to make sure that fuel overflows at hose end. If not, replace priming pump.

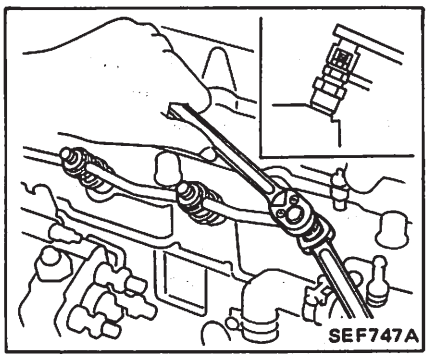


INJECTION NOZZLE ASSEMBLY

REMOVAL AND INSTALLATION

1. Remove injection tubes on nozzle side and loosen injection tubes on pump side.
2. Remove spill tube assembly.

To prevent spill tube from breaking, remove it by gripping nozzle holder.

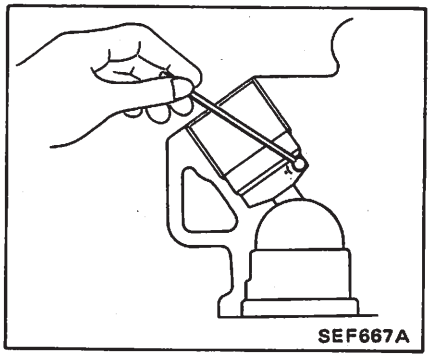


Ⓣ : **Spill tube nut**
39 - 49 N·m
(4 - 5 kg-m,
29 - 36 ft-lb)

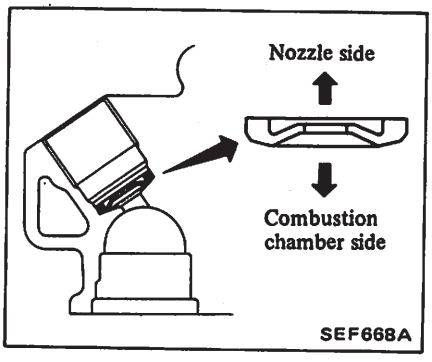
3. Remove injection nozzle and gasket.
4. Install injection nozzle in the reverse order of removal.

Ⓣ : **Injection nozzle to engine**
59 - 69 N·m
(6 - 7 kg-m,
43 - 51 ft-lb)
Injection tube flare nut
22 - 25 N·m
(2.2 - 2.5 kg-m,
16 - 18 ft-lb)

a. Always clean nozzle holes.

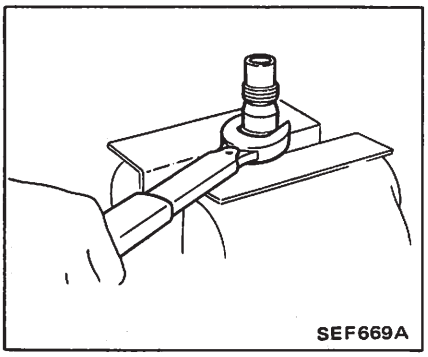


b. Always replace nozzle gasket and install in the direction shown.

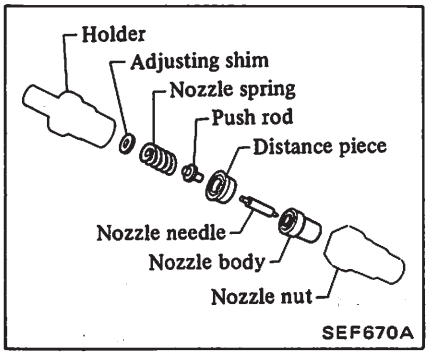


DISASSEMBLY

1. Loosen nozzle nut while preventing nozzle top from turning.



2. Arrange all of disassembled parts in the order shown below.



INSPECTION

Thoroughly clean all disassembled parts with fresh kerosene or solvent..

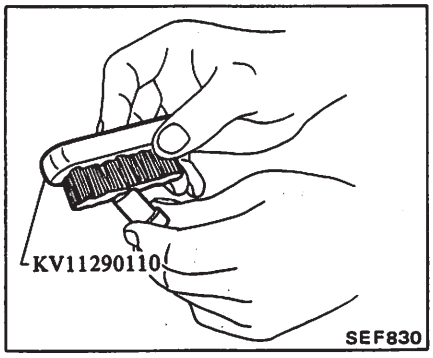
- If nozzle needle is damaged or fused, replace nozzle assembly with a new one.
- If end of nozzle needle is seized or excessively discolored, replace nozzle assembly.
- Check nozzle body and distance piece for proper contact. If excessively worn or damaged, replace nozzle assembly or distance pieces.
- Check distance piece and nozzle holder for proper contact. If excessively worn or damaged, replace distance piece or nozzle holder.
- Check nozzle spring for excessive wear or damage. If excessively worn or damaged, replace it with a new spring.

CLEANING

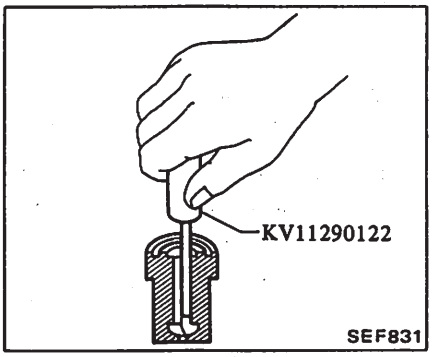
a. Do not touch the nozzle mating surface with your fingers.

b. To wash the nozzles, use a wooden stick and brass brush with clean diesel fuel.

1. Remove any carbon from exterior of nozzle body (except wrapping angle portion) by using Tool.

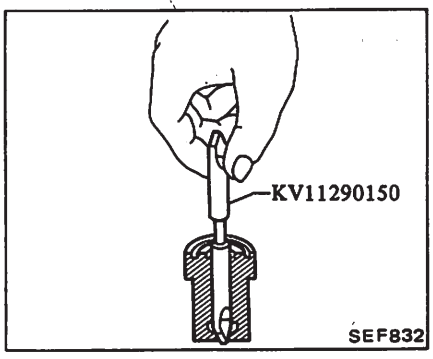


2. Remove oil sump of nozzle body using Tool.



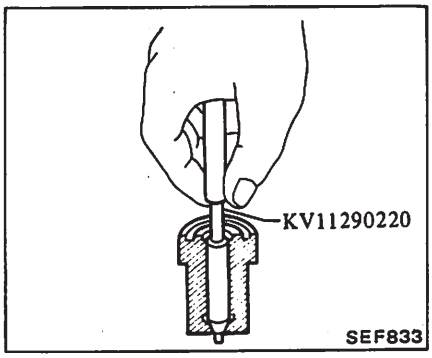
3. Clean nozzle seat by using Tool.

This job should be performed with extra precautions, since efficiency of nozzle depends greatly on a good nozzle seat.

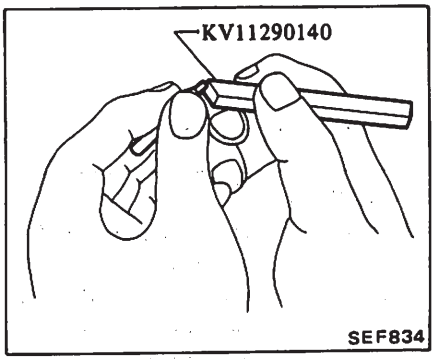


4. Clean spray hole of nozzle body by using Tool.

To prevent spray hole from canting, always clean it by starting with inner side and working towards outside.



5. Decarbonate nozzle needle tip by using Tool.



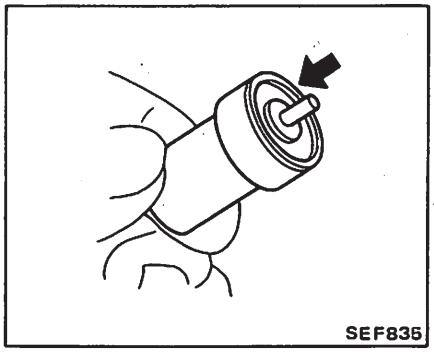
6. Check sinking test.

(1) Pull needle about halfway out from body and then release it.

(2) Needle should sink into body very smoothly form just its own weight.

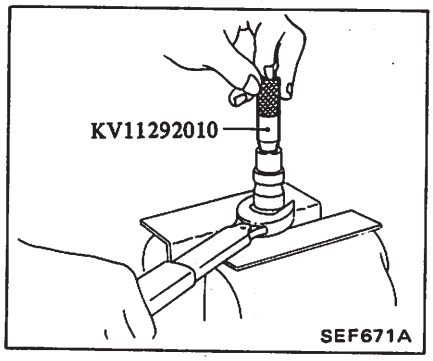
(3) Repeat this test and rotate needle slightly each time.

If needle fails to sink smoothly from any position, replace both needle and body as a unit.



ASSEMBLY

Assemble in the reverse order of disassembly, observing the following.



If nozzle body is not installed properly. Tool cannot be removed and it may be damaged.

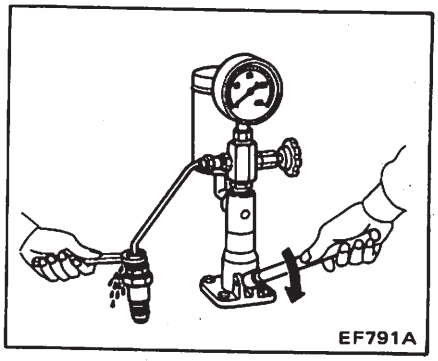
Ⓣ : Holder to nozzle nut
78 - 98 N·m
(8.0 - 10.0 kg-m,
58 - 72 ft-lb)

TEST AND ADJUSTMENT

WARNING:
When using nozzle tester, be careful not to allow diesel fuel sprayed from nozzle to come into contact with your hand or body, and make sure that your eyes are properly protected with goggles.

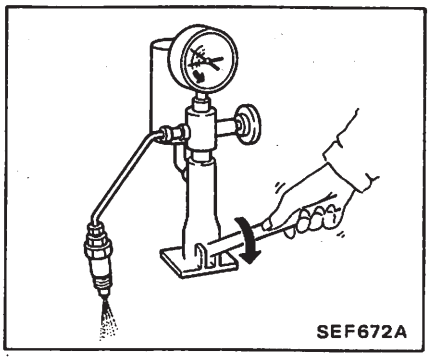
Injection pressure test

1. Install nozzle to injection nozzle tester and bleed air from flare nut.



2. Pump the tester handle slowly (one time per second) and watch the pressure gauge.

3. Read the pressure gauge when the injection pressure just starts dropping.

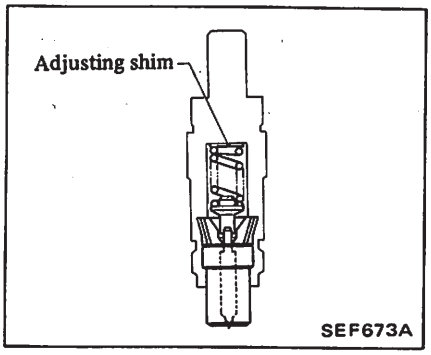


Initial injection pressure:
Used
12,259 - 13,239 kPa
(125 - 135 kg/cm², 1,778 - 1,920 psi)
New
13,239 - 14,024 kPa
(135 - 143 kg/cm², 1,920 - 2,033 psi)

New nozzle is required to always check initial injection pressure.

4. To adjust injection pressure, change adjusting shims.

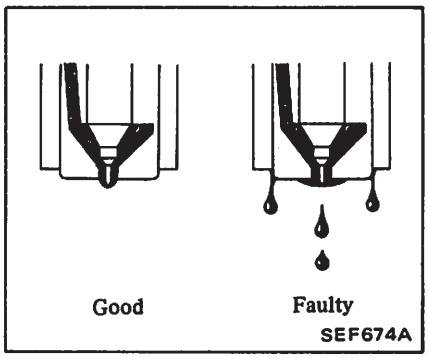
a. Increasing the thickness of adjusting shims increases initial injection pressure. Decreasing thickness reduces initial pressure.
b. A shim thickness of 0.04 mm (0.0016 in) corresponds approximately to a difference of 471 kPa (4.8 kg/cm², 68 psi) in initial injection pressure.



Leakage test

1. Maintain the pressure at about 981 to 1,961 kPa (10 to 20 kg/cm², 142 to 284 psi) below initial injection pressure.

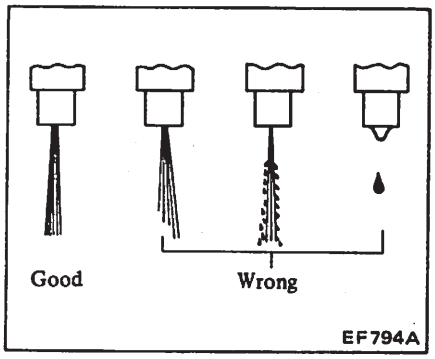
2. Check that there is no dripping from the nozzle tip or around the body.



3. If there is leakage, clean, overhaul or replace it.

Spray pattern test

1. Pump the tester handle 4 to 6 times per second or more.
2. Check the spray pattern.



3. If the spray pattern is not correct, clean or replace it.

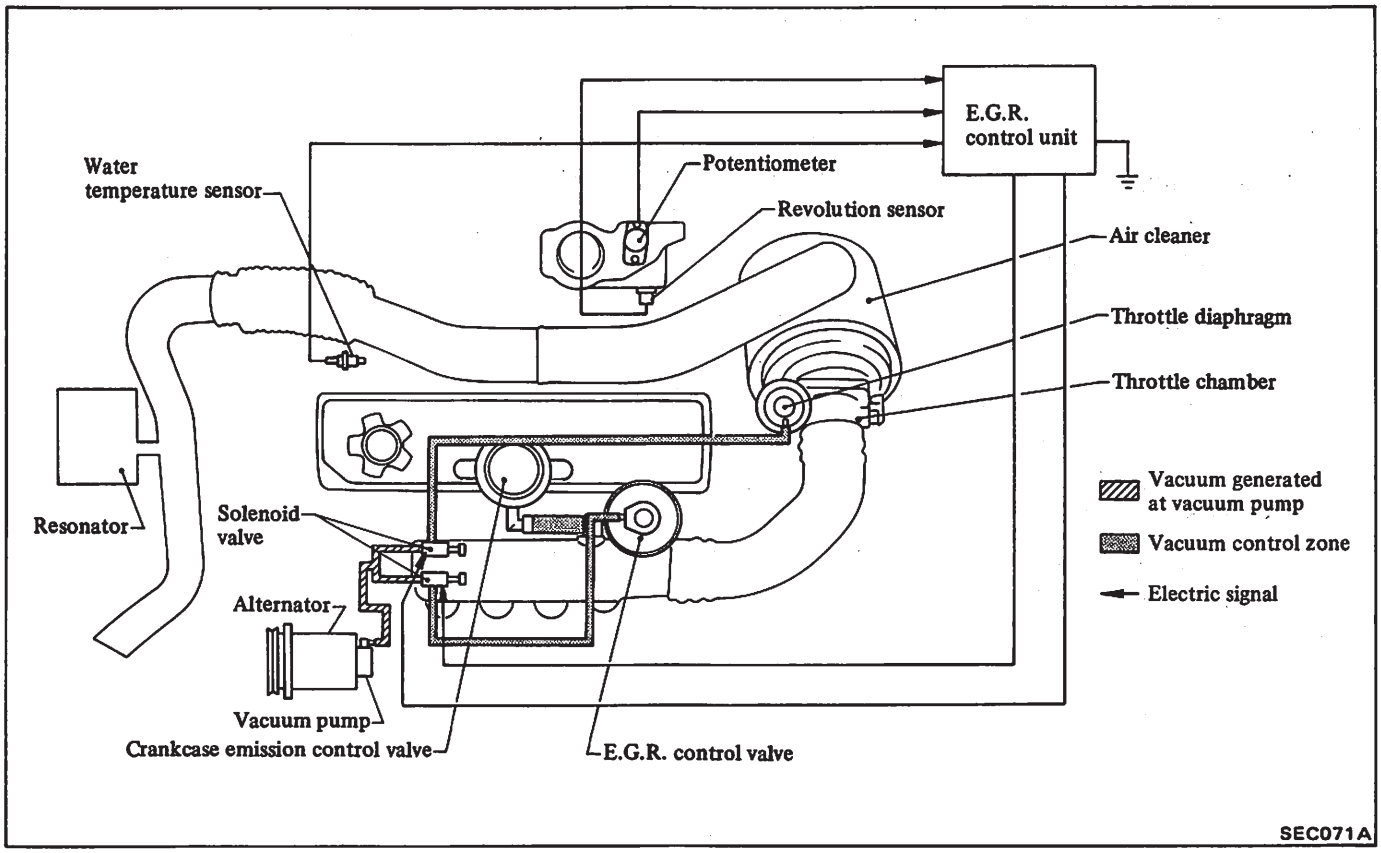
EMISSION CONTROL DEVICE

Item	Engine model	CD17	
	Destination	California	Non-California
Crankcase emission control system	Crankcase emission control valve	X	X
E.G.R. control system	E.G.R. control valve	X	X
	E.G.R. control unit	X	X
	Throttle chamber (1-barrel)	X	X
	Potentiometer	X	X
	Revolution sensor	X	X
	Solenoid valve	X	X
	Water temperature sensor	X	X
Altitude emission control system	Altitude compensator	X	X
	E.G.R. control unit		
	For low altitude	X	X
	For high altitude	–	X

GENERAL DESCRIPTION

There are three types of control systems which are as follows:
1. Closed type crankcase emission control system
2. Exhaust emission control system
3. High altitude emission control system

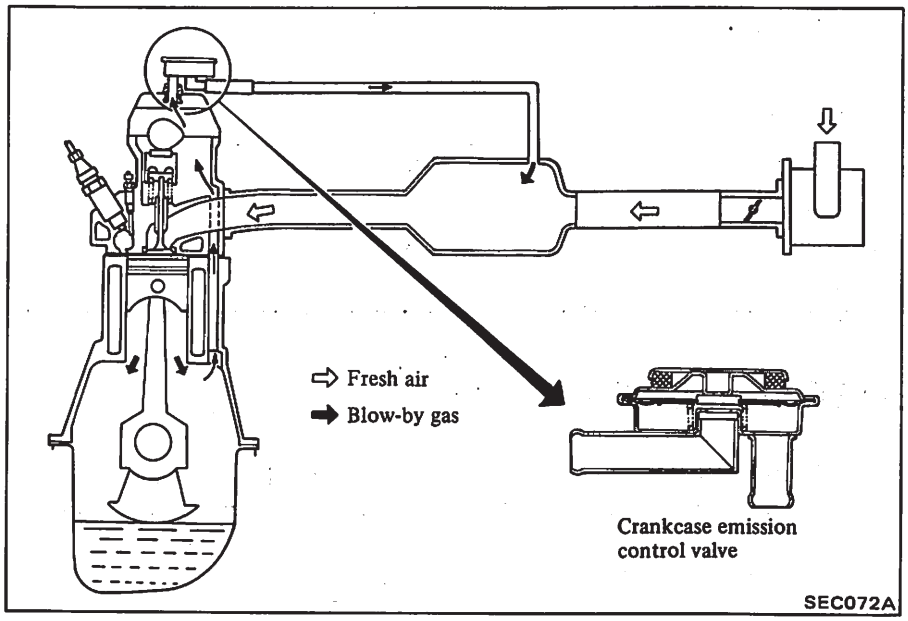
Periodic inspection and necessary servicing of these systems should be performed to keep harmful emissions to a minimum.



CRANKCASE EMISSION CONTROL SYSTEM

DESCRIPTION

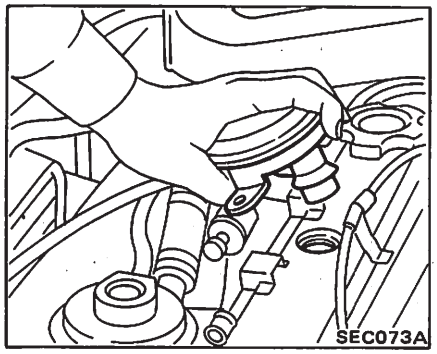
The closed-type crankcase emission control system prevents blow-by gas from entering the atmosphere and keeps the internal crankcase pressure constant.
During the valve operation, the blow-by gas is fed into the intake manifold by the crankcase emission control valve.
This is activated by the internal rocker cover pressure. When the intake air flow is restricted by the throttle chamber, the internal rocker cover pressure decreases. At this point, the crankcase emission control valve keeps the internal rocker cover pressure constant so that air or dust is not sucked in around the crankshaft oil seal.



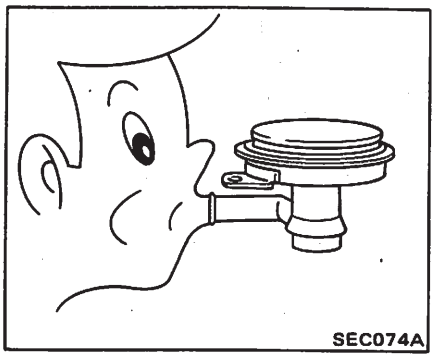
INSPECTION

CRANKCASE EMISSION CONTROL VALVE

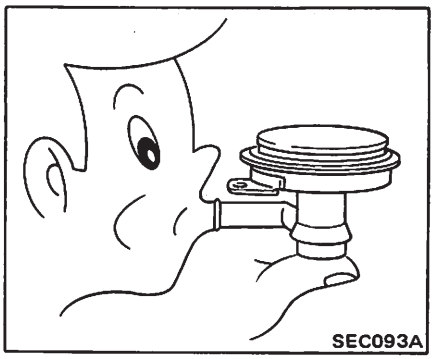
1. Remove crankcase emission control valve.



2. Suck on pipe to make sure that air flows on the intake manifold side.



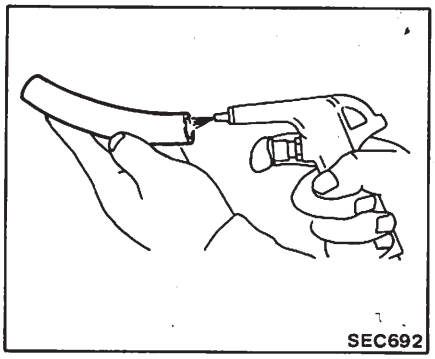
3. Close rocker cover side and suck on pipe to make sure that diaphragm makes clicking sounds.



VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air.

If any hose cannot be free of obstructions, replace.



EXHAUST EMISSION CONTROL SYSTEM

DESCRIPTION

The exhaust emission control system is made up of the following:

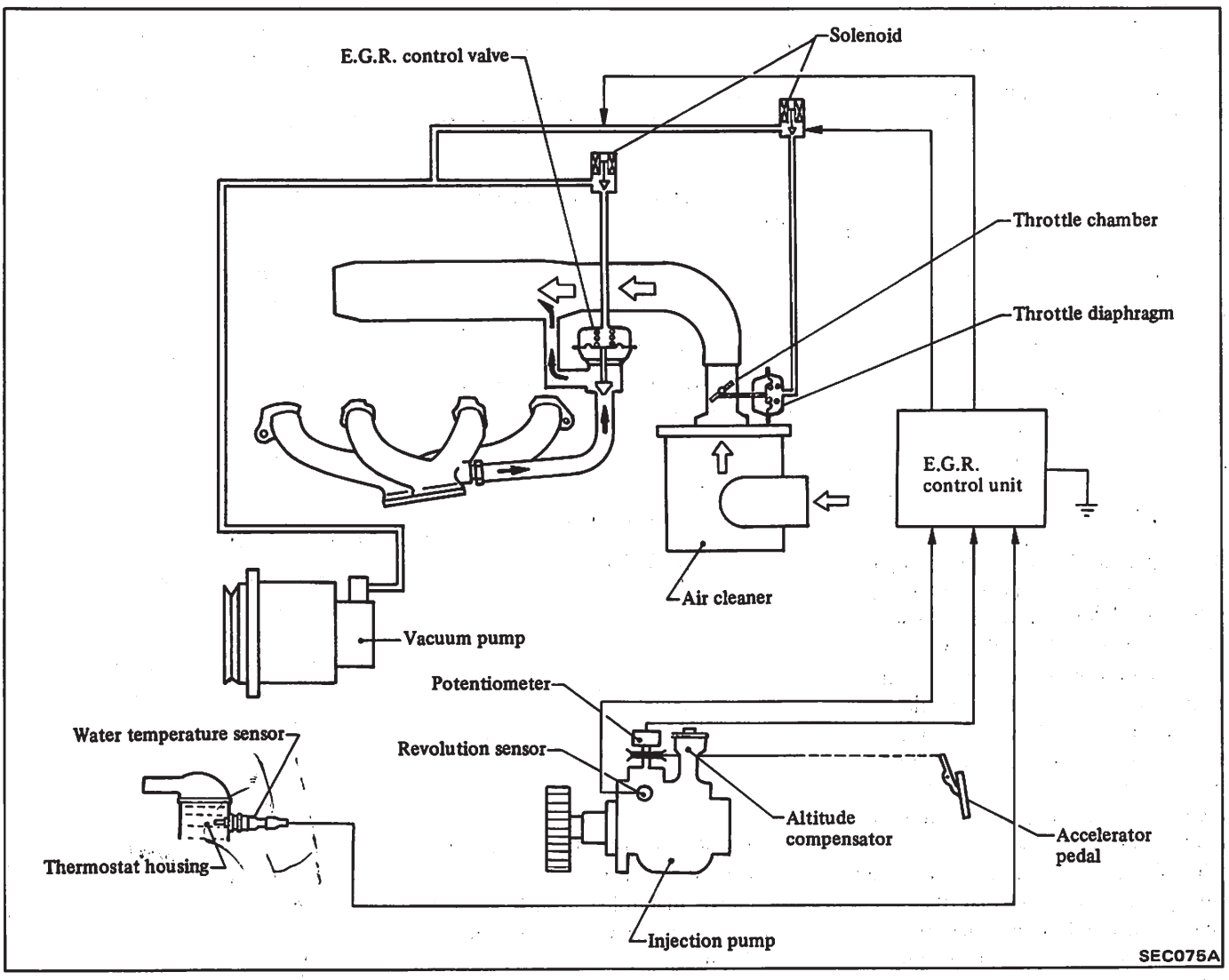
Emission control system	
E.G.R. system	E.G.R. control valve E.G.R. control unit Throttle chamber Potentiometer Revolution sensor Solenoid valve Water temperature sensor
Altitude emission control system	Altitude compensator E.G.R. control unit

EXHAUST GAS RECIRCULATION (E.G.R.) CONTROL SYSTEM

DESCRIPTION

The E.G.R. system is designed to control the formation of NOx emission by recirculating the exhaust gas into the intake manifold passage through the control valve.

The E.G.R. system is composed of the E.G.R. control valve, the throttle chamber, the solenoid valves and the E.G.R. control unit.



OPERATION

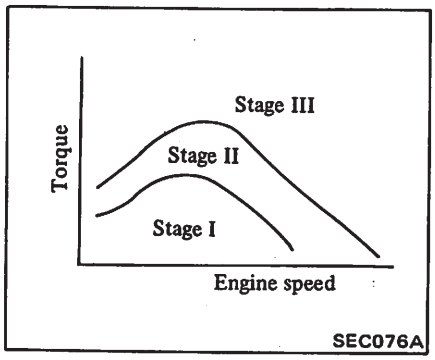
The E.G.R. flow rate is controlled in three stages in accordance with the engine speed, load and altitude. The first stage, "HIGH E.G.R."/"LOW E.G.R.", is obtained in the combination of closed throttle valve/open throttle valve and open E.G.R. valve. The second stage, "LOW E.G.R.", is attained by opening the throttle valve. The third stage is Zero-E.G.R. condition and is attained by closing E.G.R. valve.

Low altitude

Stage	Throttle valve	E.G.R. control valve	E.G.R. rate
I	Closed	Open	High
II	Full Open	Open	Low
III	Full Open	Closed	Zero

High altitude

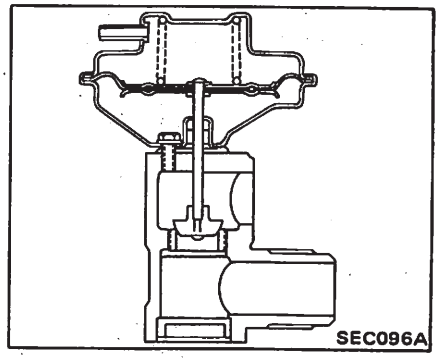
Stage	Throttle valve	E.G.R. control valve	E.G.R. rate
I	Full Open	Open	Low
II	Full Open	Open	Low
III	Full Open	Closed	Zero



The engine load signal is picked up by the potentiometer installed on the injection pump control lever. The engine speed signal is by the electromagnetic revolution sensor on the injection pump itself. The throttle diaphragm and E.G.R. valve is actuated by the vacuum generated at the vacuum pump. Solenoids are utilized to convert the electric signal from the control unit to the vacuum signal.
The E.G.R. system is deactivated under the conditions that the water temperature is low in order to assure good car drive-ability and to prevent unsafe car driving. The temperature sensor is of a thermistor type and it senses temperatures at engine water inlet.

E.G.R. control valve

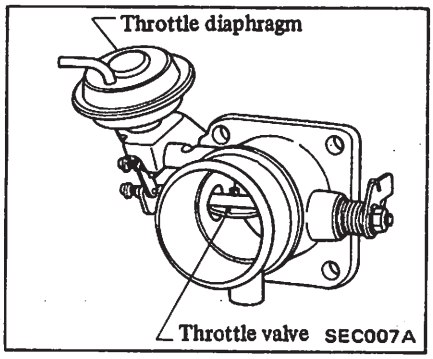
The E.G.R. control valve is operated only of full open and close.



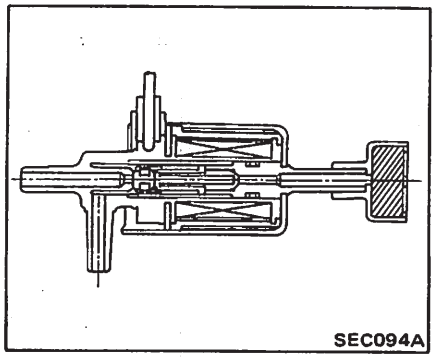
The E.G.R. control valve controls the quantity of exhaust gas to be led to the intake manifold through vertical movement of the valve connected to the diaphragm, to which vacuum is applied in response to the operation of the solenoid valve.

Throttle chamber

The throttle chamber consists of the throttle valve and throttle diaphragm. The throttle valve is controlled by the throttle diaphragm, to which vacuum is applied in response to the operation of the solenoid valve.

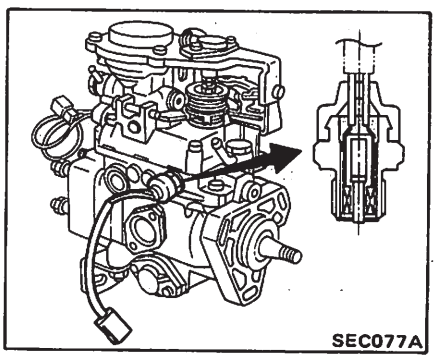


Two solenoid valves are used in the E.G.R. system to lead/cut off the vacuum to the actuators – one is for throttle diaphragm and the other is for E.G.R. control valve.



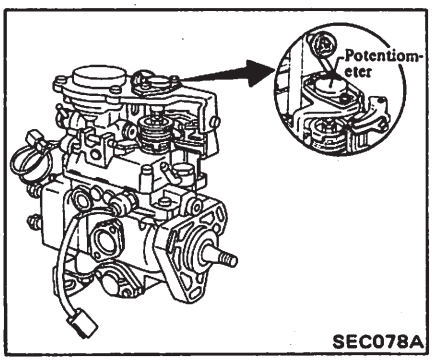
Revolution sensor

The revolution sensor picks up the engine speed to control E.G.R. by counting the number of teeth on the flyweight which is driven by the injection pump drive shaft.



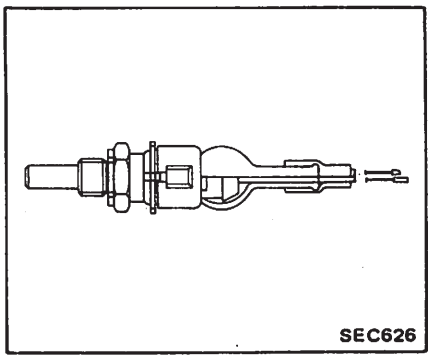
Potentiometer

The potentiometer converts the opening angle of the control lever of the fuel injection pump into a voltage signal. The securing screw of the potentiometer is sealed at the factory and should not be readjusted.



Water temperature sensor

The water temperature sensor is of a thermistor type. It senses coolant temperature at water inlet of the engine to control E.G.R. and glow system.

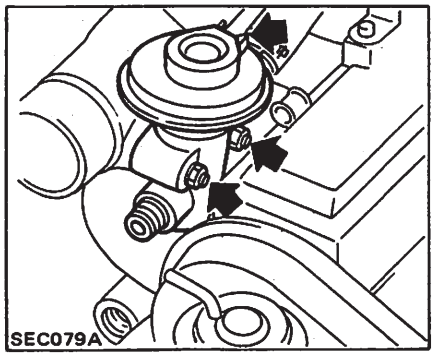


REMOVAL AND INSTALLATION

WARNING:
Be sure to install vacuum hoses in their original positions after removal. Otherwise, it may cause seriously unsafe driving conditions.

E.G.R. control valve

1. Remove nut which secures E.G.R. tube to E.G.R. control valve, and disconnect tube from valve.
2. Disconnect vacuum hose and remove nuts mounting E.G.R. control valve to intake manifold. The E.G.R. control valve can then be taken out.

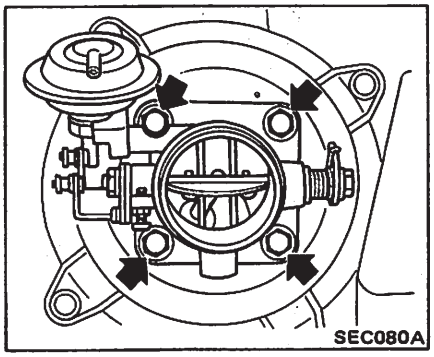


3. Installation is in the reverse sequence of removal.

CAUTION:
Always replace E.G.R. gasket.

Throttle chamber

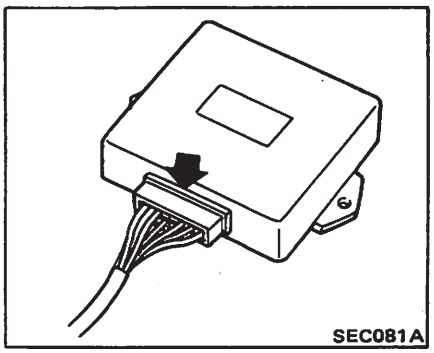
1. Loosen clamp and disconnect air duct hose.
2. Remove throttle chamber.



3. Installation is in the reverse sequence of removal.

E.G.R. control unit

1. Remove left side seat.
2. Disconnect harness connector and remove E.G.R. control unit.



3. Installation is in the reverse sequence of removal.

INSPECTION

Entire system

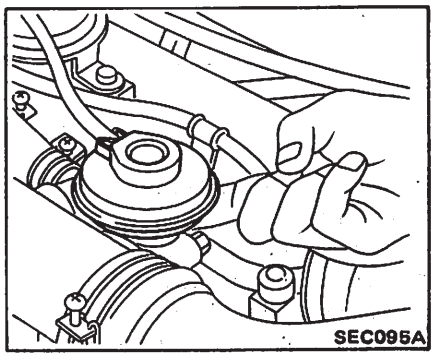
1. Make a thorough visual check of E.G.R. control system. If necessary, wipe away oil to facilitate inspection. If any hoses are cracked or broken, replace them.

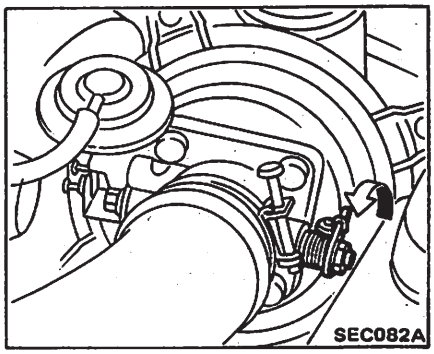
Make sure that all harness connectors are connected securely.

2. With engine stopped, inspect E.G.R. control valve and throttle chamber for any indication of binding or sticking by moving diaphragm/rod upwards with handy vacuum pump.
3. With engine running, inspect E.G.R. control valve and throttle valve for normal operation as described below.

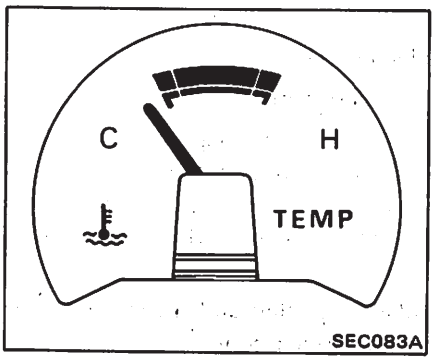
Place your finger on diaphragm of E.G.R. control valve to ensure that the valve functions.

WARNING:
Take care not to let your finger get caught between diaphragm and body of E.G.R. control valve.

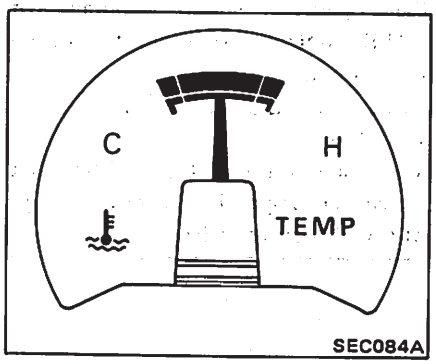




(1) When temperature of the engine coolant is low:
[Below 40°C (104°F)]

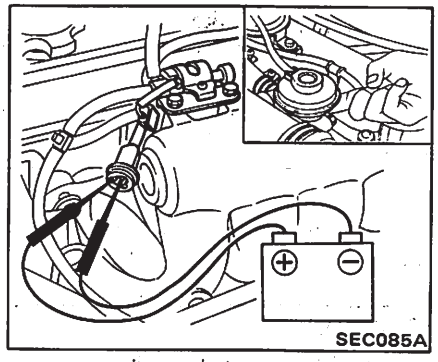


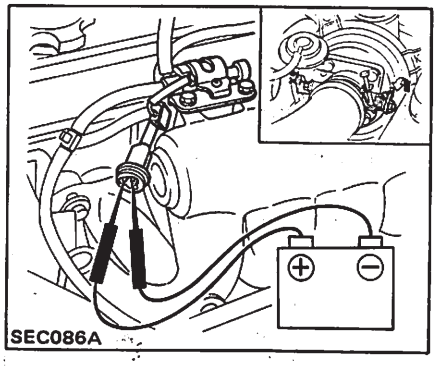
Make sure that E.G.R. control valve does not operate and throttle valve is open when engine is at idling and then revved up.
(2) When temperature of the engine coolant is high:
[Above 40° (104°F)]



- Make sure that E.G.R. control valve operates and throttle valve is closed when engine is at idling.
- Increase engine speed gradually and make sure that throttle valve opens and E.G.R. control valve closes in this order.

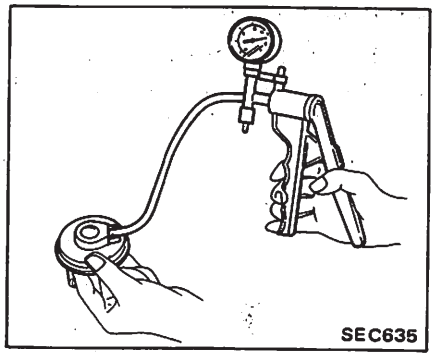
4. If E.G.R. control valve operates and/or throttle valve is closed in step (1) of 3, check water temperature sensor.
And, if the sensor appears normal, replace E.G.R. control unit.
5. If E.G.R. control valve and/or throttle valve do not operate properly in step (2) of 3, check them as follows:
(1) Run engine at idle.
(2) Disconnect harness connector at solenoid valve. Apply battery voltage at harness connector of solenoid valve and check that E.G.R. control valve operate/throttle valve closes normally.





E.G.R. control valve

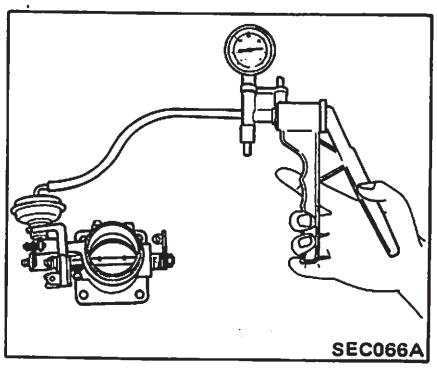
1. Dismount E.G.R. control valve from engine.
2. Apply vacuum to E.G.R. control valve, referring to the following figure. If the valve moves to full position, it is normal.
E.G.R. control valve will remain open, for more than 30 seconds after vacuum has cut off.



3. Visually check E.G.R. control valve for damage, wrinkle or deformation.

Throttle chamber

1. Remove throttle chamber from air cleaner.
2. Apply vacuum to throttle diaphragm, referring to the following figure. If the throttle valve moves to fully-closed position, it is normal.
Throttle valve will remain closed for more than 30 seconds after vacuum has cut off.

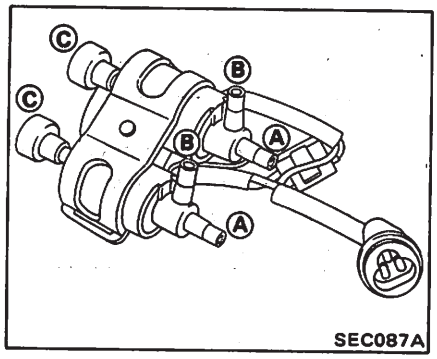


3. Visually check throttle chamber for damage or deformation.

Solenoid valve

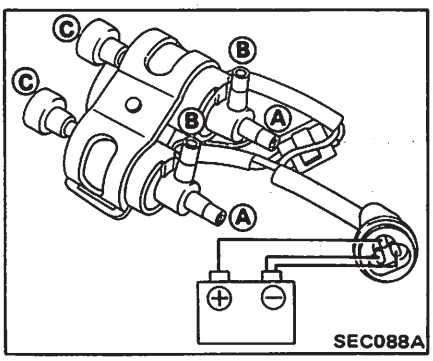
1. Remove solenoid valve from engine.
2. Check solenoid valve.

- Check the continuity of air passage by sucking or blowing on it.



Terminals	Continuity
Ⓐ – Ⓑ	No
Ⓑ – Ⓒ	Yes
Ⓒ – Ⓐ	No

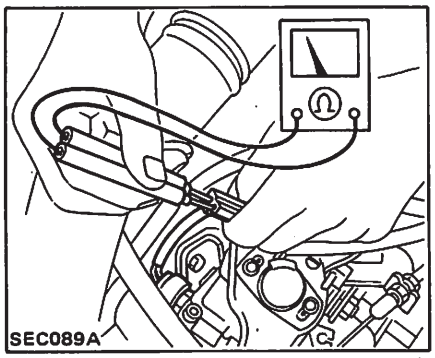
- Apply battery voltage at harness connector, and check the continuity of air passage by sucking or blowing it.



Terminals	Continuity
Ⓐ – Ⓑ	Yes
Ⓑ – Ⓒ	No
Ⓒ – Ⓐ	No

Revolution sensor

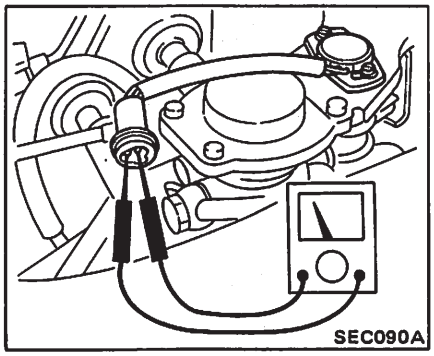
1. Disconnect revolution sensor harness connector and connect ohmmeter as shown below.



2. Make sure that a resistance exists.

Potentiomenter

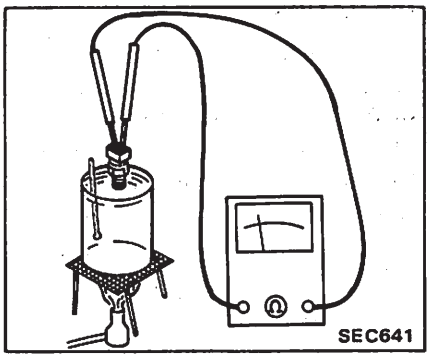
1. Disconnect potentiometer harness connector and connect ohmmeter as shown below.



2. Make sure that the resistance changes when the opening angle of the control lever of the fuel injection pump is changed.

Water temperature sensor

1. Remove water temperature sensor from water outlet.
2. Dip water temperature sensor in a pan of water and connect ohmmeter as shown below.



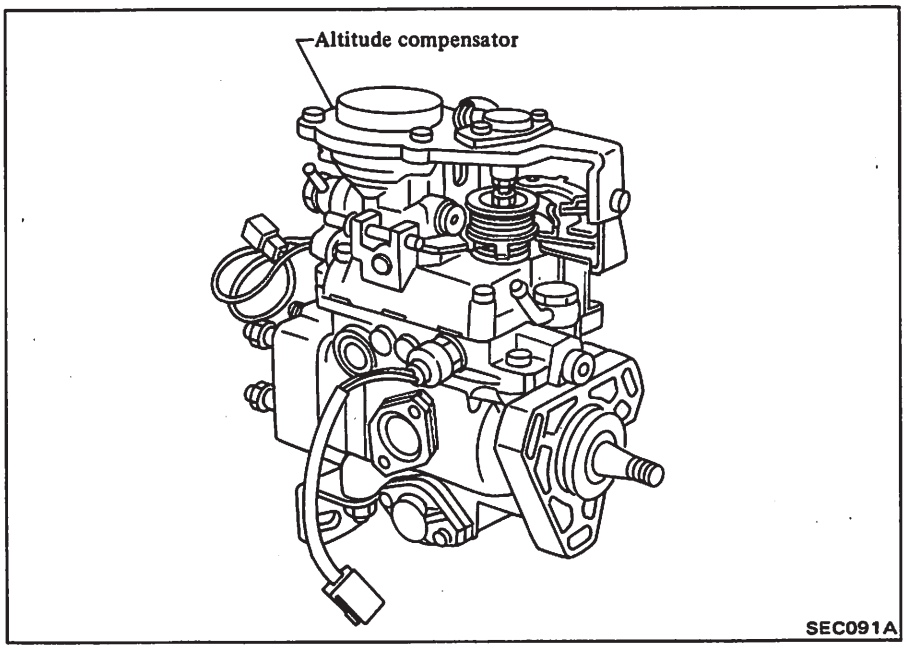
3. Check the resistance at the specified water temperature.

Water temperature °C (°F)	Resistance kΩ
19 - 21 (66 - 70)	2.1 - 2.9

HIGH ALTITUDE EMISSION CONTROL SYSTEM

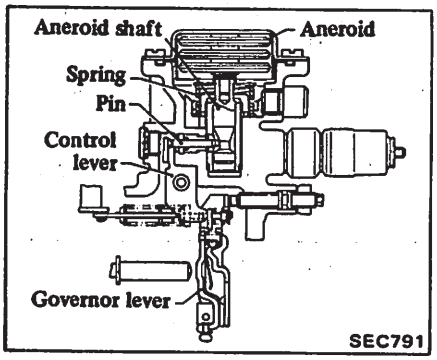
DESCRIPTION

The high altitude emission control system is designed to control the formation of HC and CO emissions and improve driveability in high altitude areas. In order to ensure decreased exhaust emission, the injection timing and E.G.R. control unit have to be changed/replaced.

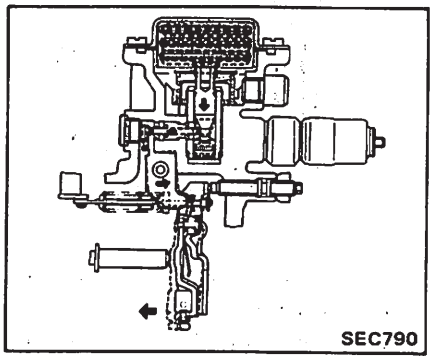


OPERATION

The altitude compensator is located on top of injection pump, and altitude shaft is in contact with the pin.
The pin is connected to the control lever which is in contact with the governor lever.



The higher the altitude, the lower the atmospheric pressure. Due to this fact, the pressure inside the aneroid is higher than the atmospheric pressure at high altitudes, which causes the aneroid to expand like a balloon.
When this happens, the aneroid shaft is lower and the aneroid shaft and pin's contact surface is changed to decrease fuel. Thus, the system controls the amount of fuel supplied in proportion to the altitude.



MODIFICATIONS

Changing injection timing

Refer to Adjusting Injection Timing in section MA for changing injection timing.

Replacing E.G.R. control unit

Replace E.G.R. control unit for high altitudes or low altitudes.
Refer to Removal and Installation.

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

E15 & E16

GENERAL SPECIFICATIONS

CARBURETOR

Item			Destination	California		Non-California		M.P.G.	Canada	
			Engine	E16		E16		E15	E16	
			Transaxle	M/T	A/T	M/T	A/T	M/T	M/T	A/T
Carburetor model				DFC328-1	DFC328-2	DCZ328-1	DCZ328-2	DFP306-2	DCZ328-11	DCZ328-12
Air outlet diameter	mm (in)	P		28 (1.10)		28 (1.10)		26 (1.02)	28 (1.10)	
		S		32 (1.26)		32 (1.26)		30 (1.18)	32 (1.26)	
Venturi diameter	mm (in)	P		24 (0.94)		24 (0.94)		23 (0.91)	24 (0.94)	
		S		27 (1.06)		27 (1.06)		27 (1.06)	27 (1.06)	
Main jet		P		#91		#106		#98	#100	
		S		#130		#133		#140	#135	
Main air bleed		P		#105		#100		#60	#110	
		S		#60		#60		#80	#60	
Slow jet		P		#43		#43		#43	#43	
		S		#70		#55		#55	#65	
Slow air bleed		P		#170		#185		#160	#180	
		S		#80		#100		#80	#100	
Power jet				–		#35		–	#35	
Solenoid controlled slow air bleed				#220		–		#220	–	
Solenoid controlled fuel orifice				#70				#70		

P: Primary S: Secondary

INSPECTION AND ADJUSTMENT

A.T.C. AIR CLEANER		
Air control valve partially opens	°C (°F)	38 - 53 (100 - 127)
Air control valve fully opens	°C (°F)	Above 53 (127)
IDLE COMPENSATOR		
Idle compensator partially opens		
Bimetal No. 1	°C (°F)	60 - 70 (140 - 158)
Bimetal No. 2	°C (°F)	70 - 80 (158 - 176)
Idle compensator fully opens		
Bimetal No. 1	°C (°F)	Above 70 (158)
Bimetal No. 2	°C (°F)	Above 80 (176)
FUEL PUMP		
Fuel pressure	kPa (kg/cm², psi)	19.6 - 26.5 (0.20 - 0.27, 2.8 - 3.8)
Fuel pump capacity	mℓ (US fl oz, Imp fl oz)/min. at rpm	More than 1,300 (44.0, 45.8)/600

Item \ Destination / Engine / Transaxle	California		Non-California		M.P.G.	Canada	
	E16		E16		E15	E16	
	M/T	A/T	M/T	A/T	M/T	M/T	A/T
Carburetor model	DFC328-1	DFC328-2	DCZ328-1	DCZ328-2	DFP306-2	DCZ328-11	DCZ328-12
Choke type	Automatic		Automatic			Automatic	
Fuel level adjustment mm (in) Gap between float and carburetor body "H"	12 (0.47)						
Gap between valve stem and float seat "h"	1.3 - 1.7 (0.051 - 0.067)						
Fast idle adjustment Clearance "A" (*4 at 2nd cam step) mm (in)	0.86±0.07 (0.0339± 0.0028)	1.15±0.07 (0.0453± 0.0028)	0.86±0.07 (0.0339± 0.0028)	1.15±0.07 (0.0453± 0.0028)	0.8±0.07 (0.0315± 0.0028)	0.72±0.07 (0.0283± 0.0028)	1.00±0.07 (0.0394± 0.0028)
Fast idle speed rpm	2,600 - 3,400	2,900 - 3,700	2,400 - 3,200	2,700 - 3,500	2,400 - 3,200	1,900 - 2,700	2,400 - 3,200
Vacuum break adjustment [at temperature °C (°F)] Clearance "R" mm (in)	1.53±0.09 (0.0602±0.0035) [13.6 (56)] 2.60±0.09 (0.1024±0.0035) [24.0 (75)]		1.88±0.09 (0.0740±0.0035) [11 (52)] 2.60±0.09 (0.1024±0.0035) [18 (64)]		1.7±0.09 (0.0669± 0.0035) [9 (48)] 3.2±0.09 (0.1260± 0.0035) [25 (77)	1.38±0.09 (0.0543±0.0035) [11.5 (53)] 2.03±0.09 (0.0799±0.0035) [18.5 (65)]	
Choke unloader adjustment Clearance "C" mm (in)	2.96 (0.1165)		2.96 (0.1165)		2.36 (0.0929)	2.96 (0.1165)	
Interlock opening adjustment Clearance "G" mm (in)	6.28±0.60 (0.2472±0.0236)						
Dash pot adjustment Gap between throttle valve and carburetor body mm (in)		0.56 (0.0220)		0.56 (0.0220)		0.72 (0.0283)	0.56 (0.0220)
Throttle opener adjustment Gap between throttle valve and carburetor body mm (in)	Refer to first idle adjustment for air conditioner. (Page HA-27)				–	0.52±0.07 (0.0205±0.0028)	

CD17

INSPECTION AND ADJUSTMENT

INJECTION PUMP

Plunger lift

Unit: mm (in)

For low altitude	
M/T	0.94±0.03 (0.0370±0.0012)
A/T	0.88±0.03 (0.0346±0.0012)
For high altitude	
M/T	1.00±0.03 (0.0394±0.0012)
A/T	0.94±0.03 (0.0370±0.0012)

INJECTION NOZZLE ASSEMBLY

Initial injection pressure		
New	kPa (kg/cm², psi)	13,239 - 14,024 (135 - 143, 1,920 - 2,033)
Used	kPa (kg/cm², psi)	12,259 - 13,239 (125 - 135, 1,778 - 1,920)

Adjusting shim

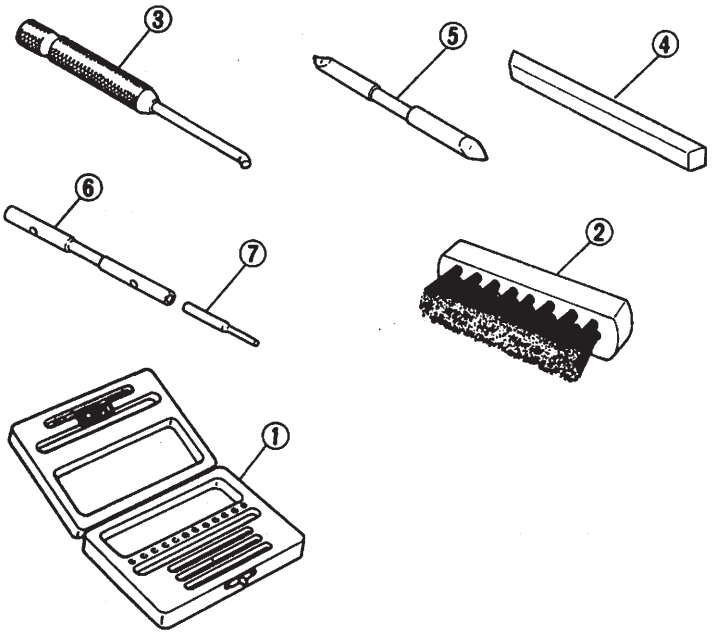
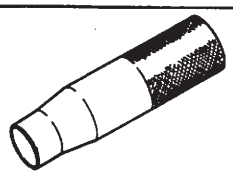
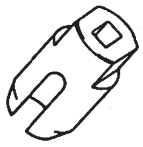
Thickness mm (in)	Parts No.
0.50 (0.0197)	16613-V0700
0.54 (0.0213)	16613-V0702
0.58 (0.0228)	16613-V0704
0.62 (0.0244)	16613-V0706
0.66 (0.0260)	16613-V0708
0.70 (0.0276)	16613-V0710
0.74 (0.0291)	16613-V0712
0.78 (0.0307)	16613-V0714
0.82 (0.0323)	16613-V0716
0.86 (0.0339)	16613-V0718
0.90 (0.0354)	16613-V0720
0.94 (0.0370)	16613-V0722
0.98 (0.0386)	16613-V0724
1.00 (0.0394)	16613-V0760

TIGHTENING TORQUE

	N·m	kg-m	ft-lb
Fuel cut solenoid valve	20 - 25	2.0 - 2.5	14 - 18
Injection pump drive pulley nut	59 - 69	6.0 - 7.0	43 - 51
Injection nozzle to engine	59 - 69	6.0 - 7.0	43 - 51
Injection to tube flare nut	22 - 25	2.2 - 2.5	16 - 18
Injection pump to bracket (nut)	13 - 18	1.3 - 1.8	9 - 13
Injection pump to bracket (bolt)	45 - 60	4.6 - 6.6	33 - 44
Spill tube nut	39 - 49	4.0 - 5.0	29 - 36
Plug bolt	14 - 20	1.4 - 2.0	10 - 14
Nozzle holder to nozzle nut	78 - 98	8.0 - 10.0	58 - 72
Tensioner nut	16 - 21	1.6 - 2.1	12 - 15
Dust cover bolt	3 - 5	0.3 - 0.5	2.2 - 3.6
Crankcase emission control valve mounting bolt	3.7 - 5.0	0.38 - 0.51	2.7 - 3.7
E.G.R. control valve mounting nut	18 - 23	1.8 - 2.3	13 - 17
E.G.R. tube securing nut	34 - 44	3.5 - 4.5	25 - 33
Throttle body mounting bolt	9.1 - 11.8	0.93 - 1.2	6.7 - 8.7

SPECIAL SERVICE TOOLS

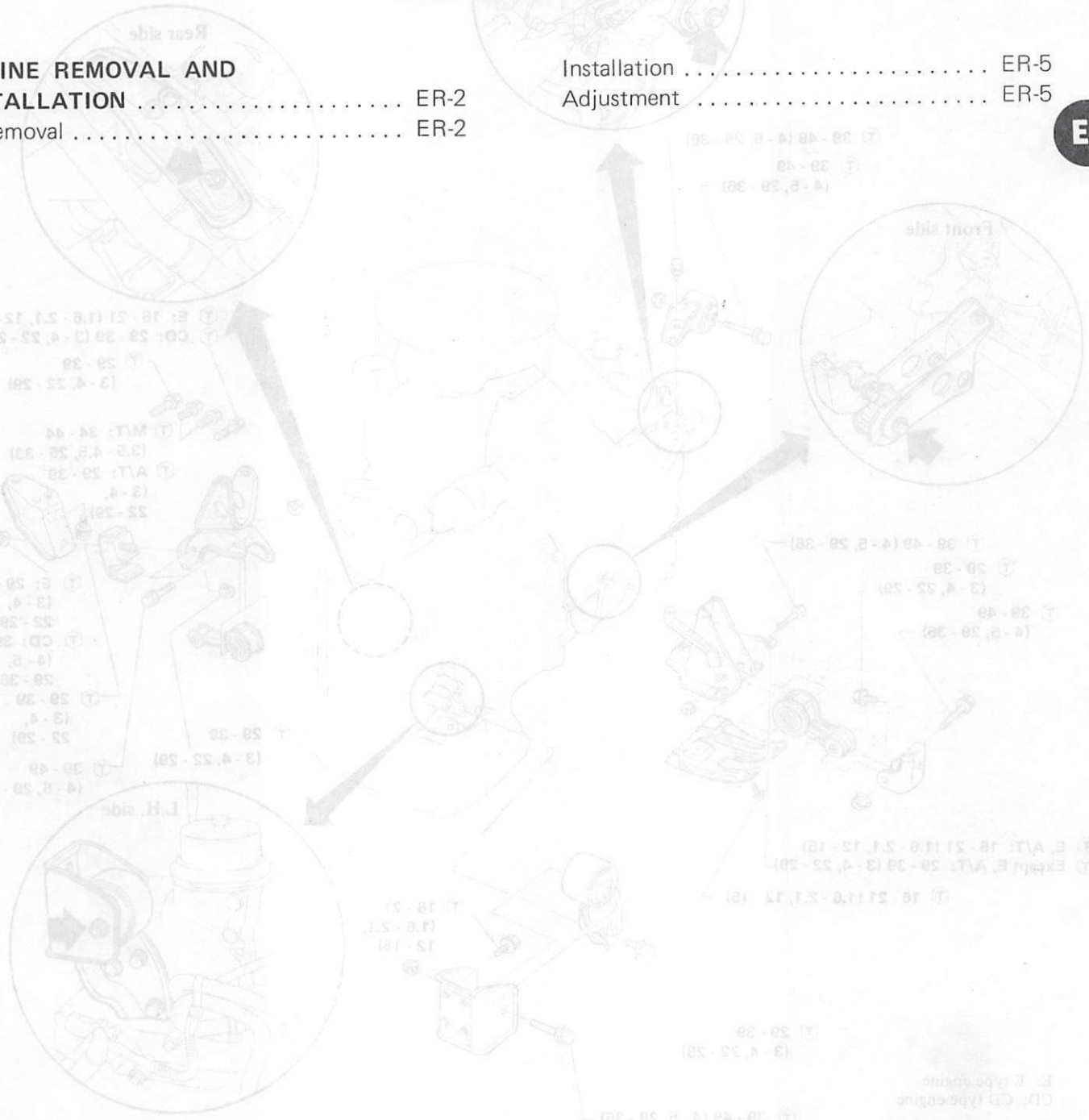
CD17

Tool number (Kent-Moore No.)	Tool name
KV11289004 (J28826) ① KV11290012 (–) ② KV11290110 (–) ③ KV11290122 (–) ④ KV11290140 (–) ⑤ KV11290150 (–) ⑥ KV11290210 (–) ⑦ KV11290220 (–)	Nozzle cleaning kit Box Brush Nozzle oil sump scraper Nozzle needle tip cleaner Nozzle seat scraper Nozzle holder Nozzle hole cleaning needle 
KV11292010 (–)	Nozzle centering device 
KV11100300 (–)	Nozzle holder socket 

ENGINE REMOVAL & INSTALLATION

SECTION ER

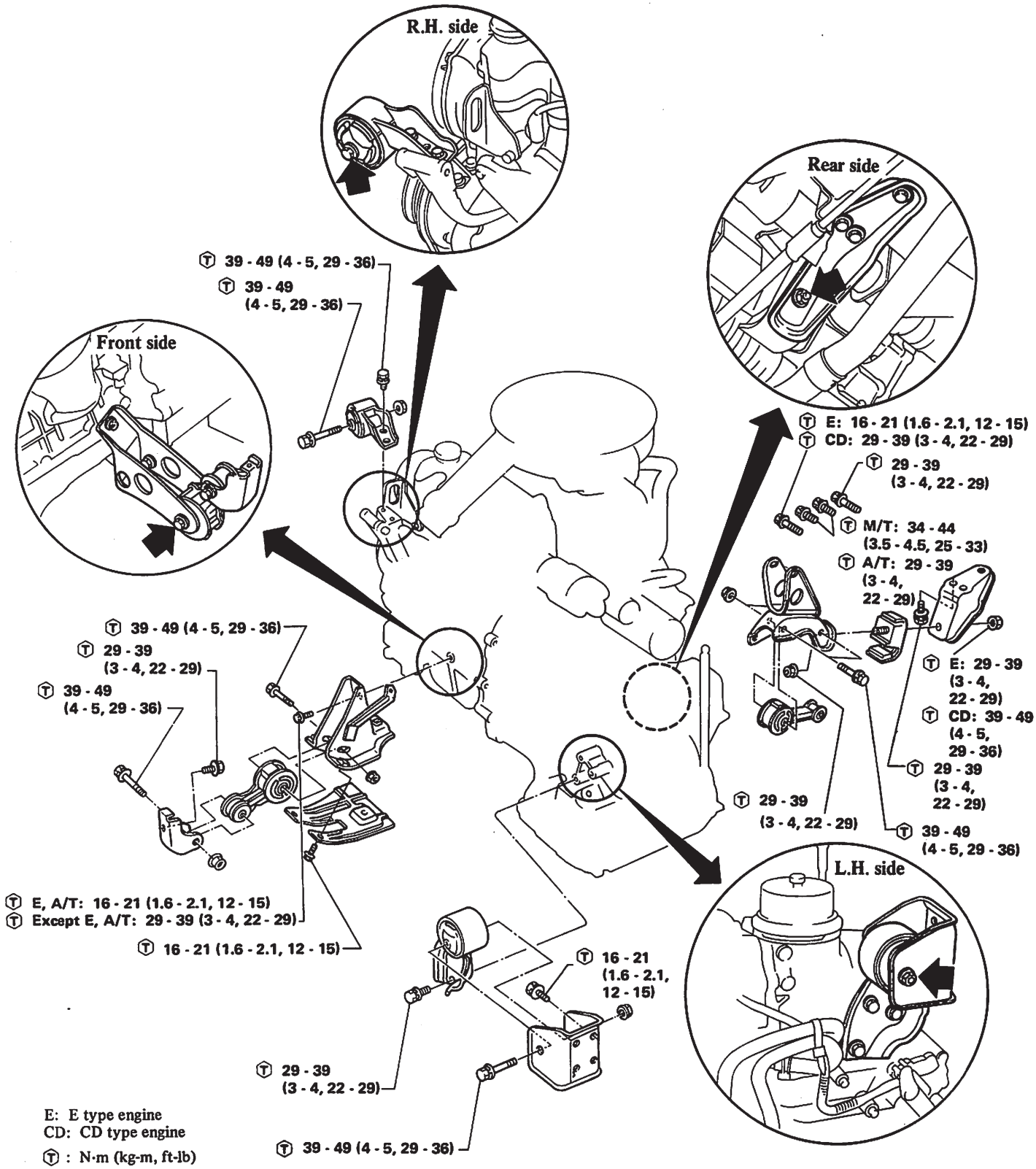
CONTENTS



ENGINE REMOVAL AND INSTALLATION

REMOVAL

ENGINE BRACKET FITTING

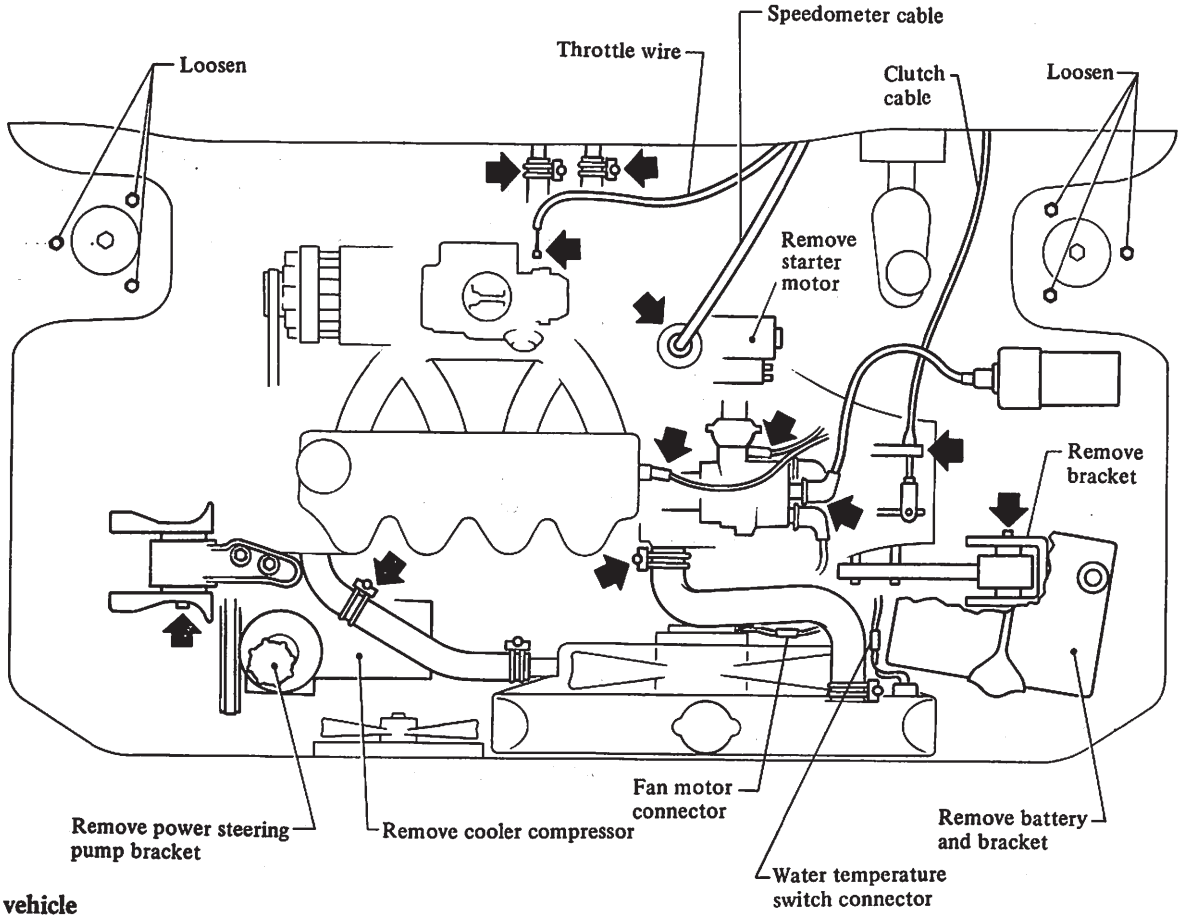


E: E type engine
CD: CD type engine
T : N·m (kg-m, ft-lb)

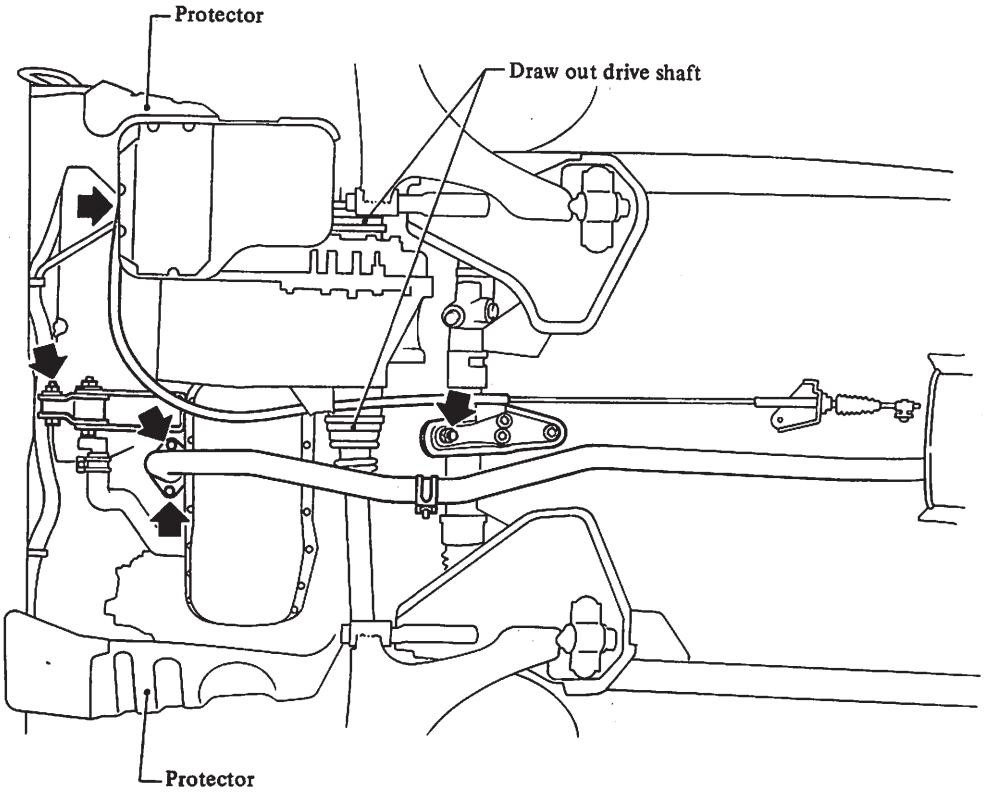
SER270

SEPARATING POSITIONS

Engine room



Under vehicle



SER266

When it is necessary to remove engine from vehicle, engine and transaxle should be dismounted as a unit.

WARNING:

- **a. Situate vehicle on as flat and solid a surface as possible.**
- **b. Place chocks at front and rear of rear wheels.**
- **c. Before removing front axle from transaxle unit, place safety stands under designated front supporting points. Refer to GI section for lifting points and towing.**
- **d. Be sure to hoist engine and transaxle in a safe manner.**
- **e. You should not remove engine until exhaust system has completely cooled off.**
  Otherwise, you may burn yourself and/or fire may break out in the fuel line.

1. Remove hood (See BF section).

Make hood hinge locations on hood to facilitate proper reinstallation.

CAUTION:

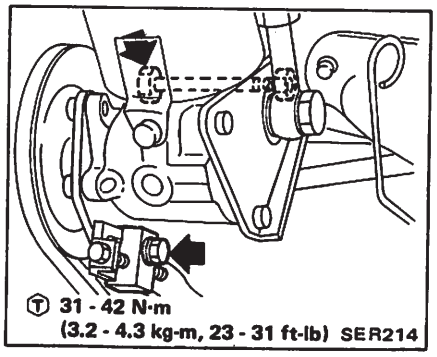
Have an assistant help you so as to prevent damage to the body.

2. Remove battery and battery support bracket.
3. Remove air cleaner.

Plug air horn of carburetor with clean rag to prevent entry of foreign matter.

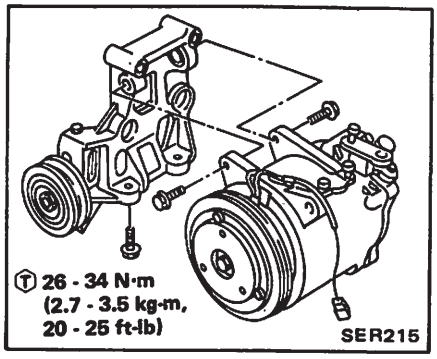
4. Drain engine coolant and remove radiator with radiator cooling fan (See LC section).
5. Remove power steering oil pump (See ST section).

Oil must not be drained from power steering oil circuit.



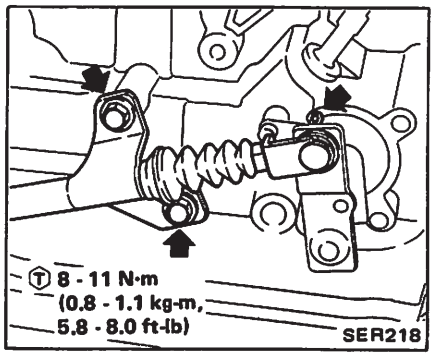
6. Remove cooler compressor and idler pulley (See HA section).

Gas must not be discharged from air conditioner circuit.



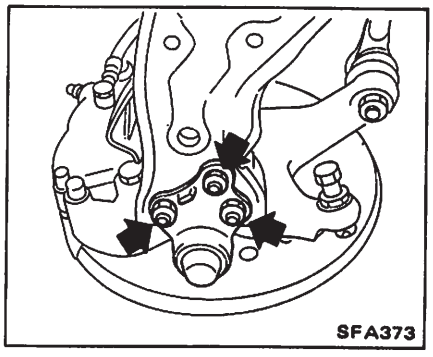
While removing engine, support compressor with a suitable rope to prevent it from dropping.

7. Disconnect exhaust front tube from exhaust manifold (See FE section).
8. Disconnect manual transaxle control rod link support rod from transaxle (See MT section).
9. Disconnect automatic transaxle control wire from transaxle (See AT section).



10. Remove lower ball joint.

Do not reuse nut once it has been removed.

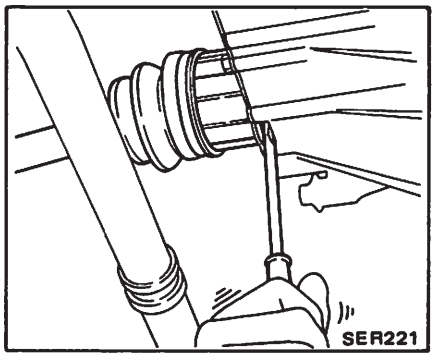


11. Drain gear oil.
12. Disconnect right and left drive shafts from transaxle (See FA section).

When drawing out drive shaft, it is necessary to loosen strut head bolts.

CAUTION:

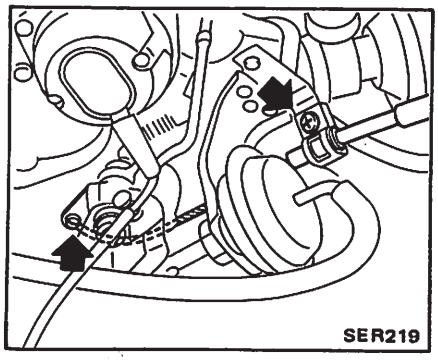
In removing drive shaft, be careful not to damage grease seal of transaxle side.



13. Disconnect clutch wire.
14. Remove speedometer cable with pinion from transaxle.

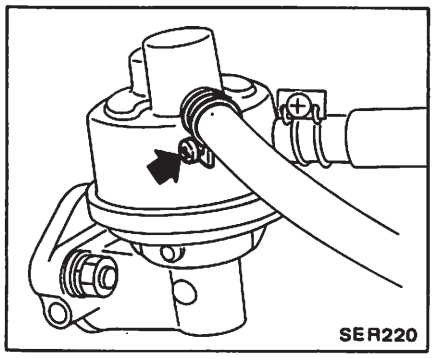
Plug hole from which pinion gear was removed with clean rag to prevent entry of foreign matter.

15. Disconnect accelerator wire.

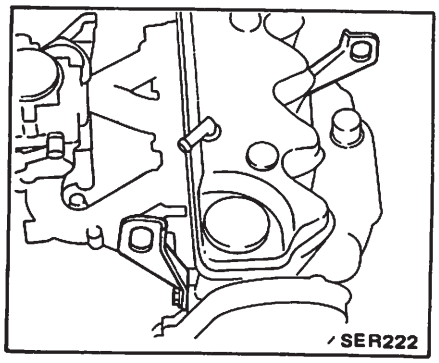


16. Remove vacuum and air hoses between engine and vehicle body.
17. Disconnect completely cables, wires and harness connectors.

18. Disconnect fuel hoses from fuel pump.



19. Attach front engine slinger 10005 01M00 and rear engine slinger 10006 23M00 to cylinder head.

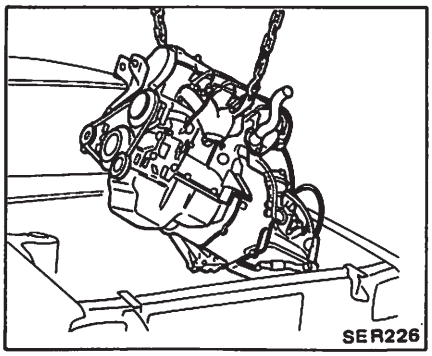


20. Connect suitable wires or chains between overhead hoist and engine slingers.

WARNING:
For safety during subsequent steps, the tension of wires or chains should be slackened against the engine.

21. Disconnect engine mounting insulators (See Engine Bracket Fitting).
22. Lift engine up and away from vehicle.

CAUTION:
In lifting engine, be careful not to hit it against adjacent parts, especially against brake tube and brake master cylinder.



23. Separate engine and transaxle.

INSTALLATION

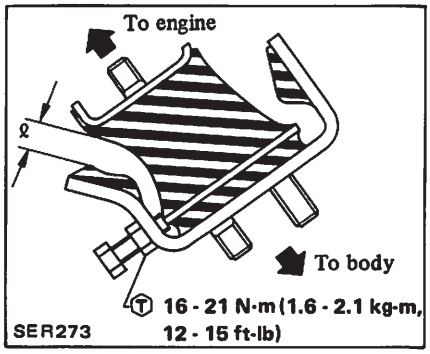
1. Install engine with transaxle on vehicle.

a. When installing, ensure that brake tubes, brake master cylinder, etc. do not interfere with engine and transaxle.
b. Ensure that cooler compressor and power steering oil pump are in their proper positions when lowering engine.

2. Tighten engine mounting insulator bolts, and ensure rubber insulator clearance.
3. For subsequent steps, refer to instructions under heading "Removal".

ADJUSTMENT

Stopper clearance "ℓ"
(CD17 engine models only):
M/T 10 - 15 mm (0.39 - 0.59 in)
A/T 15 - 20 mm (0.59 - 0.79 in)

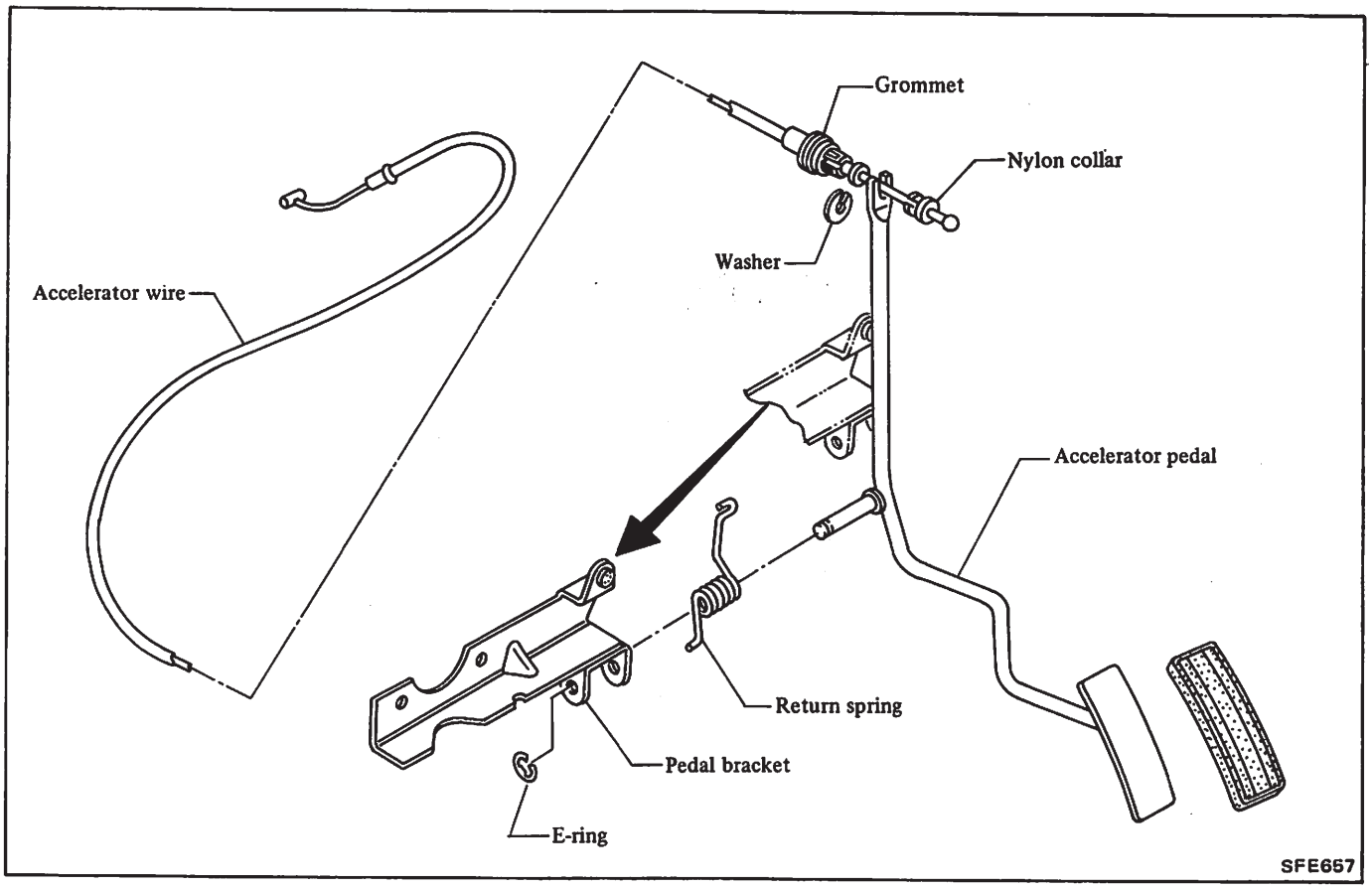


ENGINE CONTROL, FUEL & EXHAUST SYSTEMS

SECTION FE

CONTENTS

ENGINE CONTROL SYSTEM



ACCELERATOR SYSTEM

ACCELERATOR WIRE

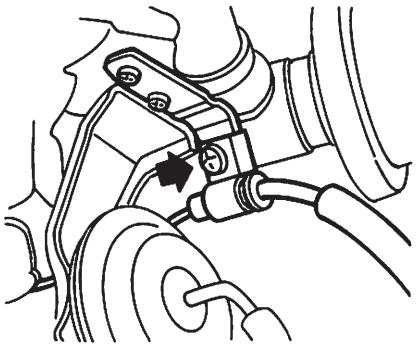
Adjustment

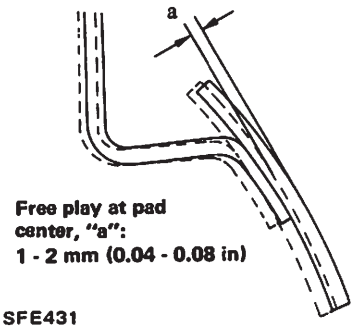
1. Disconnect battery ground cable.
2. Remove air cleaner.
3. Depress accelerator pedal fully.

Before adjusting, open auto-choke valve if it is not already open.

4. Adjust wire length so that the specified pedal free play exists.

Make sure that accelerator operates smoothly and throttle valve fully closes when accelerator is released.





SFE492

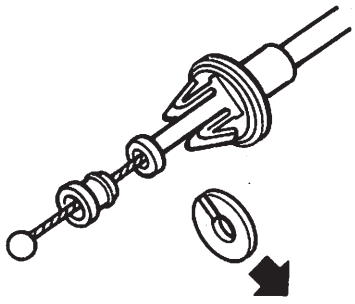
Removal and installation

- Remove accelerator wire in the order of 1 to 5.
- Install in the reverse order of removal.

1. Disconnect battery ground cable.
2. Disconnect wire at pedal arm.

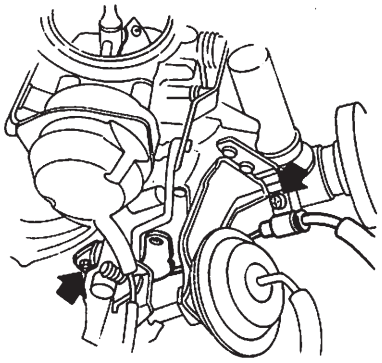
SFE397

3. Remove plastic washer.



SFE435

4. Disconnect accelerator wire.



5. Take wire out from engine compartment.

a. **Be careful not to damage or bend wire.**

b.

Apply multi-purpose grease.

SFE658

Inspection

Check accelerator wire, case and fastening locations for rust, damage or looseness.
If necessary, replace.

ACCELERATOR PEDAL

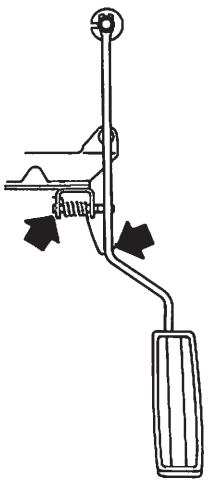
Removal and installation

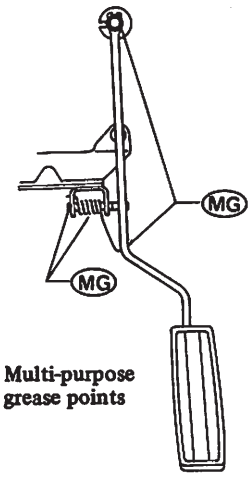
- Remove accelerator pedal in the order of 1 to 2.
- Install in the reverse order of removal.

1. Disconnect wire at pedal arm.

SFE397

2. Remove E-ring, disengage return spring, and then remove accelerator pedal.





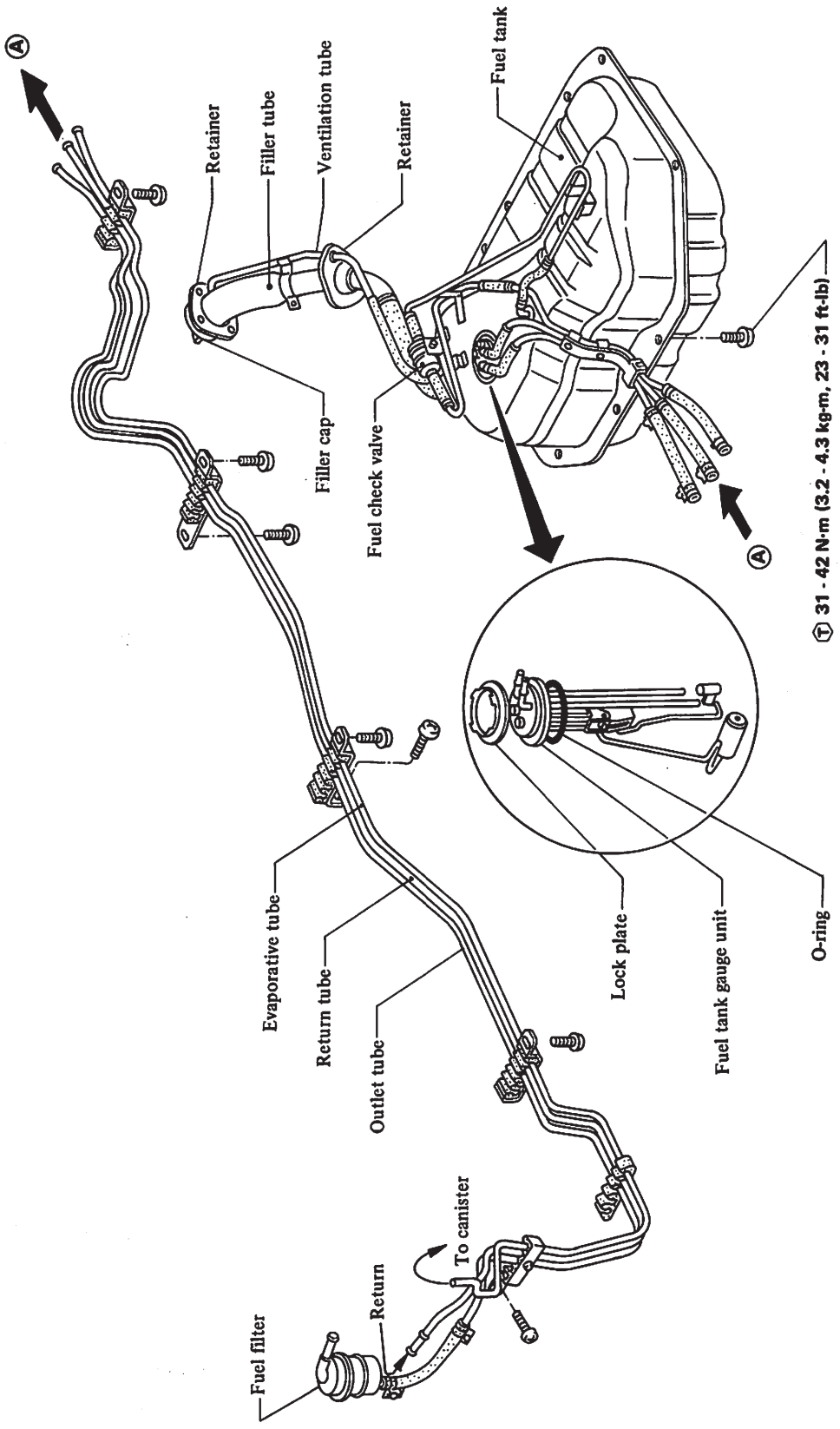
MG: Multi-purpose grease points

SFE659

Inspection

Check accelerator pedal return spring for rust, fatigue or damage.
Replace if necessary.

FUEL SYSTEM



SFE660

PRECAUTIONS

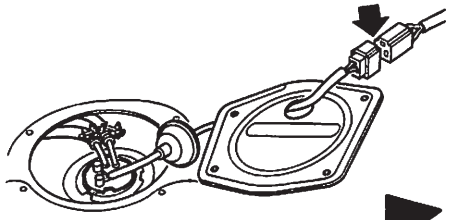
WARNING:
When replacing fuel line parts, be sure to observe the following:
a. Put a "CAUTION: INFLAMMABLE" sign in workshop.
b. Be sure to furnish workshop with an asphyxiator.
c. Be sure to disconnect battery ground cable before starting work.
d. Put drained fuel in an explosionproof container and put on lid securely.

FUEL TANK

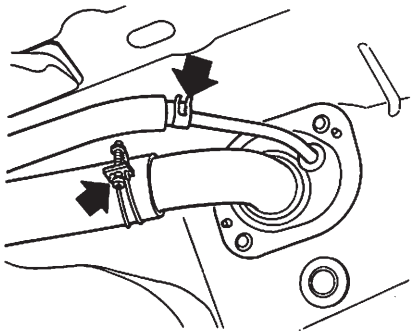
REMOVAL AND INSTALLATION

- Remove fuel tank in the order of 1 to 5.
- Install in the reverse order of removal.

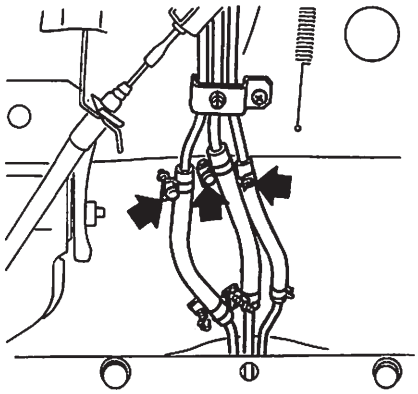
1. Drain fuel.
2. Remove inspection cover and disconnect fuel tank gauge unit harness connector.



3. Disconnect fuel filler and ventilation tubes.

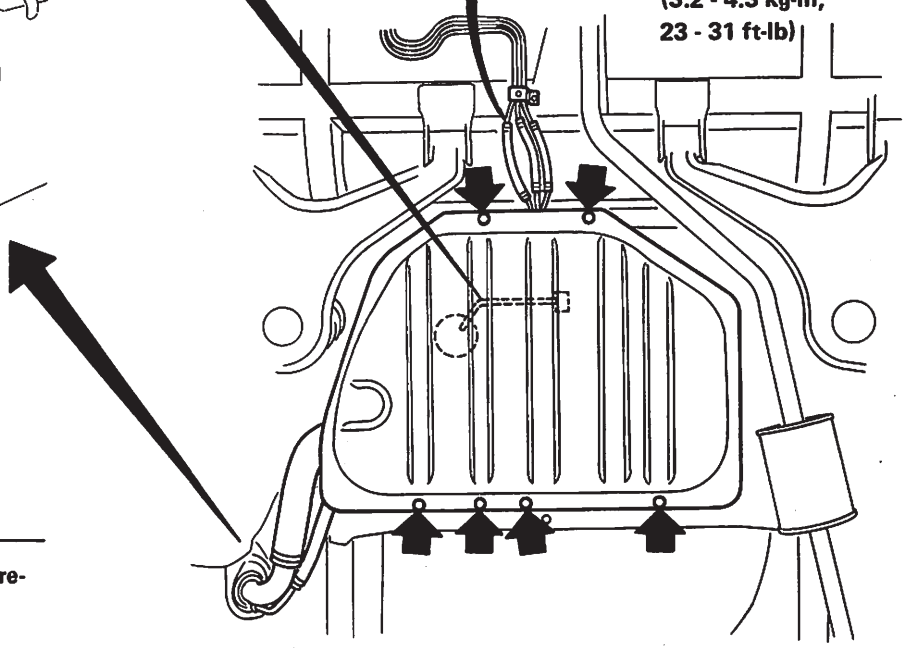


4. Disconnect fuel outlet, return and evaporation hoses.



5. Remove six bolts attaching fuel tank and then take out fuel tank.

Ⓣ : 31 - 42 N·m
(3.2 - 4.3 kg-m, 23 - 31 ft-lb)



Plug hose and pipe openings to prevent entry of dust or dirt.

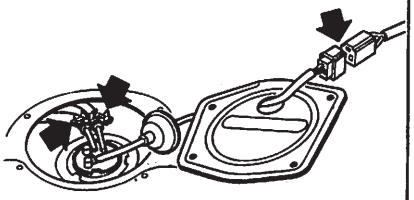
SFE661

FUEL TANK GAUGE UNIT

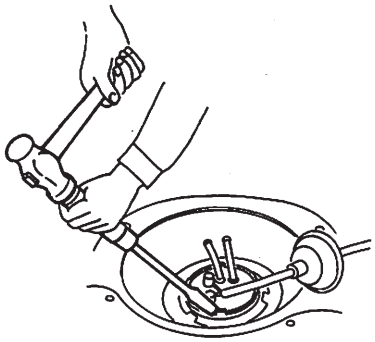
REMOVAL AND INSTALLATION

- Remove fuel tank gauge unit in the order of 1 to 3.
- Install in the reverse order of removal.

1. Remove inspection cover and disconnect fuel tank gauge unit harness connector.
2. Disconnect fuel outlet and return hoses.

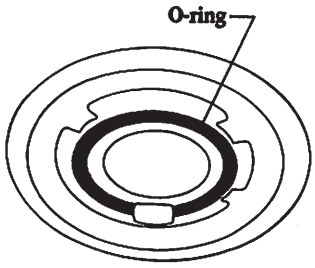


3. Remove lock plate and take out fuel tank gauge unit.



a. When taking out fuel tank gauge unit, be careful not to damage or deform.

b. Install new O-ring.



c. Plug the opening to prevent entry of dust or dirt.

SFE662

INSPECTION

Refer to Fuel Tank Guage Unit for inspection (section EL).

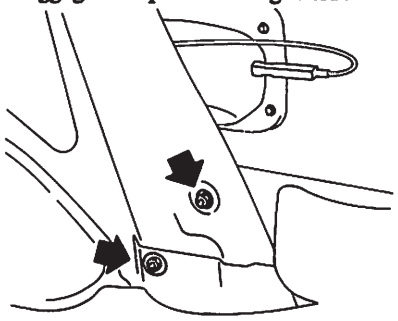
FUEL FILLER HOSE AND TUBE

REMOVAL AND INSTALLATION

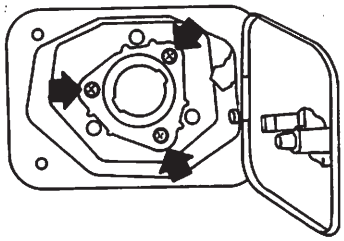
- Remove fuel filler hose and tube in the order of 1 to 5.
- Install in the reverse order of removal.

1. Drain fuel.
2. Remove screws attaching filler tube stay from inside luggage compartment.

Luggage compartment right side

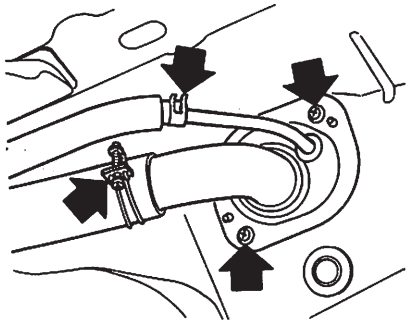


3. Remove filler cap and filler neck retainer.



SFE450

4. Remove filler hose and ventilation hose clamps.
5. Remove lower retainer, and then take out filler tube in a downward direction.



Plug hose and pipe openings to prevent entry of dust or dirt.

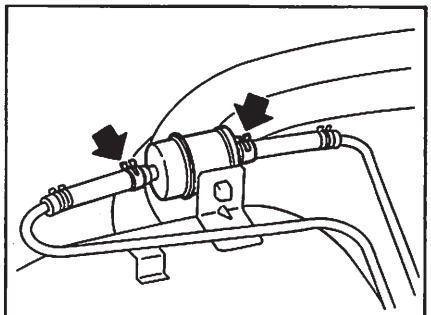
SFE663

INSPECTION

Inspect all hoses and tubes for cracks, fatigue, sweating or deterioration. Replace any hose or tube that is damaged.

FUEL CHECK VALVE

REMOVAL AND INSTALLATION



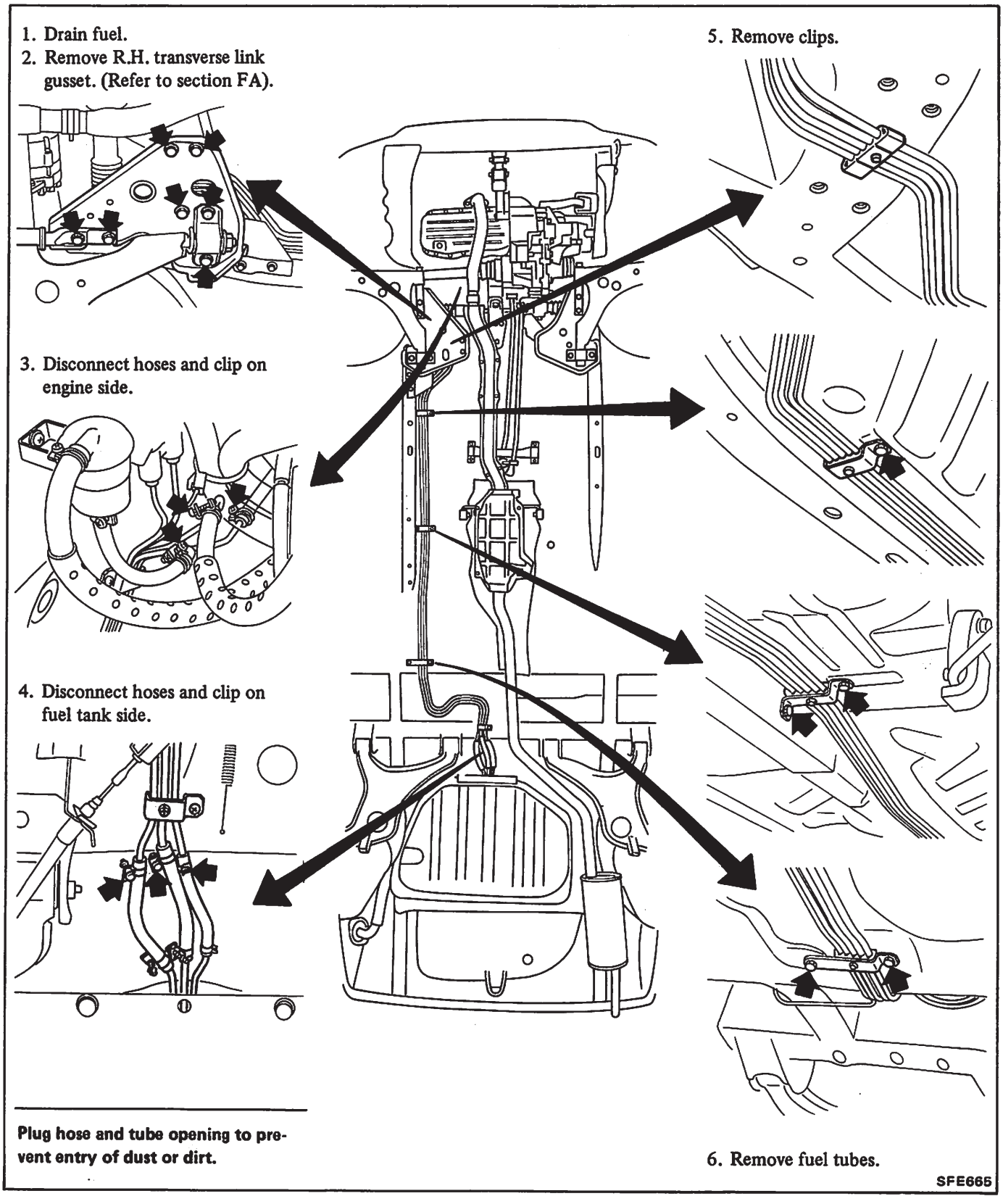
SFE664

FUEL TUBE

REMOVAL AND INSTALLATION

Fuel tubes are serviced as an assembly. Do not disconnect any fuel line unless absolutely necessary.

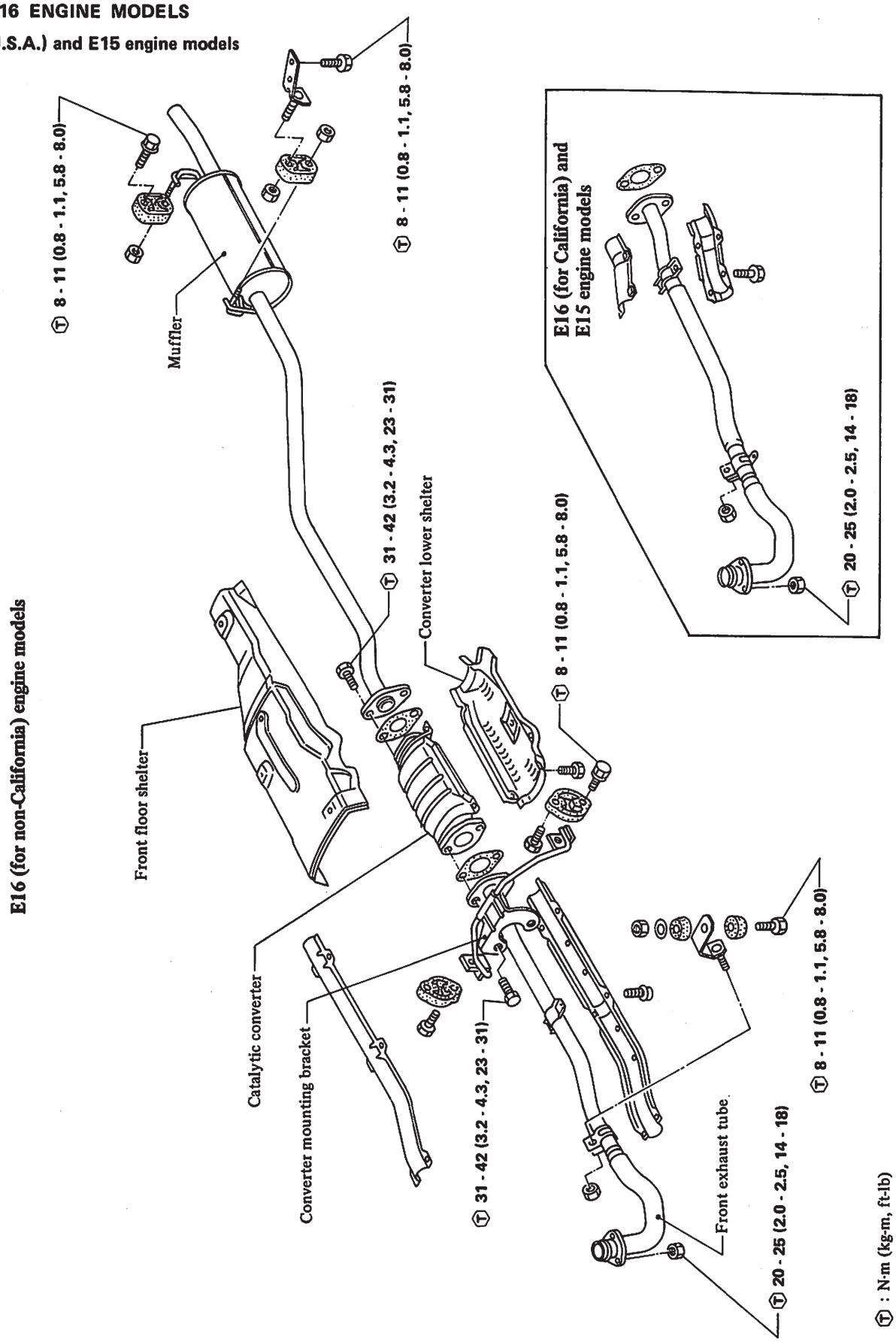
- Remove fuel tube in the order of 1 to 6.
- Install in the reverse order of removal.



EXHAUST SYSTEM

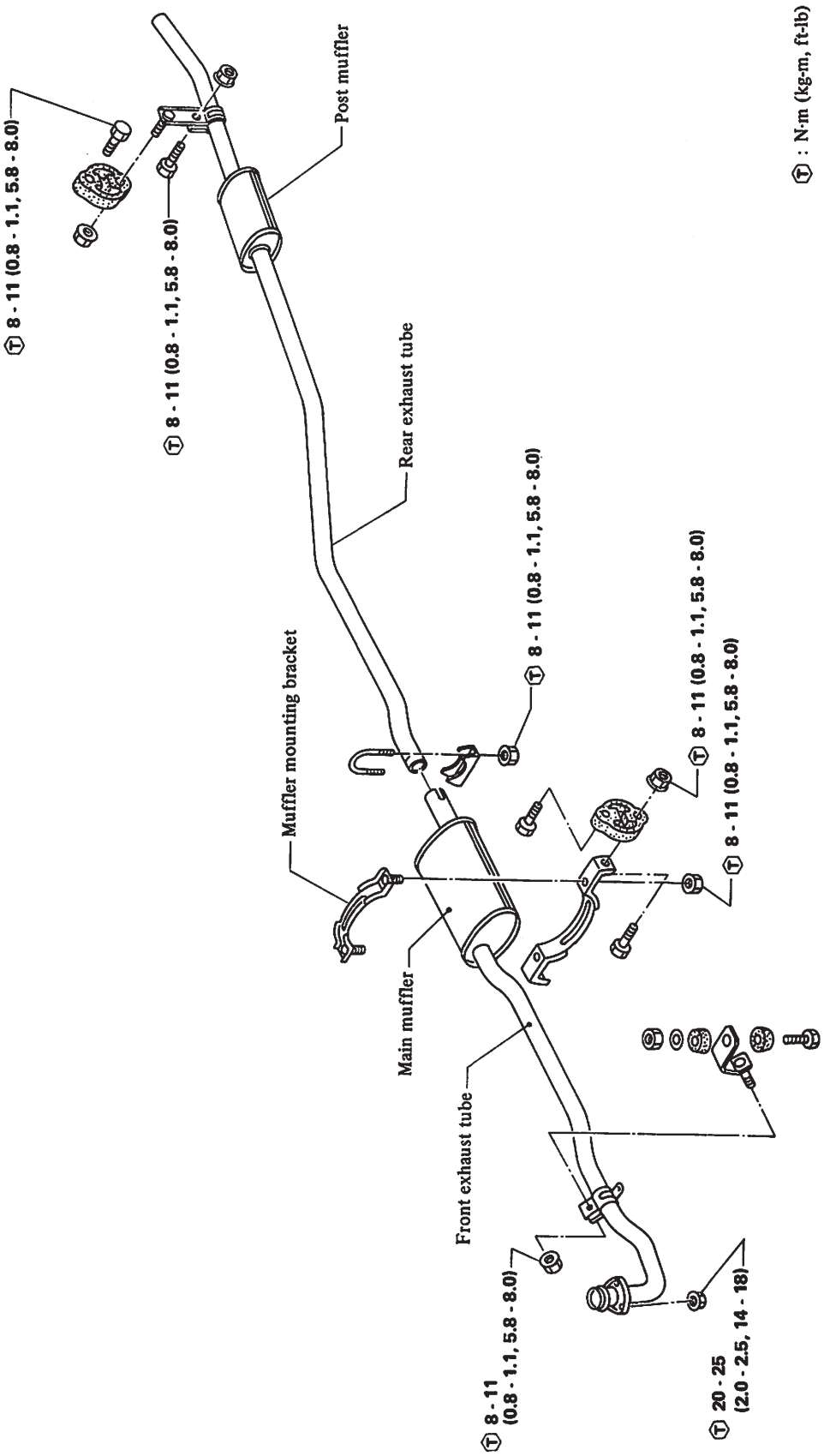
E15, E16 ENGINE MODELS

E16 (U.S.A.) and E15 engine models



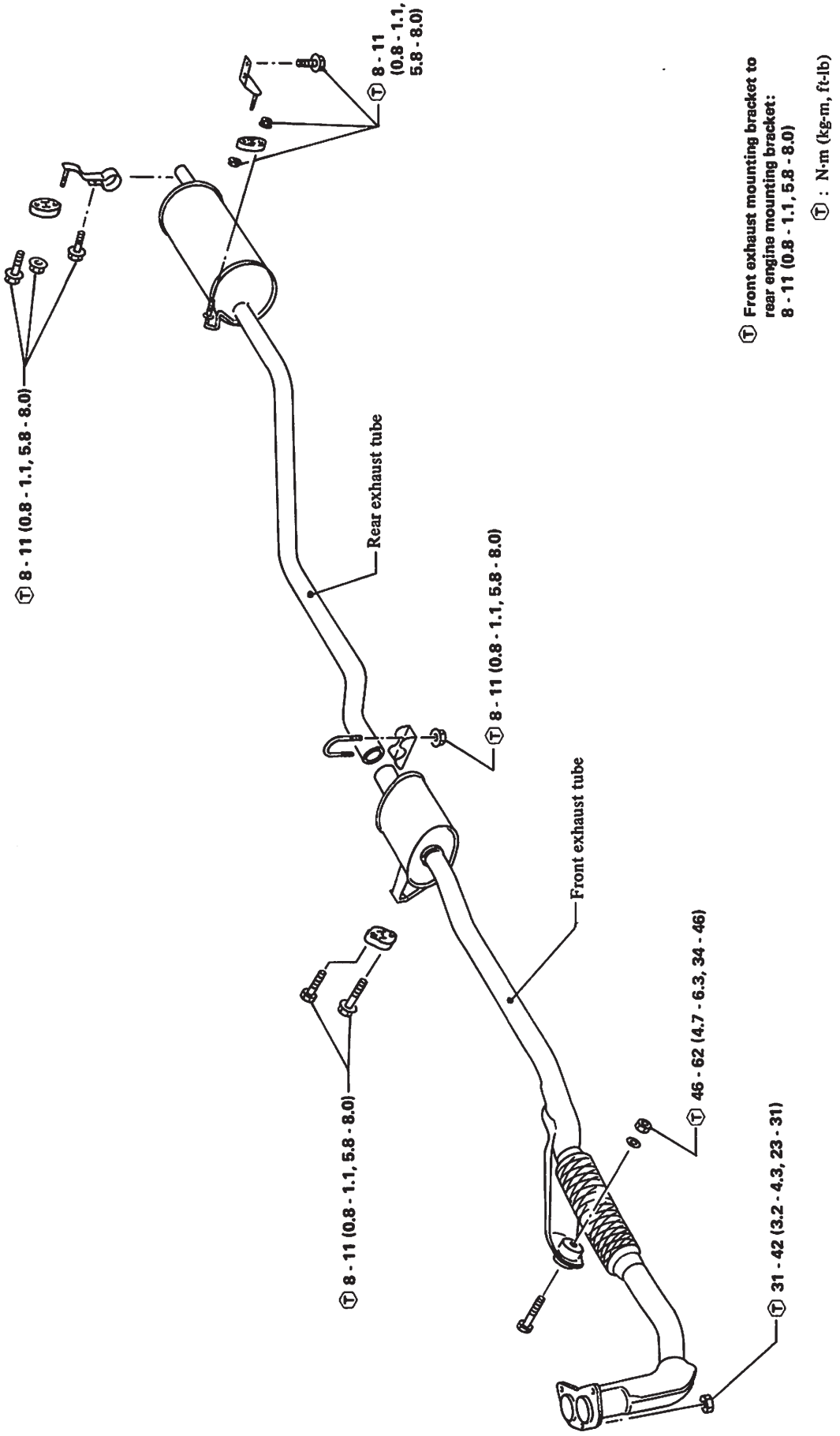
SFE666

E16 (for Canada) engine models



SFE667

CD17 ENGINE MODELS



SFE685

EXHAUST TUBE AND MUFFLER ASSEMBLY

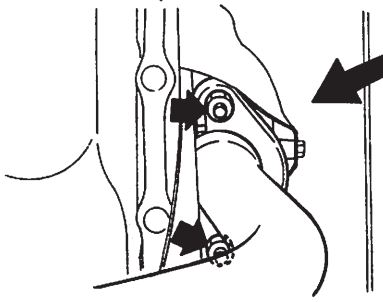
REMOVAL AND INSTALLATION

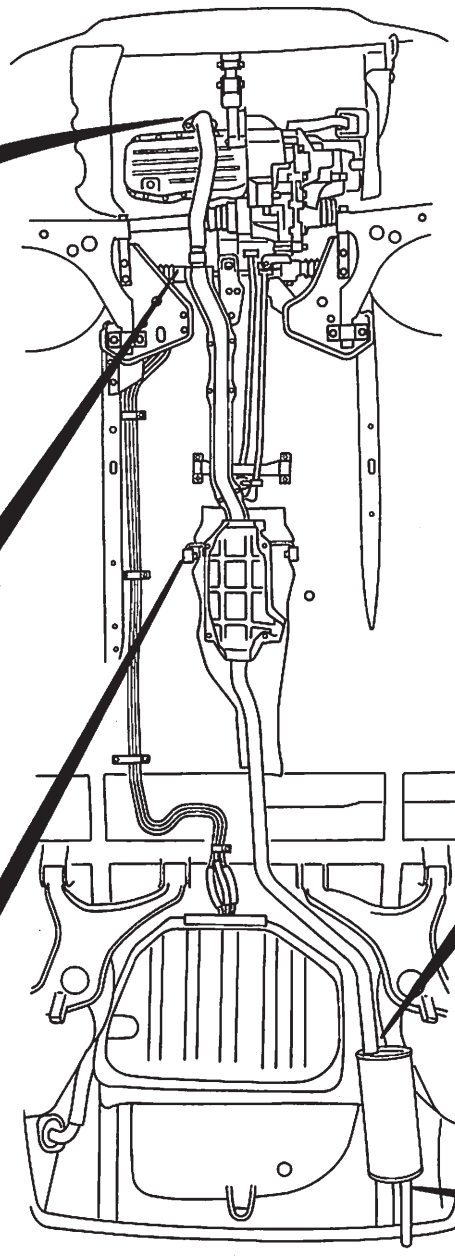
- Remove exhaust tube and muffler assembly in the order of 1 to 5.
- Install in the reverse order of removal.

1. Remove manifold fixing bolts.

E15, E16
Ⓣ 20 - 25 N·m (2.0 - 2.5 kg-m, 14 - 18 ft-lb)

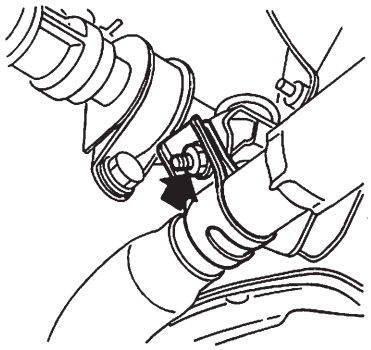
CD17
Ⓣ 31 - 42 N·m (3.2 - 4.3 kg-m, 23 - 31 ft-lb)



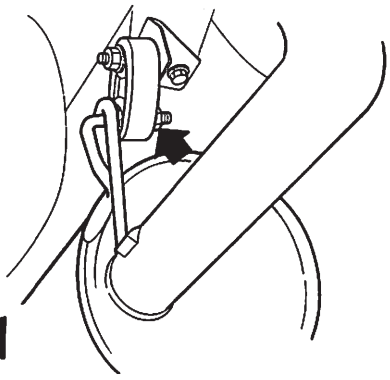


Ⓣ : Mounting bolts and nuts
Front tube of CD17
46 - 62 N·m (4.7 - 6.3 kg-m, 34 - 46 ft-lb)
Except front tube of CD17
8 - 11 N·m (0.8 - 1.1 kg-m, 5.8 - 8.0 ft-lb)

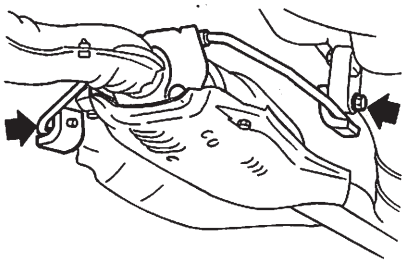
2. Remove front tube mounting nut.



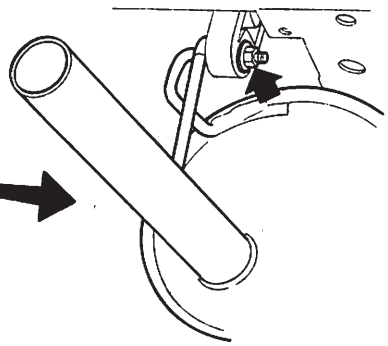
4. Remove muffler mounting (front) nut.



3. Remove converter mounting bolts.



5. Remove muffler mounting (rear) nut.



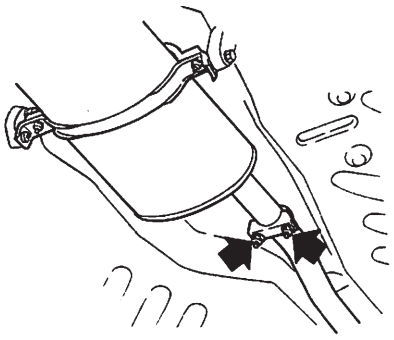
a. Be careful not to deform mounting rubbers.
b. Install new converter gasket.
c. Keep sufficient clearance between exhaust system parts and adjacent parts.

SFE668

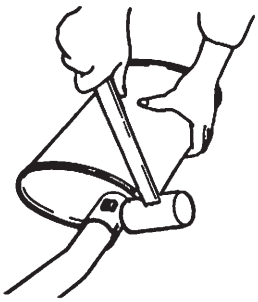
DISASSEMBLY AND ASSEMBLY

E16 (for Canada) and CD17 engine models

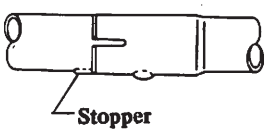
1. Remove U-Bolt nuts.



2. Break sealant and separate front tube and main muffler.

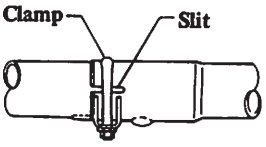


a.



Insert muffler as far as stopper.

b.



Clamp should be centered over slit.

c. When injecting sealant, refer to SEALING.

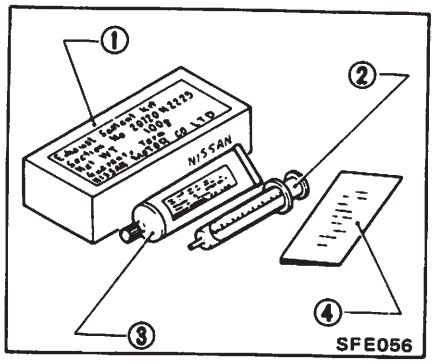
SFE669

INSPECTION

1. Check exhaust tube and muffler for cracks or damage. Replace any part that is damaged beyond repair.
2. Replace any bracket, hanger or rubber part that is cracked, fatigued or sweated.

SEALING

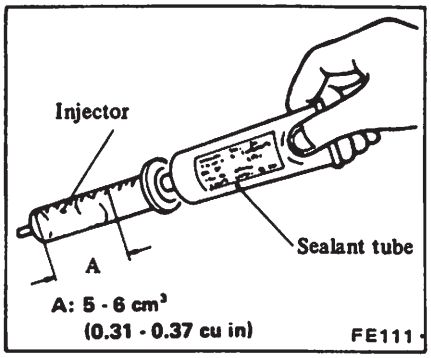
After installing exhaust parts, use the genuine Nissan Sealant "Exhaust Kit 20702-N2225" to eliminate gas leakage at the joint. Be sure to observe the following procedures.



SFE056

1 Case
2 Injector
3 Sealant tube (Polyethylene)
4 Instruction sheet

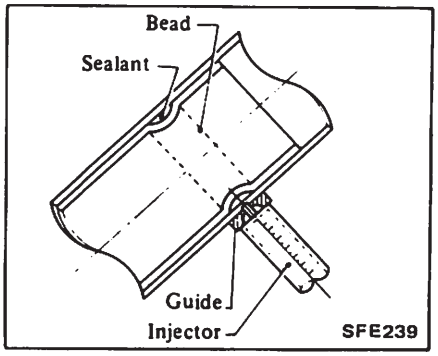
1. Squeeze 5 to 6 cm^3 (0.31 to 0.37 cu in) of sealant into injector from the sealant tube.
Be sure to place the cap back to the sealant tube since sealant will dry.



FE111

2. Position the nozzle of injector to the guide and press it there firmly. Inject sealant slowly until sealant begins to flow out of the slit of the tube. This indicates that the bead requires no further sealant. Excessive sealant can cause a clogged tube.

After injecting, wash injector thoroughly in clean water to remove all traces of sealant.



SFE239

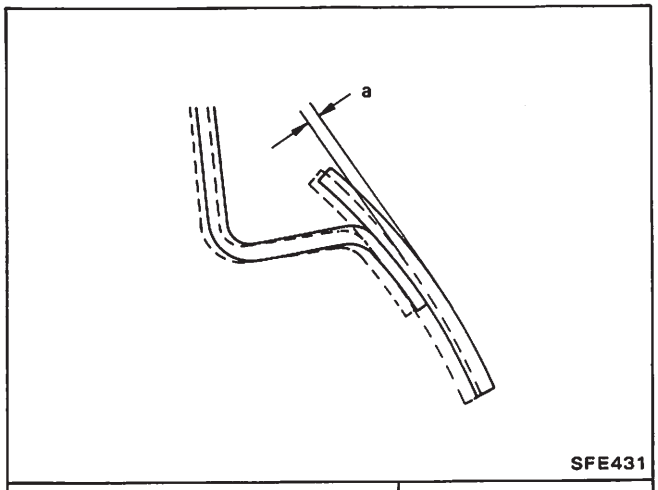
3. Start the engine and let it idle slowly for ten minutes (minimum) to harden sealant with the heat of exhaust gas.
4. Check the condition of sealant before driving the car. It is also essential that the vehicle should no be accelerated sharply for 20 to 30 minutes subsequent to this operation.

a. The sealant should be used within guaranty term indicated on the kit case.
b. Exposure of the skin to sealant may cause a rash. Wash sealant off the skin with water.
c. Do not keep the sealant tube in a place where the ambient temperature is 40°C (104°F) or above. A sealant hardened at 40°C (104°F) or above cannot be used. The most suitable storage temperature is from 15 to 35°C (59 to 95°F). If sealant becomes hardened because of low temperatures, warm the sealant tube with lukewarm water until the sealant is softened. Do not warm the tube at a temperature of over 40°C (104°F) for a long period of time.
d. Thoroughly read the instruction sheet furnished with the kit before using the sealant.
e. Check all tube connections for exhaust gas leaks, and entire system for unusual noise, with engine running.

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

INSPECTION AND ADJUSTMENT

ACCELERATOR SYSTEM



Free play at pedal pad center, "a"	mm (in)	1 - 2 (0.04 - 0.08)

TIGHTENING TORQUE

FUEL SYSTEM

Unit	N·m	kg-m	ft-lb
Fuel tank mounting bolt	31 - 42	3.2 - 4.3	23 - 31

EXHAUST SYSTEM

Unit		N·m	kg-m	ft-lb
Exhaust front tube fixing nut	E15, E16	20 - 25	2.0 - 2.5	14 - 18
	CD17	31 - 42	3.2 - 4.3	23 - 31
Exhaust mounting insulator and bracket bolt (nut)	Front tube of CD17	46 - 62	4.7 - 6.3	34 - 46
	Except front tube of CD17	8 - 11	0.8 - 1.1	5.8 - 8.0
U-bolt nut		8 - 11	0.8 - 1.1	5.8 - 8.0
Catalytic converter fixing bolt		31 - 42	3.2 - 4.3	23 - 31