

TOYOTA 4A-FE, 4A-GE ENGINE REPAIR MANUAL

Datos de puesta a punto

Juego de válvulas

Tiempo de encendido

Ralentí

Comprobación de compresión

correa de distribución

INTRODUCTION

ENGINE MECHANICAL

FIS SYSTEM

COOLING SYSTEM

LUBRICATION SYSTEM

IGNITION SYSTEM

STARTING SYSTEM

CHARGE SYSTEM

SERVICE SPECIFICATIONS

STANDARD BOLT TORQUE SPECIFICATIONS

SSP AND SSM

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40%



TOYOTA

4A-FE

ENGINE

REPAIR MANUAL

Sep., 1989

VIN	JT1LAT17100099603
Build Date	02/1990
Model	AT171L-ALMDKG
Body	LB LIFTBACK
Specification	LB LEFT-HAND DRIVE VEHICLES
Grade	XL XL TYPE
Market	EU EUROPE
Engine	4AFE 1600CC 16-VALVE DOHC EFI
Fuel system	G EUROPE (W/CATALYZER)
Transmission	MTM MANUAL TRANSMISSION
Gear Shift Type	SF MTM, 5-SPEED FLOOR SHIFT
Frame Number	AT171-0099603
Color Code	182

AUTO COLLEGE AALBORG
Special Edition

INTRODUCTION

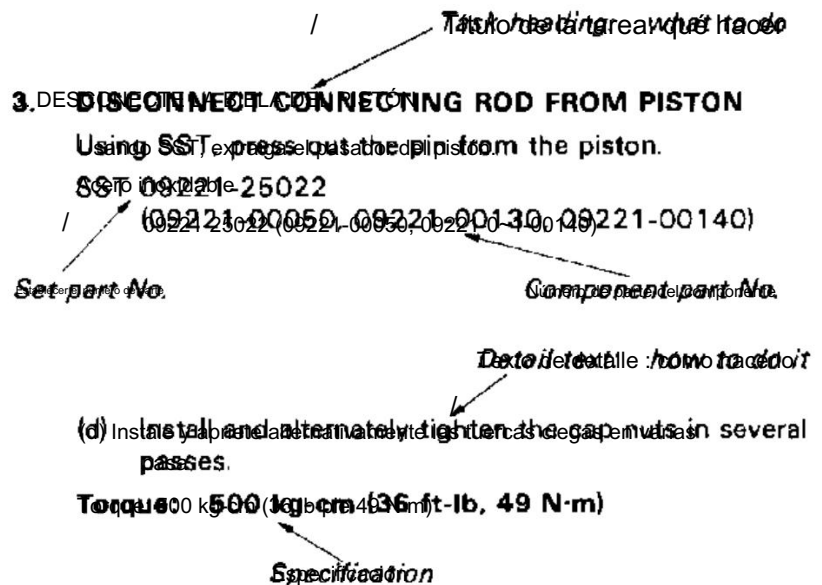
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IN

The procedures are presented in a step-by-step format:

- The illustration shows **what** to do and **where** to do it.
- The task heading tells **what** to do.
- The detailed text tells **how** to perform the task and gives other information such as specifications and warnings.

Example:



This format provides the experienced technician with a FAST (Fast and Simple) method for the information needed. He can read the task heading and only refer to the detailed text when he needs it. Important specifications and warnings always stand out in bold type.

REFERENCES

References have been kept to a minimum and shown where they are required. A page is given at the end of the page to go to.

SPECIFICATIONS

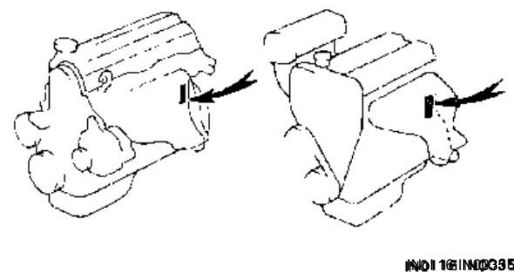
Specifications are presented in bold type throughout the text in the applicable step. You never have to leave the procedure to look up a specification. All specifications are also shown in the Appendix for a quick reference.

CAUTIONS, NOTES, HINTS:

- **CAUTIONS** are presented in bold type and indicate the possibility of injury to you or the people.
- **NOTES** are also presented in bold type and indicate there is a possibility of damage to the components being repaired.
- **HINTS** are separated from the text but do not appear in bold type. They provide additional information to help you efficiently perform the repair.

Motor Engine

Motor Engine



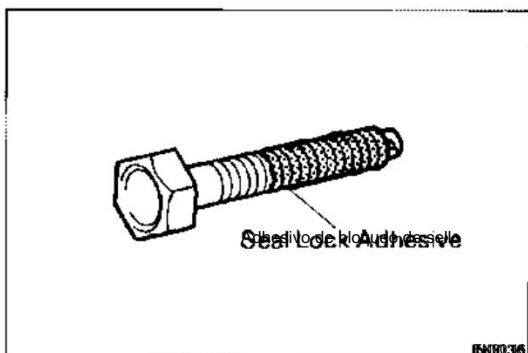
IDENTIFICATION INFORMATION

ENGINE SERIAL NUMBER

The engine serial number is stamped on the left side of the cylinder block.

GENERAL REPAIR INSTRUCTIONS

1. Use fender, seat and floor covers to keep the vehicle clean and prevent damage.
2. During disassembly, keep parts in order to facilitate reassembly.
3. Observe the following:
 - (a) Before performing electrical work, disconnect the negative cable from the battery terminal.
 - (b) If it is necessary to disconnect the battery for inspection or repair, always disconnect the cable from the negative terminal. The negative terminal is grounded to the vehicle body.
 - (c) To prevent damage to the battery terminal post, loosen the terminal nut and raise the cable straight up without twisting or prying it.
 - (d) Clean the battery terminal posts and cable terminals with a shop rag. Do not scrape them with a file or other abrasive object.
 - (e) Install the cable terminal to the battery post with the nut loose and tighten it after installation. Do not use a hammer to tap the terminal onto the post.
 - (f) Be sure the cover for the positive (+) terminal is properly in place.
4. Recheck hose and wiring connections to make sure that they are secure and correct.
5. Non-reusable parts
 - (a) Always replace O-rings, gaskets, O-rings, oil seals, etc. with new ones.
 - (b) Non-reusable parts are indicated in the component illustrations by the symbol "♦".



6. Precoated Parts

Precoated parts are the bolts, nuts, etc. which are coated with a seal lock adhesive at the factory.

(a) If a precoated part is tightened, loosened or caused to move in any way, it must be recoated with the specified adhesive.

(b) Recoating of Precoated Parts

(1) Clean off the old adhesive from the part's threads.

(2) Dry with compressed air.

(3) Apply the specified seal lock adhesive to the part's threads.

(c) Precoated parts are indicated in the "component illustrations by the symbol $\overline{\text{P}}$.

7. When necessary, use sealers, gaskets to prevent leaks.

8. Carefully observe all specifications for bolt torques. Always use a torque wrench.

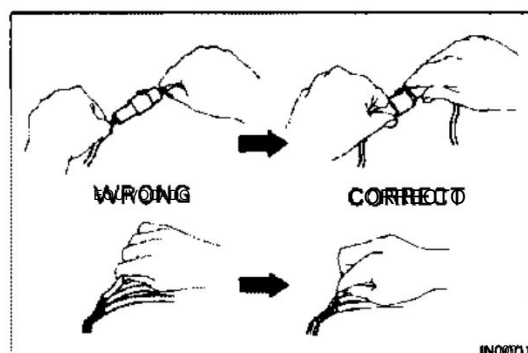
9. Use of special service tools (SST) and special (service materials) (SSM) may be required depending on the nature of the repair. Be sure to use SST and SSM where specified and follow the proper work procedure. A list of SST and SSM can be found at the back of this manual.

10. When replacing fuses, be sure the new fuse is the correct amperage. DO NOT exceed the fuse amperating value or of a lower rating.

11. Care must be taken when jacking up and supporting the vehicle. Be sure to lift and support the vehicle at the proper locations.

(a) If the vehicle is to be jacked up only at the front or rear, be sure to shock the wheels in order to ensure safety.

(b) After the vehicle is jacked up, be sure to support it on stands. It is extremely dangerous to do any work on the vehicle raised on a jack alone, even for a small job that can be finished quickly.



12. Observe the following precautions to avoid damaging the parts:

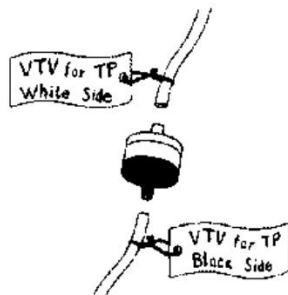
(a) Do not open the cover of the ECU unless absolutely necessary. If the ECU terminals are touched, they may be destroyed by static electricity.

(b) Do not disconnect vacuum hoses by pulling on the end of the hose, not the middle.

(c) To separate electrical connectors, pull on the connector itself, not the wires.

- (d) **When steam cleaning an engine, protect the distributor, air filter, and A/C from water.**
- (e) **Never use a ramp or a wrench to remove or install distributor switches or timing sensors.**
- (f) **When checking continuity at the wire sensor, insert the tester probe carefully to prevent terminals from bending.**
- (g) **When using a vacuum gauge, never force the hose onto a connector that is too large; use a stepped down adapter instead. Once the hose has been stretched, it may leak.**

Example



IN0002

13. Etiqueta las mangueras antes de desconectarlas:

- (a) **When disconnecting a vacuum hose, use tags to identify which they should be reconnected.**
- (b) **After completing a job, double check that the vacuum hoses are properly connected. A label under the bleed hole is a proper label.**

PRECAUTIONS FOR VEHICLES EQUIPPED WITH A CATALYTIC CONVERTER

CAUTION: If large amounts of unburned gasoline flow into the converter, it may overheat and create a fire hazard. **Para prevenir esto observe las siguientes precauciones y explíqueles a su cliente.**

1. Utilice sólo gasolina sin plomo.

2. Evite el ralentí prolongado.

Avoid running the engine at fast idle speed for more than 10 minutes and at idle speed for more than 20 minutes.

3. Evite el ajuste de la bujía.

(a) Realice el ajuste de la bujía sólo cuando sea absolutamente necesario y tan rápidamente como sea posible.

(b) Durante el ajuste, nunca toque la bujía.

4. Evite el ralentí prolongado de la bujía.

Engine compression tests must be made as quickly as possible.

5. No corra el motor cuando el tanque de combustible esté casi vacío.

This may cause the engine to misfire and create an extra load on the converter.

6. Evite el ralentí con la ignición apagada y el frenado prolongado.

7. No deseches el catalizador usado con partes contaminadas con gasolina o aceite.

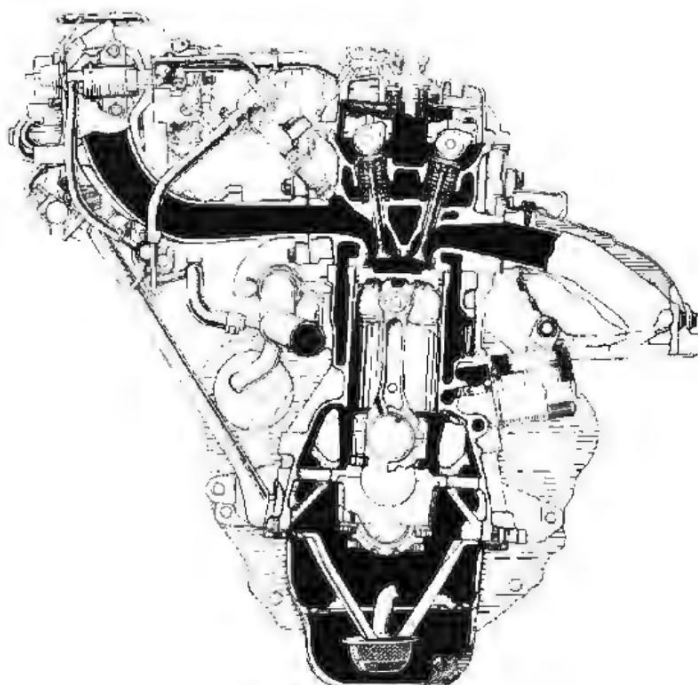
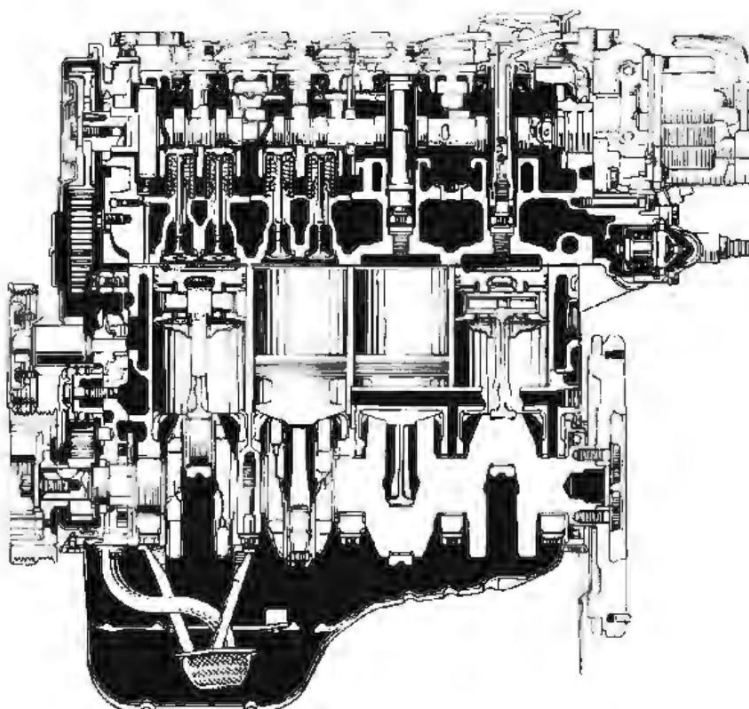
ABBREVIATIONS USED IN THIS MANUAL

A/C	Air Conditioner
ACV	Air Control Valve
Approx.	Approximately
A/T	Automatic Transmission
BTDC	Before Top Dead Center
BVSV	Bimetal Vacuum Switching Valve
DP	Dash Pot
ECU	Electronic Control Unit
EFI	Electronic Fuel Injection
EGR	Exhaust Gas Recirculation
ESA	Electronic Spark Advance
EX	Exhaust manifold valve (válvula múltiple)
Ex.	Except
FIPG	Powered in Place Gasket
FL	Fusible Link
IG	Ignition
IA	Integrated Ignition Assembly
IN	Intake (manifold, valve)
ISC	Idle Speed Control
LH	Left Hand
LSD	Left Hand Drive
LHC	Long Life Coolant (Líquido de enfriamiento de larga vida)
MP	Multipurpose
M/T	Manual Transmission
O/S	Oversized
PCV	Positive Crankcase Ventilation
RH	Right Hand
RHD	Right Hand Drive
SSM	Special Service Materials
SS T	Special Service Tools
STD	Standard
SW	Switch
TDC	Top Dead Center
TEMP	Temperature
TWC	Three-Way Catalyst
UDS	Undersized
VSV	Vacuum Switching Valve
w/	With
w/o	Without
2WD	Two Wheel Drive
4WD	Four Wheel Drive

DESCRIPTION

4A-FE ENGINE

The 4A-FE engine is a DOHC 16-valve, 1.6-liter, 4-cylinder engine. It is a DOHC 16-valve engine.



The 4A-FE engine is an inline 4-cylinder engine with a bore of 76 mm and a stroke of 86 mm. The crankshaft is supported by 5 specified bearings in the crankcase. These bearings are made of aluminum alloy.

The crankshaft is connected with 8 connecting rods which are attached to the piston pins. The connecting rods are made of aluminum alloy. The crankshaft is supplied with oil from the oil pump through the oil galleries in the crankcase. The oil pump is driven by the crankshaft and is located at the front of the engine.

The ignition system consists of a distributor and 4 spark plugs. The distributor is located at the front of the engine and is driven by the crankshaft. The spark plugs are located in the center of the combustion chamber. The ignition system is supplied with high voltage from the ignition coil.

The intake and exhaust valves are operated by a camshaft. The camshaft is located at the front of the engine and is driven by the crankshaft. The intake and exhaust valves are made of aluminum alloy. The camshaft is supplied with oil from the oil pump through the oil galleries in the crankcase.

The exhaust valve is operated by a camshaft. The camshaft is located at the front of the engine and is driven by the crankshaft. The exhaust valve is made of aluminum alloy. The camshaft is supplied with oil from the oil pump through the oil galleries in the crankcase.

The exhaust valve is operated by a camshaft. The camshaft is located at the front of the engine and is driven by the crankshaft. The exhaust valve is made of aluminum alloy. The camshaft is supplied with oil from the oil pump through the oil galleries in the crankcase.

The adjustment of the valve clearance is done by means of shims. The shims are located between the valve and the camshaft. The shims are made of aluminum alloy. The adjustment of the valve clearance is done by means of shims.

The timing of the valves is controlled by the timing belt. The timing belt is located at the front of the engine and is driven by the crankshaft. The timing belt is made of rubber. The timing of the valves is controlled by the timing belt.

The pistons are made of aluminum alloy. The pistons are supplied with oil from the oil pump through the oil galleries in the crankcase. The pistons are made of aluminum alloy.

The pistons are made of aluminum alloy. The pistons are supplied with oil from the oil pump through the oil galleries in the crankcase. The pistons are made of aluminum alloy.

The compression rings are made of cast iron. The compression rings are located in the cylinder. The compression rings are made of cast iron. The compression rings are supplied with oil from the oil pump through the oil galleries in the crankcase. The compression rings are made of cast iron.

The cylinder block is made of cast iron. The cylinder block is located in the engine. The cylinder block is made of cast iron. The cylinder block is supplied with oil from the oil pump through the oil galleries in the crankcase. The cylinder block is made of cast iron.

The cylinder head is made of cast iron. The cylinder head is located in the engine. The cylinder head is made of cast iron. The cylinder head is supplied with oil from the oil pump through the oil galleries in the crankcase. The cylinder head is made of cast iron.

EXCESSIVE FUEL CONSUMPTION

Problem	Possible cause	Remedy	Page
Poor gasoline mileage	Fuel leak	Repair as necessary	EM-25 EM-28
	Air cleaner clogged	Check air filter	
	Incorrect ignition timing	Reset timing	
	EFI system problems	Repair as necessary	
	● Injector faulty		EM-30, 31 IG-11, 122
	● Deceleration fuel cut system faulty		
	Idle speed too high	Adjust idle speed	
	Spark plug faulty	Inspect plugs	
	EGR system always on (w/ EGR system)	Check EGR system	EM-38
	Low compression	Check compression	
	Tires improperly inflated	Inflate tires to proper pressure	
	Clutch slips	Troubleshoot clutch	
	Brakes drag	Troubleshoot brakes	

UNPLEASANT ODOR

Problem	Possible cause	Remedy	Page
Unpleasant odor	Incorrect idle speed	Adjust idle speed	EM-30, 31 EM-28
	Incorrect ignition timing	Reset timing	
	Fuel system leaks	Repair as necessary	
	● PCV line		
	● EGR line (w/ EGR system)		EM-38
	● Intake manifold		
	● Throttle body		
	● Brake booster line		
	EFI system problems	Repair as necessary	

ENGINE TUNE UP (4A-FE)

INSPECTION OF ENGINE COOLANT

(See steps 1 and 2 on page CO-5)

INSPECTION OF ENGINE OIL

(See steps 1 and 2 on page LU-6)

INSPECTION OF BATTERY

(See page 1 and 2 on page CH-3)

Standard specific gravity:

1.25 - 1.27 when fully charged at 20°C (68°F)

INSPECTION OF AIR FILTER

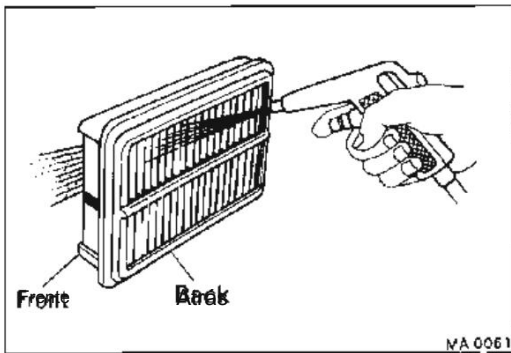
1. INSPECT AIR FILTER

Visually check that the element is not excessively dirty, damaged or soiled.

2. FILTER CLEANING

Clean the element with compressed air.

First blow from the back thoroughly. Then blow off the front of the element.



INSPECTION OF HIGH TENSION CORDS

(See page KG-5)

Maximum resistance: cab 25 Ω per cord

INSPECTION OF SPARK PLUGS

(See page GG-6)

Correct electrode gap: 0.8 mm (0.031 in.)

Recommended spark plugs:

ND Q16R-16R-U

NGK B6CR6EY

INSPECTION OF ALTERNATOR DRIVE BELT

(See page 3 on page CH-3)

Drive belt deflection:

Used belt Coltrada 120 mm (0.394 in.) - 0.472 in.)

New belt 8,5 mm (0.335 in.) - 0.413 in.)

Drive belt tension (Reference):

Used belt 40-55 kg

New belt 60-70 kg

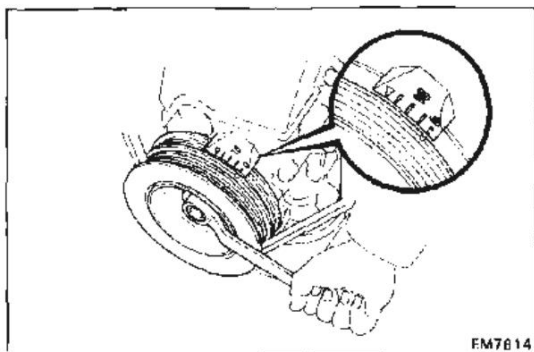
INSPECTION AND ADJUSTMENT OF VALVE CLEARANCE

HINT Inspect and adjust the valve clearance when the engine is cold.

1. DISCONNECT HIGH TENSION CORDS FROM SPARK PLUGS

2. REMOVE CYLINDER HEAD COVER (See page EM-62)

3. SET NO.1 CYLINDER TO TOP COMPRESSION



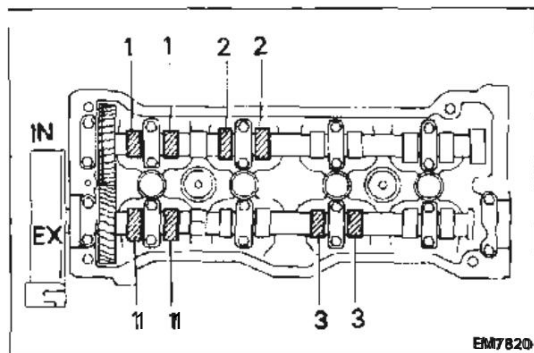
FM7614

(a) Turn the crankshaft pulley and align its groove with the timing mark "0" of the No.1 timing belt cover.

(b) Check that the valve lifters on the No.1 cylinder are loose and valve lifters on the No.4 cylinder are tight.

If not, turn the crankshaft one revolution (360°) and align the mark as above.

4. INSPECT VALVE CLEARANCE



EM7820

(a) Check only those valves indicated in the illustration.

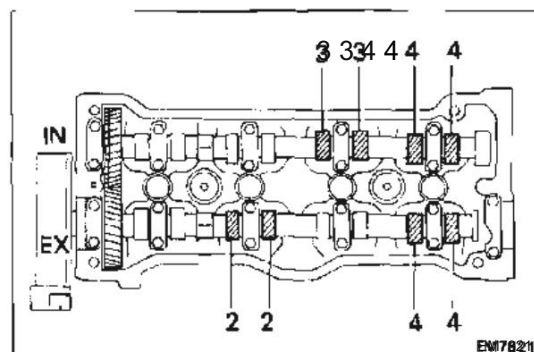
● Using a thickness gauge, measure the clearance between the valve lifter and camshaft.

● Record the valve clearance measurements which are out of specification. They will be used later to determine the required replacement adjusting shim.

Valve clearances (Cold):

Intake 0.0150-0.0250 (0.0060-0.010 in.)

Exhaust 0.0200-0.0300 (0.0080-0.012 in.)



EM7821

(b) Turn the crankshaft one revolution (360°) and align the mark as above. (See procedure step 3)

(c) Check only the valves indicated as shown.

Measure the valve clearance.

(See procedure step (a)).

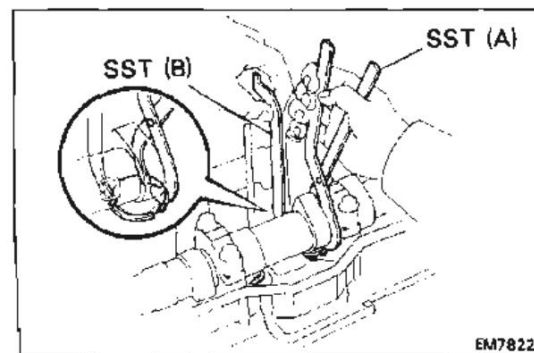
5. ADJUST VALVE CLEARANCE

(a) Remove the adjusting shim.

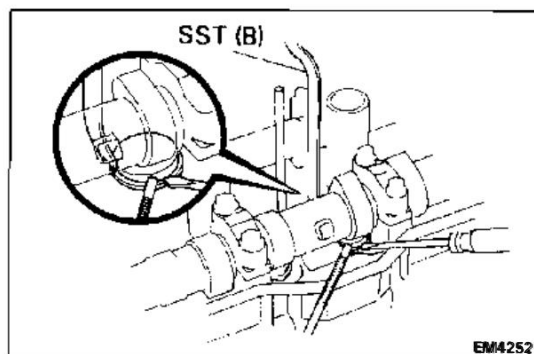
● Turn the crankshaft to position the cam lobe of the camshaft on the adjusting valve upward.

● Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter. Remove SST (A).

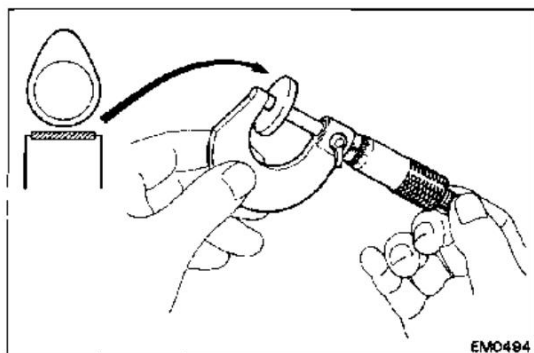
SST 09248-55010



EM7822



- Remove the adjusting shim with small screwdriver and magnetic finger.



- (b) Determine the replacement adjusting shim size by using the following Formula or Charts.

- Using a micrometer, measure the thickness of the shim which was removed.

- Calculate the thickness of the new shim so the valve clearance comes within specified value.

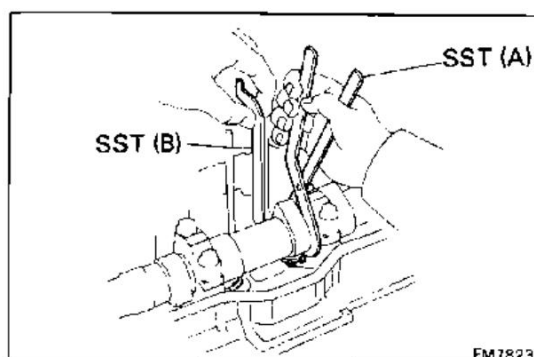
T Thickness of shim used
 A Valve clearance measured
 N Thickness of new shim

Intake: $N = T + (A - 0.202 \text{ mm} (0.008 \text{ in}))$

Exhaust: $N = T + (A - 0.25 \text{ mm} (0.010 \text{ in}))$

- Select a shim with a thickness as close as possible to the calculated values.

HINT Shim are available in seventeen sizes of 0.05 mm (0.0020 in.) from 2.504 mm (0.0984 in.) to 3.30 mm (0.1299 in.).



- (c) Install a new adjusting shim.

- Place a new adjusting shim on the valve lifter.

- Using SST (A), press down the valve lifter and remove SST (B).

SST 09248-55010

- (d) Recheck the valve clearance.

6. INSTALL CYLINDER HEAD COVER (See page EM-86)

7. CONNECT HIGH TENSION CORDS TO SPARK PLUGS

Adjuntas e Sección de Chate

INTAKE

Measured Chirp rate (min)	Installed Shim Thickness (mm)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
	0.000	0.005	0.010	0.015	0.020	0.025	0.030	0.035	0.040	0.045	0.050	0.055	0.060	0.065	0.070	0.075	0.080	0.085	0.090	0.095	0.100	0.105	0.110	0.115	0.120	0.125	0.130	0.135	0.140	0.145	0.150	0.155	0.160	0.165	0.170	0.175	0.180	0.185	0.190	0.195	0.200	0.205	0.210	0.215	0.220	0.225	0.230	0.235	0.240	0.245	0.250	0.255	0.260	0.265	0.270	0.275	0.280	0.285	0.290	0.295	0.300	0.305	0.310	0.315	0.320	0.325	0.330	0.335	0.340	0.345	0.350	0.355	0.360	0.365	0.370	0.375	0.380	0.385	0.390	0.395	0.400	0.405	0.410	0.415	0.420	0.425	0.430	0.435	0.440	0.445	0.450	0.455	0.460	0.465	0.470	0.475	0.480	0.485	0.490	0.495	0.500	0.505	0.510	0.515	0.520	0.525	0.530	0.535	0.540	0.545	0.550	0.555	0.560	0.565	0.570	0.575	0.580	0.585	0.590	0.595	0.600	0.605	0.610	0.615	0.620	0.625	0.630	0.635	0.640	0.645	0.650	0.655	0.660	0.665	0.670	0.675	0.680	0.685	0.690	0.695	0.700	0.705	0.710	0.715	0.720	0.725	0.730	0.735	0.740	0.745	0.750	0.755	0.760	0.765	0.770	0.775	0.780	0.785	0.790	0.795	0.800	0.805	0.810	0.815	0.820	0.825	0.830	0.835	0.840	0.845	0.850	0.855	0.860	0.865	0.870	0.875	0.880	0.885	0.890	0.895	0.900	0.905	0.910	0.915	0.920	0.925	0.930	0.935	0.940	0.945	0.950	0.955	0.960	0.965	0.970	0.975	0.980	0.985	0.990	0.995	1.000	1.005	1.010	1.015	1.020	1.025	1.030	1.035	1.040	1.045	1.050	1.055	1.060	1.065	1.070	1.075	1.080	1.085	1.090	1.095	1.100	1.105	1.110	1.115	1.120	1.125	1.130	1.135	1.140	1.145	1.150	1.155	1.160	1.165	1.170	1.175	1.180	1.185	1.190	1.195	1.200	1.205	1.210	1.215	1.220	1.225	1.230	1.235	1.240	1.245	1.250	1.255	1.260	1.265	1.270	1.275	1.280	1.285	1.290	1.295	1.300	1.305	1.310	1.315	1.320	1.325	1.330	1.335	1.340	1.345	1.350	1.355	1.360	1.365	1.370	1.375	1.380	1.385	1.390	1.395	1.400	1.405	1.410	1.415	1.420	1.425	1.430	1.435	1.440	1.445	1.450	1.455	1.460	1.465	1.470	1.475	1.480	1.485	1.490	1.495	1.500	1.505	1.510	1.515	1.520	1.525	1.530	1.535	1.540	1.545	1.550	1.555	1.560	1.565	1.570	1.575	1.580	1.585	1.590	1.595	1.600	1.605	1.610	1.615	1.620	1.625	1.630	1.635	1.640	1.645	1.650	1.655	1.660	1.665	1.670	1.675	1.680	1.685	1.690	1.695	1.700	1.705	1.710	1.715	1.720	1.725	1.730	1.735	1.740	1.745	1.750	1.755	1.760	1.765	1.770	1.775	1.780	1.785	1.790	1.795	1.800	1.805	1.810	1.815	1.820	1.825	1.830	1.835	1.840	1.845	1.850	1.855	1.860	1.865	1.870	1.875	1.880	1.885	1.890	1.895	1.900	1.905	1.910	1.915	1.920	1.925	1.930	1.935	1.940	1.945	1.950	1.955	1.960	1.965	1.970	1.975	1.980	1.985	1.990	1.995	2.000	2.005	2.010	2.015	2.020	2.025	2.030	2.035	2.040	2.045	2.050	2.055	2.060	2.065	2.070	2.075	2.080	2.085	2.090	2.095	2.100	2.105	2.110	2.115	2.120	2.125	2.130	2.135	2.140	2.145	2.150	2.155	2.160	2.165	2.170	2.175	2.180	2.185	2.190	2.195	2.200	2.205	2.210	2.215	2.220	2.225	2.230	2.235	2.240	2.245	2.250	2.255	2.260	2.265	2.270	2.275	2.280	2.285	2.290	2.295	2.300	2.305	2.310	2.315	2.320	2.325	2.330	2.335	2.340	2.345	2.350	2.355	2.360	2.365	2.370	2.375	2.380	2.385	2.390	2.395	2.400	2.405	2.410	2.415	2.420	2.425	2.430	2.435	2.440	2.445	2.450	2.455	2.460	2.465	2.470	2.475	2.480	2.485	2.490	2.495	2.500	2.505	2.510	2.515	2.520	2.525	2.530	2.535	2.540	2.545	2.550	2.555	2.560	2.565	2.570	2.575	2.580	2.585	2.590	2.595	2.600	2.605	2.610	2.615	2.620	2.625	2.630	2.635	2.640	2.645	2.650	2.655	2.660	2.665	2.670	2.675	2.680	2.685	2.690	2.695	2.700	2.705	2.710	2.715	2.720	2.725	2.730	2.735	2.740	2.745	2.750	2.755	2.760	2.765	2.770	2.775	2.780	2.785	2.790	2.795	2.800	2.805	2.810	2.815	2.820	2.825	2.830	2.835	2.840	2.845	2.850	2.855	2.860	2.865	2.870	2.875	2.880	2.885	2.890	2.895	2.900	2.905	2.910	2.915	2.920	2.925	2.930	2.935	2.940	2.945	2.950	2.955	2.960	2.965	2.970	2.975	2.980	2.985	2.990	2.995	3.000	3.005	3.010	3.015	3.020	3.025	3.030	3.035	3.040	3.045	3.050	3.055	3.060	3.065	3.070	3.075	3.080	3.085	3.090	3.095	3.100	3.105	3.110	3.115	3.120	3.125	3.130	3.135	3.140	3.145	3.150	3.155	3.160	3.165	3.170	3.175	3.180	3.185	3.190	3.195	3.200	3.205	3.210	3.215	3.220	3.225	3.230	3.235	3.240	3.245	3.250	3.255	3.260	3.265	3.270	3.275	3.280	3.285	3.290	3.295	3.300	3.305	3.310	3.315	3.320	3.325	3.330	3.335	3.340	3.345	3.350	3.355	3.360	3.365	3.370	3.375	3.380	3.385	3.390	3.395	3.400	3.405	3.410	3.415	3.420	3.425	3.430	3.435	3.440	3.445	3.450	3.455	3.460	3.465	3.470	3.475	3.480	3.485	3.490	3.495	3.500	3.505	3.510	3.515	3.520	3.525	3.530	3.535	3.540	3.545	3.550	3.555	3.560	3.565	3.570	3.575	3.580	3.585	3.590	3.595	3.600	3.605	3.610	3.615	3.620	3.625	3.630	3.635	3.640	3.645	3.650	3.655	3.660	3.665	3.670	3.675	3.680	3.685	3.690	3.695	3.700	3.705	3.710	3.715	3.720	3.725	3.730	3.735	3.740	3.745	3.750	3.755	3.760	3.765	3.770	3.775	3.780	3.785	3.790	3.795	3.800	3.805	3.810	3.815	3.820	3.825	3.830	3.835	3.840	3.845	3.850	3.855	3.860	3.865	3.870	3.875	3.880	3.885	3.890	3.895	3.900	3.905	3.910	3.915	3.920	3.925	3.930	3.935	3.940	3.945	3.950	3.955	3.960	3.965	3.970	3.975	3.980	3.985	3.990	3.995	4.000	4.005	4.010	4.015	4.020	4.025	4.030	4.035	4.040	4.045	4.050	4.055	4.060	4.065	4.070	4.075	4.080	4.085	4.090	4.095	4.100	4.105	4.110	4.115	4.120	4.125	4.130	4.135	4.140	4.145	4.150	4.155	4.160	4.165	4.170	4.175	4.180	4.185	4.190	4.195	4.200	4.205	4.210	4.215	4.220	4.225	4.230	4.235	4.240	4.245	4.250	4.255	4.260	4.265	4.270	4.275	4.280	4.285	4.290	4.295	4.300	4.305	4.310	4.315	4.320	4.325	4.330	4.335	4.340	4.345	4.350	4.355	4.360	4.365	4.370	4.375	4.380	4.385	4.390	4.395	4.400	4.405	4.410	4.415	4.420	4.425	4.430	4.435	4.440	4.445	4.450	4.455	4.460	4.465	4.470	4.475	4.480	4.485	4.490	4.495	4.500	4.505	4.510	4.515	4.520	4.525	4.530	4.535	4.540	4.545	4.550	4.555	4.560	4.565	4.570	4.575	4.580	4.585	4.590	4.595	4.600	4.605	4.610	4.615	4.620	4.625	4.630	4.635	4.640	4.645	4.650	4.655	4.660	4.665	4.670	4.675	4.680	4.685	4.690	4.695	4.700	4.705	4.710	4.715	4.720	4.725	4.730	4.735	4.740	4.745	4.750	4.755	4.760	4.765	4.770	4.775	4.780	4.785	4.790	4.795	4.800	4.805	4.810	4.815	4.820	4.825	4.830	4.835	4.840	4.845	4.850	4.855	4.860	4.865	4.870	4.875	4.880	4.885	4.890	4.895	4.900	4.905	4.910	4.915	4.920	4.925	4.930	4.935	4.940	4.945	4.950	4.955	4.960	4.965	4.970	4.975	4.980	4.985	4.990	4.995	5.000	5.005	5.010	5.015	5.020	5.025	5.030	5.035	5.040	5.045	5.050	5.055	5.060	5.065	5.070	5.075	5.080	5.085	5.090	5.095	5.100	5.105	5.110	5.115	5.120	5.125	5.130	5.135	5.140	5.145	5.150	5.155	5.160	5.165	5.170	5.175	5.180	5.185	5.190	5.195	5.200	5.205	5.210	5.215	5.220	5.225	5.230	5.235	5.240	5.245	5.250	5.255	5.260	5.265	5.270	5.275	5.280	5.285	5.290	5.295	5.300	5.305	5.310	5.315	5.320	5.325	5.330	5.335	5.340	5.345	5.350	5.355	5.360	5.365	5.370	5.375	5.380	5.385	5.390	5.395	5.400	5.405	5.410	5.415	5.420	5.425	5.430	5.435	5.440	5.445	5.450	5.455	5.460	5.465	5.470	5.475	5.480	5.485	5.490	5.495	5.500	5.505	5.510	5.515	5.520	5.525	5.530	5.535	5.540	5.545	5.550	5.555	5.560	5.565	5.570	5.575	5.580	5.585	5.590	5.595	5.600	5.605	5.610	5.615	5.620	5.625	5.630	5.635	5.640	5.645	5.650	5.655	5.660	5.665	5.670	5.675	5.680	5.685	5.690	5.695	5.700	5.705	5.710	5.715	5.720	5.725	5.730	5.735	5.740	5.745	5.750	5.755	5.760	5.765	5.770	5.775	5.780	5.785	5.790	5.795	5.800	5.805	5.810	5.815	5.820	5.825	5.830	5.835	5.840	5.845	5.850	5.855	5.860	5.865	5.870	5.875	5.880	5.885	5.890	5.895	5.900	5.905	5.910	5.915	5.920	5.925	5.930	5.935	5.940	5.945	5.950	5.955	5.960	5.965	5.970	5.975	5.980	5.985	5.990	5.995	6.000	6.005	6.010	6.015	6.020	6.025	6.030	6.035	6.040	6.045	6.050	6.055	6.060	6.065	6.070	6.075	6.080	6.085	6.090	6.095	6.100	6.105	6.110	6.115	6.120	6.125	6.130	6.135	6.140	6.145	6.150	6.155	6.160	6.165

Inskrivning av elever och studenter:

Orbits: 0, 15, 25, 25mm (0.0006 - 0.0016 g.)

Example: Set A 2800 super shim is installed and the measured clearance is 0.450 mm.
Replace the 2800 with a 2805 shim with a clearance of 0.550 mm.

Spine thicknesses mm (in.)

Shim No.	Thickness	Shim No.	Thickness
02 2.5600 (0.1024)	04 2.9520 (0.1161)	12 2.5600 (0.1161)	
04 2.5600 (0.1024)	06 2.7040 (0.1081)	14 2.6080 (0.1031)	
06 2.6400 (0.1043)	08 2.6080 (0.1031)	16 2.6080 (0.1031)	
08 2.6080 (0.1031)	10 2.6080 (0.1031)	18 2.6080 (0.1031)	
10 2.6080 (0.1031)	12 2.6080 (0.1031)	14 2.6080 (0.1031)	
14 2.6080 (0.1031)	16 2.6080 (0.1031)	18 2.6080 (0.1031)	
16 2.6080 (0.1031)	18 2.6080 (0.1031)		
18 2.6080 (0.1031)			

Adjusting Selection of Chate

EXHAUST

[illegible]

Exhaust valve clearance (cold):

0.20 0.30 mm (0.008 0.012 in.)

Example: A 2,800 mm shim is installed inside the guña de 2,500 mm and the measured clearance is 0.450 mm.

**Replace the 2.800 mm shim
with shim No. 22 (3.000 mm).**

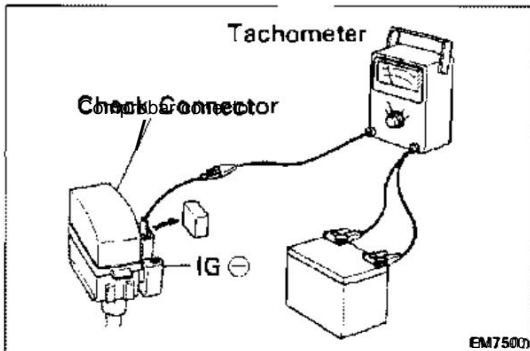
Expressões de sua mm (in) m (in)

Shim No.	Thickness	Shim No.	Thickness
02	2.500 (0.084 284)	20	2.950 (0.091 161)
04	2.550 (0.084 204)	22	3.000 (0.101 201)
06	2.600 (0.102 224)	24	3.050 (0.120 201)
08	2.650 (0.103 243)	26	3.100 (0.122 20)
10	2.700 (0.103 283)	28	3.150 (0.124 00)
12	2.750 (0.108 01)	30	3.200 (0.126 0)
14	2.800 (0.111 02)	32	3.250 (0.128 0)
16	2.850 (0.122)	34	3.300 (0.129 9)
18	2.900 (0.1142)		

INSPECTION AND ADJUSTMENT OF IGNITION TIMING

1. WARM UP ENGINE

Allow the engine to reach normal operating temperature.



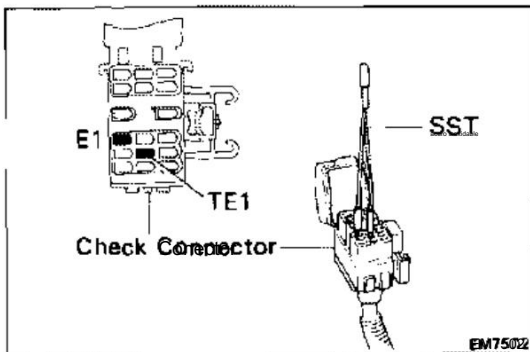
2. CONNECT TACHOMETER

Connect the test probe of a tachometer to terminal IG of the check connector.

LOCATION: See page 8F-133

NOTICE:

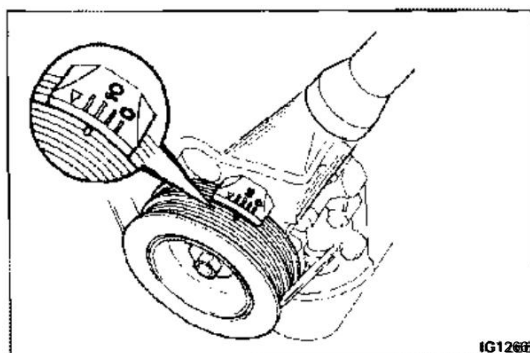
- NEVER allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.
- Some tachometers are not compatible with this ignition system. We recommend that you confirm the compatibility of the tachometer before use.



3. INSPECT AND ADJUST IGNITION TIMING

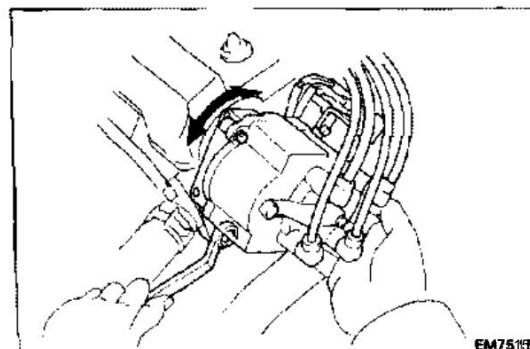
(a) Using SST, connect terminals TE1 and E1 of the check connector.

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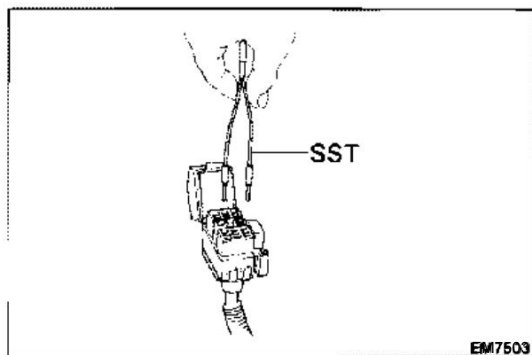
(b) Using a timing light, check the ignition timing.

Ignition timing: 10° BTDC @ idle
(Transmission in neutral range)

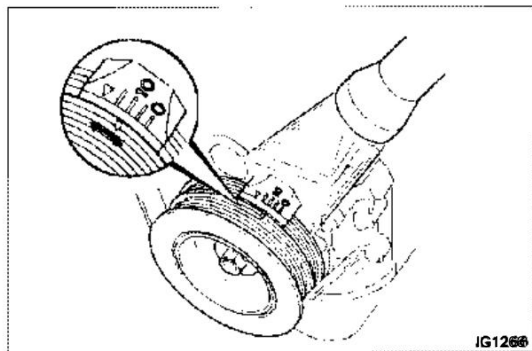


If necessary, loosen the distributor bolts and turn the distributor to correct the timing after tightening the distributor bolts.

Torque: 2.00 kg·cm (14 ft·lb, 20 N·m)



EM7503



JG1266

4. VERIFICAR EL TIEMPO DE ENCENDIDO

(a) Retirar el SST del conector del vehículo.

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(b) Verificar el tiempo de encendido.

Ignition timing: 5-15° BTDC @ idle

(Transmission in neutral range)

ENGINE idling gradually increase in average between 5° to 15°.

5. DESCONECTAR EL TACÓMETRO Y EL LUMEN DEL MOTOR

INSPECTION AND ADJUSTMENT OF IDLE SPEED (w/ TWG)

VELOCIDAD DE RALENTÍ (con TWG)

1. CONDITIONS

- (a) Air cleaner installed
- (b) Normal engine operating temperature
- (c) All pipes and hoses of air induction system connected
- (d) All vacuum lines connected
- HINT** All vacuum hoses for EGR systems, etc. should be properly connected.
- (e) All accessories switched off
- (f) EFI system wiring connectors fully plugged
- (g) Ignition timing set correctly
- (h) Transmission in "neutral" range

2. WARM UP ENGINE

Allow the engine to reach normal operating temperature.

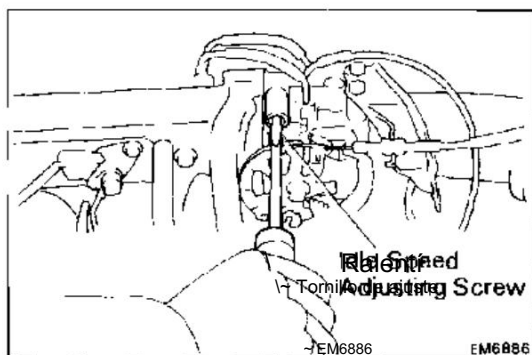
3. CONNECT TACHOMETER (See page EM-20)

4. CHECK AIR VALVE OPERATION (See page FI-131)

5. INSPECT AND ADJUST IDLE SPEED

Idle speed: 800 rpm (w/ Cooling fan OFF)

If not as specified, adjust the idle speed by turning the IDLE SPEED ADJUSTING SCREW.



INSPECTION AND ADJUSTMENT OF IDLE SPEED AND IDLE MIXTURE (w/ L TWC)

1. INITIAL CONDITIONS

- Filter and air cleaner installed
- Normal engine operating temperature
- All pipes and hoses of air induction system connected
- All accessories switched off
- EFI system wiring connectors fully plugged
- Ignition timing set correctly
- Transmission in "neutral" range
- H/C/CO meter operates normally

2. WARM UP ENGINE

Allow the engine to reach normal operating temperature.

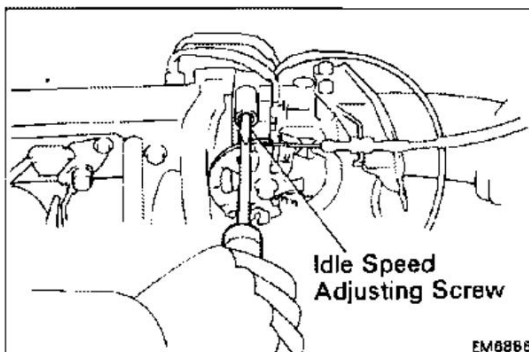
3. CONNECT TACHOMETER (See page EM-20)

4. CHECK AIR VALVE OPERATION (See page EM-13.1)

5. INSPECT AND ADJUST IDLE SPEED

Idle speed: **800 rpm (w/ Cooling fan OFF)**

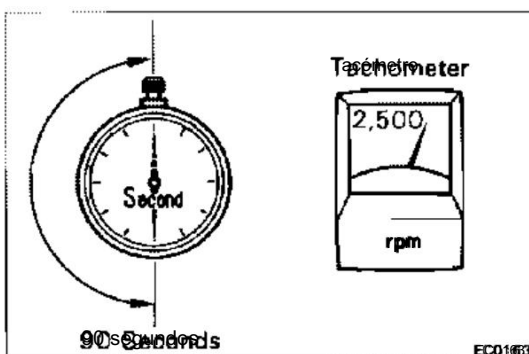
If not as specified, adjust the idle speed by turning the **IDLE SPEED ADJUSTING SCREW**.



6. ADJUST IDLE MIXTURE

NOTICE: Always use a H/C/CO meter when adjusting the idle mixture. It is not necessary to adjust with the idle mixture adjusting screw in most vehicles if they are in good condition. If a CO meter is not available, DO NOT ATTEMPT TO ADJUST IDLE MIXTURE.

- Run the engine at 2,500 rpm for approx. 90 seconds.

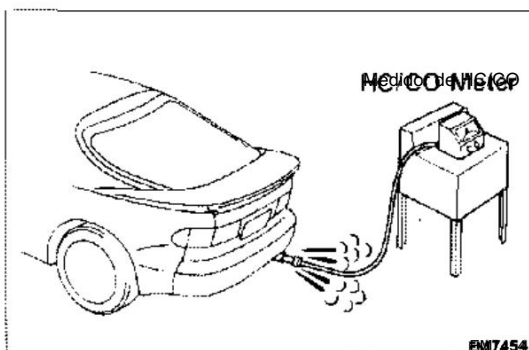


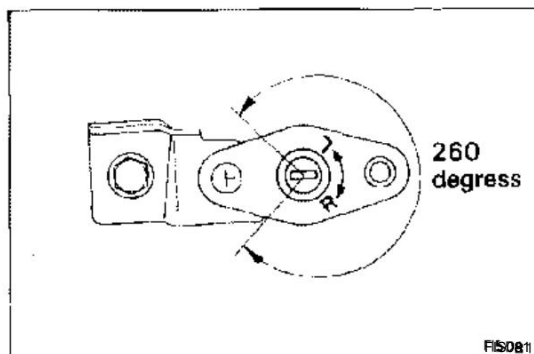
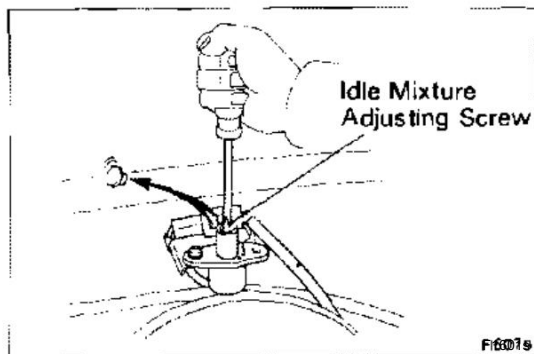
- Insert a testing probe at least 40 cm (1.3 ft) into the tailpipe.

- Measure the concentration 1-2 minutes after running the engine to allow the concentration to stabilize.

Idle CO concentration: **1.5 ± 0.5 %**

(w/ Cooling fan OFF)





If the CO concentration is not as specified, adjust the idle mixture by turning the IDLE MIXTURE ADJUSTING SCREW in the variable resistor.

- If the concentration is within specification, this adjustment is complete.
- If the CO concentration cannot be corrected by idle mixture adjustment, see the table below for other possible causes.

NOTE: Always check the idle speed after turning the idle mixture adjusting screw. If it is incorrect, repeat steps 5 and 6.

Troubleshooting

HC	CO	Symptoms	CAUSES
High	Normal	Rough idle	1. Faulty ignition: • Incorrect timing • Broken or shorted or improper gap spark plugs • Open or crossed ignition wires • Cracked distributor cap 2. Incorrect valve clearance 3. Leaky EGR valve (w/ EGR system) 4. Leaky intake and exhaust valves 5. Liner for cylinder
High	Low	Rough idle (Fluctuating HC reading)	1. Vacuum leak: • Malfunctioning hose • Leaky EGR valve (w/ EGR system) • Intake manifold • PCV line • Throttle body • Cylinder head gasket • Broken booster line 2. Broken mixture or sensing idiosyncrasy
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Plugged PCV valve 3. Faulty EGR system • Faulty pressure regulator • Clogged fuel return line • Faulty vacuum sensor • Defective water temp sensor • Defective intake air temp sensor • Faulty ECU • Faulty injector • Faulty cold start injector • Faulty throttle position sensor

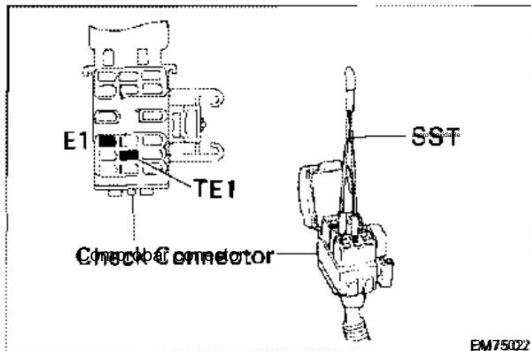
ENGINE MECHANICAL

IDLE HC/CO CONCENTRATION CHECK METHOD (w/ TWC)

HINT: This check is used only to determine whether or not the idle HC/CO complies with regulations.

1. INITIAL CONDITIONS

- Engine to reach normal operating temperature
- Air cleaner installed
- All pipes and hoses of air induction system connected
- All accessories switched off
- All vacuum lines properly connected
- All vacuum hoses for EGR systems etc. should be properly connected.
- EFI system wiring connectors fully plugged
- Ignition timing set correctly
- Transmission in neutral range
- Tachometer and HC/CO meter calibrated and at hand.



2. START ENGINE

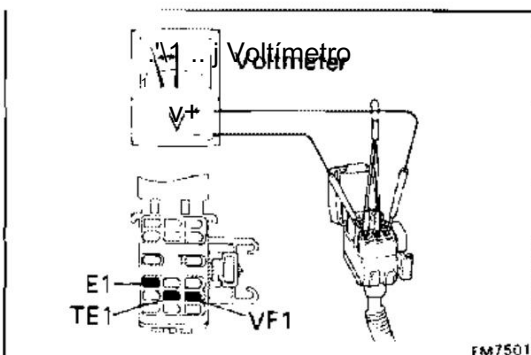
3. CHECK IDLE SPEED

Idle speed: 800 ± 50 rpm

4. CHECK OXYGEN SENSOR OPERATION

- Using SST, connect the terminal TE1 and E1 of the check connector.

SST: 09843-18020



- Connect the positive (+) probe of a voltmeter to terminal VF1 of the check connector and negative (-) probe to terminal E1.

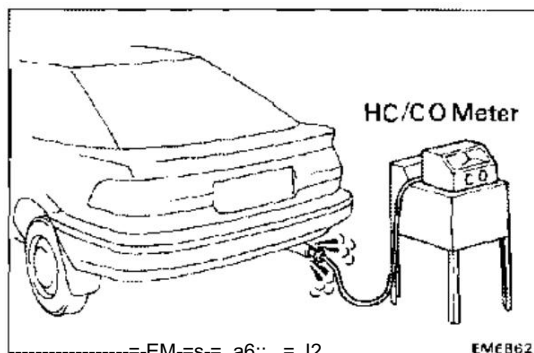
- Hold the engine speed at 2,500 rpm for approx. 90 seconds to warm up the oxygen sensor.

- Then, maintaining engine at 2,500 rpm, count how many times the needle of the voltmeter fluctuates between 0 and 5 V.

Minimum needle fluctuation:

4-8 times for every 10 seconds

If the fluctuation is less than minimum, check the air induction system. If necessary, see EFI SYSTEM.



FM-s- a6" = .12

EMER 62

5. ~~MOTOR CRANKS AT 2,500 RPM~~ **RACE ENGINE AT 2,500 RPM FOR APPROX. 120**
SECONDS

6. INSERT DO METER TESTING PROBE INTO TAILPIPE
AT LEAST 40 cm (1.3 ft)

7. COMPLETAR CONCENTRACIÓN DE LA DIFUSIÓN EN EL ENTÉ

Wait at least one minute before measuring to allow the concentration to stabilize. Complete the measuring within three minutes.

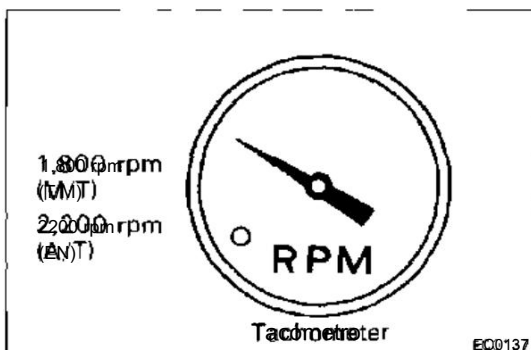
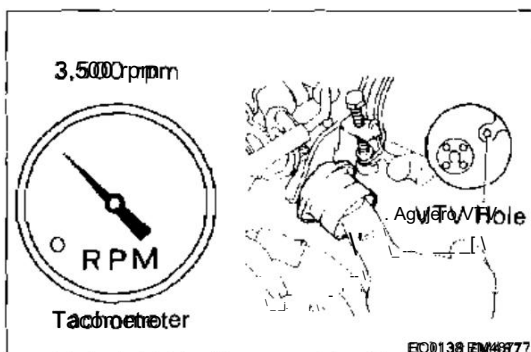
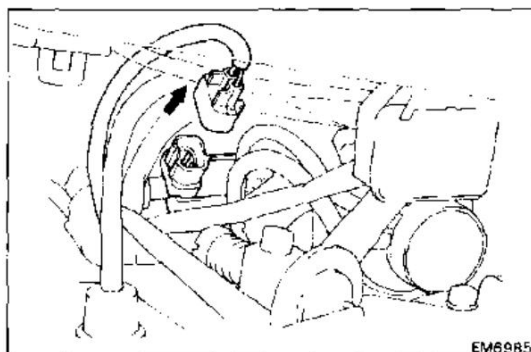
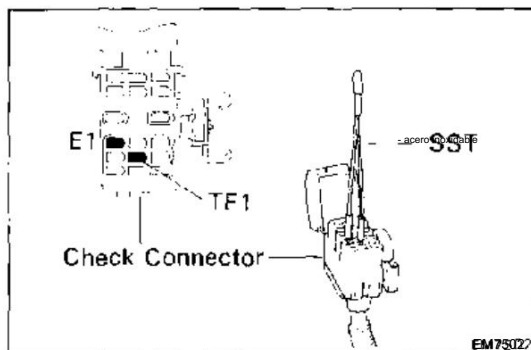
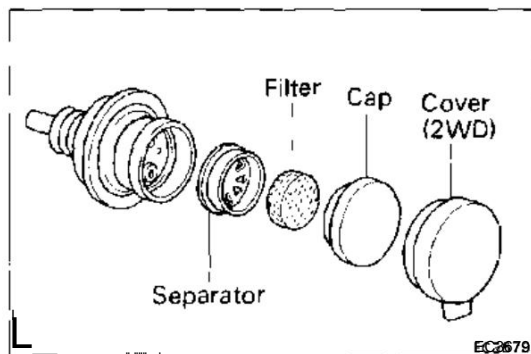
Idle CO concentration: 0 - 0.5 %

Verificación de refrigeración (OFF)

If the HC/CO concentration does not conform to regulations, see the table below for possible causes.

Troubles shooting

HC	CO	Symptoms	Causes
High	Normal	Rough idle	1. Faulty ignition: ● Short circuit timing ● Burned, shorted or improperly gapped plugs ● Open or crossed ignition wires ● Cracked I/A or distributor cap 2. Valve free valve clearance 3. Leaky EGR valve (w/ EGR system) 4. Leaky intake or exhaust valves 5. Leaky cylinder
High	Low	Rough idle (fluctuating HC reading)	1. Vacuum leak: ● Manifold hose ● Valve cover (w/ EGR system) ● Intake manifold ● Lip of PCV ● Throttle body ● Cylinder head gasket ● For broken thermostat 2. Poor lubrication causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Clogged air filter 2. Clogged PCV valve (I/A-FE) 3. Faulty EGR system ● Faulty pressure regulator 4. Clogged fuel or return line 5. Faulty main flow meter (w/ air flow meter) 6. Faulty air mass sensor (w/ air flow meter) 7. Defective temp. temp. sensor 8. Defective intake air temp. sensor 9. Faulty ECU 10. Faulty injector 11. Faulty cold start injector 12. Faulty throttle position sensor



INSPECTION AND ADJUSTMENT OF DASH POT (DP) SYSTEM (4A-FE)

1. CAUTION: WARM UP AND STOP ENGINE

Allow the engine to reach normal operating temperature.

2. CHECK IDLE SPEED (See page EM-22, 23)

COMPROBAR EL VELOCIDAD DE ROLLO (consulte la página EM-22-23)

3. REMOVE COVER (2WD), CAP, FILTER AND SEPARATOR FROM DP

4. ADJUST DP SETTING SPEED

(a) (2WD)

Using SST, connect terminals TF1 and E1 of the check connector.

SST 09843-9948-020

LOCATION: See page FI-133

(b) (2WD w/ EGR system)

Disconnect the check connector.

(c) Race the engine at 3,500 rpm for a few seconds.

Accelere el motor a 3,500 rpm durante unos segundos.

Plug the VTY hole with your finger.

(e) Release the throttle valve.

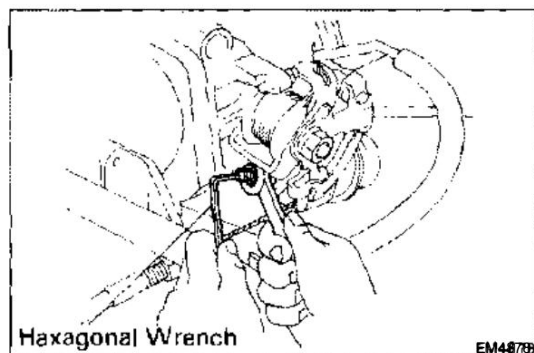
(f) Check the DP setting speed.

DP setting speed: 1,800rpm

(w/ Cooling fan OFF)

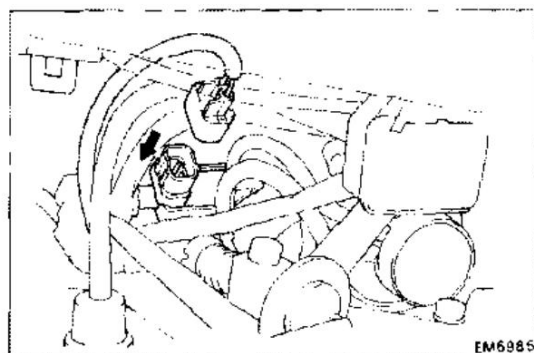
(con ventilador de refrigeración APAGADO)

EM 36 ENGINE MECHANICAL Inspection and Adjustment of Dash Pot (DP) System (4A-FE)

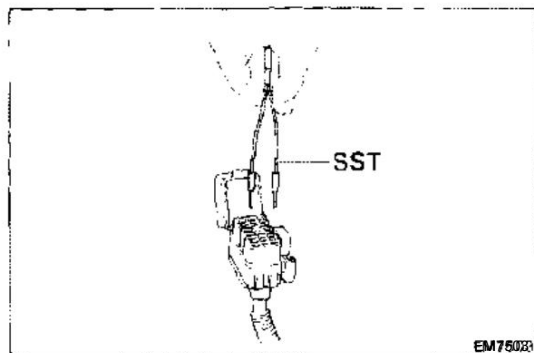


(g) Adjust the DP setting speed by turning the DP ADJUSTING SCREW.

(h) Repeat steps (a) to (c) to verify, compare and check the DP setting speed.

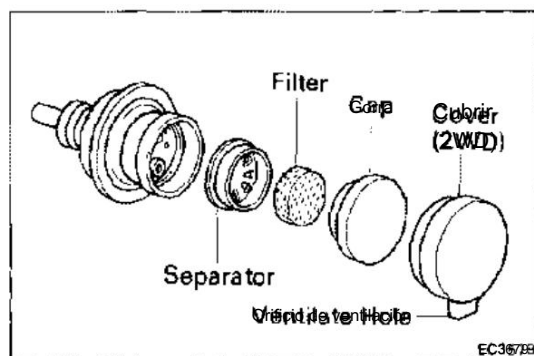


(i) (2WD system) Connect the 6V connector.



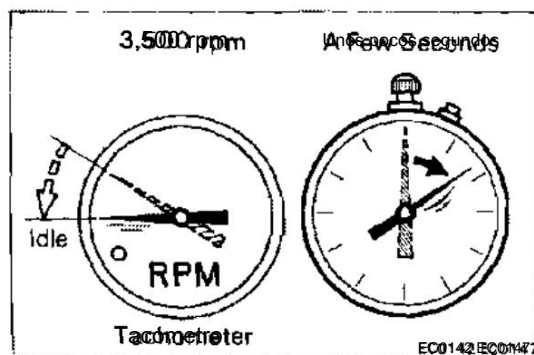
(j) (2WD) Remove SST from the connector.

SST 09843-8020



5. REINSTALL DP SEPARATOR, FILTER, CAP AND COVER (2WD)

NOTE: When installing the cover, install it with the ventilation holes below.



6. CHECK VTV OPERATION

Run the engine at 3,500 rpm for a few seconds, release the throttle valve and check that the engine returns to idle in a few seconds.

COMPRESSION CHECK

NOTE: If there is a lack of power, excessive oil consumption, poor fuel economy, or irregular pressure, the compression pressure.

1. WARM UP AND STOP ENGINE

2. DISCONNECT COLD START INJECTOR CONNECTOR

3. DISCONNECT DISTRIBUTOR CONNECTOR(S)

4. (4A-FE)

REMOVE FUEL CORD COVER

5. REMOVE SPARK PLUGS (See page IG-7, 11)

6. CHECK CYLINDER COMPRESSION PRESSURE

(a) Insert the compression gauge into the spark plug hole.

(b) Fully open the throttle.

(c) While cranking the engine, measure the compression pressure.

NOTE: Always use a fully charged battery to obtain engine speed of 2500 rpm or more.

(d) Repeat steps (a) through (c) for each cylinder.

NOTE: This measurement must be done in as short a time as possible.

Compression pressure:

4A-FE 13.5 kg/cm² (191 psi, 1920 kPa)

Minimum pressure:

10.0 kg/cm² (142 psi, 981 kPa)

Difference between each cylinder:

1.0 kg/cm² (14 psi, 98 kPa) or less

(e) If the cylinder compression is one or more cylinders low, add a small amount of engine oil into the cylinder through the spark plug hole and repeat steps (a) through (c) for the cylinder with low compression.

• If adding oil helps the compression, the chances are that the piston rings and/or cylinder bore are worn or damaged.

• If pressure stays low, the valve may be sticking or seating improperly, or there may be leakage past the gasket.

7. REINSTALL SPARK PLUGS (See page IG-8, 12)

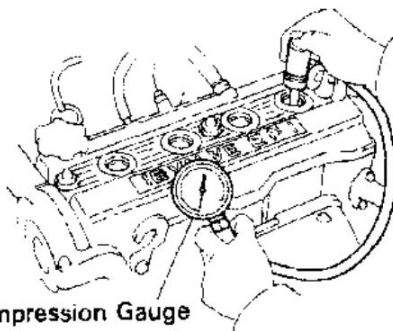
Torque 18.0 N·m (13 ft-lb) 18 N·m

8.

9. RECONNECT DISTRIBUTOR CONNECTOR(S)

10. RECONNECT COLD START INJECTOR CONNECTOR

4A-FE



Compression Gauge

TROUBLESHOOTING (4A-FE)**ENGINE OVERHEATING**

Problem	Possible cause	Remedy	Page
Engine overheats	Cooling system faulty	Troubleshoot cooling system	CO-44
	Incorrect ignition timing	Reset timing	EM-20

HARD STARTING

Problem	Possible cause	Remedy	Page
Engine will not crank or cranks slowly	Starting system faulty	Troubleshoot starting system	ST-2
Engine will not start/ Hard to start (cranks OK)	No fuel supply to carburetor	Troubleshoot EFI system	FL-110
	• No fuel in tank • Fuel pump not working • Fuel line clogged or leaking	Repairs necessary	IG-6
	EFI system problems	Repair as necessary	
	Ignition problems	Repair as necessary	
	• Ignition coil • Igniter • Distributor (IIA)	Repair as necessary	IG-7
	Spark plugs faulty	Inspect plugs	
	High tension cords disconnected or broken	Inspect cords	IG-7
	Vacuum leaks	Repairs necessary	EM-38
	• PCV line • EGR line (w/ EGR system) • Intake manifold • Throttle body • Brake booster line	Repairs necessary	
	Low compression	Check compression	

ROUGH IDLING

Problem	Possible cause	Remedy	Page
Rough idle, stalls or misses	Spark plugs faulty	Inspect plugs	IG-7
	High tension cords faulty	Inspect cords	IG-7
	Ignition wiring faulty	Inspect wiring	
	Ignition problems		
	● Ignition coil	Inspect coil	
	● Igniter	Inspect igniter	
	● Distributor (IIA)	Inspect IIA	
	Incorrect ignition timing	Reset timing	EM-20
	Incorrect valve clearance	Adjust valve clearance	EM-16
	Fuel system problems		
	Vacuum leaks	Repairs necessary	
	● PCV line		
	● EGR line (w/ EGR system)		
	● Intake manifold		
	● Throttle body		
	● Brake booster line		
	Incorrect idle speed	Adjust idle speed	EM-22, 23
	Efficiency problems	Repairs necessary	
	EGR valve faulty (w/ EGR system)	Check EGR valve	
	Engine overheats	Check cooling system	
	Low compression	Check compression	EM-38

ENGINE HESITATES/POOR ACCELERATION

Problem	Possible cause	Remedy	Page
Engine hesitates/ poor acceleration	Spark plugs faulty	Inspect plugs	16-77
	High tension cords faulty	Inspect cords	16-77
	Vacuum leaks	Repairs as necessary	
	● PCV line		
	● EGR line (w/ EGR system)		
	● Intake manifold		
	● Throttle body		
	● Brake booster line		
	Incorrect ignition timing	Reset timing	EM-20
	Incorrect valve clearance	Adjust valve clearance	EM-16
	Fuel system clogged	Check fuel system	
	Air cleaner clogged	Check air filter	EM-15
	EFI system problems	Repairs as necessary	
	Engine overheats	Check cooling system	C0-44
	Low compression	Check compression	EM-38

ENGINE DIESELING

Problem	Possible cause	Remedy	Page
Engine dieseling (runs after ignition switch is turned off)	EFI system problems	Repairs as necessary	
	Incorrect ignition timing	Reset timing	EM-20
	EGR system faulty (w/ EGR system)	Check EGR system	

AFTER FIRE, BACKFIRE

Problem	Possible cause	Remedy	Page
Muffler explosion (after fire) on deceleration only	Deceleration fuel cut system always off DP system always off	Check fuel cut system Check DP system	
Muffler explosion (after fire) all the time	Air cleaner clogged EFI system problem Incorrect ignition timing Incorrect valve clearance	Check air cleaner Repair as necessary Reset timing Adjust valve clearance	EM-15 EM-20 EM-16
Engine backfires	EFI system problem Vacuum leak • MAP hoses • Intake manifold • Throttle body • Brake booster line Insufficient fuel flow Incorrect ignition timing Incorrect valve clearance Carbon deposits in combustion chambers	Repair as necessary Check hoses and repair as necessary Troubleshoot fuel system Reset timing Adjust valve clearance Inspect cylinder head	 EM-20 EM-16 EM-68

EXCESSIVE OIL CONSUMPTION

Problem	Possible cause	Remedy	Page
Excessive oil consumption	Oil leak PCV line clogged Piston rings worn or damaged Valve stem and guide bushing worn Valve stem oil seal worn or damaged	Repair as necessary Check PCV system Check rings Check valves and guide bushings Check oil seals	EM-130 EM-70

POOR GASOLINE MILEAGE

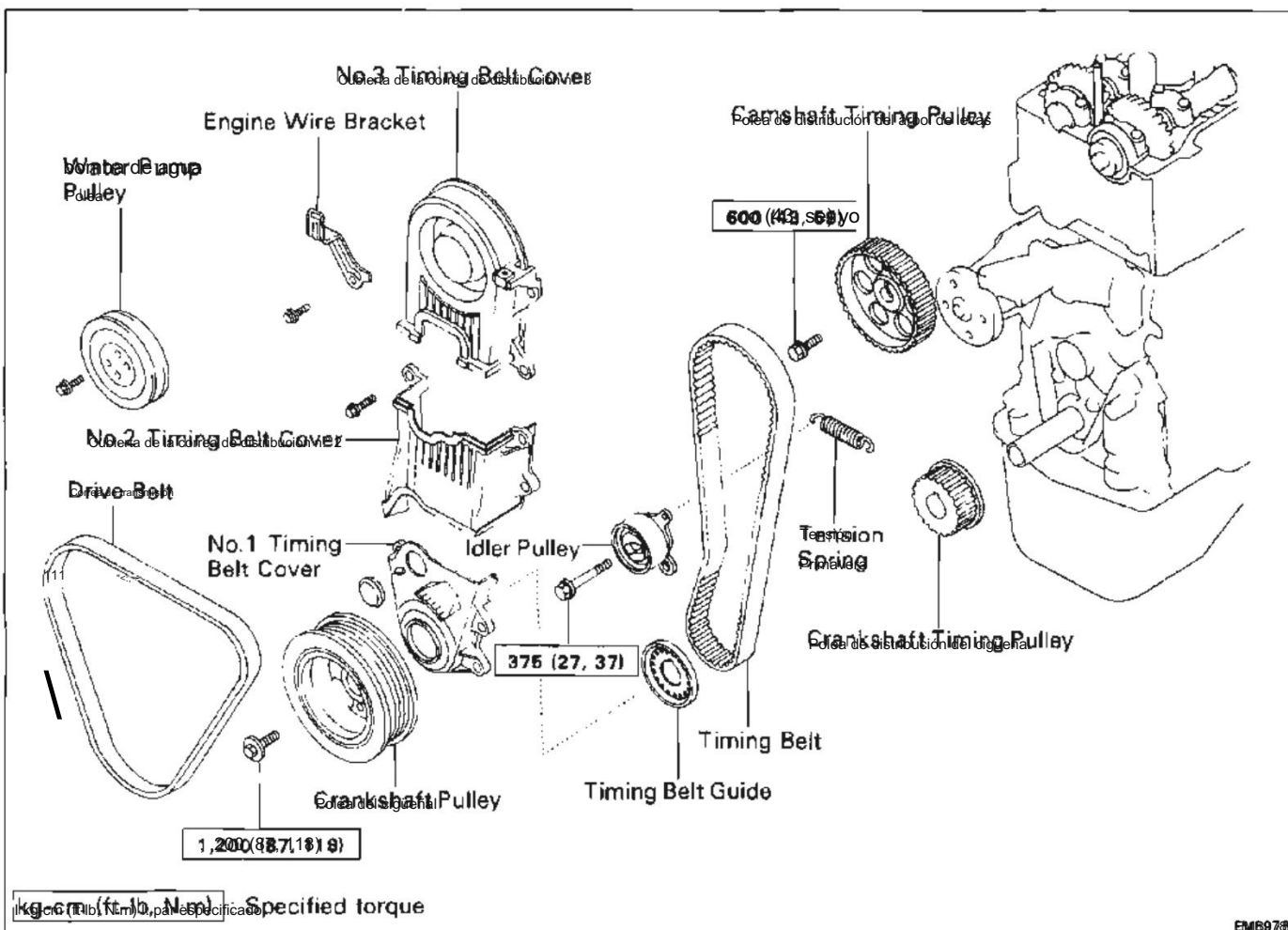
Problem	Possible cause	Remedy	Page
Poor gasoline mileage	Fuel leak	Repair as necessary	EM-20
	Air cleaner clogged	Check air cleaner	
	Incorrect ignition timing	Reset timing	
	EFI system problems	Repair as necessary	
	● Injector faulty		EM-22, 23 IG-7
	● Deceleration fuel cut system faulty		
	Idle speed too high	Adjust idle speed	
	Spark plugs faulty	Inspect plugs	
	EGR system always on (w/ EGR system)	Check EGR system	EM-38
	Low compression	Check compression	
	Tires improperly inflated	Inflate tires to proper pressure	
	Clutch slips	Troubleshoot clutch	
	Brakes drag	Troubleshoot brakes	

UNPLEASANT ODOR

Problem	Possible cause	Remedy	Page
Unpleasant odor	Incorrect idle speed	Adjust idle speed	EM-22, 23
	Incorrect ignition timing	Reset timing	
	Vacuum leaks	Repair as necessary	EM-20
	● PCV line		
	● EGR line (w/ EGR system)		
	● Intake manifold		
	● Throttle body		
	● Brake booster line		
	EFI system problems	Repair as necessary	

TIMING BELT (4A-FE)

COMPONENT



REMOVAL OF TIMING BELT

1. REMOVE DRIVE BELT AND WATER PUMP PULLEY

2. REMOVE SPARK PLUGS (See page IG-7)

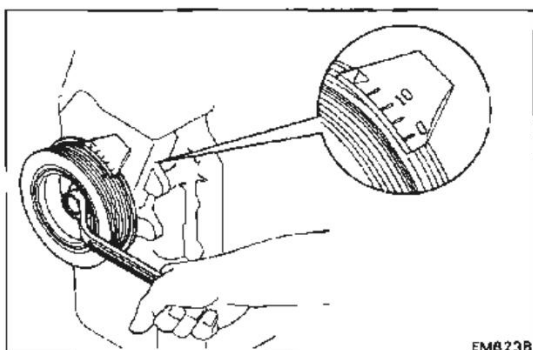
3. REMOVE CYLINDER HEAD COVER
(See steps 8 and 12 on pages 6M-60 and 62)

4. SET NO. 1 CYLINDER TO TOP DEAD CENTER (TDC)

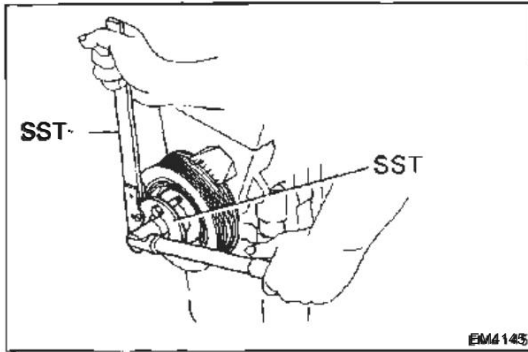
(a) Turn the crankshaft pulley and align its groove with the timing mark of the No. 1 timing belt cover.

(b) Check that the hole of the camshaft timing pulley is aligned with the timing mark of the bearing cap.

Then turn the crankshaft one revolution (360°).



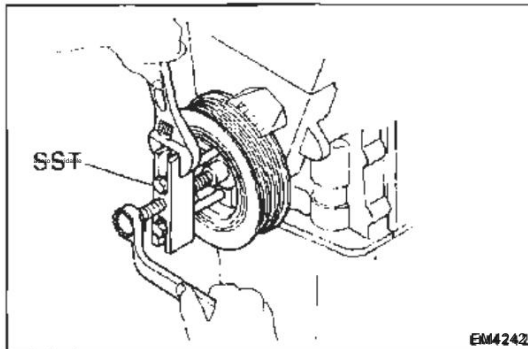
EM6238



5. REMOVE CRANKSHAFT PULLEY

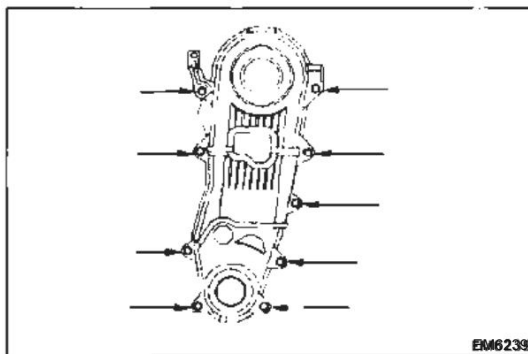
- (a) Using SST, hold the crankshaft pulley, remove the pulley bolt.

SST 09321-10140, 09330-00021



- (b) Using SST, remove the pulley.

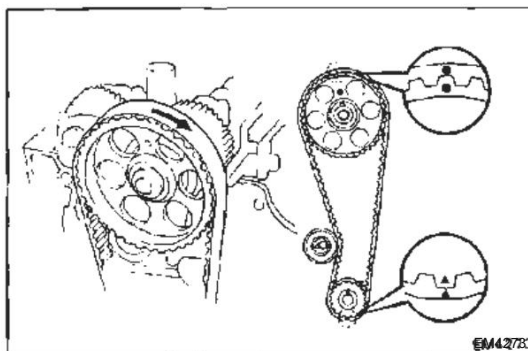
SST 09213-33101



6. REMOVE TIMING BELT COVERS

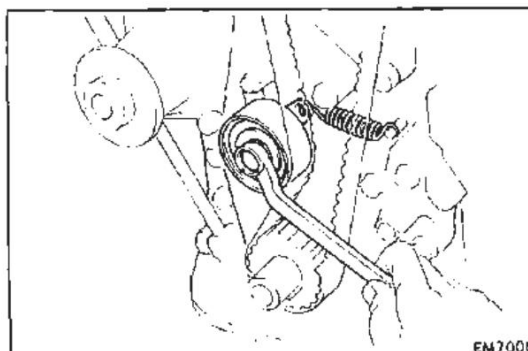
- Remove the pins, bolts, engine wire bracket, and timing belt covers.

7. REMOVE TIMING BELT GUIDE



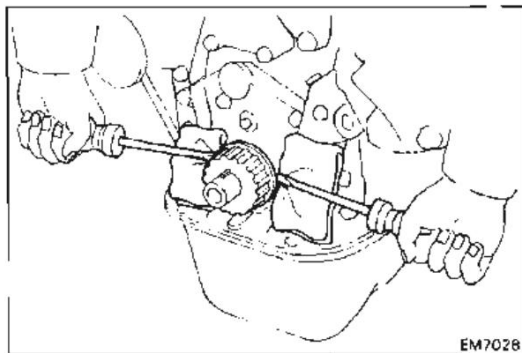
8. REMOVE TIMING BELT AND IDLER PULLEY

- OBSERVATION:** Using the timing belt, draw a direction arrow on the belt in the direction of engine revolution, and place matchmarks on the pulleys as shown in the illustration.



- (a) Remove the idler pulley and tension spring.

- (b) Remove the belt.

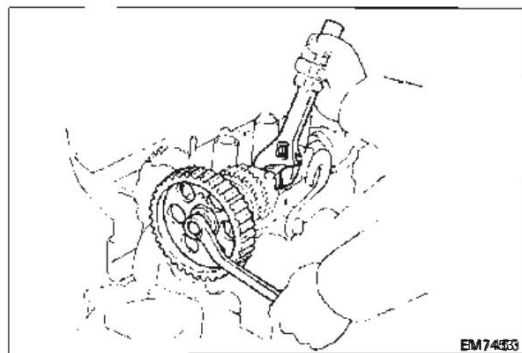


EM7028

9. EXTERIOR REMOVE CRANKSHAFT TIMING PULLEY

If the pulley cannot be removed by hand, use two screwdrivers.

NOTICE Position shop tags as shown to prevent damage.

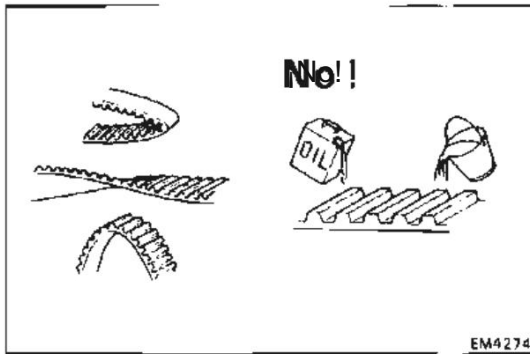


EM7433

10. EXTERIOR REMOVE CAMSHAFT TIMING PULLEY

Hold the personal head crank position of the camshaft with a wrench and remove the bolt and timing pulley.

NOTICE Be careful not to damage the cylinder head with the wrench.



INSPECTION OF TIMING COMPONENTS

1. INSPECT CORRECT TIMING BELT

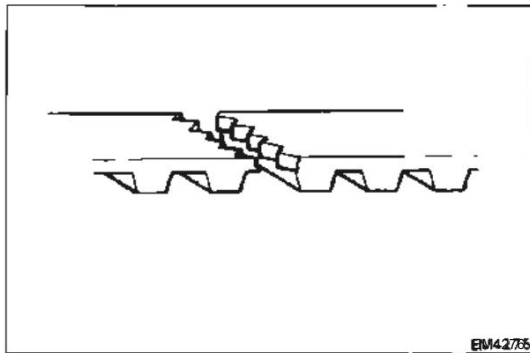
NOTICE:

- Do not bend or twist the timing belt. Take the timing belt inside out.
- Do not allow the timing belt to come in contact with the oil, water, or steam.
- Do not use a timing belt with a tensioner when installing or removing the motor and pulley. Do not use a timing belt with a tensioner.

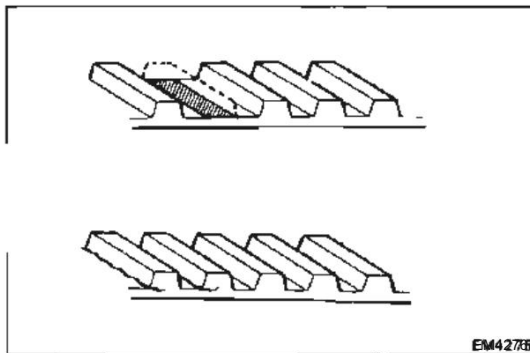
If there are any defects as shown in the illustrations, check the following points:

(a) Premature splitting

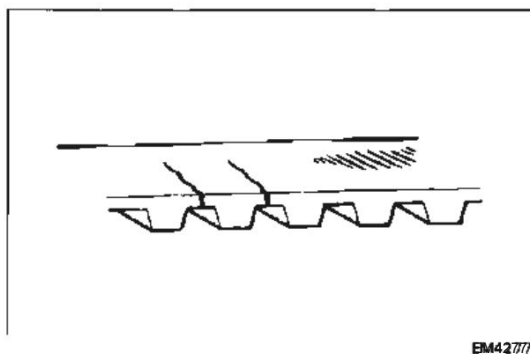
- Check the proper installation.
- Check the timing cover gasket for damage and proper installation.



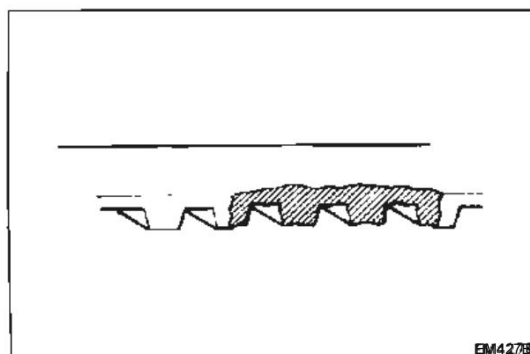
- (b) If the belt teeth are cracked or damaged, check to see if the camshaft or water pump is locked.



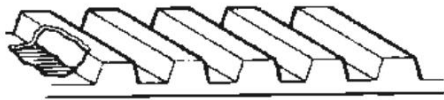
- (c) If the timing belt has a crack or a crack on the belt face, either in the middle or on one side of the idler pulley, check the belt guide and the alignment of each pulley.



- (d) If there is no damage on only one side of the belt, check the belt guide and the alignment of each pulley.



RETTESER



EM4279

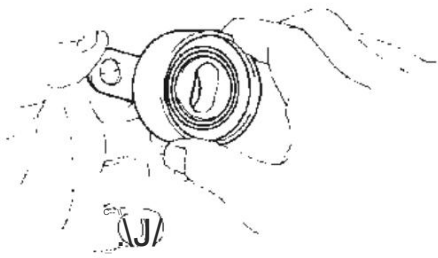
- (e) If there is significant wear on the belt teeth, check the timing cover for damage and check for contact gasket installation and for foreign material on the pulley teeth.

If necessary, replace the timing belt.

2. INSPECT IDLER PULLEY

Check the turning smoothness of the idler pulley.

If necessary, replace the idler pulley.



EM4280

3. INSPECT TENSION SPRING

- (a) Measure the free length of the tension spring.

Free length: 38.4 mm (1.512 in.)

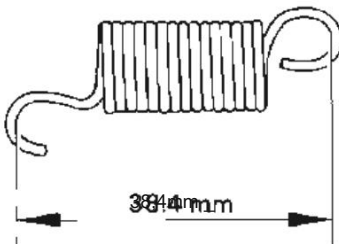
If the free length is not as specified, replace the tension spring.

- (b) Measure the tension of the tension spring at the specified installed length.

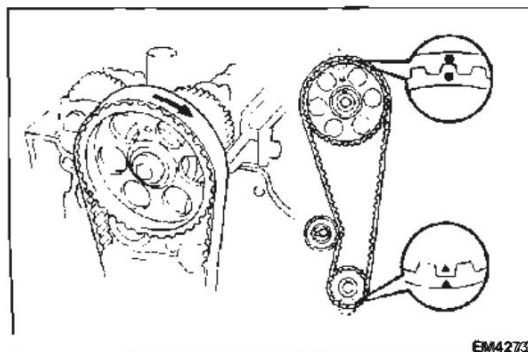
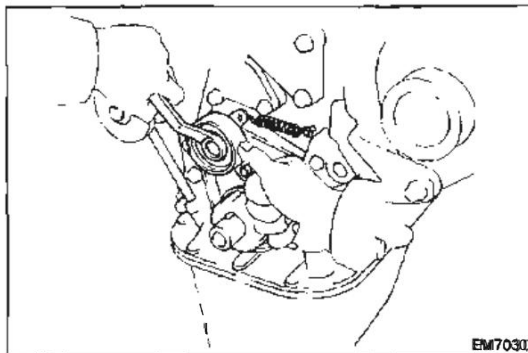
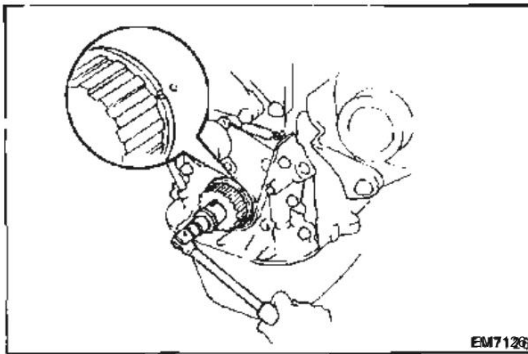
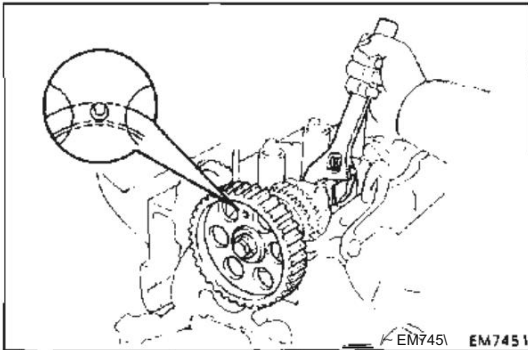
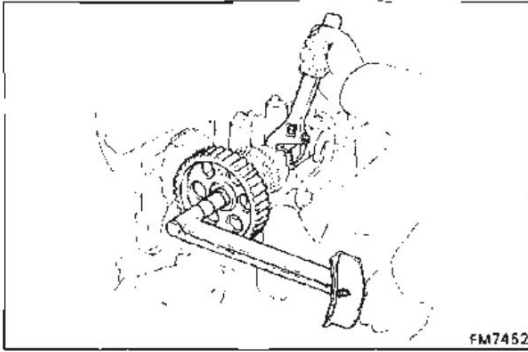
Installed length:

2.6 kg (5.7 lb), 7.9 N (1.77 lbf) at 50.2 mm (1.976 in.)

If the tension is not as specified, replace the tension spring.



EM6995



INSTALLATION OF TIMING BELT

(See page EM-39)

1. INSTALL CAMSHAFT TIMING PULLEY

- Align the camshaft key with the key groove of the pulley, and slide on the pulley.
- Temporarily install the timing pulley bolt.
- Hold the hexagonal recessed portion of the camshaft with a wrench and tighten the timing pulley bolt.

Torque: 600 kg·cm (4.3 ft·lb, 59 N·m)

- Turn the hexagonal recessed portion of the camshaft and align the hole of the camshaft timing pulley with the timing mark of the bearing cap.

2. INSTALL CRANKSHAFT TIMING PULLEY

- Align the pulley key with the key groove of the pulley.
- Slide on the timing pulley, facing the flange side inward.
- Using the crankshaft pulley, hold the crankshaft and align the timing marks of the crankshaft timing pulley and the pump body.

3. INSTALL TENSION SPRING AND TENSION SPRING

- Install the tension pulley with the bolt. Do not tighten the bolt yet.
- Install the tension spring.
- Push the pulley toward the belt as far as it will go and tighten the bolt.

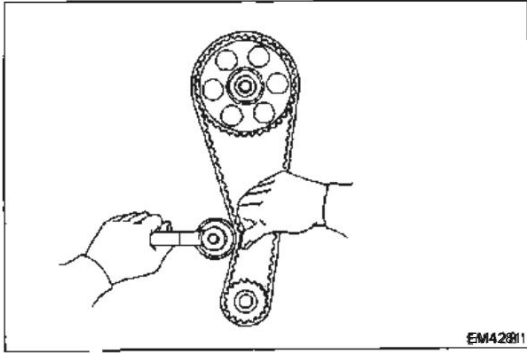
4. INSTALL TIMING BELT

NOTE: The tensioner is cold.

OBSERVATION: Using the timing belt, align the points marked during removal, and install the belt in the direction of engine rotation.

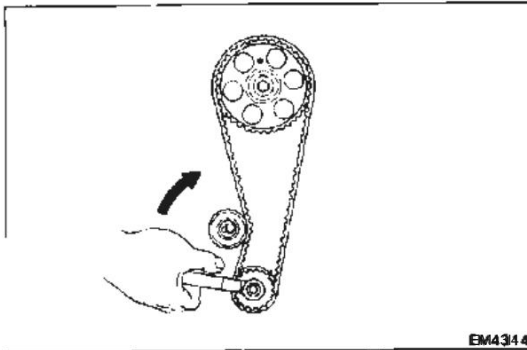
5. CHECK VALVE TIMING AND TIMING BELT TENSION

(a) Loosen the idle pulley bolt.



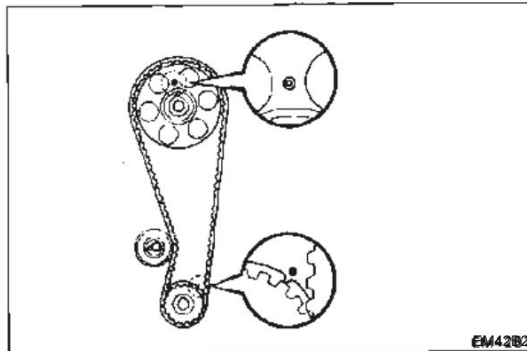
(b) Temporarily install the crank pulley bolt and turn the crankshaft two revolutions from TDC to TDC.

Always turn the crankshaft clockwise.



(c) Check the valve timing.

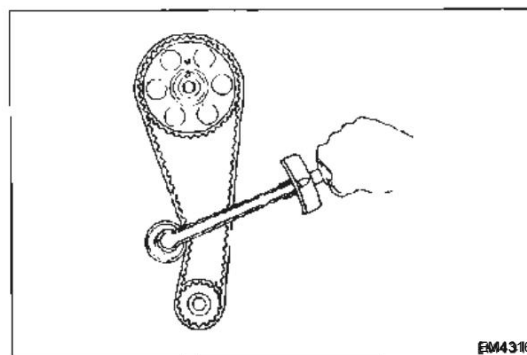
Ensure that each pulley aligns with the marks as shown in the illustration.



(d) Tighten the timing belt idle pulley mount bolt.

Torque: 37.5 kg-cm (2.7 ft-lb, 3.7 N-m)

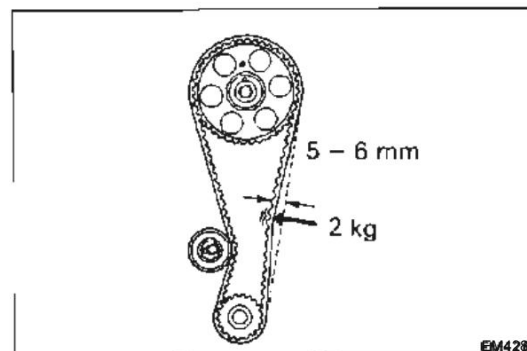
(e) Remove the temporarily installed crank pulley bolt.

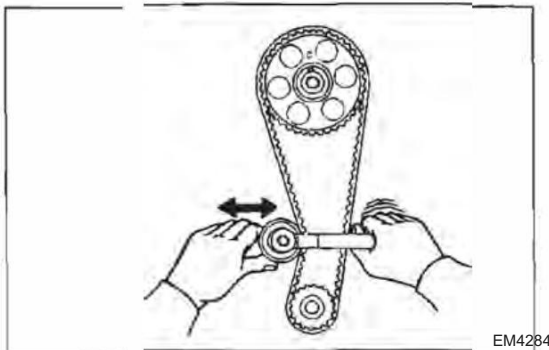


(Reference)

(a) Measure the timing belt deflection as shown in the illustration.

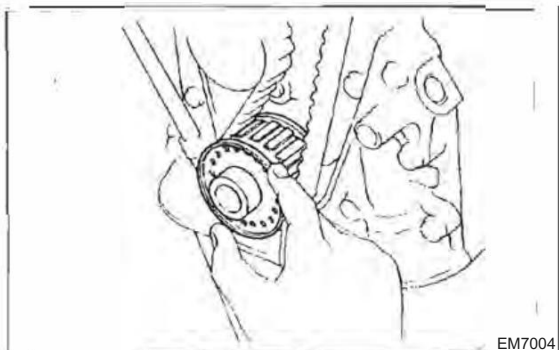
Deflection: 5 - 6 mm (0.20 in. - 0.24 in.)
4.2 kg (9.3 lb, 20 N)





EM4284

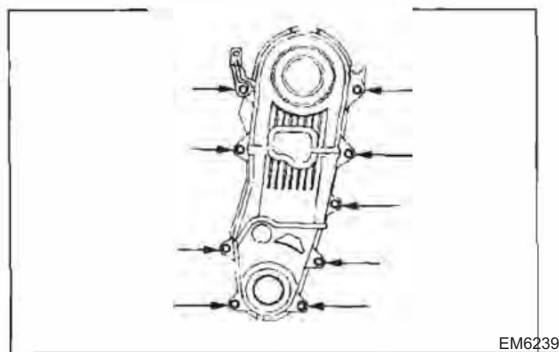
- (b) Si el valor medido no está dentro del estándar, vuelva a ajustar con la polea loca.



EM7004

6. INSTALE LA GUÍA DE LA CORREA DE DISTRIBUCIÓN

Instale la guía, con el lado de la copa hacia afuera.

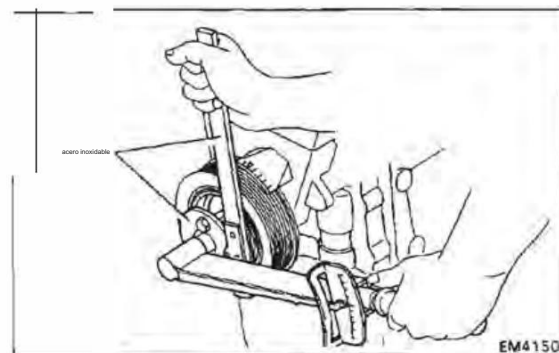


EM6239

7. INSTALE LAS CUBIERTAS DE LA CORREA DE DISTRIBUCIÓN

- (a) Instale la cubierta de la correa de distribución n° 1 con los tres pernos.
 (b) Instale las cubiertas de la correa de distribución n.º 2 y n.º 3 y el soporte de cables del motor con los seis pernos.

Torque: 80 kg-cm (69 in.-lb, 7.8 N·m)



EM4150

8. INSTALE LA PULLEY DEL EJE KS DE LA CRANÜA

- (a) Alinee la chaveta del juego de poleas con la ranura de chaveta del polea, deslice la polea.

- (b) Instale temporalmente el perno de la polea.

SST 09213-14010 y 09330-00021 Torsión: 1200

kg-cm {87 ft-lb, 118 N·m}

9. INSTALE LA CUBIERTA DE LA CULATA (Vea los pasos 14 y 18 en las páginas EM-86 y 88)

10. INSTALE LAS BUJÍAS (Consulte la página IG-8)

Torque: 180 kg-cm {13 ft-lb, 18 N·m}

11. INSTALE LA PULEVA DE LA BOMBA DE AGUA Y LA CORREA DE IMPULSIÓN

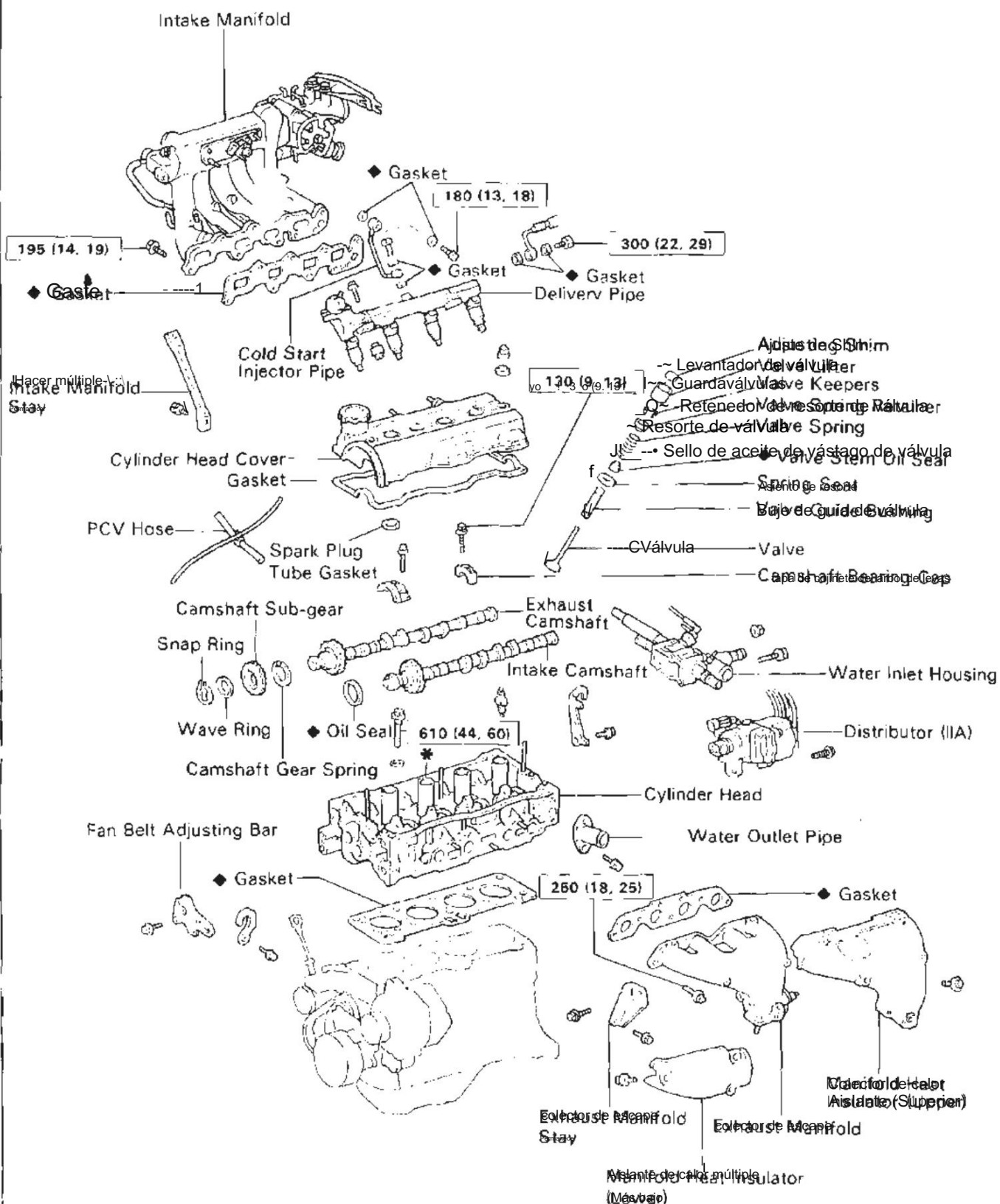
12. REVISE Y AJUSTE LA CORREA DE TRANSMISIÓN

(Vea el paso 3 en las páginas CH-3 y 4)

CYLINDER HEAD (4A-FE)

COMPONENTS

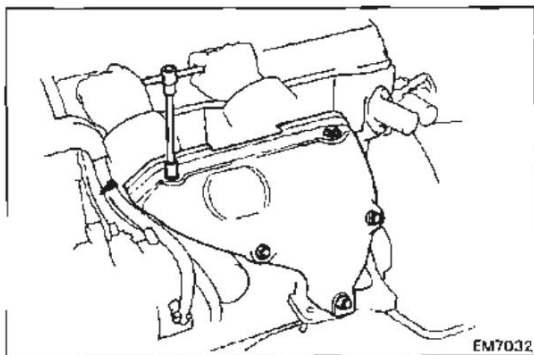
2WD



log-cft-lb, Nm, in-lb, or specified torque

◆ Part not available

* : No debe quitarse el tubo de la bujía



EM7032

REMOVAL OF CYLINDER HEAD

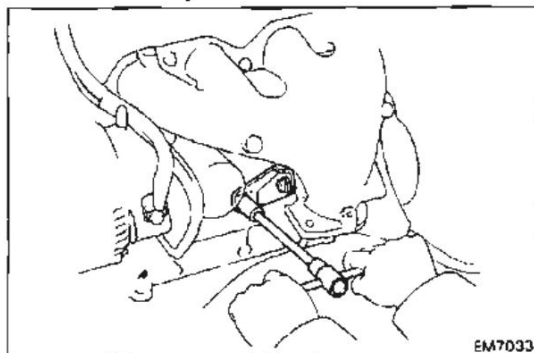
(See pages EM-56, 57)

1. REMOVE IIA

2. REMOVE EXHAUST MANIFOLD (2WD)

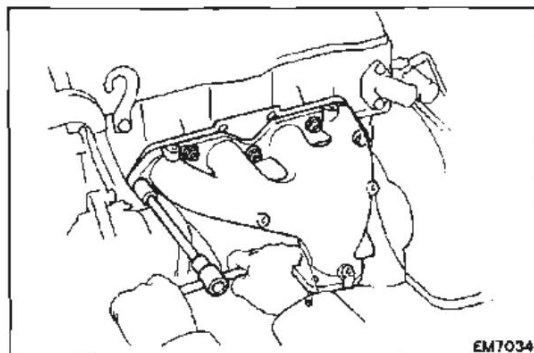
(a) Remove the five bolts and upper heat insulator.

(b) Remove the two bolts and manifold stay.



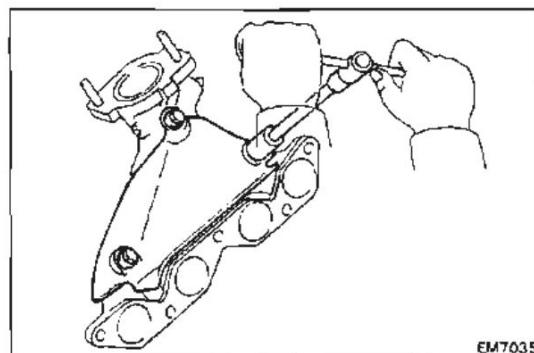
EM7033

(c) Remove the two bolts, three nuts, exhaust manifold and gasket.

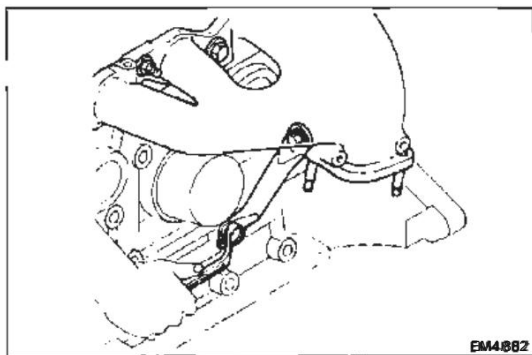


EM7034

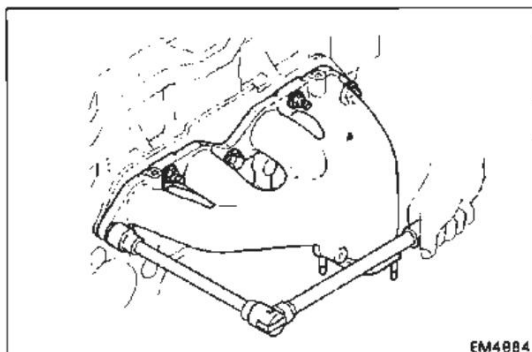
(d) Remove the three bolts and lower heat insulator from the exhaust manifold.



EM7035

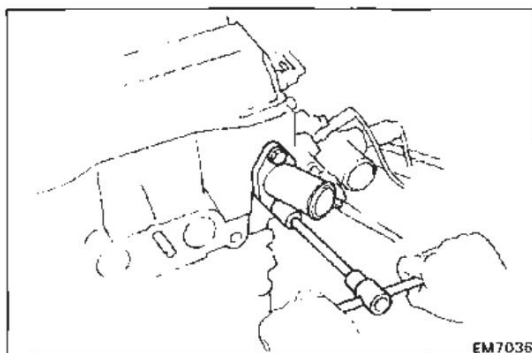


(b) Remove the two bolts and manifold stay.



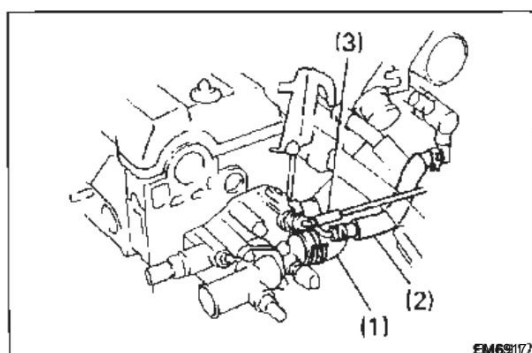
(c) Remove the three bolts, two nuts, manifold and gasket.

(d) Remove the three bolts and lower heat insulator from the exhaust manifold.



3. REMOVE WATER OUTLET

Remove the two bolts and water outlet.



4. REMOVE WATER INLET AND INLET HOUSING

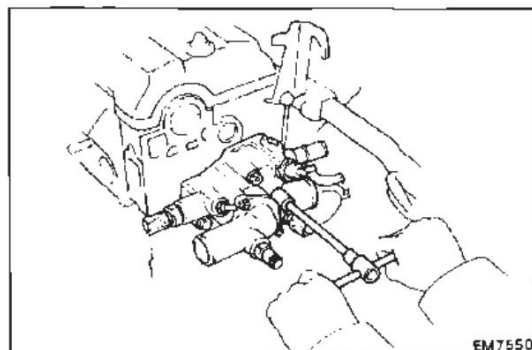
(a) Disconnect the following connectors:

- Water temperature sender gauge connector
- Water temperature sensor connector
- Start injector time switch connector

(b) Disconnect the following hoses:

- (1) Manifold water hose
- (2) Water by-pass hose
- (3) BVS/VAC vacuum hose(s)

(c) Remove the bolt, two nuts, the water inlet and inlet housing assembly.



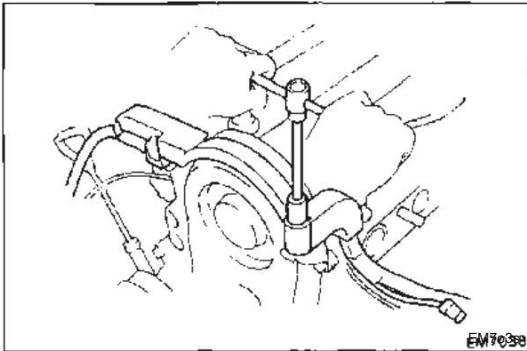
5. REMOVE COLD START INJECTOR PIPE

(See step 2 on page EM-105)

6. (4x4WD)

7. REMOVE DELIVERY PIPE AND INJECTORS
(See steps 3 to 6 and also pages EM-113, 114, 114)

8. DISCONNECT ENGINE WIRE FROM NO. 3 TIMING BELT COVER



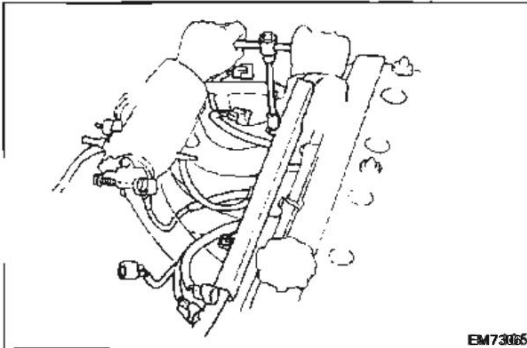
(a) Disconnect the following connectors and wire:

- Alternator connector
- Alternator wire
- Oil pressure switch connector

(b) Remove the bolt

(c) Disconnect the wire clamp from the wire bracket and disconnect the engine wire from the timing belt cover.

9. DISCONNECT ENGINE WIRE FROM INTAKE MANIFOLD



(a) Disconnect the following connectors:

- Throttle position sensor connector
- CVT valve selector
- (2WD system) EGR system
- EGR valve connector
- Cold start injector connector

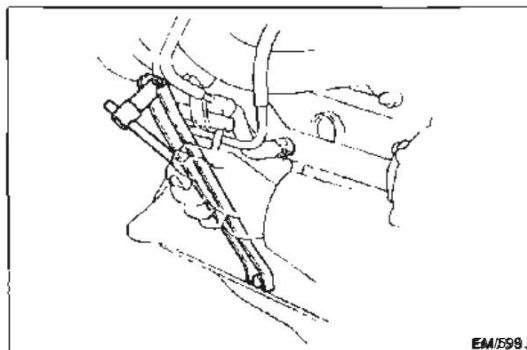
(b) Disconnect the wire clamp from the vacuum pipe.

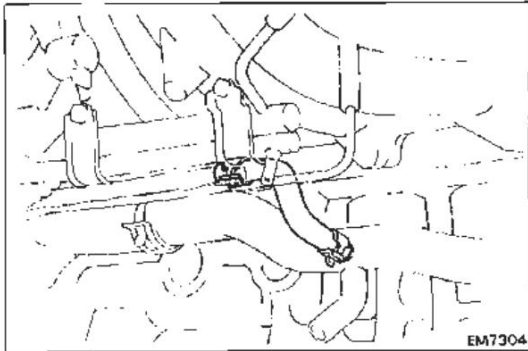
(c) Remove the three bolts, and disconnect the engine wire from the intake manifold.

10. (4x4WD)

11. REMOVE INTAKE MANIFOLD
(2WD)

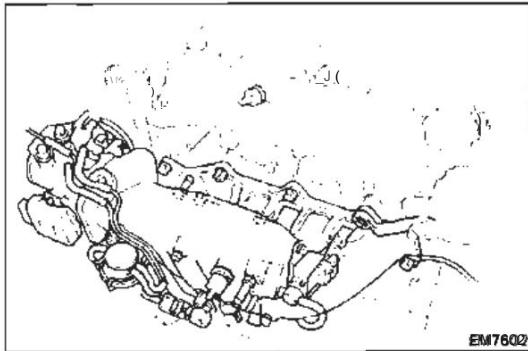
(a) Remove the two bolts and manifold stay.





EM7304

(b) Disconnect the water pump drive pulley from the drive pulley.

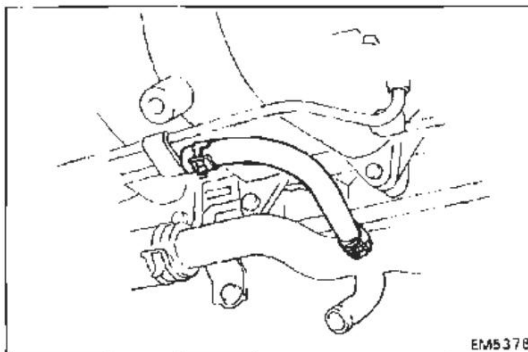


EM7602

(c) Remove the screws, seal the intake manifold, and remove the intake manifold and gasket.

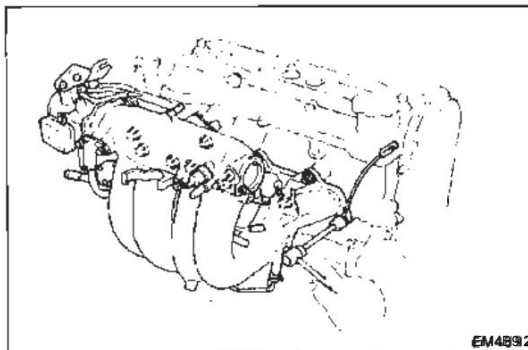
(4WD)

(g)



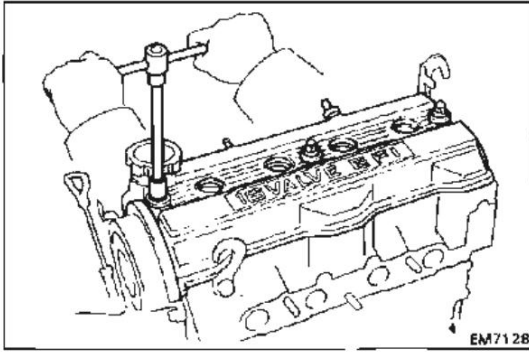
EM5378

(b) Disconnect the water pump drive pulley from the drive pulley.



EM4892

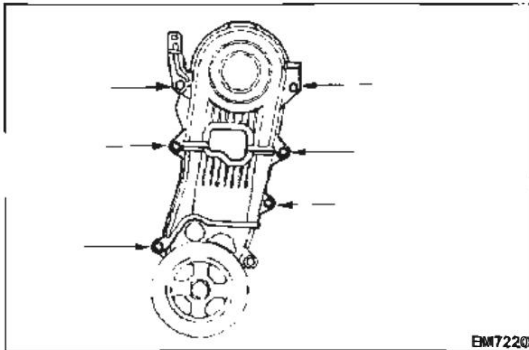
(c) Remove the screws, seal the intake manifold, and remove the intake manifold and gasket.



EM7128

12. REMOVE CYLINDER HEAD COVER

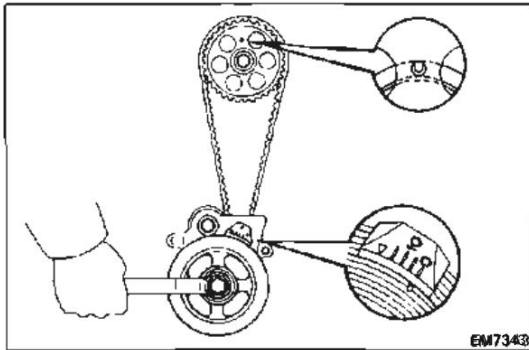
Remove the three cap nuts, grommets, head cover and gasket.
 Retire las tres tuercas de gas, los ojales, la tapa del cabezal y la junta.

13. REMOVE SEMICIRCULAR PLUG

EM7220

14. REMOVE NO. 3 AND NO. 2 TIMING BELT COVERS

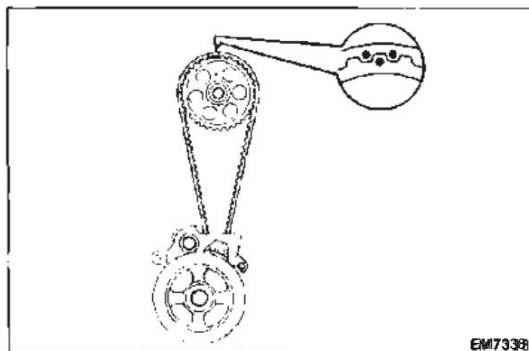
Remove the six bolts, engine wire bracket, No. 3 and No. 2 timing belt covers.
 Retire los seis tornillos, el soporte de cables de motor, las cubiertas de la correa de distribución n.º 3 y n.º 2.



EM7343

15. SET NO. 1 CYLINDER TO TDC/COMPRESSION

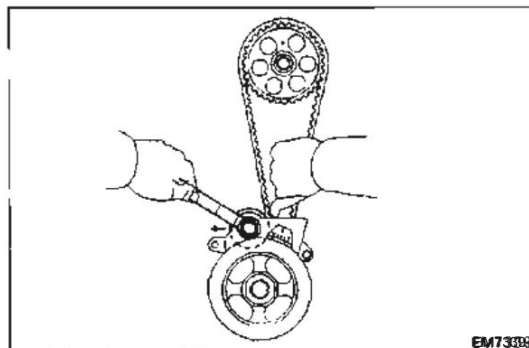
- Turn the crankshaft pulley and align its groove with the timing mark "Q" of the No. 1 timing belt cover.
 (a) Gire la polea del cigüeñal y alinee su ranura con la marca de distribución "Q" de la tapa de la correa de distribución n.º 1. (b) Compruebe que el centro de la polea de sincronización del árbol de levas esté alineado con la marca de sincronización de la tapa del cigüeñal.
 If not, turn the crankshaft one revolution (360°).
 Si no coincide, gíre el cigüeñal una vuelta (360°).



EM7338

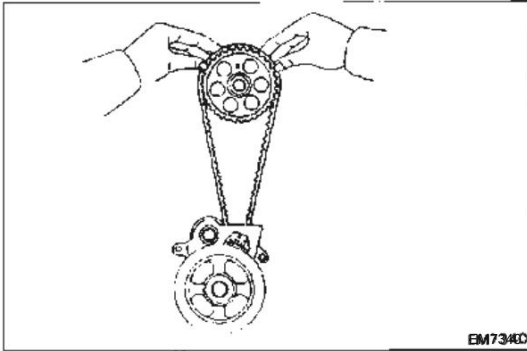
16. REMOVE TIMING BELT FROM CAMSHAFT TIMING PULLEY

- Remove the plug from the No. 1 timing belt cover.
 (a) Retire el tapón de la tapa de la correa de distribución n.º 1. (b) Coloque las marcas de coincidencia en la polea de distribución y el árbol de levas.
 Place match marks on the camshaft timing pulley and belt.



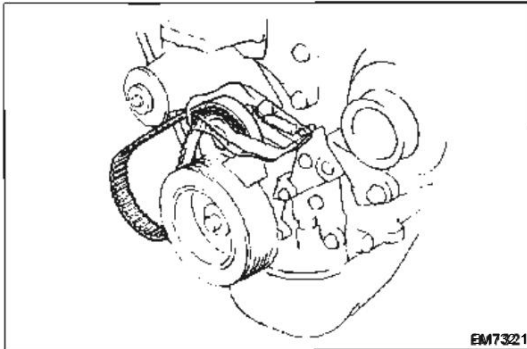
EM7339

- Loosen the idler pulley mount belt and push the idler pulley toward the left as far as it will go, then tighten it temporarily.
 Afloje el montaje del eje de la polea de levas y empuje la polea de levas hacia la izquierda tan lejos como sea posible, luego apriete la temporalmente.



EM7340

- (d) Remove the timing belt from the camshaft timing pulley.



EM7321

NOTICE:

Support the belt so that the meshing of the crankshaft timing pulley and timing belt does not shift.

- Be careful not to drop anything inside the timing belt cover.
- Do not allow the belt to come in contact with oil, water or dust.

17. REMOVE CAMSHAFT TIMING PULLEY

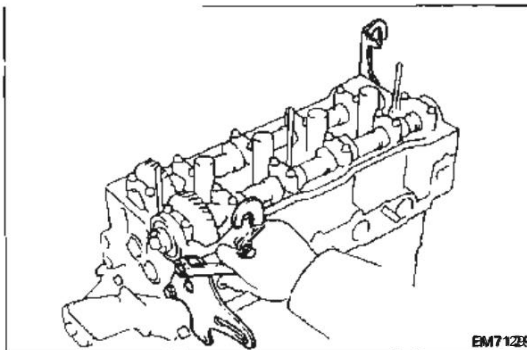
(See step 16 on page EM741)

18. REMOVE FAN BELT ADJUSTING BAR

Remove the two bolts and adjusting bar.

19. REMOVE ENGINE HANGERS

Remove the two bolts and engine hangers.



EM7129

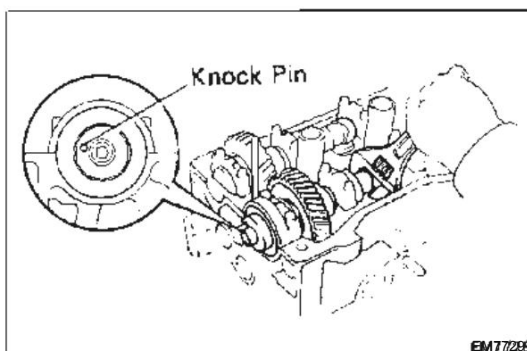
20. REMOVE CAMSHAFTS

NOTICE: Give the camshaft clearance of the lever as is equal, the camshaft must be kept level while it is being removed. The camshaft must be kept at the portion of the cylinder head receiving the shaft thrust and not be damaged causing the camshaft to seize or break. To avoid this, the following steps should be carried out.

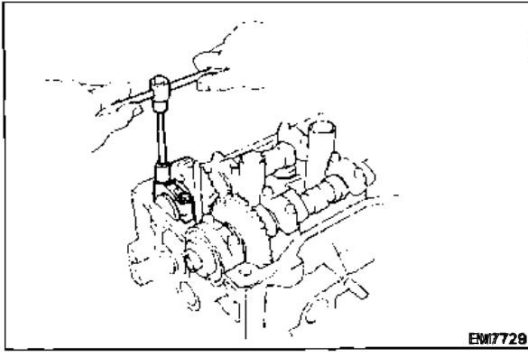
A. Remove intake camshaft

- (a) Set the intake camshaft to the knock pin is slightly above the top of the cylinder head.

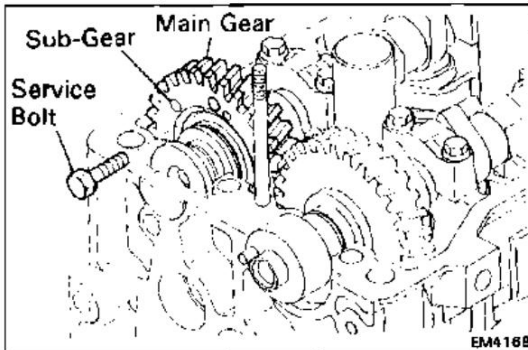
OBSERVATION: Above angle allows the No. 1 and No. 3 cylinder lobes of the intake camshaft to push their valve lifters evenly.



EM7128



(b) Remove the two bolts and front bearing cap.



(c) Secure the intake camshaft sub-gear to the main gear with a service bolt.

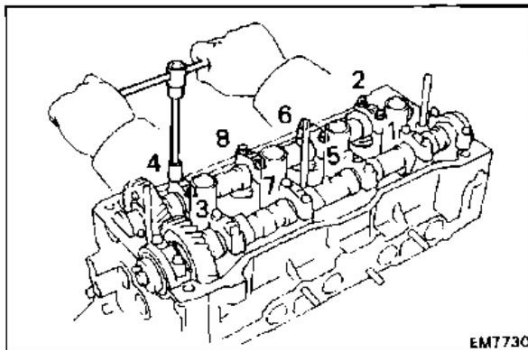
Recommended service bolt:

Thread diameter 1.6 mm

Thread pitch P-0.5 mm

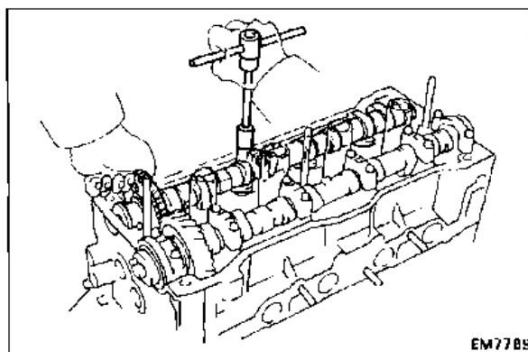
Bolt length 20 mm (0.63 - 0.79 in.)

HINT When removing the camshaft, make certain that the torsional spring force of the sub-gear has been eliminated by the above operation.



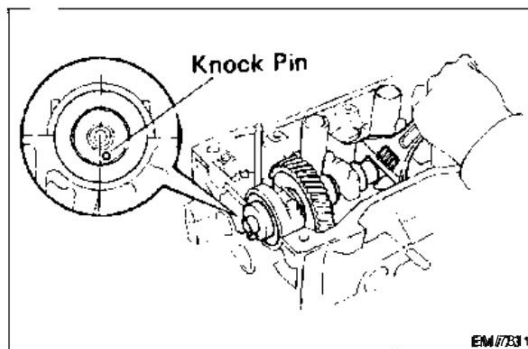
(d) Uniformly loosen and remove the eight bearing cap bolts in several passes in the sequence shown.

(e) Remove the four bearing caps and camshaft.



HINT If the camshaft is not being lifted out straight and level, reinstall the bearing cap with the two bolts, then alternately loosen and remove the bearing cap bolts with the camshaft gear pulled up.

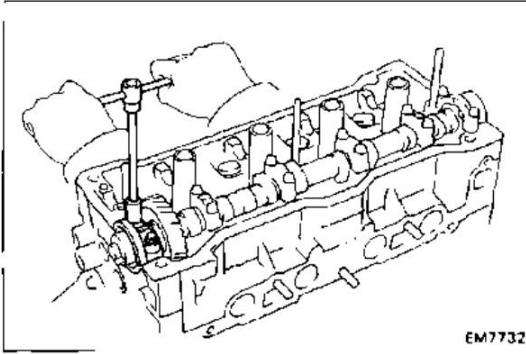
NOTICE Do not pry or attempt to force the camshaft with a tool or other objects.



B. Remove exhaust camshaft

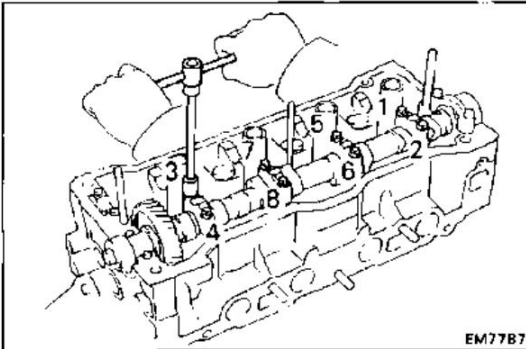
(a) Set the exhaust camshaft so that the knock pin is located slightly counterclockwise from the vertical axis of the camshaft.

HINT The above angle allows the No. 1 and No. 3 cylinder cam lobes of exhaust camshaft to push their valve lifters evenly.



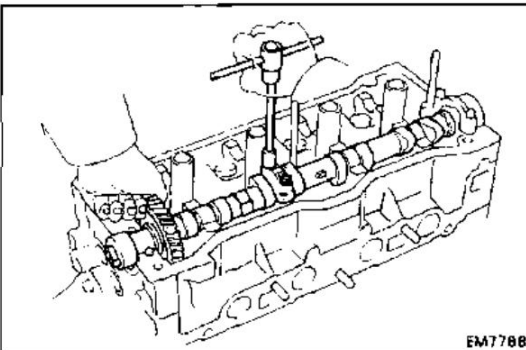
EM7732

- (b) Remove the two bolts from the front bearing cap and oil seal.
- NOTICES:** If the front bearing cap is not removable by hand, do not try to remove it by force, but leave it as is without bolts.



EM7787

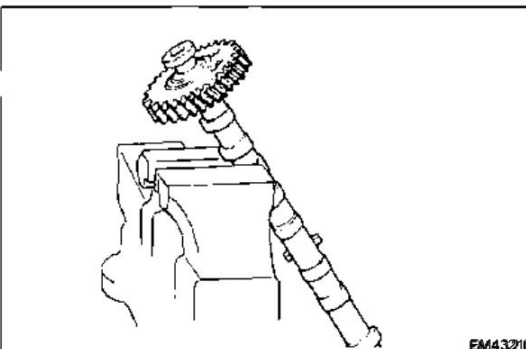
- (c) Uniformly loosen and remove the eight bearing cap bolts in several passes in the sequence shown.
- (d) Remove the four bearing caps and the camshaft.



EM7788

- OBSERVATION:** The camshaft is not being lifted out straight and level. Install the No. 3 bearing cap with the two bolts. Then alternately loosen and remove the two bearing cap bolts with the camshaft gear pulled up.

NOTICE: Do not pry on or attempt to force the camshaft with a tool or other objects.

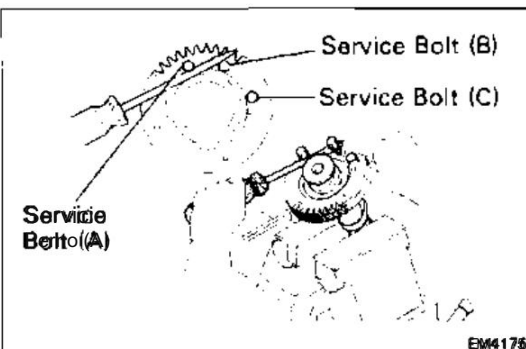


EM4321

21. DISASSEMBLE INTAKE CAMSHAFT

- (a) Mount the hexagonal wrench in the position of the camshaft in a vise.

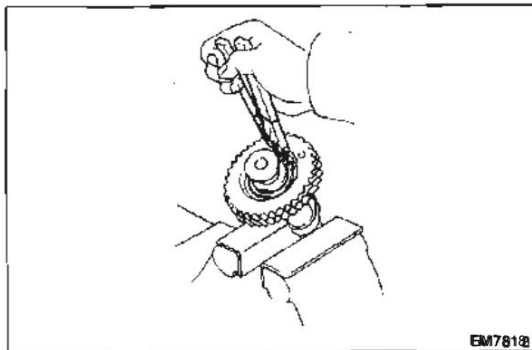
NOTICE: Be careful not to damage the camshaft.



EM4175

- (b) Insert service bolts (A) and (B) into the service holes of the camshaft sub-gear.
- (c) Using a screwdriver, turn the sub-gear clockwise, and remove the service bolt (C).

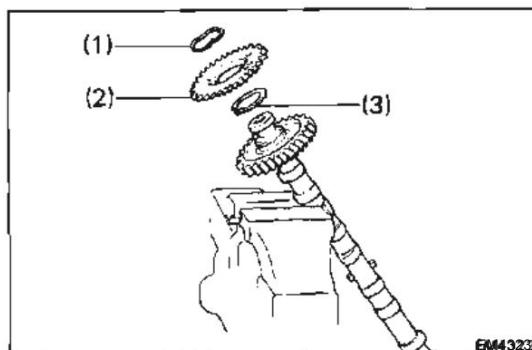
NOTICE: Be careful not to damage the camshaft.



EM7818

(d) Using snap ring pliers, remove the snap ring.

(e) Con un alicates para anillos elásticos, extraiga el anillo elástico.



EM4323

(e) Remove the following parts:

(e) Retire las siguientes piezas:

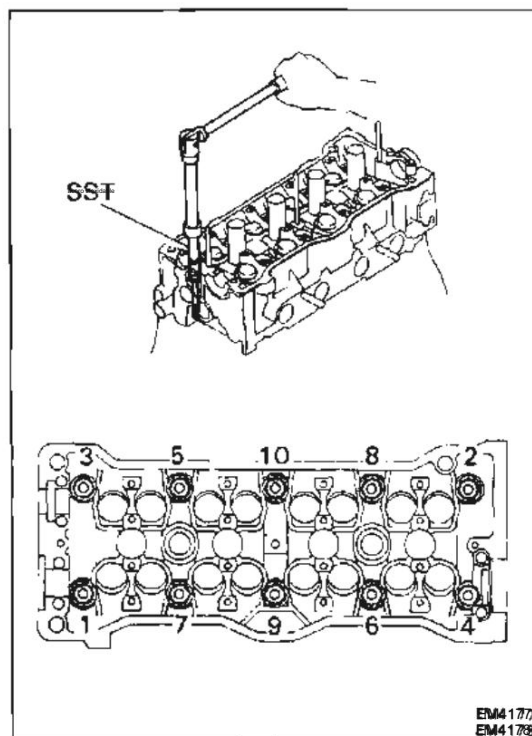
(1) Wave washer

(2) Camshaft sub-gear

(3) Camshaft gear spring

(2) Engranaje secundario de árbol de levas

(3) Resorte del engranaje de árbol de levas

EM4177
EM4178

22. REMOVE CYLINDER HEAD

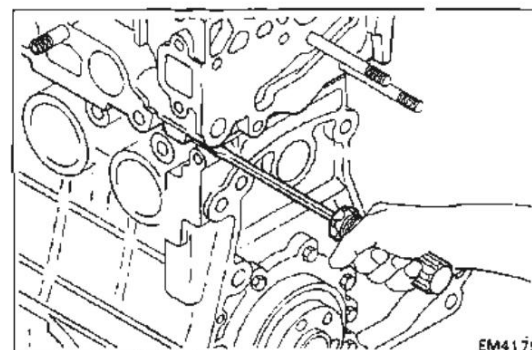
(a) Using SST, uniformly loosen and remove the ten cylinder head bolts in several passes in the sequence shown.

SST 09205-6010

NOTICE a cylinder head warpage or cracking can result from removing the bolts in an incorrect order.

SST 09205-6010

NOTICE a cylinder head warpage or cracking can result from removing the bolts in an incorrect order.



EM4179

(b) Lift the cylinder head from the dowels of the cylinder block and place the head on wooden blocks on a bench.

(b) Levante la culata de los pasadores del bloque de cilindros y coloque la culata sobre bloques de madera en un banco.

HINT: If the cylinder head is difficult to lift off, pry with a screwdriver between the cylinder head and block surfaces.

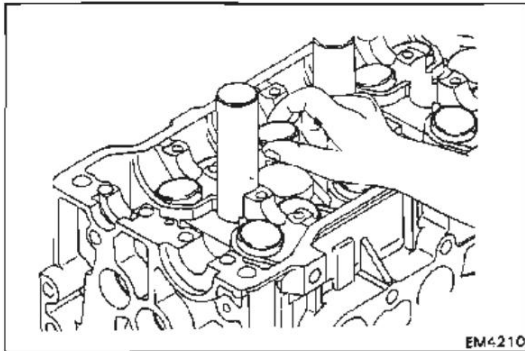
OBSERVACIÓN: Si resulta difícil levantar la culata, haga palanca con un destornillador entre la culata y las salientes del bloque.

NOTICE Be careful not to damage the cylinder head and the cylinder block surfaces of the cylinder head gasket side.

NOTICE Evite dañar no dañar la superficie de la culata y la superficie de la culata del lado de la junta de la culata.

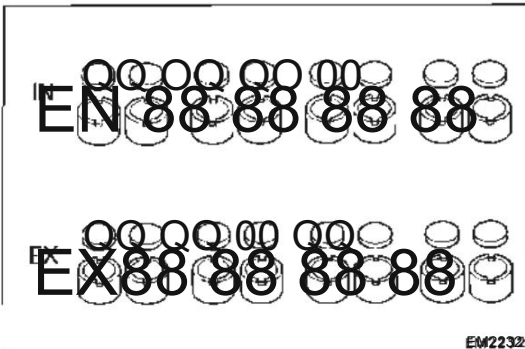
DISASSEMBLY OF CYLINDER HEAD

(See pages EM56, 57)

1. REMOVE VALVE LIFTERS AND SHIMS

HINT: Arrange the valve lifters and shims in correct order.

OBSERVACION: Coloque los levantes de válvulas y los calces en el orden correcto.

**2. REMOVE VALVES**

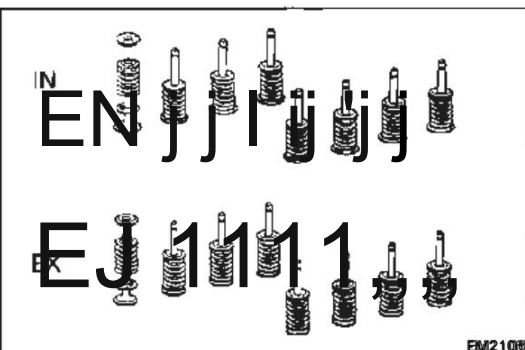
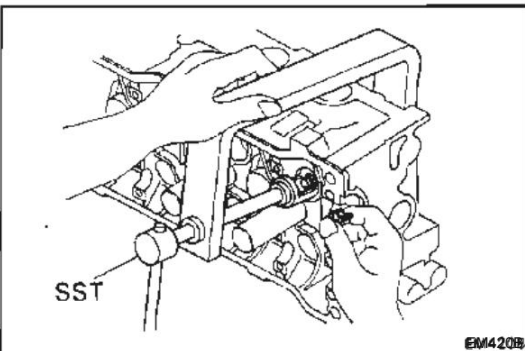
(a) Using SST, compress the valve spring and remove the two keepers.

SST in 09202-20010

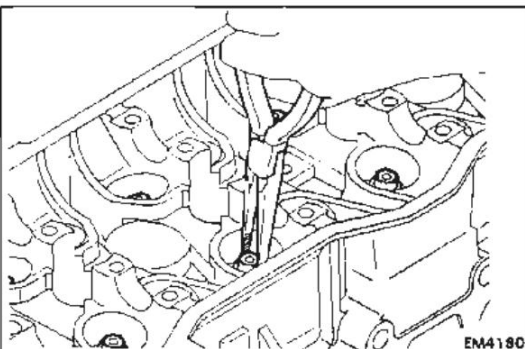
(b) Remove the spring retainer, valve spring, valve and spring seat.

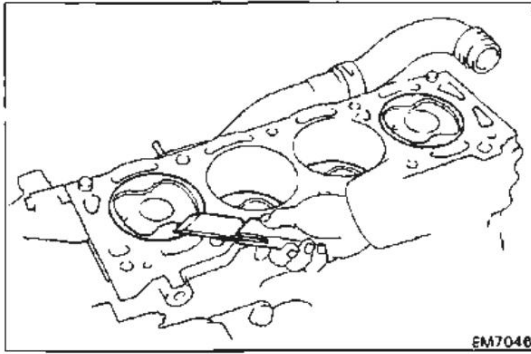
HINT: Arrange the valves, valve springs, spring seats and spring retainers in correct order.

OBSERVACION: Coloque las válvulas, los resortes de las válvulas, los asiento de los resortes y los retenedores de los resortes en el orden correcto.

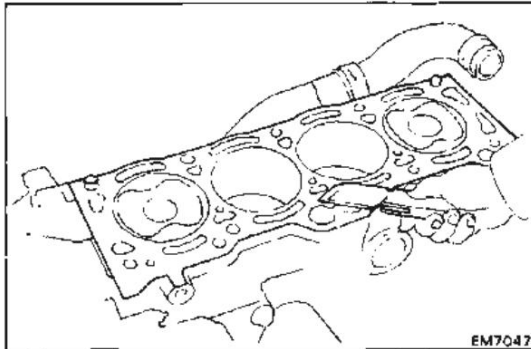


(c) Using needle nose pliers, remove the oil seal.

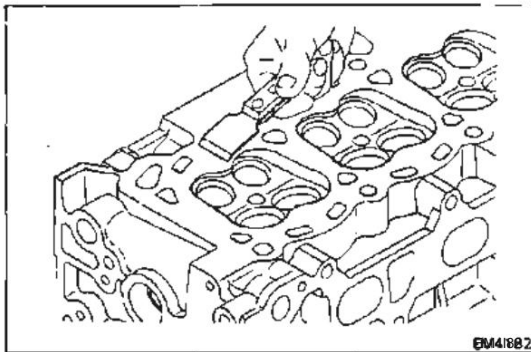




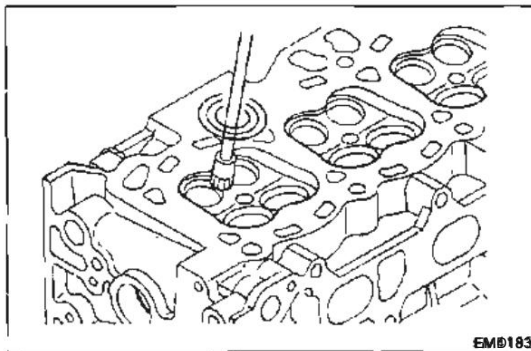
EM7046



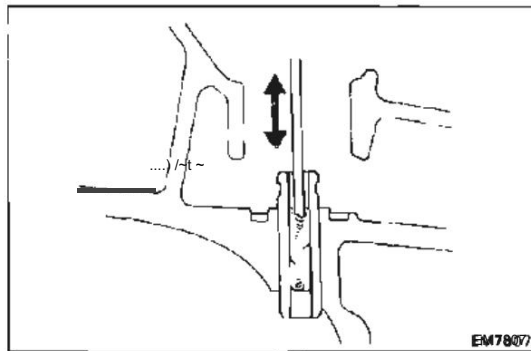
EM7047



EM41882



EM8183



EM7807

INSPECTION, CLEANING AND REPAIR OF CYLINDER HEAD COMPONENTS

1. LIMIT AS SURFACES OF PISTONS AND BLOCK

- (a) Turn the crankshaft and bring each piston to the top dead center (TDC). While using a gasket scraper, remove all the carbon from the piston top surface.

- (b) Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.

- (c) Using compressed air, blow carbon and oil from the bolt holes.

CAUTION: Protect your eyes when using high pressure compressed air.

2. CLEAN CYLINDER HEAD

A. Remove gasket material

Using a gasket scraper, remove all the gasket material from the cylinder head surface.

NOTICE: Be careful not to scratch the cylinder block contact surface.

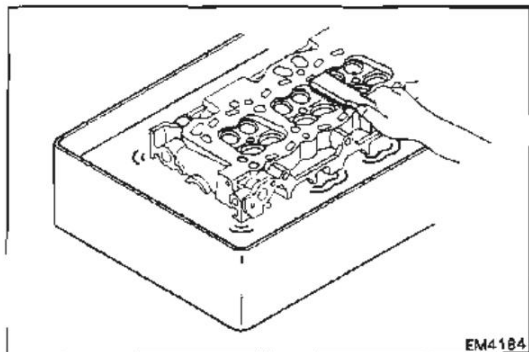
B. Clean combustion chambers

Using a wire brush, remove all the carbon from the combustion chambers.

NOTICE: Be careful not to scratch the cylinder block contact surface.

C. Clean valve guide bushings

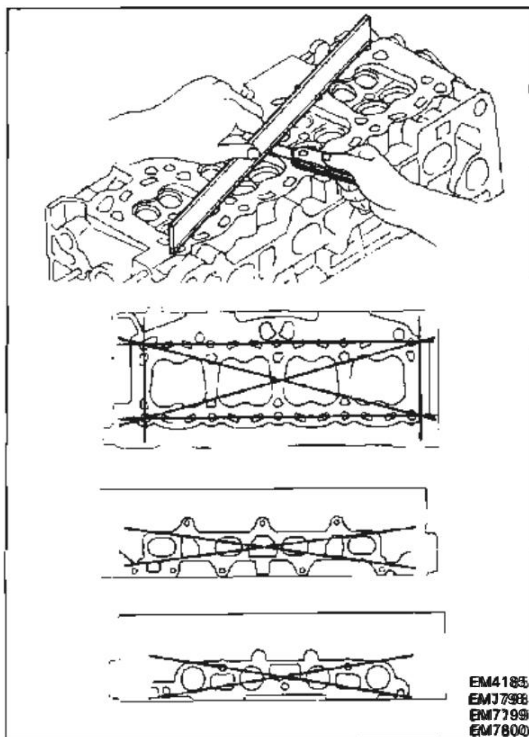
Using a valve guide bushing brush and solvent, clean all the guide bushings.



EM4184

D. Limit the cylinder head

Using a soft brush and solvent, thoroughly clean cylinder head.

EM4183
EM7793
EM7793
EM7800

3. INSPECTION OF CYLINDER HEAD

A. Inspect for flatness

Using a precision straight edge and feeler gauge, measure the surfaces contacting the cylinder block and manifolds for warpage deformations.

Maximum warpage:

Cylinder block side (0.0025 mm (0.0021 in.)

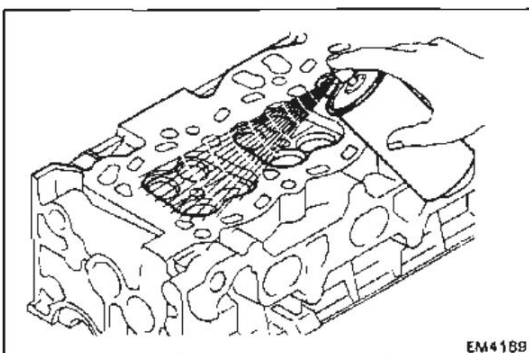
Manifold side 10 mm (0.039 in.)

If warpage is greater than the maximum, replace the cylinder head.

B. Inspect for cracks

Using a dye penetrant, check the combustion chamber, intake and exhaust ports, head surfaces and the deck of the head for cracks.

If cracked, replace the cylinder head.

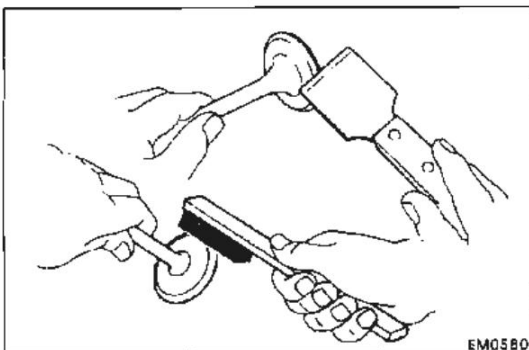


EM4189

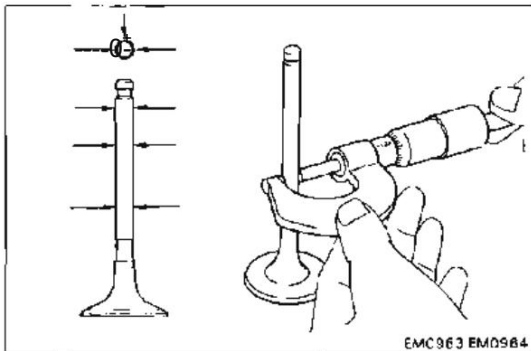
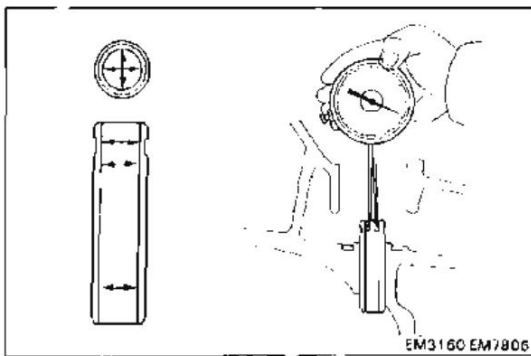
4. LIMIT CLEAN VALVES

(a) Using a gasket scraper, remove any carbon from the valve seat.

(b) Using a wire brush, thoroughly clean the valve.



EM0580



5. INSPECT TO VALVE STEMS AND GUIDE BUSHINGS

- (a) Using a dial indicator, measure the inside diameter of the guide bushing.

Bushing inside diameter:

6.01 mm (0.236 in.)

- (b) Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter:

Intake 5.970 - 5.986 mm
(0.2350 - 0.2356 in.)

Exhaust 5.965 - 5.980 mm
(0.2348 - 0.2354 in.)

- (c) Remove the valve stem diameter measurement from the guide bushing inside diameter measurement.

Standard oil clearance:

Intake 0.025 - 0.060 mm
(0.0010 - 0.0024 in.)

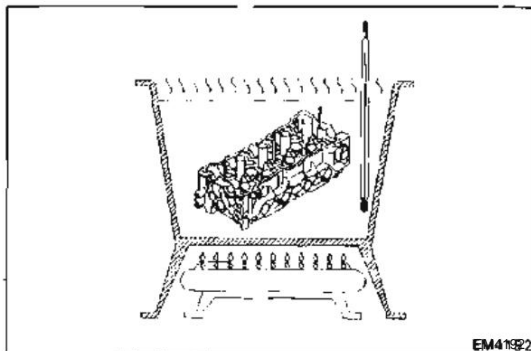
Exhaust 0.030 - 0.065 mm
(0.0012 - 0.0026 in.)

Maximum oil clearance:

Intake 0.08 mm (0.0031 in.)

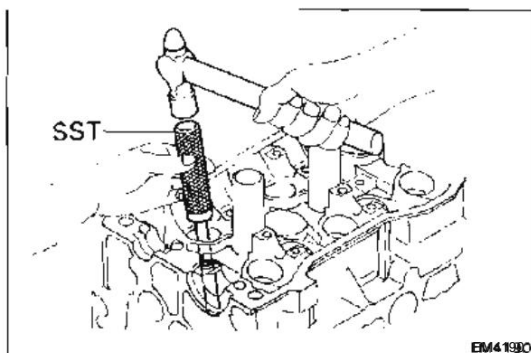
Exhaust 0.10 mm (0.0039 in.)

If the oil clearance is greater than the maximum, replace the valve and guide bushing.



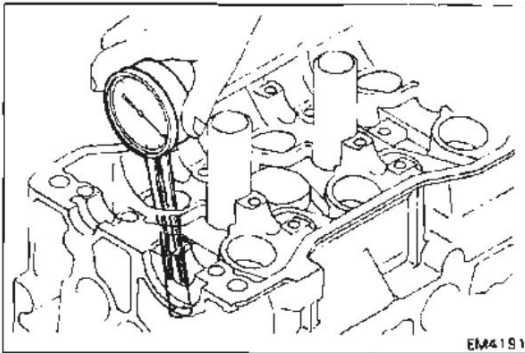
6. IF NECESSARY, REPLACE VALVE GUIDE BUSHINGS

- (a) Carefully warm the cylinder head to 80°C (176°F) - 212°F.



- (b) Using SST and a hammer, tap out the guide bushing.

SST 00201920010



Bore diameter measurement

Bore diameter mm (in.)	Bore diameter
11.000 - 11.027 (0.4331 - 0.4343 in.)	STD
11.050 - 11.077 (0.4369 - 0.4361 in.)	0.05

(c) Codsingal bore diameter of the cylinder head bore diameter of the cylinder head.

Standard gauge grade (std):

11.000 - 11.027 mm (0.4331 - 0.4343 in.)

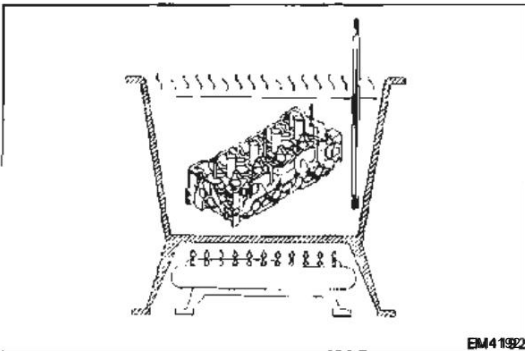
(d) Selecciona una escuadra de biela (STD o 0.05)

Si el diámetro interior del cilindro es mayor que 11.027 mm (0.4343 in.), mide el diámetro interior del cilindro con la escuadra de biela.

Revised cylinder head bushing specification

11.050 - 11.077 mm (0.4369 - 0.4361 in.)

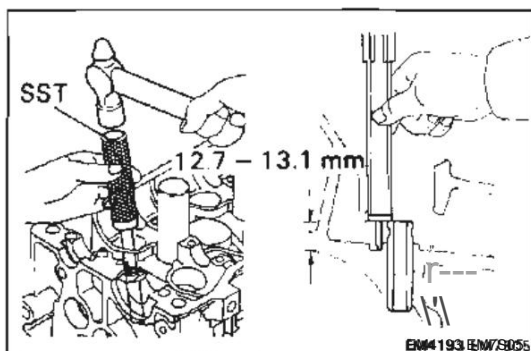
Si el diámetro interior del cilindro es mayor que 11.077 mm (0.4361 in.), sustituya la cabeza del cilindro.



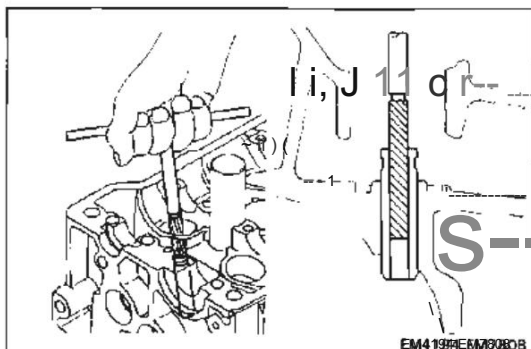
(e) Calentado la cabeza del cilindro a 100-120°C (212°F - 250°F)

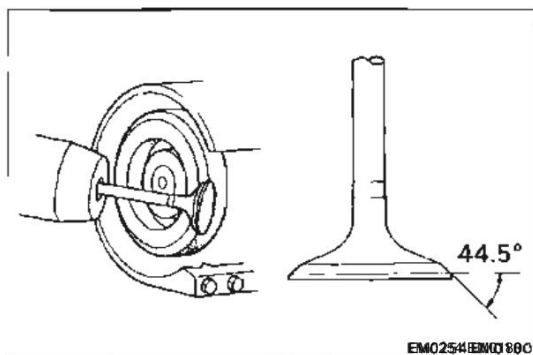
(f) Coloca la escuadra de biela en la cabeza del cilindro para medir el diámetro interior del cilindro.

STD 11.000 - 11.027 mm



(g) Codsingal bore diameter of the cylinder head bore diameter of the cylinder head.

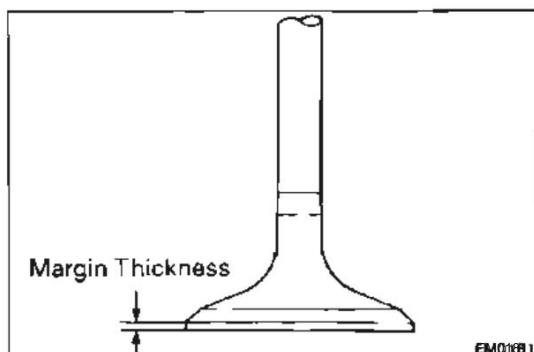




7. INSPECT AND GRIND VALVES

- Grind the valve face enough to remove pits and carbon.
- Verify that the valves are ground to the correct valve face angle.

Valve face angle: 44.5°



- Check the valve head margin thickness.

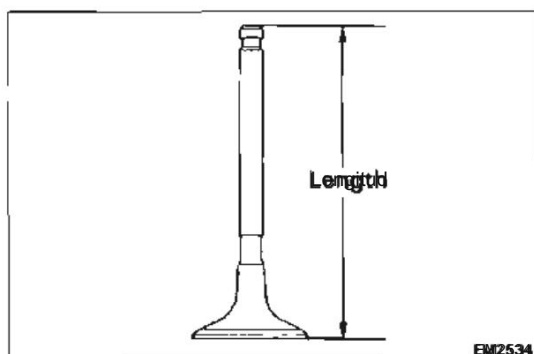
Standard margin thickness:

Intake 1.05 mm (0.0413 – 0.0571 in.)

Exhaust 1.51 mm (0.059 – 0.0626 in.)

Minimum margin thickness: 0.5 mm (0.020 in.)

If the margin thickness is less than minimum, replace the valve.



- Check the valve overall length.

Standard overall length:

Intake 91.46 mm (3.6004 in.)

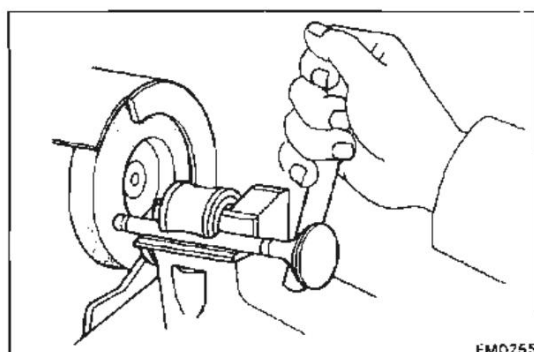
Exhaust 91.90 mm (3.6181 in.)

Minimum overall length:

Intake 90.95 mm (3.5807 in.)

Exhaust 91.40 mm (3.5984 in.)

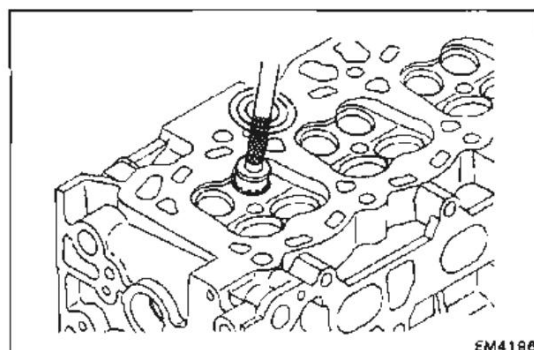
If the overall length is less than minimum, replace the valve.



- Check the surface of the valve stem tip for wear.

If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.

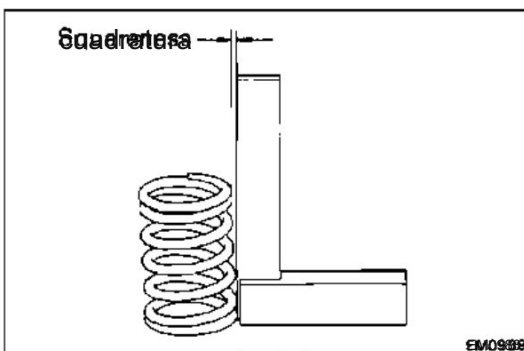
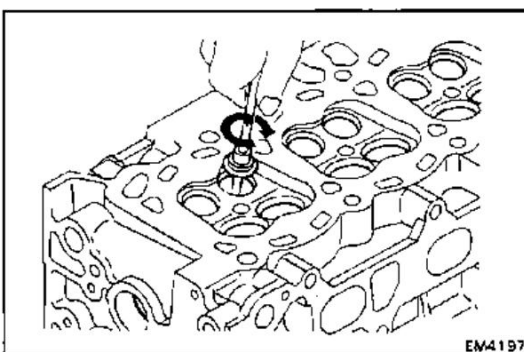
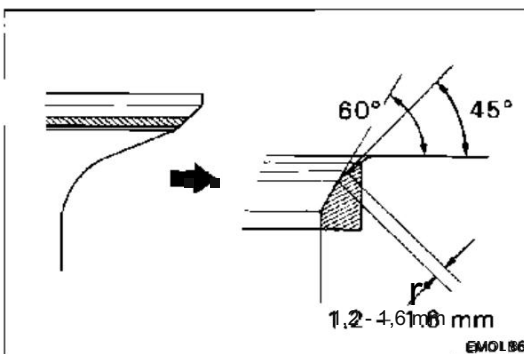
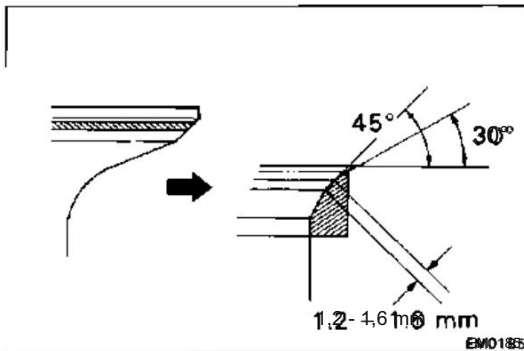
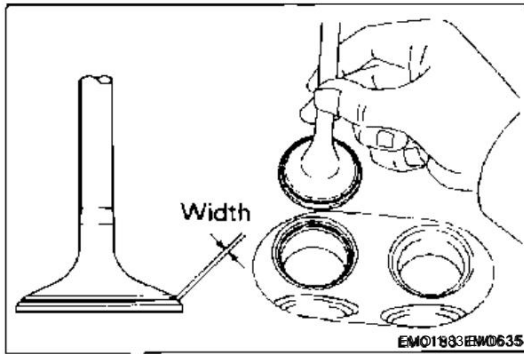
NOTICE Do not grind off more than minimum.



8. INSPECT AND CLEAN VALVE SEATS

- Using 45° carbide wire, resurface the valve seats.

Remove only enough material to clean the seats.



(b) Check the valve seating position.

Apply a thin coat of prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate the valve.

(c) Check the valve face and seat for the following:

- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
- Check that the seat contact is in the middle of the valve face with the following width:

1.2 - 1.6 mm (0.047 - 0.063 in.)

If not correct the valve seats as follows:

- (1) If the seating is too high on the valve face, use 30° and 45° cutters to correct the seat.

- (2) If the seating is too low on the valve face, use 60° and 45° cutters to correct the seat.

(d) Hand lap the valve and valve seat with an abrasive compound.

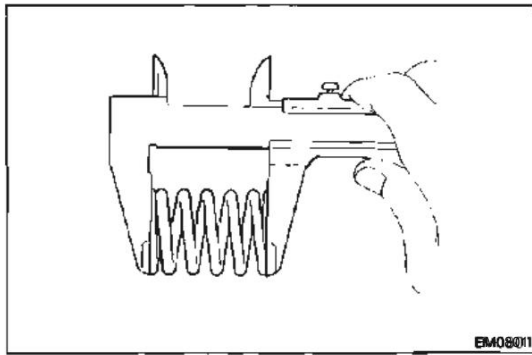
After hand lapping, clean the valve and valve seat.

9. INSPECT VALVE SPRINGS

- (a) Using a steel square, measure the squareness of the valve spring.

Maximum squareness 1.276 mm (0.075 in.)

If squareness is greater than maximum, replace the valve spring.

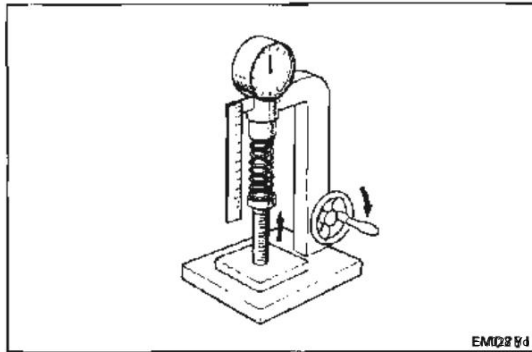


EM08011

(b) Using feeler gauges, measure the clearance between the valve spring and the valve stem.

Free length: 43.8 mm (1.724 in.)

If the free length is not as specified, replace the valve spring.



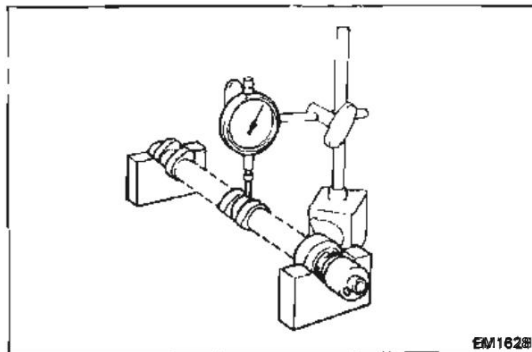
EM0294

(c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

Installed tension:

14.6 kg (32.4 lb) at 34.7 mm (1.366 in.)

If the tension is not as specified, replace the valve spring.



EM1628

10 INSPECT CAMSHAFTS AND BEARINGS

A. Inspect camshaft for runout

(a) Place the camshaft on a V-block.

(b) Using a dial indicator, measure the runout at the center journal.

Maximum circular runout: 0.04 mm (0.0016 in.)

If the circular runout is greater than the maximum, replace the camshaft.

B. Inspect cam lobes

Using a micrometer, measure the cam lobe height.

Standard cam lobe height:

Intake 35.21 mm (1.3862 in.)

Exhaust 35.01 mm (1.3783 in.)

Minimum cam lobe height:

Intake 34.84 mm (1.3716 in.)

Exhaust 34.51 mm (1.3587 in.)

If the cam lobe height is greater than the minimum, replace the camshaft.

C. Inspect camshaft journals

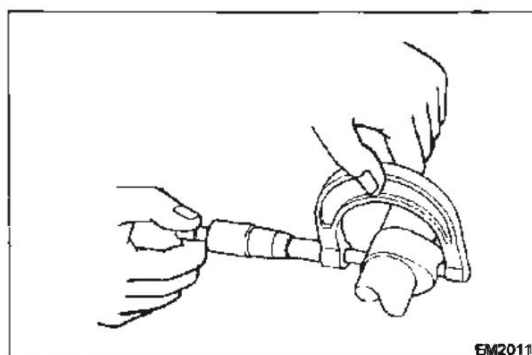
Using a micrometer, measure the journal diameter.

Standard diameter:

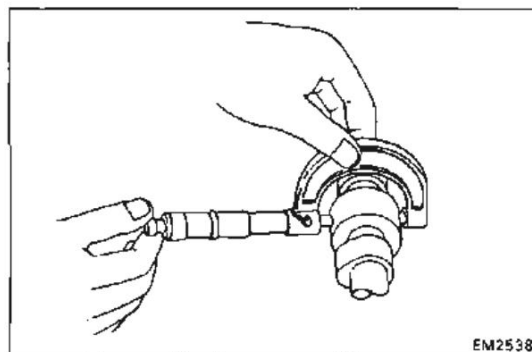
Exhaust No. 1 24.949 mm (0.9822 in.)

Others 22.949 mm (0.9035 in.)

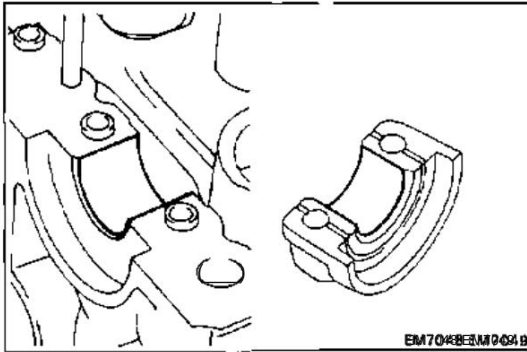
If the journal diameter is not as specified, check the oil clearance.



EM2011

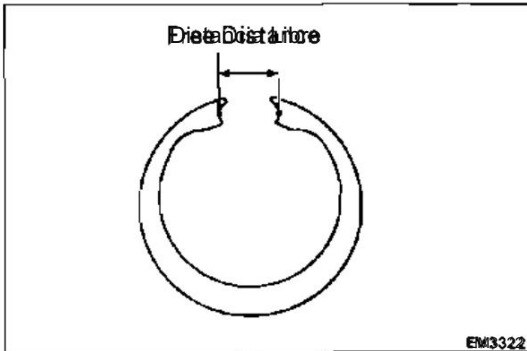


EM2538

**D. Inspect camshaft bearings**

Check the bearings for flaking and scoring.

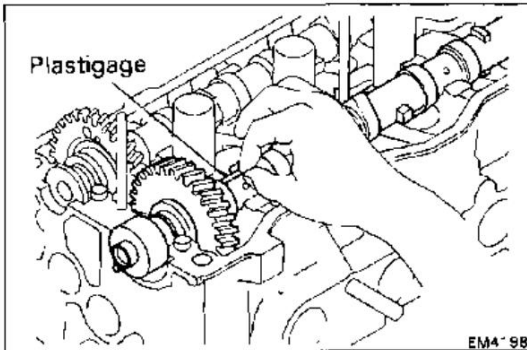
If the bearings are damaged, replace the bearing caps and cylinder head as a set.

**E. Inspect camshaft gear spring**

Using vernier calipers, measure the free distance between the spring end.

Free distance: 17.1 - 17.5 mm
(0.673 - 0.689 in.)

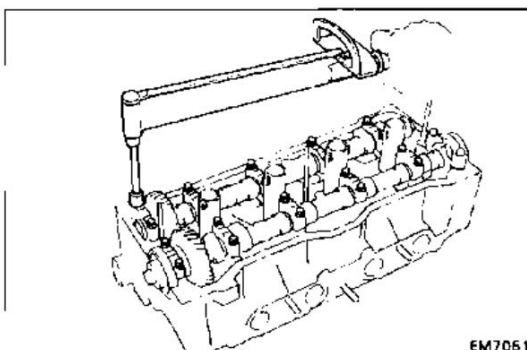
If the free distance is not as specified, replace the gear spring.

**F. Inspect camshaft journal oil clearance**

(a) Clean the bearing caps and camshaft journals.

(b) Place the camshafts on the cylinder head.

(c) Lay a strip of Plastigage across each of the camshaft journals.

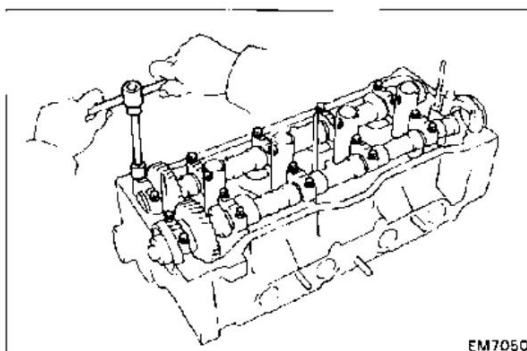


(d) Install the bearing caps.

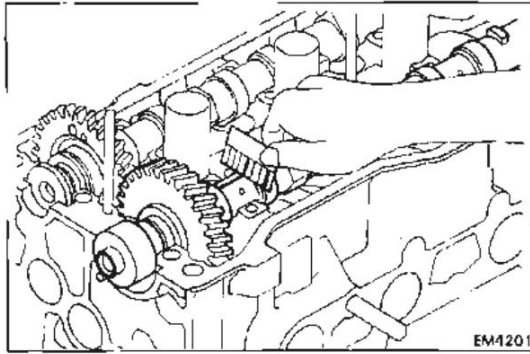
(See step 3 on page EM81 to 83)

Torque: 30 kg-cm (2 ft-lb, 13 N-m)

NOTICE Do not turn the camshaft.



(e) Remove the bearing caps.



EM4201

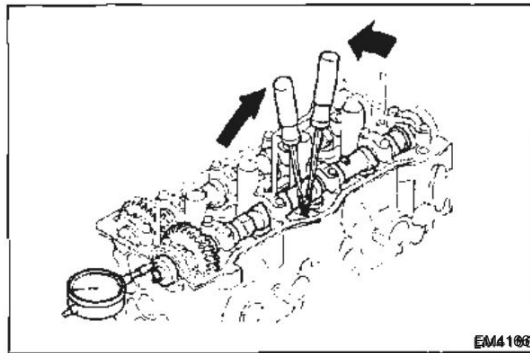
(f) Measure the Plastigage at its widest point.

Standard oil clearance: 0.072 mm (0.0028 in.)
0.035 – 0.072 mm (0.0014 – 0.0028 in.)

Maximum oil clearance: 0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace the camshaft, if necessary, replace the bearing caps and cylinder head as a set.

(g) Completely remove the Plastigage.



EM4186

G. Inspect camshaft thrust clearance

(a) Install the camshaft.

(See step 3 on pages EM-81 to 83.)

(b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

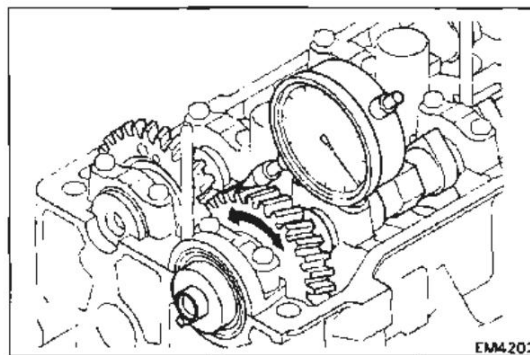
Standard thrust clearance:

Intake: 0.085 mm (0.0033 in.)
0.030 – 0.085 mm (0.0012 – 0.0033 in.)

Exhaust: 0.095 mm (0.0037 in.)
0.035 – 0.095 mm (0.0014 – 0.0037 in.)

Maximum thrust clearance: 0.11 mm (0.0043 in.)

If the thrust clearance is greater than maximum, replace the camshaft, if necessary, replace the bearing caps and cylinder head as a set.



EM4202

H. Inspect camshaft gear backlash

(a) Install the camshaft without trailing the exhaust camshaft as a set.

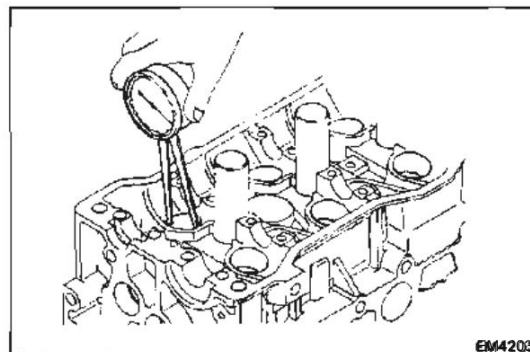
(See step 3 on page EM-81 to 83.)

(b) Using a dial indicator, measure the backlash.

Standard backlash: 0.020 mm (0.0008 in.)
0.020 – 0.020 mm (0.0008 – 0.0008 in.)

Maximum backlash: 0.30 mm (0.0118 in.)

If the backlash is greater than maximum, replace the camshafts.

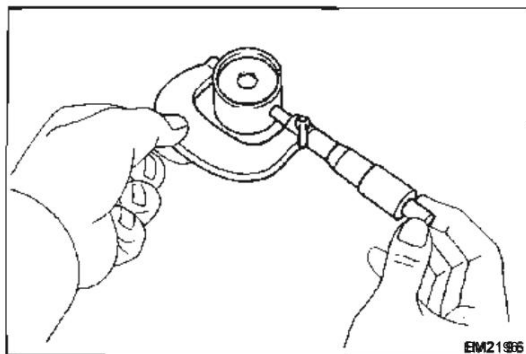


EM4203

11. INSPECT VALVE LIFTERS AND LIFTER BORES

(a) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.

Lifter bore diameter: 28.006 mm (1.0971 in.)
28.006 – 28.006 mm (1.0971 – 1.0971 in.)



(b) Using a micrometer, measure the lift diameter.

Diameter: 27.25 - 27.985 mm
(1.074 - 1.101 in.)

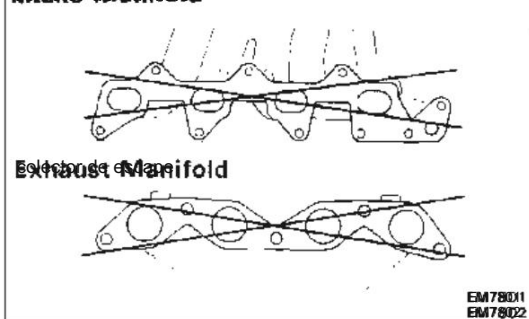
(c) Standard lift diameter: 0.020 - 0.051 mm
(0.0008 - 0.0020 in.)

Standard oil clearance: 0.020 - 0.051 mm
(0.0008 - 0.0020 in.)

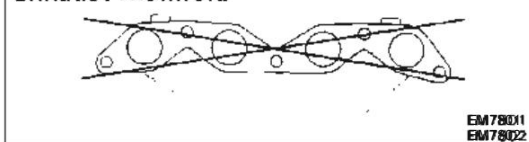
Maximum oil clearance: 0.051 mm (0.0020 in.)

If the oil clearance is greater than maximum, replace the lifters. If necessary, replace the cylinder head.

Intake Manifold



Exhaust Manifold



12. INSPECT INTAKE AND EXHAUST MANIFOLDS

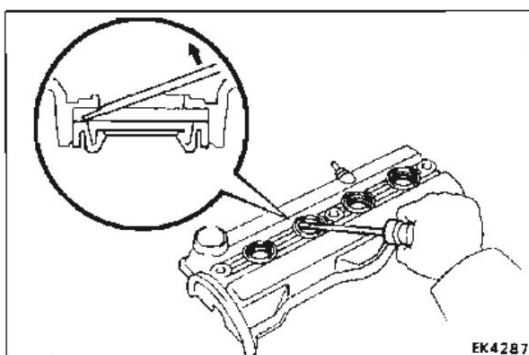
Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head for warpage.

Maximum warpage:

Intake 0.20 mm (0.0079 in.)

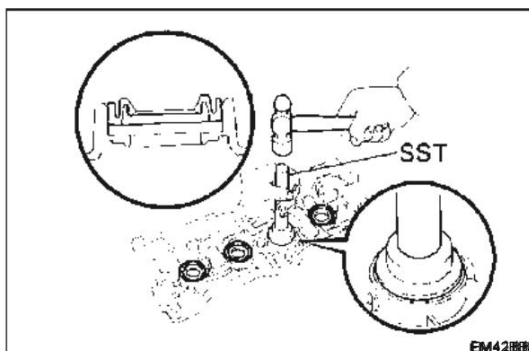
Exhaust 0.30 mm (0.0118 in.)

If warpage is greater than maximum, replace the manifold.



13. IF NECESSARY, REPLACE SPARK PLUG TUBE GASKET

(a) Using a screwdriver, pry out the gasket.



(b) Using SST, tap in a new gasket until its surface is flush with the upper edge of the cylinder head cover.

SST 0.9850 - 1.0012 (0.0352 - 0.0394 in.)

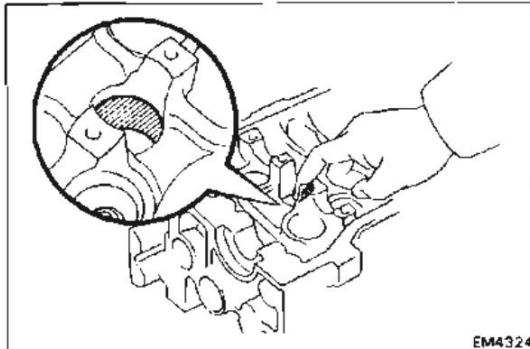
(c) Apply a light coat of MP grease to the gasket lip.

ASSEMBLY OF CYLINDER HEAD

(See pages EM-56, 57)

HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new ones.



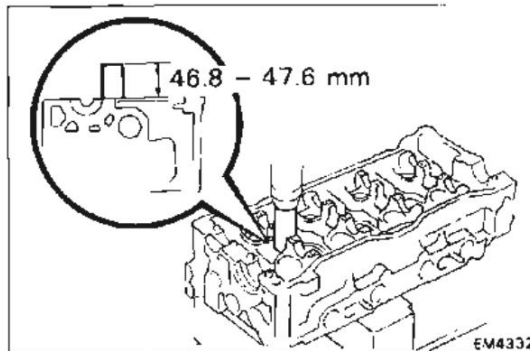
EM4324

1. INSTALL SPARK PLUG TUBES

NOTE: When using a new cylinder head, spark plug tubes must be installed.

- (a) Apply adhesive to the spark plug tube hole of the cylinder head.

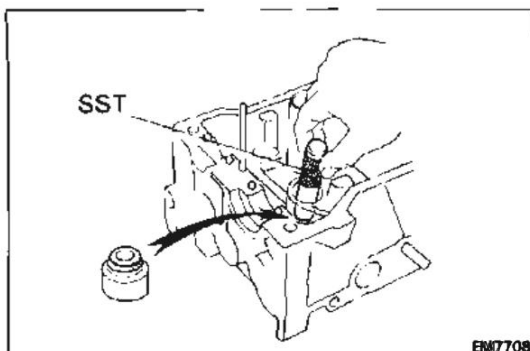
Adhesive: Part No. 08833-00070, THREE BOND 1324 or equivalent



EM4332

- (b) Using a press, press a new spark plug tube until 46.8-47.6 mm (1.843-1.874 in.) is protruding from the cylinder head.

NOTE: Avoid tapping a new spark plug tube in too far by measuring the amount of protrusion while pressing.

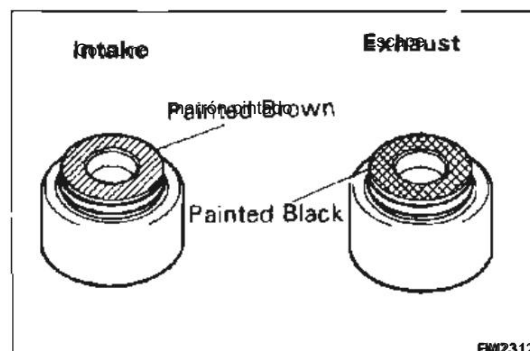


EM7708

2. INSTALL VALVES

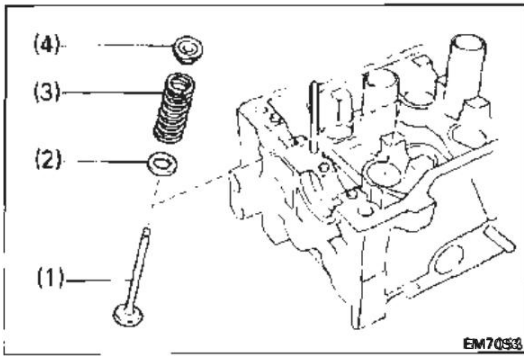
- (a) Use SST to push in new valve seal.

SST: 0920 41020



EM2312

HINT: The intake valve oil seal is brown and the exhaust valve oil seal is black.

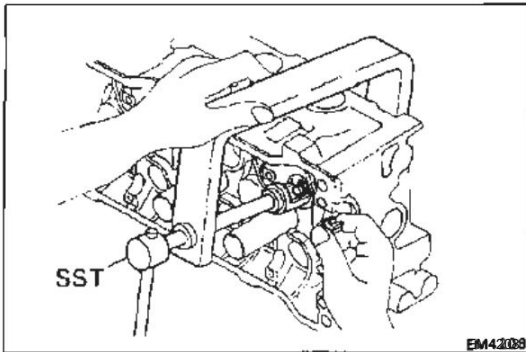


(b) Install the following parts:

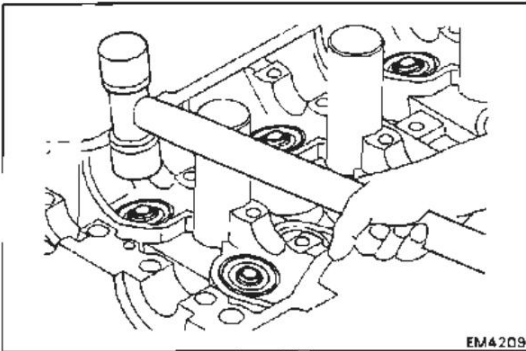
- (1) Valve
- (2) Spring seat
- (3) Valve spring
- (4) Spring retainer

(c) Using SST, compress the valve spring and place the SST on the top of the valve stem.

SST 09202-92010



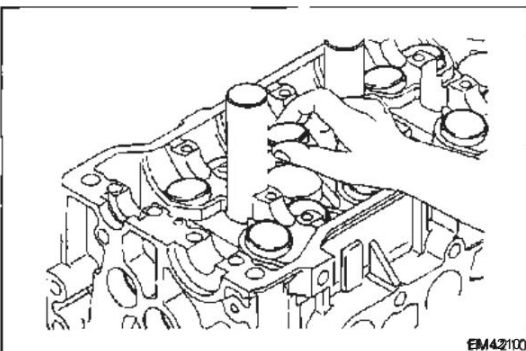
(d) Using a plastic faced hammer, lightly tap the valve stem tip to assure proper fit.

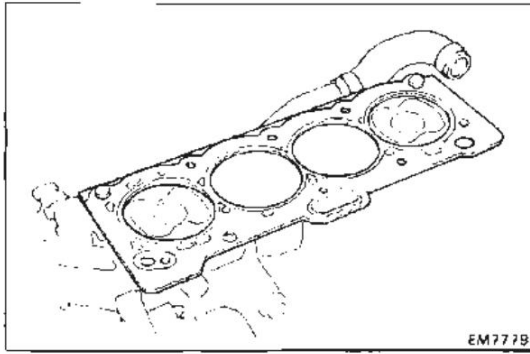


3. INSTALL VALVE LIFTERS AND SHIMS

(a) Install the valve lifter and shim.

(b) Check that the valve lifter rotates smoothly by hand.





INSTALLATION OF CYLINDER HEAD

(See page EM 56, 57)

1. INSTALL CYLINDER HEAD

- (a) Place a new cylinder head gasket in position on the cylinder block.

NOTICE Be careful of the installation direction.

- (b) Place the cylinder head in position on the cylinder head gasket.

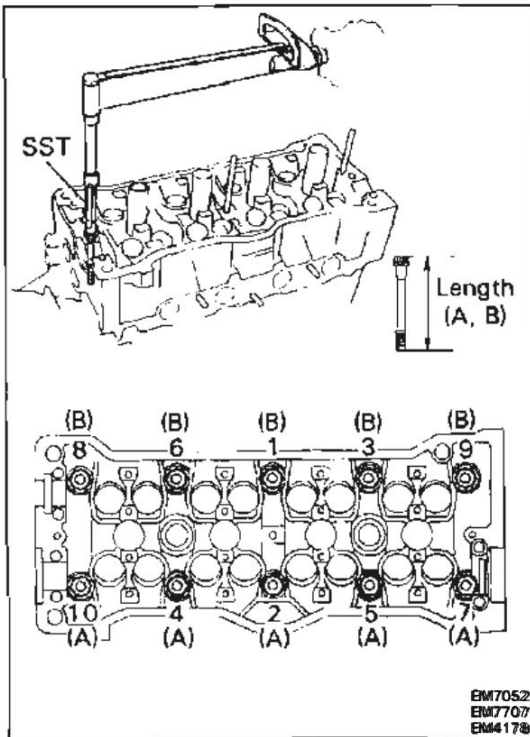
- (c) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.

- (d) Using SST, apply and maintain the proper torque to the ten cylinder head bolts in several passes in the sequence shown.

SST 09205 16010

Torque 610 kg-cm (44.0 lb-ft, 50 N·m)

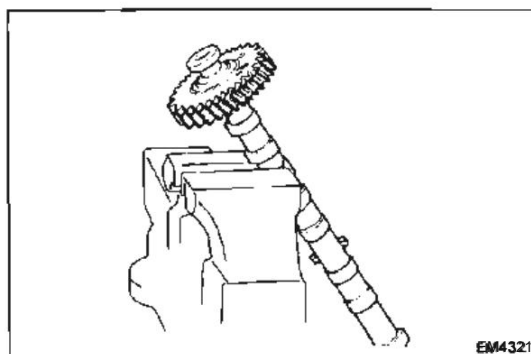
HINT Cylinder head bolts are 90 mm (3.54 in) and (3.08 in) (4.25 in) in length. Install the 90 mm (3.54 in) bolts in the position installed the 108 mm (4.25 in) bolts in the side position.



2. MONITOR ASSEMBLY OF CAMSHAFT

- (a) Mount the hexagonal hexagonal head portion of the camshaft in a vise.

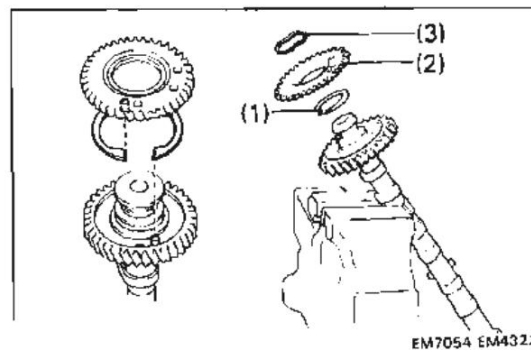
NOTICE Be careful not to damage the camshaft.

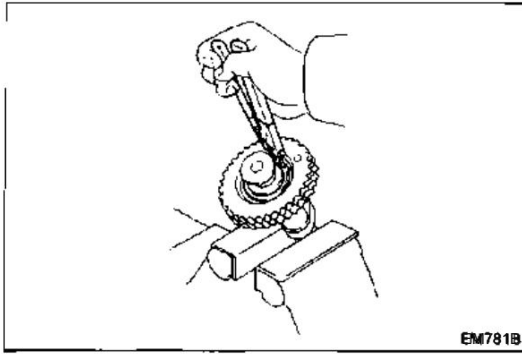


- (b) Install the following parts:

- (1) Resistor gear spring
- (2) Engine camshaft sub gear
- (3) Wave washer

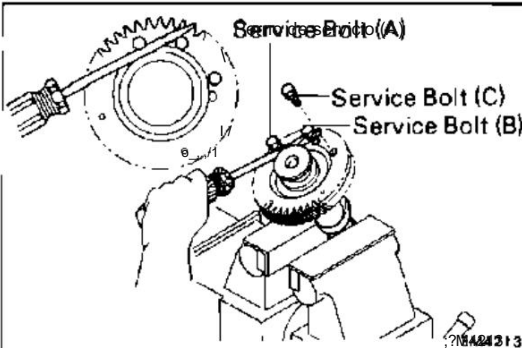
HINT Align the pins on the gears with the gear spring ends.





EM781B

(c) Using snapping pliers, install the snapping.



EM781C

(d) Insert the service bolts (A) and (B) into the service hole of the camshaft sub-gear.

(e) Using a screwdriver, align the holes of the camshaft bearing gear and sub-gear by turning the camshaft sub-gear clockwise and install a service bolt (C).

NOTICE Be careful not to damage the camshaft.

3. INSTALL INTAKE AND EXHAUST CAMSHAFT

NOTICE Since the intake clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, the portion of the cylinder head receiving the pusher might be cracked or damaged, causing the camshaft to seize or break.

To avoid this, the following steps should be carried out.

A. Install the exhaust camshaft

(a) Apply MP grease to the thrust portion of the camshaft.

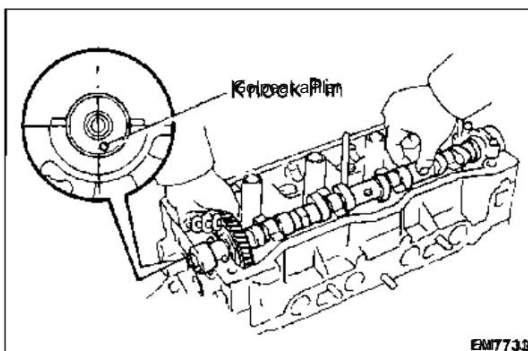
(b) Place the intake camshaft so the knuckle pin is located slightly around clockwise from the vertical axis of the camshaft.

HINT The above angle allows the No.1 and No.3 cylinder cam lobes of the exhaust camshaft to push the valve lifters evenly.

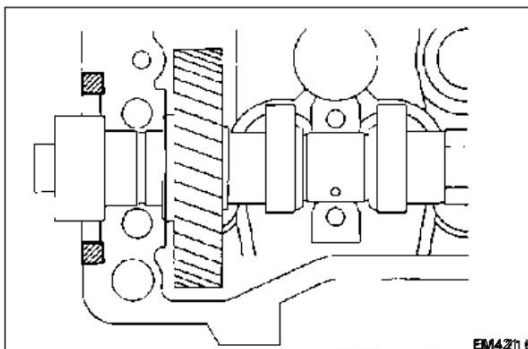
(c) Remove the old packing (EPG) material.

(d) Apply seal packing to the cylinder head as shown in the figure.

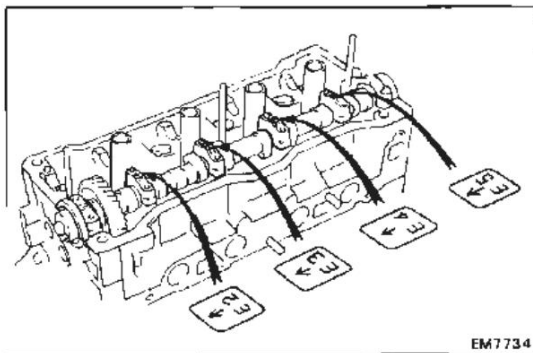
Seal packing: Part No. 08826-00080 or equivalent



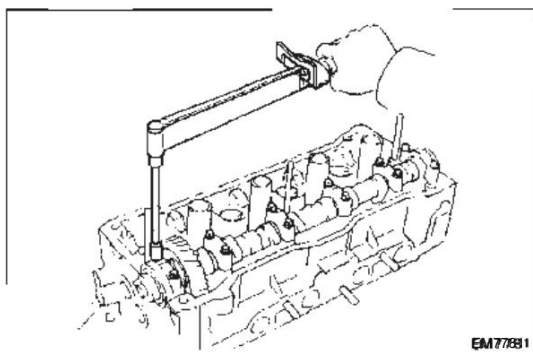
EM7733



EM4216



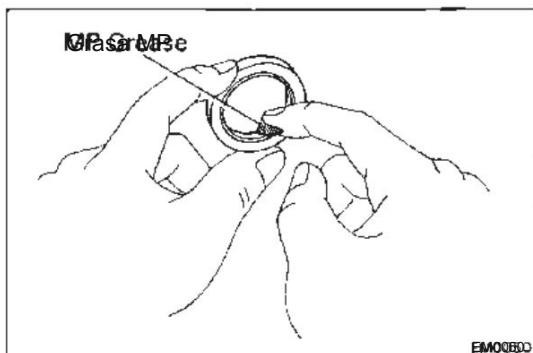
(e) Install the five bearing caps in their proper locations.



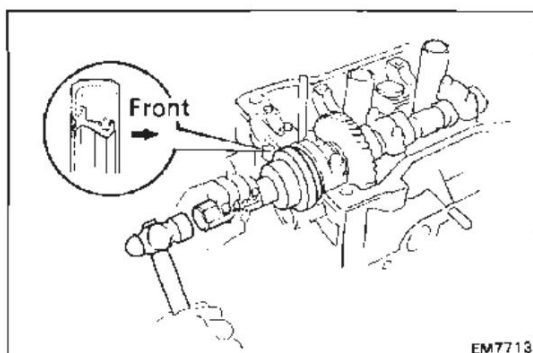
(f) Apply a light coat of engine oil to the threads and under the heads of the bearing cap bolts.

(g) Install and uniformly tighten the ten bearing cap bolts in several passes in the sequence shown.

Torque: 130 kg-cm (9 ft-lb, 13 N-m)



(h) Apply MP grease to new oil seal lip.

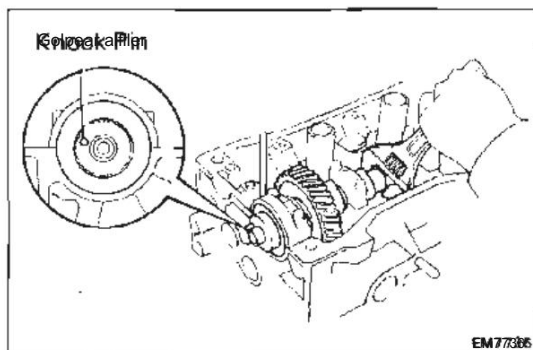


(i) Using SST, tap in the oil seal.

SST 09223-46011

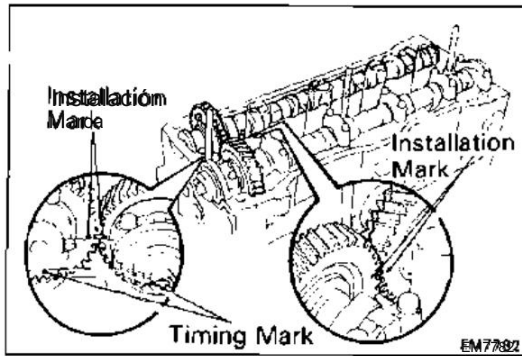
HINT:

- Do not install the oil seal with the lip facing the wrong direction.
- Insert the oil seal into the deepest part of the cylinder head.



B. Install intake camshaft

(a) Set the top pin of the exhaust camshaft so that the top pin is slightly above the top of the cylinder head.



(b) Apply MP grease to the thrust pin on the camshaft.

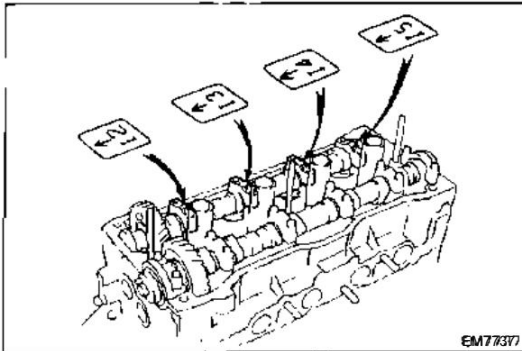
(c) Engage the intake camshaft gear to the exhaust camshaft gear by matching the assembly installation marks on each gear.

NOTICE There are also timing marks (for TDC) on each gear as shown in the illustration. Do not use these marks.

(d) Roll down the intake camshaft onto the bearing journals while engaging gears with each other.

NOTE The above angle allows the No.1 and No.3 cylinder valves of the intake camshaft to push their valve lifters evenly.

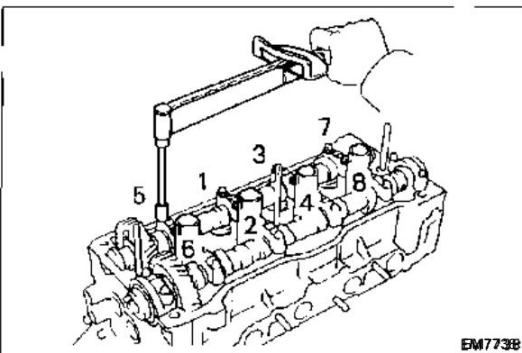
(e) Install the four bearing caps in their proper locations.



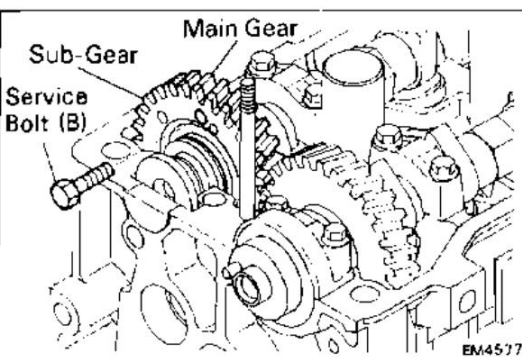
(f) Apply a light coat of engine oil to the threads and under the heads of bearing cap bolts.

(g) Install and uniformly tighten the eight bearing cap bolts in several passes in the sequence shown.

Torque: 130 kg-cm (9.5 ft-lb, 13 N·m)



(h) Remove the service bolt (B).



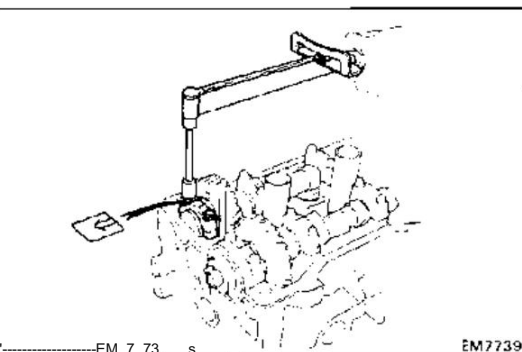
(i) Install the No.1 bearing cap with the arrow mark facing forward.

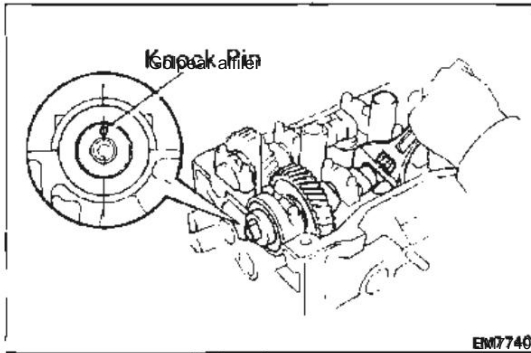
NOTICE If the bearing cap does not fit properly, push the camshaft gear backwards by prying apart the cylinder head and camshaft gear with a screwdriver.

(j) Apply a light coat of engine oil to the threads and under the heads of bearing cap bolts.

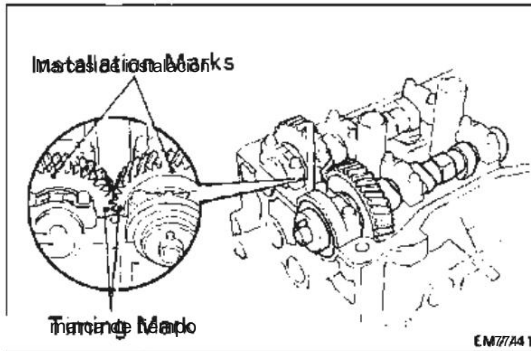
(k) Install and uniformly tighten the two bolts in several passes.

Torque: 30 kg-cm (9 ft-lb, 13 N·m)





- (l) Turn the exhaust camshaft clockwise and set it with the knock pin facing upward.



- (m) Check that the timing marks of the camshaft gears are aligned.

HINT: The assembly installation marks are on the upside.

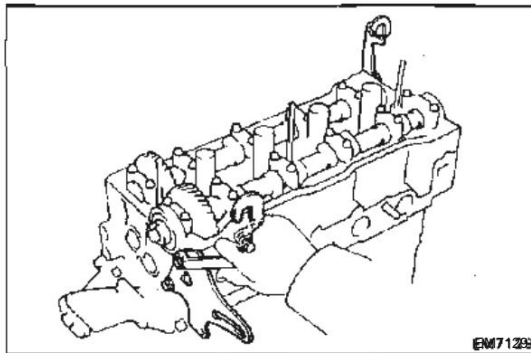
4. CHECK AND ADJUST VALVE CLEARANCE (See page EM106)

Turn the camshaft and position the cam lobe upward and check and adjust the valve clearance.

Valve clearance (if Cold):

Intake 0.0515-0.25 mm (0.006-0.010 in.)

Exhaust 0.20-0.30 mm (0.008-0.012 in.)



5. INSTALL ENGINE HANGERS

Install the two engine hangers with the two bolts.

Torque 280 N·m (207 ft·lb) (20.127 N·m/2.7 N·m)

6. INSTALL FAN BELT ADJUSTING BAR

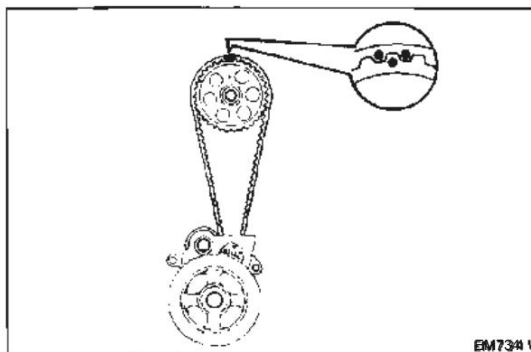
Install the adjusting bar with the two bolts.

Torque 200 N·m (147 ft·lb) (14.0 N·m/2.0 N·m)

7. INSTALL CAMSHAFT TIMING PULLEY (See step 1 on page EM-44)

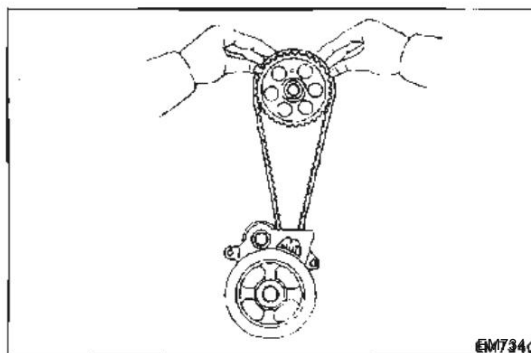
8. INSTALL REAR TIMING BELT

Align the match marks of the timing belt and camshaft timing pulley.



- (a) Remove any oil or water on the camshaft timing pulley, and keep it clean.

- (b) Install the timing belt, ensuring the tension between the crankshaft timing pulley and camshaft timing pulley.



9. INSTALLATION AND TIMING

(a) Affix the timing belt to the crankshaft pulley 1/2 turn.

(b) Turn the crankshaft clockwise two complete revolutions from BTDC to TDC.

NOTICE Always turn the crankshaft clockwise.

(c) Verify that each pulley aligns with the timing marks as shown in the illustration.

If the timing marks do not align, remove the timing belt and re-install it.

(d) Tighten the idler pulley bolt.

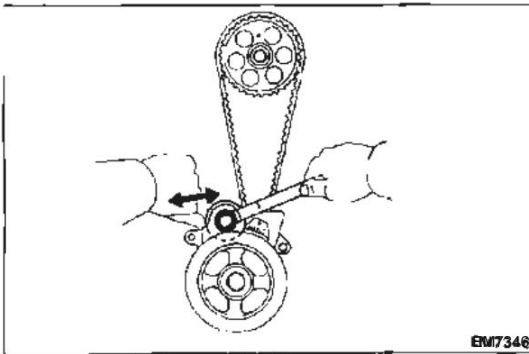
Torque: 37.5 N·m (27 ft·lb, 37 N·m)

10. (REFERENCE)

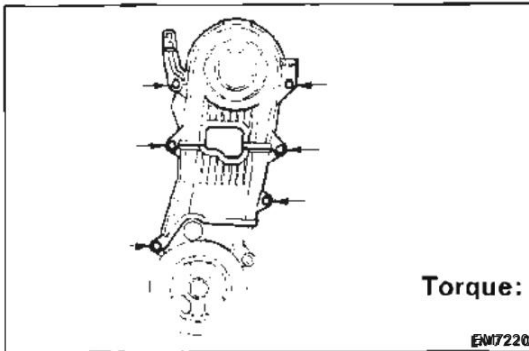
INSTALLATION BELT TENSION

Check that the belt tension is at the position indicated in the illustration.

Deflection: 6 mm (0.24 in.)
at 2 kg (4.4 lb, 20 N)



If the deflection is not as specified, adjust with the idler pulley.



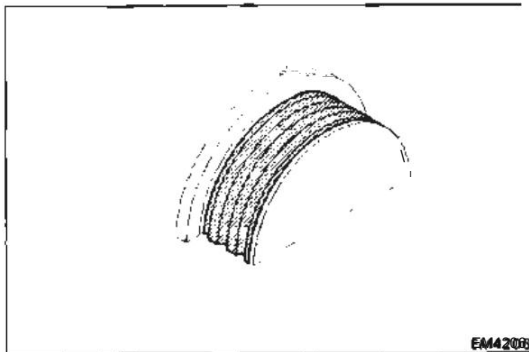
11. INSTALL NO. 2 AND NO. 3 TIMING BELT COVERS

Install the No. 2 and No. 3 timing belt covers and engine wire bracket with the six bolts.

12. INSTALL SPARK PLUGS (See page IG-8)

Torque: 180 kg-cm (12 ft.-lb, 13.8 N·m)

Torque: 80 kg-cm (69 in.-lb, 7.8 N·m)

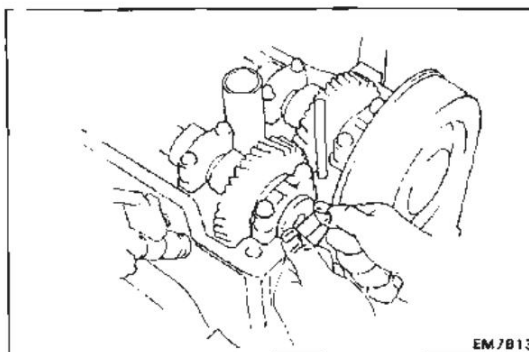


13. INSTALL SEMICIRCULAR PLUG

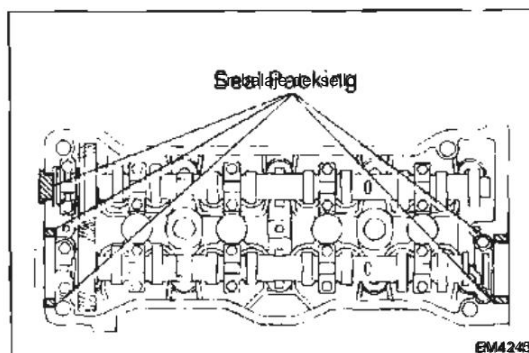
(a) Remove any old packing (RTG) material.

(b) Apply seal packing to the circular plug.

Seal packing: Part No. 08828-260080 or equivalent



(c) Install the semi-circular plug to the cylinder head.

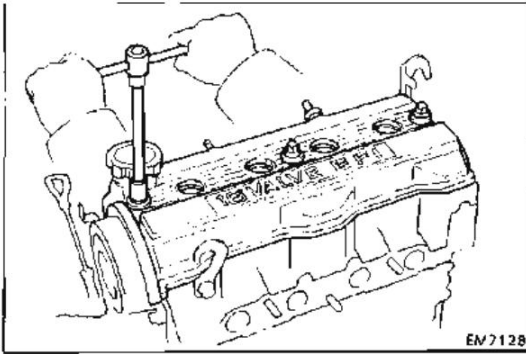


14. INSTALL CYLINDER HEAD COVER

(a) Remove any old packing (RTG) material.

(b) Apply seal packing to the cylinder head as shown in the figure.

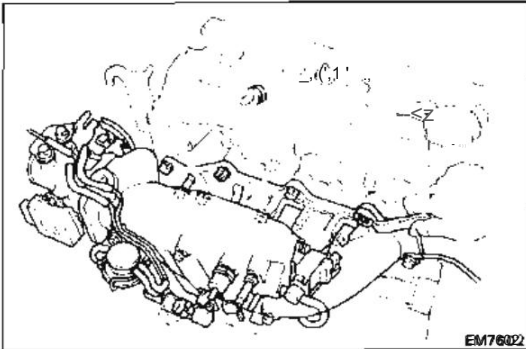
Seal packing: Part No. 08828-260080 or equivalent



(c) Install the gasket on the head cover.

(d) Install the head cover with the three gaskets and cap nuts.

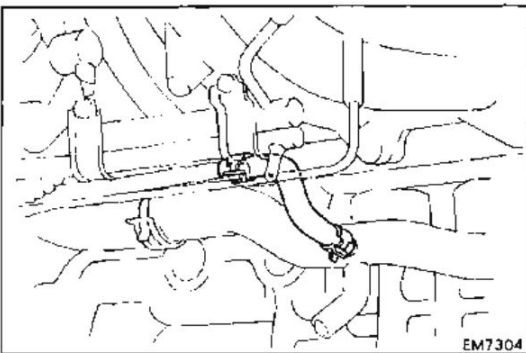
Torque 80 kg-cm (6.9 ft-lb, 7.8 N·m)



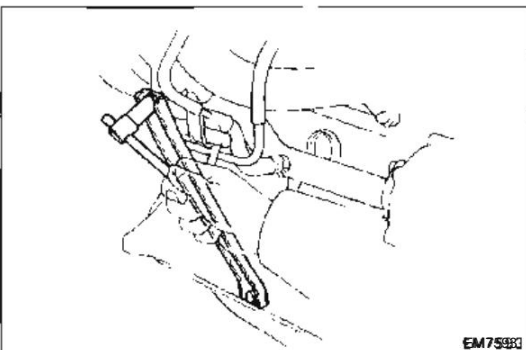
15. INSTALL INTAKE MANIFOLD (2WD)

(a) Install a new gasket on the intake manifold with the seven bolts, grommet and two nuts.

Torque 195 kg-cm (14 ft-lb, 19 N·m)



(b) Connect the water hose to the intake pipe.



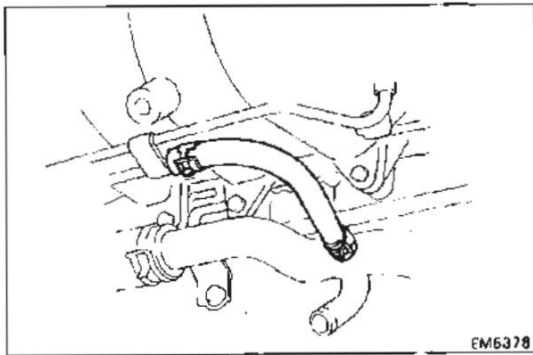
(c) Install the serpentine belt with the two bolts.

Torque:

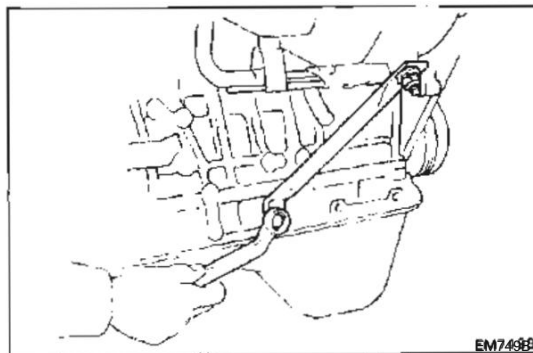
2 bezel head: 195 kg-cm (14 ft-lb, 19 N·m)

4 bezel head: 1400 kg-cm (229 ft-lb, 39 N·m)

(4WD)



(b) Connect the water by pass hose to the air pipe.



(c) Install the manifold stay with the bolt and nut.

Torque: 19.5 kgf·cm (1.4 ft·lb, 1.9 N·m)

16. (4WD)

17. INSTALL ENGINE WIRE TO INTAKE MANIFOLD

(a) Install the engine wire with the three bolts.

(b) Install the engine wire to the engine vacuum pipe with the wire clamp.

(c) Connect the following connectors:

- Throttle position sensor connector
- Cold valve connector
- (2WD w/ EGR system)
EGR valve connector
- Cold start injector connector

18. INSTALL ENGINE WIRE TO NO. 2 TIMING BELT COVER

(a) Install the wire clamp on engine wire to the wire bracket.

(b) Install the engine wire with the bolt.

(c) Connect the following connectors and wire:

- Alternator connector
- Alternator wire
- Oil pressure switch connector

19. INSTALL INJECTORS AND DELIVERY PIPE

(See steps 1 and 3 to 6 on pages FI-116 to 119)

20. (4A)WD)

21. INSTALL COLD START INJECTOR PIPE
(See step 2 on page EM-108)

22. INSTALL WATER INLET AND OUTLET HOUSING

- (a) Remove any old packing (FIP) material and be careful not to drop any on the contact surfaces of the inlet housing and cylinder head.

- Using a scraper blade and gas hose to scrape away all the coil packing (FIP) material from the gasket surfaces and sealing groove.

- Thoroughly clean all components to remove all the loose material.

- Using a cotton swab to clean both sealing surfaces.

- (b) Apply seal packing to the inlet housing groove.

Seal packing gasket Part No. 0288260100 or equivalent

- Install a nozzle that has been cut with a 2 – 3 mm (0.080, +2 pin) diameter opening.

DONT Avoid applying an excessive amount to the surface.

- Laps must be assembled within 15 minutes of application. Otherwise the material must be removed and reapplied.

- Immediately remove the nozzle from the tube and reinstall cap.

- (c) Install the water inlet housing with the bolts and two nuts.

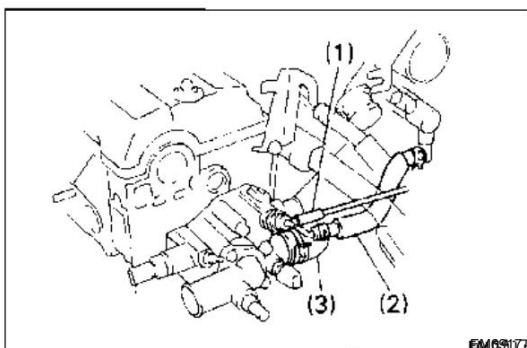
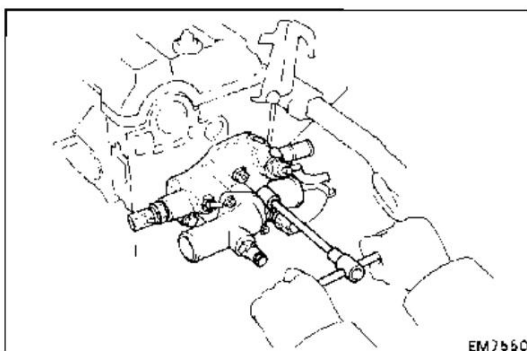
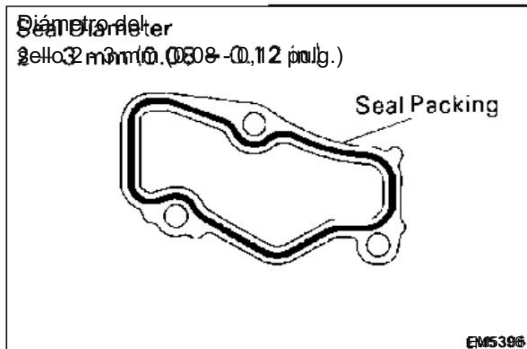
Torque 200 kgf-cm (14.0 N·m) 30 N·m)

- (d) Connect the following hoses:

- (1) Mangle vacuum hose(s)
- (2) Water bypass hose
- (3) Mangle water hose

- (e) Connect the following connectors:

- Water temperature sender gauge connector
- Water temperature sensor connector
- Stop injector diameter switch connector



23. INSTALL A WATER OUTLET

(a) Remove any old packing (FIP G) material and head surface before applying the new packing material. The contact surfaces of the water outlet may be damaged.

• Using a scraper blade and gasket scraper, remove all the old packing and any material from the gasket surfaces and sealing groove.

• Thoroughly clean both components to remove all the valve material.

• Using a non-ferrous wire brush, clean both sealing surfaces.

(b) Apply seal packing to the water outlet groove.

Seal packing is **PART NO. 08826200000** or equivalent.

• Install a nozzle that fits well in the 2 - 3 mm (0.080, ± 0.012 in.) opening.

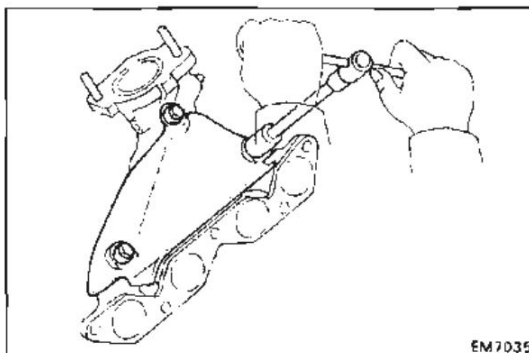
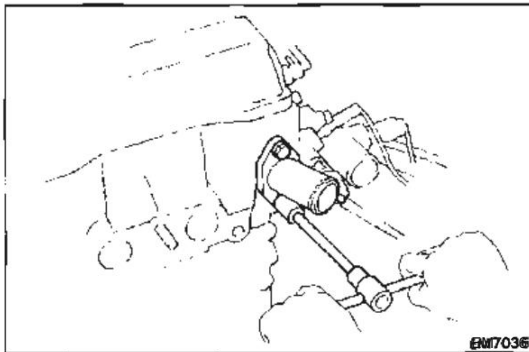
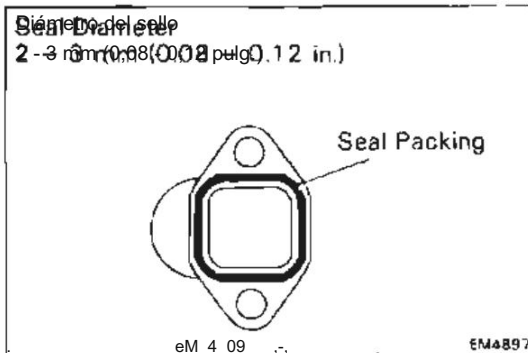
• Avoid applying an excessive amount to the surface.

• As the nozzle is inserted, it is not possible to apply the compound. Otherwise, the material must be removed and reapplied.

• Immediately remove nozzle from the tube and reinstall cap.

(c) Install the water outlet with the two bolts.

Torque **150 kg-cm (11.5 N-m, 15 N-m)**

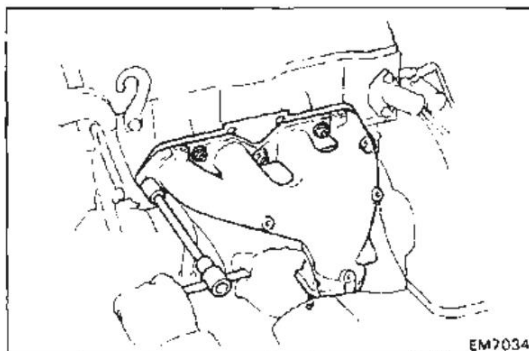


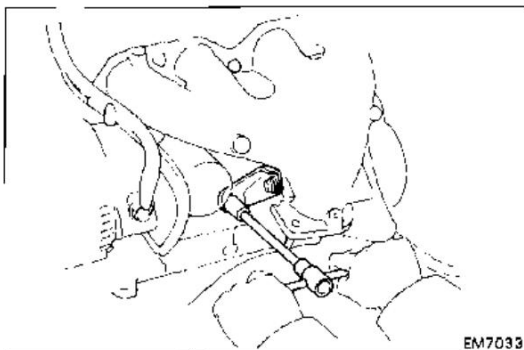
24. INSTALL EXHAUST MANIFOLD (2WD)

(a) Install the lower insulator to the exhaust manifold with the three bolts.

(b) Install a new gasket and the exhaust manifold with the four bolts and three nuts.

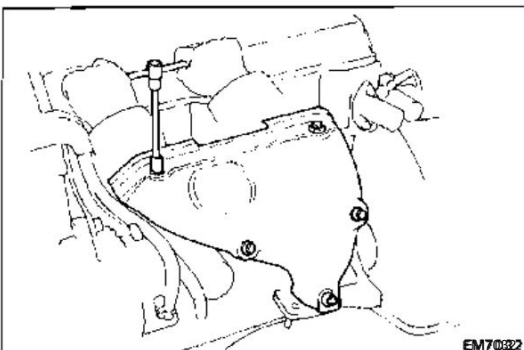
Torque **250 kg-cm (18 N-m, 25 N-m)**





(c) Install the manifold stay with the two bolts.

Torque 400 kg-cm (29 ft-lb) 39 N·m



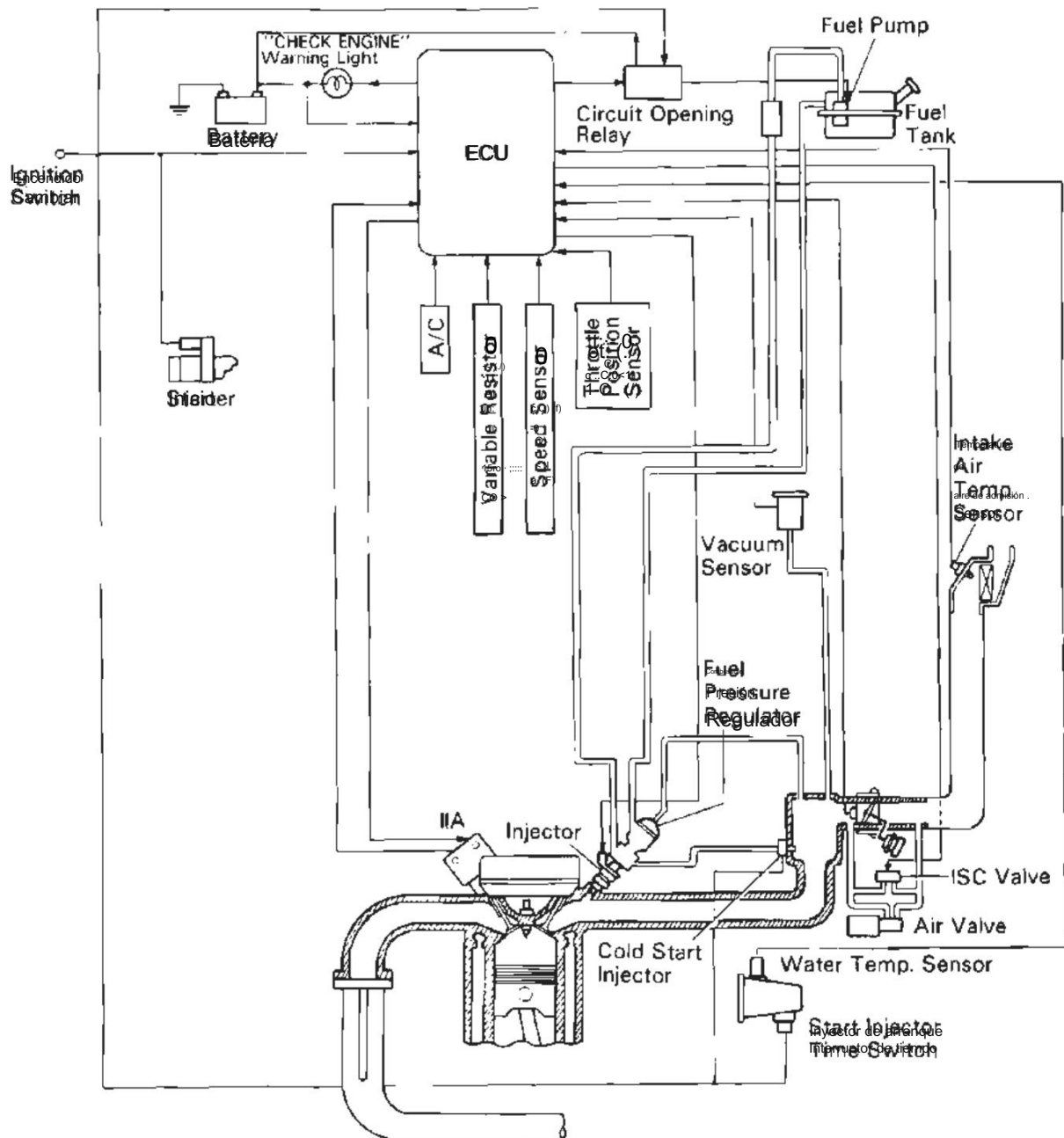
(d) Install the upper heat insulator with the five bolts.

EFI SYSTEM

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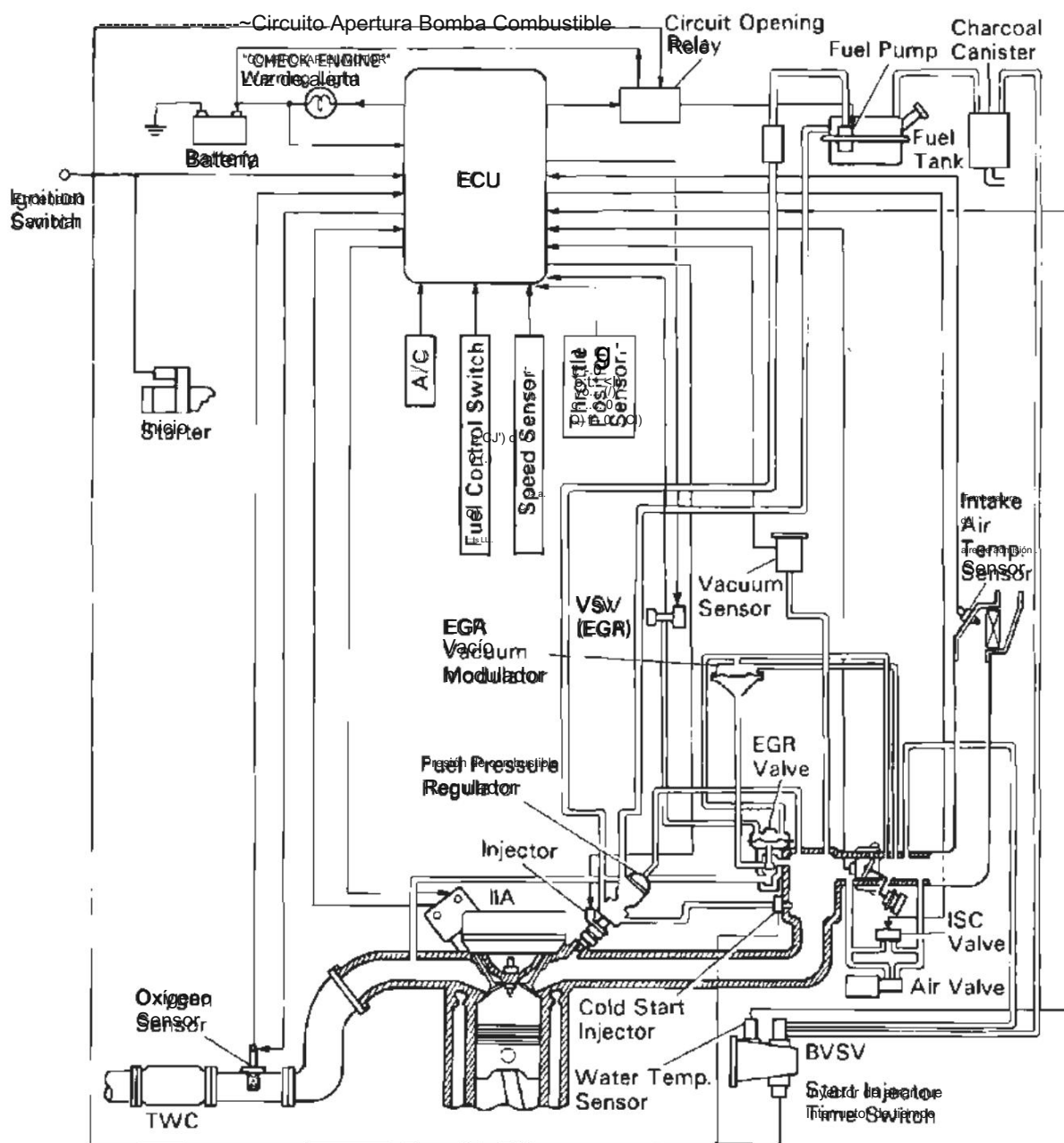
SYSTEM DESCRIPTION

4A-FE (2VDD) system ECU (ECU)



SYSTEM DESCRIPTION (Cont'd)

4A-FE (2WD, car) EIS System



The EFI system is composed of three basic sub-systems: **Fuel, Air Induction and Electronic Control Systems**.

FUEL SYSTEM

Fuel is supplied under constant pressure to the EFI injectors by an electric fuel pump. The injectors inject a metered quantity of fuel into the intake ports in accordance with signals from the ECU (Electronic Control Unit).

AIR INDUCTION SYSTEM

The air induction system provides sufficient air for engine operation.

ELECTRONIC CONTROL SYSTEM

4A-FF, 4A-GE engines are equipped with a Toyota Computer Control System (TCCS) which centrally controls the EFI, ESA, Diagnostic systems etc. by means of an Electronic Control Unit (ECU, formerly EFI computer) employing a microcomputer.

The ECU, the TCCS, controls the following functions:

1. Electronic Fuel Injection (EFI)

The ECU receives signals from various sensors indicating changing engine operating conditions such as:

- Intake manifold absolute pressure (w/o Air flow meter)
- Intake air volume (w/ Air flow meter)
- Intake air temperature
- Coolant temperature
- Engine rpm
- Throttle valve opening valve
- Exhaust oxygen content (w/ TWC) etc.

These signals are utilized by the ECU to determine the injection duration necessary for an optimum air-fuel ratio.

2. Electronic Spark Advance (ESA)

The ECU is programmed with data for optimum ignition timing under all operating conditions, using data provided by sensors which monitor various engine functions (rpm, coolant temperature etc.) the microcomputer (ECU) triggers the spark at precisely the right instant. (See IG section)

3. Diagnosis

The ECU detects any malfunctions or abnormalities in the sensor network and lights a "CHECK ENGINE" warning light on the instrument panel. At the same time, the trouble is identified and a diagnostic code is recorded by the ECU. The diagnostic code can be read by the number of blinks of the check engine warning light. The diagnostic code terminals TE1 and E1 are connected. The diagnostic codes are referred to the later page.

(See pages 28 to 31)

4. Fail Safe Function

In the event of the sensor malfunctioning, a back-up circuit will take over to provide minimum drivability and a "CHECK ENGINE" warning light will illuminate.

PRECAUTIONS

1. **Before working on the fuel system, disconnect the negative (-) terminal from the battery.**

SUTER Any diagnostic code retained by the computer will be cleared when the battery terminal is removed. Therefore, if necessary, erase the diagnosis data before removing the battery terminal.

2. (for SOLARIS) **Do not start the engine after approximately 20 seconds after the ignition switch is turned to the "ON" position.**

WARNING The engine must be started after approximately 20 seconds after the ignition switch is turned to the "ON" position. If the engine is started immediately, the engine may be damaged. Therefore, wait for approximately 20 seconds after the ignition switch is turned to the "ON" position before starting the engine.

3. **When working on the fuel system, do not use a flame or work near any fire hazard.**

4. **Keep gasoline off of clothes and other parts.**

INSPECTION PRECAUTIONS

MAINTENANCE PRECAUTIONS

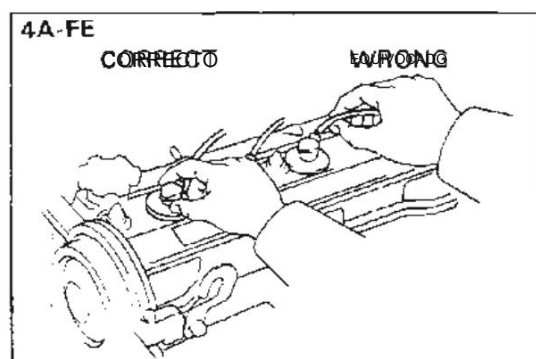
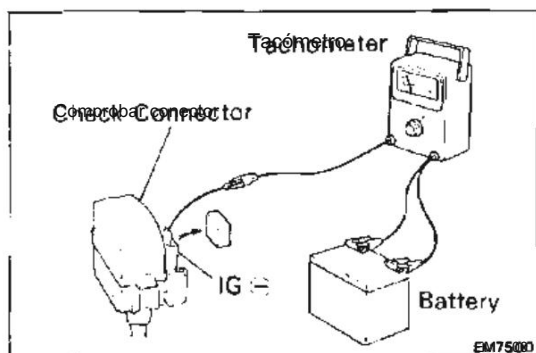
1. **CHECK CORRECT ENGINE TUNE-UP**

2. **PRECAUTIONS WHEN TACHOMETER GAUGE**

- (a) **Connect the tachometer to the terminal of the check connector.**

LOCATION Consult page FL-333

- (b) **Use the battery as the power source for the timing light, tachometer, etc.**

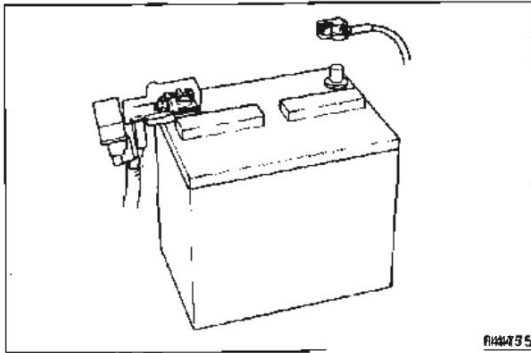


3. **IN CASE OF ENGINE OVERHEAT, THE CATALYTIC CONVERTER MAY OVERHEAT. THEREFORE, THE FOLLOWING PRECAUTIONS SHOULD BE TAKEN**

- (a) **Check proper connection of battery terminals (b) etc.**
- (b) **Handle high tension components fully.**
- (c) **After repair work, check that all ignition system wires are reconnected securely.**
- (d) **When cleaning the engine compartment, use a special care fusible to protect the electrical system from water.**

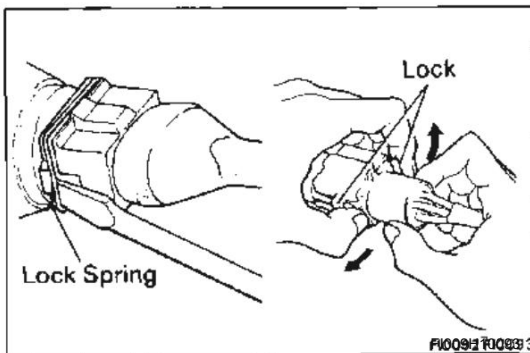
4. **PRECAUTIONS WHEN HANDLING OXYGEN SENSOR**

- (a) **Do not allow the oxygen sensor to receive any physical impact or shocks.**
- (b) **Do not allow water to come in contact with the sensor.**

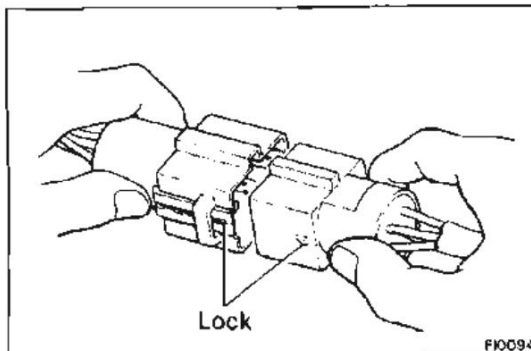


ELECTRONIC CONTROL SYSTEM

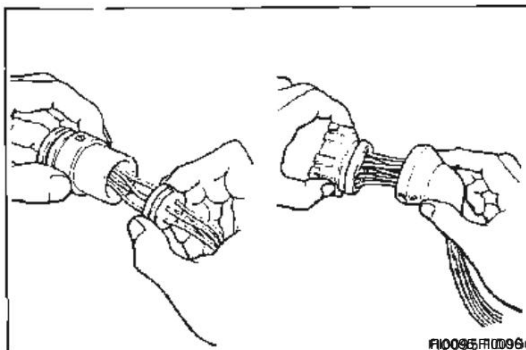
1. **Before removing or installing connectors, terminals, or wires, disconnect the battery by either turning OFF the ignition switch or disconnecting the battery terminals.**
2. **When installing the battery, be especially careful not to connect the cables the positive and negative (-) cables.**
3. **Do not permit parts to touch during reconnection or installation. Handle all ECU parts carefully and do not, in particular, the ECU.**
4. **Take great care during a loud disconnection, as there are numerous circuits and systems and even a slight electrical contact can cause further troubles.**
5. **Do not tap the ECU cover.**
6. **When inspecting during the work, wear the cap to prevent entry of dirt or water. Also, when washing the engine compartment, spray and wipe the connectors on the ECU parts and wiring connectors.**



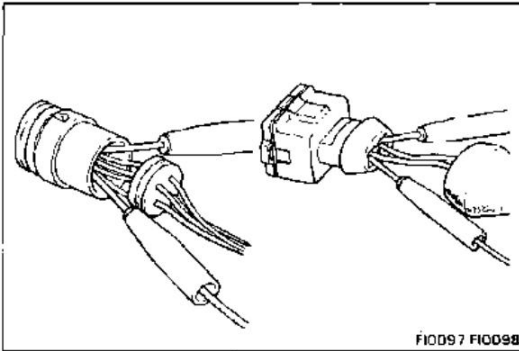
7. **Parts should be replaced as an assembly.**
8. **Seals are required when pulling and connecting wiring connectors.**
 - (a) **Push the connector out, release the lock and pull on the connector.**



- (b) **Insert the connector and check that it is locked.**



9. **When inspecting a connector with a ohmmeter.**
 - (a) **Refer to the wiring diagram in the service manual for the connector type connector.**



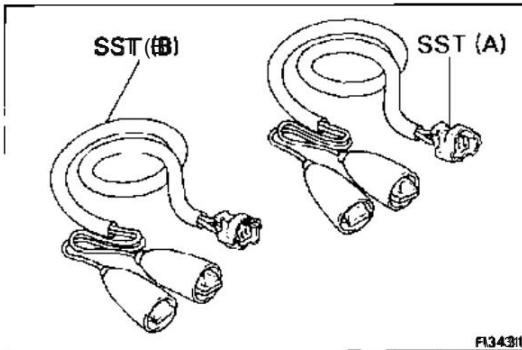
(b) Insert the tester probe into the connector cable wiring side when checking the continuity, amperage or voltage.

(c) Do not apply unnecessary force to the terminal.

(d) After the check, securely install the waterproofing rubber on the connector.

10. Use SST for inspection or test of the injector cold start injector or their wiring connectors.

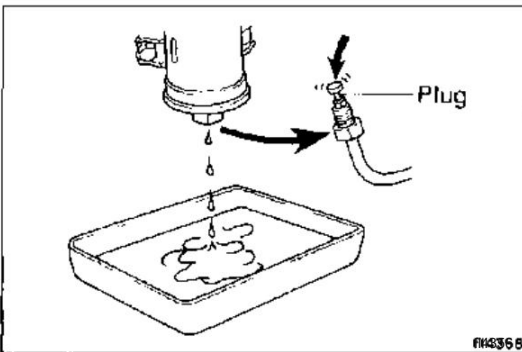
SST 09842-30055 (A) and 09842-30070 (B)



FUEL SYSTEM

1. When disconnecting the fuel pipe union on the high pressure pipe, observe the following procedure.

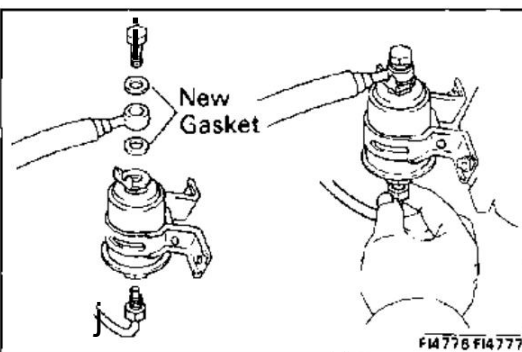
- Place a container under the connection.
- Slowly loosen the connection.
- Disconnect the connection.
- Plug the connection with a rubber plug.



2. When connecting the fuel pipe union on the high pressure pipe, observe the following procedure.

(Union bolt type)

- Always use a new gasket.
- Tighten the union bolt.
- Torque the bolt to the specified torque.



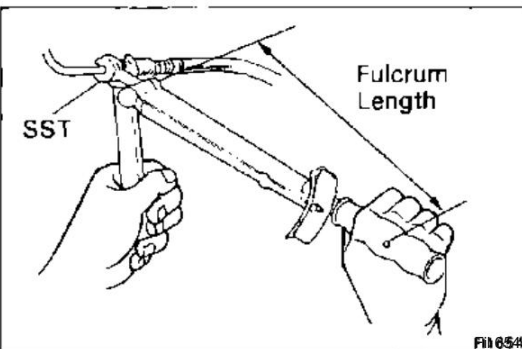
(Flare nut type)

- Apply a thin coat of oil to the flare and tighten the flare nut.
- Use the SST to torque the union to the specified torque.

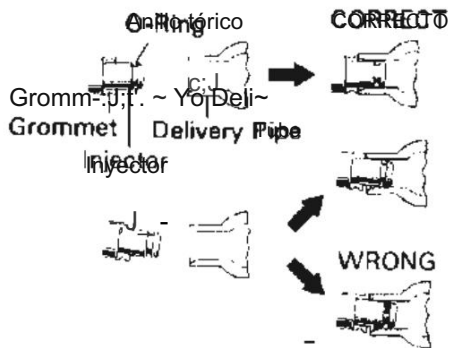
SST 09651-22020

Torque 310 kg (22 ft-lb) (220 N·m) (30 N·m)

Use a torque wrench with a fulcrum length of 30 cm (11.8 in.).



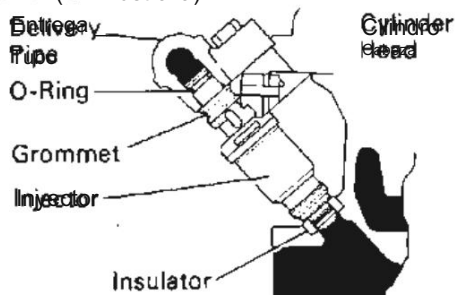
4A-FE (E.Australia)



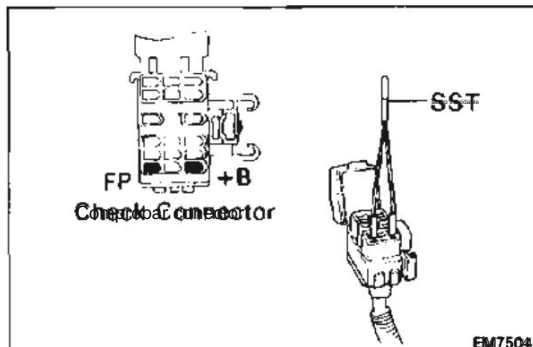
3. Take the following precautions when removing and installing the injectors.

- Never reuse the O-ring.
- When replacing an O-ring on the injector, use care not to damage it in any way.
- Lubricate the O-ring with spindle oil or gasoline before installing. Never use engine oil or brake oil.

4A-FE (E.Australia)



4. Install the injector to the delivery pipe and cylinder head as shown in the figure.



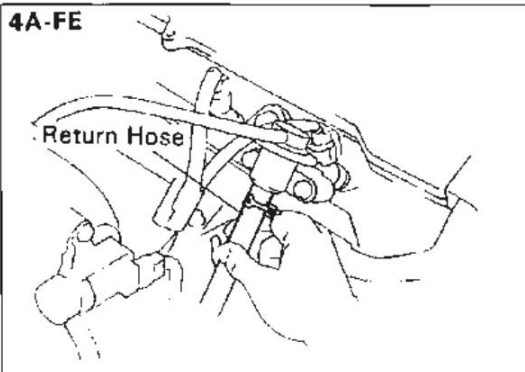
5. Confirm that there are no fuel leaks after performing maintenance on the fuel system.

- With engine stopped, turn the ignition switch ON.
- Using SST, connect SST terminals +B and FP of the check connector.

SST 09843-98020

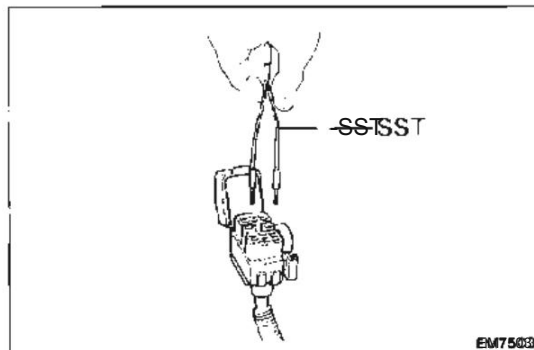
LOCATION: See page FI-133

4A-FE



(c) Cuando se abre la retención de la presión, la presión hidráulica se libera y la presión de aceite puede aumentar a aproximadamente 2352 psi (163 MPa). En este estado, verifique que no haya fugas de aceite en ninguna parte del sistema de combustible.

NOTICE Siempre asegure el extremo de la manguera al quitarla. Si no se asegura, la manguera puede causar lesiones o daños.



(d) Retire el SSST del conector de verificación.

Set 00843 8020

TROUBLESHOOTING

TROUBLESHOOTING HINTS

1. Los problemas de funcionamiento del motor generalmente no son causados por el sistema EFI. Cuando se esté haciendo troubleshooting, siempre primero revise la condición de los otros sistemas.

(a) Electronic source

- Battery
- Loose electrical connections
- Fuses

(b) Tire body ground

(c) Fuel system

- Fuel leakage
- Fuel filter
- Fuel pump

(d) Ignition system

- Spark plugs
- High tension cords
- Cap of Distributor
- Ignition coil
- Igniter (Encendido • Encendedor)

(e) Air induction system

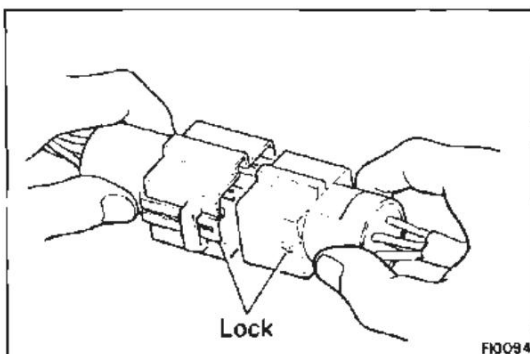
- Vacuum leaks

(f) Emission control system

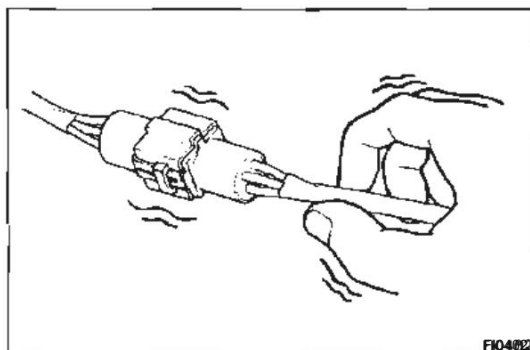
- PCV system
- EGR system (or EOR system)

(g) Others

- Ignition timing
- Idle speed
- etc.



FI0094



FI0482

2. La causa más frecuente de problemas es simplemente una mala conexión de los conectores. Siempre revise que las conexiones sean seguras.

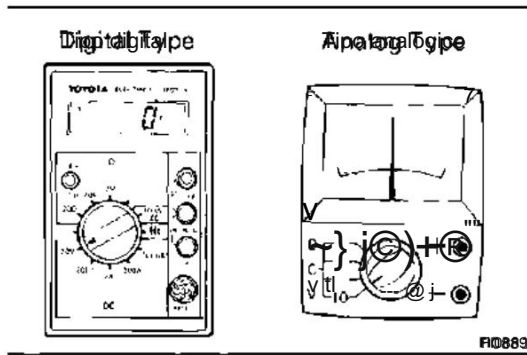
When inspecting the connector, pay particular attention to the following points:

- (a) Check to see that the terminals are not bent.
- (b) Check to see that the connector is pushed in completely and locked.

(c) Check to see that there is no signal change when the connector is slightly tapped or wiggled.

3. Solución de problemas de funcionamiento del motor no debe ser causada por el sistema EFI. Cuando se esté haciendo troubleshooting, siempre primero revise la condición de los otros sistemas.

Sufficiently troubleshooting to other causes before replacing the ECU as the ECU is high quality and expensive.



4. Utilice un ohmímetro con una impedancia mínima (10 k Ω /V mínimo) para la depuración del circuito eléctrico. (See page FI-34)

TROUBLESHOOTING PROCEDURES

SYMPTOM: DIFFICULT TO START OR NO START (ENGINE WILL NOT CRANK OR CRANKS SLOWLY)

CHECK ELECTRIC SOURCE

BAD

1. Battery
 - (1) Connection
 - (2) Gravity-Drive belt on charging system
 - (3) Voltage
2. Fusible link

OK

CHECK STARTING SYSTEM

BAD

1. Ignition switch
2. Starter
3. Neutral start switch (A/T)
4. Wiring/Connection

SYMPTOM: DIFFICULT TO START OR NO START (CRANKS OK)

CHECK DIAGNOSIS SYSTEM

Check for output of diagnosis code.
(See page FI-25)

Malfunction to
code(s)

- Diagnosis code(s)
- 4A EE (See page FI-28)
 - 4A GF (See page FI-29)

Normal code

CHECK FOR VACUUM LEAKS IN AIR INTAKE LINE

BAD

1. Oil dipstick
2. Hose connection(s)
3. PCV hose(s)
4. EGR system (valve EGR partially open)

OK

CHECK IGNITION SPARK

4A EE (See page IG-6)
4A GF (See page IG-10)

BAD

1. High-tension cords
2. Distributor
3. Ignition coil/igniter

OK

CHECK IGNITION TIMING

1. Short test terminals TE1 and E1 of the check connector.

2. Check ignition timing.

Standard BTDC @ IDLE

NO

Ignition timing just Adjust
4A EE (See page EM-20)
4A GF (See page EM-28)

OK CONTINUED ON PAGE FI-16

OK CONTINUED FROM PAGE FI-15

CHECK FUEL MINIMUM FUEL SUPPLY TO INJECTOR

1. Check fuel tank
2. Check fuel pressure at fuel line
 - (a) Connect terminals B and FP of the check ohmmeter.
 - (2) See fuel pressure at fuel hose of fuel filter on barrel (See page FI-95)

BAD

1. Fuel line possible leakage deformation
2. Fuse
3. Circuit opening relay (See page FI-135)
4. Fuel pump (See page FI-94)
5. Fuel filter
6. Fuel pressure regulator (See page FI-109)

OK

(w/MAIR FLOW METER)

CHECK FUEL PUMP SWITCH IN AIR FLOW METER

Check continuity between terminals FC and F while measuring plate of air flow meter is open.

BAD

Medidor de flujo de (See page FI-120)

OK

CHECK SPARK PLUGS

Standard: 0.8 mm (0.031 in.)

Check compression pressure and valve clearance if necessary.

NO

1. Spark plugs
2. Compression pressure
Minimum: 10.0 kg/cm²
(142 psi, 981 kPa)
at 250 rpm
3. Valve clearance (Cold)
Standard: IN - 0.25 mm (0.006 in.)
EX - 0.30 mm (0.012 in.)

BAD
(Add
Plugs)
(WEC)

1. Injectors shorted or leaking
2. Injector wiring short circuited
3. Cold start injector leakage (See page FI-105)
4. Start injector time switch (See page FI-137)

OK

CHECK AUXILIARY AIR VALVE (See page FI-130)

BAD

1. Auxiliary air valve
2. Water bypass hose(s)
3. Air hose(s)

OK

CHECK INTAKE VALVE

BAD

Intake valve carbon deposits

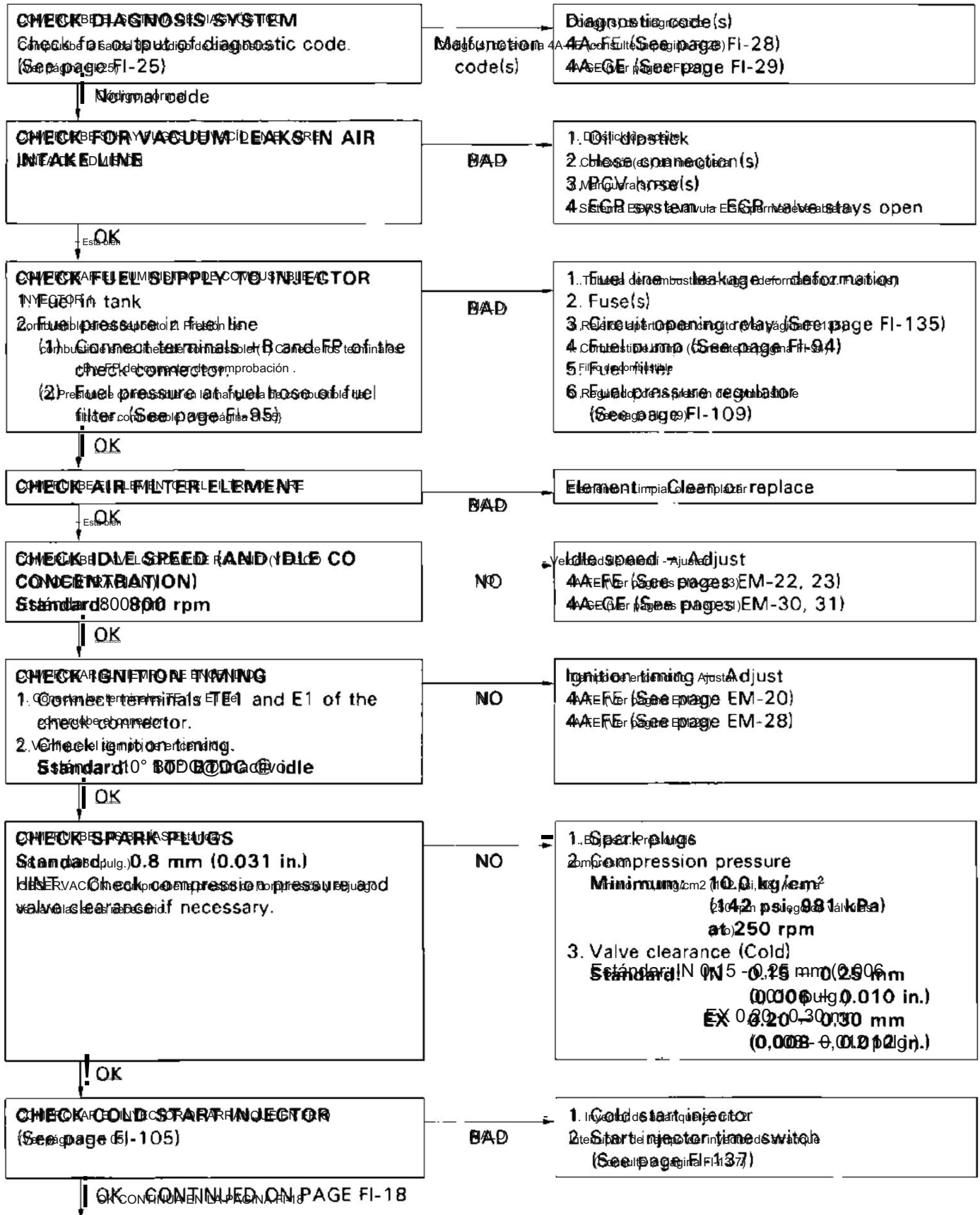
OK

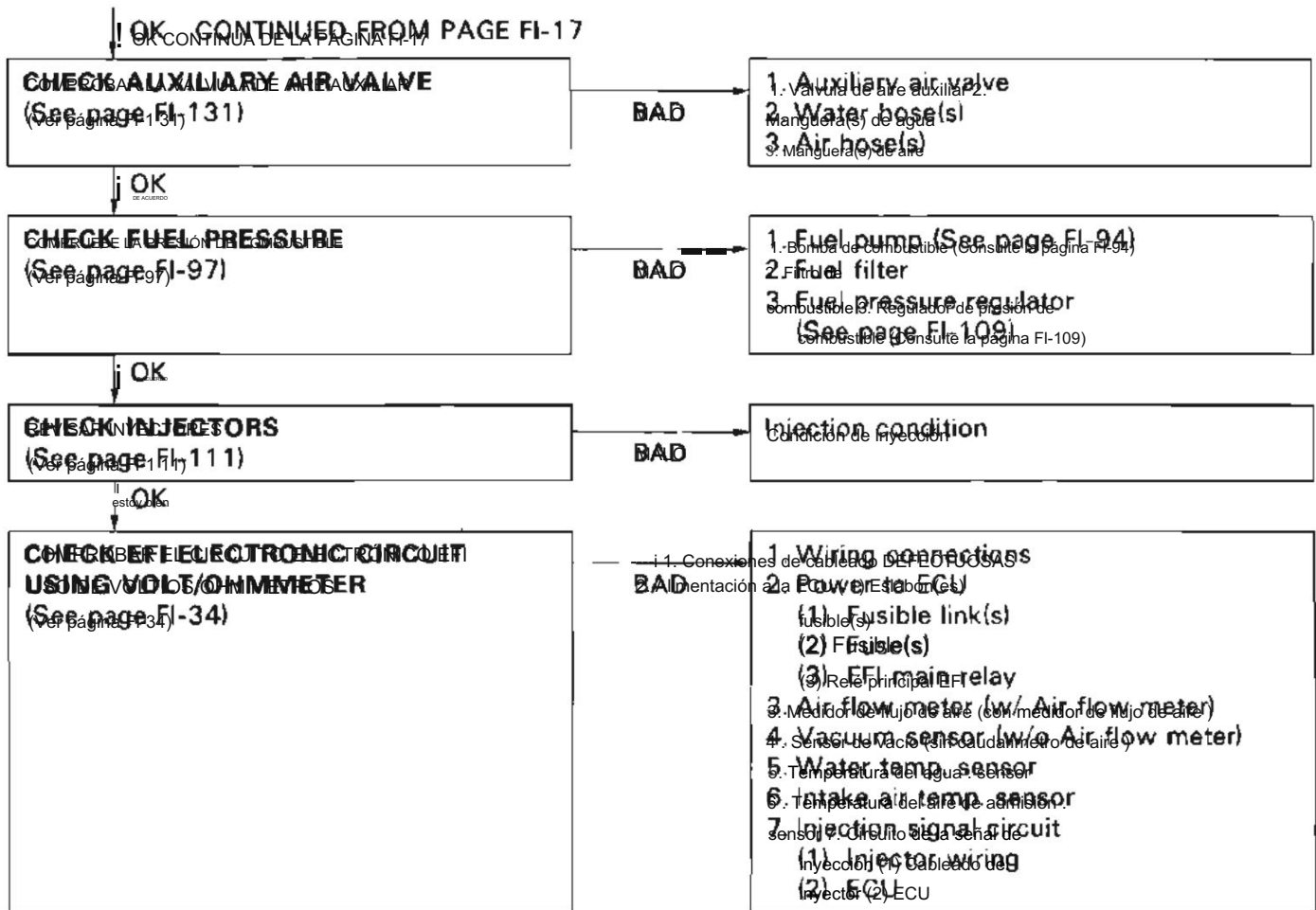
CHECK EFI ELECTRONIC CIRCUIT USING VOLTS/Ohm METER (See page FI-34)

BAD

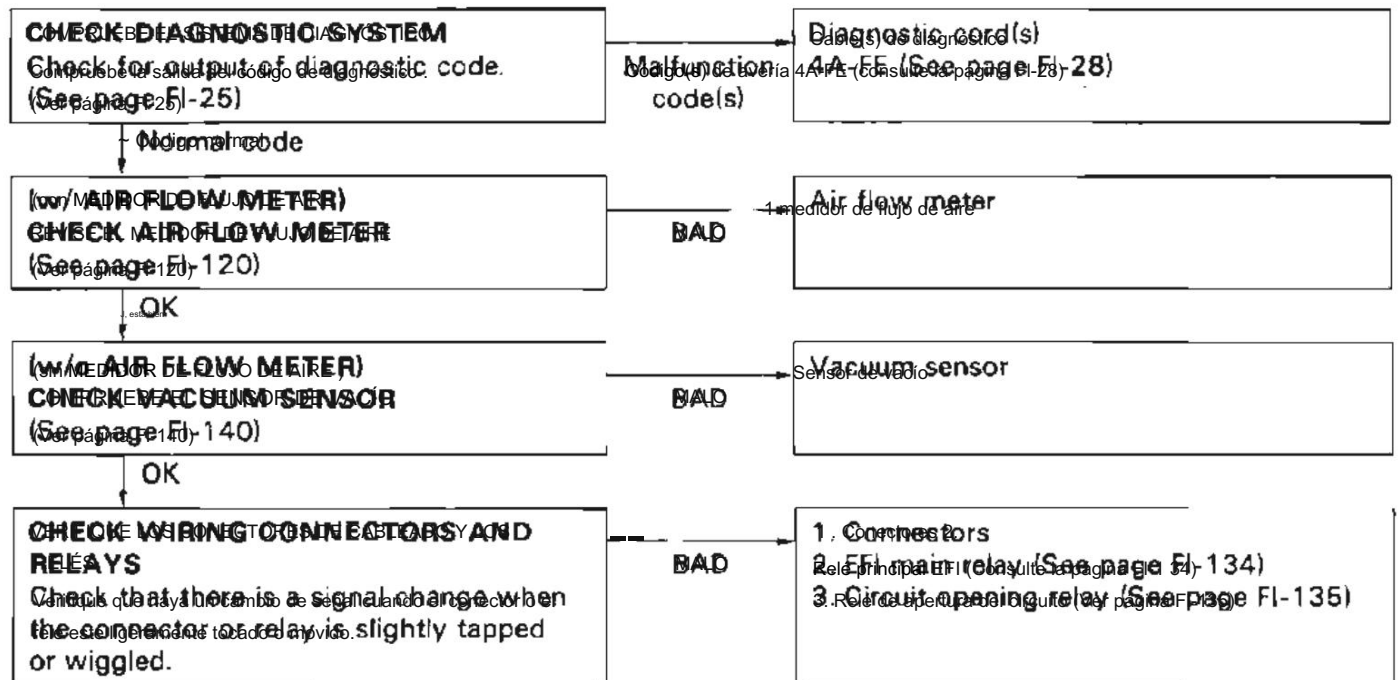
1. Wiring connection(s)
2. Power to ECU
 - (1) Fuse(s) link(s)
 - (2) Fuse(s)
 - (3) Relay (main relay)
3. Air flow meter (w/air flow meter)
4. Vacuum sensor (w/air flow meter)
5. Water temp. sensor
6. Intake air temp. sensor
7. Injection signal circuit
 - (1) Injector wiring
 - (2) ECU

SYMPTOM: MOTOREN REBELLE A L'ALLUMAGE

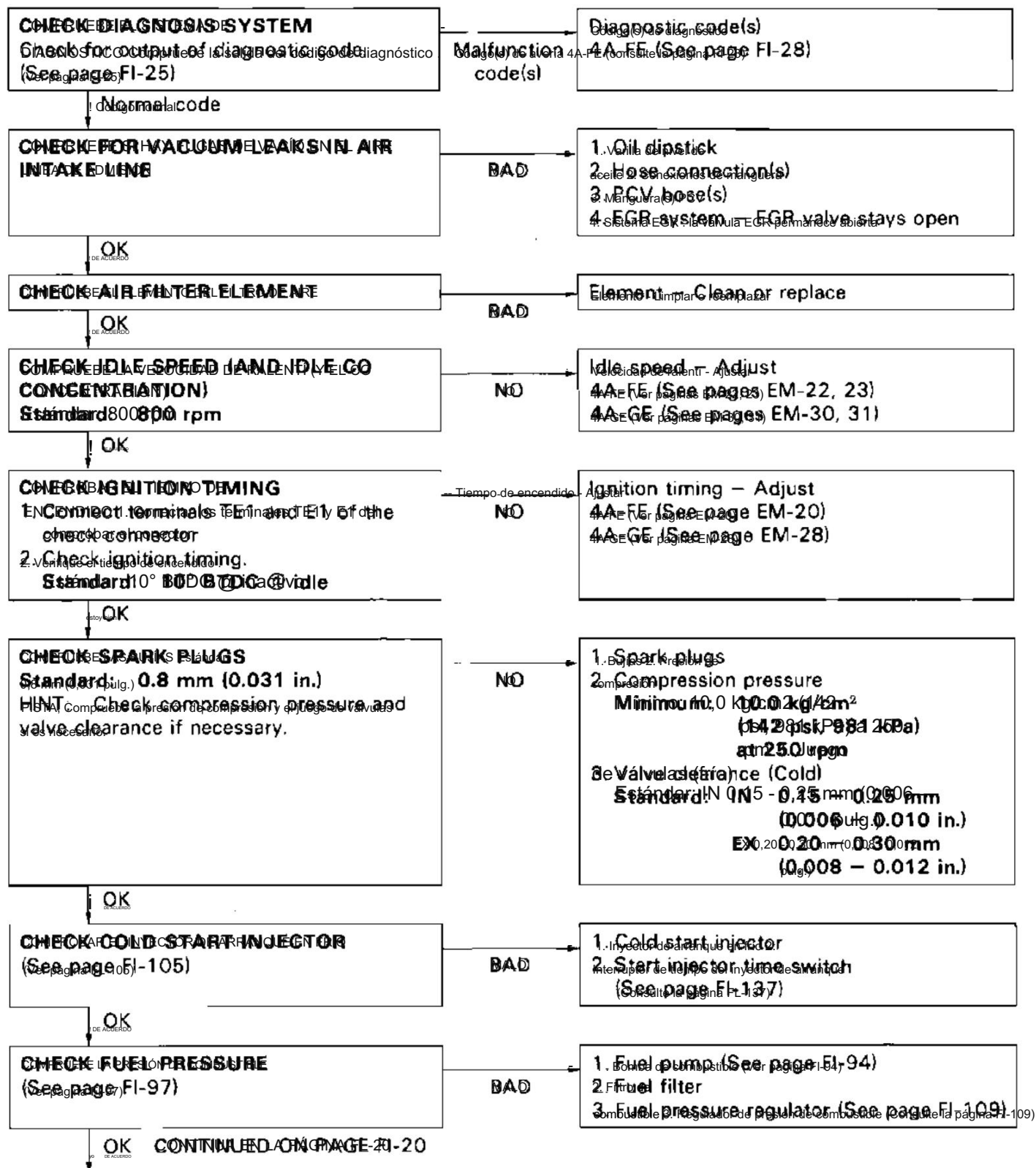


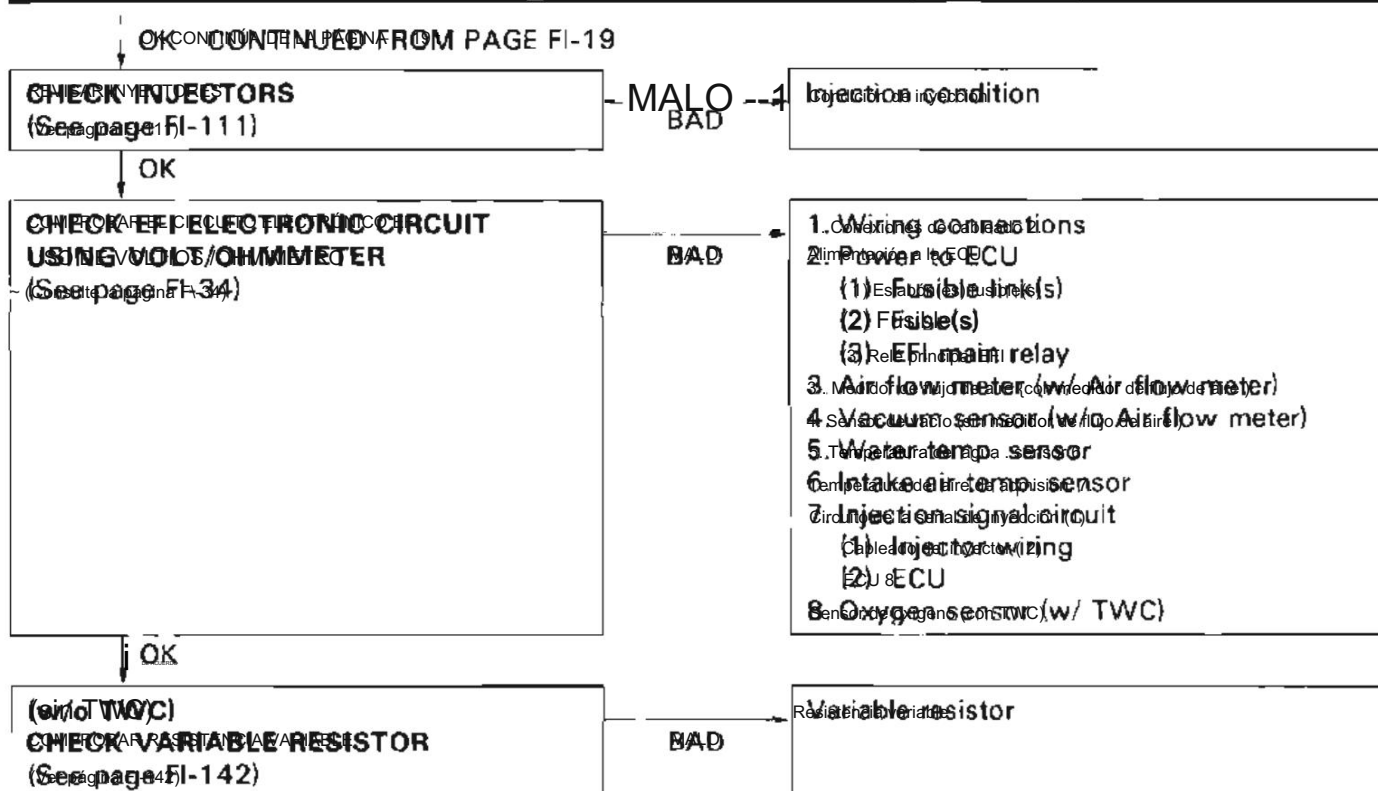


SYMPTOM MOTORS ENGINE SOMETIMES STALLS

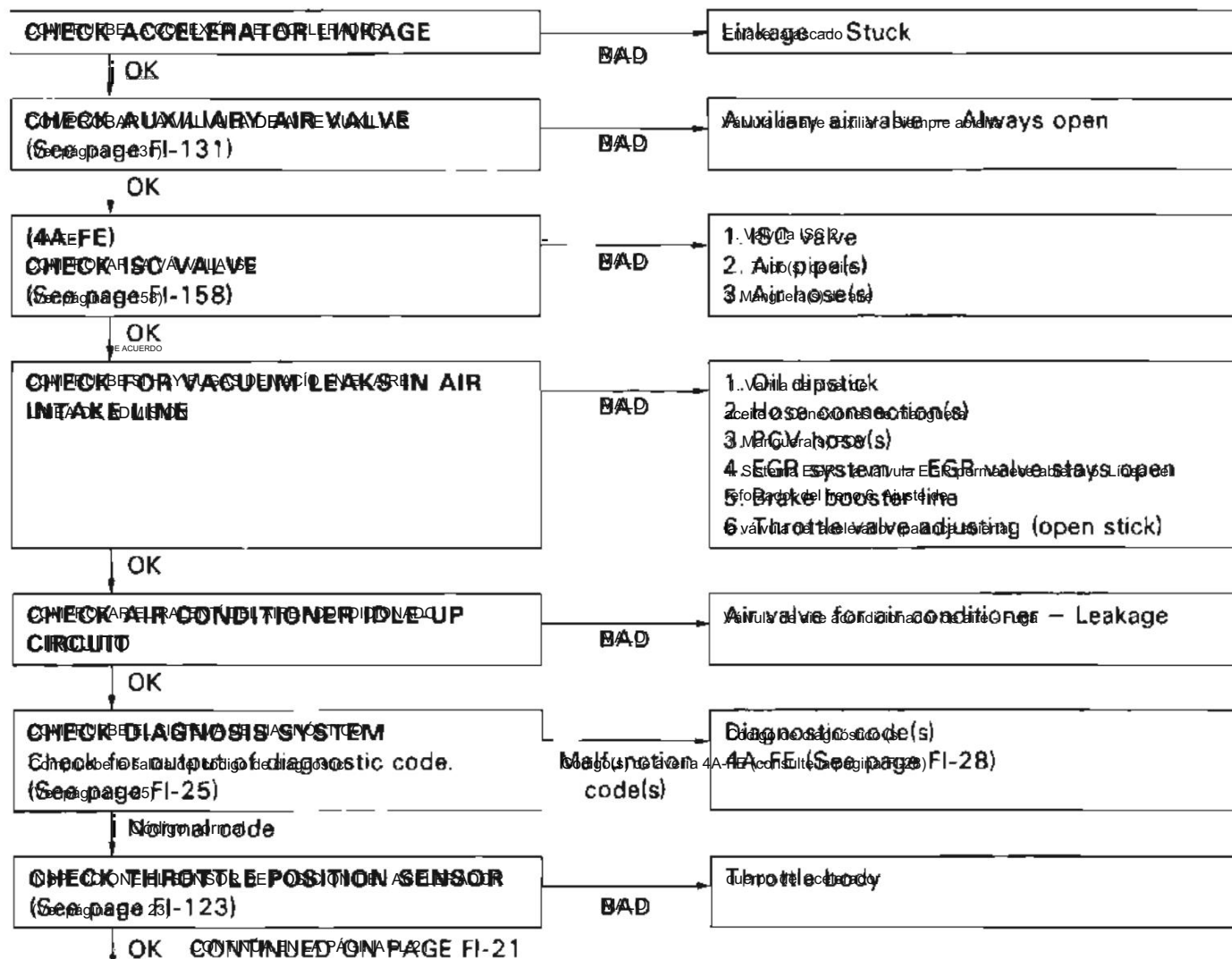


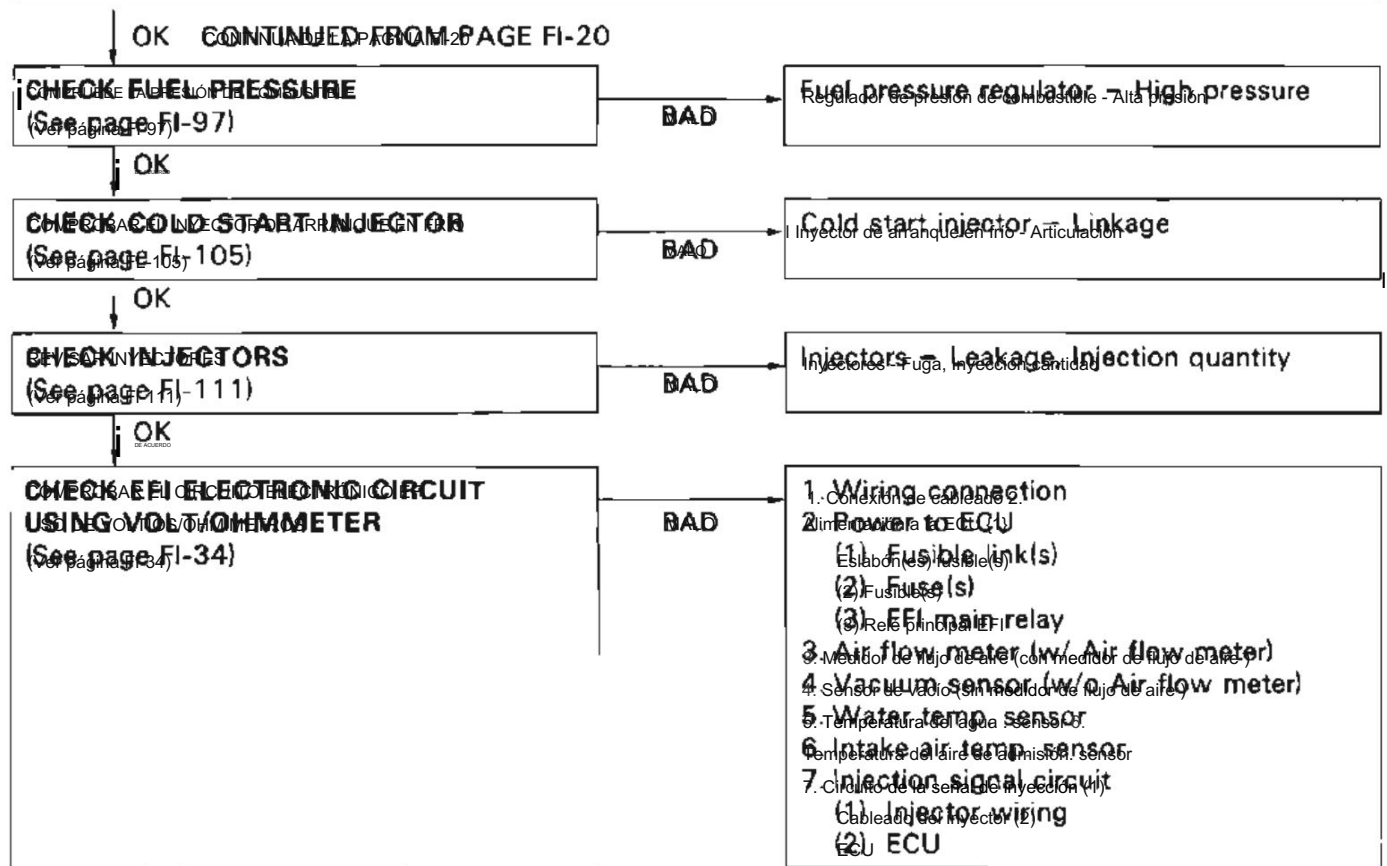
SYMPTOM: ENTHROUSING AND/OR MISSING



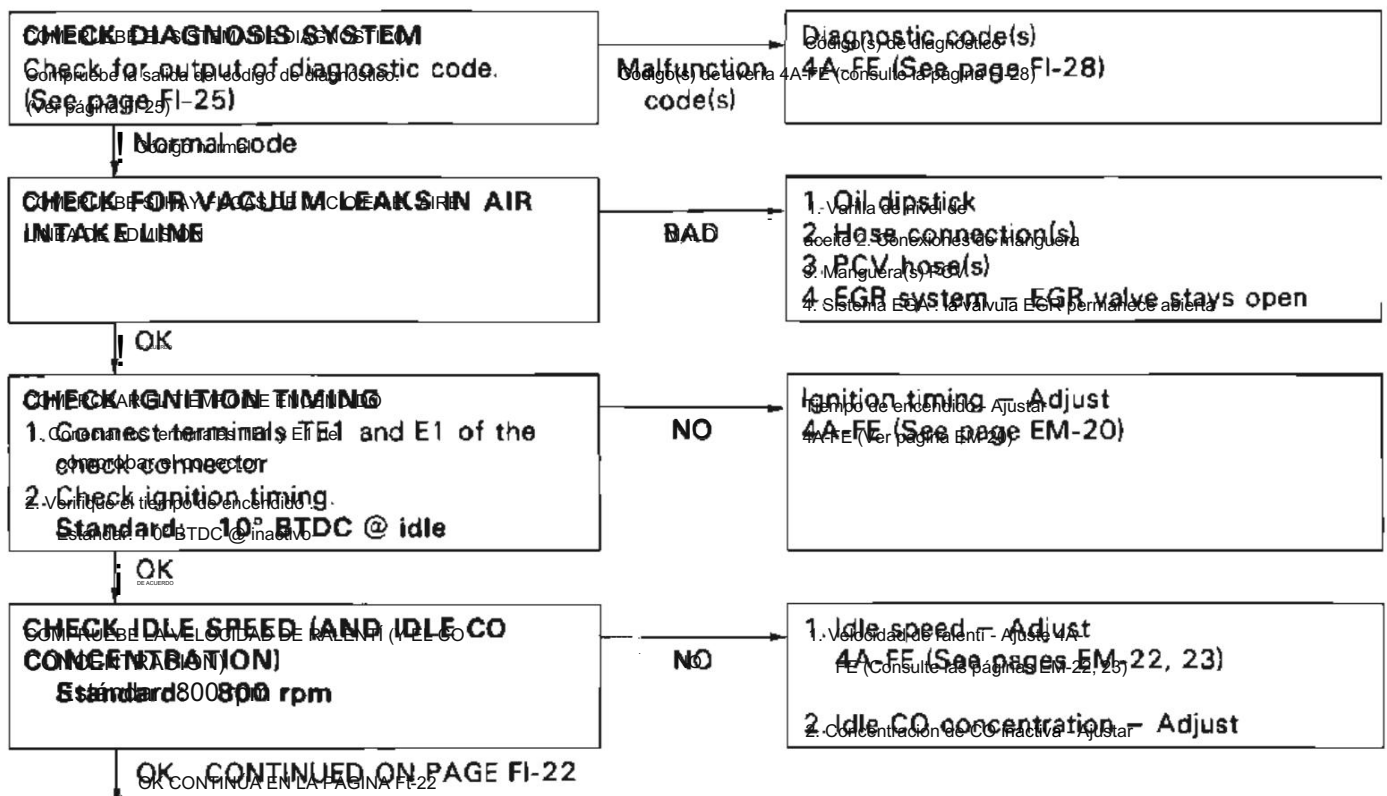


SYMPTOM A - HIGH ENGINE IDLE SPEED (NO DROP)

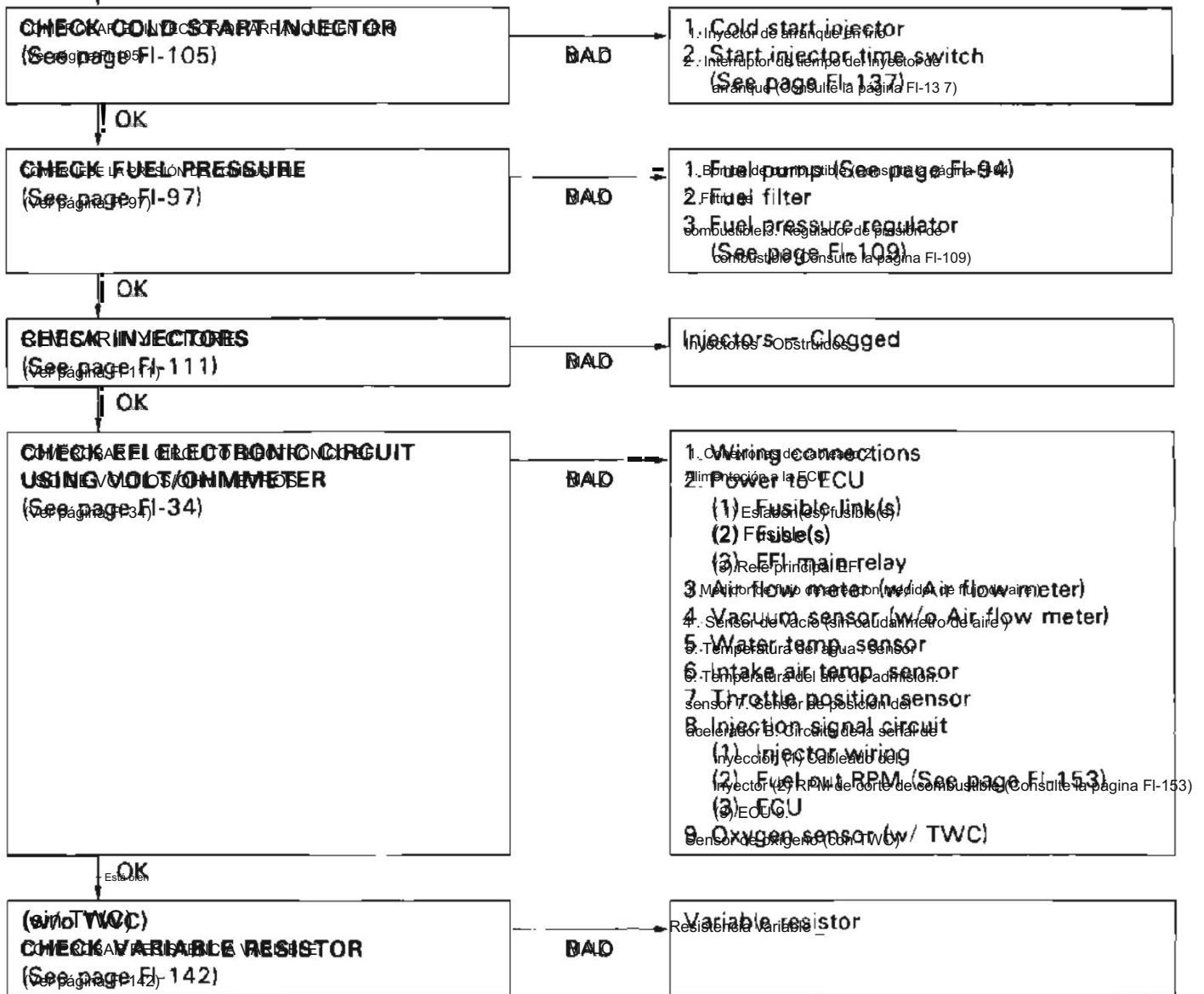




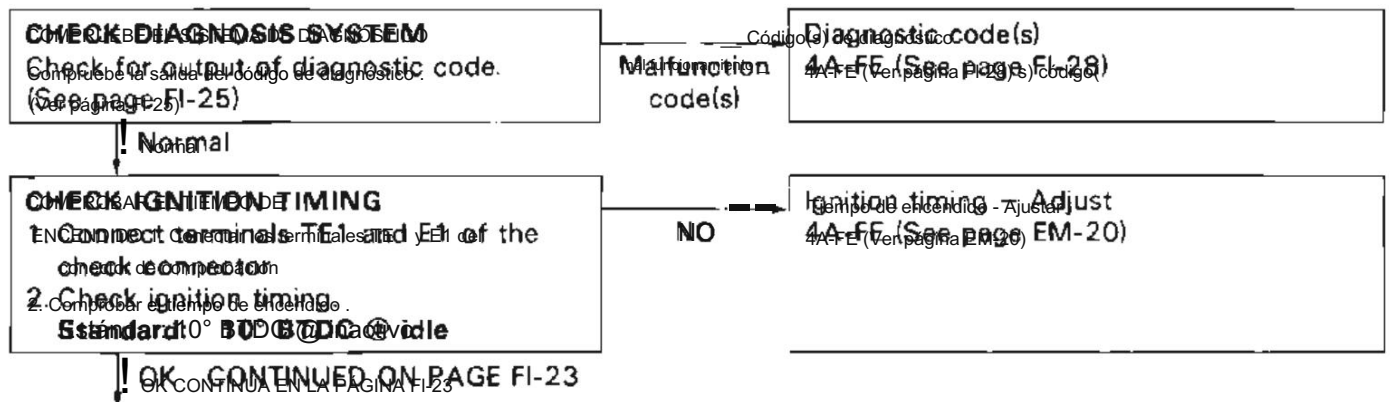
SYMPTOM ENGINE BACKFIRES Lean Fuel Mixture



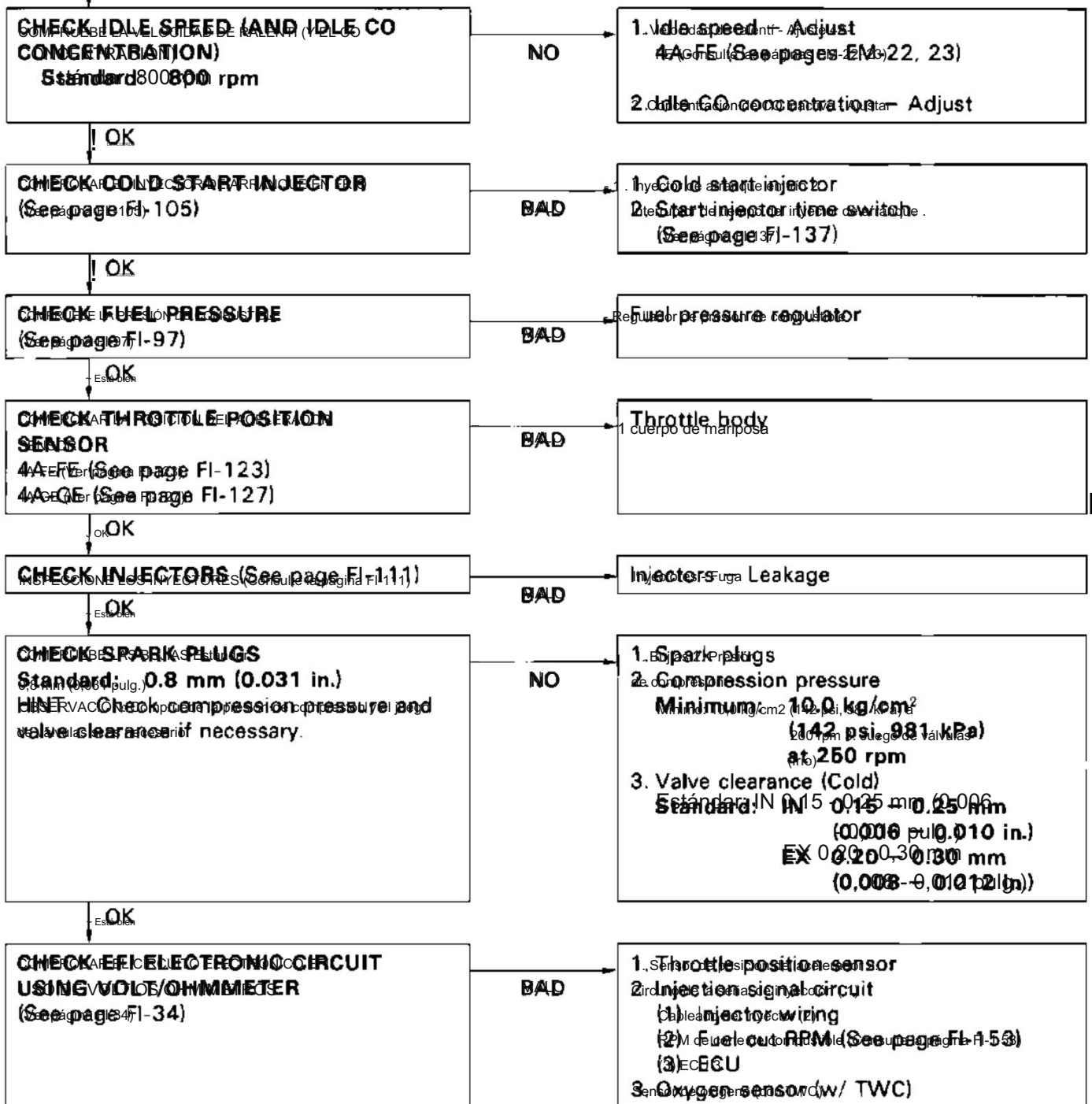
OK CONTINUED FROM PAGE FI-21



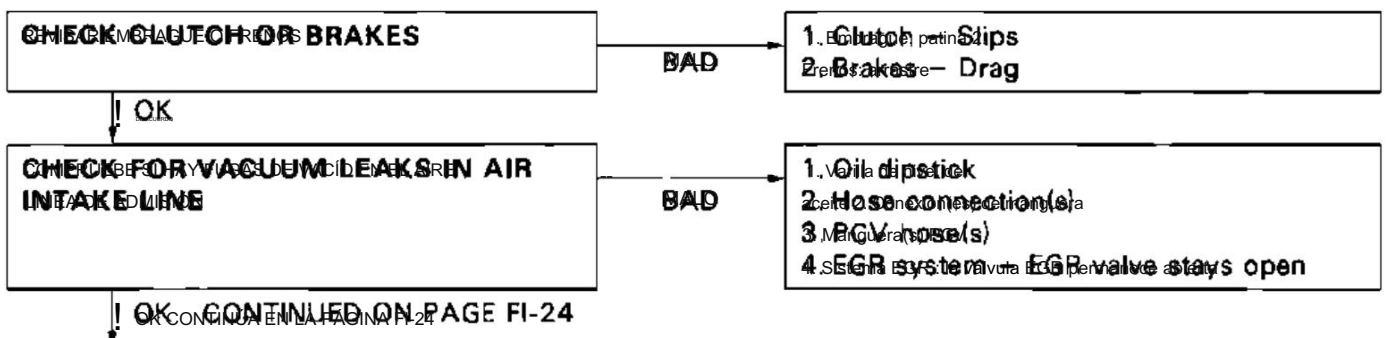
SYMPTOM Los cilindros explotan (después de encendido) Rich Fuel Mixture Misfire

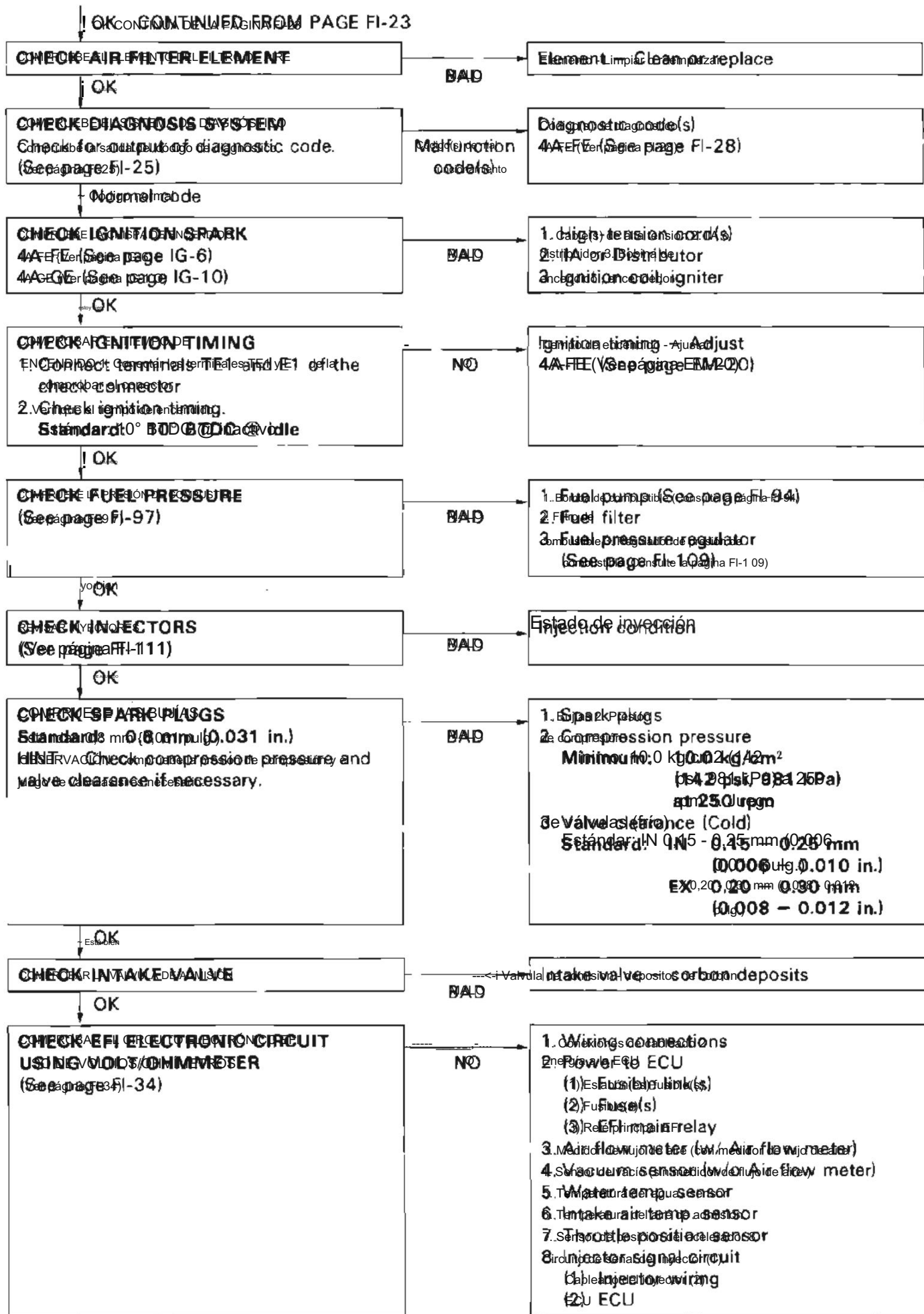


OK CONTINUED FROM PAGE FI-22



SYMPTOM ENGINE HESITATES AND/OR POOR ACCELERATION





DIAGNOSIS SYSTEM

DESCRIPTION

The ECU contains a built-in self diagnosis system by which troubles with the engine signal network are detected and the "CHECK ENGINE" warning light on the instrument panel flashes.

By analyzing various signals as shown in the table (See pages FI-28 to FI-31) the ECU detects system malfunctions which are related to the various operating parameter elements of digital data. The ECU stores the failure code associated with the detected failure until the diagnosis system is cleared by removing the fuse stop 15A (AE) or EFI 15A (AT) with the ignition switch OFF.

The "CHECK ENGINE" warning light on the instrument panel informs the driver that a malfunction has been detected.

The light goes out automatically when the malfunction has been cleared.

CHECK ENGINE WARNING LIGHT CHECK

1. The "CHECK ENGINE" warning light will come on when the ignition switch is placed at ON and the engine is not running.
 2. When the engine is started, the "CHECK ENGINE" warning light should go out.
- If the light remains on, the diagnosis system has detected a malfunction or abnormality in the system.

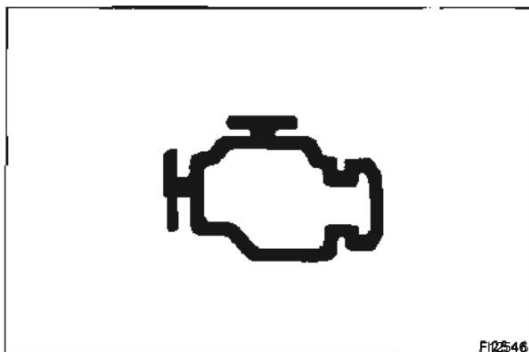
OUTPUT OF DIAGNOSTIC CODES

To obtain an output of diagnostic codes proceed as follows:

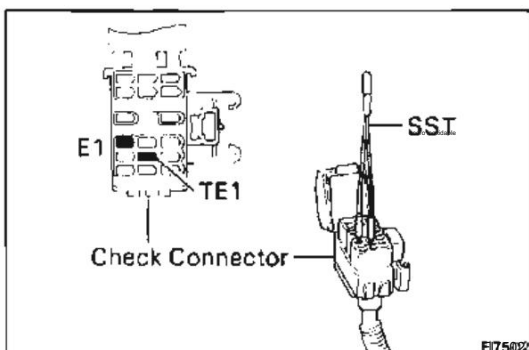
1. Prepare conditions
 - (a) Voltage battery voltage 11V or more
 - (b) Throttle valve fully closed (throttle position sensor input points closed)
 - (c) Transmission in neutral position
 - (d) Accessories switched OFF
2. Turn the ignition switch to ON. Do not start the engine.
3. Using SST, connect terminals E1 and E2 of the check connector.

SST 09843-18020

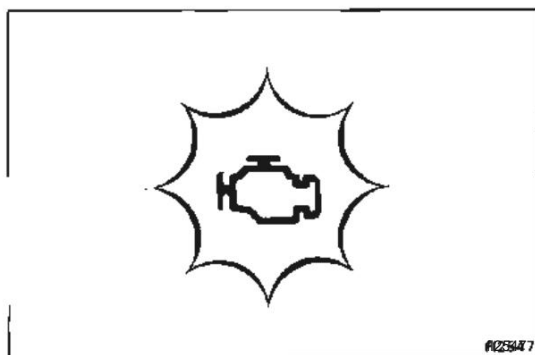
LOCATION See page FI-133



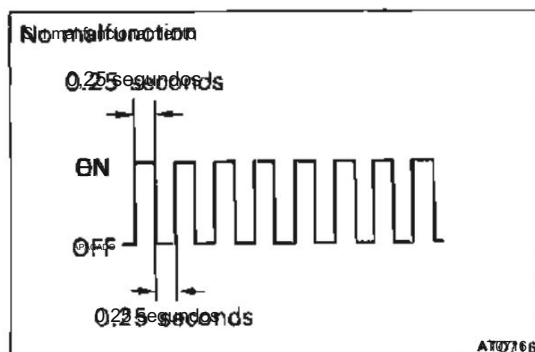
FI2546



FI7502



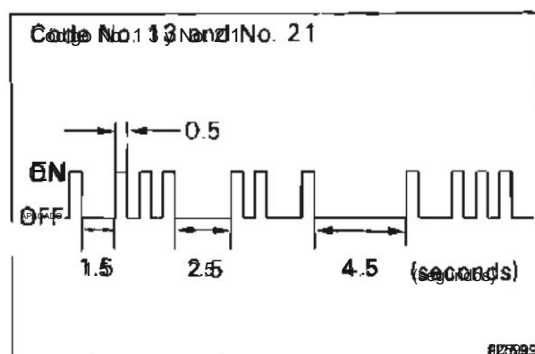
4. Read the diagnostic code as indicated by the number of flashes of the "CHECK ENGINE" warning light.



Diagnostic Codes (See pages FL-28 to FL-31)

(a) Normal System Operation (no malfunction)

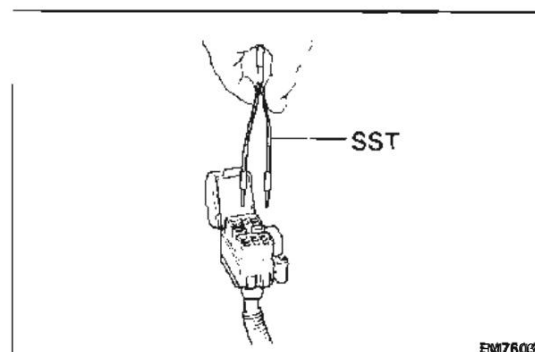
- The light will alternately blink ON and OFF at 0.25 second intervals.



(b) Malfunction Code Indication

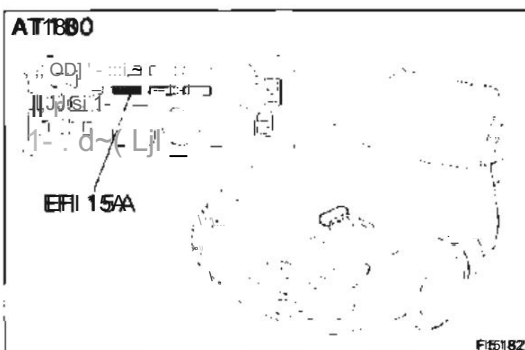
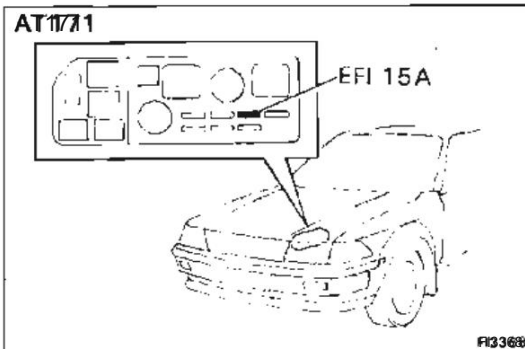
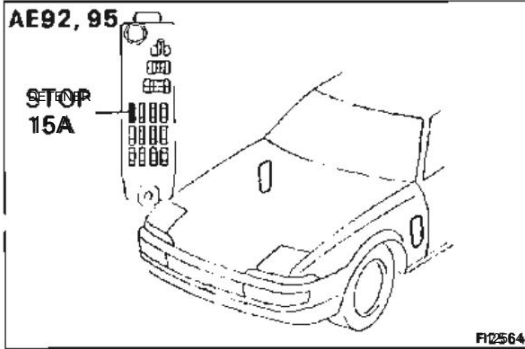
- At the event of a malfunction, the light will blink every 0.5 seconds. The first number of blinks will equal the first digit of a 2-digit diagnostic code and after a 1.5 second pause the 2nd number of blinks will equal the 2nd digit. If there are two or more codes, there will be a 2.5 second pause between each code.
- After all the codes have been output, there will be a 4.5 second pause and they will all be repeated as long as the terminals TE1 and E1 of the check connector are connected.

HINT: In the event of a number of trouble codes, indication will begin from the small value and continue to the larger.



5. After the diagnosis check, remove SST from the check connector.

SST 09843-38020



CANCELING DIAGNOSTIC CODE

1. After repair of the trouble, the diagnostic code retained in memory by the ECU does not disappear unless the STOP (EFI 15A) fuse is removed. The engine will stop, depending on the battery level, depending on the temperature, depending on the engine temperature, (that is, once the temperature is high, the engine will stop). The engine will stop with the STOP switch OFF.

HINT:

- If the diagnostic code is cancelled by removing the battery negative (-) terminal (B), in this case, other secondary systems (clock, etc.) will also be cancelled.
- If the diagnostic code is cancelled, the ECU will be retained by the ECU and will appear as a new code in the event of future trouble.
- If it is necessary to replace the engine or the engine requiring a new model of the battery terminal, the check must first be made to see if the diagnostic code has been recorded.

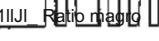
2. After cancellation, the engine must be started. The vehicle must be checked to see if a normal code is now read on the "CHECK ENGINE" warning light.

If the same diagnostic code appears, it indicates that the trouble has not been repaired thoroughly.

DIAGNOSIS INDICATION

1. In the "normal" state, the ECU does not display the following diagnostic codes.
2. If the code is stored in the ECU, the code will be displayed first.
3. All the diagnostic codes except the No. 51 will be retained in memory by the ECU. Under the condition of detection, the code will be cancelled.
4. Once the main electrical system is started, the "CHECK ENGINE" light on the instrument panel will go out. The diagnostic code will remain stored in the ECU (except No. 51).

DIAGNOSTIC CODES (4A-FE)

Code No.	Number of blinks "CHECK ENGINE"	System	Diagnosis	Trouble area	See page
—	 ON OFF FI1001	Normal	This appears when none of the other codes are identified	—	—
112	 FI1009	RPM Signal	No NE signal "G" signal to ECU within 2 seconds after the engine is cranked.	● Distributor (IIA) circuit ● Distributor (IIA) ● Starter signal circuit ● Igniter circuit ● Igniter - Encendedor ● ECU	19-44
113	 FI1090	RPM Signal	No NE signal to ECU. When the engine speed is above 1000 rpm.	● Distributor (IIA) circuit ● Distributor (IIA) ● Igniter circuit ● Igniter ● ECU	
114	 FI1391	Ignition Signal	No IG signal to ECU 4 times in succession.	● Igniter circuit ● Igniter ● ECU	FL-48 FL-62
*21	 FI1400	Oxygen Sensor Heater	During air-fuel ratio feedback correction, the output from the oxygen sensor does not exceed the value on the lean side and the rich side continuously for a certain period.	● Oxygen sensor circuit ● Oxygen sensor	FL-50 FL-64
		Oxygen Sensor Heater	Open or short circuit in oxygen sensor heater (H/H).	● Oxygen sensor heater circuit ● Oxygen sensor heater ● ECU	
22	 FI1092	Water Temp. Sensor	Open or short circuit in water temp. (Sensor signal (THW)).	● Water temp. sensor circuit ● Water temp. sensor ● ECU	FL-46 FL-60
24	 FI1011	Intake Air Temp. Sensor Signal	Open or short circuit in intake air temp. sensor signal (THA).	● Intake air temp. sensor circuit ● Intake air temp. sensor ● ECU	FL-45 FL-59
*25	 FI2562	Air-fuel Ratio Lean Malfunction	When air-fuel ratio feedback correction value continues at the lean side (lean) limit for a certain period of time.	● Oxygen sensor circuit ● Oxygen sensor ● ECU	FL-50 FL-64
*25	 FI2563	Air-fuel Ratio Rich Malfunction			

DIAGNOSTIC CODES (4A-FE) (Cont'd)

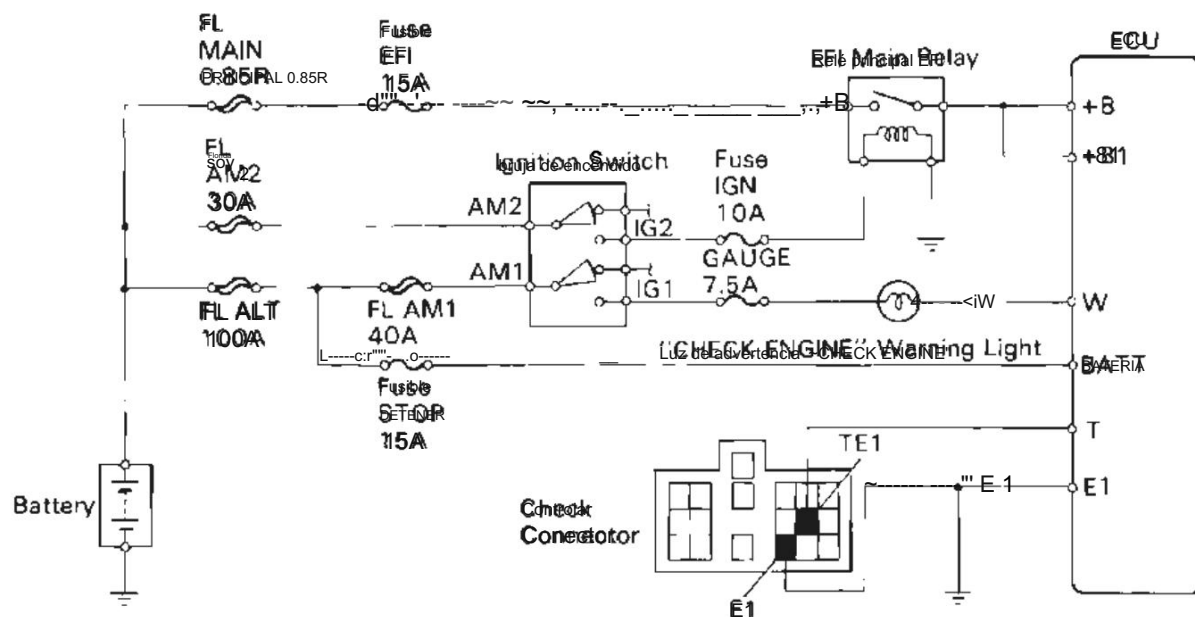
Code No.	Number of blinks "CHECK ENGINE"	System	Diagnosis	Trouble area	See page
31		Vacuum Sensor Signal	Open or short circuit intake manifold pressure signal (BIM) circuit.	• Vacuum sensor circuit • Vacuum sensor • ECU	FL-44 FL-58
41		Throttle Position Sensor Signal	The "IDL" and "PSW" signals are outputs simultaneously for several seconds.	• Throttle position sensor circuit • Throttle position sensor • ECU	FL-41 FI-55
42		Vehicle Speed Sensor Signal	No "SPD" signal for 8 seconds when engine speed is between 2,000 rpm and 4,500 rpm and coolant temp is below 80°C (176°F) except when cranking the engine.	• Vehicle speed sensor circuit • Vehicle speed sensor • ECU	-
43		Starter Signal	No "STA" signal to ECU until engine speed reaches 800 rpm with vehicle not moving.	• Circuit switch circuit • Ignition switch circuit • ECU	FL-47 FI-61
51		Switch Condition Signal	No "IDL" signal, "NSW" signal or "A/C" signal to ECU with all checked terminals E1 and E5 connected.	• A/C switch circuit • A/C switch • A/C amplifier • Neutral start switch circuit • Neutral start switch • Accelerator pedal and cable • Throttle position sensor circuit • Throttle position sensor • ECU	FL-49 FI-63

DIAGNOSTIC CODES (4A-GE)

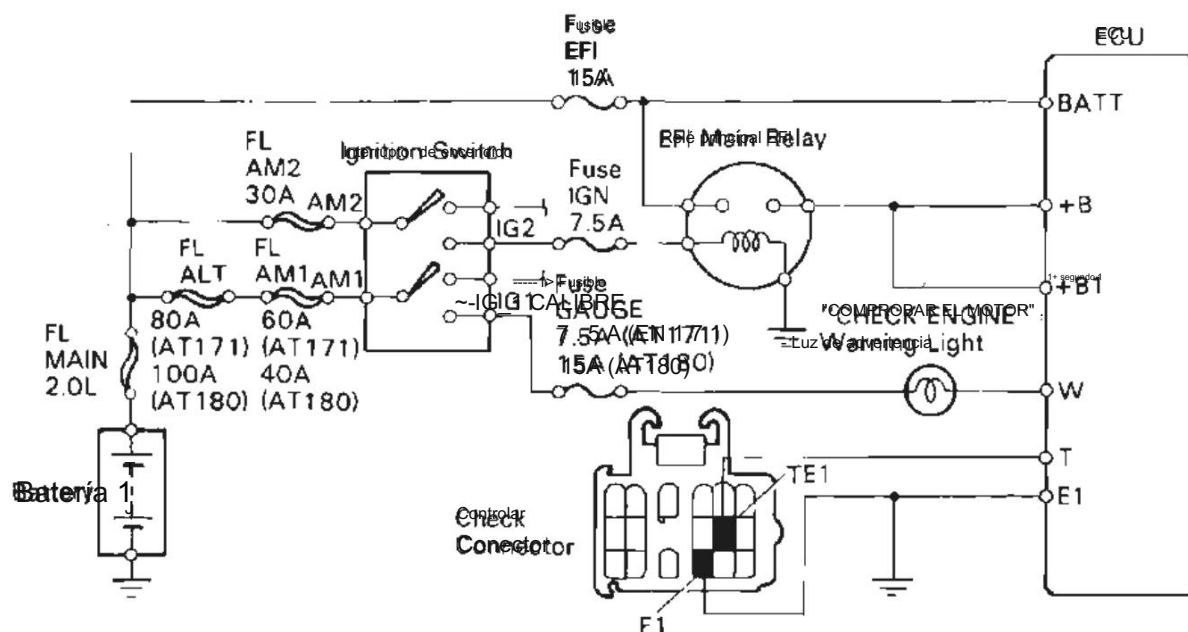
Code No.	Number of blinks "CHECK ENGINE"	System	Diagnosis	Trouble area	See page
-		Normal	This appears when none of the other codes are identified.	-	-
12		BPM Signal	(w/ Air Flow Meter) No "NE" or "G" signal to ECU within 2 seconds after engine has been cranked. (w/ Air Flow Meter) No "NE" signal to ECU within 2 seconds after the engine has been cranked. No "G" signal to ECU 4 times in succession when engine speed is between 500 rpm and 4,000 rpm.	• Distributor circuit • Distributor • Starter signal circuit • ECU	IG-65

INSPECTION OF DIAGNOSIS CIRCUIT

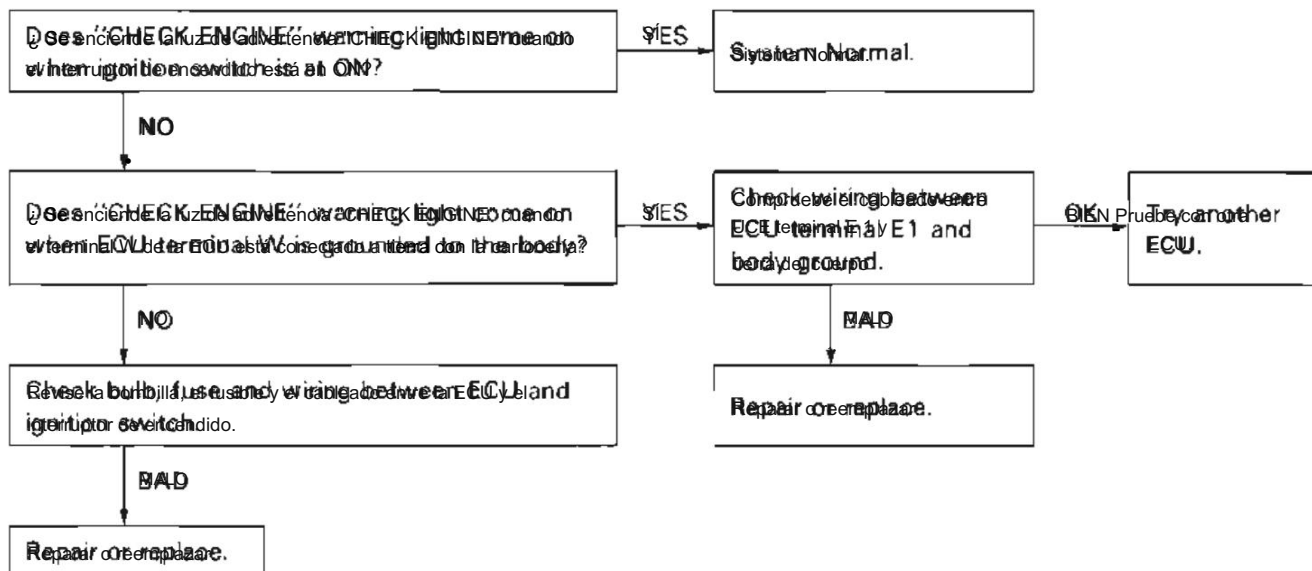
AE



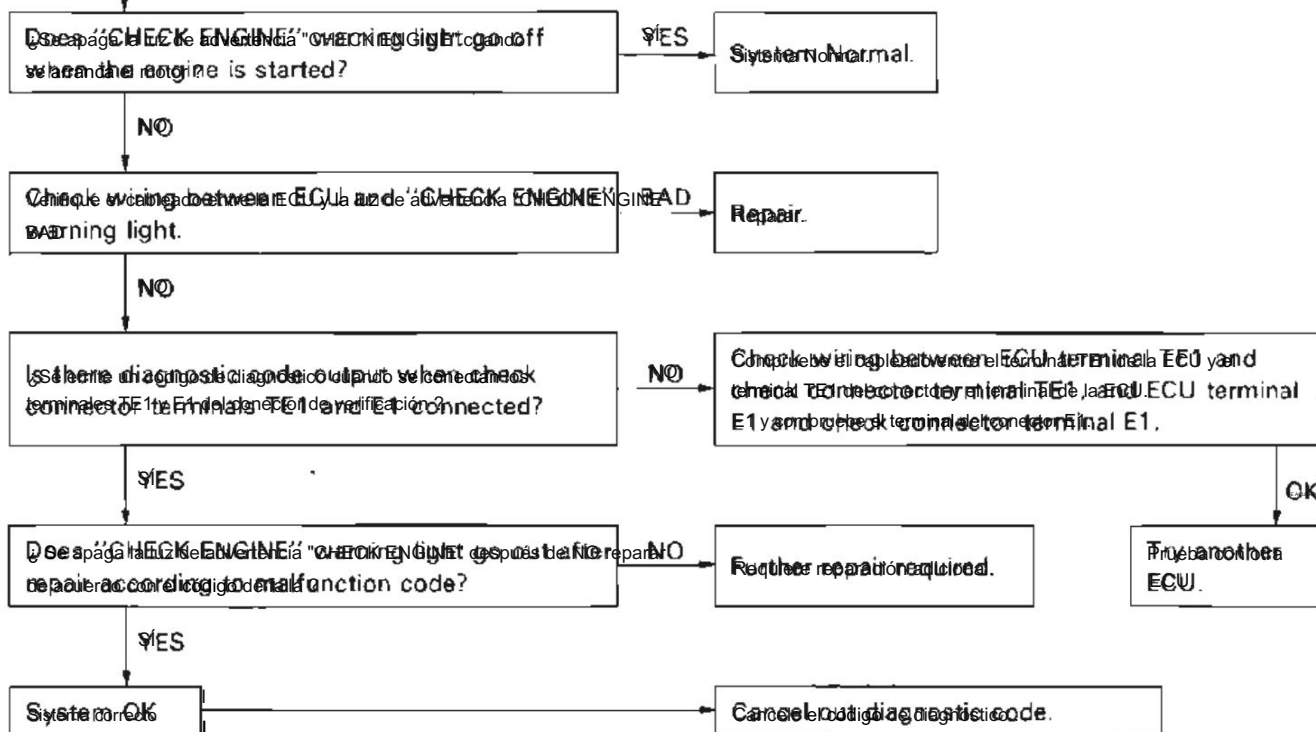
EN



1.



2.



TROUBLESHOOTING WITH VOLT/OHMMETER

NOTE: The following troubleshooting procedures are designed for inspection of each separate system; therefore, the procedure may vary somewhat. However, troubleshooting should be performed according to the inspection methods described in this manual.

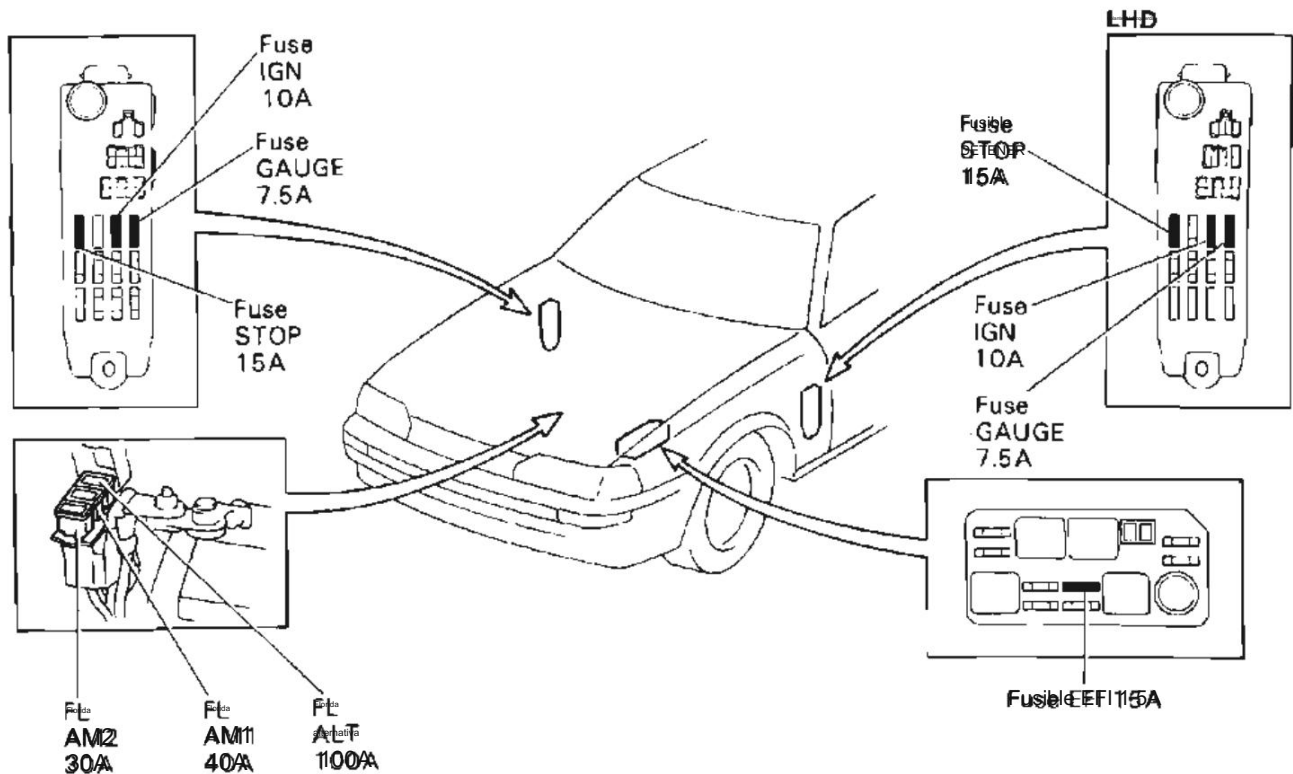
Before beginning inspection, it is best to first make a simple check of the fuses, fusible links and condition of the connectors.

The following troubleshooting procedures are based on the supposition that the trouble lies in either a shorted or open circuit or a component located outside the computer or its circuitry within the computer.

If engine trouble occurs even though proper operating voltage is detected and the computer connector terminals are secured, then the ECU is faulty and should be replaced.

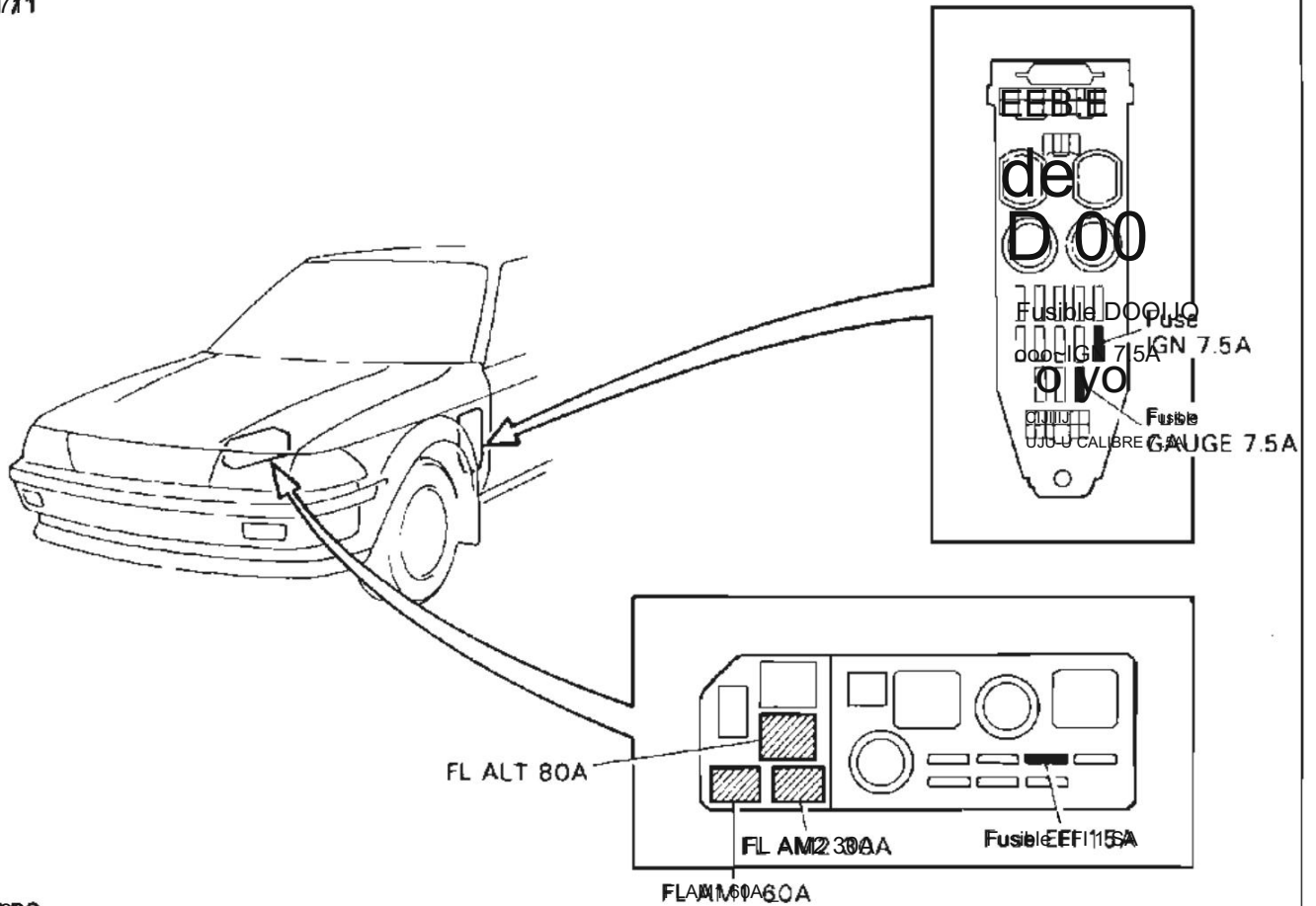
LOCATION OF FUSES AND FUSIBLE LINKS

AE

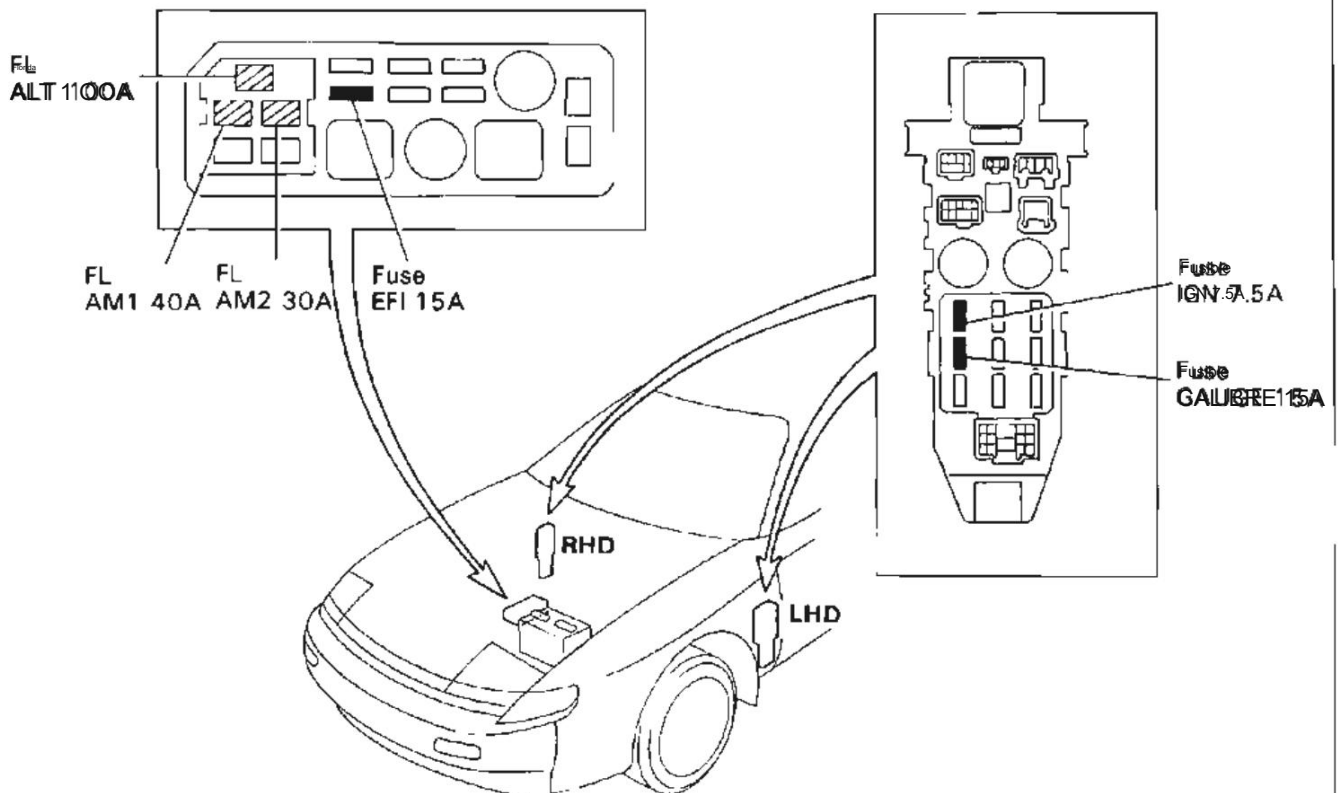


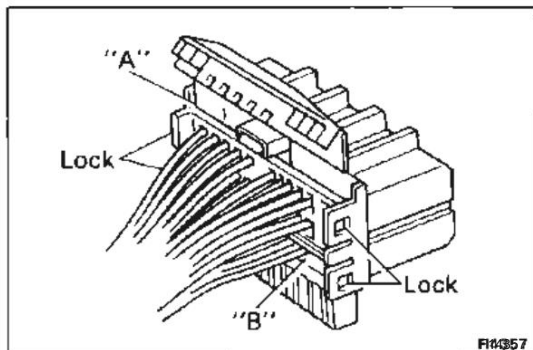
LOCATION OF FUSES AND FUSIBLE LINKS (Cont'd)

AT1711

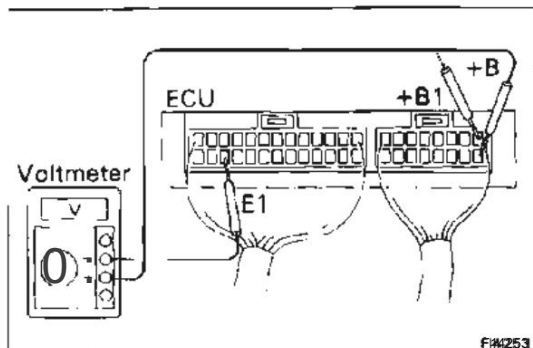


AT1880





FI4357



FI4253

EFI SYSTEM CHECK PROCEDURE

PREPARATION

- Disconnect the battery negative (-) terminal from the ECU.
 - Remove the lockers shown in the illustrations so that the test probes can easily come in.
- NOTICE** Pay attention to sections "A" and "B" in the illustrations which can be easily broken.
- Reconnect the connectors to the ECU.

HINT:

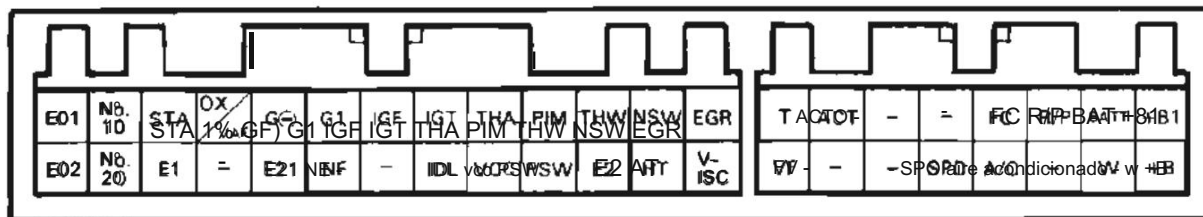
- Be careful not to short-circuit the terminals with the connectors connected.
- Verify that the battery voltage is 11.0V or above when the ignition switch is in the ON position.

Using a voltmeter, measure the voltage at each terminal of the wiring connectors.

Terminals of ECU (4A-E2V/D)

Symbol	Terminal Name	Symbol	Terminal Name
E01	POWER GROUND	PSW	THROTTLE POSITION SENSOR
E02	POWER GROUND	THW	WATER TEMP. SENSOR
No.10	INJECTOR	E2	SENSOR GROUND
No.20	INJECTOR	* ³ NSW	NEUTRAL START SWITCH
STA	STARTER MAGNETIC SWITCH	* ¹ HT	OXYGEN SENSOR
E1	EGR GROUND	EGR	VSV (EGR)
* ¹ OX	OXYGEN SENSOR	V-ISC	VSV (ISC VALVE)
* ² VAF	VARIABLE RESISTOR	T	CHECK CONNECTOR
G	DISTRIBUTOR	WF	CHECK CONNECTOR
E21	SENSOR GROUND	* ¹ ACCT	A/C AMPLIFIER
G1	DISTRIBUTOR	SPD	SPEED SENSOR
NE	DISTRIBUTOR	FC	CRUISE CONTROL OPENING RELAY
IGF	IGNITER	A/C	A/C COMPRESSOR
IGT	IGNITER	* ¹ R/P	FUEL CONTROL SWITCH
IDL	THROTTLE POSITION SENSOR	BATT	BATTERY
THA	INTAKE AIR TEMP. SENSOR	WU	CHECK ENGINE WARNING LIGHT
VCC	VACUUM SENSOR	+B1	RELAY MAIN RELAY
PIM	VACUUM SENSOR	+B	RELAY MAIN RELAY

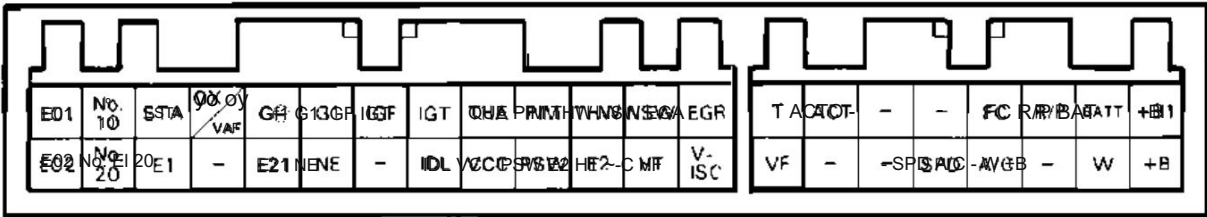
ECU Terminals

*¹: w/ EGR System *²: w/o EGR System, *³: A/T

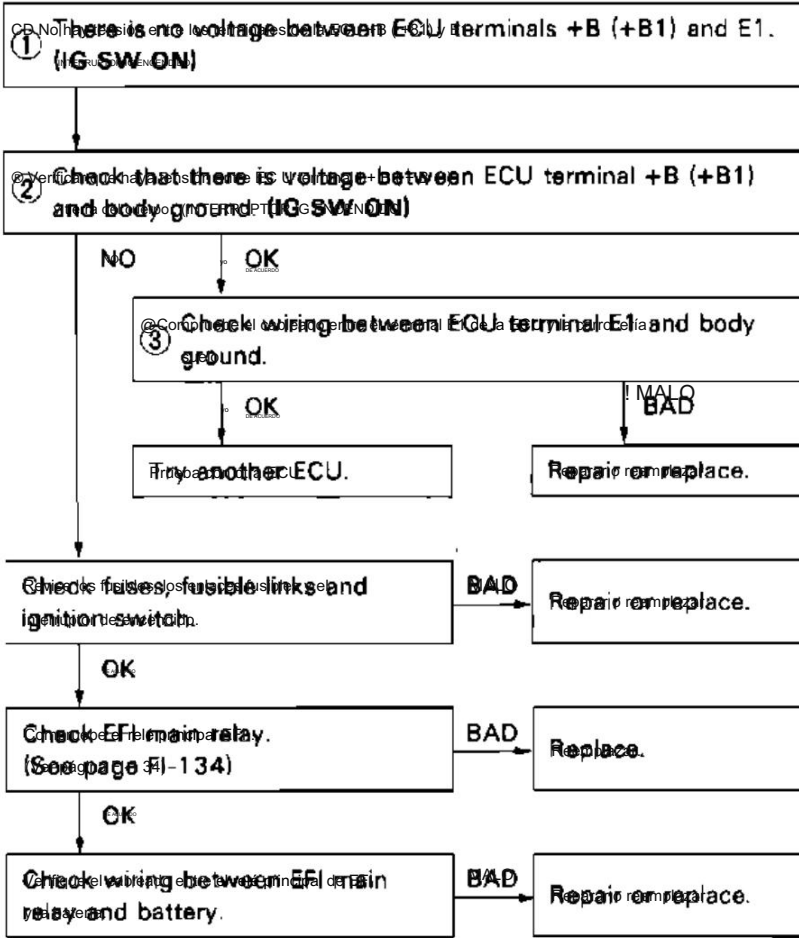
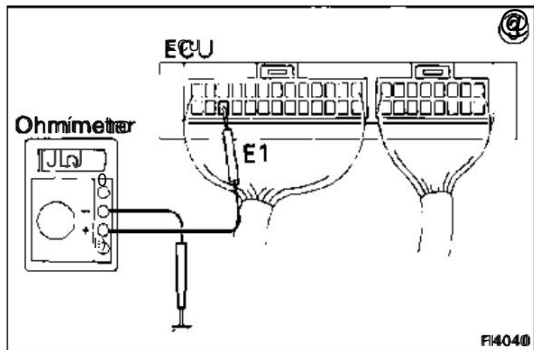
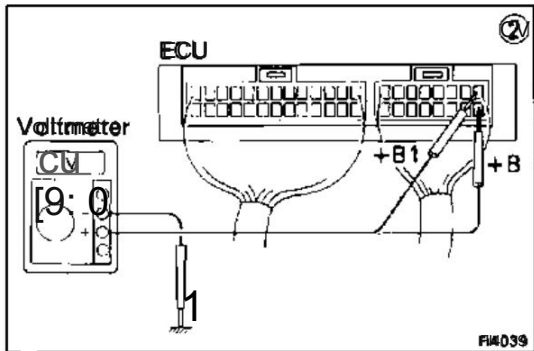
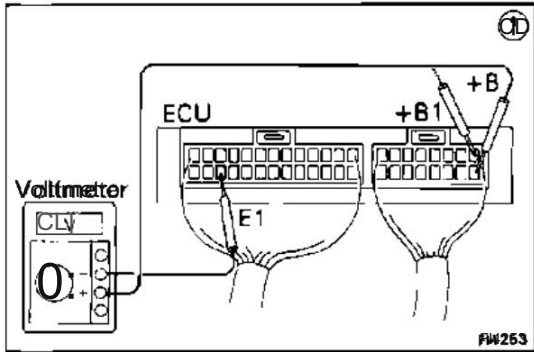
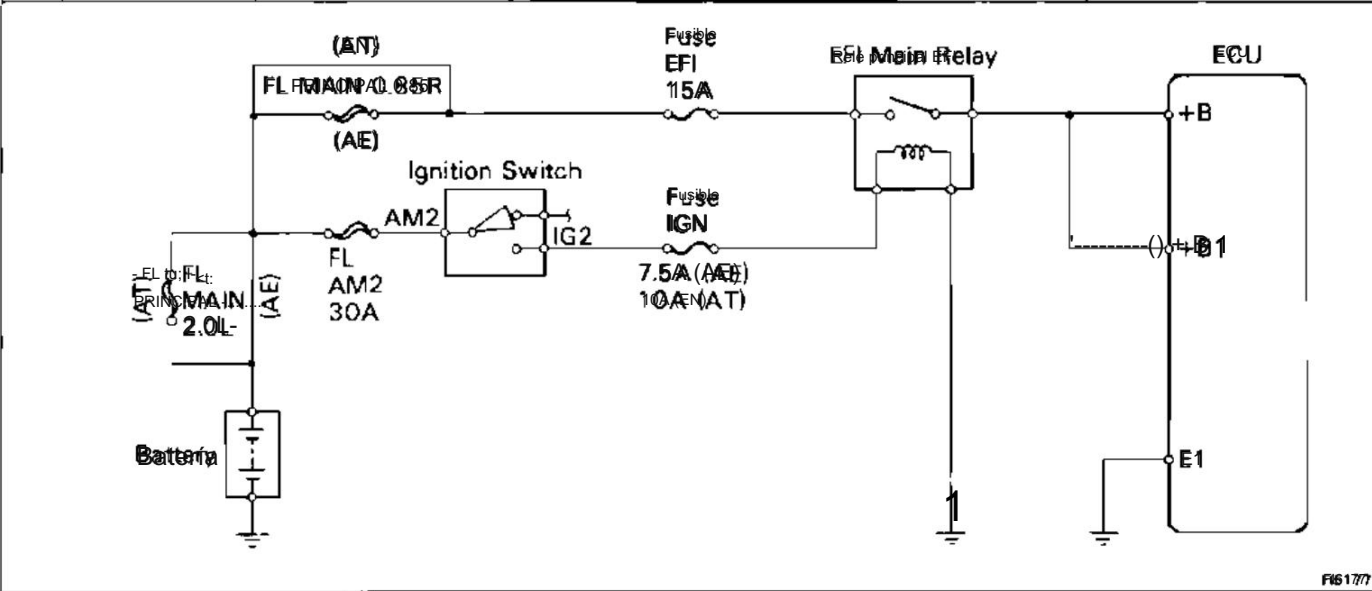
Voltage at ECU wiring connectors
(4A-EF2WD)

No.	Terminals	STD voltage (V)	Condition	See page
1	+B -E1 +B11	10-14 14	Ignition SW ON	FL-39
2	BAT/BATT - E1	10-14 4	—	FL-40
3	IDL -E2	4.5-5.5 5.5	Ignition SW ON Throttle valve open	FL-41
	PSW -E2		Throttle valve fully closed Valve to ramp up completely open closed	
4	No.100 E01 No.200 E02	10-14 4	Ignition SW ON	FL-42
5	W -E1 E1	10-14 4	No trouble (CHECK ENGINE warning light off) and engine running	FL-43
6	PIM E2 E2	3.3-3.9 3.9	Ignition SW ON	FL-44
	VCC E2 - E2	4.5-5.5 5.5		
7	THW E2 E2	2.0-2.5 2.5	Ignition SW ON	FL-45
8	THW E2 - E2	0.4-0.7 0.7		FL-46
9	SSTA -E1 E1	6-14 14	Cranking	FL-47
10	IGT E4 E1	0.7-1.0 1.0	Idling	FL-48
11	A/C E1	5-14 14	Air conditioning ON	FL-49

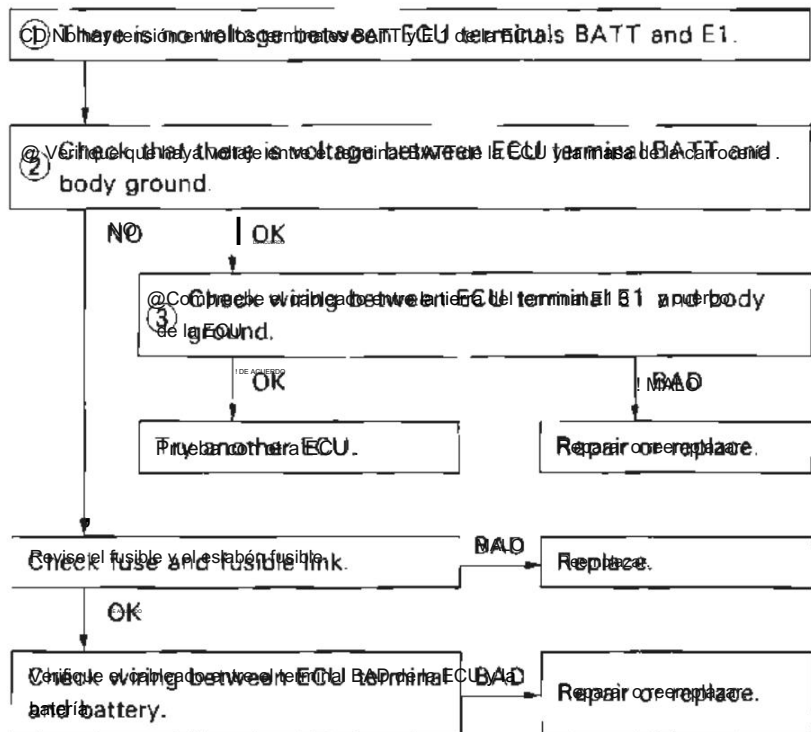
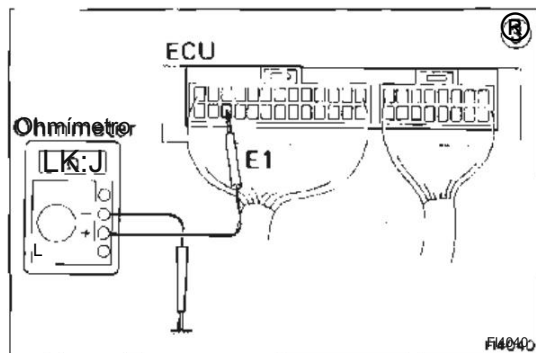
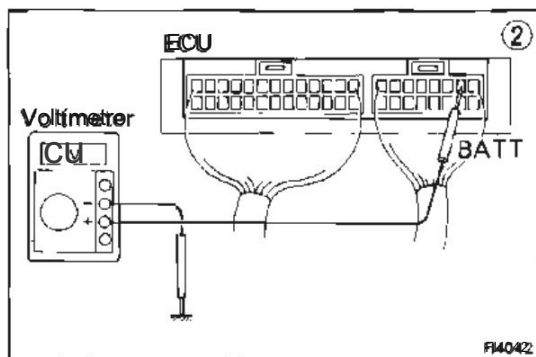
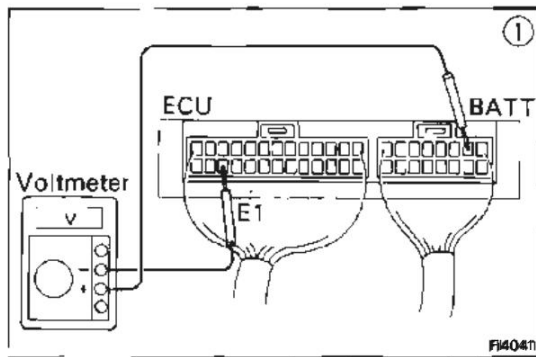
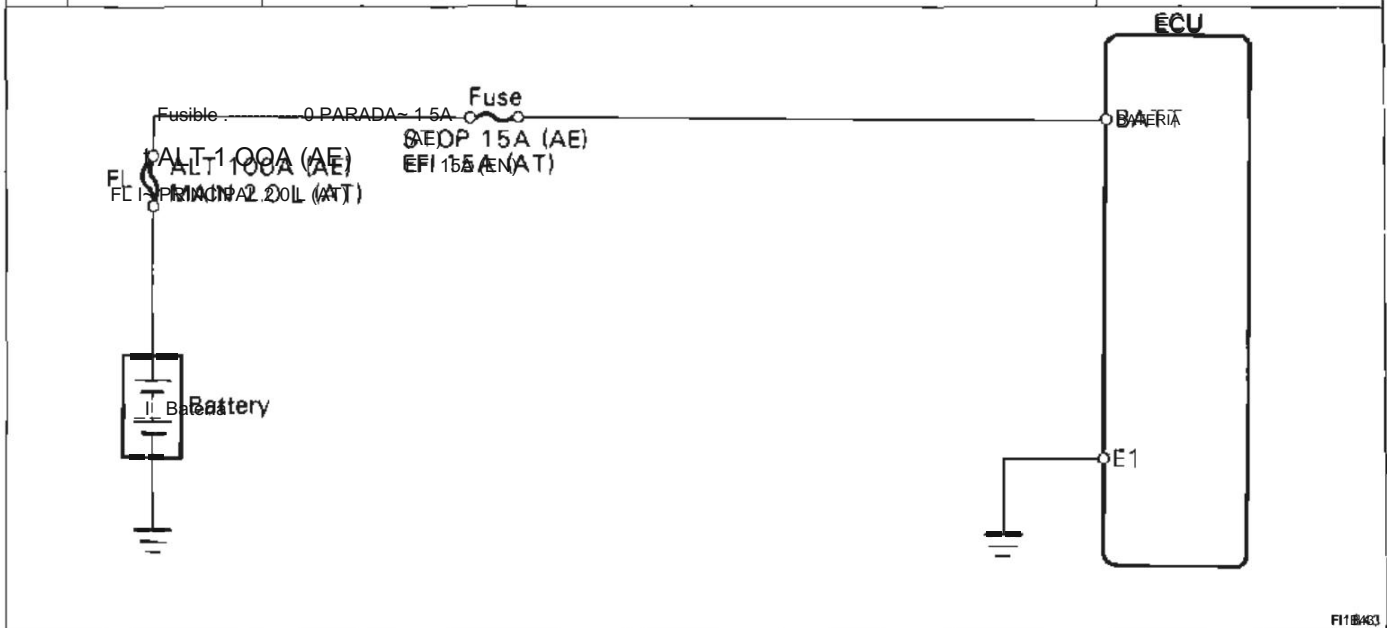
ECU Terminals



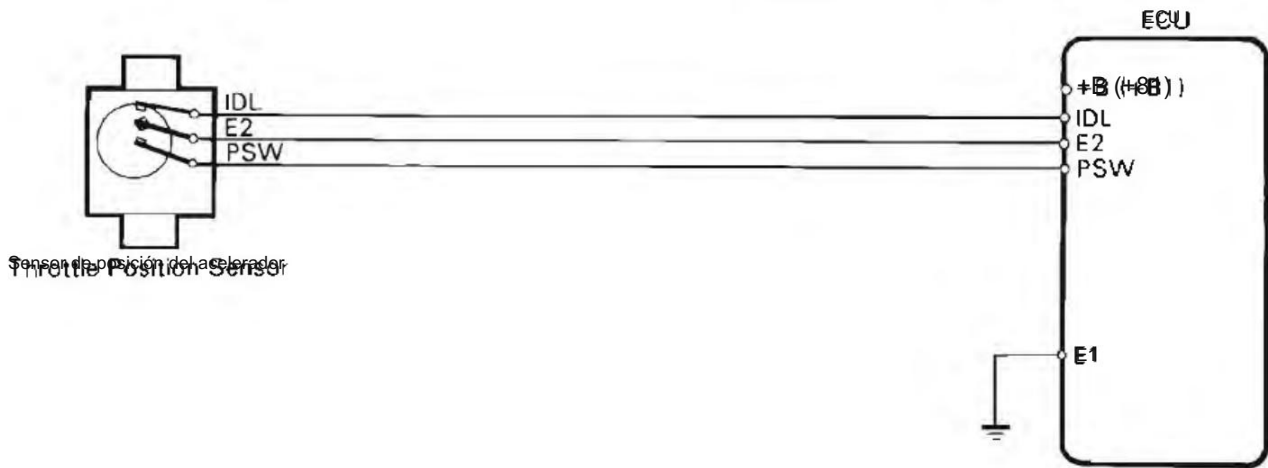
No.	Terminals	Proble	Condition	STD Voltage
1	+B - E1 E1 +B1	No voltage	IG SW ON	11-14V 14 V



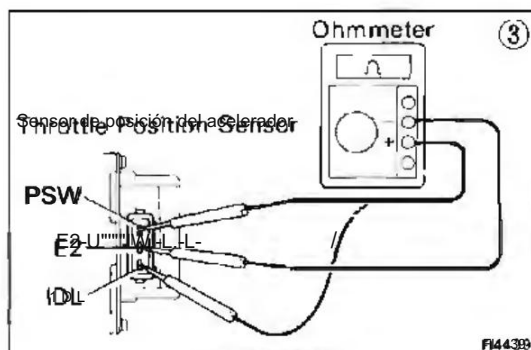
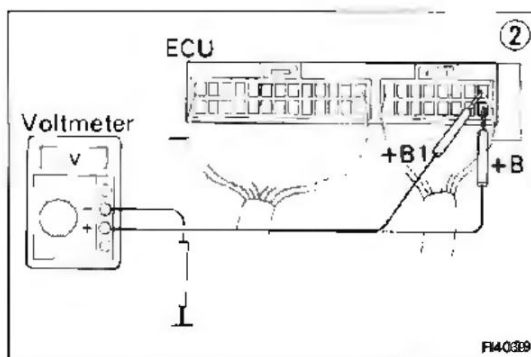
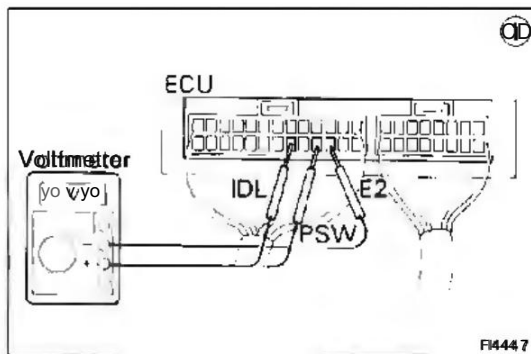
No. Terminals	Terminals	Problem	Condition	STD voltage
2	BATT - E1	No voltage	—	10-14 Volts



No.	Terminals	Problem	Condition	STD. Voltage
3	IDL-E2	No voltage	Throttle valve open	4.5-5.5 Volts
	PSW-E2		Throttle valve fully closed	4.5-5.5 Volts



FI0984



① Check for voltage between ECU terminals IDL and E2. (IG SW ON) (Throttle valve open)

② Check that there is voltage between ECU terminal +B (+B1) and body ground. (IG SW ON)

NO

OK

Check voltage between ECU terminal E1 and body ground.

OK

BAD

Prepare another ECU.

Repair or replace.

Refer to +B - E1 trouble sections. (No. 1) (See page 38-39)

BAD

Repair or replace.

③ Check the throttle position sensor. (See page FI-123)

BAD

No voltage

BAD

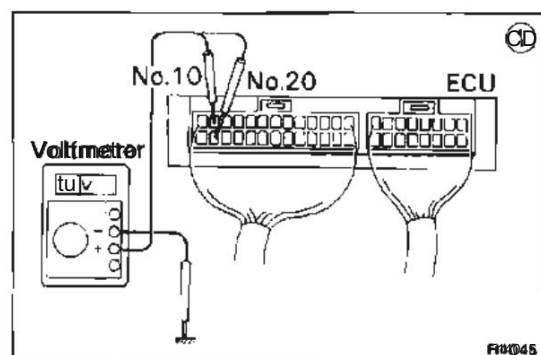
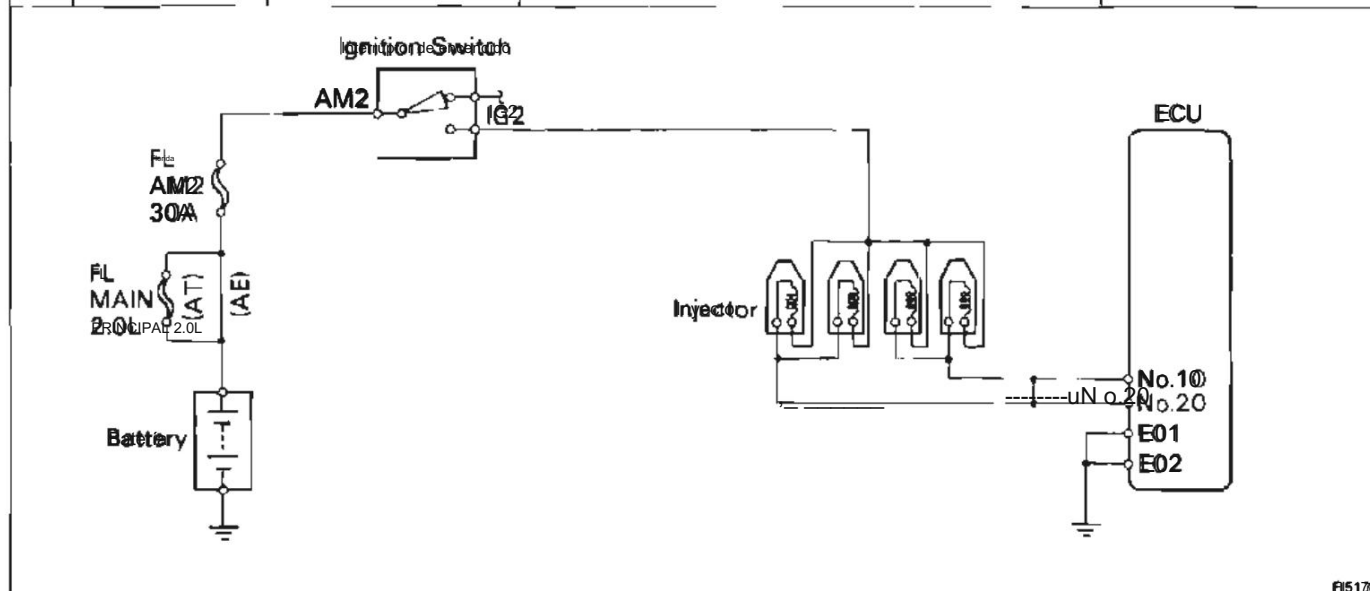
Repair or replace the throttle position sensor.

Check wiring between ECU and throttle position sensor.

OK

Try another ECU.

No.	Terminals	Proble	Condition	STD voltage
4	No.10 E01 No.20 E02	No voltage	IG SW ON	10-14 Volts



① There is no voltage between ECU terminals No.10 and/or No.20 and E01, and/or E02 (IG SW ON)

② Check that there is voltage between ECU terminal No.10 and/or No.20 and body ground.

NO

OK

Check wiring between ECU terminal No.20 and/or E02 and body ground.

OK

BAD

Try another ECU.

Repair or replace.

Check fuse, fusible link, ignition switch.

BAD

Repair or replace.

OK

③ Check resistance of magnetic coil in each injector.
RESistance: Approx. 8.8 Ω

OK

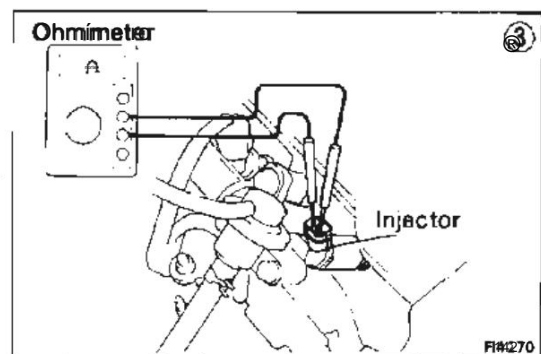
BAD

Replace injector.

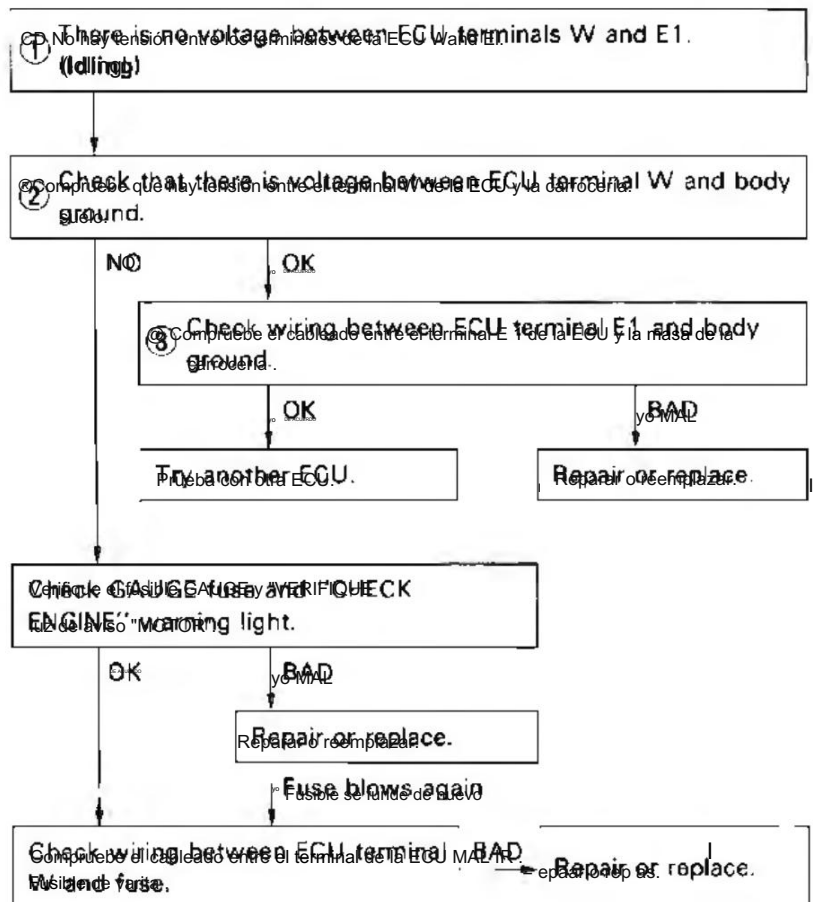
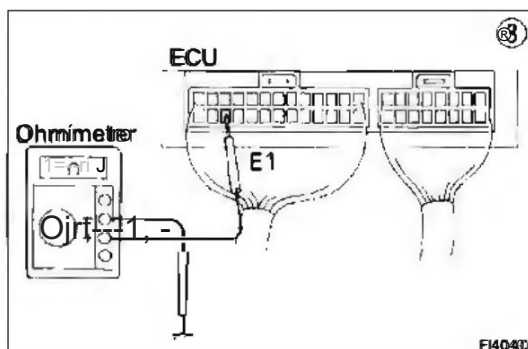
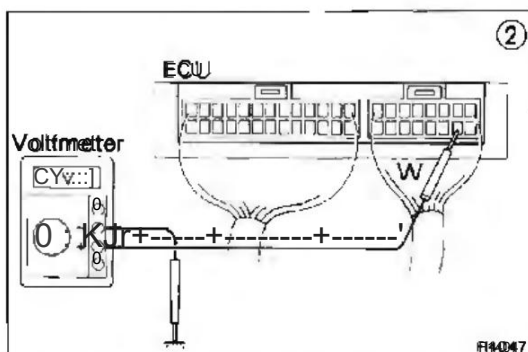
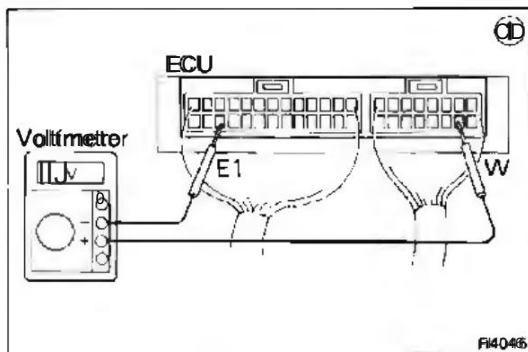
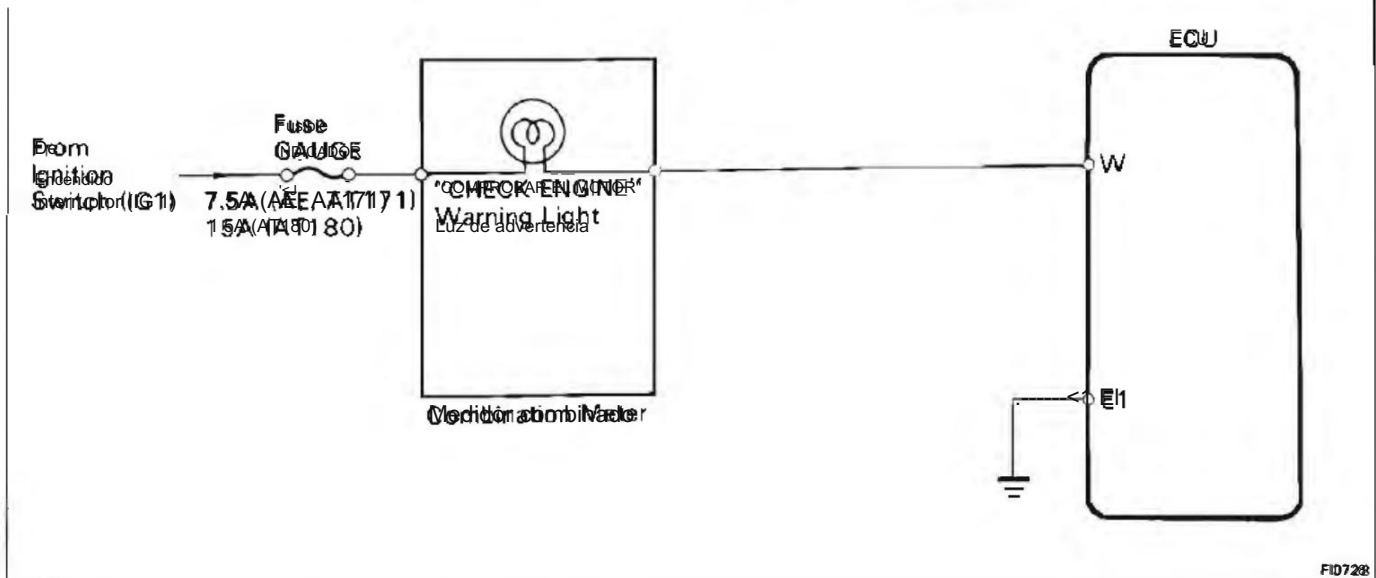
Check wiring between ECU terminal No.10 and/or No.20 and battery.

BAD

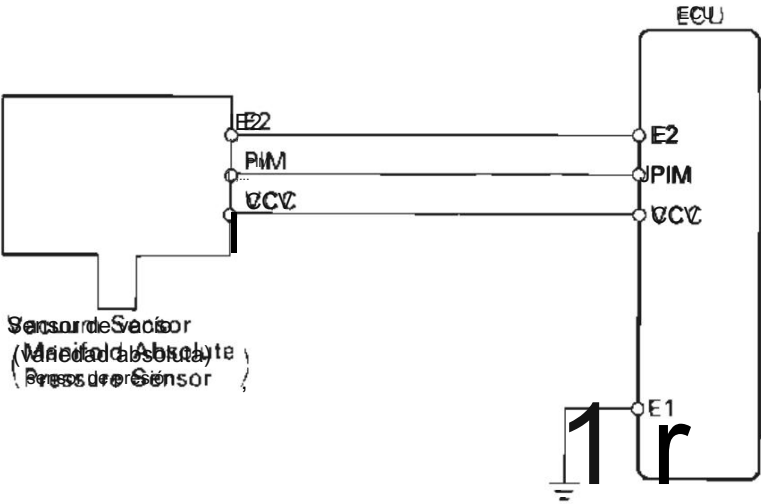
Repair or replace.



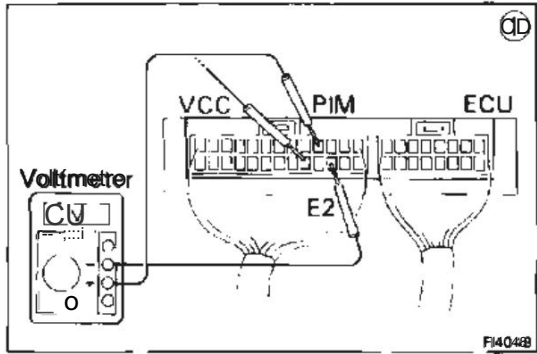
No.	Terminals	Problem	Condition	STD voltage
5	W - EW - E1	No voltage	No trouble (CHECK ENGINE Warning Light OFF) and engine running.	10-44 Vdc



No.	Terminals	Problem	Condition	STD voltage
6	PIM -E2	No voltage	IG SW ON	3.3 - 3.9 V
	VCC -E2			4.5 - 5.0 V



F11238



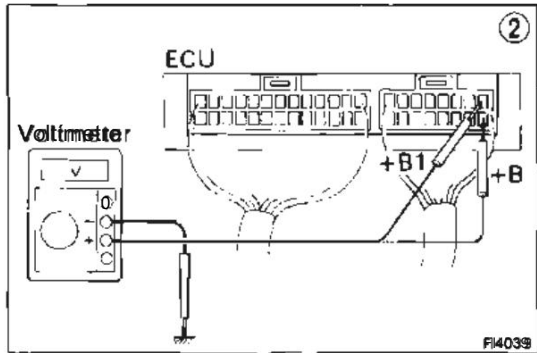
① There is no voltage between ECU terminals PIM or VCC and E2. (IG SW ON)

② Check that there is voltage between ECU (terminal +B (+B1) and body ground (IG SW ON)

NO

!NO

Refer to 4B - E1 trouble sections (No.1). (See page 37-39)



③ Check wiring between ECU terminal E1 and body ground.

OK

BAD

Check heat sensor sensor. (See page 140)

Repair or replace.

BAD

OK

Replace vacuum sensor.

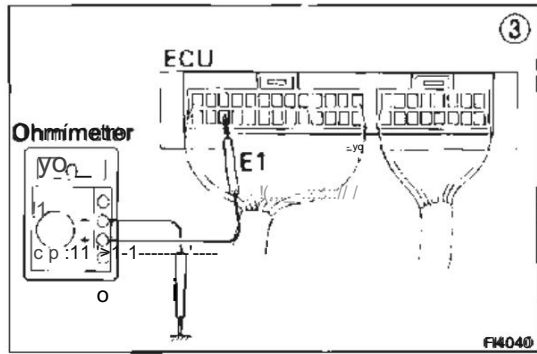
Check wiring between ECU and vacuum sensor.

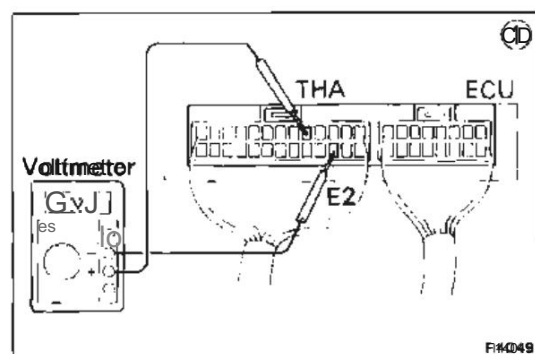
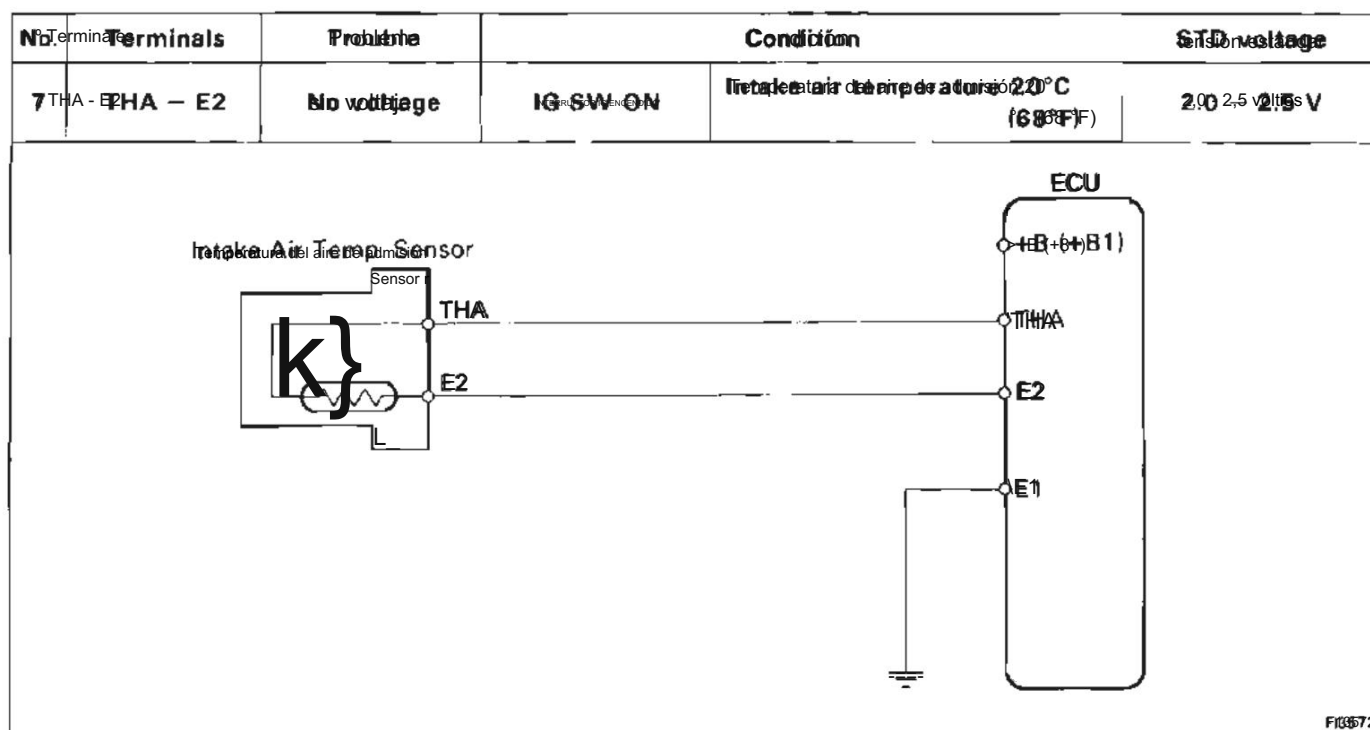
BAD

OK

Preparation ECU.

Repair or replace.





① There is no voltage between ECU terminals THA and E2.
(IG SW ON)

② Check that there is voltage between ECU terminal +B (+B1) and body ground (IG SW ON)

OK

NO

Refer to B+B1 - E1
secondary sections (No. 1).
(See page 39-39)

Check voltage between ECU terminal E1 and body ground.

OK

BAD

③ Check intake air temp sensor.
(See page F19-39)

Repair or replace.

BAD

OK

Replace intake
air temp sensor

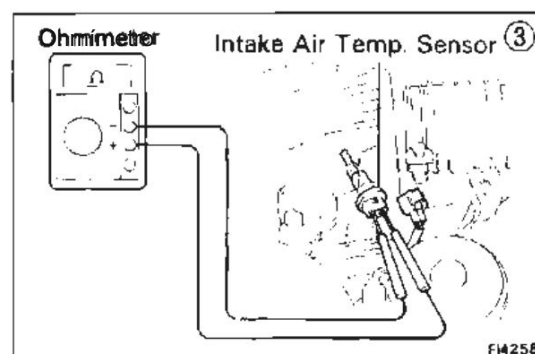
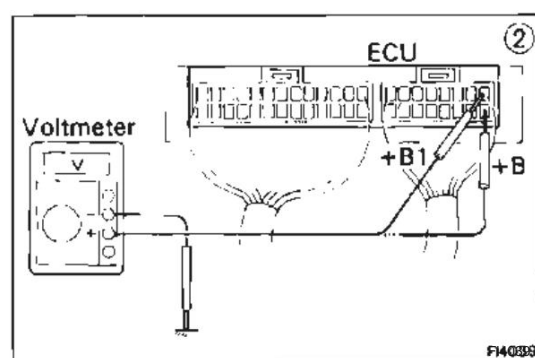
Check wiring between ECU and intake
air temp sensor.

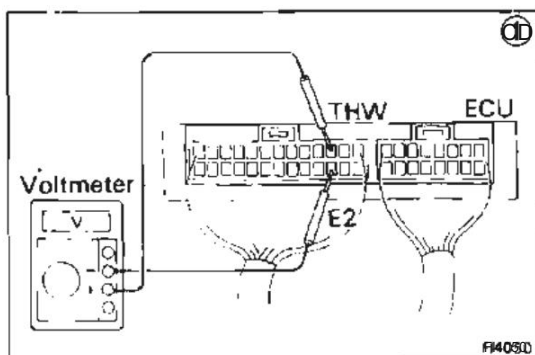
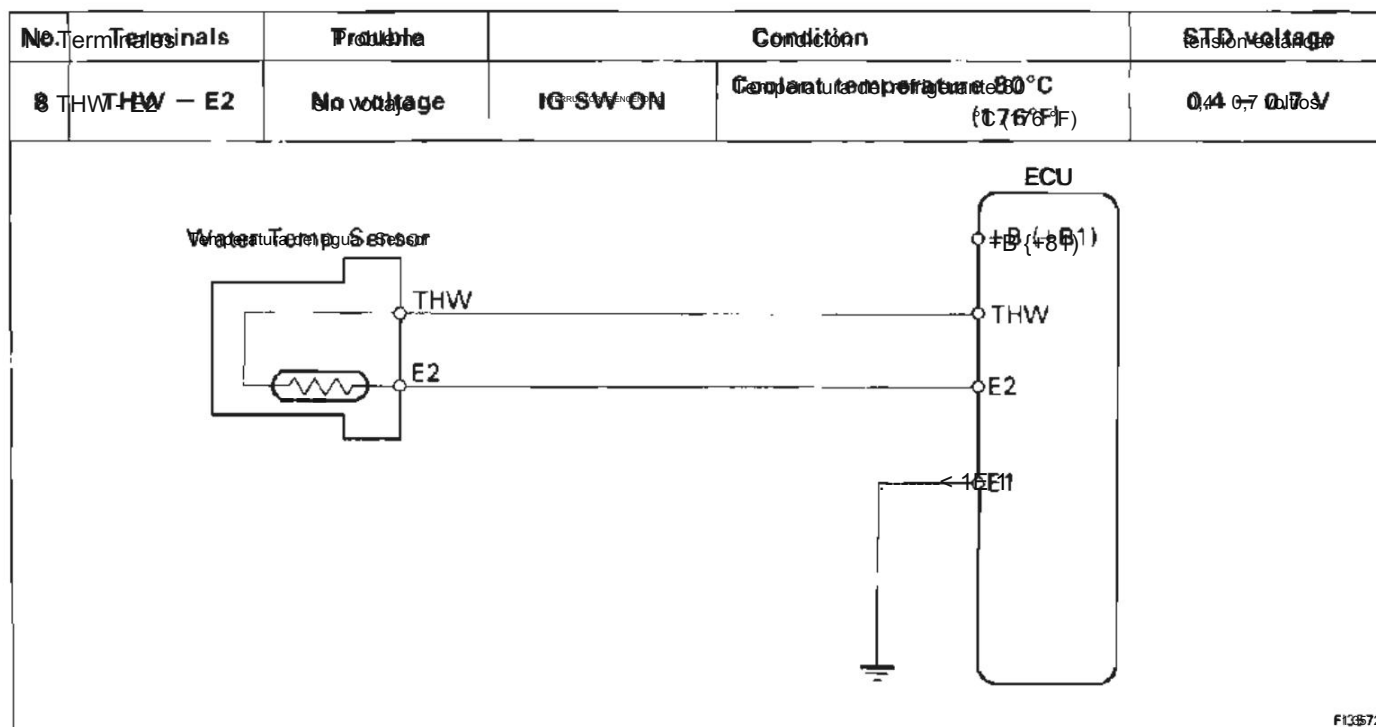
OK

NO
MAL
BAD

Try another ECU.

Repair or replace
wiring.





① There is no voltage between ECU terminals THW and E2.
(IG SW ON)

② Check that there is voltage between ECU terminal +B (+B1) and body ground. (IG SW ON)

OK

NG

Refer to +B - E1
trouble section (No. 1).
(See page 31-39)

Check wiring between ECU terminal E1 and body ground.

OK

BAD

Repair or replace.

③ Check water temp sensor.
(See page 18-138)

BAD

OK

Replace water
temp sensor.

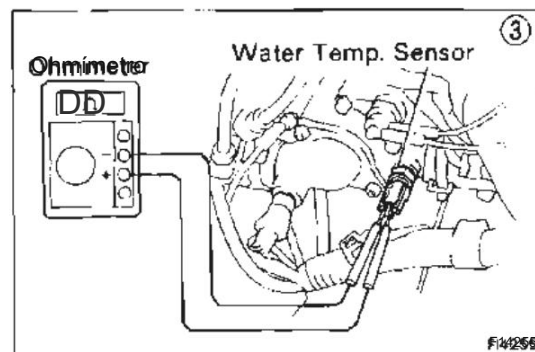
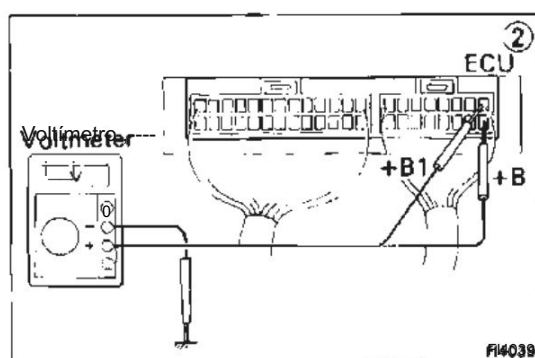
Check wiring between ECU and water
temp sensor.

OK

BAD

Try another ECU.

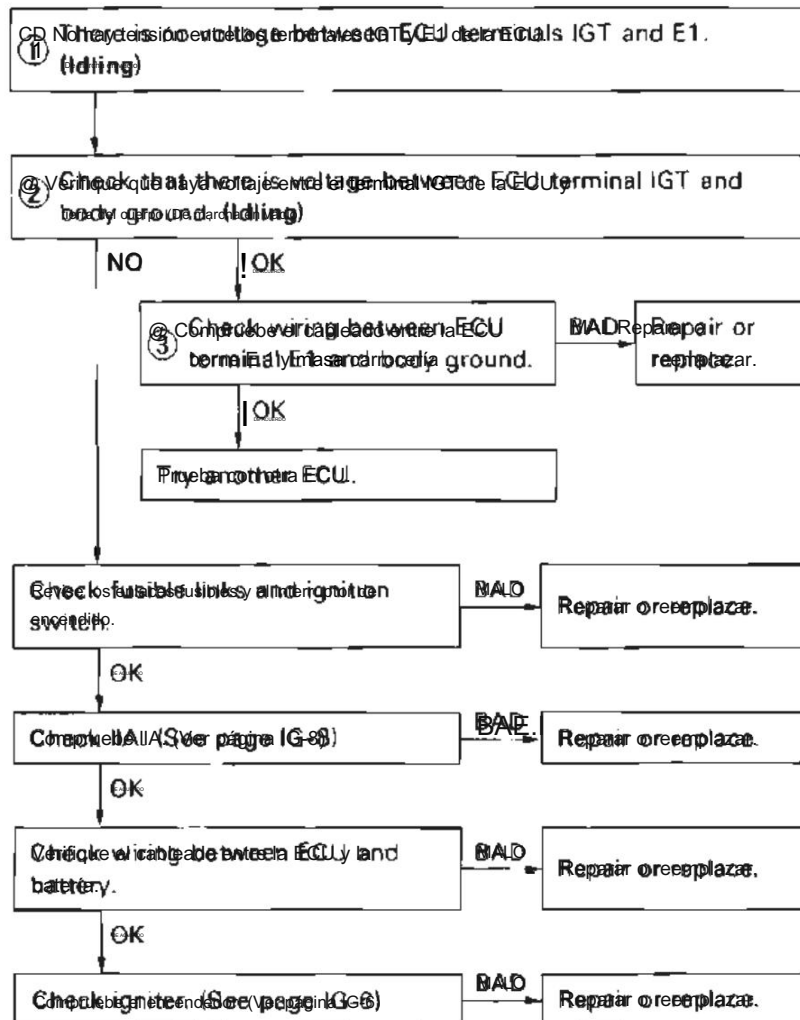
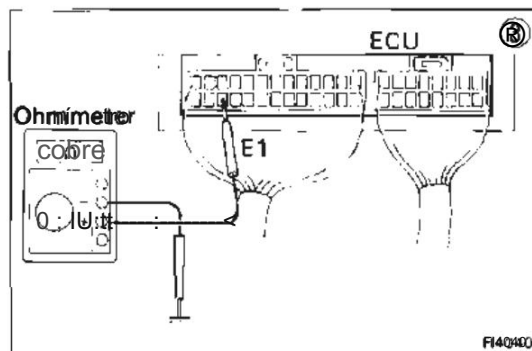
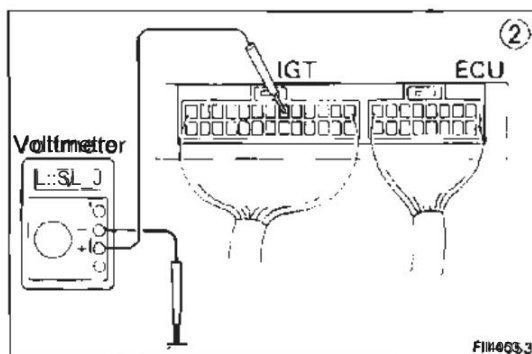
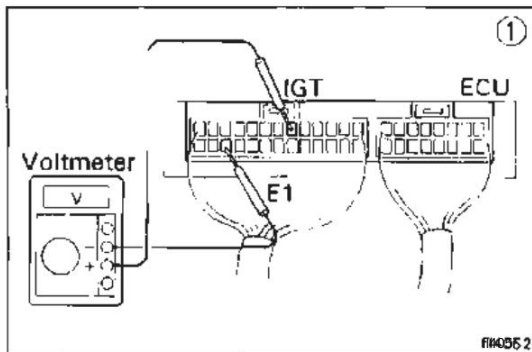
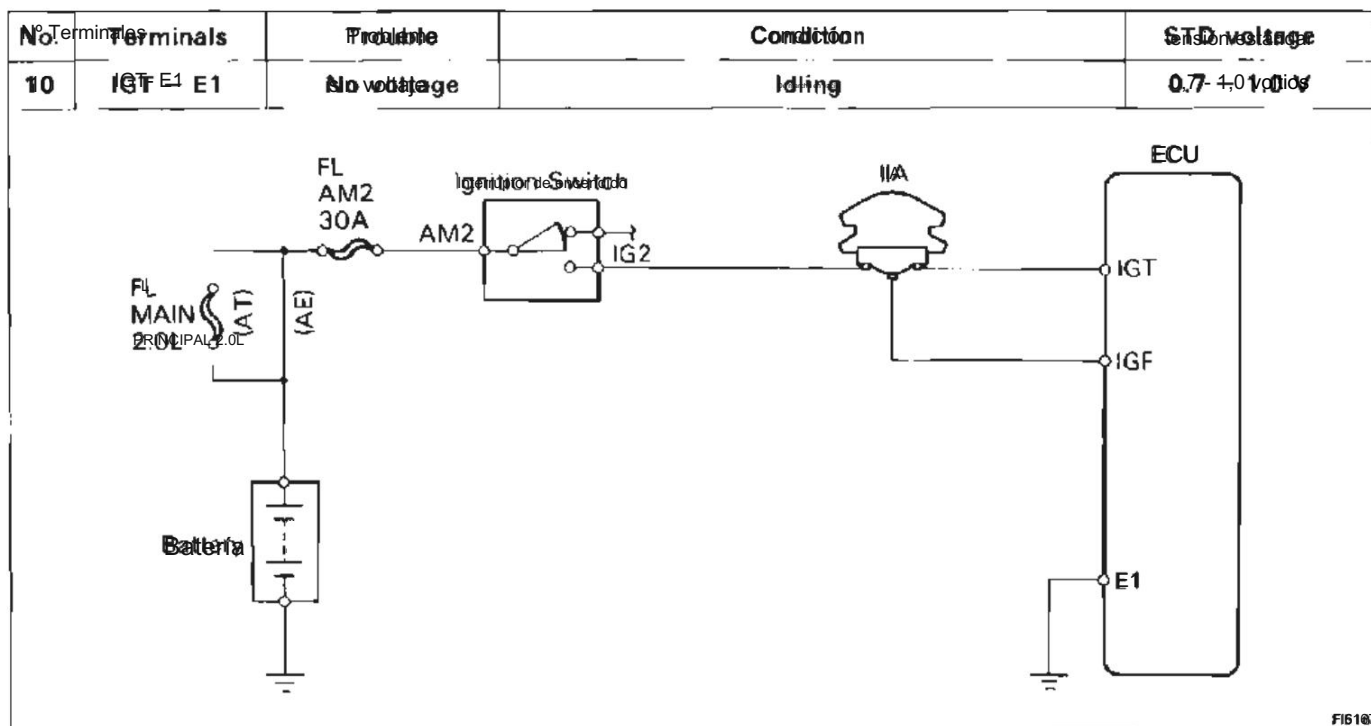
Repair or replace.



```

graph TD
    Start([1]) --> Step1[Check starter operation  
Comprobar el funcionamiento del arranquador.]
    Step1 -- BAD --> Step3[Check that there is voltage at STA / 50 terminal of starter.  
(NO SW START) STD voltage: 6 - 14 V]
    Step1 -- OK --> Step2[Check wiring between ECU terminal STA and ignition switch terminal ST1.  
Comprobar el cableado entre el terminal STA del ECU y el terminal ST1 del interruptor de encendido.]
    Step2 -- BAD --> Repair1[Replace replace.]
    Step2 -- OK --> Step2_2[Check wiring between ECU terminal E1 and body shield.  
Comprobar el cableado entre el terminal E1 del ECU y la carcasa blindada.]
    Step2_2 -- OK --> Repair2[Try another ECU.]
    Step2_2 -- BAD --> Repair3[Repair or replace.]
    Step3 -- BAD --> Repair4[Repair or replace.]
    Step3 -- OK --> Step4[Check starter.  
Comprobar el motor de arranque.]
    Step4 --> End([End])

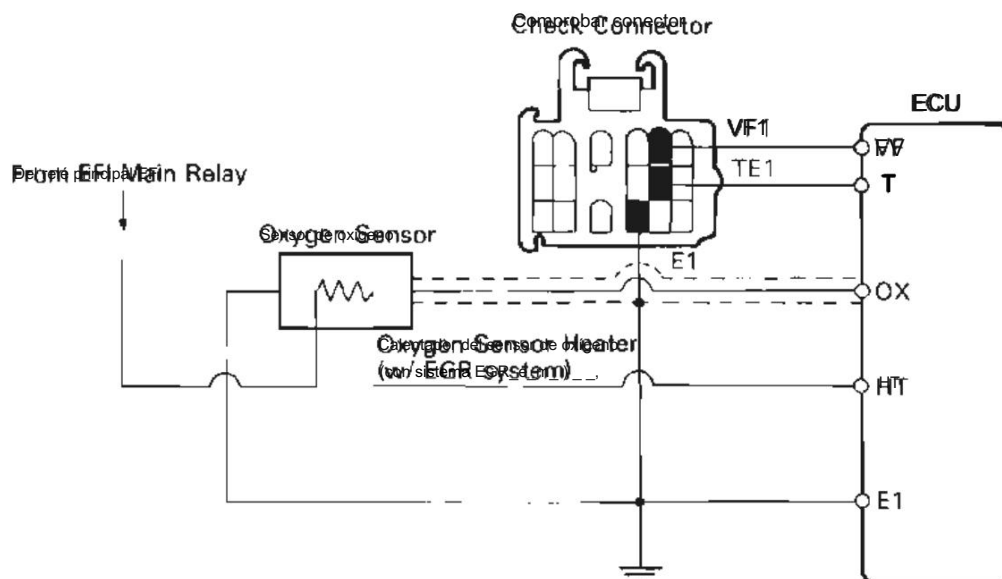
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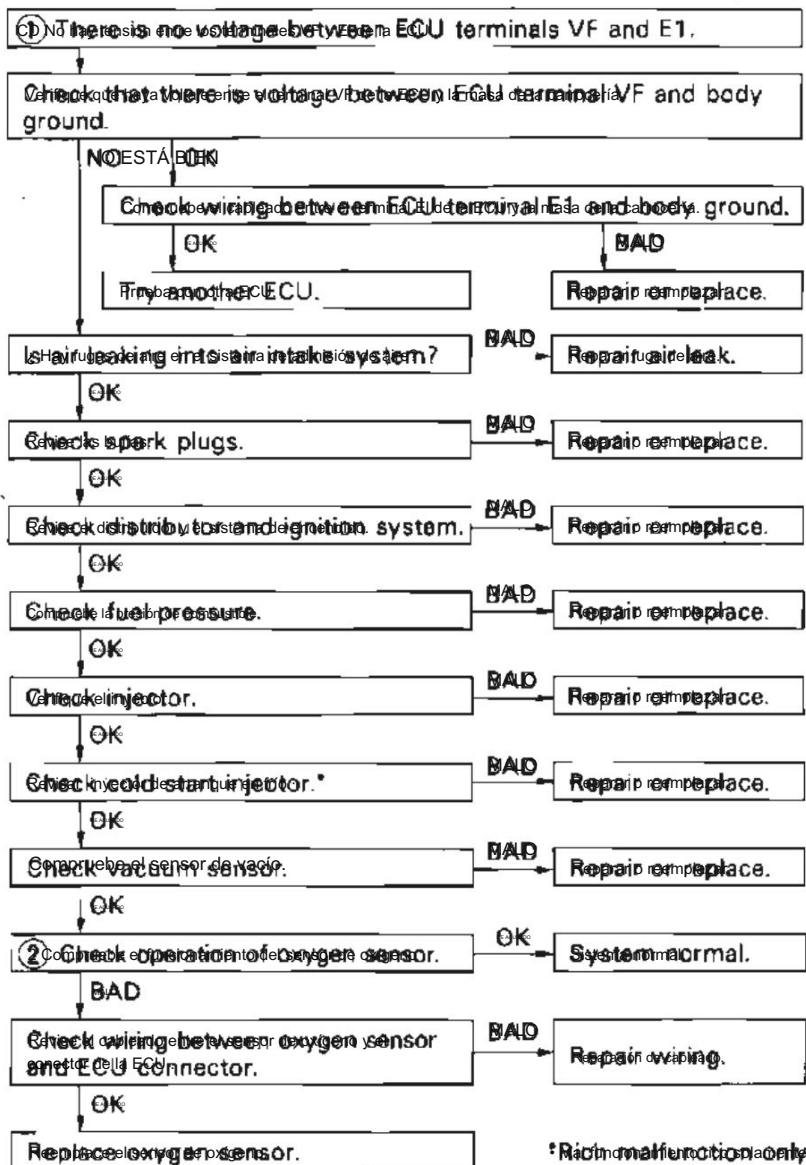
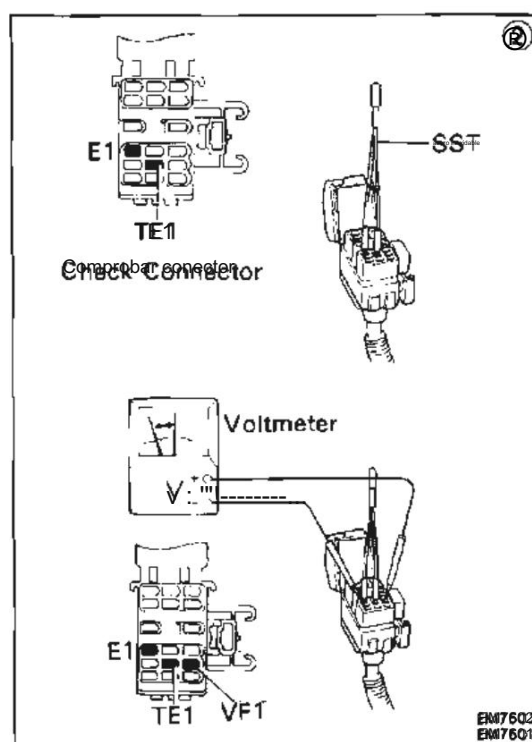
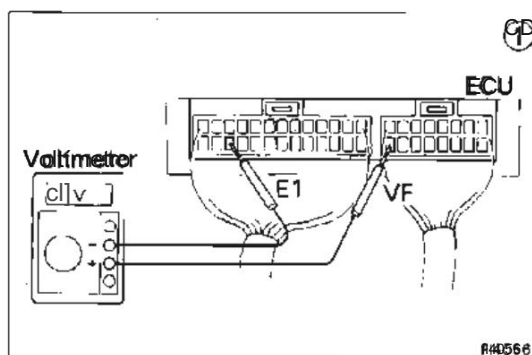
FD0922

Repair or replace

Repaired: Overlaid. 0.

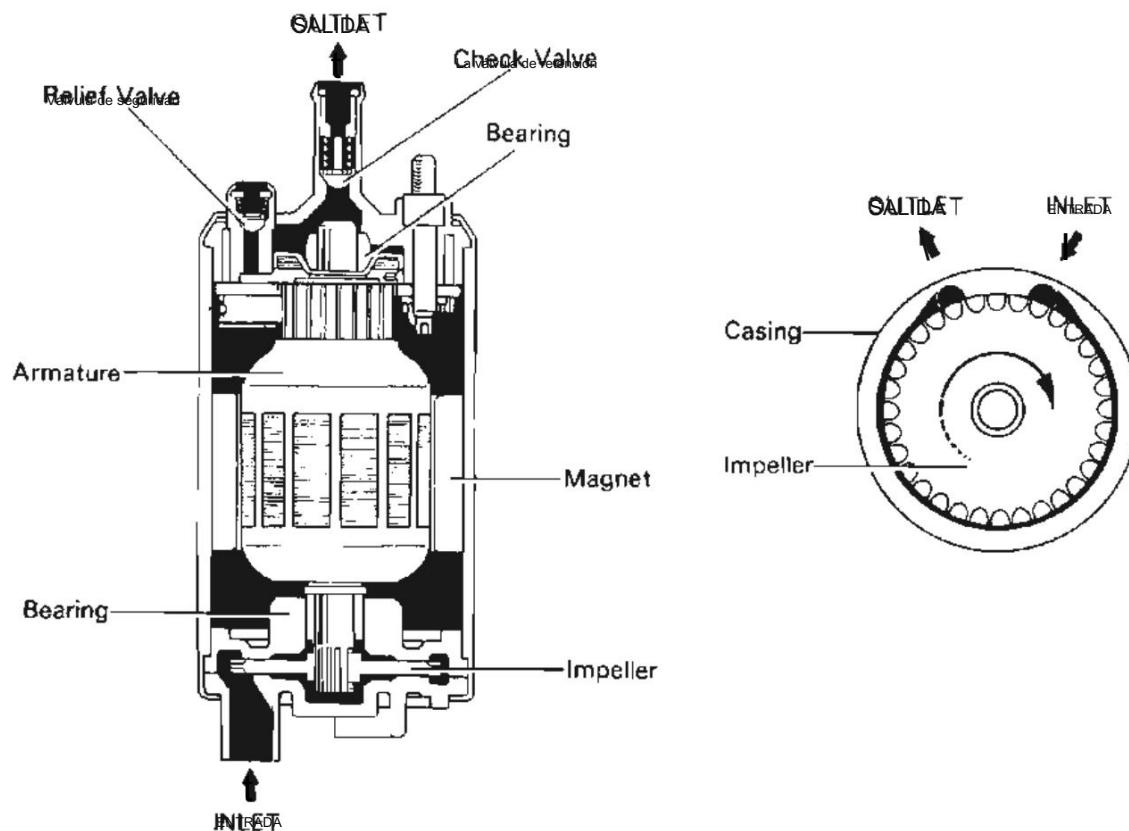


FL3840

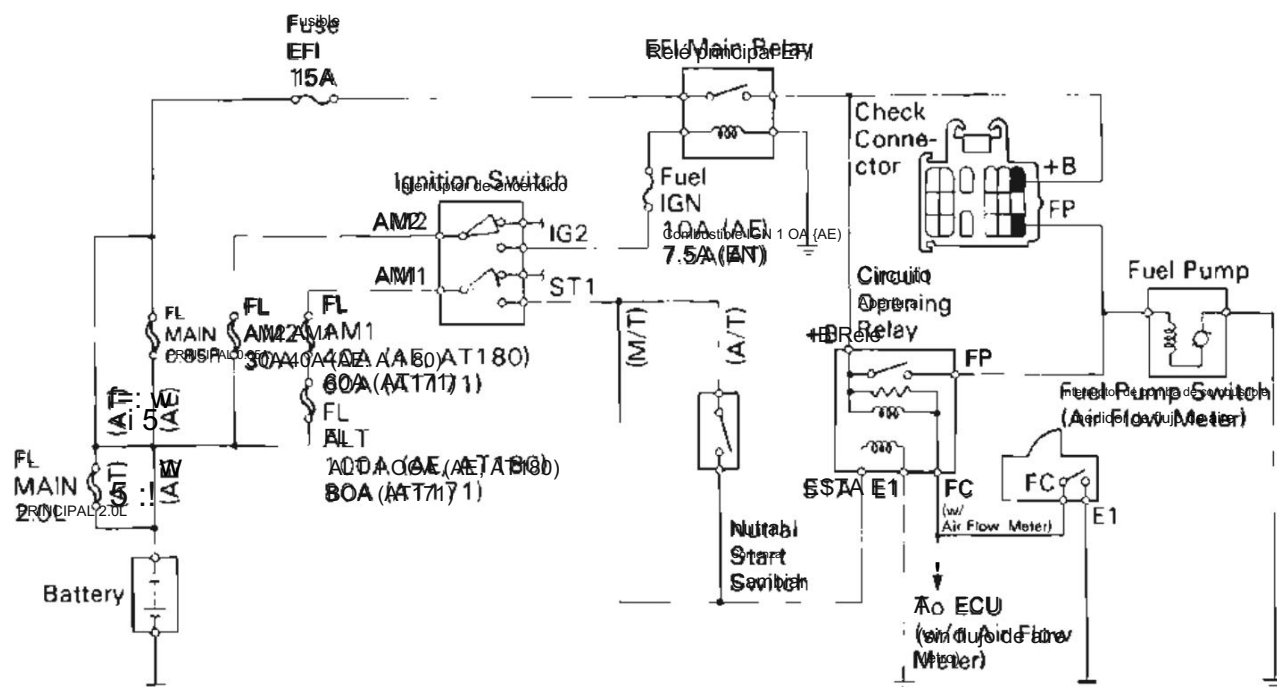


* Rich malfunction only

FUEL SYSTEM

Fuel Pump
Bomba de combustible

F1053061F140479



F105176

ON-VEHICLE INSPECTION**1. CHECK FUEL PUMP OPERATION**

(a) Turn the ignition to ON.

CAUTION Do not start the engine.

(b) Using SST, connect terminals FP+B and FP of the check connector.

SST 09843-18020

LOCATION: See page FI-133

(c) Verify that a pressure is present in the hose from the fuel filter.

HINT At this time, you will hear fuel return noise from the pressure regulator.

(d) Remove SST from the check connector.

SST 09843-18020

(e) Turn the ignition switch to OFF.

If there is no pressure, check the following parts:

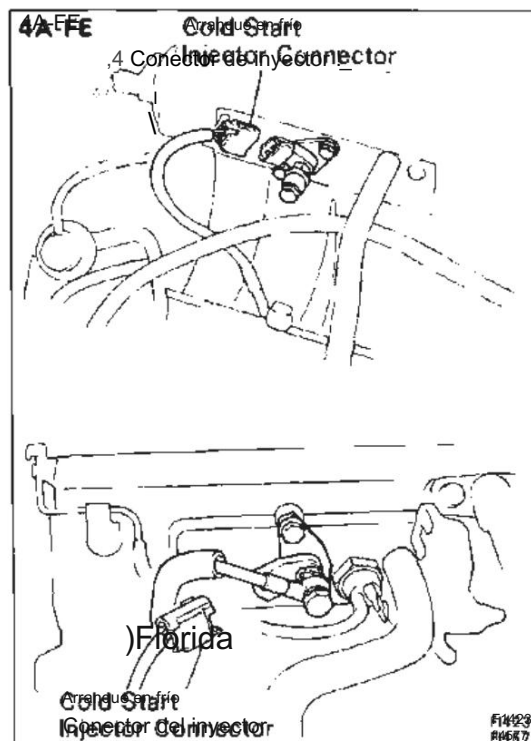
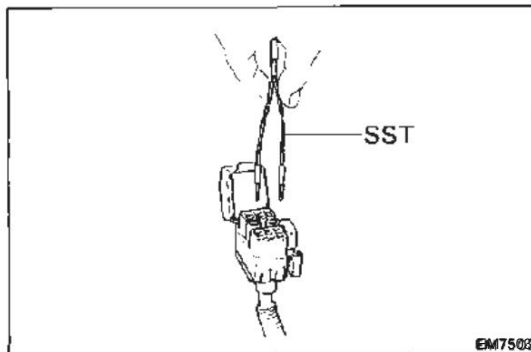
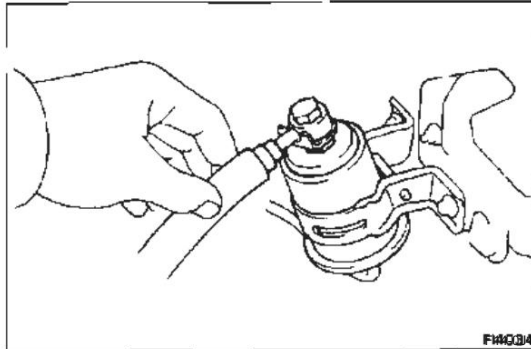
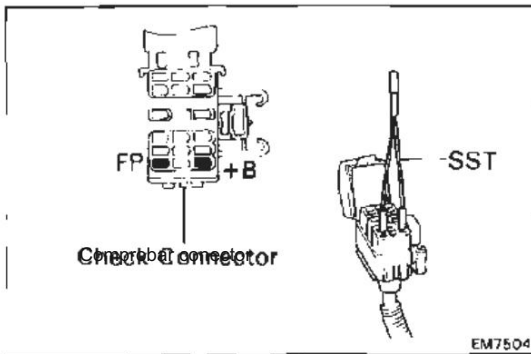
- Fusible links
- Fuses
- Relay (main relay)
- Relay (fuel pump relay)
- Fuel pump
- ECU
- Wiring connections

2. INSPECT FUEL PRESSURE

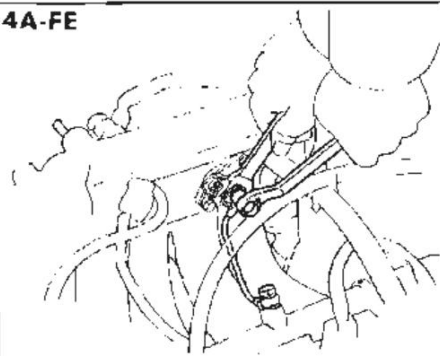
(a) Verify that the battery voltage is above 12 V.

(b) Disconnect the cable from the negative (-) terminal of the battery.

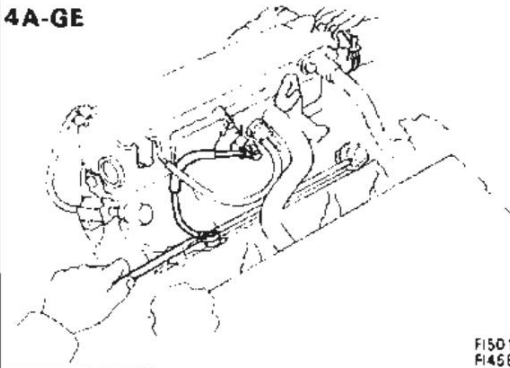
(c) Disconnect the wiring connector from the cold start injector.



4A-FE

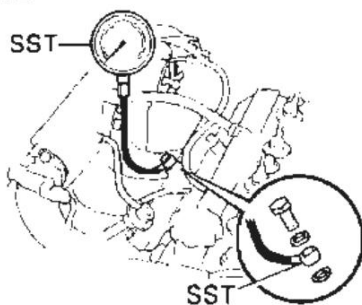


4A-GE

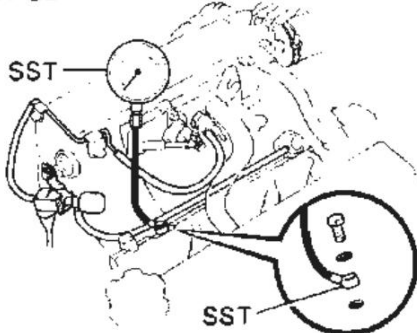
F15010
F14588

- (d) Put a suitable container on shop towel under cold start injector pipe.
- (e) Slowly loosen the union bolts of the cold start injector pipe and remove the bolts, cold start injector pipe and four gaskets.
- (f) Drain the fuel from the delivery pipe.

4A-FE



4A-GE

F14297
F14688

- (g) Install SST (pressure gauge) to the delivery pipe with new gaskets and union bolt.

SST 09268-25012

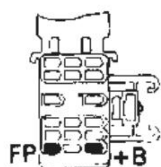
Torque 4A-4A-168 kg (10 ft-lb, 18 N·m)

- (h) Wipe off any splattered gasoline.
- (i) Reconnect the battery (negative -) cable.

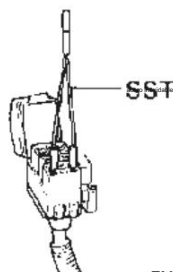
- (j) Using SST connect terminals +B and FP of the check connector.

SST 09843-48020

LOCATION See page FI-133

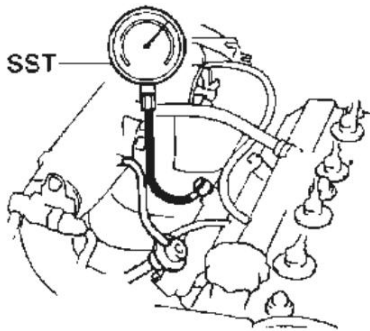


Check Connector

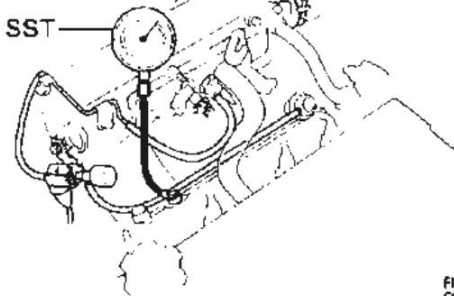


EM7604

4A-FE



4A-GE

FI4235
FI4584

(k) Turn the ignition switch ON.

(l) Measure the fuel pressure.

Fuel pressure at bus 27: $\pm 23.13 \text{ kg/kgm}^2$
 (3.2 (3.44 psi) 2.65 (3.04 PaPa)

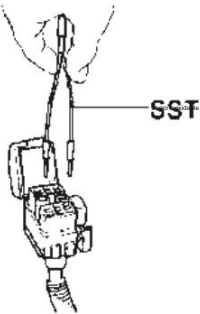
If pressure is high, replace the fuel pressure regulator.

If pressure is low, check the following parts:

- Fuel hoses and connection
- Fuel pump
- Fuel filter
- Fuel pressure regulator

(m) Remove SST from the check connector.

SST 09843-18020



EM7503

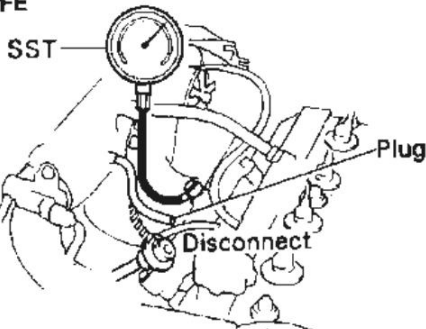
(n) Start the engine.

(o) Disconnect the vacuum sensing hose from the fuel pressure regulator and plug the hose end.

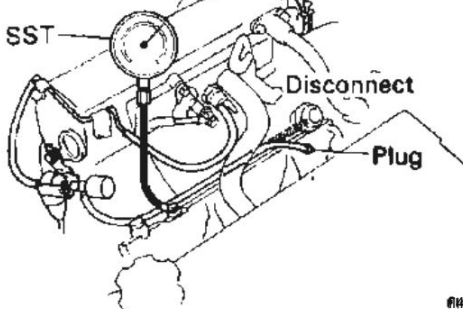
(p) Measure the fuel pressure at idling.

Fuel pressure at bus 27: $\pm 23.13 \text{ kg/kgm}^2$
 (3.2 (3.44 psi) 2.65 (3.04 PaPa)

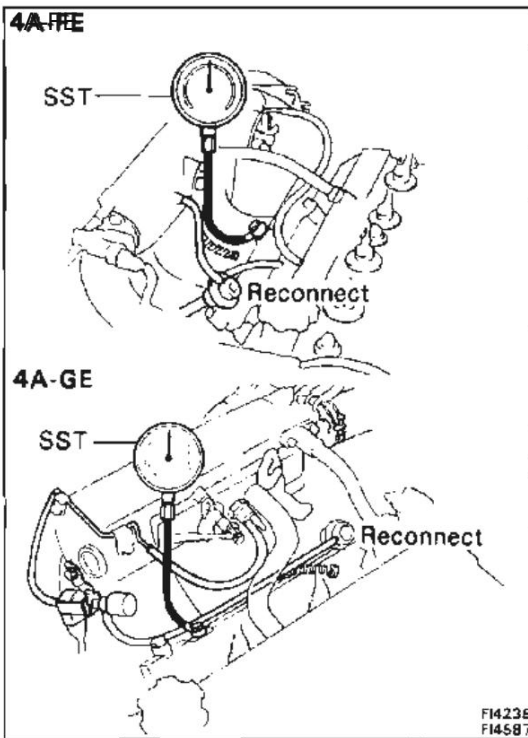
4A-FE



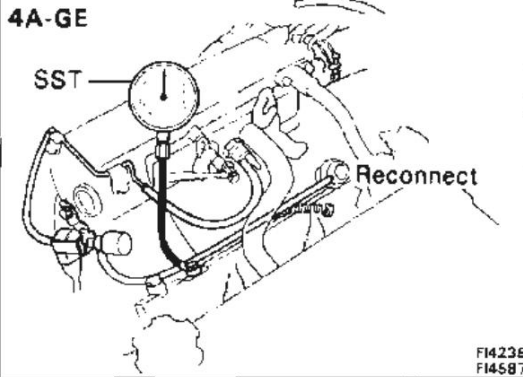
4A-GE

FI4235
FI4585

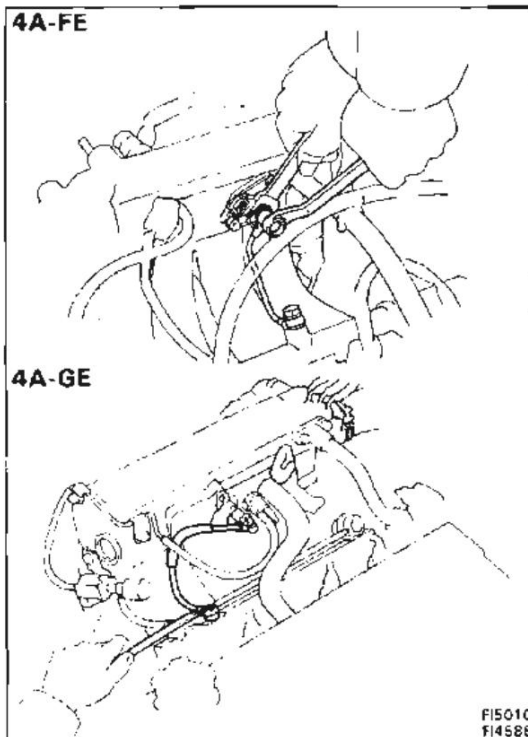
4A-FE



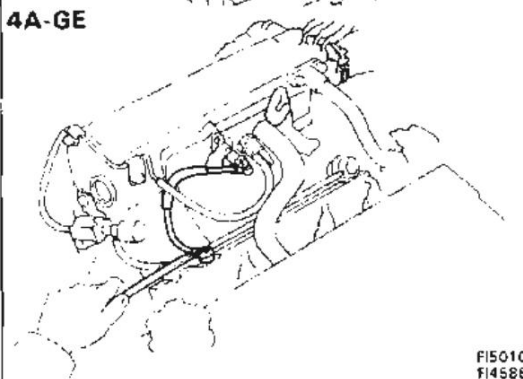
4A-GE

FI4238
FI4587

4A-FE



4A-GE

FI5010
FI4588

(q) Reconnect the vacuum sensor sensing all hoses to the fuel pressure regulator.

(r) Measure the fuel pressure at idling.

Fuel pressure: 2.1 kg/cm² (30.3 psi)
(2.0 - 2.5 kg/cm²) (29.4 - 35.3 psi)

If pressure is not as specified, check the vacuum sensing hose and fuel pressure regulator.

(s) Stop the engine and check that the fuel pressure remains at 1.5 kg/cm² (21.7 psi) for 5 minutes after the engine is turned off.

If pressure is not as specified, check the fuel pump, pressure regulator and/or injector.

(t) After checking fuel pressure, disconnect the battery negative cable and carefully remove the SST to prevent gas from splashing.

SST: 09268-245012

(u) Install the cold start injector pipe with new gaskets and two union bolts.

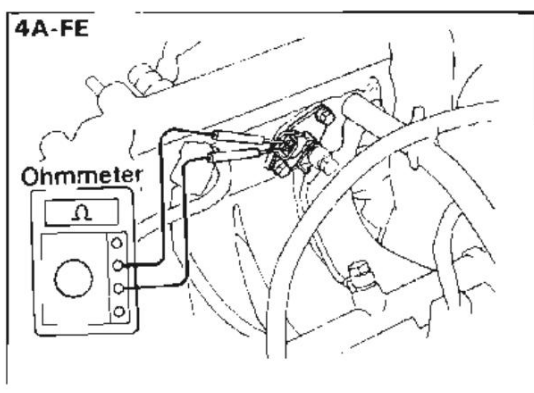
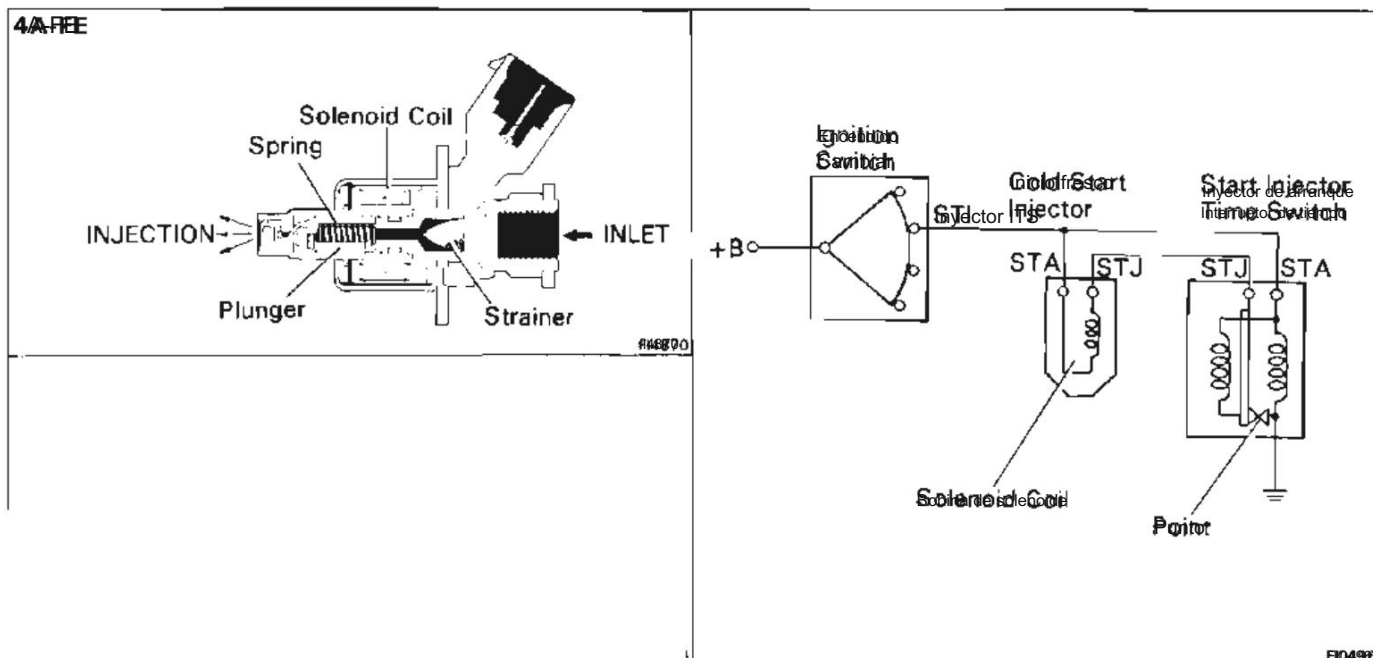
Torque: 4A-FE 40 N·m (13.0 lb-ft) (13 ft-lb, 18 N·m)

(v) Reconnect the cold start injector connector.

(w) Reconnect the cable to the negative (-) battery terminal of the battery.

(x) Check for fuel leakage (See page FI112)

Gold Start Injector



ON-VEHICLE INSPECTION

INSPECT RESISTANCE OF COLD START INJECTOR

- (b) **Using an ohmmeter, measure the resistance between the terminals.**

Resistance 4A FE 3 - 5 Ω

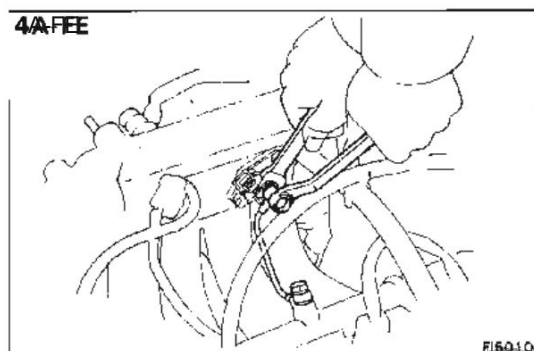
(c) Reconnect the cold start injector connector.

REMOVAL OF COLD START INJECTOR

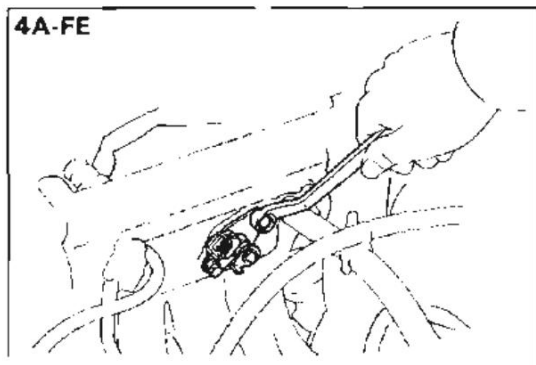
1. **DISCONNECT CABLE CABLE FROM NEGATIVE TERMINAL OF BATTERY**
2. **DISCONNECT COLD START INJECTOR CONNECTOR**
3. **REMOVE COLD START INJECTOR PIPE**

- (a) Put a reusable container or shop towel under the injector pipe**
Coloque un recipiente reutilizable o una toalla debajo del tubo del inyector.
- (b) Remove the two union bolts, four gaskets and injector tube.**
Retire los dos pernos de unión, las cuatro juntas y el inyector.

Don't Slowly Loosen the prior bolts.



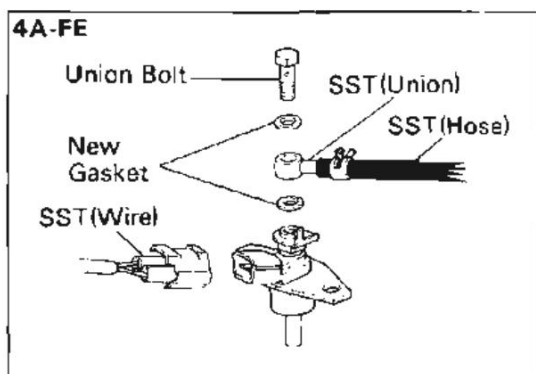
4A-FE



4. REMOVE COLD START INJECTOR

Remove the two bolts, cold start injector and gasket.

4A-FE



INSPECTION OF COLD START INJECTOR

1. INSPECTION OF COLD START INJECTOR

CAUTION: Keep clear of sparks during the test.

(a) Install SST (two unions) in the injector and delivery pipe with new gaskets and the union bolts.

SST 09268-41045 (09268-41080)

(b) Connect SST (hose) to the union.

SST 09268-41045

(c) Connect SST (wire) to the injector.

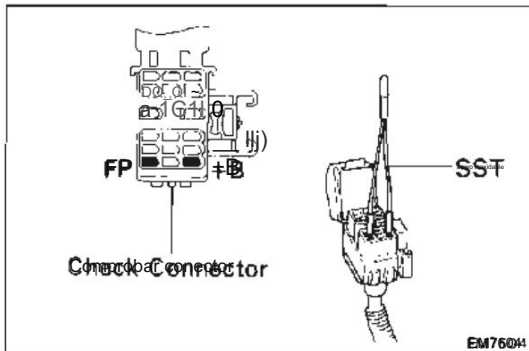
SST 09842-30055

(d) Connect the battery (-) to the injector.

(e) Reconnect the battery (-) to the battery (-) terminal.

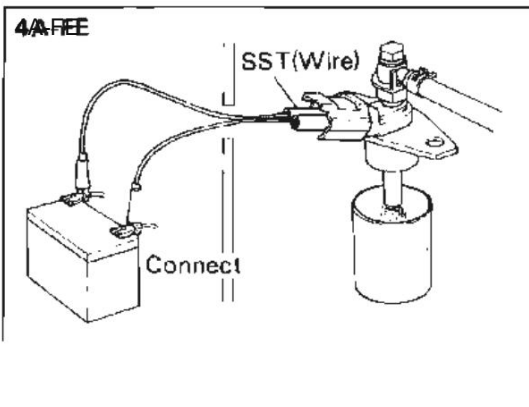
(f) Turn the ignition switch ON.

NOTE: Do not start the engine.



(g) Utilizing SST, connect terminals #B and #F of the check connector.

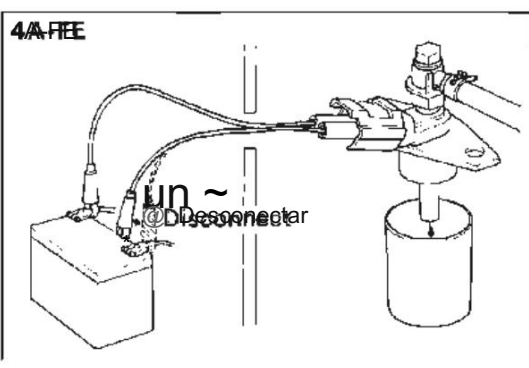
SST 09843-18020



(h) Connect the test probe to the SST (Wire) and the battery. Verify that the battery is properly connected.

SST 09842-30055

NOTICE Realiza esta comprobación en el menor tiempo posible.



2. INSPECT LEAKAGE

(a) In the condition after disconnecting the test probe of the SST (Wire) from the battery, verify that there is no fuel leakage from the injector.

SST 09842-30055

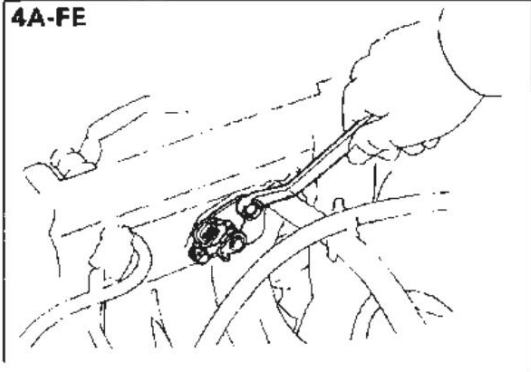
Do not drop or blow the probe.

(b) Disconnect the negative (-) cable.

(c) Remove the SST.

SST 09268-14150 (09268-92168) / 10982-30055 09843-18020

4A-FE



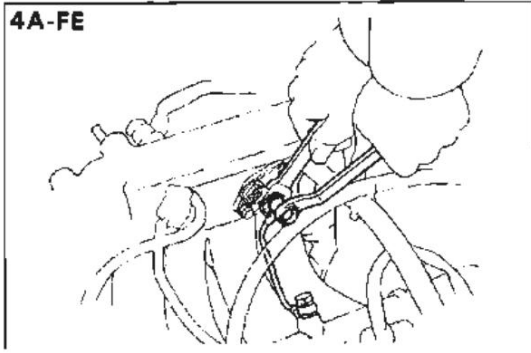
INSTALLATION OF COLD START INJECTOR

1. INSTALL COLD START INJECTOR

Install a new gasket and the injector with the two bolts.

Torque: 4A-FE 9.5 kg·m (67.5 lb·ft) 9.3 N·m

4A-FE



2. INSTALL COLD START INJECTOR PIPE

Install the injector pipe with four new gaskets and the two union bolts.

Torque: 4A-FE 18 kg·m (130 lb·ft) 18 N·m

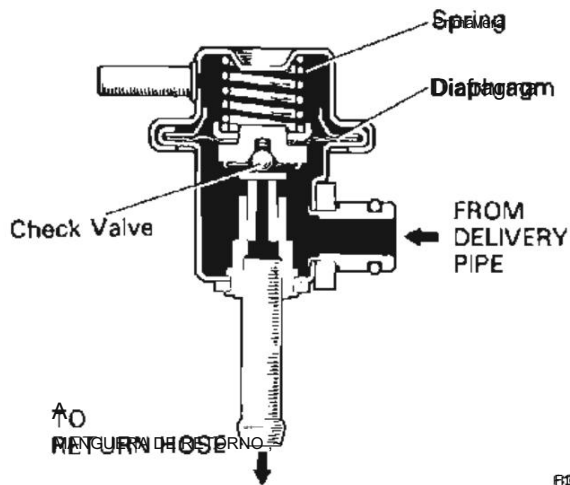
3. CONNECT COLD START INJECTOR CONNECTOR

4. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

5. CHECK FOR FUEL LEAKAGE (See page FI-12)

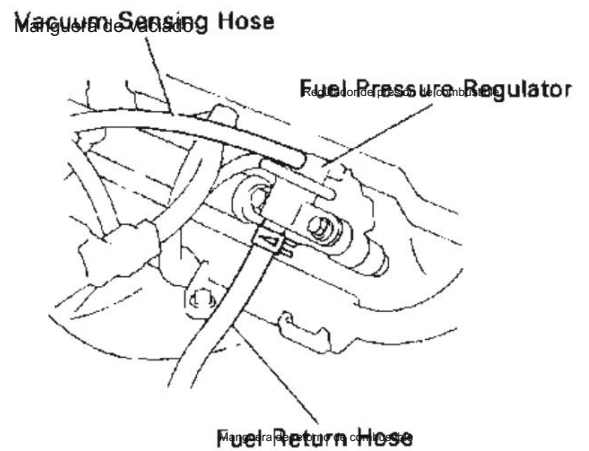
Fuel Pressure Regulator

4A-FEE



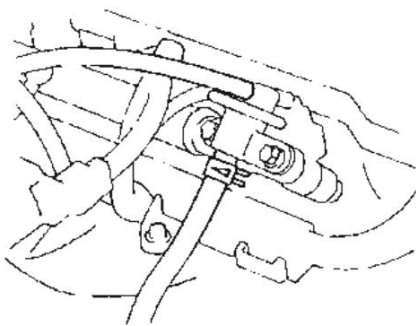
F10093

4A-FEE



F10133

4A-FEE



ON-VEHICLE INSPECTION

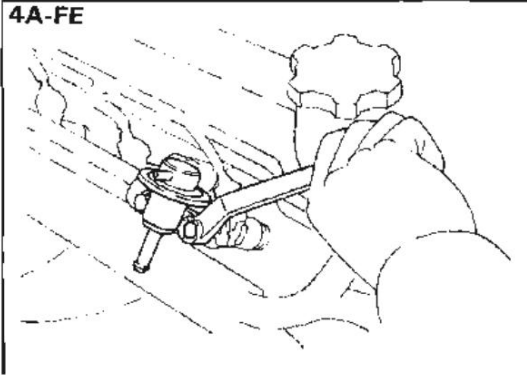
INSPECT FUEL PRESSURE (See page FI-95)

REMOVAL OF FUEL PRESSURE REGULATOR

1. DISCONNECT VACUUM SENSING HOSE

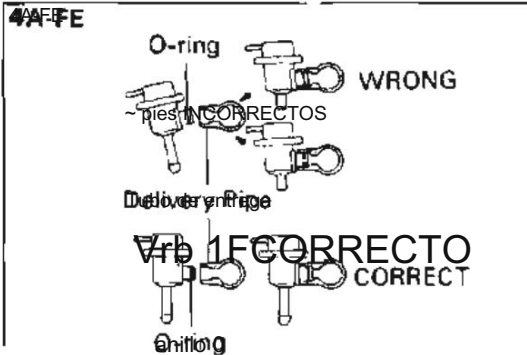
2. DISCONNECT FUEL RETURN HOSE

4A-FE

**3. REMOVE FUEL PRESSURE REGULATOR**

- (a) Retire los tornillos y extraiga el regulador de presión regulator.
- (b) Retire la junta O-ring regulador de presión regulator.

4A-FE

**INSTALLATION OF FUEL PRESSURE REGULATOR****1. INSTALL FUEL PRESSURE REGULATOR**

- (a) Aplique una ligera ligera de gasolina a la junta O-ring y instálelo en el regulador de presión.

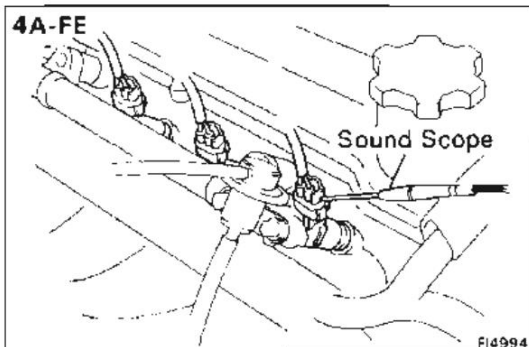
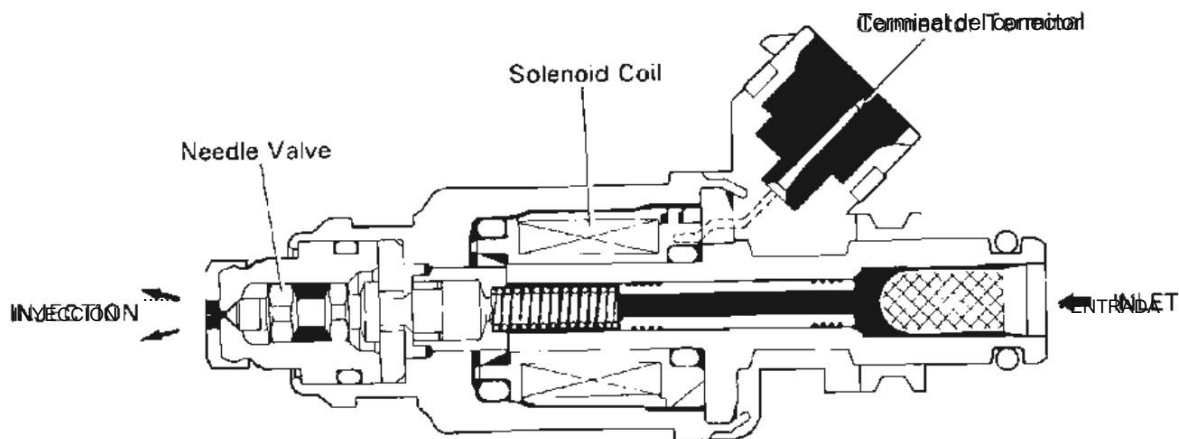
- (b) Install the pressure regulator with the two bolts.

Torque 4A-4E 9.3 N·m (82 in·lb) 4A-5E 9.3 N·m (82 in·lb)

2. CONNECT FUEL RETURN HOSE**3. CONNECT VACUUM SENSING HOSE****4. CHECK FOR FUEL LEAKAGE (See page FI-12)**

Injector

4A-FE(2V/D)



ON-VEHICLE INSPECTION

1. INSPECT INJECTOR OPERATION

Check operation of each injector.

- (a) With the engine running, or cranking, use a sound scope to check that there is normal operating noise in proportion to engine rpm.

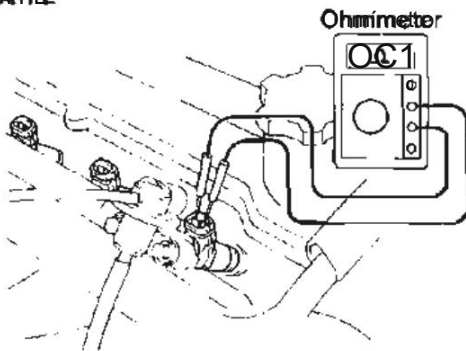
4A-FE



- (b) If you have a scope, verify that the injector is firing in operation with 4A-FE finger (4A-FE)

If no sound or irregular sound is heard, check the wiring connected to the injector signal feed on the ECU.

4A-FE



2. INSPECTING A RESISTOR RESISTANCE

- (a) Disconnect the injector connector.
 (b) Using an ohmmeter, measure the resistance between the terminals.

Resistance: Approx. 13.8 Ω

If the resistance is not as specified, replace the injector.

- (c) Reconnect the injector connector.

REMOVAL OF INJECTORS

1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**
(See step 3 page FL-105)
2. **REMOVE COLD START INJECTOR PIPE**
(See step 3 page FL-105)
3. **DISCONNECT FUEL PRESSURE SENSING HOSE FROM FUEL PRESSURE REGULATOR**
4. **DISCONNECT INJECTOR CONNECTORS**
5. **DISCONNECT HOSE FROM FUEL RETURN PIPE**

6. **DISCONNECT FUEL INLET HOSE FROM DELIVERY PIPE**

(a) (4A-FE)

Remove the inlet pipe mount bolt.

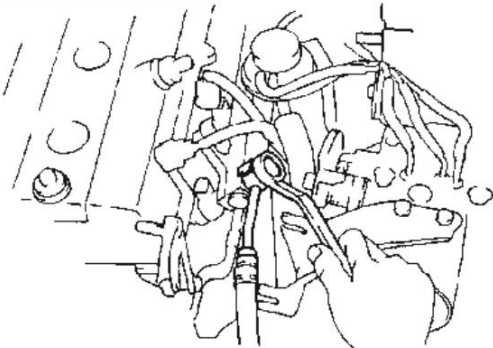
(b) Remove the union bolt and two gaskets and disconnect the inlet hose from the delivery pipe.

7. (4A-FE 4WD)

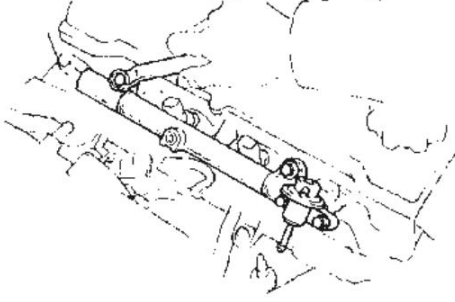
REMOVE EGR VACUUM MODULATOR

(See step 6 page EM-60)

4A-FE (Australia)



4A-FE (Ex. Australia)



8. REMOVE DELIVERY PIPE AND INJECTORS

(a) (4A-FE)

Remove the two bolts that hold the delivery pipe to the cylinder head.

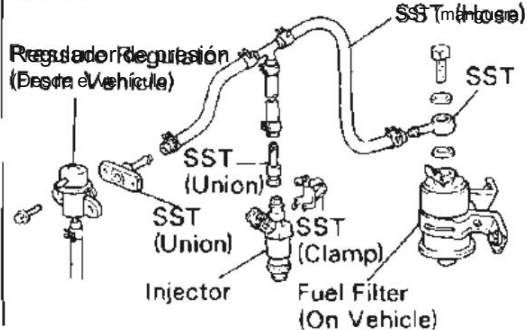
NOTICE Be careful not to drop the injector when removing the delivery pipe.

(b) (4A-FE)

Remove the four injectors and special spacers from the cylinder head.

(c) Pull out the four injectors from the delivery pipe.

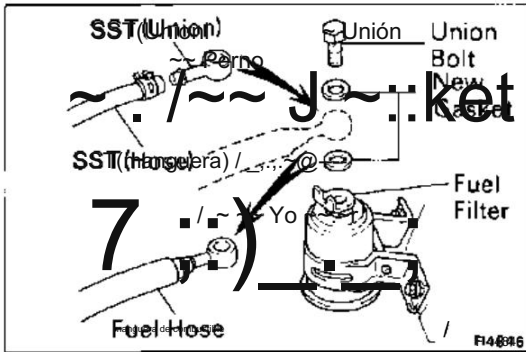
4A-FE



INSPECTION OF INJECTORS

1. INSPECT INJECTOR INJECTION

CAUTION Keep clear of sparks during the test.

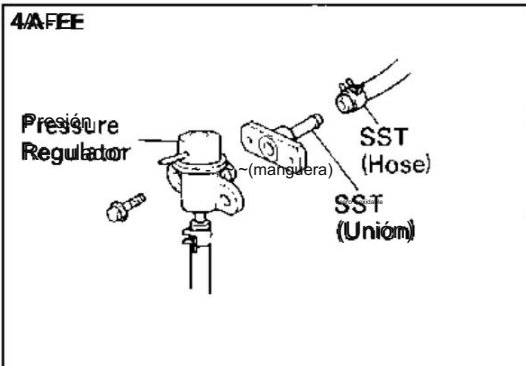


(a) Disconnect the fuel inlet hose from the fuel filter outlet.

(b) Connect SST (union and hose) to the fuel filter outlet with new gaskets and the union bolt.

SST 09268-40265 (90403-009015)

NOTE: Use the vehicle's fuel filter.

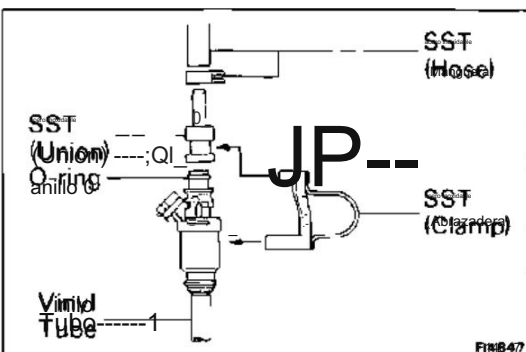


(c) Remove the pressure regulator from the delivery pipe and connect the fuel hose to pressure regulator.

(d) Install a new O-ring to the pressure regulator.

(e) Connect the SST (hose) to the pressure regulator with SST (union) and two bolts.

SST 09268-40465 (90403-009015)



(f) Install the grommet and a new O-ring to the injector.

(g) Connect SST (union and hose) to the injector and hold the injector and union with SST (clamp).

SST 09268-40465

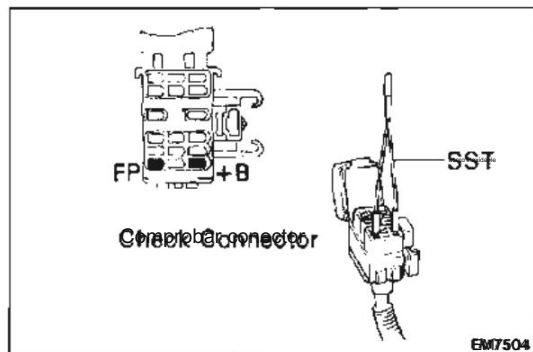
(h) Put the injector into the graduated cylinder.

NOTE: Install the suitable vinyl hose onto the injector to prevent gasoline from splashing out.

(i) Reconnect the battery (negative (-)) cable.

(j) Turn the ignition switch ON.

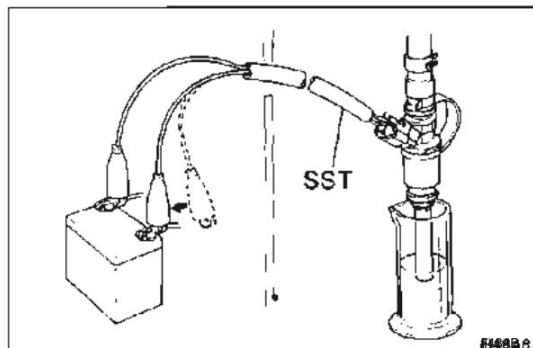
NOTE: Do not start the engine.



(k) Using SST connect terminals +B and FP of the check connector.

SST 09843-9848-020

LOCATION: See page FI-133



(l) Connect SST (wire) to the injector and battery for 15 seconds and measure the injection volume with a graduated cylinder. Test each injector two or three times.

SST 09842-9807-0

Volume:

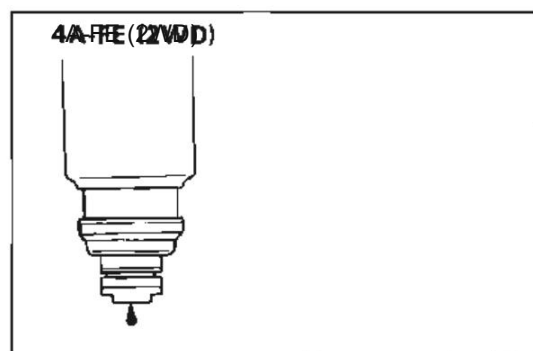
4A-FE

40-50 cc (2.4-2.9 pulgada cúbica) per 15 seg.

Difference between each injector:

5cc (0.3 pulgada cúbica) or less

If the injection volume is not as specified, replace the injector.



2. INSPECT FOR LEAKAGE

(a) In the condition where disconnect the test probes of SST (wire) from the battery and check the fuel leakage from the injector.

SST 09842-9807-0

Fuel drop: One drop or less per minute.

(b) Disconnect the battery negative cable.

(c) Remove SST and the service wire.

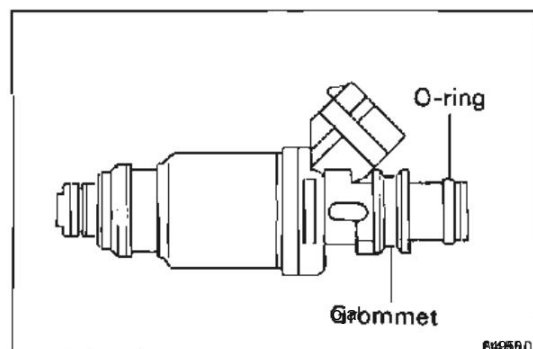
SST 09268-41045

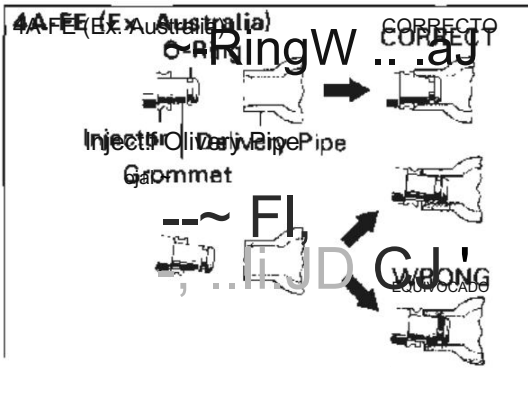
INSTALLATION OF INJECTORS

1. INSTALL INJECTORS AND DELIVERY PIPE

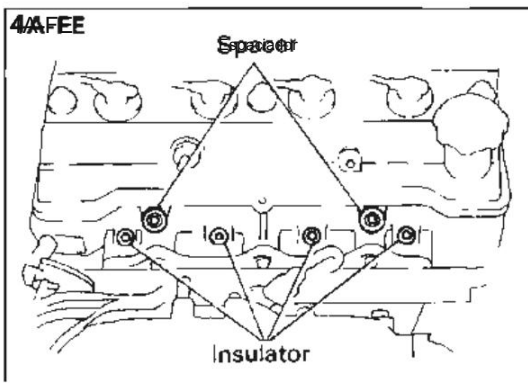
(a) Install a new grommet to the injector.

(b) Apply a light coat of gasoline to the new O-ring and install it to the injector.





- (c) While turning the injector left and right, install it to the delivery pipe. Install the four injectors.

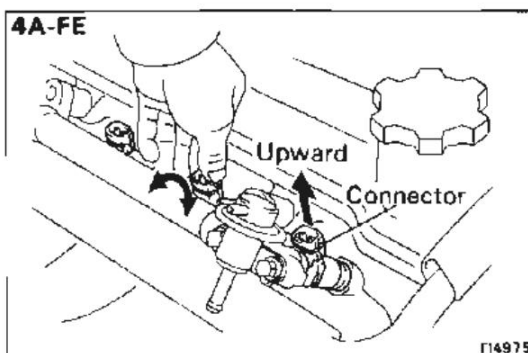


- (d) (4A-4E)

Place the four insulators and two spacers in position on the cylinder head.

- (4AGE)

Place the four insulators and two spacers in position on the cylinder head.



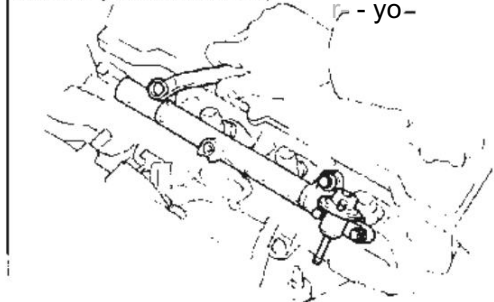
- (e) Place the injectors together with the delivery pipe in position on the cylinder head.

- (f) Check that the injectors rotate smoothly.

CAUTION If injectors do not rotate smoothly, the probable cause is incorrect installation of O-rings. Replace the O-ring.

- (g) Position the injector connector upward.

4A-FE (Ex. Australia)



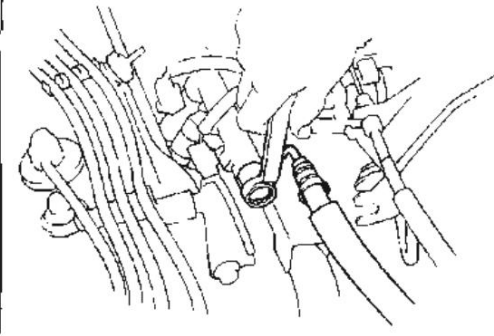
(h) (4A-FE)

Instale y apriete los dos pernos.

(4A-FE)

Instale y apriete los tres pernos.

Torque 4A-FE 100 kg-cm (14 ft-lb, 15 N·m)

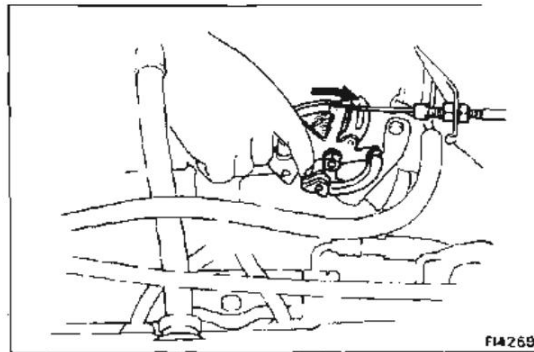
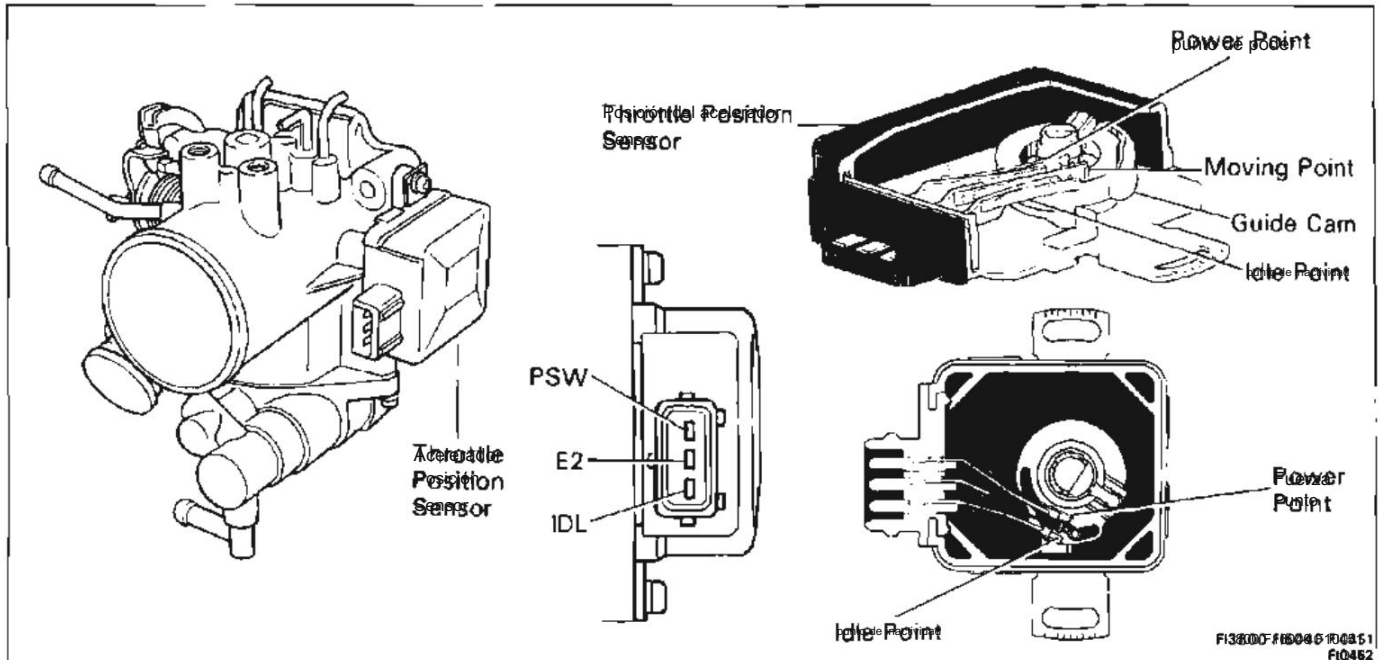
4A-FE (Ex. Australia)**3. CONNECT FUEL INLET HOSE TO DELIVERY PIPE**

- (a) Connect the inlet hose with two new gaskets and the union bolt.

Torque 300 kg (22 ft-lb) (22.9 N·m)

4. CONNECT FUEL RETURN HOSE**5. CONNECT INJECTOR CONNECTORS****6. CONNECT VACUUM SENSING HOSE****7. INSTALL COLD START INJECTOR PIPE**
(See step 2 page FI-108)**8. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY****9. CHECK FOR FUEL LEAKAGE (See page FI-12)**

Throttle Body (4A-FE)



ON-VEHICLE CHECK

1. CHECK THROTTLE BODY

(a) Check that the throttle linkage moves smoothly.

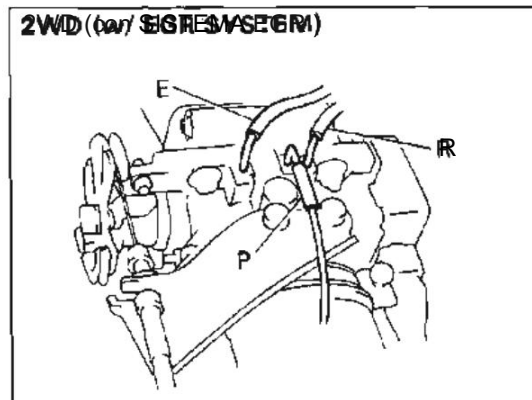
(b) Check the vacuum at each port.

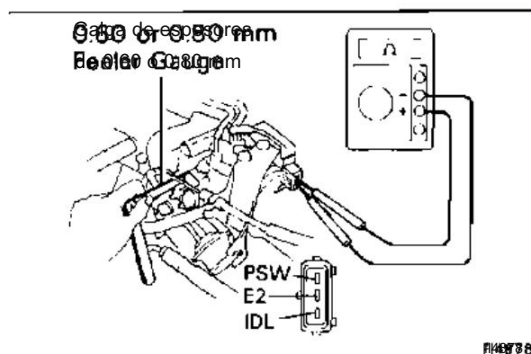
- Start and warm up the engine.
- Check the vacuum with your finger.

Port	Throttle Valve Opening
P*1	Positioned more than P port.
E*2	Positioned more than E port.
R*2	Positioned more than R port.

*1: With fuel evaporative emission control system
 *2: With exhaust gas recirculation system

2WD (car) EFI SYSTEM





2. INSPECT THROTTLE POSITION SENSOR

- Disconnect the sensor connector.
- Insert a feeler gauge between the throttle stop screw and stop lever.
- Using an ohmmeter, measure the resistance between each terminal.

If the resistance is not as specified, adjust or replace the throttle position sensor.

Alignment between lever and stop screw	Continuity between terminals		
	IDL-E2 E2	PSW-E2 E2	IDL-PSW
0.60mm (0.0236 in.)	Continuity	No continuity	No continuity
0.80mm (0.0315 in.)	No continuity	No continuity	No continuity
Throttle valve fully opened position	No continuity	Continuity	No continuity

- Reconnect the sensor connector.

REMOVAL OF THROTTLE BODY

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. DRAIN ENGINE COOLANT

3. DISCONNECT ACCELERATOR CABLE

4. (A/T) DISCONNECT THROTTLE CABLE

5. DISCONNECT AIR CLEANER HOSE

6. REMOVE CABLE BRACKET FROM THROTTLE BODY

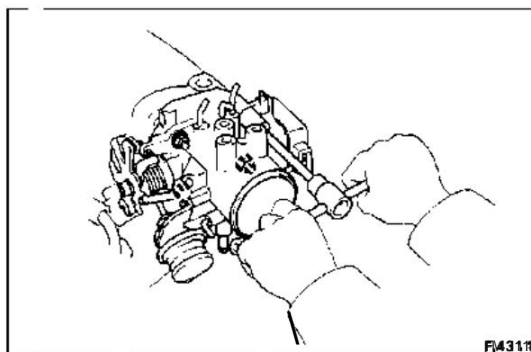
7. DISCONNECT THROTTLE POSITION SENSOR CONNECTOR

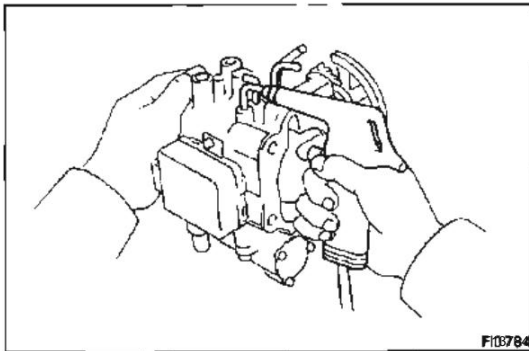
8. DISCONNECT FOLLOWING HOSES:

- No. 2 water by-pass hose from the air valve.
- PCV hose from the throttle body.
- Vacuum hose(s) from the port(s).

9. REMOVE THROTTLE BODY

- Remove the two bolts and nuts, and disconnect the throttle body and gasket.
- Disconnect the No. 1 water by-pass hose, and remove the throttle body.



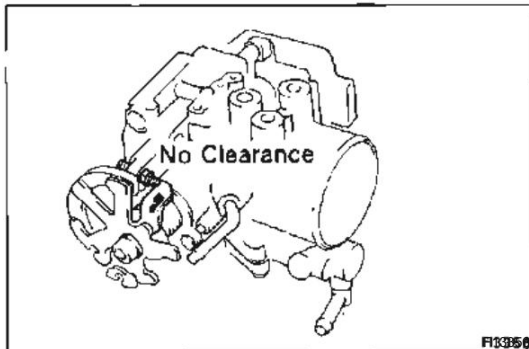


INSPECTION OF THROTTLE BODY

1. CLEAN THROTTLE BODY

- Using a soft brush and carburetor cleaner, clean the cast parts.
- Using compressed air, clean all the passages and apertures.

NOTICE To prevent deterioration, do not clean the throttle position sensor.



2. INSPECT THROTTLE BODY VALVE

Check that there is no clearance between the throttle stop screw and throttle lever when the throttle valve is fully closed.

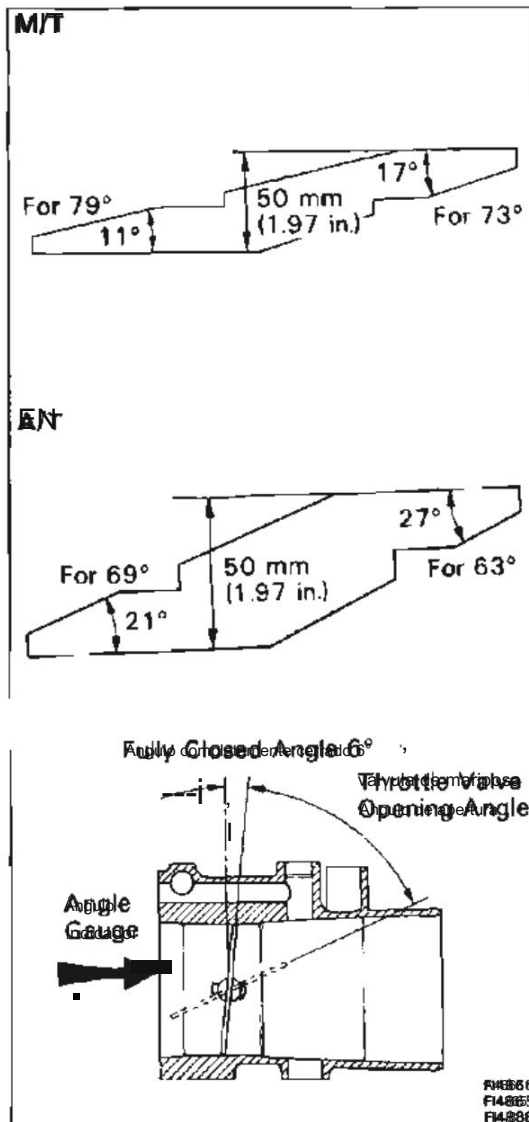
3. INSPECT THROTTLE POSITION SENSOR

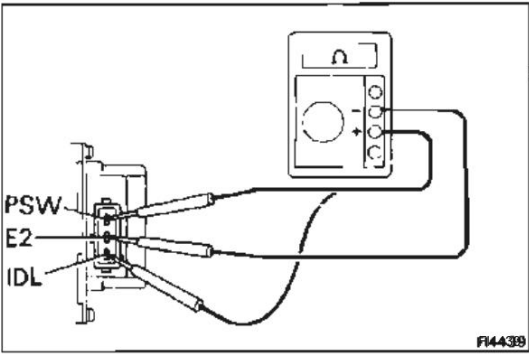
- Make an angle gauge as shown in the figure.
- Set throttle valve opening angle to the specifications below from the vertical position (in the case of throttle valve fully closed angle 6°).

Throttle valve opening angle:

M/T 73° 79° or 79°

A/T 63° 69° or 69°



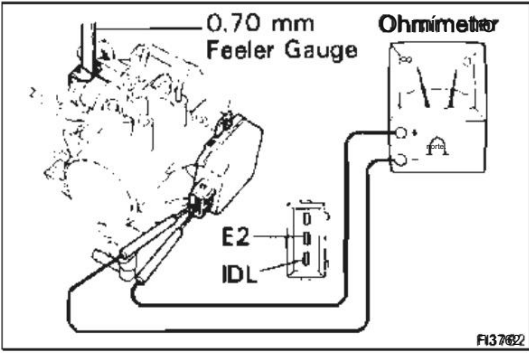
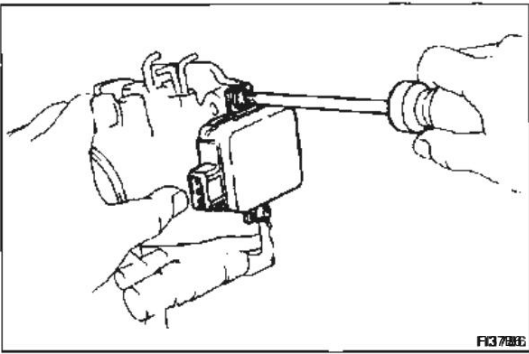


(e) Using an ohmmeter, check the continuity between each of the terminals.

Throttle valve opening range		Continuity		
MYE	ENT	IDL - E2 PSW	PSW - IDL - PSW	IDL - PSW
73° desde vertical	63° desde vertical	No continuity	No continuity	No continuity
79° desde vertical	69° desde vertical	No continuity	Continuity	No continuity
less than 7.5 degrees	vertical	Continuity	No continuity	No continuity

4. IF NECESSARY, ADJUST THROTTLE POSITION SENSOR

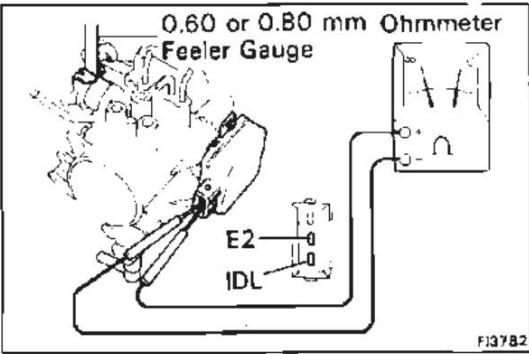
(a) Loosen the two set screws of the sensor.



(b) Insert a 0.70 mm (0.028 in.) feeler gauge between the throttle stop screw and throttle lever.

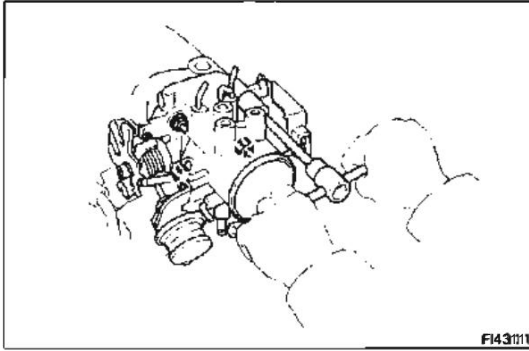
(c) Connect the test probe of an ohmmeter to the terminals IDL and E2 of the sensor.

(d) Gradually turn the sensor counter-clockwise until the ohmmeter deflects and secure it with the two screws.



(e) Recheck the continuity between terminals IDL and E2.

Clearance between lever and stop screw	Continuity (IDL - E2)
0.60 mm (0.024 in.)	Continuity
0.80 mm (0.031 in.)	No continuity



INSTALLATION OF THROTTLE BODY

1. INSTALL THROTTLE BODY

- Connect the hydraulic hose.
1. Install the main gasket and the throttle body with the two bolts and nuts.

Torque: 22 N·m (16 ft·lb)

2. CONNECT FOLLOWING HOSES:

1. Connect the hydraulic hose.
2. Connect the main gasket to the throttle body.
3. Connect the main gasket to the throttle body.

3. CONNECT THROTTLE POSITION SENSOR CONNECTOR

4. INSTALL CABLE BRACKET TO THROTTLE BODY

5. CONNECT AIR CLEANER HOSE

6. (T/A/T)

CONNECT THROTTLE CABLE AND ADJUST IT

7. CONNECT CABLE DETON CABLE AND ADJUST IT

8. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

9. FILL WITH ENGINE COOLANT (See page CQ-6)

Auxiliary Air Valve

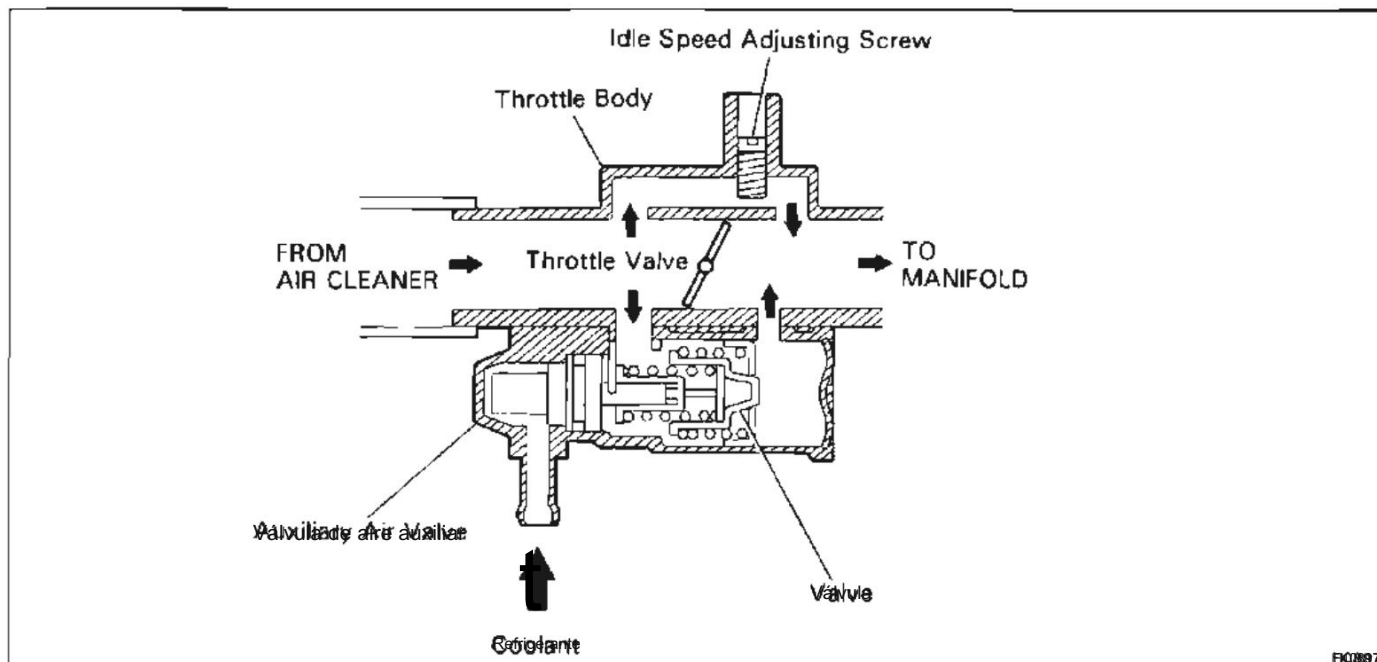
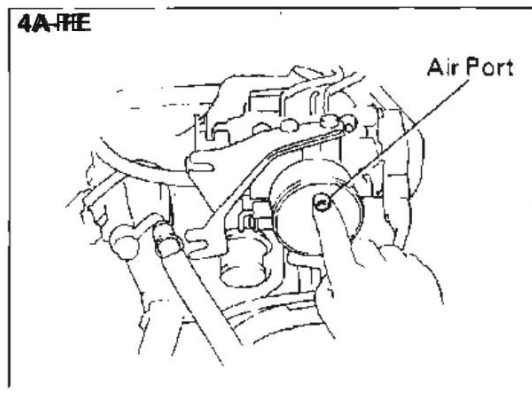


FIG 897

4A-FE



ON-VEHICLE INSPECTION

INSPECT AIR VALVE OPERATION

(w/o Air Flow Meter)

(a) Remove the air cleaner hose.

(b) Check the engine rpm by closing the air port on the throttle body.

At low temp. (Coolant temp. below 80.8°C (176°F))

- The engine RPM should drop.

After warm up

- Check that engine RPM does not drop more than 100 rpm.

(c) Install the air cleaner hose.

If operation is not as specified, replace the air valve.

(w/ Air Flow Meter)

Check the engine rpm by fully screwing in the idle speed adjusting screw.

At low temp. (Coolant temp. below 80.8°C (176°F))

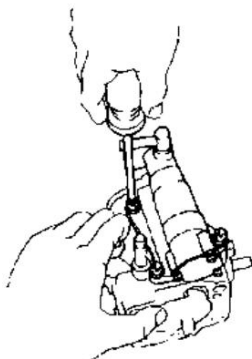
- When the idle speed adjusting screw is in, the engine rpm should drop.

After warm up

- When the idle speed adjusting screw is in, the engine rpm should drop below idle speed dual stop.

If operation is not as specified, replace the air valve.

4A-FE



REMOVAL OF AUXILIARY AIR VALVE

1. **REMOVE THROTTLE BODY**
4A-FE (See page FI23)23)

2. **REMOVE AIR VALVE FROM THROTTLE BODY**
(4A-FE)

Remove the three screws, air valve gasket and O-ring.

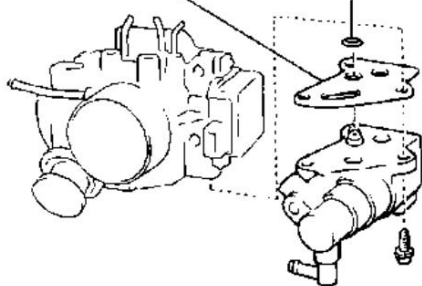
(4A-GE)

Remove the five screws, air valve gasket and O-ring.

4A-FE

New Gasket

New O-Ring



INSTALLATION OF AIR VALVE

1. **INSTALL AIR VALVE TO THROTTLE BODY**

(a) Place a new gasket and O-ring on the throttle body.

(b) (4A-FE)

Install the air valve with the three screws.

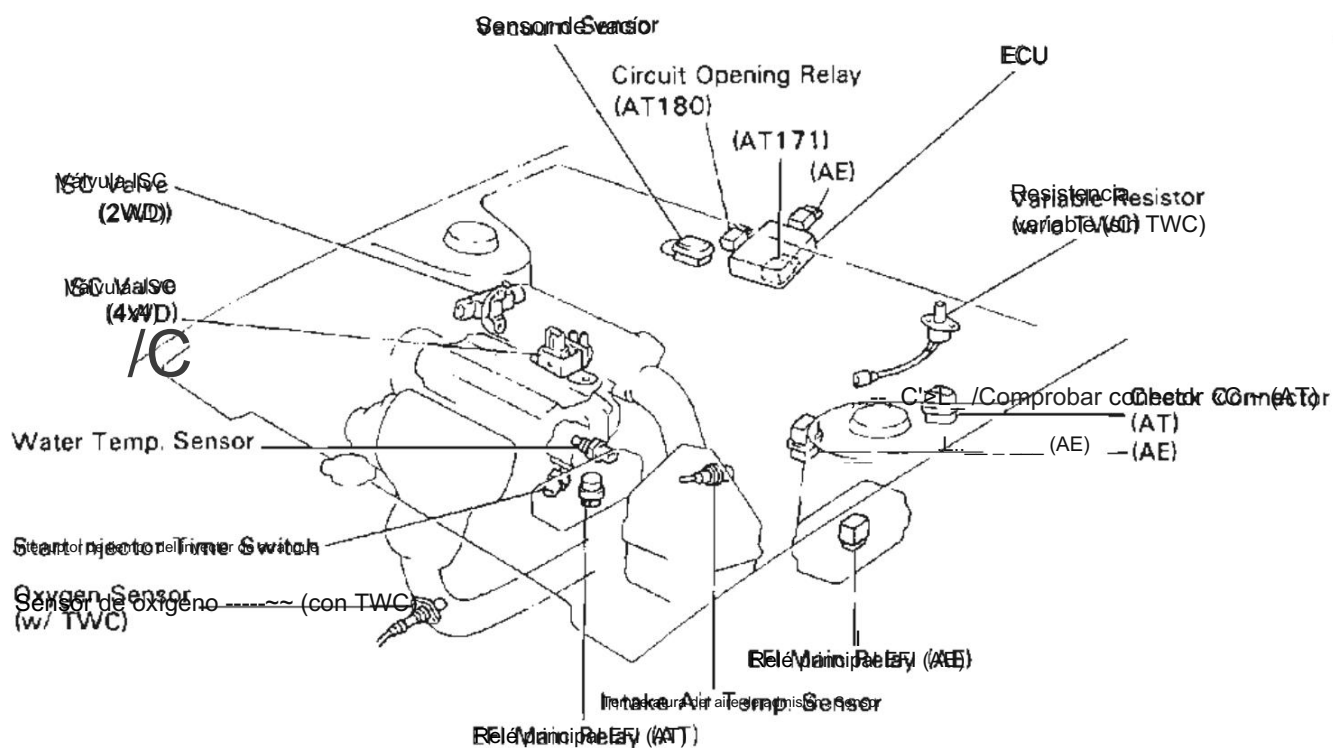
(4A-GE)

Install the air valve with the five screws.

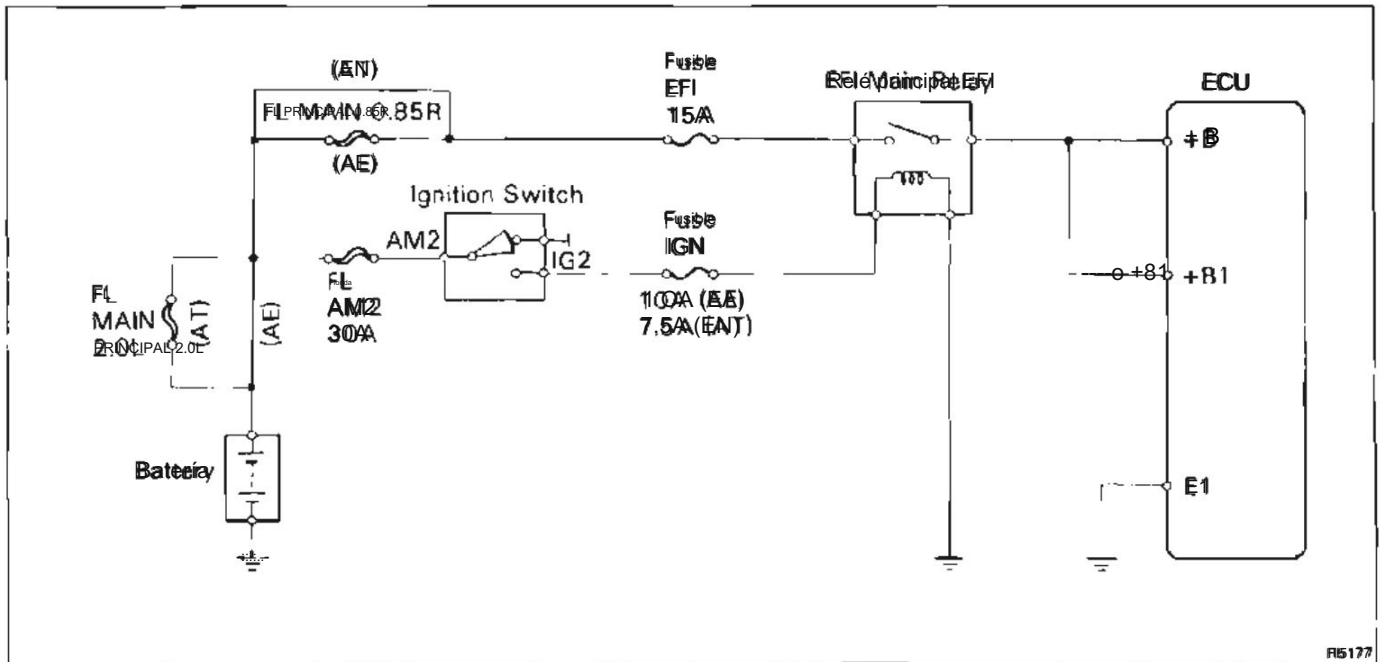
2. **INSTALL THROTTLE BODY**

4A-FE (See page FI26)

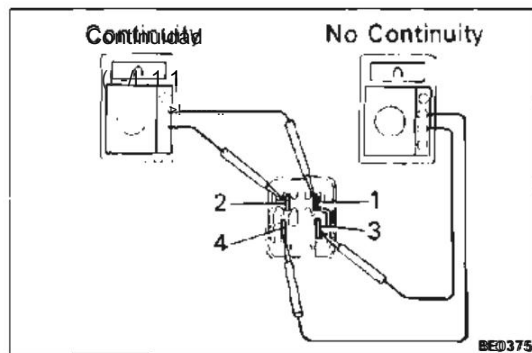
Location of Electronic Control Parts



Relé Main Rel Fyl



R15177



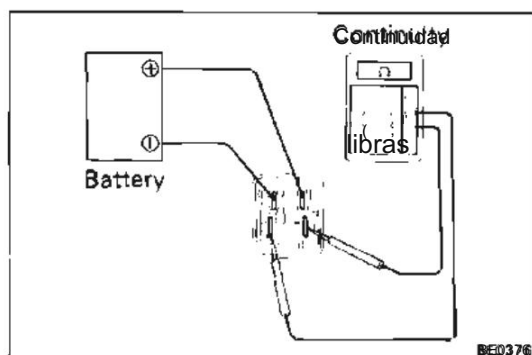
BE0375

INSPECTION OF MAIN RELAY (AE)

1. INSPECT RELAY CONTINUITY

- Using an ohmmeter, check that there is continuity between terminals 1 and 2.
- Check that there is no continuity between terminals 3 and 4.

If continuity is not as specified, replace the relay.

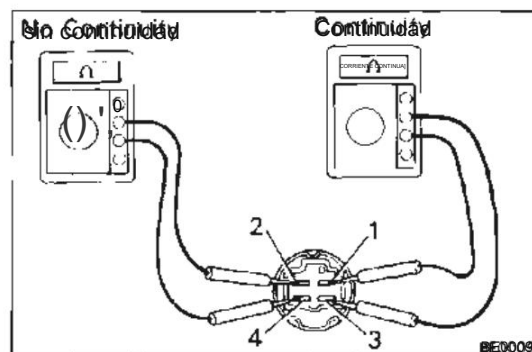


BE0376

2. INSPECT RELAY OPERATION

- Apply battery voltage across terminals 1 and 2.
- Using an ohmmeter, check that there is continuity between terminals 3 and 4.

If operation is not as specified, replace the relay.



BE0009

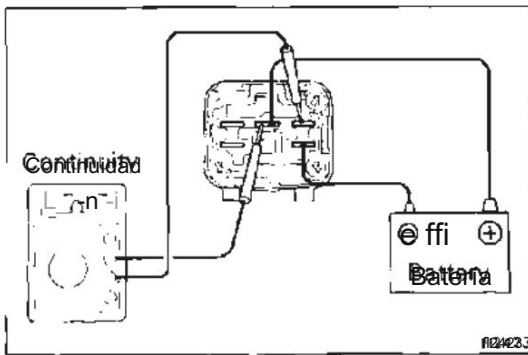
INSPECTION OF MAIN RELAY (AT)

1. INSPECT RELAY CONTINUITY

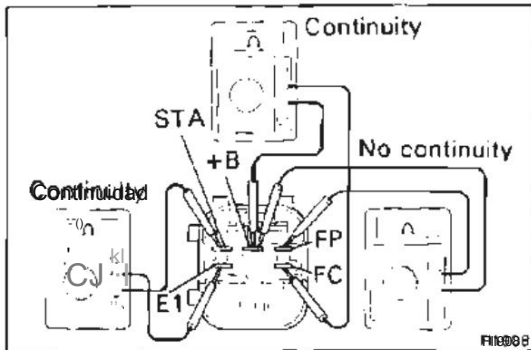
- Using an ohmmeter, check that there is continuity between terminals 1 and 3.
- Check that there is no continuity between terminals 2 and 4.

If continuity is not as specified, replace the relay.

**FIG174**



- (c) Apply intermittent voltage across terminals FC (+B) and FC.
- (d) Check that there is continuity between terminals +B and FC.
- If operation is not as specified, replace the relay.



INSPECTION OF CIRCUIT OPENING RELAY (w/ Air Flow Meter)

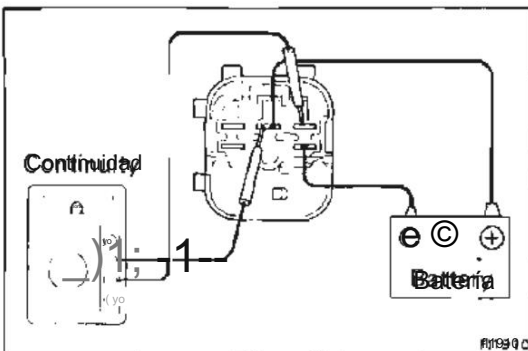
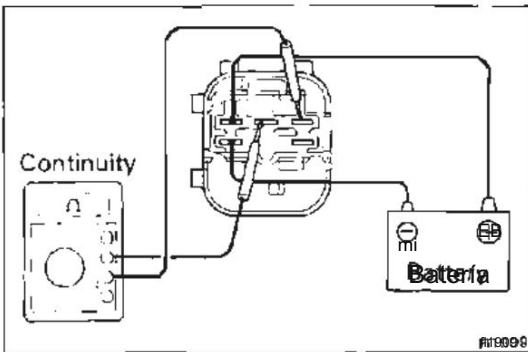
1. INSPECT RELAY CONTINUITY

- (a) Using the method, verify that there is continuity between terminals STA and E1.
- (b) Check that there is continuity between terminals +B and FC.
- (c) Check that there is continuity between terminals +B and FP.

If continuity does not as specified, replace the relay.

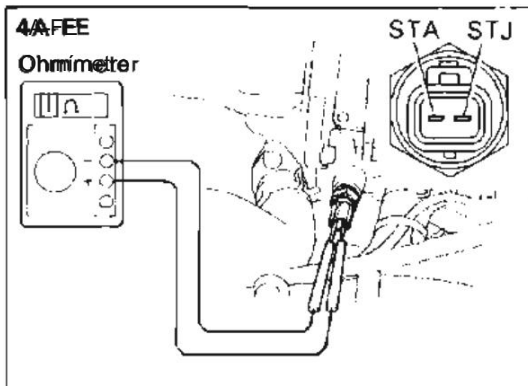
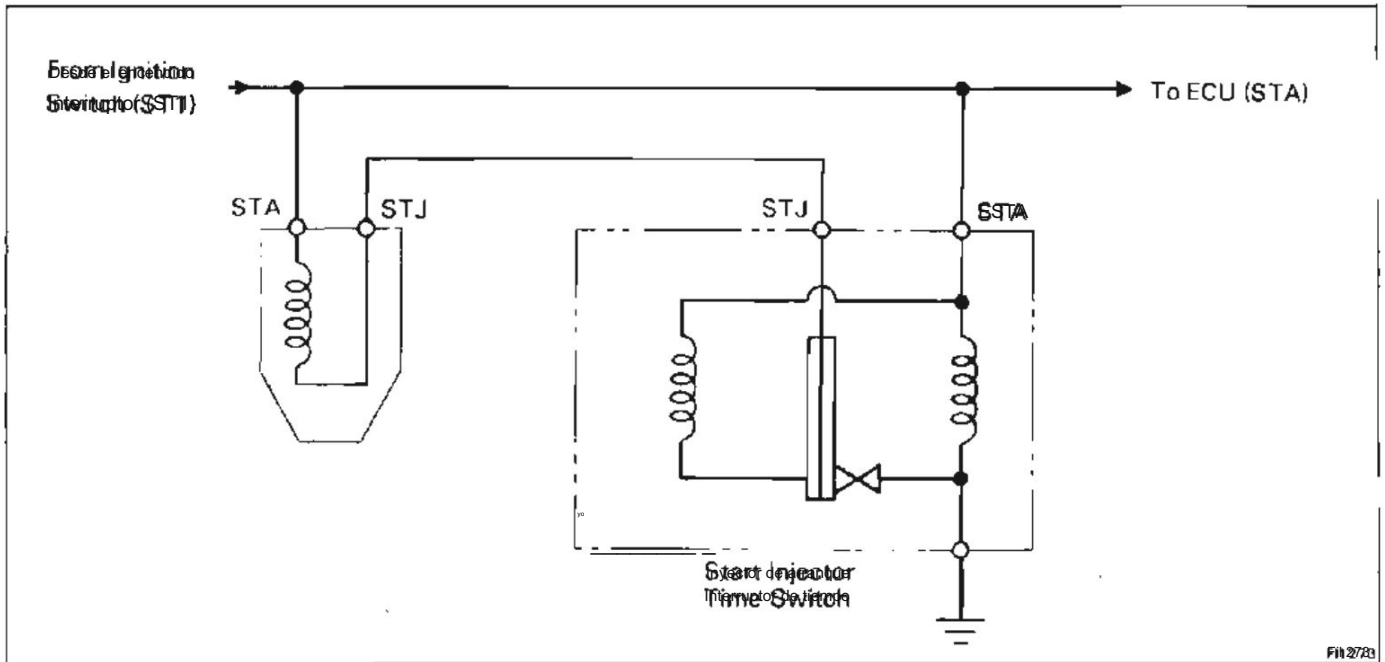
2. INSPECT RELAY OPERATION

- (a) Apply intermittent voltage to terminals STA (+B) and E1.
- (b) Using the method, verify that there is continuity between terminals +B and FP.



- (c) Apply intermittent voltage to terminals FC (+B) and FC.
- (d) Check that there is continuity between terminals +B and FP.
- If operation is not as specified, replace the relay.

Start Injector Time Switch



INSPECTION OF START INJECTOR TIME SWITCH

INSPECT START INJECTOR TIME SWITCH

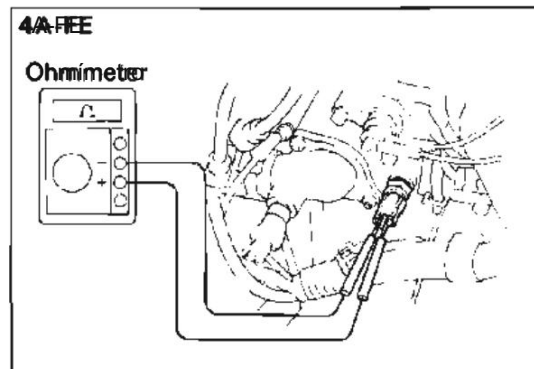
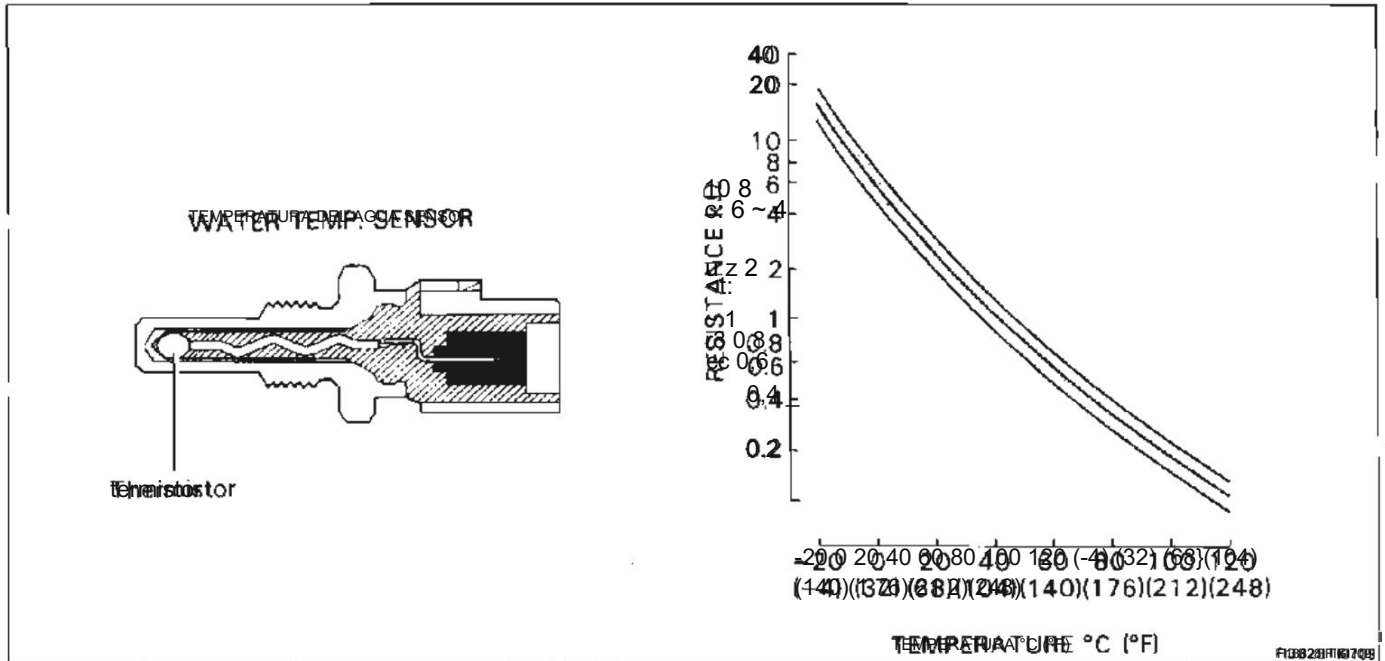
Using an ohmmeter, measure resistance between each terminal.

Resistance.

STA - STJ	20 - 40 Ω below 30°C (86°F)
STA - Ground	40 - 60 Ω above 40°C (104°F)

If the resistance is not as specified, replace the switch.

Water Temperature Sensor



INSPECTION OF WATER TEMPERATURE SENSOR

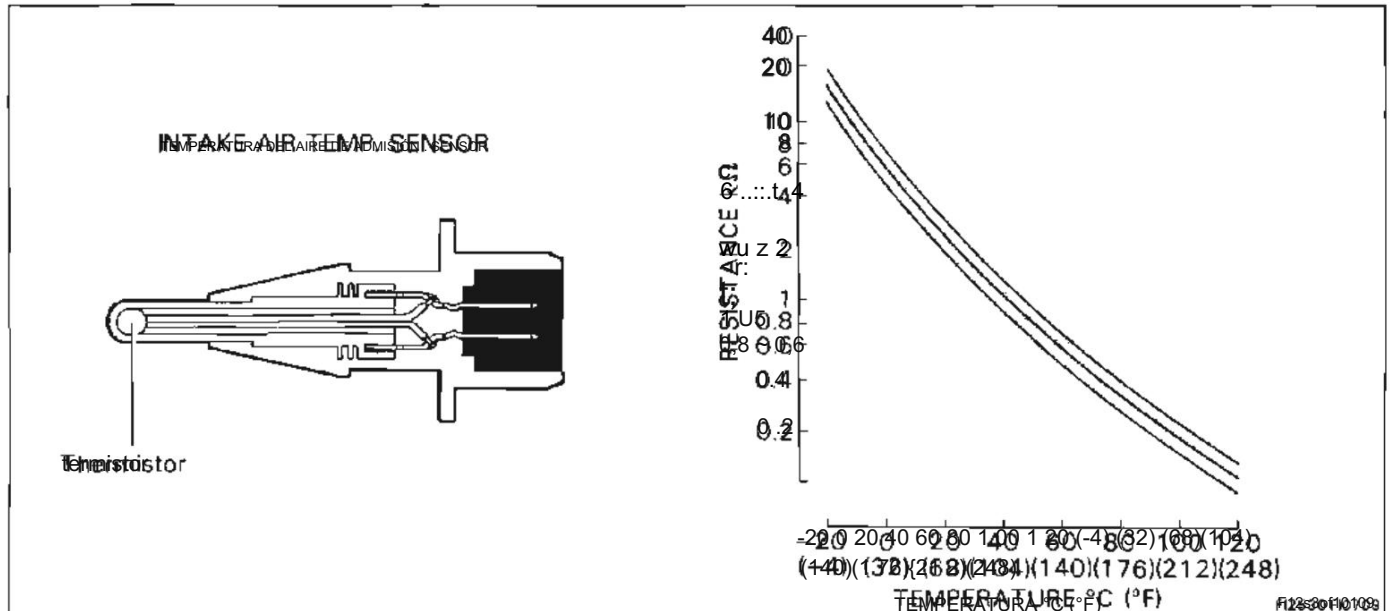
INSPECT WATER TEMPERATURE SENSOR

Using an ohmmeter, measure the resistance between the terminals.

Resistance Consult the chart above

If the resistance is not as specified, replace the sensor.

Intake Air Temperature Sensor (w/o Air Flow Meter)



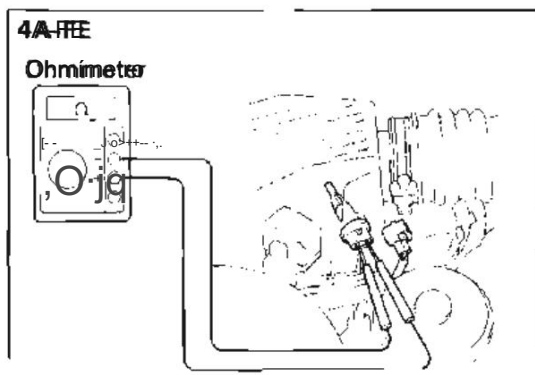
INSPECTION OF INTAKE AIR TEMPERATURE SENSOR

INSPECT RESISTANCE OF INTAKE AIR TEMPERATURE SENSOR

Using an ohmmeter, measure the resistance between the terminals.

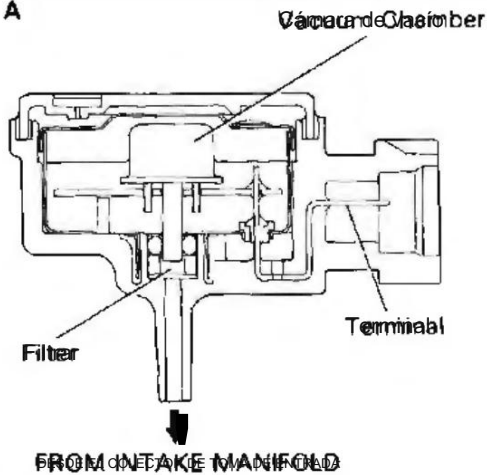
Resistance: Refer to the chart above

If the resistance is not as specified, replace the sensor.

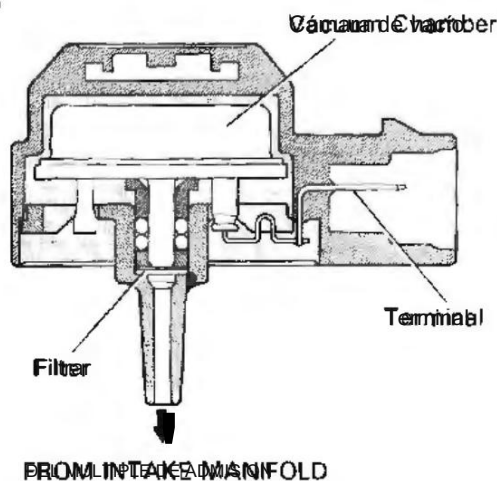
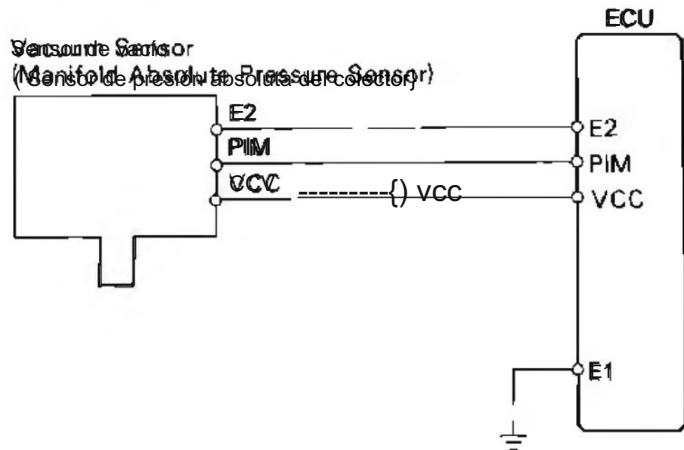


Vacuum Sensor (w/old Air Flow Meter) (Manifold Absolute Pressure Sensor)

Type A



Type B

Vacuum Sensor
(Manifold Absolute Pressure Sensor)F14424
F14548/11 226

INSPECTION OF VACUUM SENSOR

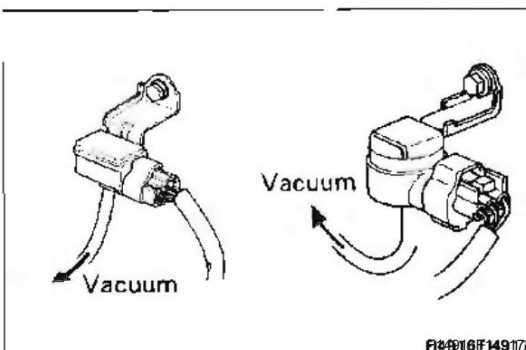
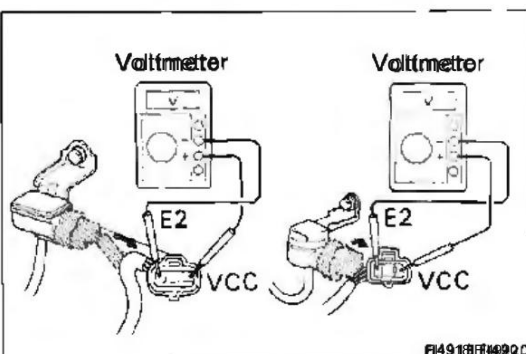
1. INSPECT POWER SOURCE VOLTAGE OF VACUUM SENSOR

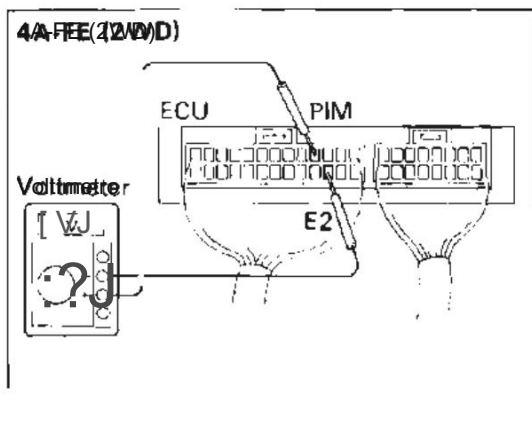
- Disconnect the vacuum sensor connector.
- Turn the ignition switch ON.
- Using a voltmeter, measure the voltage between terminals VCC and E2 of the vacuum sensor connector.

Voltage: - 64 - 6 V

2. INSPECT POWER OUTPUT OF VACUUM SENSOR

- Turn the ignition switch ON.
- Disconnect the vacuum hose of the intake manifold side.





(c) Connect a voltmeter to terminals PIM and E2 of the ECU. The voltmeter should read a positive voltage under ambient atmospheric pressure.

(d) Apply vacuum to the vacuum sensor in 100 mmHg (3.94 in. Hg, 13.3 kPa) at 500 segments (19.69 mmHg, 66.7 kPa) (19.69 mmHg, 66.7 kPa).

(e) Measure voltage drop from step (d) above for each segment.

Voltage drop

Applied Vacuum mmHg (in. Hg) (kPa)	100	200	300	400	500
	(3.94) (13.3)	(7.87) (26.7)	(11.81) (40.0)	(15.75) (53.3)	(19.69) (66.7)
Voltage drop mV	0.3-0.5	0.7-0.9	1.1-1.3	1.5-1.7	1.9-2.1

4A-FEE - RT171

E.C. - Ver. C. 11.18V

E.E. - PIM 2.96V

- 0.1 bar 2.83V

- 0.2 bar 2.68V

- 0.3 bar 2.53V

- 0.4 bar 2.38V

- 0.5 bar 2.23V

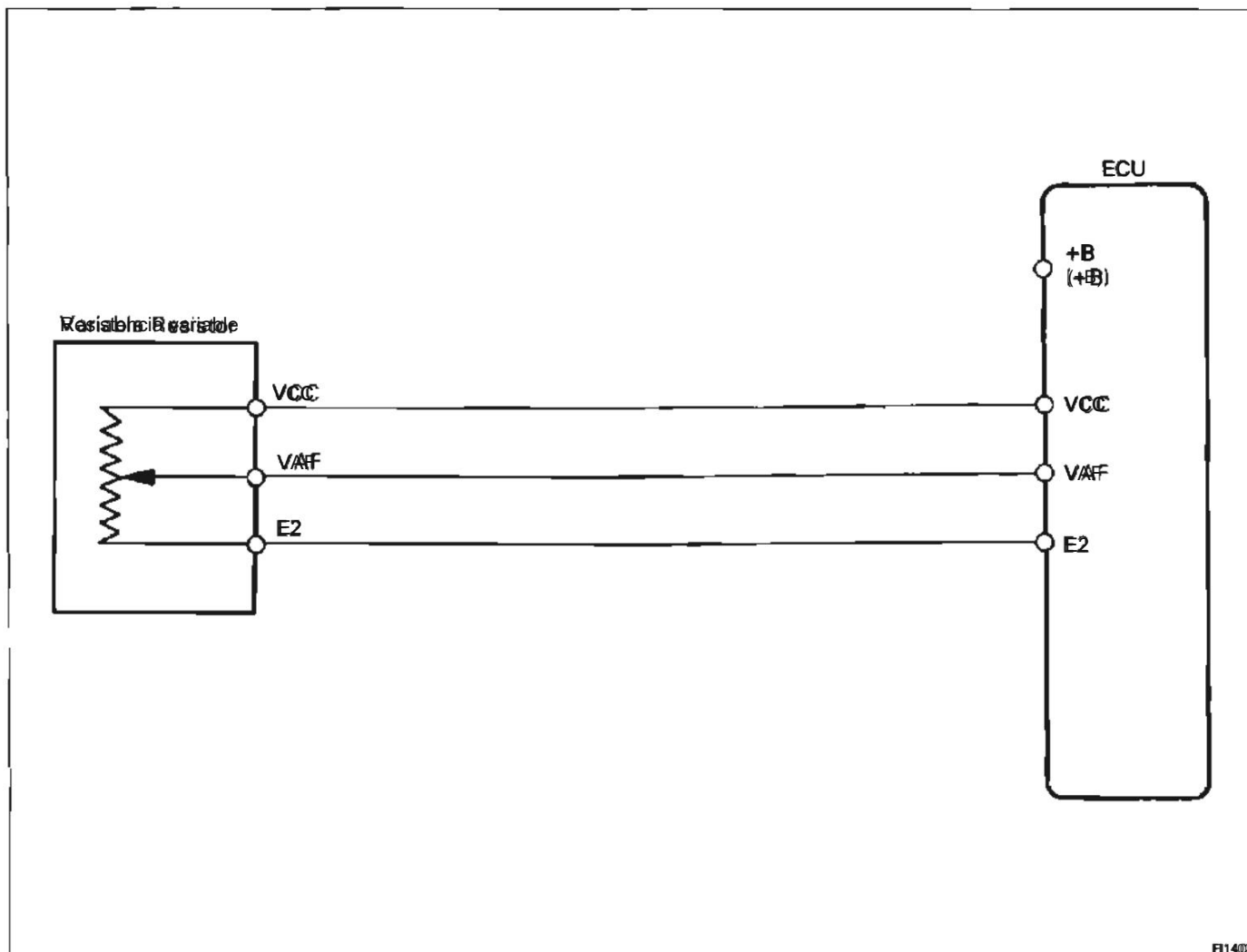
- 0.6 bar 2.08V

- 0.7 bar 1.93V

- 0.8 bar 1.78V

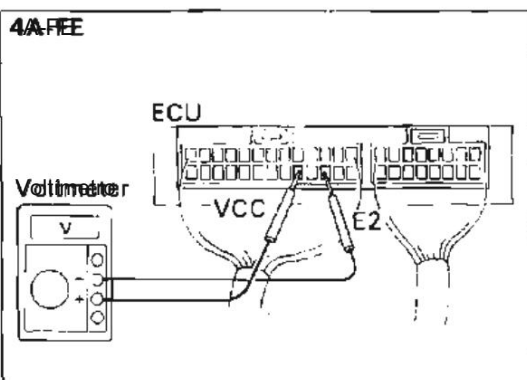
- 0.9 bar 1.63V

Variable Resistor (sin/6VDC)



F114022

4A-FEE

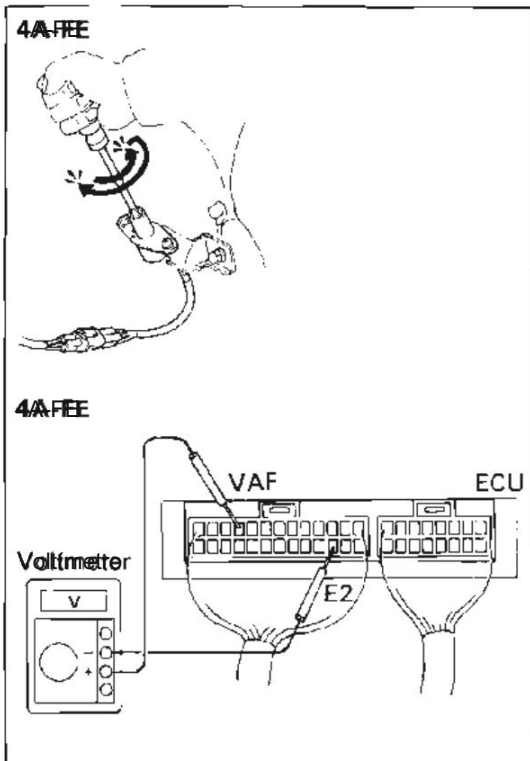


INSPECTION OF VARIABLE RESISTOR

1. INSPECT VOLTAGE OF VARIABLE RESISTOR

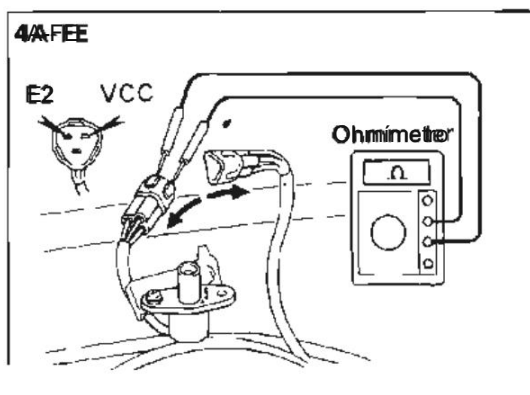
- (a) Using a voltmeter, check the voltage between ECU terminals VCC and E2.

Voltage: 6V ~ 6V



- (b) Measure the voltage between ECU terminals VAF and E2 while slowly turning the mixture adjusting screw first fully counterclockwise and then fully clockwise.

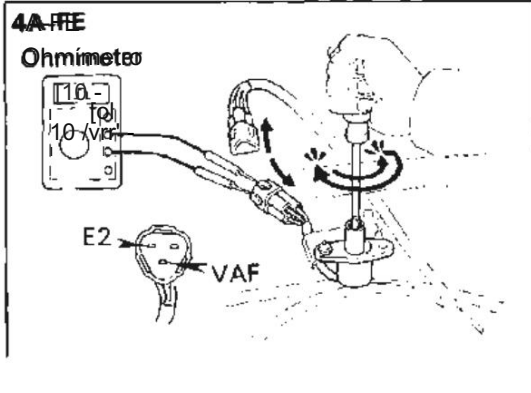
- (c) Check that the voltage changes smoothly from 0 V to approximately 5 V.



2. INSPECT RESISTANCE OF VARIABLE RESISTOR

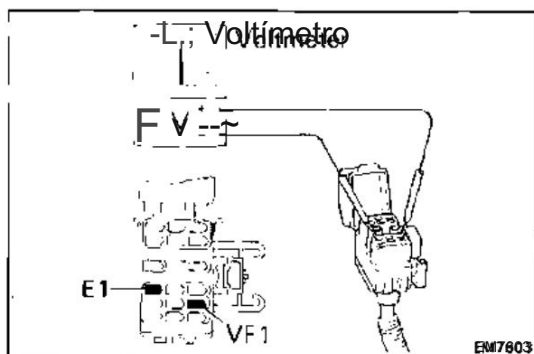
- (a) Disconnect the variable resistor connector.
- (b) Using an ohmmeter, measure the resistance between the terminals VCC and E2.

Resistance: 6 k Ω - 6 k Ω



(c) Turn the idle mixture adjusting screw fully counter-clockwise.

(d) Connect the ohmmeter to the VAF and E2. Turn the adjusting screw fully clockwise and check that the ohmmeter reads infinity. Turn the adjusting screw back to the original position and check the ohmmeter reading.



Oxygen Sensor (w/ TWC)

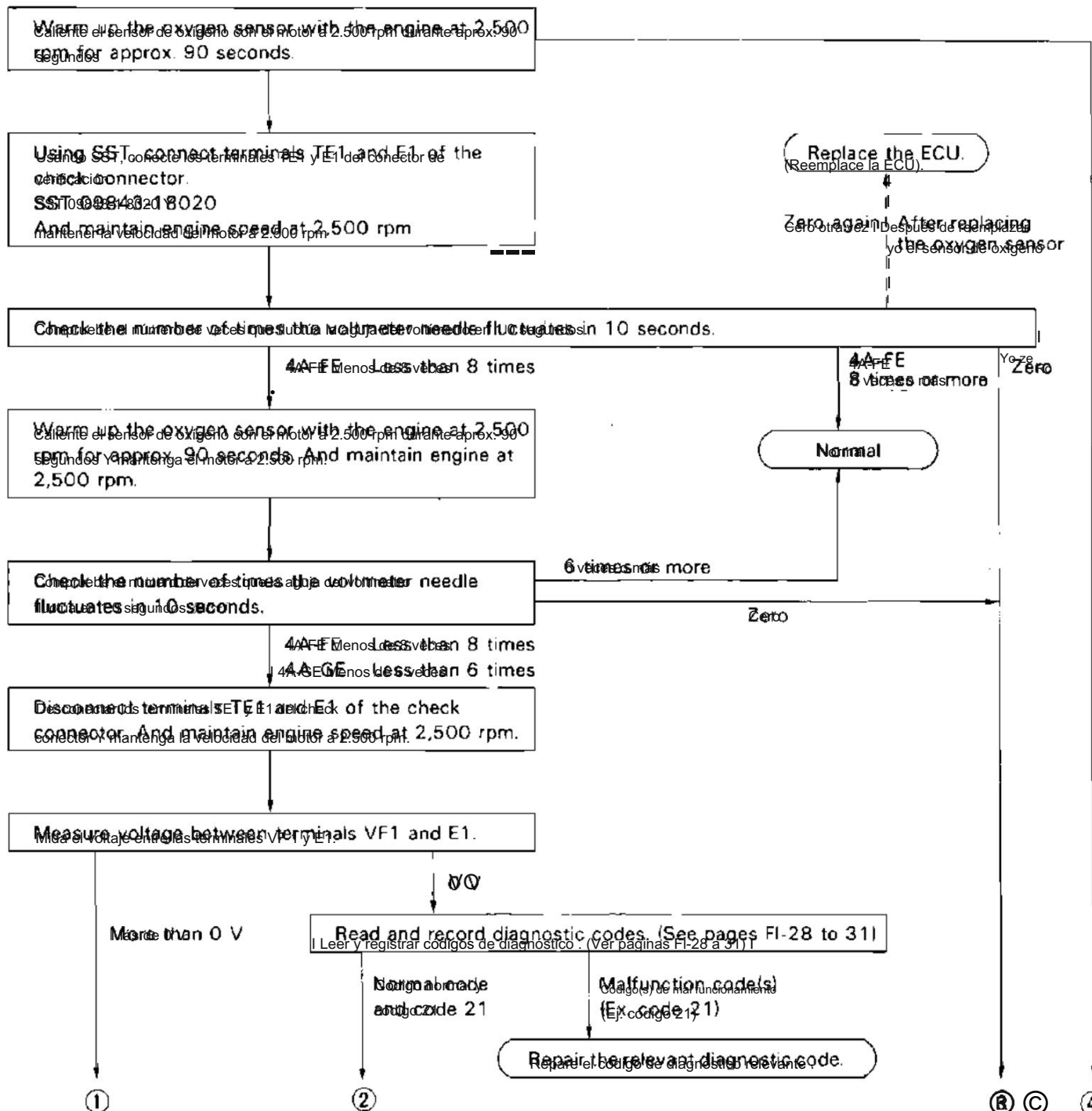
INSPECTION OF OXYGEN SENSOR

1. WARM UP ENGINE

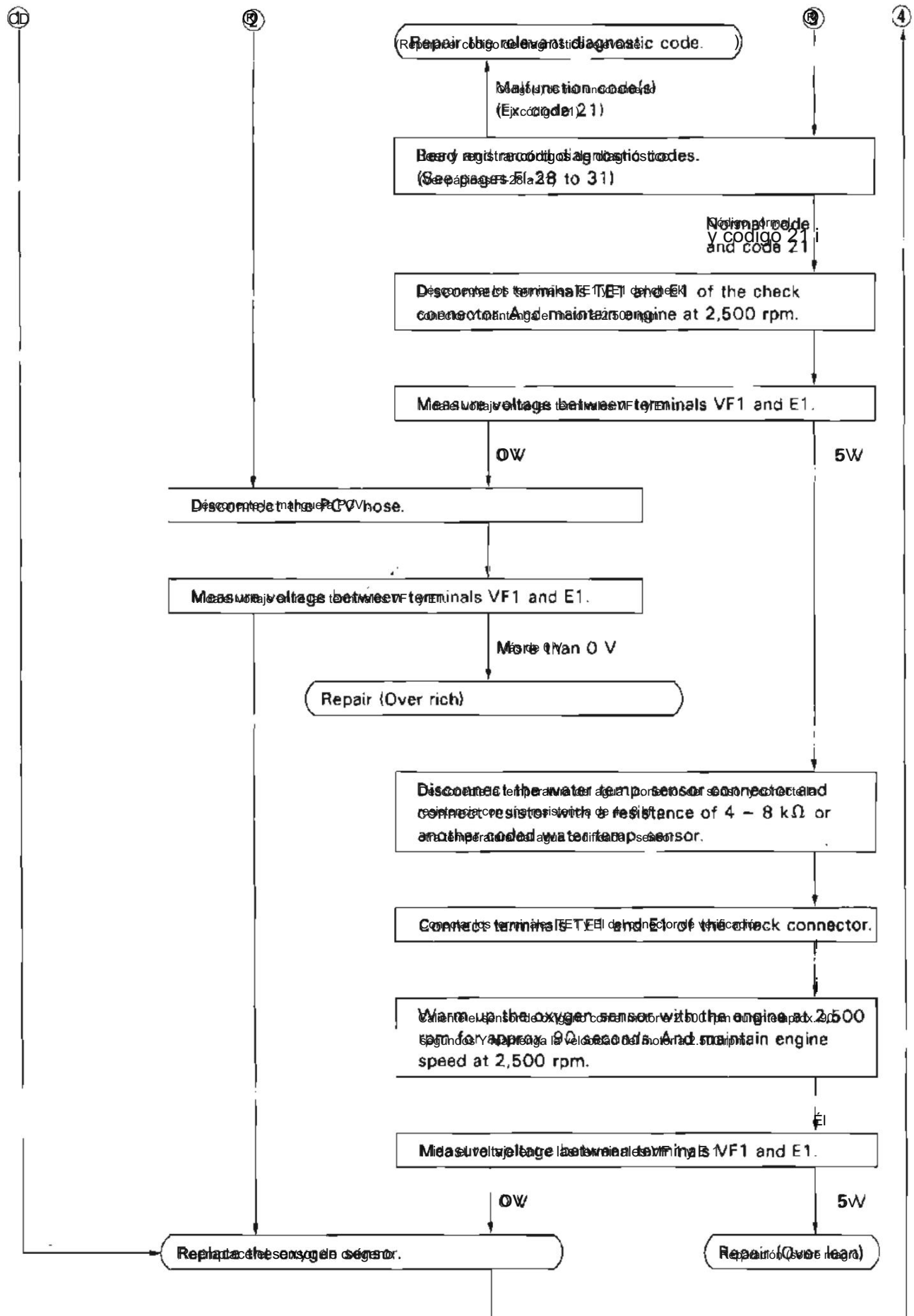
Allow the engine to reach normal operating temperature.

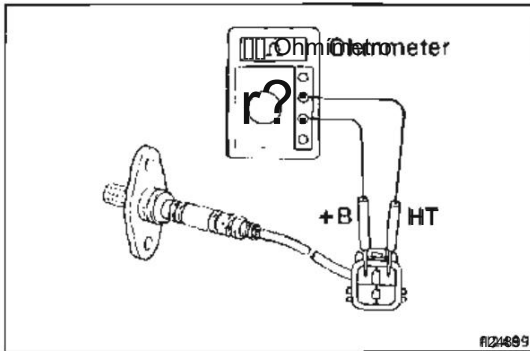
2. INSPECT FEEDBACK VOLTAGE (VF)

Connect the positive (+) probe of the voltmeter to terminal E1 of the check connector and the negative (-) probe to terminal VF1 of the check connector. Perform the test as follows:



CONTINUED FROM PAGE 4-5





3. INSPECT HEATER COIL RESISTANCE OF OXYGEN SENSOR

Using an ohmmeter, measure the resistance between the terminals +B and HT.

Resistance: 5.5-16.3 Ω

If the resistance is not as specified, replace the sensor.

Engine ECU

INSPECTION OF ECU

HINT: The EFI circuit can be checked by measuring the resistance and voltage between the wiring connectors of the ECU.

1. PREPARATION (See page FI-36)

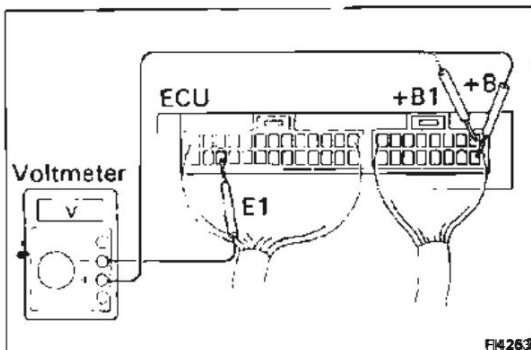
2. INSPECT VOLTAGE OF ENGINE ECU

Check the voltage between each terminal of the wiring connectors.

- Turn the ignition switch to ON.
- Measure the voltage at each terminal.

HINT:

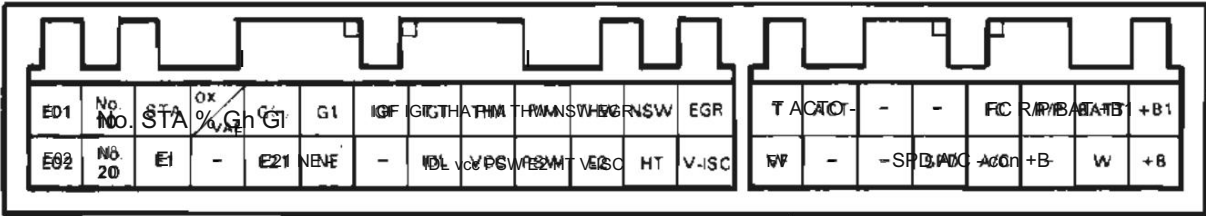
- **CAUTION:** All voltage measurements should be taken with the connectors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is ON position.



Voltage at ECU Winding Connectors (4A-FE)

Terminals	Condition		STD voltage (V)
+B -E1 E1	Ignition SW ON Interruptor de encendido ON		10-14 14
+B1 E+ E1			
BATERIA- E1	-		10-14 14
IDL- E2 E2	Ignition SW ON Interruptor de encendido ON	Throttle valve open Valvula de mariposa abierta	4.5-5.5 5
PSW- E2 E2		Throttle valve fully closed Valvula de mariposa completamente cerrada	4.5-5.5 5
No.1 E01 E01 No.2 E02 E02	Ignition SW ON Interruptor de encendido ON		10-14 14
W- E4 E1	Ignition SW ON Interruptor de encendido ON		0
	No trouble ("CHECK ENGINE" light off) and engine running Sin problemas (Luz "CHECK ENGINE" apagada) y motor en marcha		10-14 14
PIM -E22	Ignition SW ON Interruptor de encendido ON		3.3-3.9 9
VCC- E2 E2			4.5-5.5 5
THW- E2 E2	Ignition SW ON Interruptor de encendido ON	Intake air temperature 20°C (68°F) Temperatura del aire de admision 20°C (68°F)	2.0-2.5 2.5
THW- E2 E2		Coolant temperature 80°C (176°F) Temperatura del refrigerante 80°C (176°F)	0.4-0.7 0.7
STA -E1 E1	Cranking Arranque		6-14 14
IGT- E1 E1	Idling Lectura ECU		0.7-1.0 1.0
A/C - E1 Aire acondicionado CE1	Ignition SW ON Interruptor de encendido ON	A/C switch ON Interruptor de aire acondicionado ON	5-14 4
		A/C switch OFF Interruptor de aire acondicionado OFF	0
T- E1 E1	Ignition SW ON Interruptor de encendido ON	Check connector TE1 no connected Comprobar conector TE1 no conectado	10-14 14
		Check connector TE1 connected Comprobar conector TE1 conectado	0

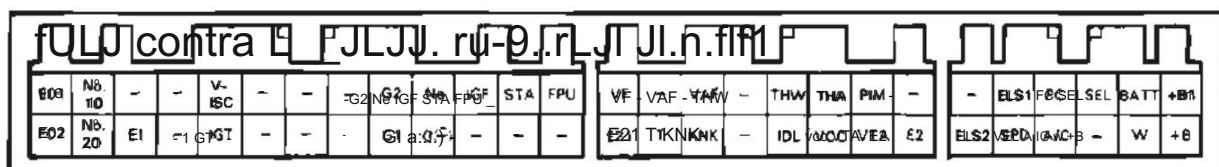
ECU Terminals (2WD)

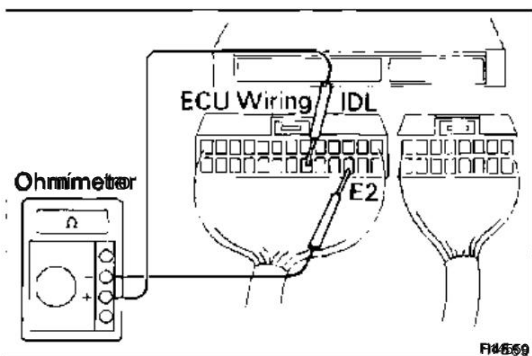


Voltage at ECU Wiring Connectors (4A ECU w/old Air Flow Meter)

Terminals	Condition		Signal voltage (V)
+B -EE1 +B1	Ignition SW ON Interruptor de encendido ON		10- 44 14
BATT-E1-E1	-		10 -14 4
IDL-E2 E2	Ignition SW ON Interruptor de encendido ON	Throttle valve open Valvula de mariposa abierta	4.5- 5.5 5.5
VTA-E2 E2		Throttle valve fully closed Valvula de mariposa completamente cerrada	0.5 or less
		Throttle valve fully open Valvula de mariposa completamente abierta	3.5- 5.5 5.5
VCC-E2 E2		-	4.5- 5.5 5.5
IGT-E1 E1	Idling Reposicion		0.7- 4.0 1.0
STA-E2E2	Cranking		6-4414
No1001 E01 - No2002 E02	Ignition SW ON Interruptor de encendido ON		10- 44 14
W-E4 E1	No trouble ("CHECK ENGINE" warning light off) and engine running Sin problemas (luz de advertencia "CHECK ENGINE" apagada) y motor en marcha		10- 44 14
PIM-E2E2	Ignition SW ON Interruptor de encendido ON		3.3- 3.9 3.9
VCC-E2 E2			4.5- 5.5 5.5
THA-E2 E2	Ignition SW ON Interruptor de encendido ON	Intake air temp 20°C (68°F) Temperatura del aire de admisión 20°C (68°F)	2.0- 2.8 2.8
THW-k2 E2		Coolant temp 80°C (176°F) Temperatura del refrigerante 80°C (176°F)	0.4- 0.7 0.7
A/C-E1		Air conditioning ON Aire acondicionado ENCENDIDO	10- 44 14
T-E1 E1		Check connector TE-E1 no connect	
	Check connector TE-E1 connect		0.5 or less

ECU Terminals





2. INSPECT RESISTANCE OF ECU

NOTICE:

- Do not touch the ECU terminals.
- The tester probe should be inserted into the wiring connector from the wiring side.

Check the resistance between each terminal of the wiring connectors.

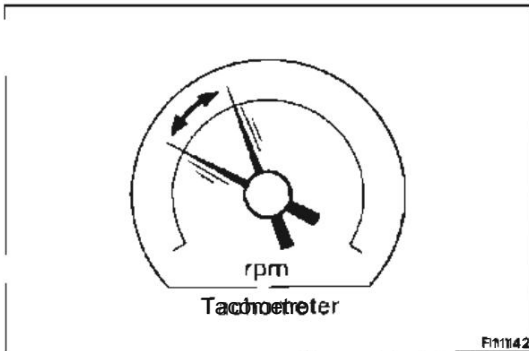
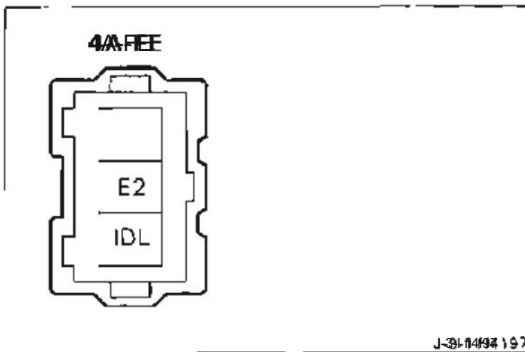
- Disconnect the connected ECU.
- Measure the resistance at each terminal.

Resistance of ECU Wiring Connectors (4A-FE)

Terminals	Condition	Resistance (Ω)
IDL - E2E2	Throttle valve open Valvula de mariposa abierta	Infinity
	Throttle valve fully closed Valvula de mariposa completamente cerrada	0
PSW - E2E2	Throttle valve fully open Valvula de mariposa completamente abierta	0
	Throttle valve fully closed Valvula de mariposa completamente cerrada	Infinity
THA E2 E2	Intake temperature 20°C (68°F) Temperatura de entrada 20°C (68°F)	2000-3000
THW E2 E2	Coolant temperature 80°C (176°F) Temperatura de refrigerante 80°C (176°F)	200-400
G1 - G8	-	140-480
NE - G8	-	140-480

ECU terminals (2WD)

E01	Nb. 10	-	OX	G1	G1	IGF	IGT	THA	PIVAT	HWMS	VTBW	NSW	EGR	T AOT	-	-	FC	AIR	B	W	+B1
E02	Nb. 20	-	-	E21	NE	-	IDL	VCC	PSW	E2	HT	WTS	ISC	W	-	-	SP	W	W	W	+B



Fuel Cut RPM

INSPECTION OF FUEL CUT RPM

- Start the engine.
- Disconnect the throttle position sensor.
- Connect the terminals IDL and E2 to the connector side.
- Gradually raise the engine rpm and verify that there is fluctuation between the fuel cut and fuel return points.

HINT:

- The vehicle should be stopped.
- Accessories switched off.

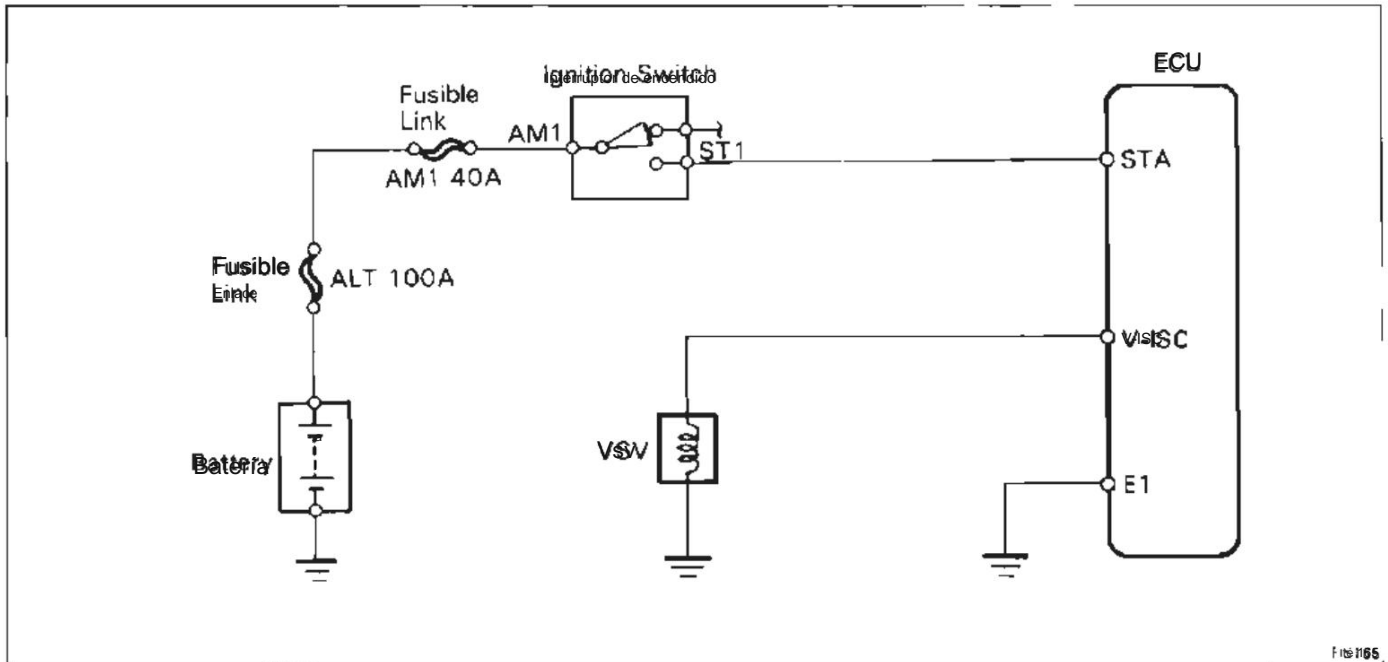
Fuel cut rpm:

4A-FEE sim TW/CWC	11,700rpm
on TWCC	11,900rpm

Fuel return rpm:

4A-FEE sim TW/CWC	12200rpm
on TWCC	12200rpm

Idle Up System (w/ Air Flow Meter)

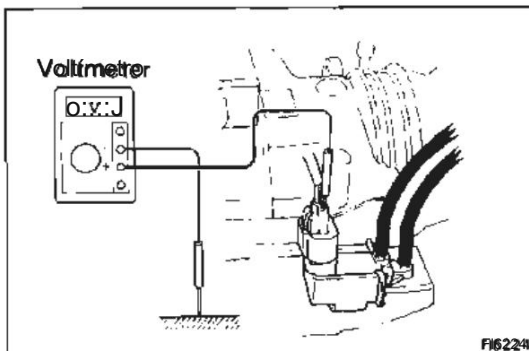


F16165

INSPECTION OF IDLE UP SYSTEM

1. INSPECTION OF BATTERY VOLTAGE (BATTERY VOLTAGE)

- Turn all accessories switched off.
- Using a voltmeter, check that it indicates battery voltage during cranking and for ten seconds after starting.



F16224

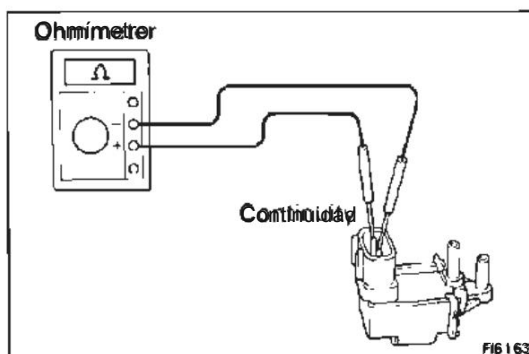
2. INSPECTION OF VSV (VACUUM SOLENOID VALVE)

A. Inspection for open circuit

Using an ohmmeter, check that there is continuity between the terminals.

Resistance (Cold): Should have 44 Ω

If there is no continuity, replace the VSV.

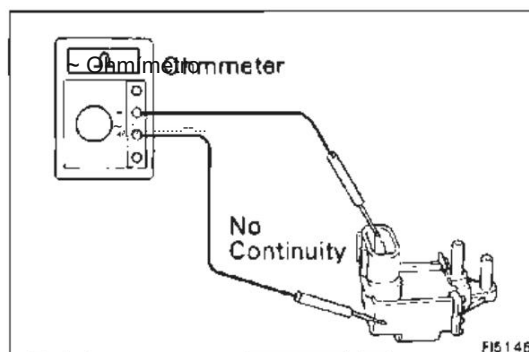


F16163

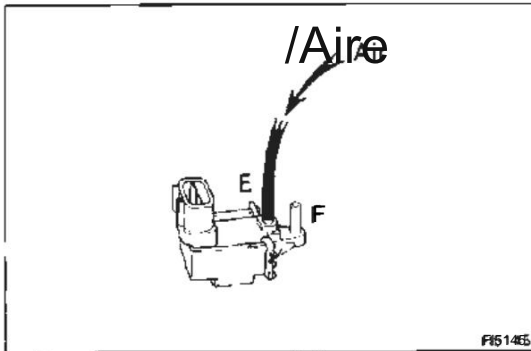
B. Inspection for ground

Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.

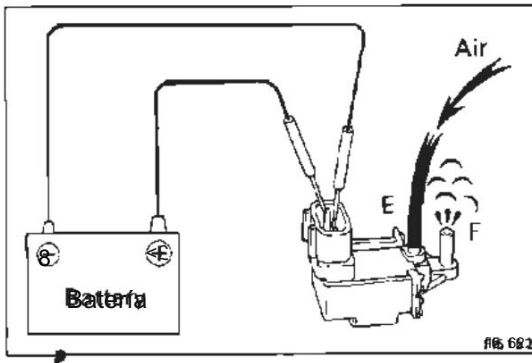


F15145



C. Inspect VSV operation

(a) Verify that air flows from pipe E to pipe F.

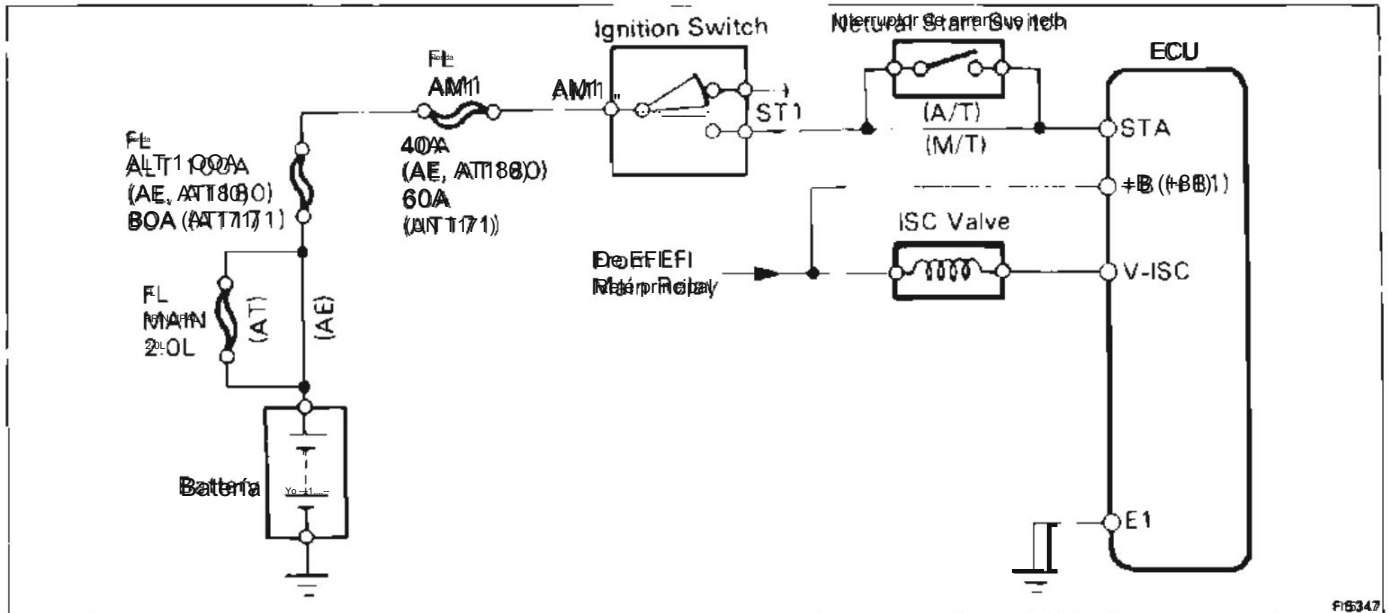


(b) Apply battery voltage across terminals.

Verify that air flows into pipe E to pipe F.

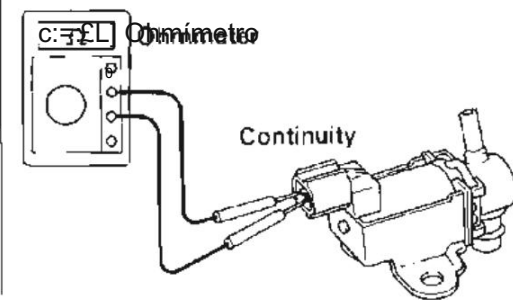
If operation is as specified, replace the VSV.

Idle Speed Control (ISC) Valve (4A-FE)



F6347

2WD



INSPECTION OF ISC VALVE

INSPECT ISC VALVE

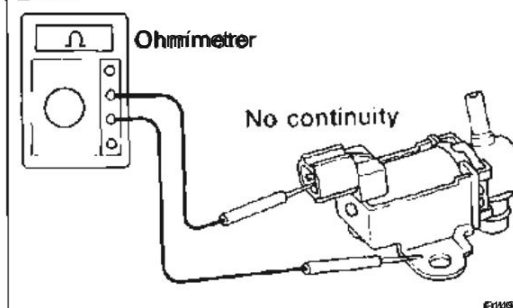
A. Inspect ISC valve for open circuit

Using an ohmmeter, check that there is continuity between the terminals.

Resistance: 2WD 30 - 33 Ω

If there is continuity, the ISC valve is good.

2WD



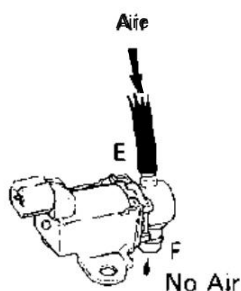
B. Inspect ISC valve for ground

Using an ohmmeter, check that there is continuity between the terminal and the body.

If there is continuity, the ISC valve is good.

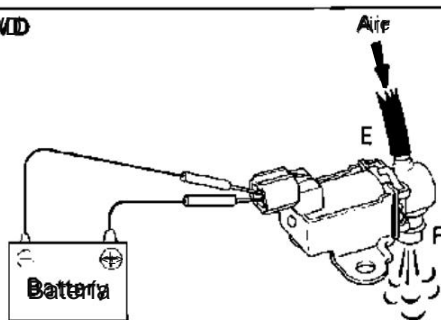
F6347

2WD

**C. Inspect ISC valve operation**

(a) Check that air does not flow from pipes E to F.

2WD



(b) Apply battery voltage across the terminals.

(c) Check that air flows from pipe E to F.

If operation is as specified, replace the ISC Valve.

COOLING SYSTEM

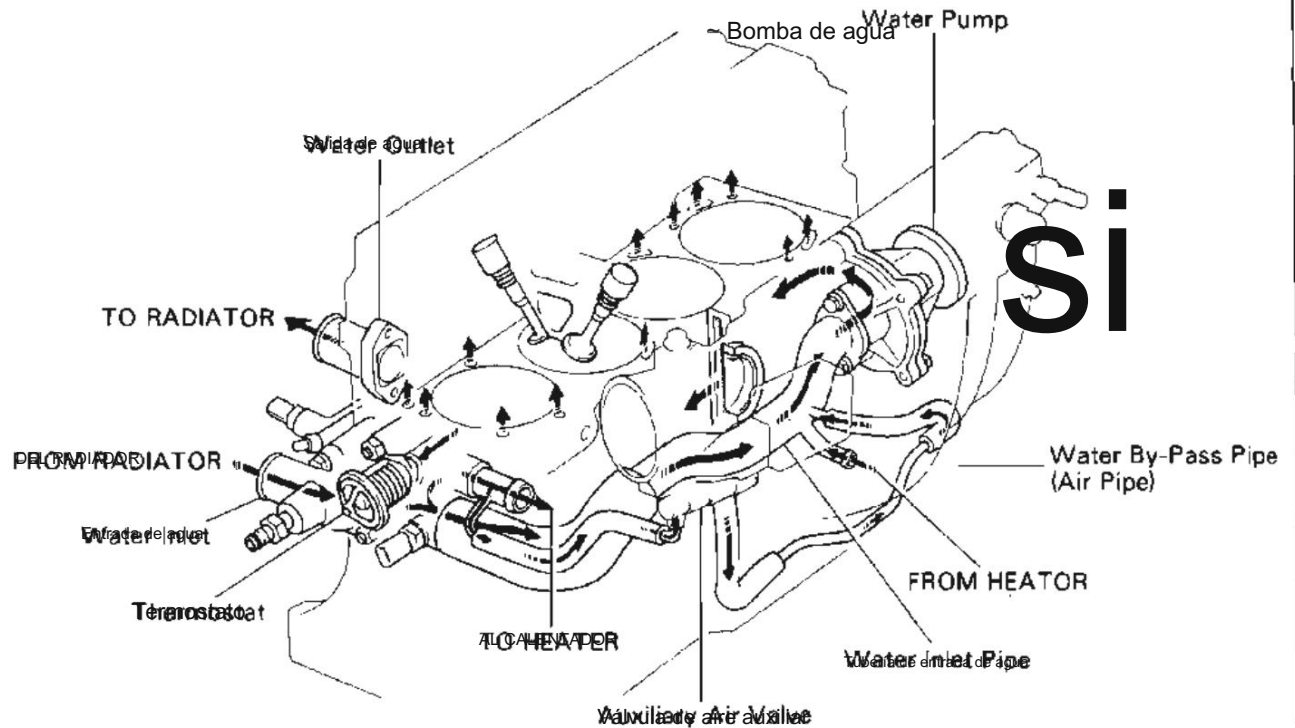
	Page
DESCRIPTION	CO-2
TROUBLESHOOTING	CO-4
CHECK AND REPLACEMENT OF ENGINE	
COOLANT	CO-5
PUMP	CO-6
THERMOSTAT	CO-13
RADIATOR	CO-15
ELECTRIC COOLING FAN ELÉCTRICO	CO-21



DESCRIPTION

Este originalizilaresisde un sistema de circulación forzada que incluye una bomba de agua equipada con una válvula de pasaje montada en el lado de estela.

4A.FEE

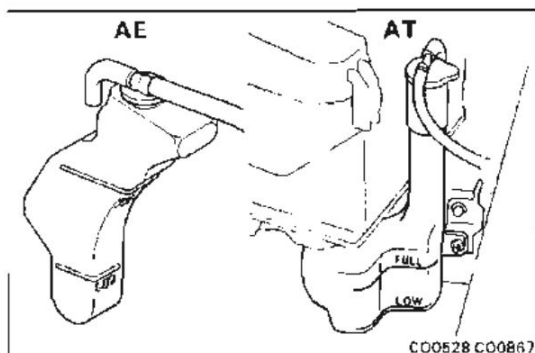


The thermostat is a valve which has a bypass valve and is mounted in the water inlet housing. The thermostat is of the wax rod type, operated automatically by fluctuations in the coolant temperature. This valve closes when the coolant temperature drops, preventing the circulation of coolant through the engine and thus permitting the engine to warm up rapidly. The valve opens when the coolant temperature rises, allowing the circulation of coolant and decreasing the thermostat expansion when heated and contracts when cooled. Heating the wax thus generates pressure which overpowers the force of the spring which keeps the valve closed, thus opening the valve. When the wax contracts its contraction causes the force of the spring to take effect once more, closing the valve. The thermostat in this engine is a temperature-actuated type of 82°C (180°F).

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine overheats	Check coolant	Replenish coolant	C0-113
	Water pump drive belt loose or missing	Adjust or replace belt	
	Dirt, leaves or insects on radiator	Clean radiator	
	Hoses, water pump, thermostat housing, radiator heater core plugs or head gasket leakage	Repair as necessary	
	Thermostat faulty	Check thermostat	C0-221
	Ignition timing retarded	Set timing	
	Electric cooling system faulty	Inspect electric cooling system	C0-6
	Radiator hose plugged or rotted	Replace hose	
	Water pump faulty	Replace water pump	C0-155
	Radiator plugged or cap faulty	Check radiator	
	Cylinder head or block cracked or plugged	Repair as necessary	

NOTE: The thermostat is equipped with a by-pass valve; if the engine tends to overheat, removal of the thermostat would have an adverse effect, causing a loss of cooling efficiency.



CHECK AND REPLACEMENT OF ENGINE COOLANT

1. CHECK ENGINE COOLANT LEVEL AT RESERVE TANK

The coolant level should be between the "PAVO" (PAVO) and "FULL" lines.

If the level is low, add coolant up to the "FULL" line.

2. CHECK ENGINE COOLANT QUALITY

There should not be any excessive rust deposits or scales around the radiator cap or radiator, filler neck and the coolant should be free from oil.

If excessively dirty, replace the coolant.

3. REPLACE ENGINE COOLANT

(a) Remove the radiator cap.

CAUTION: To avoid the danger of being burned, do not remove it while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.

(b) Drain the coolant from the radiator and engine drain cock. (The engine drain cock is near the oil filter.)

(c) Close the drain cocks.

Permissible Engine Drain Torque:
350 kg-cm (25.25 ft-lb) (34 N-m)

(d) Fill the system with coolant.

Use a good brand of ethylene glycol or alcohol type and use a TOYOTA radiator conditioner or equivalent anticorrosive mixed according to the manufacturer's directions.

Ethylene glycol type coolant has an antifreeze and anticorrosive effect.

TOYOTA radiator conditioner: This has only an anticorrosive effect.

NOTE:

- Do not use alcohol type coolant.
- The coolant must be mixed with demineralized water or distilled water.

Capacity (coolant):

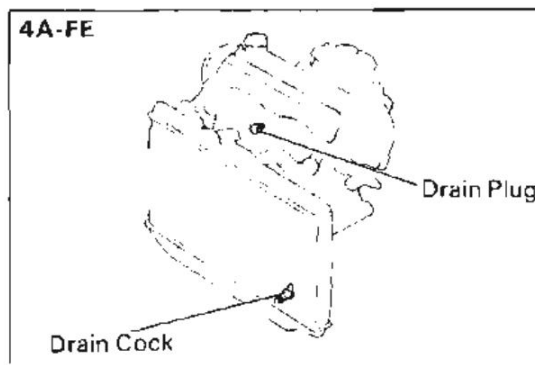
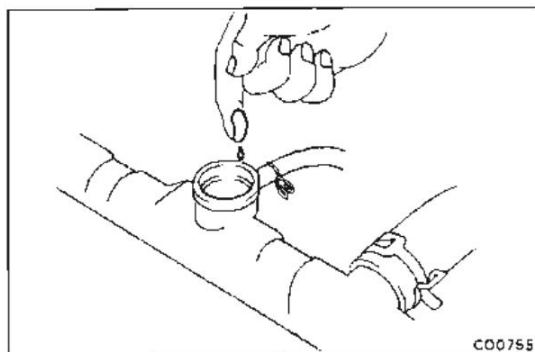
4AFE

AE, M/T 6.2 liters (6.5 US qts, 5.5 Imp qts)

(e) Install the radiator cap.

(f) Start the engine and check for leaks.

(g) Recheck the coolant level and refill as necessary.



Water Pump Body

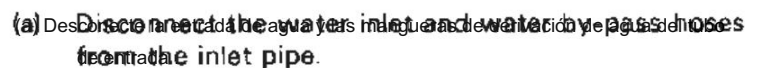
Seal

Rotor

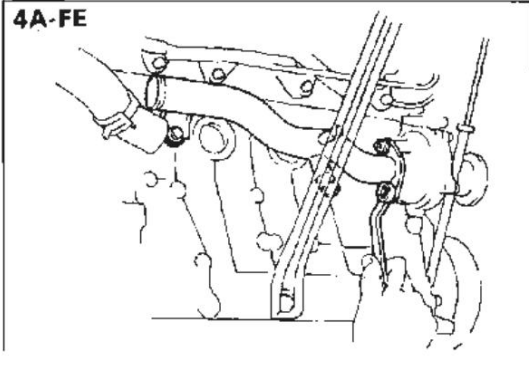
Water Pump Suction Gage

Gasket

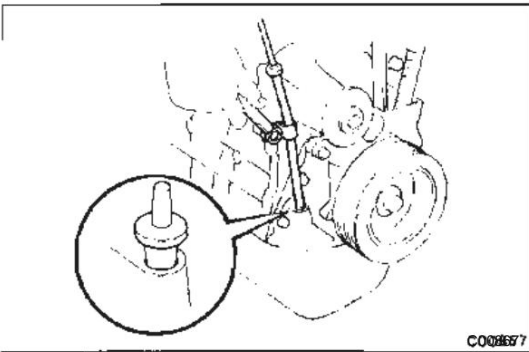
Oil Ring



4A-FE

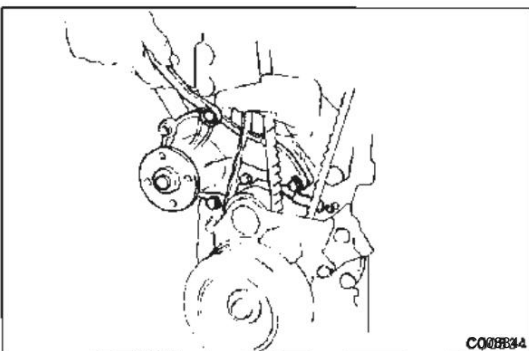


- (b) Remove the drive belt and clip bolt.
- (c) Remove the water pump and O-ring.



5. REMOVE DIPSTICK GUIDE AND DIPSTICK

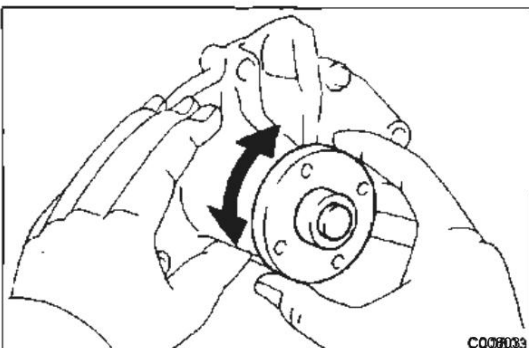
- (a) Remove the dipstick.
- (b) Remove the guide pin and the dipstick guide. Plug the guide installation hole in the block.
- (c) Remove the O-ring from the dipstick guide.



6. REMOVE WATER PUMP

- (a) Remove the bolts and the water pump.
- (b) Remove the O-ring.

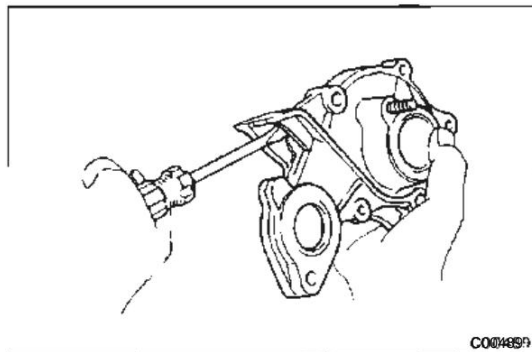
NOTICE Be careful not to get coolant on the timing belt.



INSPECTION OF WATER PUMP

INSPECT WATER PUMP

Turn the impeller to check for proper operation. The impeller should move smoothly and quietly.



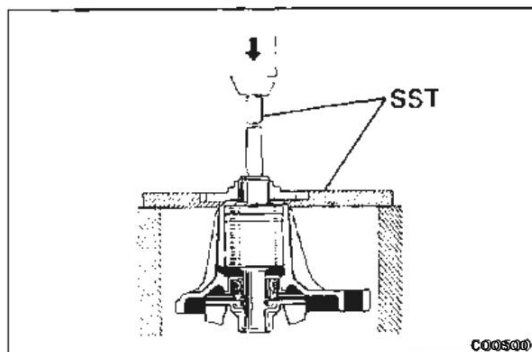
DISASSEMBLY OF WATER PUMP

(See page C0-6)

1. REMOVE WATER PUMP SUCTION COVER

(a) Remove the three bolts.

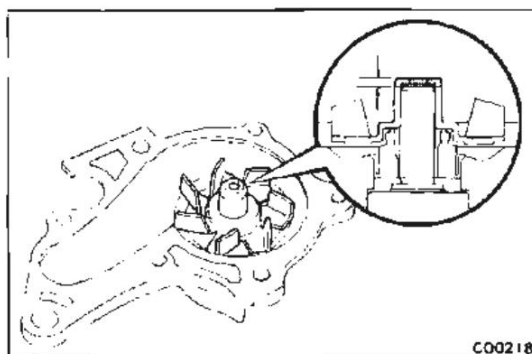
(b) Using a screwdriver, pry off the water pump suction cover.



2. REMOVE PULLEY SEAT

Using SST and press, remove the pulley seat from the water pump bearing shaft.

SST 092361-00 (09236-00) (09237-00) (09238-00) (09239-00) (09240-00)

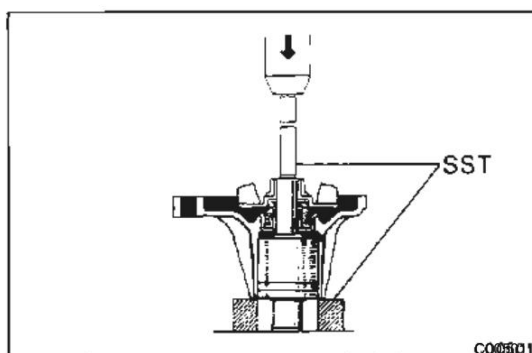


3. REMOVE WATER PUMP BEARINGS

(a) Using a grinding wheel, grind the water pump bearing shaft as shown.

NOTICE Do not grind the water pump bearing shaft.

(b) Heat the water pump body to a temperature of 85°C (185°F).

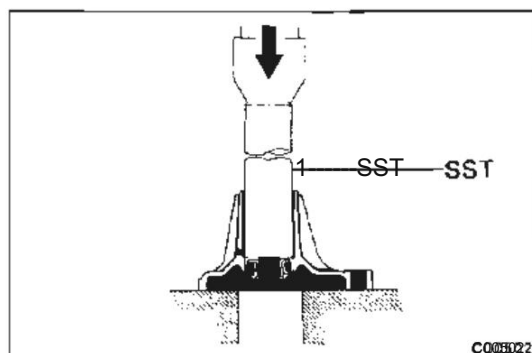


(c) Using SST and a press, remove the water pump bearings and bearing.

SST 092361-00 (09237-00) (09238-00) (09239-00) (09240-00)

(d) Remove the seal set from the water pump body.

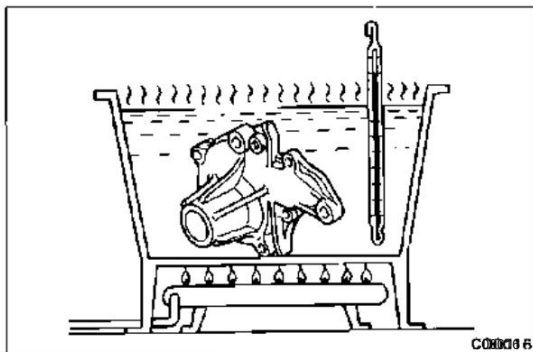
NOTICE Do not use a hammer on the water pump body.



4. REMOVE SEAL

Using SST and press, remove the seal.

SST 092361-00 (09238-00) (09239-00) (09240-00)



ASSEMBLY OF WATER PUMP

(See page C0-6)

HINT: Always assemble the water pump with a new seal set, new rotor and a new bearing.

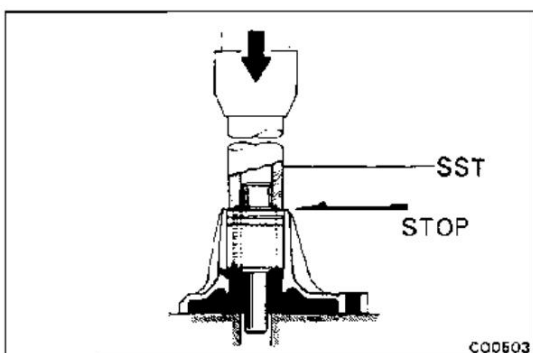
1. INSTALL WATER PUMP BEARING

(a) Gradually heat the water pump body to approx 85°C (185°F).

(b) Using SST and a press, install a **coiled water pump bearing** into the **water pump body**.

SST: 09236-0010 (09237-00020)

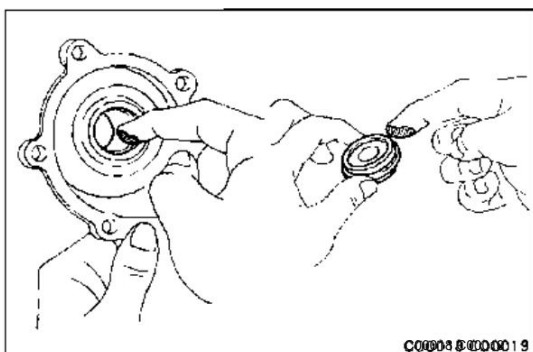
HINT: The bearing end face should be flush with the body top surface.



2. INSTALL SEAL

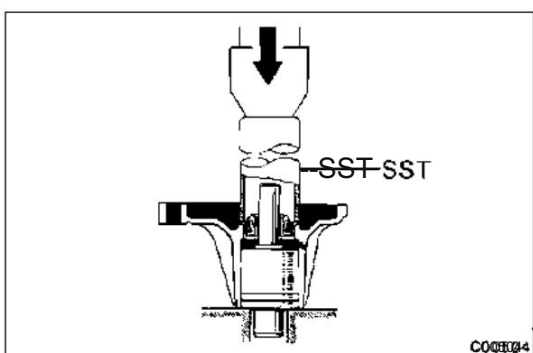
(a) Apply a seal packing No. 1282-B to a new seal and pump body.

Seal packing: Part No. 08826826-0000 or equivalent



(b) Using SST and a press, install the **coiled water pump bearing**.

SST: 09236-0010 (09237-00020)



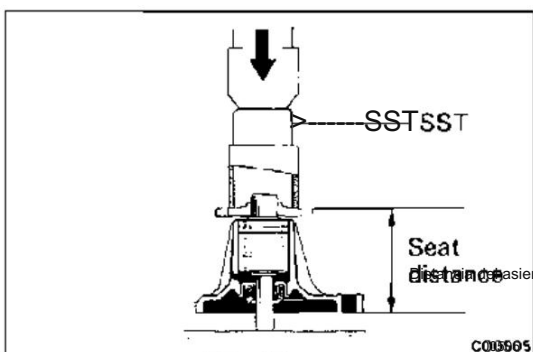
3. INSTALL PULLEY SEAT

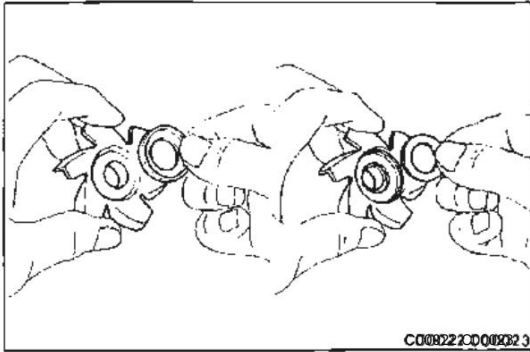
Using SST and a press, install the **pulley seat** on the **water pump bearing shaft**.

SST: 09236-0010 (09237-00020)

HINT: As shown in the figure, the distance from the pulley seat to the installation surface of the pump body should be as follows:

Seat distance: 7.67mm (3.020 in.)

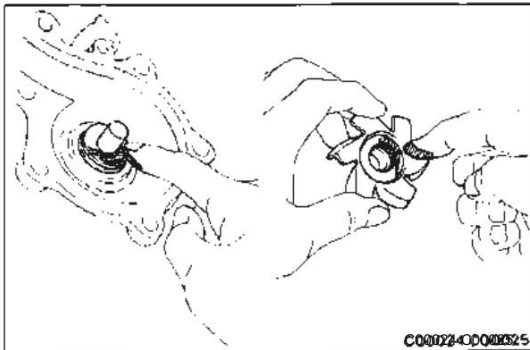




4. INSTALL ROTOR

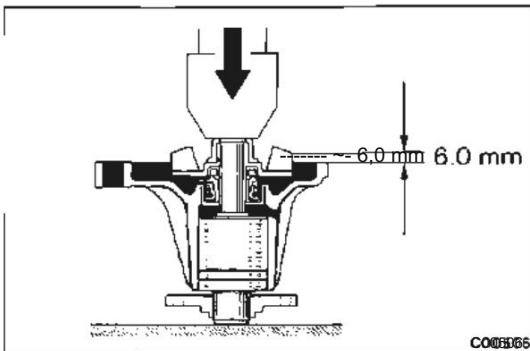
(a) Install a new packing and seat into the rotor.

(a) Instale una empaquetadura y un asiento nuevos en el rotor.



(b) Apply a little ELC to the seal and rotor contact surface.

(b) Aplique un poco de ELC al sello y la superficie de contacto del rotor.



(c) Using a press, install a new rotor on the water pump bearing shaft.

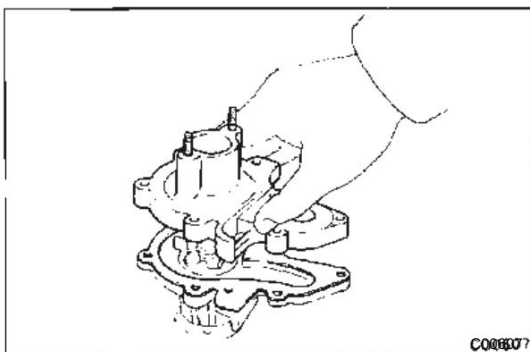
HINT: As shown in the figure, the distance from the rotor edge to the installation surface of the pump body should be 6.0 mm (0.236 in.).

CONSEJO: Como se muestra en la figura, la distancia desde el borde del rotor hasta la superficie de instalación del cuerpo de la bomba debe ser de 6.0 mm (0.236 in.).

5. CHECK WATER PUMP

After assembly, make sure that the rotor rotates smoothly.

Después del montaje, asegúrese de que el rotor gire suavemente.



6. INSTALL WATER PUMP SUCTION COVER

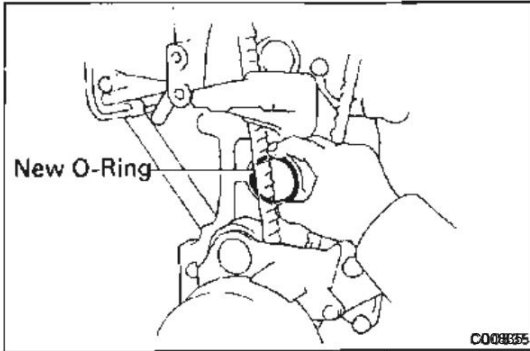
Install the water pump suction cover on a new gasket with three bolts.

Instale la cubierta de succión de la bomba de agua en una junta nueva con tres tornillos.

Torque 92.925 kgf-cm (6.6 lb-ft) (N·m)

HINT: After installing, make sure that the rotor is not in contact with the water pump suction cover.

CONSEJO: Después de la instalación, asegúrese de que el rotor no esté en contacto con la cubierta de succión de la bomba de agua.



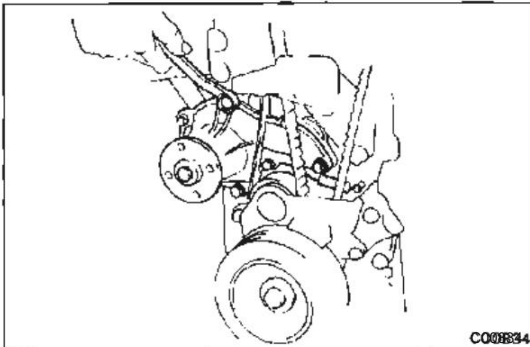
INSTALLATION OF WATER PUMP

1. INSTALL WATER PUMP

(a) Place a new O-ring in position on the cylinder block.

(b) Install the water pump with the three bolts.

Torque: 150 kg-cm (11 ft-lb) (15 N·m, 15 N·m)



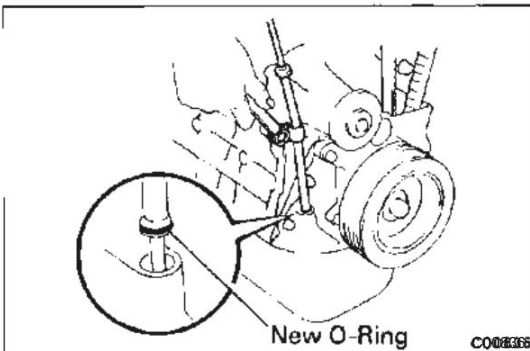
2. INSTALL OIL DIPSTICK GUIDE AND DIPSTICK

(a) Install a new O-ring to the dipstick guide.

(b) Apply a small amount of oil to the O-ring.

(c) Push the dipstick guide into the cylinder block with the bolt.

Torque: 95 kg-cm (82 in-lb) (9.3 N·m)



3. INSTALL WATER INLET PIPE

(a) Place a new O-ring in position on the water pump.

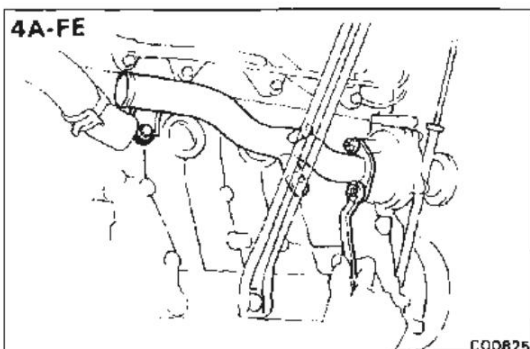
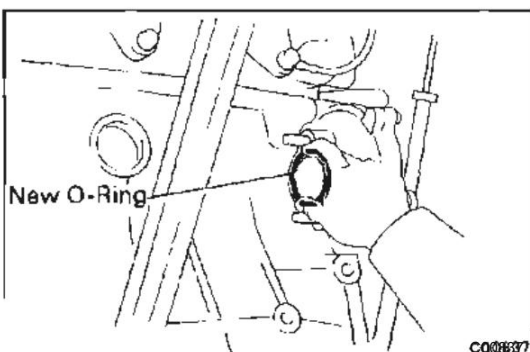
(b) Temporarily install water pump with the two nuts and bolt.

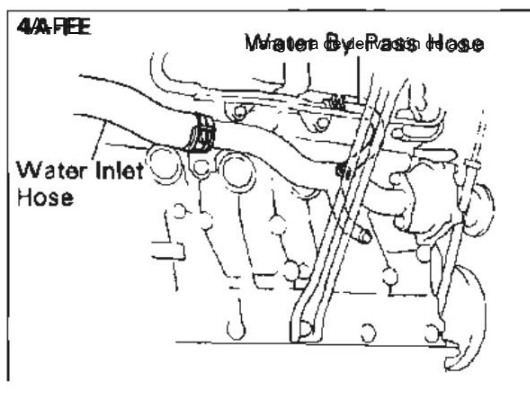
(c) Tighten the two nuts.

Torque: 200 kg-cm (14 ft-lb) (20 N·m)

(d) Tighten the bolt.

Torque: 130 kg-cm (9 ft-lb) (13 N·m)





- (e) Connect the water inlet and water by-pass hoses to the inlet pipe.

4. INSTALL NO. 2 AND NO. 3 TIMING BELT COVERS

4A-FEE (See steps 11, 14 and 18 on page EM-86 and 88)

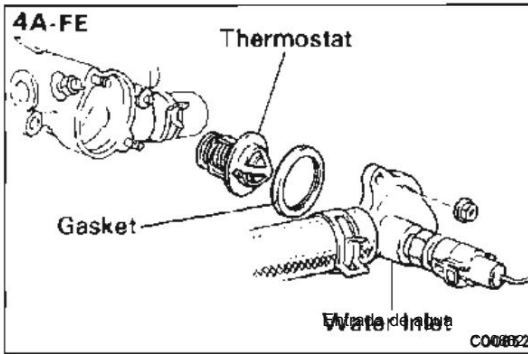
5. TEMPORARILY INSTALL WATER PUMP PULLEY

6. INSTALL ALTERNATOR DRIVE BELT

7. ADJUST DRIVE BELT (See page CH-3)

8. FILL WITH ENGINE COOLANT (See page GO-5)

9. START ENGINE AND CHECK FOR LEAKS



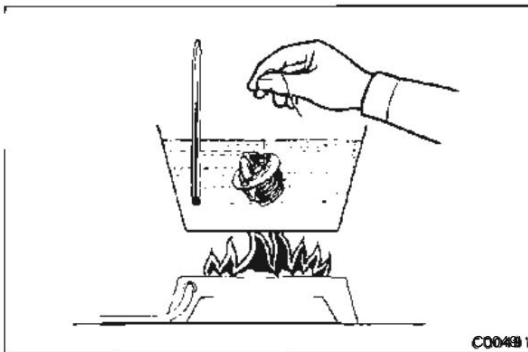
THERMOSTAT

REMOVAL OF THERMOSTAT

1. DRAIN ENGINE COOLANT (See page CO-5)

2. REMOVE WATER INLET THERMOSTAT

- Remove the two (4A-FE, 4A-15E) or two (4A-GE, 4A-15E) water inlet thermostats as described below.
- Remove the thermostat.
- Remove the gasket from the thermostat.



INSPECTION OF THERMOSTAT

INSPECT THERMOSTAT

OBSERVATION: The thermostat is numbered with the valve opening temperature.

- Immerse the thermostat in a water and gradually heat the water.

- Check the valve opening temperature.

Valve opening temperature:

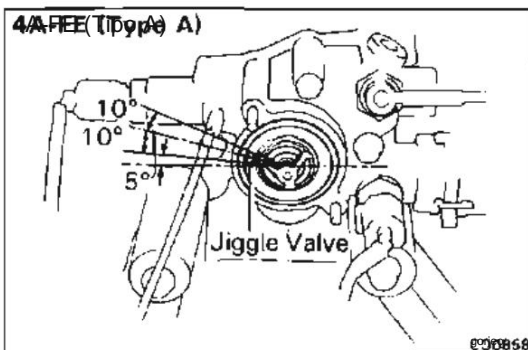
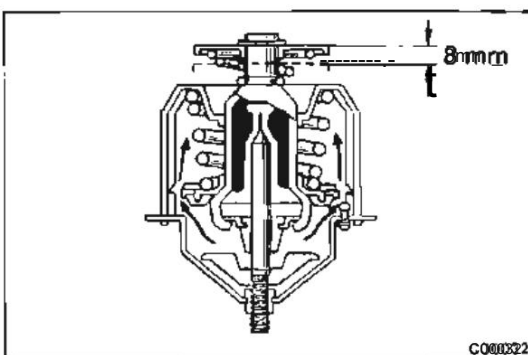
80-84°C (176-183°F)

If the valve opening temperature is not as specified, replace the thermostat.

- Check the valve lift.

Valve lift: 8 mm (0.31 in) or more at 195°C (203°F)

If the valve lift is less than specified, replace the thermostat.



INSTALLATION OF THERMOSTAT

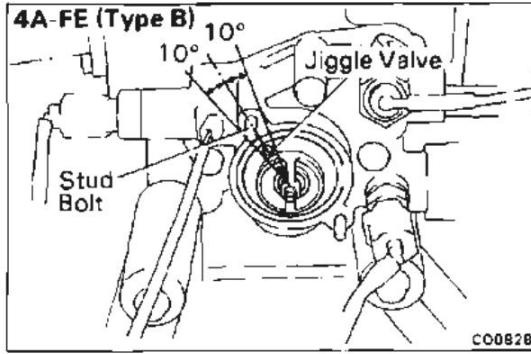
1. PLACE THERMOSTAT IN WATER PUMP

- Install a new gasket to the thermostat.

- For 4A-FE (Type A)

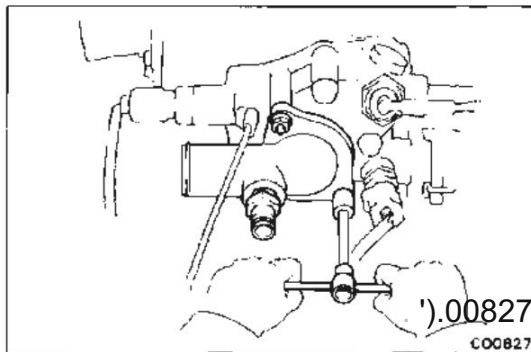
Set the jiggle valve so that the thermostat is in the open position and insert the thermostat in the water inlet, holding it.

NOTE: The jiggle valve may be set within 10° of the other side of the prescribed position.

**(4A-FE Type B)**

Align the jiggle valve of the thermostat with the upper side of the stud bolt, and insert the thermostat in the water inlet housing.

HINT The jiggle valve be set within 10° of either side of the prescribed position.

**2. INSTALL WATER INLET**

Install the water inlet with the two outputs (4A-FE)

Torque 95 kg-cm (82 in-lb, 9.3 N-m)

3. FILL WITH ENGINE COOLANT (See page CO-5)**4. START ENGINE AND CHECK FOR LEAKS**

RADIATOR

CLEANING OF RADIATOR

Use a water long steam cleaner, remove only mud and dirt from the radiator core.

NOTICE: If using a high pressure type cleaner, be careful not to deform the fins of the radiator core. If the cleaner nozzle pressure (4373098 35.2 kg/cm^2 (427 - 498) psi (2942 - 3432 kPa)) keep a distance of at least 40 cm (15.75 in.) between the radiator core and cleaner nozzle.

INSPECTION OF RADIATOR

1. INSPECT RADIATOR CAP

Using a radiator cap tester, check the radiator cap. The pressure relief valve opens. Check that the valve opens at 0.5 kg/cm^2 (0.5 kgf/cm² (2.74 KPa), 34.4 kPa) (0.5, 15 kgf/cm² (4.99 psi, 100.3 kPa)).

Verify that the pressure gauge does not drop rapidly when pressure is released below 0.6 kg/cm^2 (6.65 kPa) (59 kPa). Measure the relief valve opening pressure.

If either check is not within limits, replace the radiator cap.

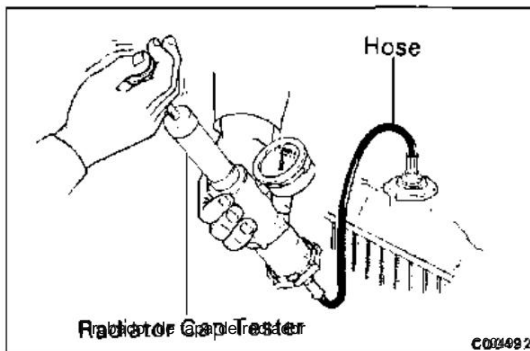
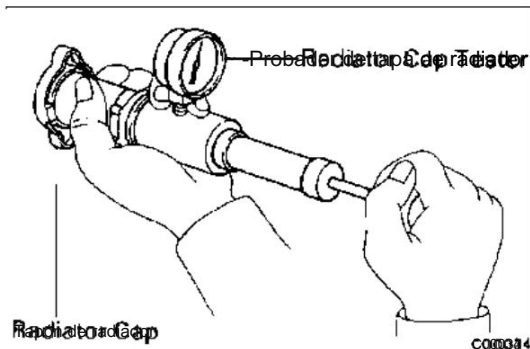
2. CHECK COOLING SYSTEM FOR LEAKS

(a) Fill the radiator with coolant and attach a radiator cap tester.

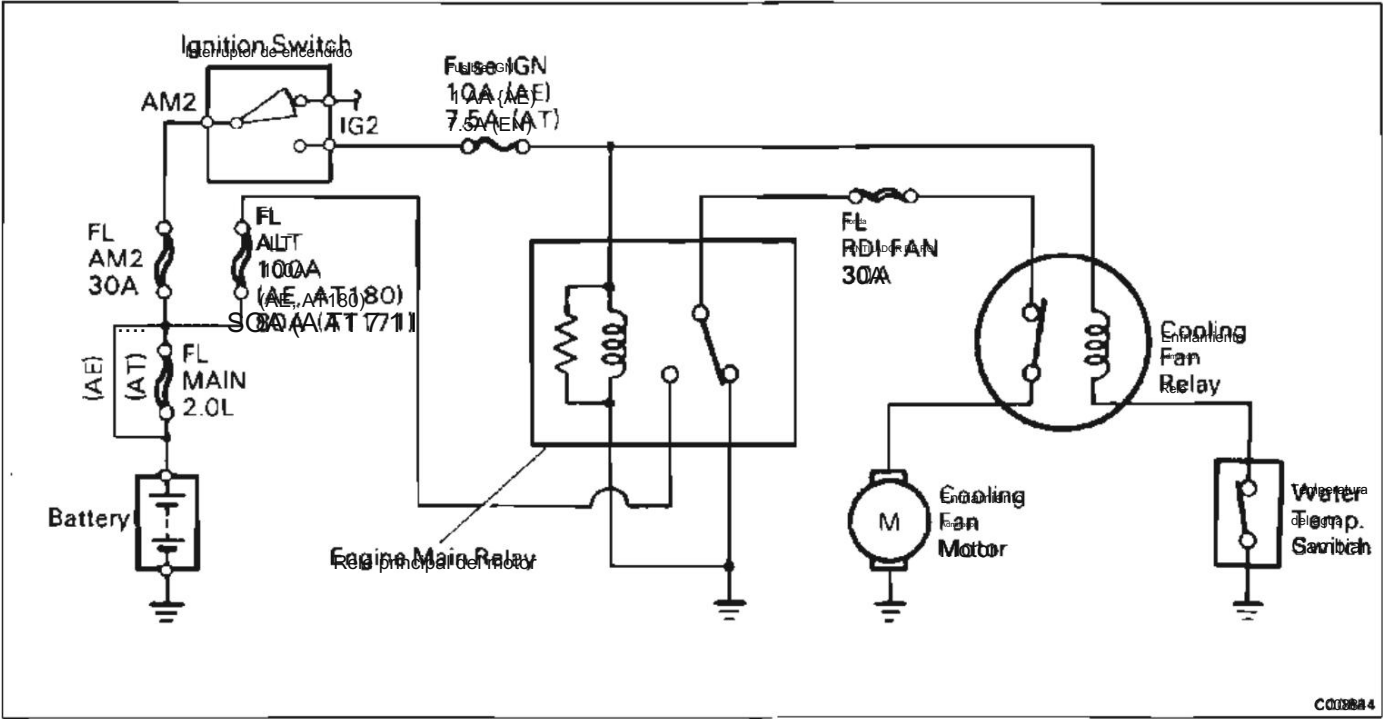
(b) Calculate the (engine).

Run the pump 2 kg or 12.1 kg/cm² (18.1 kPa) (18.1 kPa) a check that pressure does not drop.

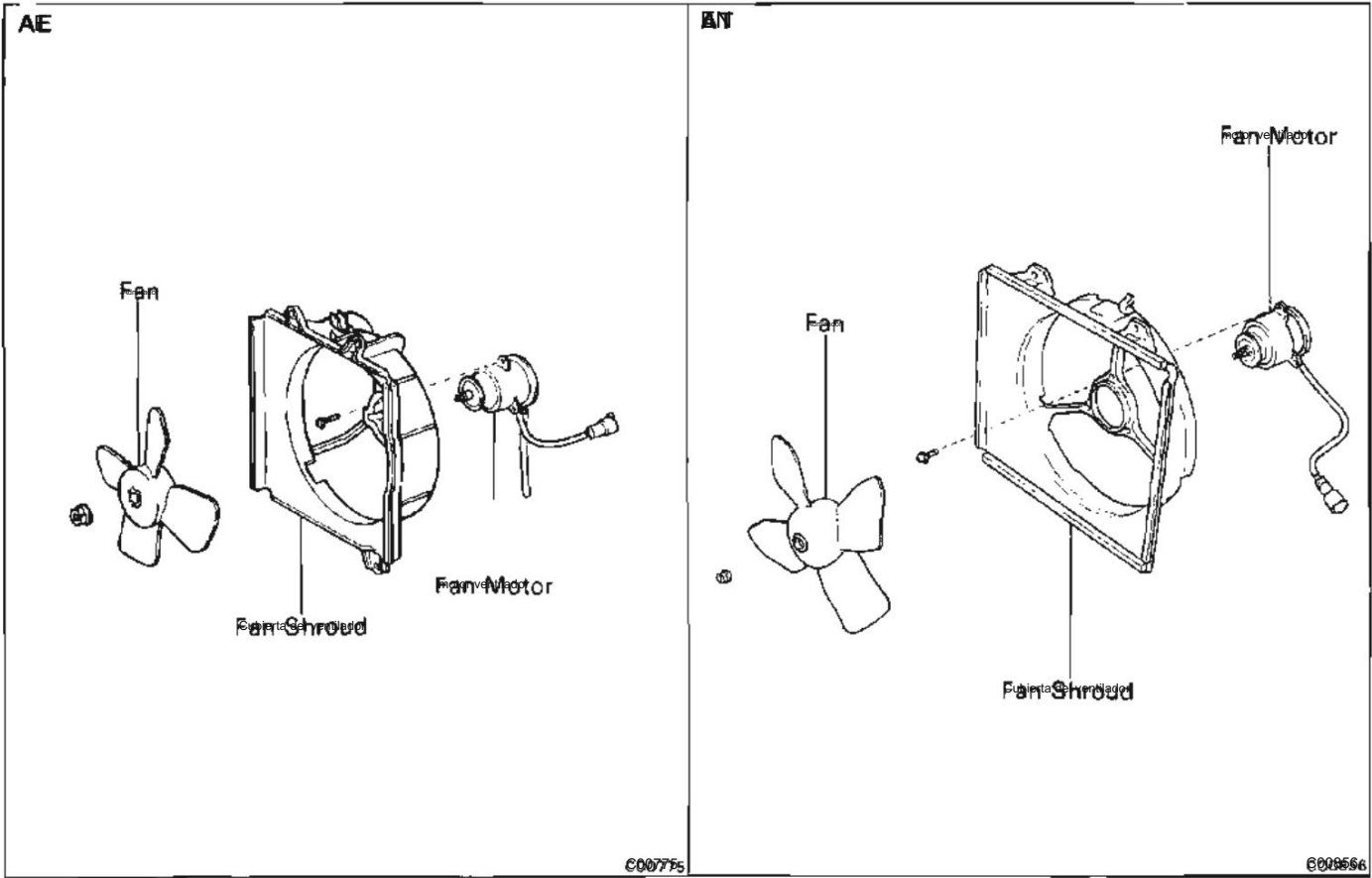
If the pressure drops, check for leaks from gaskets, hoses, radiator or water pump. If no external leaks are found, check the thermostat and bleed the radiator.

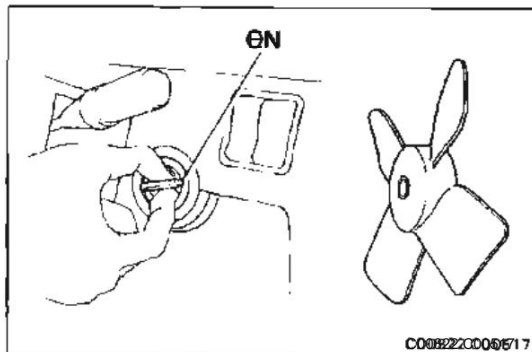


ELECTRIC COOLING FAN
Radiator Cooling Fan
SYSTEM CIRCUIT



COMPONENTS





ON-VEHICLE INSPECTION

**Below Coolant Temperature
(below 83°C (181°F))**

1. TURN IGNITION SWITCH ON

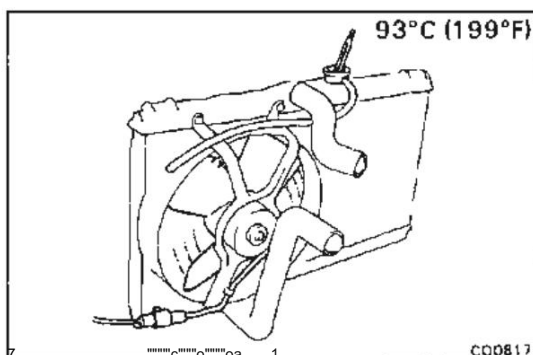
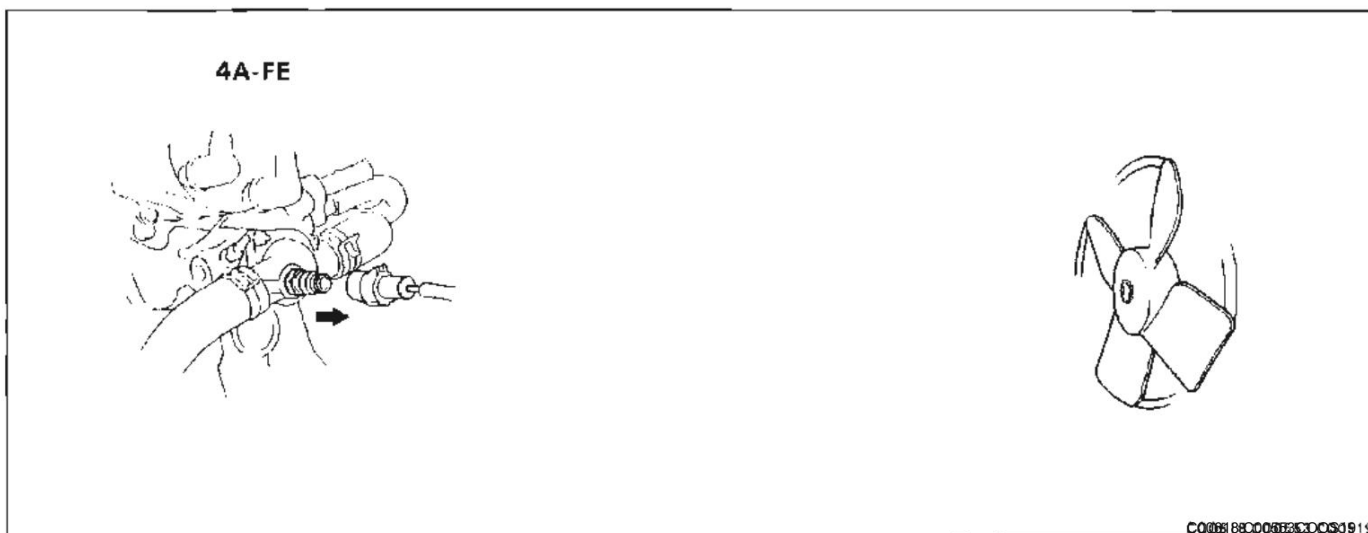
Check that the fan does not rotate.

If it rotates, check the fan relay and temperature switch, and check for a separated connector or covered wire between the relay and temperature switch.

2. DISCONNECT TEMPERATURE SWITCH CONNECTOR

Check that the fan rotates.

If it does not, check the fan relay, fan motor, ignition relay and fuse, and check for a short circuit between the fan relay and temperature switch.



3. CONNECT TEMPERATURE SWITCH CONNECTOR

**Above Coolant Temperature
(above 93°C (199°F))**

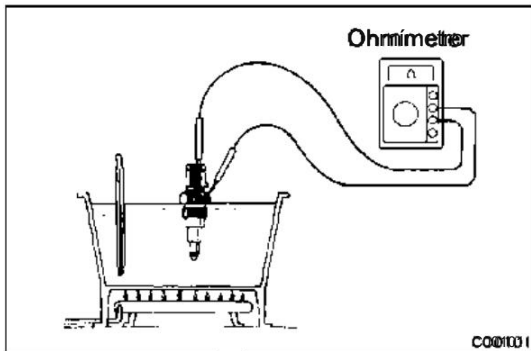
4. START ENGINE

(a) Raise engine coolant temperature to above 93°C (199°F).

(b) Check that the fan rotates.

(c) Verify that the fan stops when the coolant temperature is below 83°C (181°F).

If it does not, replace the temperature switch.



INSPECTION OF ELECTRIC COOLING FAN

1. INSPECT TEMPERATURE SWITCH

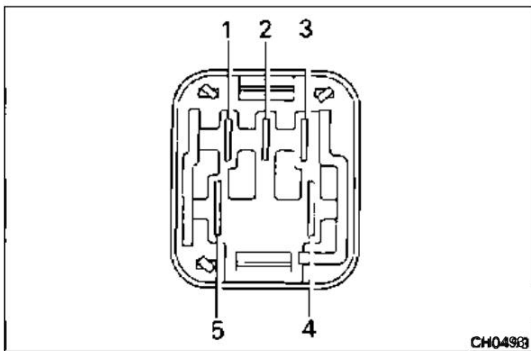
LOCATION: On the water inlet housing.

- Using an ohmmeter, check that there is continuity when the engine temperature is above 93°C (199°F).
- Check that there is continuity when the coolant temperature is below 83°C (181°F).

If continuity is not as specified, replace the switch.

2. INSPECT ENGINE MAIN RELAY

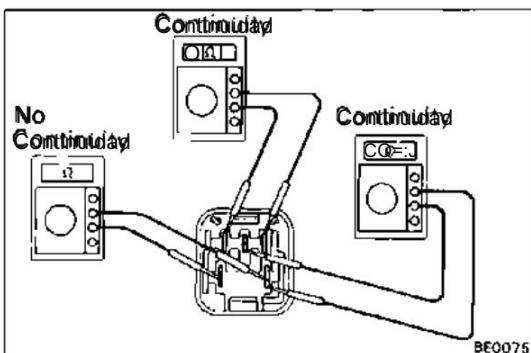
LOCATION: In the engine compartment relay box.



A. Inspect relay continuity

- Using an ohmmeter, check that there is continuity between terminals 1 and 3.
- Check that there is continuity between terminals 2 and 4.
- Check that there is no continuity between terminals 4 and 5.

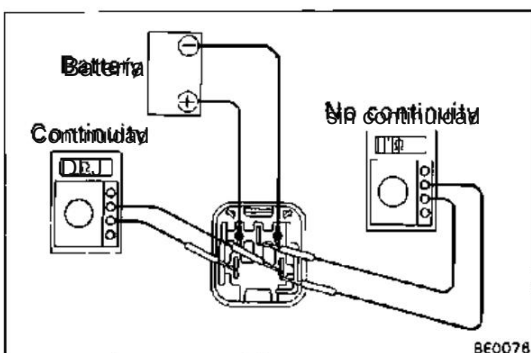
If continuity is not as specified, replace the relay.



B. Inspect relay operation

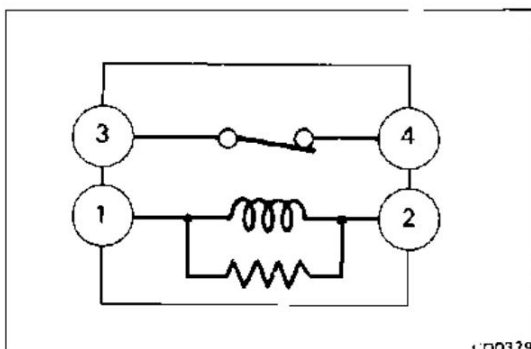
- Apply battery voltage across terminals 1 and 3.
- Using an ohmmeter, check that there is continuity between terminals 4 and 5.
- Check that there is no continuity between terminals 2 and 4.

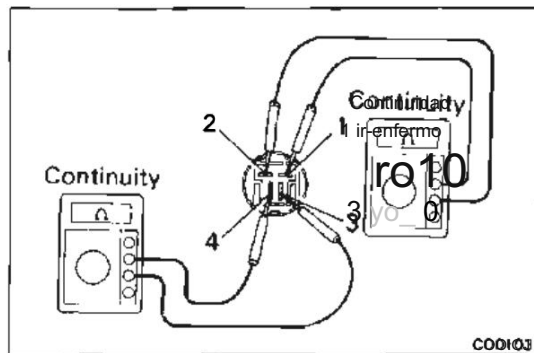
If operation is not as specified, replace the relay.



3. INSPECT COOLING FAN RELAY

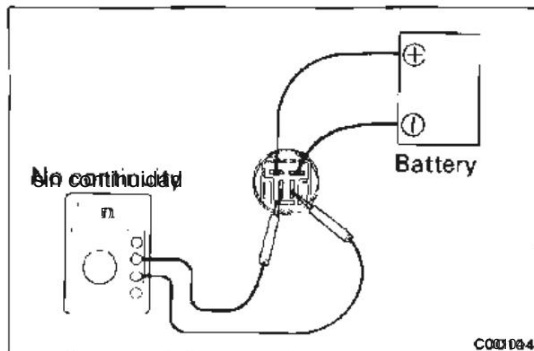
LOCATION: In the engine compartment relay box.



**A. Inspect relay continuity**

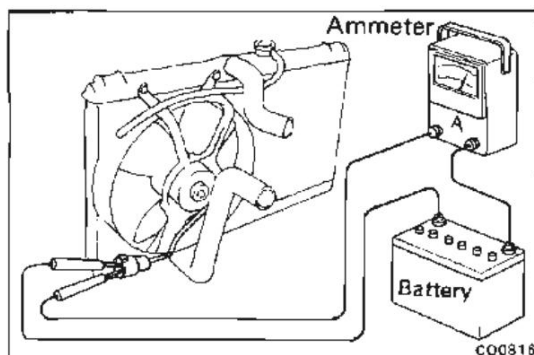
- Using an ohmmeter, verify that there is continuity between terminals 1 and 2.
- Check that there is continuity between terminals 3 and 4.

If continuity is not as specified, replace the relay.

**B. Inspect relay operation**

- Apply battery voltage across terminals 1 and 2.
- Check that there is no continuity between terminal 3 and 4.

If operation is not as specified, replace the relay.

**4. INSPECT FAN MOTOR**

- Connect the battery and ammeter to the fan motor connector.
- Verify that the motor rotates smoothly and current is as follows:

Standard range 2WD 2.4A 3.2 - 4.4A

If the amperage is not as specified, replace the cooling fan motor.

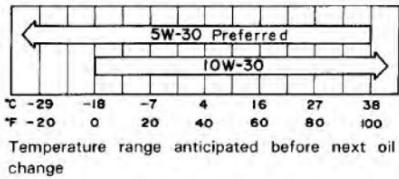
SISTEMA DE LUBRICACIÓN

Descripcion de PAGINA LU-2
 SOLUCIÓN DE PROBLEMAS LU-5
 COMPROBACION DE LA PRESION DE OIL LU-6
 REEMPLAZO DE OIL DE MOTOR Y FILTRO OIL " LU-7
 OIL BOMBA LU-9

LU

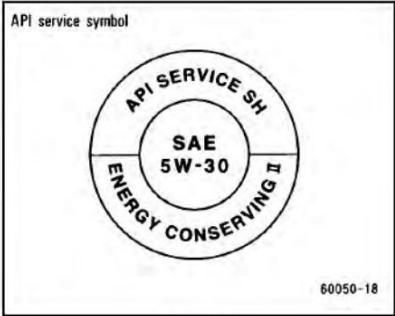
ENGINE OIL SELECTION

Use API SH, "Energy-Conserving II" multigrade engine oil or ILSAC multigrade engine oil.
Recommended viscosity (SAE):



60040-L03 U

SAE 5W-30 is the best choice for your vehicle, for good fuel economy, and good starting in cold weather.
If you use SAE 10W-30 engine oil in extremely low temperatures, the engine may become difficult to start, so SAE 5W-30 engine oil is recommended.



Oil identification marks
 Either or both API registered marks are added to some oil containers to help you select the oil you should use.
 The API Service Symbol is located anywhere on the outside of the container.
 The top portion of the label shows the oil quality by API (American Petroleum Institute) designations such as SH. The center portion of the label shows the SAE viscosity grade such as SAE 5W-30. "Energy-Conserving II" shown in the lower portion, indicates that the oil has fuel-saving capabilities. Oils marked "Energy-Conserving II" will have higher fuel-saving capabilities than oil marked "Energy-Conserving".

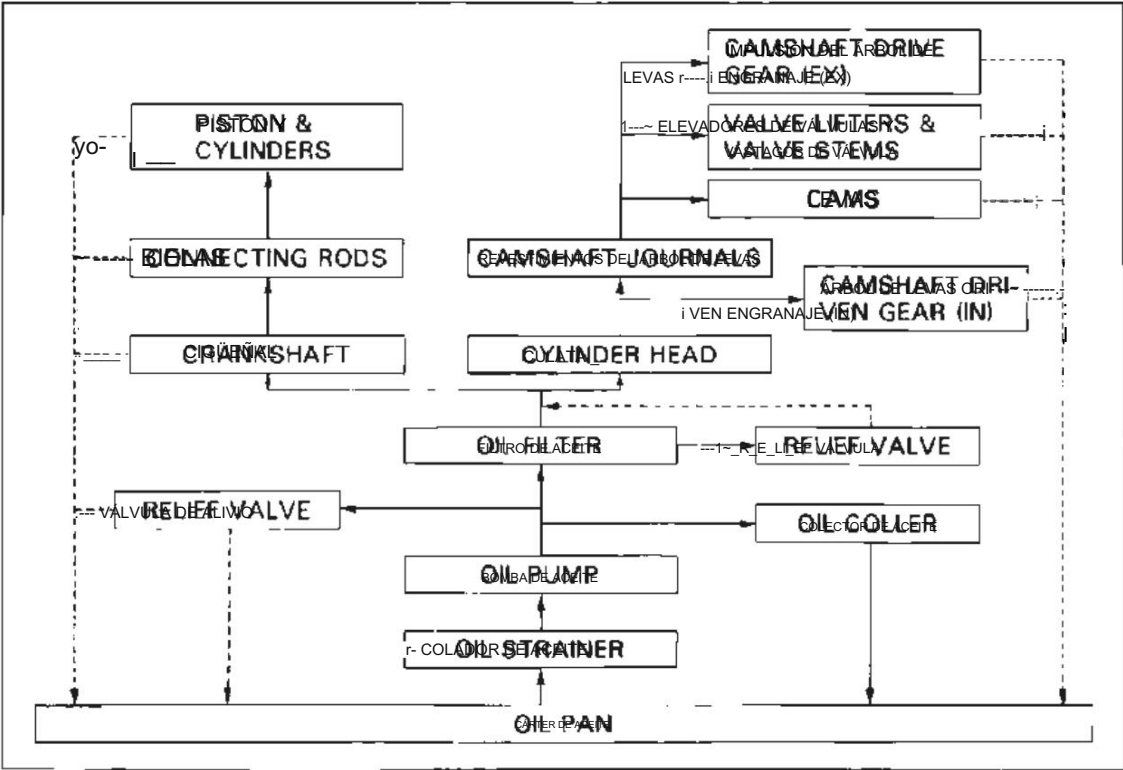
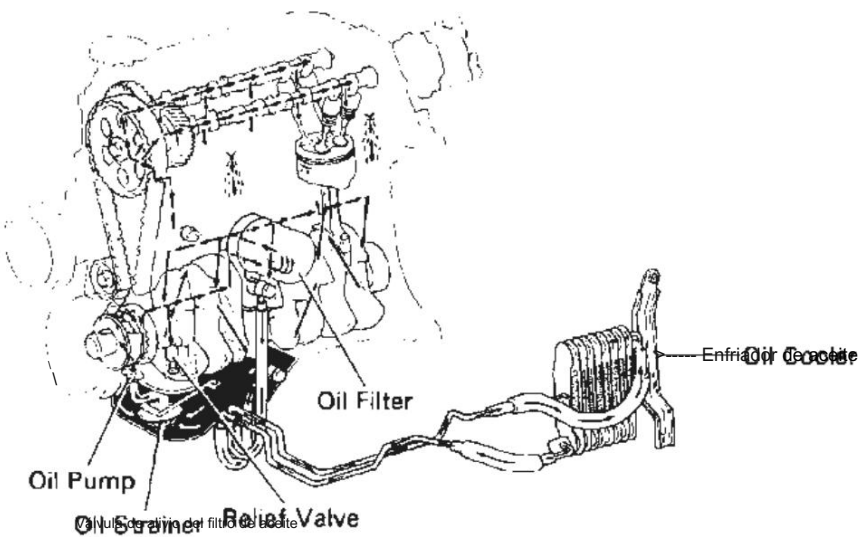


The ILSAC (International Lubricant Standardization and Approval Committee) Certification Mark is displayed on the front of the container.

DESCRIPTION

Refined and standardized, fully detailed lubrication systems are fully prescribed for all engines.

4A-FEE



A pressure feed lubrication system has been adopted to supply oil to the various parts of the engine. The lubrication system consists of a bomb oil pump, oil filter, oil cooler, and oil lines. The oil pump is driven by the engine and is located at the front of the engine. The oil filter is located at the top of the engine and is connected to the oil pump. The oil cooler is located at the bottom of the engine and is connected to the oil filter. The oil lines are connected to the oil pump, oil filter, and oil cooler. The oil pump draws oil from the oil pan and pumps it to the oil filter. The oil filter filters the oil and sends it to the oil cooler. The oil cooler cools the oil and sends it to the oil lines. The oil lines deliver the oil to the various parts of the engine. The oil pump is driven by the engine and is located at the front of the engine. The oil filter is located at the top of the engine and is connected to the oil pump. The oil cooler is located at the bottom of the engine and is connected to the oil filter. The oil lines are connected to the oil pump, oil filter, and oil cooler. The oil pump draws oil from the oil pan and pumps it to the oil filter. The oil filter filters the oil and sends it to the oil cooler. The oil cooler cools the oil and sends it to the oil lines. The oil lines deliver the oil to the various parts of the engine.

OIL PUMP

The oil pump is a gear pump. It consists of two gears, one of which is driven by the engine and the other of which is driven by the oil. The oil is drawn into the pump and is then pumped out to the oil filter. The oil filter is located at the top of the engine and is connected to the oil pump. The oil cooler is located at the bottom of the engine and is connected to the oil filter. The oil lines are connected to the oil pump, oil filter, and oil cooler. The oil pump draws oil from the oil pan and pumps it to the oil filter. The oil filter filters the oil and sends it to the oil cooler. The oil cooler cools the oil and sends it to the oil lines. The oil lines deliver the oil to the various parts of the engine.

OIL PRESSURE REGULATOR

At high engine speeds, the engine oil is supplied by the oil pump at a pressure which is too high for the engine to utilize. For this reason, the oil pressure regulator is provided. The oil pressure regulator is a valve which is located in the oil line between the oil pump and the oil filter. It is designed to maintain a constant oil pressure. When the oil pressure is too high, the regulator closes the valve and prevents the oil from flowing to the oil filter. When the oil pressure is too low, the regulator opens the valve and allows the oil to flow to the oil filter. The oil pressure regulator is a valve which is located in the oil line between the oil pump and the oil filter. It is designed to maintain a constant oil pressure. When the oil pressure is too high, the regulator closes the valve and prevents the oil from flowing to the oil filter. When the oil pressure is too low, the regulator opens the valve and allows the oil to flow to the oil filter.

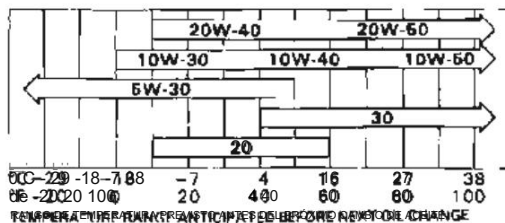
OIL FILTER

The oil filter is a filter which is used to remove dirt and debris from the oil. It is located at the top of the engine and is connected to the oil pump. The oil filter is made of a material which is designed to catch dirt and debris. The oil flows through the filter and is then sent to the oil cooler. The oil cooler cools the oil and sends it to the oil lines. The oil lines deliver the oil to the various parts of the engine. The oil filter is a filter which is used to remove dirt and debris from the oil. It is located at the top of the engine and is connected to the oil pump. The oil filter is made of a material which is designed to catch dirt and debris. The oil flows through the filter and is then sent to the oil cooler. The oil cooler cools the oil and sends it to the oil lines. The oil lines deliver the oil to the various parts of the engine.

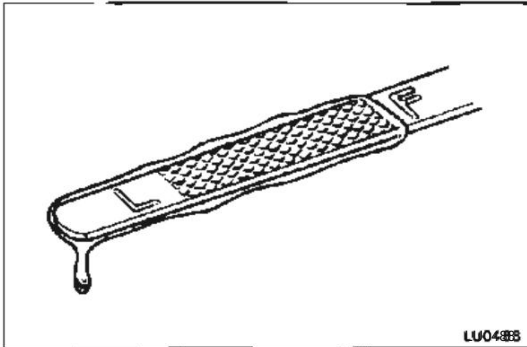
TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Oil leakage	Cylinder head, cylinder block or oil pump body damaged or cracked	Repair as necessary	EM-1355 LU-13
	Oil seal faulty	Replace oil seal	
	Gasket faulty	Replace gasket	
Low oil pressure	Oil leakage	Repair as necessary	LU-12133 LU-9 LU-6 EM-1222 EM-119 LU-7
	Relief valve faulty	Repair relief valve	
	Oil pump faulty	Repair oil pump	
	Low quality engine oil	Replace engine oil	
	Crankshaft bearing faulty	Replace bearing	
	Connecting rod bearing faulty	Replace bearing	
	Oil filter clogged	Replace oil filter	
High oil pressure	Relief valve faulty	Repair relief valve	LU-12133

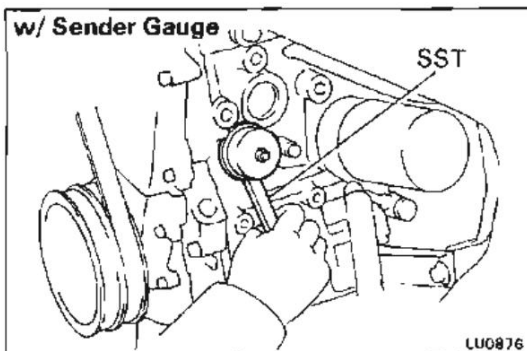
Recommended Viscosity (SAE):



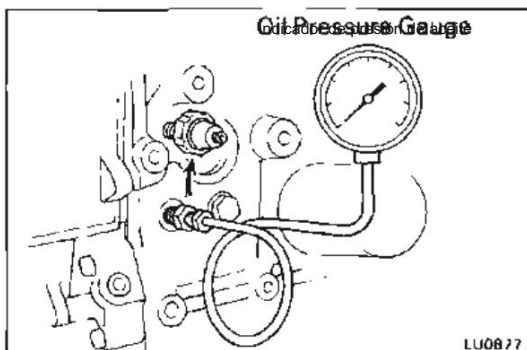
LU0310



LU0428



LU0876



LU0877

OIL PRESSURE CHECK

1. CHECK ENGINE OIL QUALITY

Check the oil for deterioration and any of water discoloring or thinning.

If the quality is poor, replace the oil.

(4A-FE for Europe & Australia and 4A-GE)

Use API grade SE, SF, SG or better and recommended viscosity oil.

(4A-FE for Others)

Use API grade SE, SF, SG or better and recommended viscosity oil.

2. CHECK ENGINE OIL LEVEL

The oil level should be between the "F" and "F" marks on the dipstick.

Always check for the leakage and add oil up to the "F" mark.

3. REMOVE OIL PRESSURE SWITCH OR SENDER GAUGE AND INSTALL OIL PRESSURE GAUGE

(a) (4A-FE)

Remove the alternator and bracket.

(b) Remove the oil pressure switch (4A-FE)

Use SST.

SST 09027-0221240

(c) Install an oil pressure gauge.

(d) (4A-FE)

Reinstall the bracket and alternator.

4. WARM UP ENGINE

Allow the engine to warm up to reach normal operating temperature.

5. CHECK OIL PRESSURE

Oil pressure:

At idling 0.3 kg/cm² (4.3 psi, 29 kPa)

or more

At 3000 rpm 2.5 kg/cm² (36 psi, 245 kPa)

(36 kPa) 71 psi, 245 - 490 kPa

6. REMOVE OIL PRESSURE GAUGE

(a) (4A-FE)

Remove the alternator and bracket.

(b) Remove an oil pressure gauge.

(c) Apply adhesive to two or three threads of the oil pressure switch (4A-FE)

Adhesive Part No. 08833-00080, THREE BOND 1244 OCTITE 242 or equivalent.

(d) Reinstall the oil pressure switch.

(e) (4A-FE)

Reinstall the bracket and alternator.

7. START ENGINE AND CHECK FOR LEAKS

Adaptor 1/8" X 28 BSPT
Max tightening torque: 10 Nm

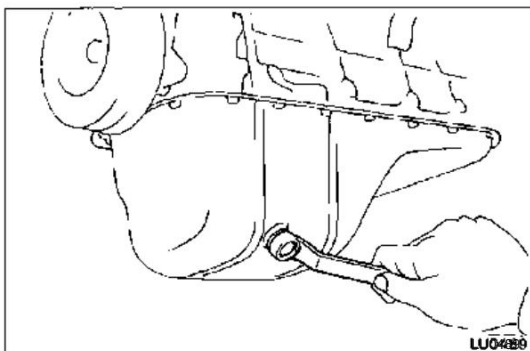
REPLACEMENT OF ENGINE OIL AND OIL FILTER

CAUTION:

- **Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer. Adequate means of skin protection and washing facilities should be provided.**
El contacto prolongado y repetido con el aceite mineral hará que se eliminen los lípidos naturales de la piel, provocando sequedad, irritación y dermatitis. Además, el aceite de motor usado contiene contaminantes potencialmente dañinos que pueden causar cáncer de piel. Se deben proporcionar medios adecuados de protección de la piel y instalaciones de lavado.
- **Care should be taken to avoid inhaling engine oil to minimize the frequency and length of time your skin is exposed to used engine oil. Protective clothing and gloves that cannot be penetrated by oil should be provided. The skin should be thoroughly washed with soap and water, or use waterless hand cleanser to remove any used engine oil. Do not use gasoline, solvents, or solvents.**
Debe tenerse cuidado de evitar inhalar el aceite de motor para minimizar la frecuencia y la longitud del tiempo que su piel está expuesta al aceite de motor usado. Se debe proporcionar ropa protectora y guantes que no puedan ser penetrados por el aceite. La piel debe lavarse a fondo con jabón y agua, o usar limpiador de manos sin agua para eliminar cualquier aceite de motor usado. No use gasolina, disolventes o solventes.
- **In order to preserve the environment, used oil must be disposed of only at designated disposal sites.**
Con el fin de preservar el medio ambiente, el aceite usado debe eliminarse únicamente en los sitios de eliminación designados.

1. DRAIN ENGINE OIL

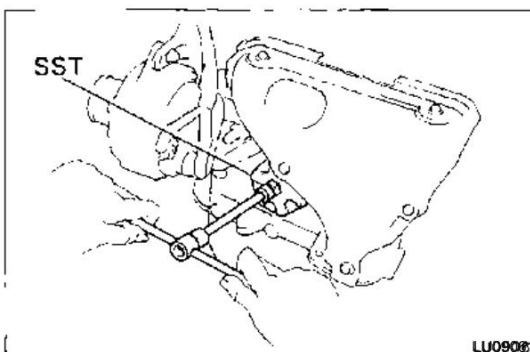
- Remove the oil filler cap.
- Remove the oil drain plug and drain the oil into a container.



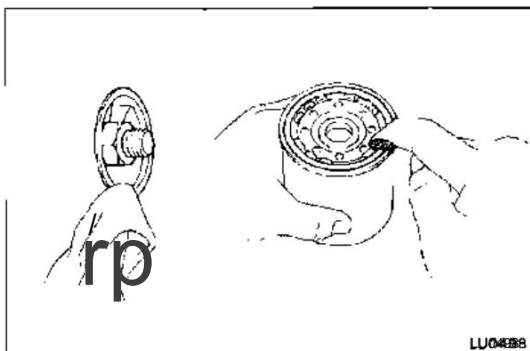
2. REPLACE OIL FILTER

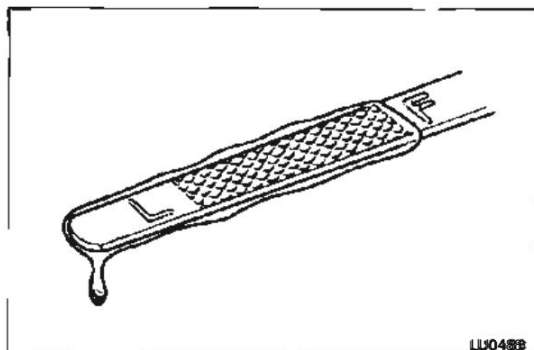
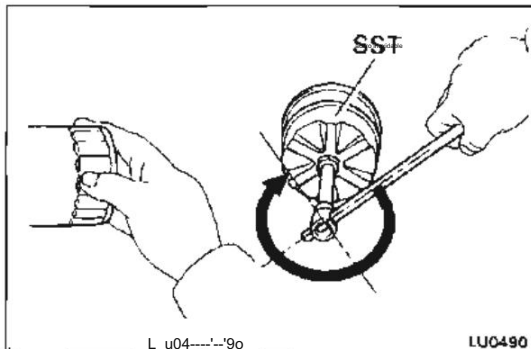
- Using SST, remove the oil filter (located on left side of the engine block).

SST 09228 26500



- Inspect and clean the oil filter installation surface.
- Apply clean engine oil to the gasket of a new oil filter.





(d) Enrosale el tapón de drenaje de aceite con una nueva junta.
Ligmente enroscar el filtro de aceite hasta donde sienta resistencia.

(e) Luego, usando SST, apriete el filtro de aceite 3/4 de vuelta.
Luego, usando SST, apriete el filtro de aceite 3/4 de vuelta.

SST 00228926500

3. LLEVAR A CABO EL REPOLENADO DE ACEITE

(a) Limpie e instale el tapón de drenaje de aceite con una nueva junta.
Torque the drain plug.

Torque: 15 Nm

(b) Llene el motor con nuevo aceite API grado SAE, SF, SG o mejor.
Fill the engine with new oil API grade SAE, SF, SG or better.

Capacity:

4A-EE

Drain and refill

Without oil filter change

3.0 liters (3.1 US qts, 2.6 Imp qts)

With oil filter change

3.2 liters (3.3 US qts, 2.8 Imp qts)

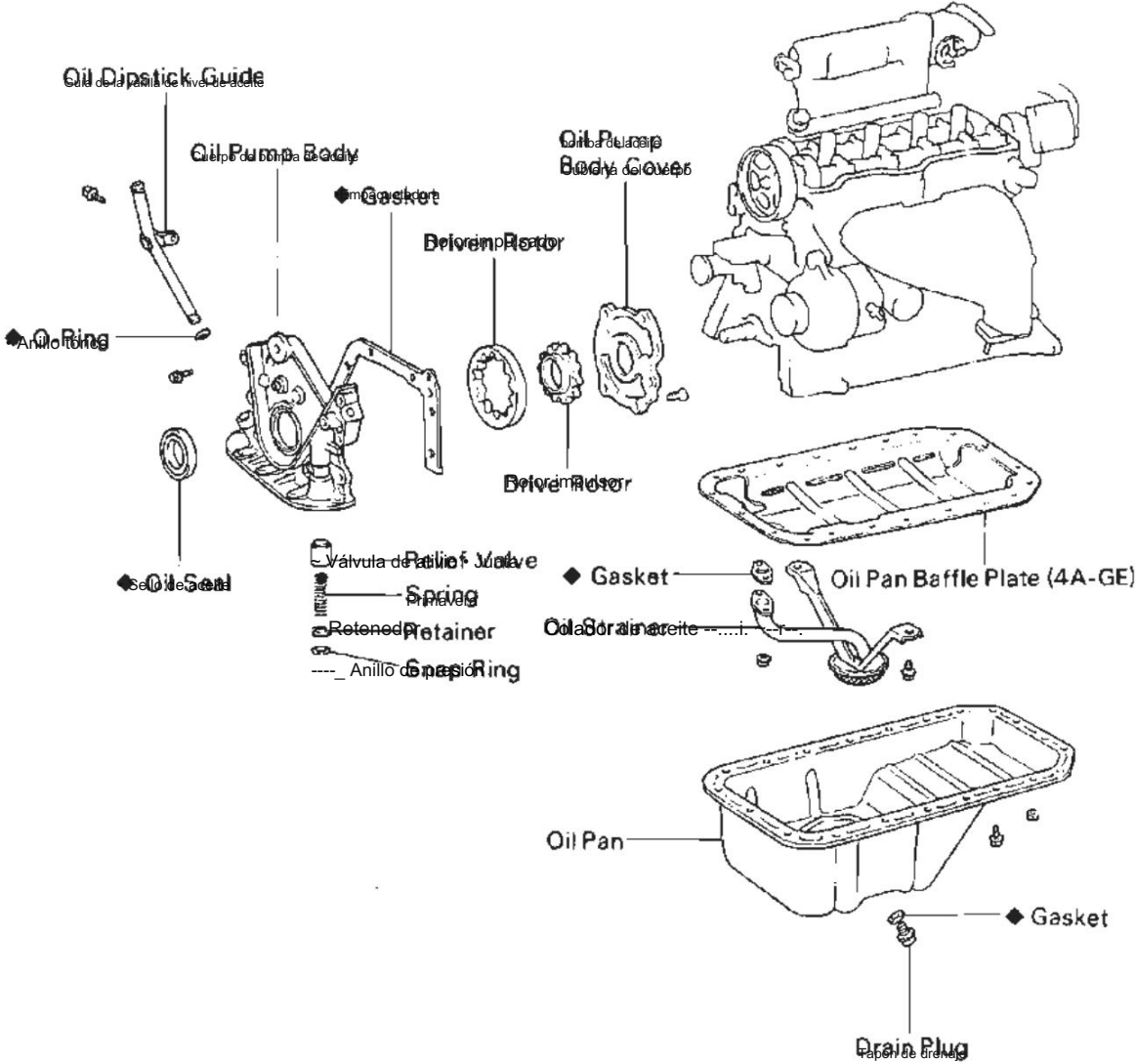
(c) Reinstale el tapón de drenaje de aceite con la junta.

4. ARRANCAR EL MOTOR Y VERIFICAR SI HAY FUGAS

5. REVERIFICAR EL NIVEL DE ACEITE DEL MOTOR (Consulte la página LU-6)

OIL PUMP

COMPONENTS

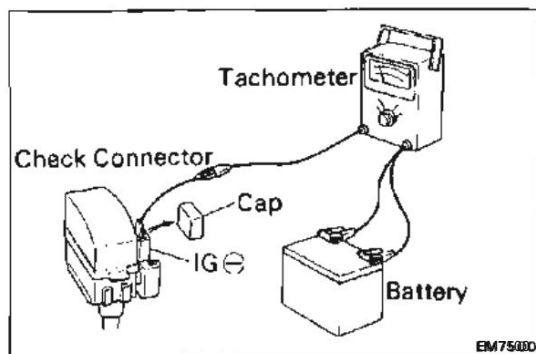


IGNITION SYSTEM

	Page
PRECAUTIONS	IG-2
TRUBLESHOOTING	IG-3
IGNITION SYSTEM CIRCUIT	IG-4
ON-VEHICLE INSPECTION	
4A-FE	IG-6
INTEGRATED IGNITION ASSEMBLY (4A-FE) ..	IG-15

PRECAUTIONS

1. Do not leave the ignition switch on for more than 100 minutes if the engine does not start.



2. Connect the tachometer to the check connector. Do not connect the tachometer to the terminal IG of the check connector.

3. As some tachometers are compatible with this ignition system, it is recommended that you confirm the compatibility of your unit before using.

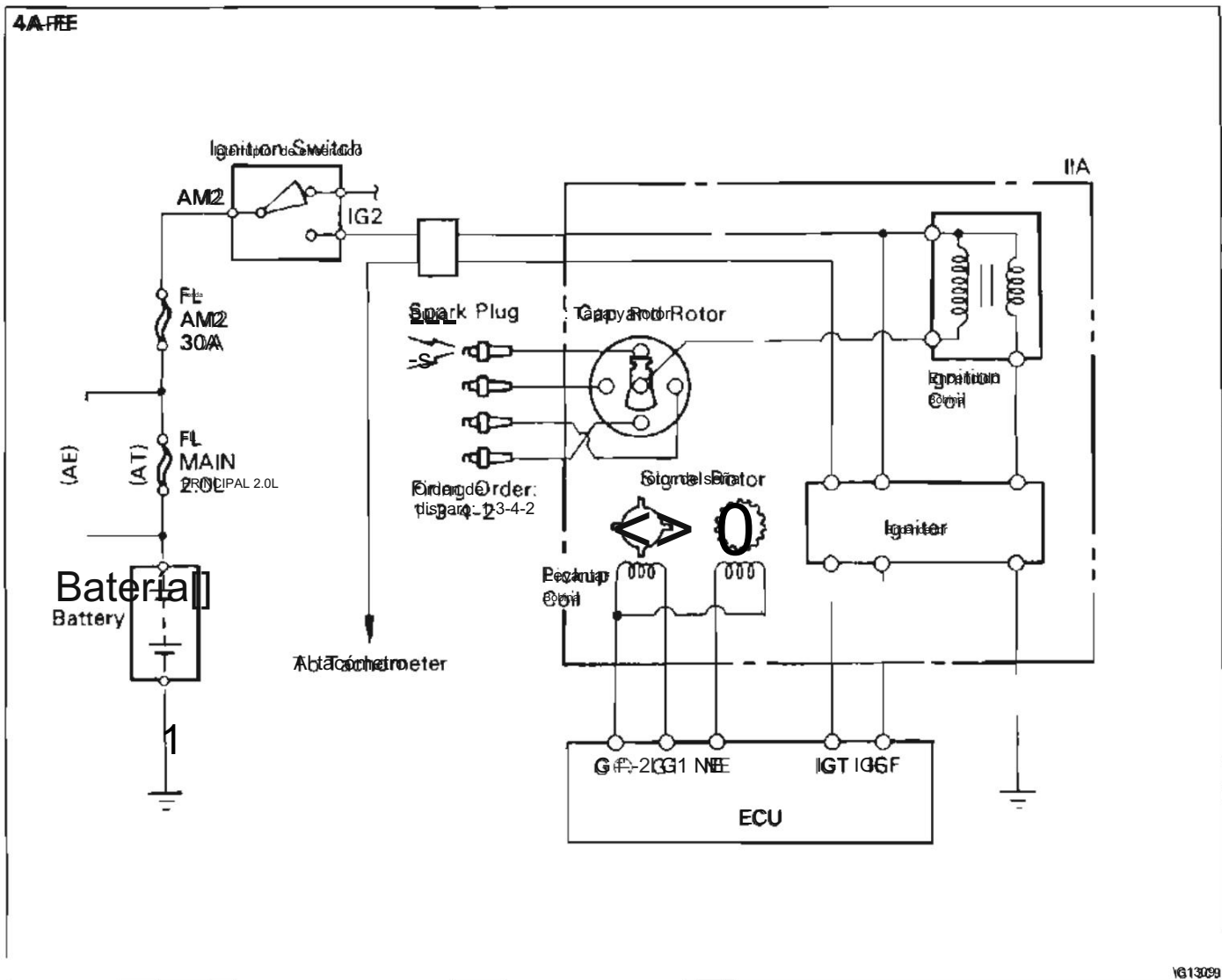
4. NEVER allow the tachometer terminal to touch any ground as this could damage the ignition coil or ignition coil.

5. Do not disconnect the battery while the engine is running.

6. Check that the ignition is properly grounded to the body.

ELECTRONIC SPARK ADVANCE (ESA)

The EPC is programmed with parameters for energy optimization and energy-related data logging. Conditions for logging data are defined by sensor values, sensor variations, or trigger variations (e.g., intake air volume, energy demand, resistance, temperature, etc.). ECU triggers data pack as EPC displays a trigger in its instance exactly.



ON-VEHICLE INSPECTION (4A-FE)

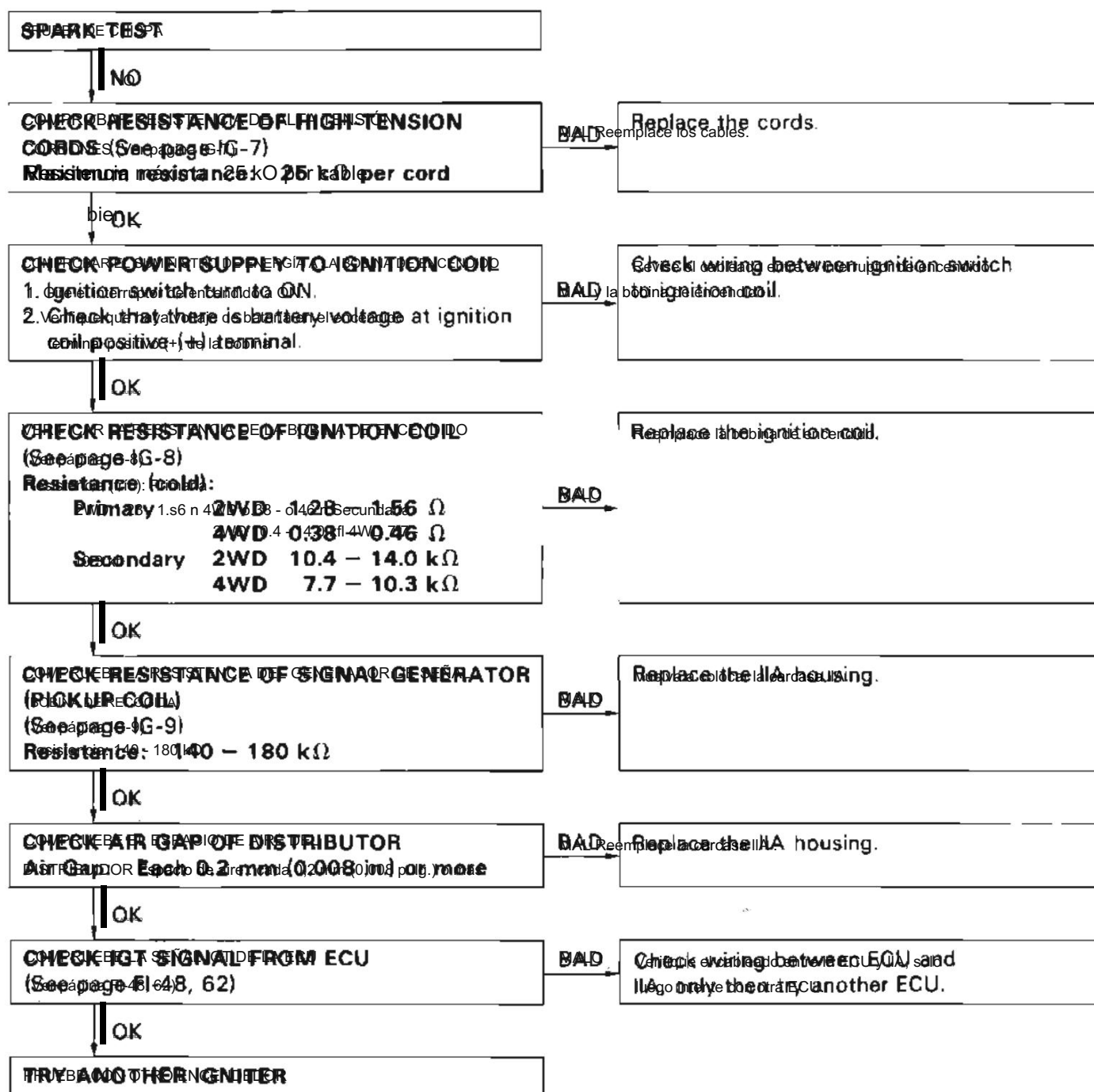
SPARK TEST

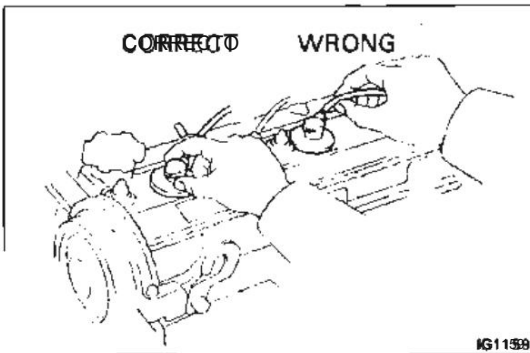
CHECK THAT SPARK OCCURS

- Disconnect high tension cords from spark plugs.
- Remove the spark plugs. (See page IG-7)
- Install the spark plugs to each high tension cord.
- Ground the spark plug.
- Check if spark occurs while engine is being cranked.

CAUTION: To prevent gasoline from being injected into the injectors during this test, crank the engine for no more than 1-2 seconds at a time.

If the spark does not occur, perform the test as follows.



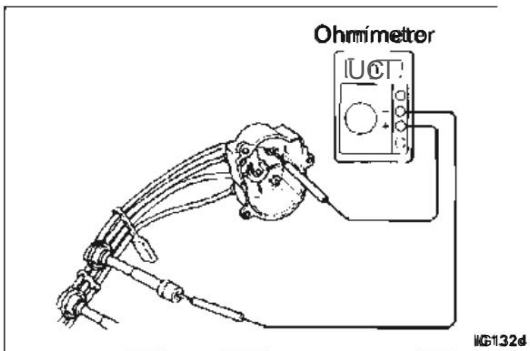


IG1139

INSPECTION OF HIGH-TENSION CORDS

1. **CAREFULLY DISCONNECT HIGH-TENSION CORDS BY THEIR RUBBER BOOTS FROM SPARK PLUGS**
 Do not pull or bend the cords in any way that could damage the conductor inside.

2. **REMOVE IIA CAPS WITHOUT DISCONNECTING HIGH-TENSION CORDS**



IG11324

3. **INSPECT HIGH-TENSION CORD RESISTANCE**

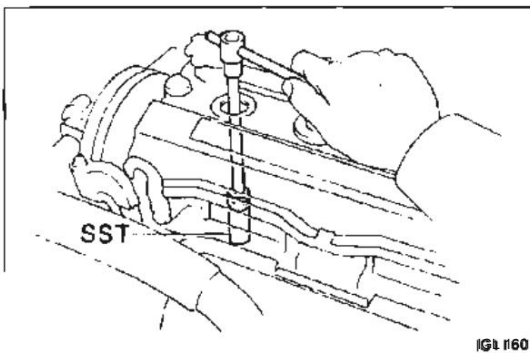
Using an ohmmeter, measure the resistance without disconnecting the IIA cap.

Resistance must be 26 k Ω or less per cord

If the resistance is greater than the maximum, check the terminals. If necessary, replace the high-tension cord and/or IIA cap.

4. **REINSTALL IIA CAP**

5. **RECONNECT HIGH-TENSION CORDS TO SPARK PLUGS**



IG1160

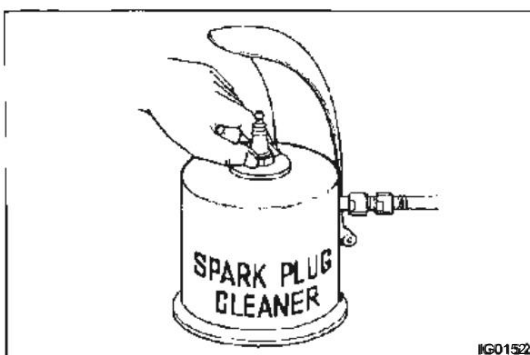
INSPECTION OF SPARK PLUGS

1. **DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS**

2. **REMOVE SPARK PLUGS**

Using SST, remove the spark plugs.

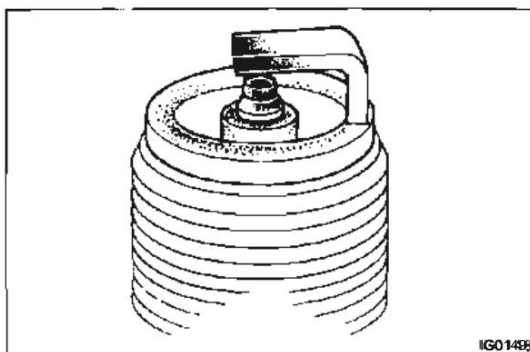
SST: 09-559156100



IG0152

3. **CLEAN SPARK PLUGS**

Using spark plug cleaner or wire brush, clean the spark plug.



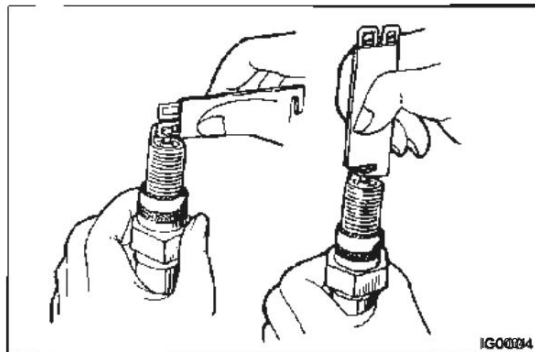
IG0149

4. **VISUALLY INSPECT SPARK PLUGS**

Check the spark plug for electrode wear, thread damage and insulator damage.

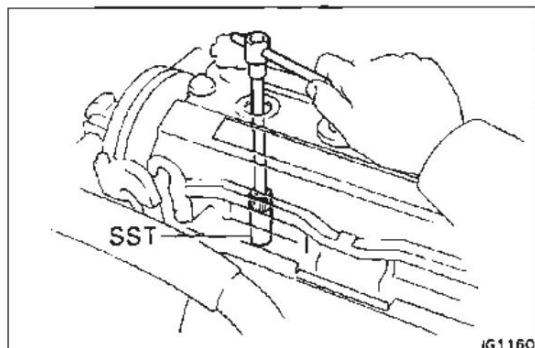
If abnormal, replace the spark plug.

Recommended spark plug: DENSO Q16R-U
 NGK BCPR5EY

**5. ADJUST ELECTRODE GAP**

Carefully bend the outer electrode to obtain the correct electrode gap.

Correct electrode gap: **0.8 mm (0.031 in.)**

**6. INSTALL SPARK PLUGS**

Using SST, install the spark plug.

SST 00155-916100

Torque: **18 N·m (1.8 kg-m, 13 ft-lb)**

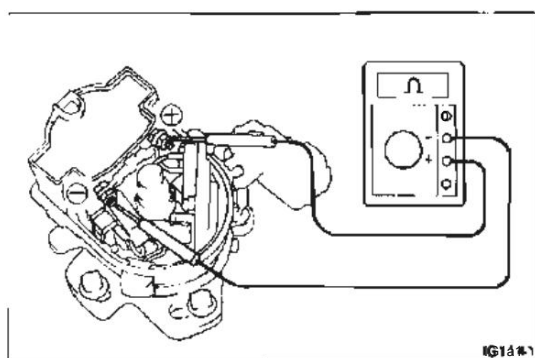
7. RECONNECT HIGH TENSION CORDS TO SPARK PLUGS**INSPECTION OF IGNITION COIL****1. INSPECT PRIMARY COIL RESISTANCE**

Using an ohmmeter, measure the resistance between the positive (+) and negative (-) terminal.

Resistance (Cold):

2WD: 1.28 - 1.56 kΩ

If the resistance is not as specified, replace the ignition coil.

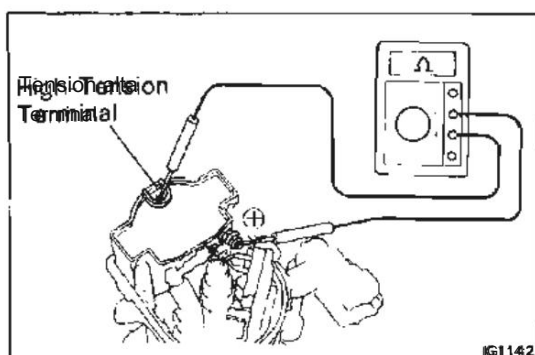
**2. INSPECT SECONDARY COIL RESISTANCE**

Using an ohmmeter, measure the resistance between the positive (+) terminal and high-tension terminal.

Secondary coil resistance: (Cold)

2WD: 10.4 - 14.0 kΩ

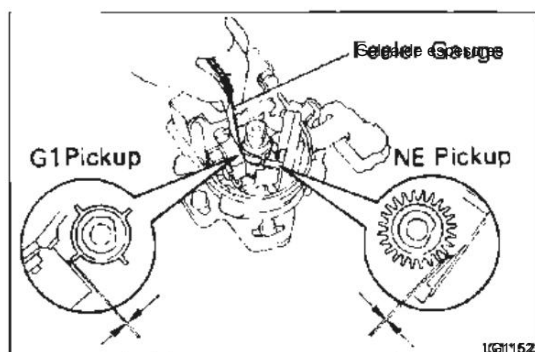
If the resistance is not as specified, replace the ignition coil.

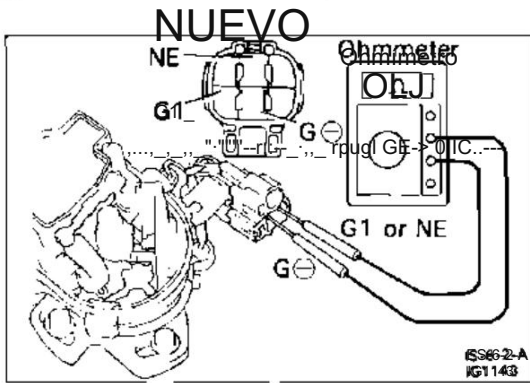
**DISTRIBUTOR****1. INSPECT AIR GAP**

Using a feeler gauge, measure the gap between the signal rotor and pickup coil projection.

Air gap: **0.2 mm (0.008 in.) or more**

If the air gap is not as specified, replace the IIA housing.





2. INSPECT SIGNAL GENERATOR (PICK-UP COIL) RESISTANCE

Using an ohmmeter, measure the resistance between the terminals (G1 and G $\ominus$, NE and G $\ominus$).

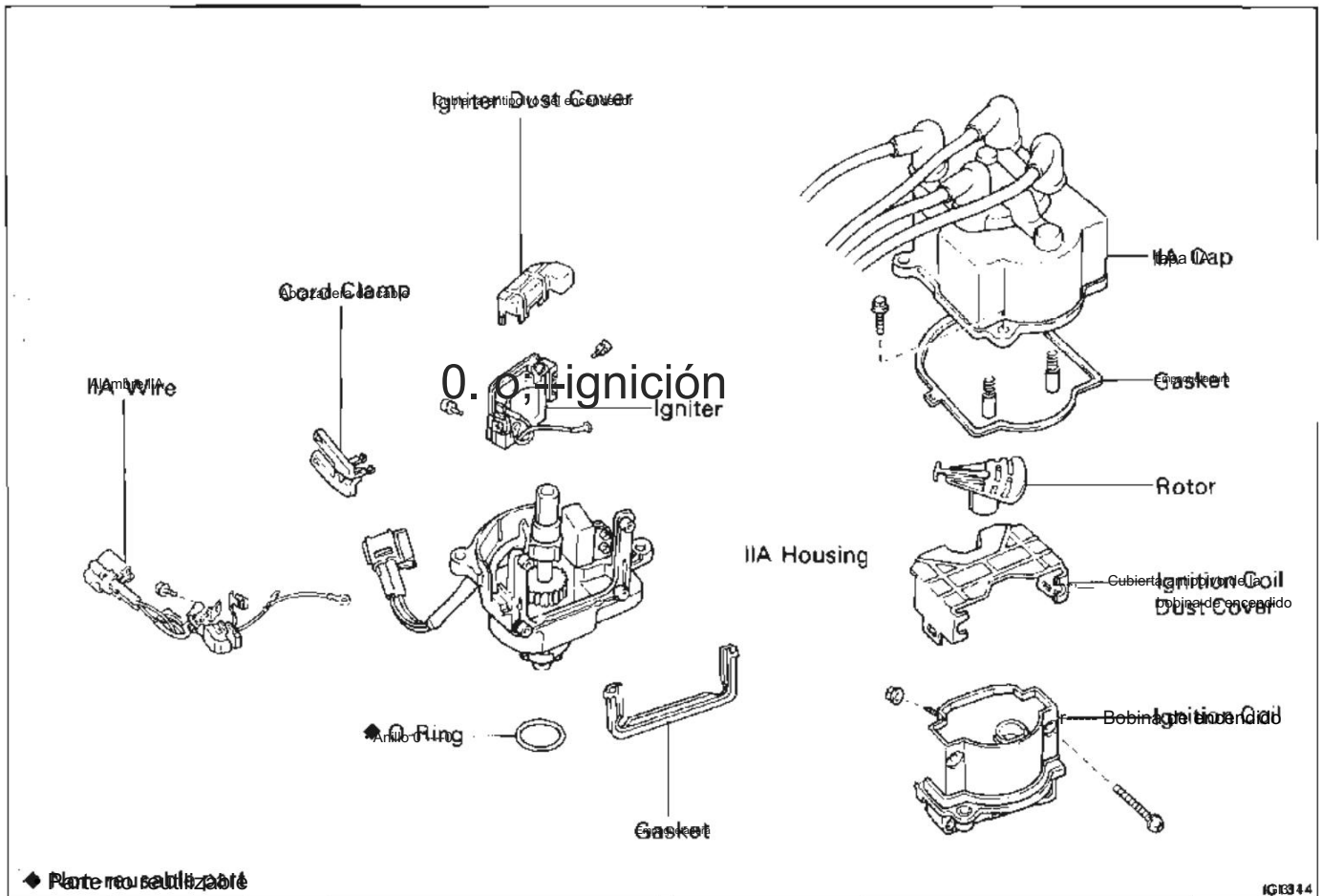
Resistance (Cold): 140 to 180 Ω

If the resistance is not as specified, replace the IIA housing.

INSPECTION OF IGNITER

(See procedure Spark Test on page IG-6)

INTEGRATED IGNITION ASSEMBLY (IIA) (4A-FE) COMPONENTS



DISASSEMBLY OF IIA

1. QUIT REMOVE DISTRIBUTOR CAP, GASKET AND ROTOR

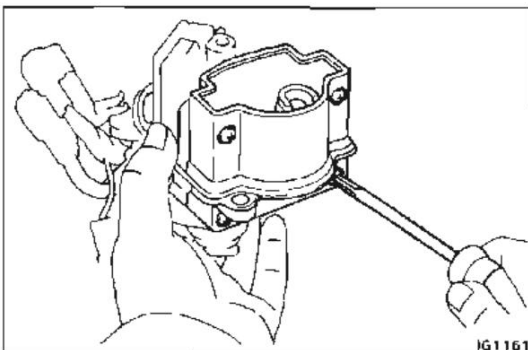
2. QUIT REMOVE IGNITION COIL DUST COVER

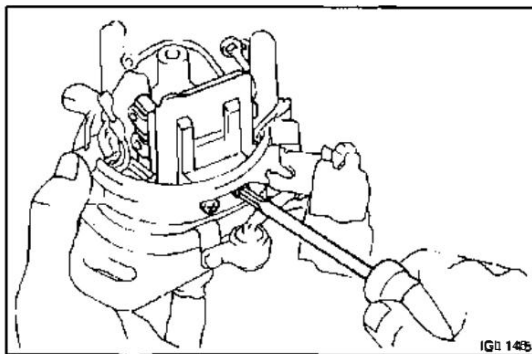
3. QUIT REMOVE IGNITER DUST COVER

4. QUIT REMOVE IGNITION COIL

(a) Remove the two nuts and disconnect the three wires from the ignition coil terminals.

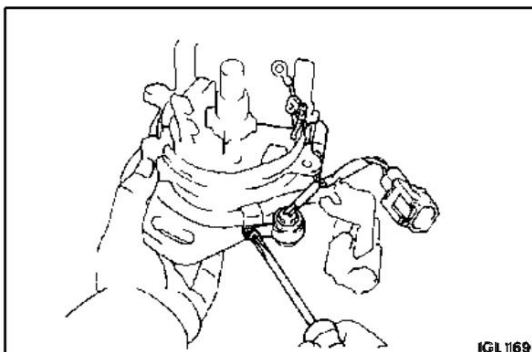
(b) Remove the four screws, ignition coil and gasket.





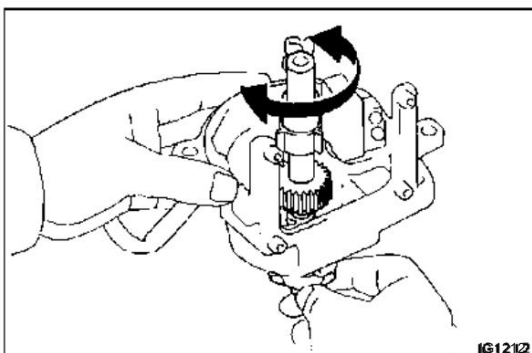
5. REMOVE IGNITER

- (a) Remove the two dust seals and disconnect the three wires from the igniter terminals.
- (b) Remove the two screws and igniter.



6. REMOVE IIA WIRE

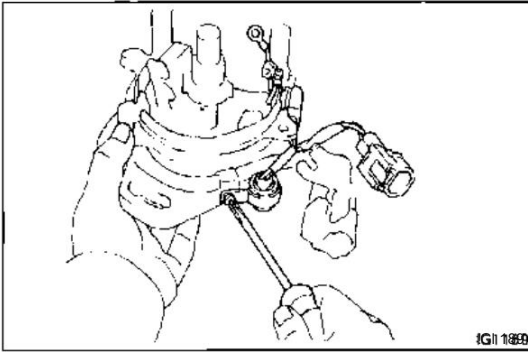
- (a) Disconnect the coil wire from the coil terminal.
- (b) Remove the coil wire and condenser.
- (c) Remove the grommet of the wire from the housing.



INSPECTION OF IIA

INSPECT GOVERNOR SHAFT

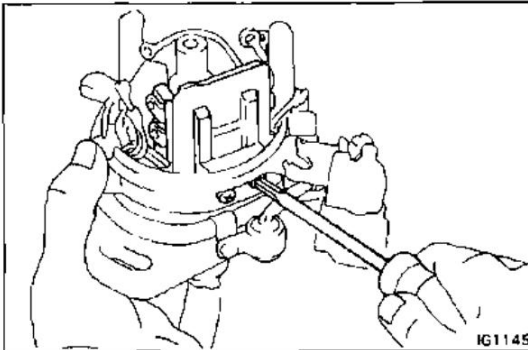
- Turn the governor shaft and check that it is not rough or worn.
- If it feels rough or worn, replace the IIA housing assembly.

**ASSEMBLY OF IIA**

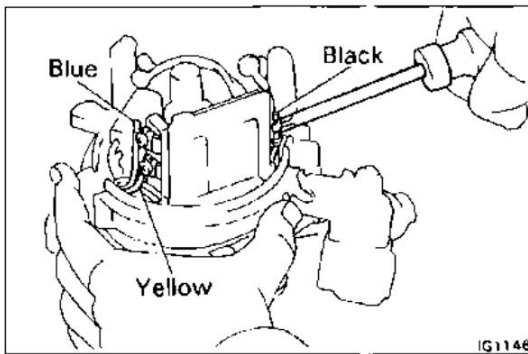
(See page IG-15)

1. INSTALL IIA WIRE

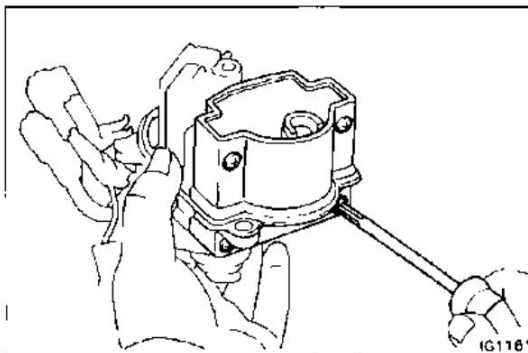
- (a) Fit the wire grommet to the IIA housing.
- (b) Install the IIA wire with the screw.
- (c) Install the connector to the ground clamp.

**2. INSTALL IGNITER**

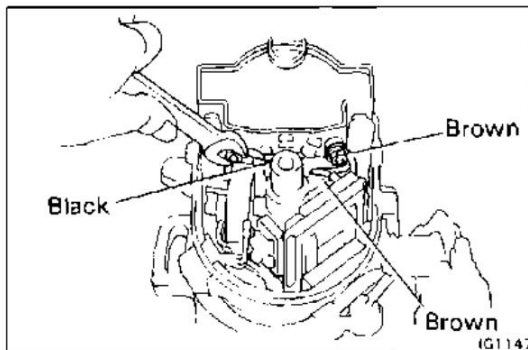
- (a) Install the igniter with the two screws.



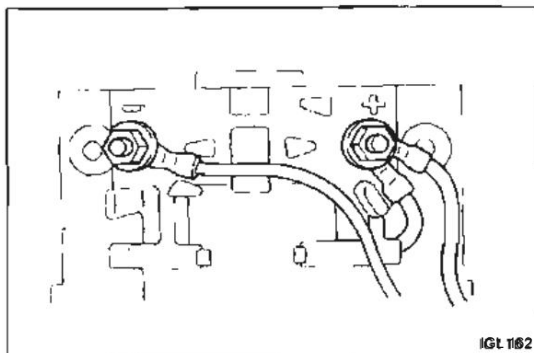
- (b) Connect the three wires to the igniter terminals with the three screws.

**3. INSTALL IGNITION COIL**

- (a) Install the gasket and ignition coil with the four screws.



- (b) Connect the three wires to the ignition coil terminals with the two nuts.



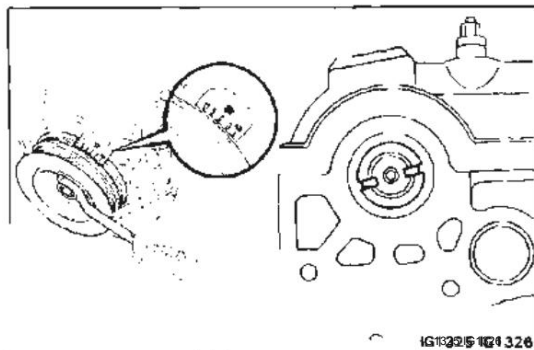
IG1162

NOTICE:

- When connecting the wires to the ignition coil, insert both properly into the sockets found on the side of the ignition coil.
- Be sure that the wires do not contact with signal rotor or distributor.

3. INSTALL IGNITION COIL DUST COVER**4. INSTALL ROTOR****5. INSTALL IIA CAP AND HIGH TENSION CORDS****INSTALLATION OF IIA****1. CONFIRM CYLINDER TOP POSITION**

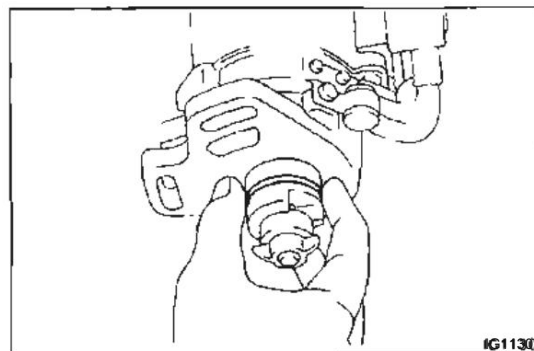
Turn the crankshaft clockwise and position the side of the intake camshaft as shown in the figure.



IG1325 IG1326

2. INSTALL IIA

- (a) Install a new O-ring to the housing.
- (b) Apply a light coat of engine oil to the O-ring.

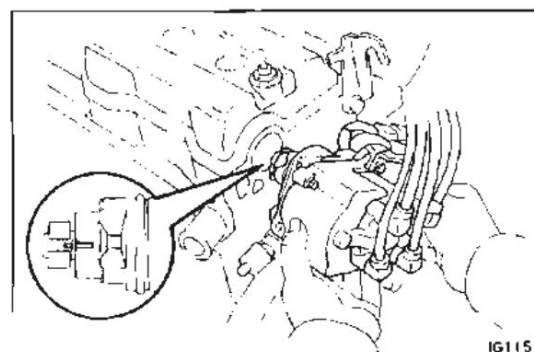


IG1130

- (c) Align the center of the coupling with the line of the housing.

- (d) Insert the IIA, aligning the center of the flange with that of a bolt hole on the cylinder head.

- (e) Apply a light coat of engine oil to the two bolts.



IG1151

3. CONNECT HIGH TENSION CORDS TO SPARK PLUGS

Firing order: 1-3-4-2

4. CONNECT SA COIL WIRE**5. ADJUST IGNITION TIMING (See page EM-20)**

Ignition timing:

10° BDC @ idle

(w/ terminals TE1 and E1 connected)

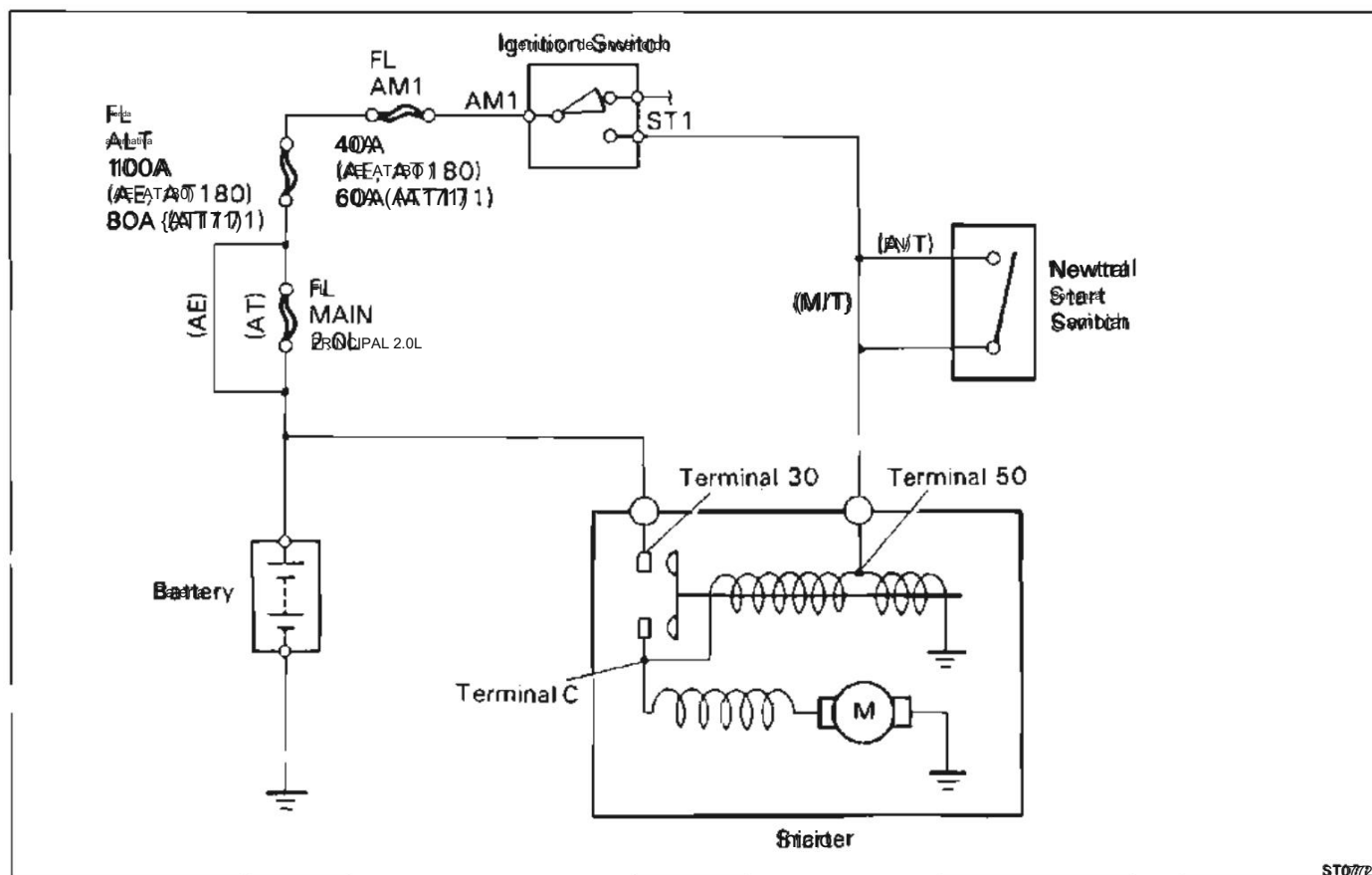
STARTING SYSTEM

	Page
TRUBLESHOOTING.....ST-2.....	ST-2
STARTING SYSTEM CIRCUITRY.....ST-2.....	ST-2
PLANETARY TYPE STARTER.....ST-3.....	ST-3

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine will not crank	Battery charge low Battery cables loose, corroded or worn Neutral start switch faulty (A/AT) Fusible link blown Starter faulty Ignition switch faulty	Check battery specific gravity Charge or replace battery Repair or replace cables Adjust or replace switch Replace fusible link Repair starter Replace ignition switch	CH-4 ST-3, 17
Engine cranks slowly	Battery charge low Battery cables loose, corroded or worn Starter faulty	Check battery specific gravity Charge or replace battery Repair or replace cables Repair starter	CH-4 ST-3, 17
Starter keeps running	Starter faulty Ignition switch faulty Short in wiring	Repair starter Replace ignition switch Repair wiring	ST-3, 17
Starter spins engine with no crank	Pinion gear teeth broken or faulty starter Flywheel or drive plate teeth broken	Repair starter Replace flywheel or drive plate	ST-3, 17

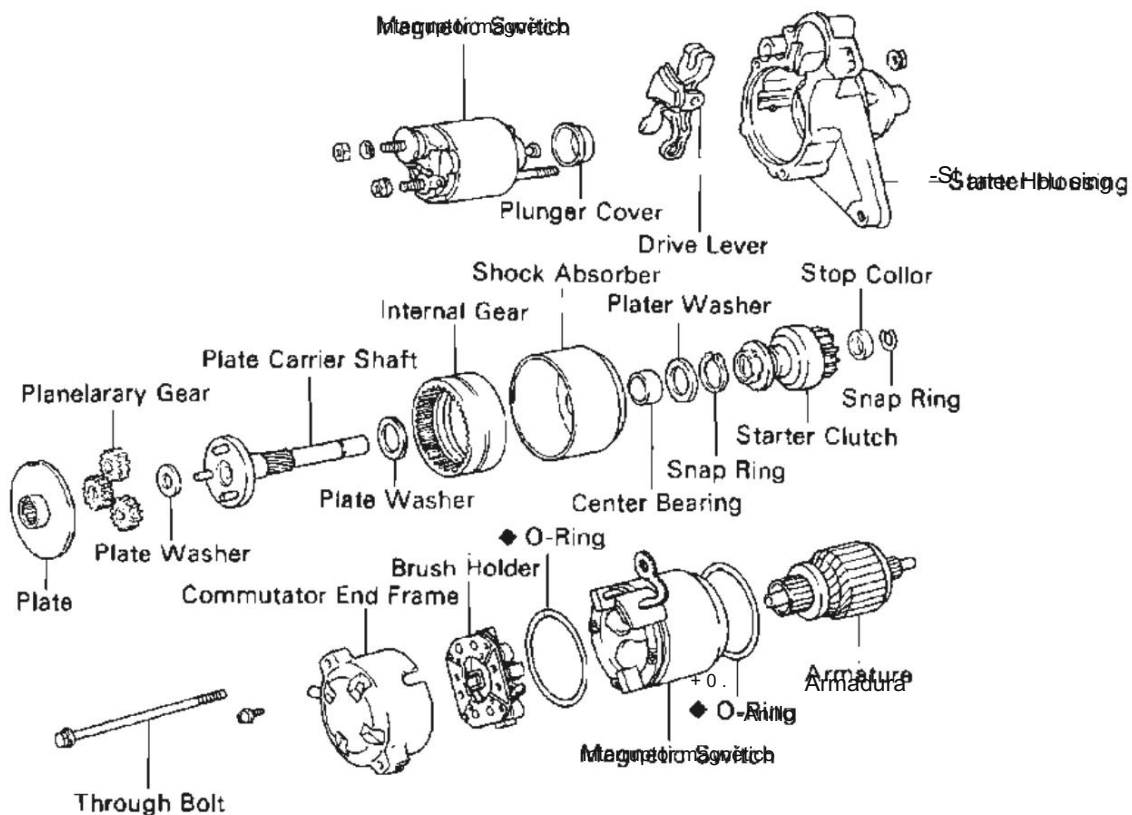
STARTING SYSTEM CIRCUIT



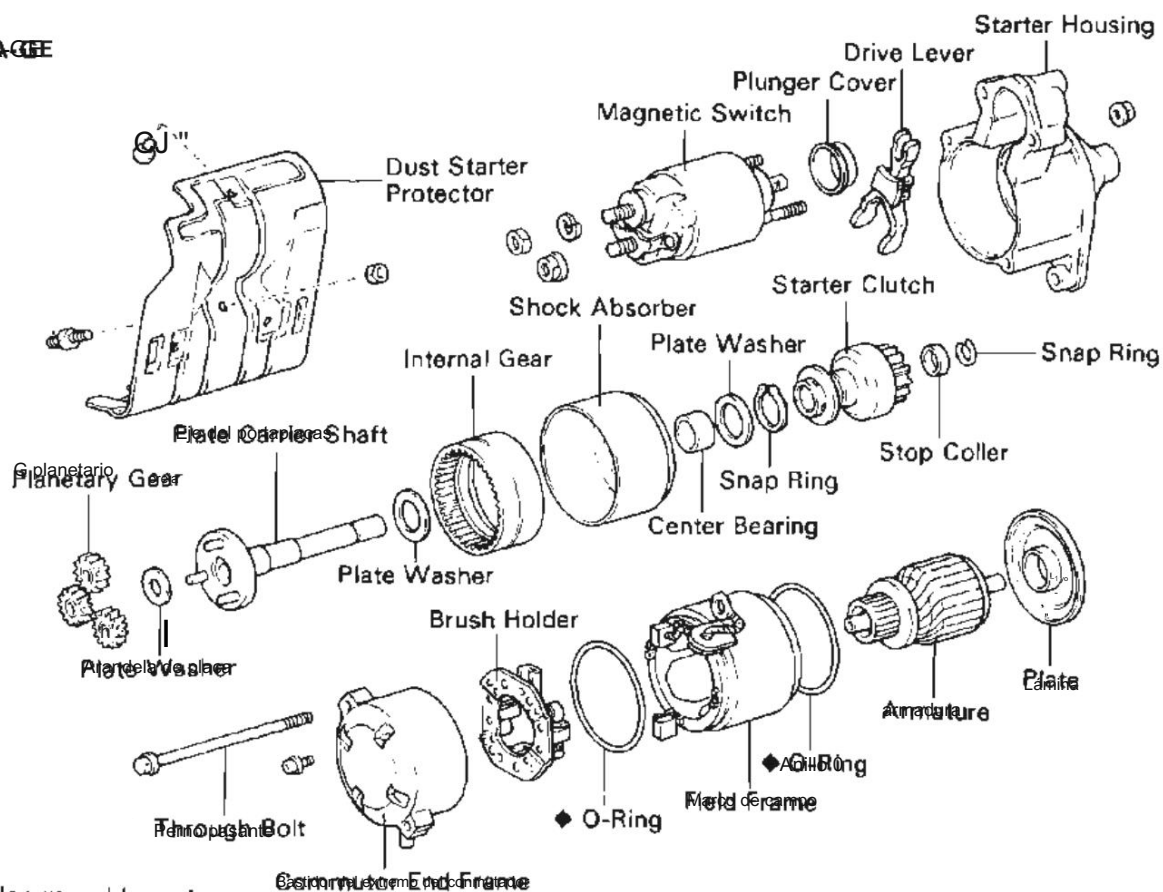
PLANETARY TYPE STARTER

COMPONENTES TIPO ESTRELLA - COMPONENTS

4A-FE



4A-GE



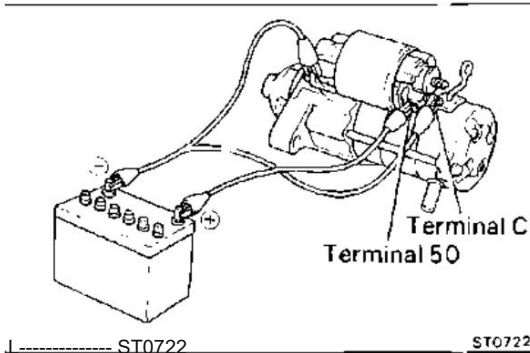
* No parts available

Commutator End Frame

S10719
S10765

PERFORMANCE TEST OF PLANETARY TYPE STARTER

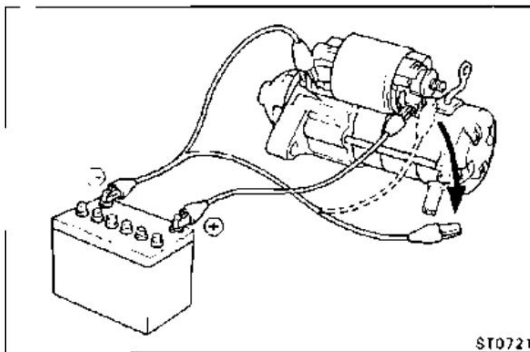
NOTICE: These tests must be performed within 3 to 5 seconds to avoid burning out the coil.



1. REPAIR PULL-IN TEST

- Disconnect the field coil lead from terminal C.
- Connect the battery to the magnetic switch as shown. Check that the clutch pinion gear moves outward.

If the clutch pinion gear does not move, replace the magnetic switch.

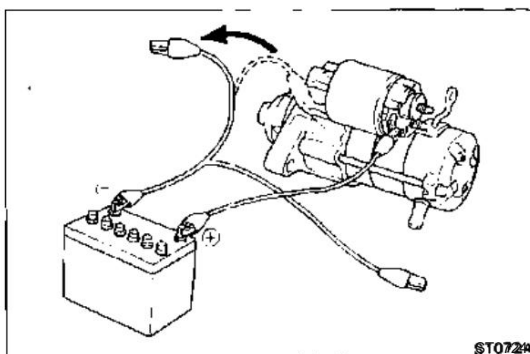


2. REPAIR HOLD-IN TEST

With the battery connected as above and with the pinion out, disconnect the (negative (-)) lead from terminal C.

Check that the clutch pinion remains out.

If the clutch pinion gear returns inward, replace the magnetic switch.

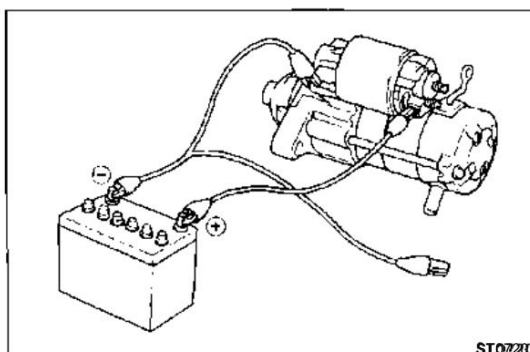


3. INSPECT CLUTCH PINION GEAR RETURN

Disconnect the negative (-) lead from the switch body.

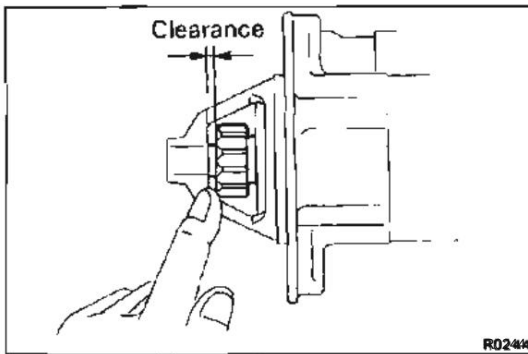
Check that the clutch pinion gear returns inward.

If the clutch pinion gear does not return, replace the magnetic switch.



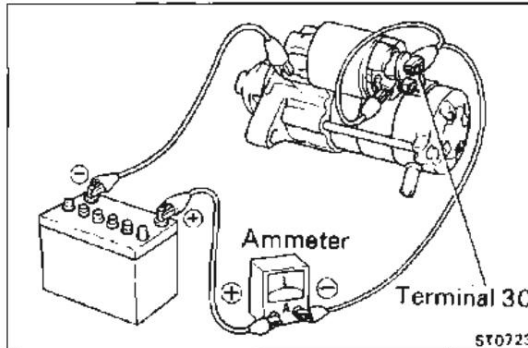
4. INSPECT CLUTCH PINION GEAR CLEARANCE

- Connect the battery to the magnetic switch as shown.



- (b) Move the pinion gear toward the armature to remove slack and measure the clearance between the pinion gear end and stop collar.

Standard clearance 5 mm (0.04 – 0.20 in.)



5. REPAIR MANUAL — AIRCRAFT TYPE STARTER

- (a) Connect the flexible lead terminal C. Check that the lead is correctly connected.
- (b) Connect the battery and ammeter to the starter as shown.
- (c) Check that the starter rotates smoothly and steadily with the clutch pinion gear moving out. Check reading on the ammeter.

Specified period a . 90A on less at 11.5V

SISAIRGANDG SXISCEM

	Page
PRECAUTIONS.....CH-2..	CH-2
TROUBLESHOOTING.....CH-2	CH-2
CIRABGNDG CIRCGHT.....CH-2.....	CH-2
ON PEACHONE INSPECTION.....CH-3.....	CH-3
ALTERNATOR.....CH-7.....	CH-7

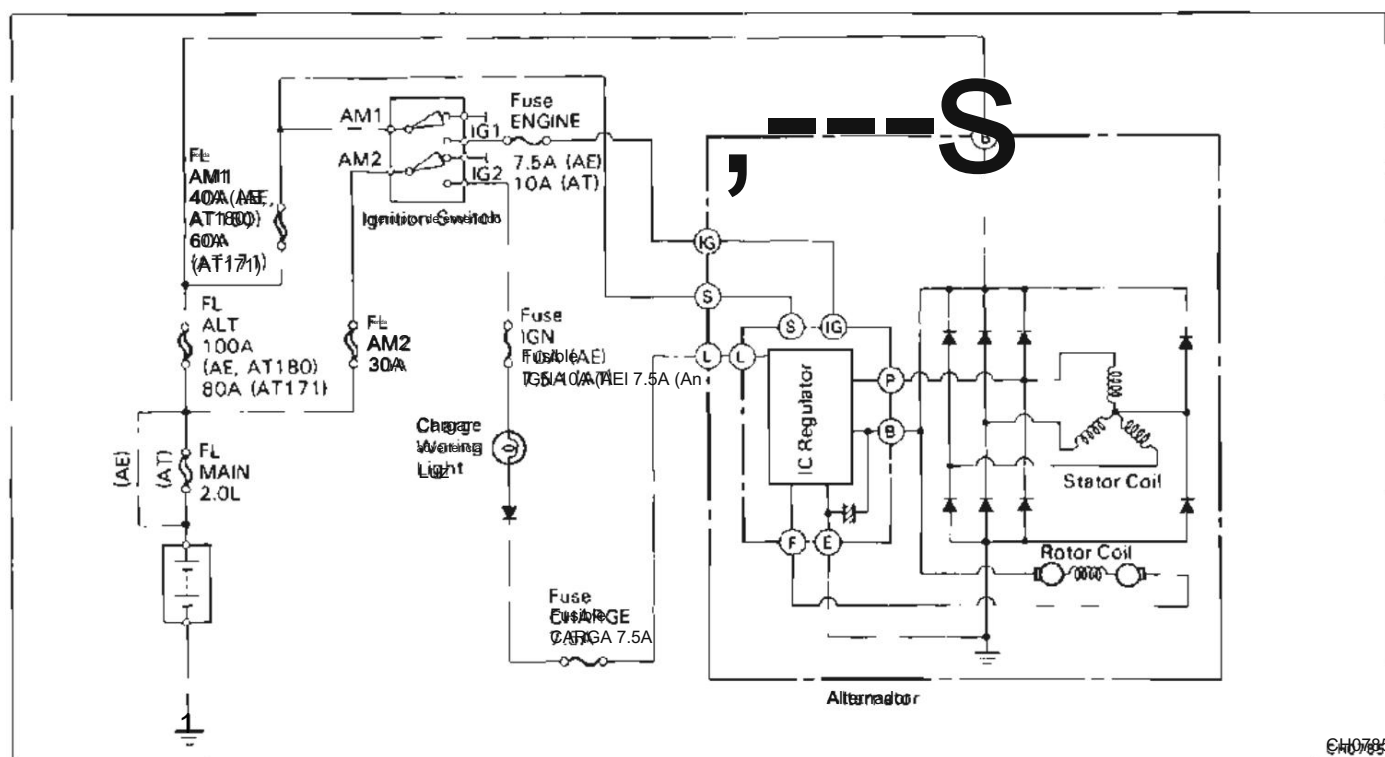
PRECAUTIONS

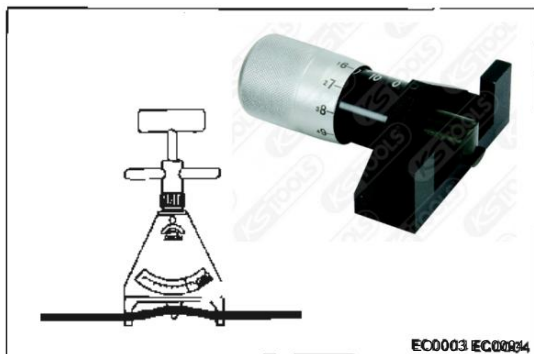
1. Verify that the battery cables are connected to the correct terminals.
2. Disconnect the battery cables when the battery is giving a quick charge.
3. Do not perform tests with a high voltage insulation resistance tester.
4. Never disconnect the battery while the engine is running.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Discharge warning light goes on and light with ignition ON and engine off	Fuse blown Light burned out Wiring connection loose Regulator faulty	Check "CHARGE" and "IGN" fuses Replace light Tighten loose connections Replace regulator	CH-7
Discharge warning light does not go out with engine running (battery requires frequent recharging)	Drive belt loose or worn Battery cables loose or corroded or worn Fuse blown Fusible link blown Regulator or alternator faulty Wiring faulty	Adjust or replace drive belt Repair or replace cables Check "CHARGE" or "IGNITION" fuses Replace fusible link Check charging system Repair wiring	CH-3 CH-2

CHARGING CIRCUIT



**(Reference)**

Using SST check the drive belt tension.

SST A 09216-00020

Drive belt tension:
Acero inoxidable B 09216-00030

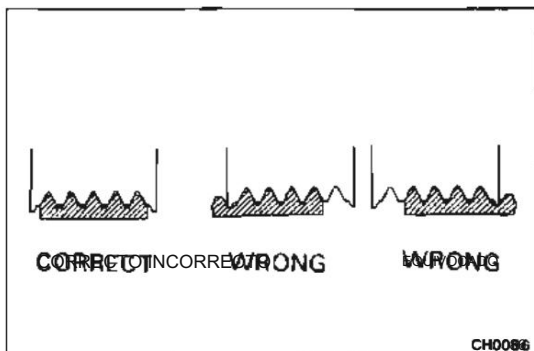
4A-FE - 15 N

Tensión de la correa de transmisión :

4A-FE

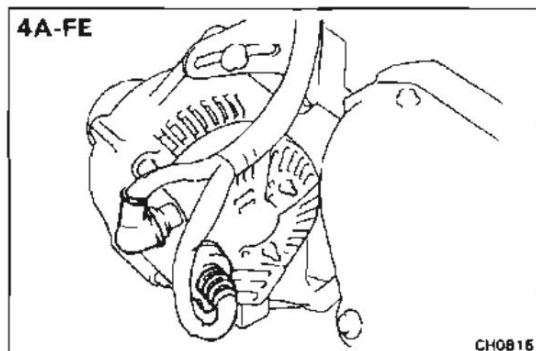
Cinturón nuevo 60 - 70 kg

Cinturón usado 40 - 55 kg

**HINT:**

- **"New belt"** refers to a belt which has been used less than 5 minutes on a running engine.
- **"Used belt"** refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing the drive belt, check that it fits properly in the ribbed grooves.
- Check with your hand to confirm that the belt has not slipped out of the groove on the bottom of the crank pulley.
- After installing the belt, run the engine for approx. 5 minutes and recheck the deflection or tension.

4A-FE

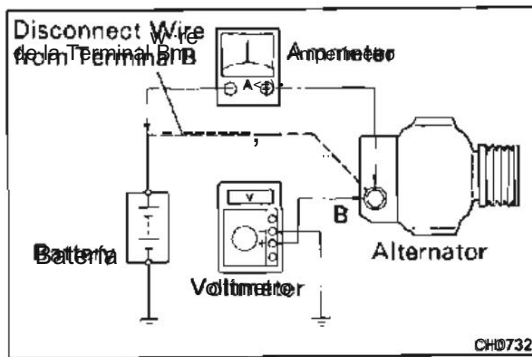


4. COMPREHENSIVELY VISUALLY CHECK ALTERNATOR WIRING AND LISTEN FOR ABNORMAL NOISES

- (a) Check that the wiring is in good condition.
- (b) Check that there are no abnormal noise from the alternator while the engine is running.

5. COMPREHENSIVELY CHECK DISCHARGE WARNING LIGHT CIRCUIT

- (a) Warm up the engine and then turn it off.
 - (b) Turn off all accessories.
 - (c) Turn the ignition switch to ON. Check that the discharge warning light is lit.
 - (d) Start the engine. Check that the light goes out.
- If the light does not function as specified, troubleshoot the warning light circuit.

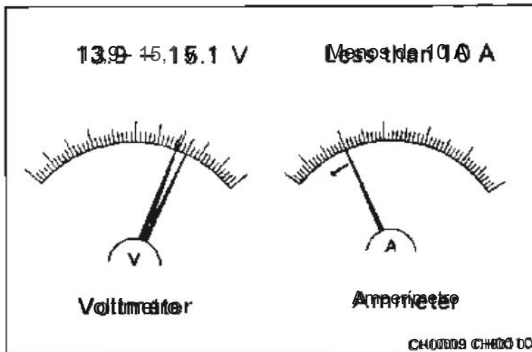


6. CHECK CHARGING CIRCUIT WITH NO LOAD

OBSERVATION: battery/alternator tester is available, connect the tester to the charging circuit as follows according to the manufacturer's instructions.

(a) If a tester is not available, connect the voltmeter and ammeter to the charging circuit as follows:

- Disconnect the wire from terminal B of the alternator and connect the wire to the negative (-) terminal of the ammeter.
- Connect the test lead from the positive (+) terminal of the ammeter to terminal B of the alternator.
- Connect the positive (+) lead of the voltmeter to terminal B of the alternator.
- Ground the negative (-) lead of the voltmeter.



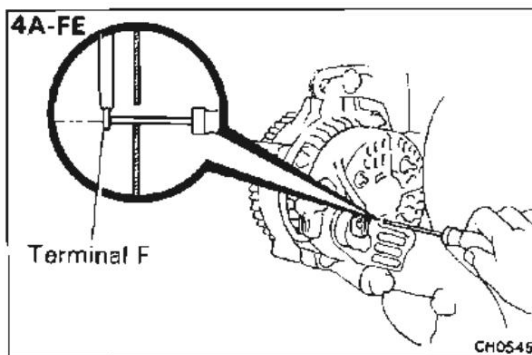
(b) Check the charging circuit as follows:

With the engine running from 2000 to 2500 rpm, check the reading on the ammeter and voltmeter.

Standard charging current is 10 A or 10 A

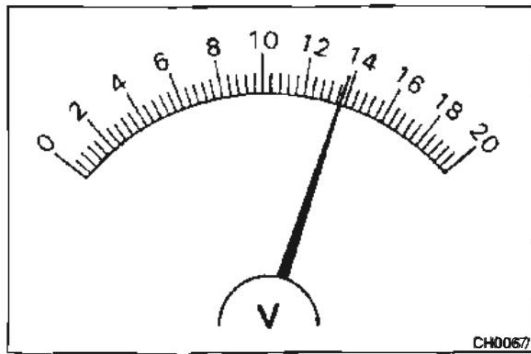
Standard voltage is 13.5-14.1 V at 25°C (77°F) 13.5-14.1 V at 25°C (77°F) 13.5-14.1 V at 25°C (77°F)

If the voltage reading is greater than standard voltage, replace the IC regulator.

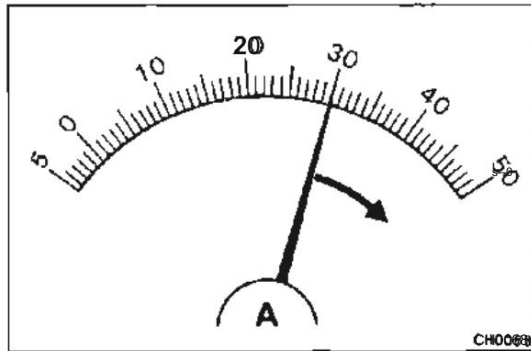


If the voltage reading is less than standard voltage, check the IC regulator and alternator as follows:

- With terminal B grounded, start the engine and check the voltage reading of terminal B.
- If the voltage reading is higher than standard voltage, replace the IC regulator.
- If the voltage reading is less than standard voltage, repair the alternator.



- Si el lecturade voltaje no es la estándar, reemplazaregulator IC regulator.
- Si el lecturade voltaje no es la estándar, reemplazaregulator IC regulator.

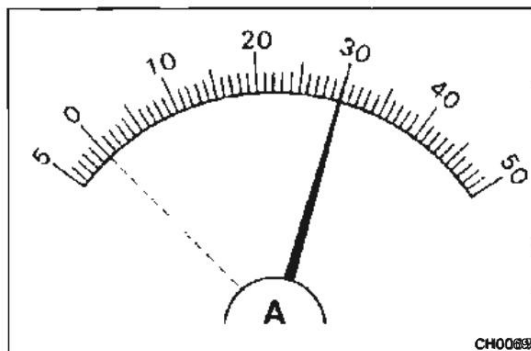


7. INSPECT CHARGING CIRCUIT WITH LOAD

(a) Con el motor funcionando a 2000 rpm, la carga de luces de freno traseras debe ser de 20.0A o más.

(b) Verifique la lectura del amperímetro.

Si el amperaje es menor de 20A o más

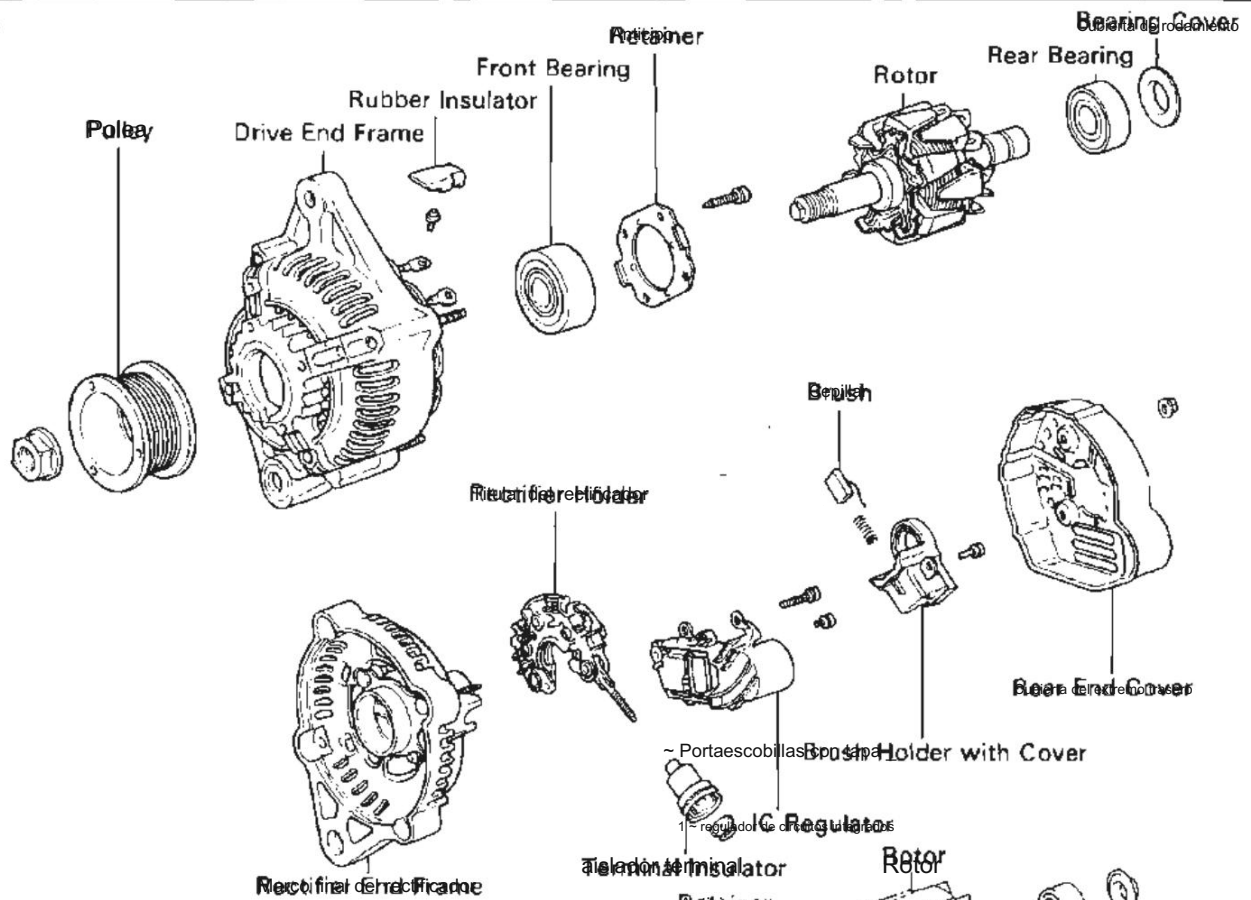


Si la lectura del amperaje es inferior a la especificada, repare el alternador (Véase página CH-7).

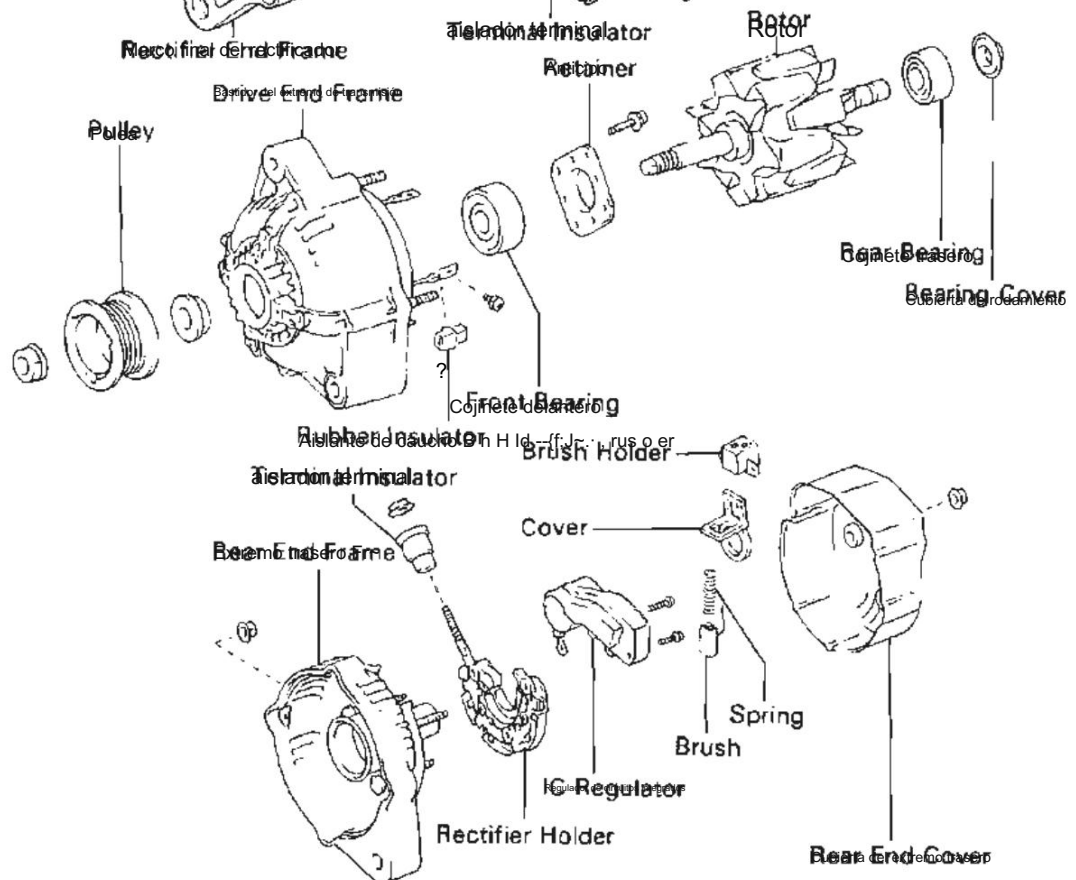
Si la lectura del amperaje es superior a la especificada, repare el alternador (Véase página CH-7).

ALTERNATOR COMPONENTS

4A-FEE



4A-GE



SERVICE SPECIFICATIONS

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ENGINE MECHANICAL (4A-FE)

Specifications

Engine type and map	Drive belt (Alternator)	Drive belt (Transistor alternator)	Drive belt (New belt)	Drive belt (Used belt)
	Definition	New belt	8.5 10.5 10.5 mm	0.335 0.413 0.413 in.
	Tension (Reference)	New belt	10.0 12.0 12.0 mm	0.394 0.47 0.472 in.
	Engine oil capacity (w/ Header)	New belt	60 - 70 kg	40 - 55 kg
	Engine oil capacity (w/ Header)	Used belt		
	AE MM/T		6.2 liters	6.5 U.S. qts
	AA AB/T		6.1 liters	6.4 U.S. qts
	AT1711		5.6 liters	5.9 U.S. qts
	AT1880		5.2 liters	5.5 U.S. qts
	Engine oil capacity			
	w/ Oil cooler Drain and fill			
	w/ Oil filter change		3.0 liters	3.2 U.S. qts
	w/ Oil filter change		3.3 liters	3.5 U.S. qts
	Day fill		3.7 liters	3.9 U.S. qts
	w/ Oil cooler Drain and fill			
	w/ Oil filter change		3.0 liters	3.2 U.S. qts
	w/ Oil filter change		3.3 liters	3.5 U.S. qts
	Day fill		4.1 liters	4.3 U.S. qts
	Engine oil API grade			
	Europe and Australia		SE, SE, SE, SE or better	
	Others		SD, SE, SE, SE or better	
	Battery specific gravity		1.25 1.27 1.27 w/ temp. 120°C (248°F) at 20°C (68°F)	
	High tension cable resistance	Limit	25 kΩ per cord	
	Spark plug			
	Type	ND	0118RTU	
		NGK	BCPR5EY	
	Gap		0.8 mm	0.031 in.
	Distributor (IA) (IIA)			
	Adjust gap		0.2 mm or more	0.008 in. or more
	Risk up oil hose resistance		140 1.4 80 Ω	
	Ignition timing		10° BTDC (w/ 1.0 mm (0.039 in.) connected)	
	Firing order		1-3-4-2-4-2	
	Valve clearance	Intake	0.15 0.25 0.25 mm	0.006 0.01 0.01 in.
		Exhaust	0.20 0.30 0.30 mm	0.008 0.012 0.012 in.
	Idle speed		800 rpm (w/ cooling fan off)	
	Volts at idle		2.5 ± 0.7 V	
	Idle CO concentration	ppm TWC	0 - 4.5 0.5 %	
		w/ TWC	1.5 ± 0.5 0.5 %	
	Dash potentiometer setting			
	MMT		1.8 0.0 (open w/ cooling fan off)	
	AAT		2.2 0.0 (open w/ cooling fan off)	
Intake manifold vacuum	at idle speed		More than 44 (0.72 mm Hg, 15.7 kPa) n. Hg, 58.7 kPa	

Compression pressure	at 2500 rpm Limit	1355 kg/cm ² 191 pspsi 1320 kPa 1902 kg/cm ² 142 pspsi 981 kPa 1.0 (kg/cm ² kPa) or less
Valve pulley tensioning location	Free length Installed length (0.2 mm (0.008 in.) Limit	384 mm 364-414 kg 1.512 in. 7.98-8.80 lbs 3539 N
Cylinder head	Head surface warpage Limit Manifold surface warpage Limit Cylinder head thickness Valve seat Angle of range Contacting angle Contacting width Spark plug tube protrusion height	0.05 mm 0.10 mm 953 mm 30°-45° 45° 1.2-1.6 mm 46.8-47.6 mm 0.020-0.021 in. 0.0039 in. 375 g 30°-45° 0.047-0.063 in. 1.843-1.874 in.
Valve guide bushing	Pin diameter Outside diameter Limit Recess height Replating temperature (cylinder head side)	60.16-60.3 mm 110.00-110.27 mm 110.05-110.77 mm 127.13-130.1 mm 80-100°C 0.2366-0.2374 in. 0.4331 - 0.4341 in. 0.4350 - 0.4361 in. 0.500-0.516 in. 176-212°F
Valve	Valve overall length Limit Valve face angle Stem diameter Limit Stem seal clearance Limit Valve head edge thickness Limit	914.5 mm 919.0 mm 909.5 mm 914.0 mm 45.5° 5.975-5.985 mm 5.985-5.995 mm 0.0250-0.0260 mm 0.030-0.031 mm 0.10 mm 0.039 in. 0.3618 in. 3.5807 in. 3.5984 in. 0.2350 - 0.2356 in. 0.2348 - 0.2354 in. 0.0010 - 0.0024 in. 0.0012 - 0.0026 in. 0.0013 in. 0.0039 in.
Valve spring	Free length Installed length Installed load Limit Squareness Limit	438.8 mm 347.7 mm 1588 kg 1466 kg 2.0 mm 1.724 in. 1.366 in. 348 lbs 323 lbs 0.0078 in.
Valve lifter	Outside diameter Pin diameter (Cylinder head lifter bore) Oil clearance Limit	27.575-27.985 mm 26.058-26.065 mm 0.022-0.051 mm 0.10 mm 1.1014 - 1.1018 in. 1.0325 - 1.033 in. 0.0008 - 0.0020 in.
Manifold	Manifold surface warpage Limit Limit	0.20 mm 0.30 mm 0.0079 in. 0.0118 in.

Specifications (Cont'd)

Crankshaft	Pin thrust clearance	STD	0.030 - 0.085 mm 0.0012 - 0.0033 in.	0.0012 - 0.0033 in.
	Exhaust	Limite	0.035 - 0.090 mm 0.0014 - 0.0035 in.	0.0014 - 0.0035 in.
	Limits		0.11 mm 0.0043 in.	
	Liquid cooling system STD	STD	0.035 - 0.072 mm 0.0014 - 0.0028 in.	0.0014 - 0.0028 in.
	Limits		0.10 mm 0.0039 in.	
	Journal diameter	STD		
	Exhaust No. 1		24.94 - 24.965 mm 0.9822 - 0.9829 in.	0.9822 - 0.9829 in.
	Others		22.94 - 22.962 mm 0.9035 - 0.9041 in.	0.9035 - 0.9041 in.
	Circle run out	Limite	0.04 mm 0.0016 in.	0.0016 in.
	Camshaft height	STD	35.2 - 35.315 mm 1.3862 - 1.3902 in.	1.3862 - 1.3902 in.
Cylinder block	Exhaust	Limite	34.9 - 35.015 mm 1.3783 - 1.3788 in.	1.3744 - 1.3783 in.
	Intake	Limite	34.8 mm 1.3708 in.	1.3708 in.
	Exhaust	Limite	34.5 mm 1.3583 in.	1.3583 in.
	Camshaft gear spring end free distance		17.1 - 17.5 mm 0.6732 - 0.6890 in.	0.6732 - 0.6890 in.
	Camshaft gear backlash	STD	0.020 - 0.200 mm 0.0008 - 0.0079 in.	0.0008 - 0.0079 in.
	Limits		0.30 mm 0.0118 in.	0.0118 in.
	Cylinder head surface warpage		0.05 mm 0.0020 in.	0.0020 in.
	Cylinder bore	STD	81.00 - 81.01 mm 3.1890 - 3.1894 in.	3.1890 - 3.1894 in.
	Mark "2"	81.01 - 81.02 mm 3.1894 - 3.1898 in.	3.1894 - 3.1898 in.	
	Mark "3"	81.02 - 81.03 mm 3.1898 - 3.1902 in.	3.1898 - 3.1902 in.	
Piston and piston ring	Emp standard sized piston	Limite	81.23 mm 3.1980 in.	3.1980 in.
	Emp 0.5 dia sized piston	Limite	81.73 mm 3.2177 in.	3.2177 in.
	Cylinder bore wear	Limite	0.2 mm 0.008 in.	0.008 in.
	Difference of bore between cylinder		0.05 mm 0.0020 in.	0.0020 in.
	Thaper and out of round - Conolly ovalado	Limite	0.02 mm 0.0008 in.	0.0008 in.
	Piston diameter	STD	80.982 - 80.994 mm 3.1862 - 3.1886 in.	3.1862 - 3.1886 in.
	Mark "2"	80.94 - 80.95 mm 3.1866 - 3.1870 in.	3.1866 - 3.1870 in.	
	Mark "3"	80.95 - 80.96 mm 3.1870 - 3.1874 in.	3.1870 - 3.1874 in.	
	0.55, 0.50		81.43 - 81.46 mm 3.2059 - 3.2071 in.	3.2059 - 3.2071 in.
	Piston to cylinder clearance		0.060 - 0.08 mm 0.0024 - 0.0031 in.	0.0024 - 0.0031 in.
Connecting rod	Piston ring end gap	Nd. ETS STD	0.25 - 0.45 mm 0.0098 - 0.0177 in.	0.0098 - 0.0177 in.
	Limits		1.05 mm 0.0413 in.	0.0413 in.
	Nd. 2 TS STD		0.15 - 0.40 mm 0.0059 - 0.0157 in.	0.0059 - 0.0157 in.
	Limits		1.00 mm 0.0394 in.	0.0394 in.
	Oil	STD	0.10 - 0.20 mm 0.0039 - 0.0079 in.	0.0039 - 0.0079 in.
	Limits		1.30 mm 0.0512 in.	0.0512 in.
	Ring to ring groove clearance	Nd. 1	0.04 - 0.08 mm 0.0016 - 0.0031 in.	0.0016 - 0.0031 in.
	Nd. 2		0.03 - 0.07 mm 0.0012 - 0.0028 in.	0.0012 - 0.0028 in.
	Piston pin installing temperature		20°C 68°F	68°F
Connecting rod	Pin thrust clearance	STD	0.15 - 0.25 mm 0.0059 - 0.0098 in.	0.0059 - 0.0098 in.
	Limits		0.30 mm 0.0118 in.	0.0118 in.
	Connecting rod bearing center wall thickness			
	STD No. 1 No. 1		1.486 - 1.490 mm 0.0585 - 0.0588 in.	0.0585 - 0.0588 in.
	Nd. 22		1.490 - 1.494 mm 0.0588 - 0.0590 in.	0.0588 - 0.0590 in.
	Nd. 33		1.494 - 1.498 mm 0.0590 - 0.0593 in.	0.0590 - 0.0593 in.
	U/S 0.25		1.60 - 1.613 mm 0.0630 - 0.0635 in.	0.0630 - 0.0635 in.

Specifications (Cont'd)

Connecting rod (cont'd)	Bearing oil clearance	STD	0.020-0.051 mm	0.0008 - 0.0020 in.
		Limit	0.03 mm	0.0031 in.
	Rod bore	Limit	0.05 mm	0.0020 in.
	Rod twist	Limit	0.05 mm	0.0020 in.
Crankshaft	Flange clearance	STD	0.020-0.22 mm	0.0008 - 0.0087 in.
		Limit	0.30 mm	0.0118 in.
	Pin retainer washer thickness	STD	2.44 (2.490 mm) 0.0961	0.0961 - 0.0980 in.
	Main journal oil clearance	STD	0.0150-0.030 mm	0.0006 - 0.0013 in.
		U/S 0-25	0.0180-0.050 mm	0.0007 - 0.0022 in.
		Limit	0.10 mm	0.0039 in.
	Main journal diameter	STD	47.982-48.006 mm	1.8891 - 1.8900 in.
	Main journal finished diameter	U/S 0-25	47.954-47.955 mm	1.8897 - 1.8801 in.
	Major bearing center wall thickness	STD	2.002-2.005 mm	0.0788 - 0.0789 in.
		Mark "2"	2.005 - 2.006 mm	0.0789 - 0.0791 in.
		Mark "3"	2.008 - 2.010 mm	0.0791 - 0.0792 in.
		Mark "4"	2.011 - 2.013 mm	0.0792 - 0.0793 in.
		Mark "5"	2.014 - 2.014 mm	0.0793 - 0.0794 in.
		U/S 0-25	2.122-2.127 mm	0.0835 - 0.0837 in.
	Crank pin diameter	STD	39.985-40.004 mm	1.5742 - 1.5748 in.
	Crank pin finished diameter	U/S 0-25	39.954-39.955 mm	1.5648 - 1.5652 in.
	Circle run out	Limit	0.06 mm	0.0024 in.
	Main journal taper and out of round	Limit	0.02 mm	0.0008 in.
	Crank pin journal taper and out of round	Limit	0.02 mm	0.0008 in.

Torque Specifications

Part tightened	kg-cm	ft-lb	N-m
Cylinder head bolt	610	44	60
Cylinder head x Crankshaft bearing cap	130	9	13
Cylinder head x Spark plug	180	13	18
Cylinder head x Intake manifold	195	14	19
Cylinder head x Exhaust manifold	250	18	25
Cylinder block x Timing belt idler pulley	375	27	37
Cylinder block x Oil pump	220	16	22
Cylinder block x Crankshaft bearing cap	610	44	60
Cylinder block x Oil pan	50	43 in-lb	4.9
Crankshaft x Crankshaft timing pulley	600	43	59
Crankshaft x Crankshaft pulley	1,200	87	118
Crankshaft x Flywheel	800	58	78
Connecting rod cap x Connecting rod	500	36	49
Oil pump x Oil strainer	95	82 in-lb	9.3

EIS SYSTEM (4A-FE)

Specifications

Fuel pressure regulator Regulador de presión de combustible	Fuel pressure at No vacuum Presión de combustible sin vacío	2.7-3.1 kg/cm ² (38-44 psi) 265 - 304 kPa
Idle start injector Inyectores de arranque	Resistance Resistencia	2-4 14 Ω
	Fuel leakage Fuga de combustible	Less than one drop of fuel per minute Menos de una gota de combustible por minuto
Injector Inyectores	Resistance Resistencia	Approx. 3.8 Ω
	Injection volume Volumen de inyección	40 to 50 cc (1.5 to 2.4 cu in.)
	Difference between injectors Diferencia entre inyectores	5 mm (0.2 in) or less
	Fuel leakage Fuga de combustible	One drop or less of fuel per minute Una gota o menos de combustible por minuto
Throttle body Cuerpo de la válvula de mariposa	Throttle valve fully closed angle Ángulo completamente cerrado de la válvula de mariposa	60°
Throttle position sensor Sensor de posición de la válvula de mariposa	Throttle opening angle from vertical (desde la posición vertical)	IDL E2 E2
	Clearance between stop screw and lever Españamiento entre tornillo de parada y palanca	PSW E2 E2
	-	Continuity
	-	No continuity
	Less than 57.5° 73° (WT), 63.8° (A/T) 79° (LSP), 69° (A/T)	Continuity
	-	No continuity
	-	No continuity
	-	No continuity
	-	Continuity
Start injector time switch Interruptor de tiempo inyectores de arranque	Resistance Resistencia	20 to 40 Ω
	STAA STJ	Below 30° (86°F)
	STAA Tien Ground	Above 40° (104°F)
	20 to 40 Ω	-
Water temp. sensor and intake air temp. sensor Sensor de temperatura del agua y sensor de temperatura de la admisión	Resistance Resistencia	10-20 20 kΩ
	at 20°C (68°F)	4-7 kΩ
	32°C (90°F)	0.9-1.3 1.3 kΩ
	40°C (104°F)	0.7 kΩ
	60°C (140°F)	0.2-0.4 0.4 kΩ
	80°C (176°F)	0.2-0.4 0.4 kΩ
Oxygen sensor Sensor de oxígeno	Heater resistance Resistencia del calentador	5.1-6.3 5.2 Ω
ECU	HINT: • Perform all voltage and resistance measurements with the ECU connected. • Realice todas las mediciones de voltaje y resistencia con la ECU conectada. • Verifique que la batería sea de 12 V o superior cuando el interruptor de encendido esté en la posición ON. Las sondas de prueba no deben hacer contacto con los terminales de oxígeno. • Pruebe los cables de prueba con los terminales de oxígeno. • Use the ECU oxygen and VF terminals.	
	Voltage	
	Terminal	STD voltage (V)
	Condition	
	+B - E1 E1	10- 44 14
	+B1 - E1	
	BATERIA - E1	
	IDL - E2 E2	4.5- 5.5 5.5
	PSW E2 E2	
	No. 10 - E1 E01	10- 44 14
	No. 20 - E02	
	W E4 E1	110 - 414

LUBRICATION SYSTEM

Oil pressure (normal operating temperature) Presión de aceite (temperatura normal de funcionamiento)		at idle speed a ralentí 900 rpm	More than 0.2 (kg/cm ² kPa), 3 psi, 0.29 daPa) 256 - 751.0 kg/cm ² (36.8a) - 71.1 psi, 245 - 490 kPa)
Oil pump Bomba de aceite	4A-FE		
	Body clearance Espacio entre el cuerpo	STD	0.080 - 0.100 mm 0.0031 - 0.0039 in.
		Limite	0.20 mm 0.0079 in.
	Tip clearance Espacio entre la punta	STD	0.025 - 0.085 mm 0.0010 - 0.0033 in.
		Limite	0.35 mm 0.0138 in.
	Side clearance Espacio lateral	ETS	0.025 - 0.085 mm 0.0010 - 0.0033 in.
		Limite	0.10 mm 0.0039 in.

IGNITION SYSTEM (4A-FE)

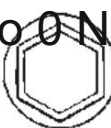
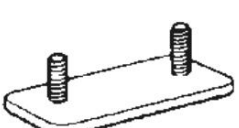
Ignition timing Tiempo de encendido		See page A-2 Consulte la página A-2	
Spark plug Bujía		See page A-2 Consulte la página A-2	
Firing order Orden de disparo		1-3-4-2-4-2	
Ignition coil Bobina de encendido	Resistance Resistencia	Limit Límite	25 k per record 25 k por registro
Ignition coil Bobina de encendido	Primary coil resistance 2WD Resistencia bobina primaria 2WD	2WD	11.25-15.6 n56 Ω
	Secondary coil resistance 2WD Resistencia bobina secundaria 2WD	2WD	10.4-14.0 kΩ
Distributor (IIA)	Air gap Espacio		0.2mm or more 0.008 in. or more
	Signal generator pickup coil resistance Resistencia del generador de señal (bobina captadora)		140 - 180 Ω

STANDARD BOLT TORQUE SPECIFICATIONS

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STANDARD BOLT TORQUE SPECIFICATIONS

HOW TO DETERMINE BOLT STRENGTH

	Marca	Class		Marca	Class
Hexagon cabeza hexagonal head bolt 	4— 5— 6— 7— 8— 9— 10— 11—	4T 5T 6T 7T 8T 9T 10T 11T	Stud bolt 	Sin marca No mark 	4T
Hexagon flange bolt con levadura hexagon bolt Hexagono 0 Nomark 	No mark	4T	6 strands 	6T	
Hexagon cabeza hexagonal head bolt 	Dos Two líneas protruding sobresalientes lines	5T			
Hexagon flange bolt con levadura 0 perno de brida hexagon bolt 	Dos Two líneas protruding sobresalientes lines	6T	Perno soldado Welded bolt 		4T
Hexagon head bolt 0 perno de cabeza 	tres Three sobresalientes protruding lines	7T			
Hexagon head bolt perno de cabeza Q Cuatro 	Four sobresalientes protruding lines	8T			

SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt			Hexagon flange bolt		
			kg-cm	ft-lb	N-m	kg-cm	ft-lb	N-m
4T	6	1	55	48 ping-lb	5	60	52 ping-lb	6
	8	1.25	130	9	12.5	145	10	14
	10	1.25	260	19	26	290	21	29
	12	1.25	480	35	47	540	39	53
	14	1.5	760	55	74	850	61	84
	16	1.5	1,150	83	115	—	—	—
5T	6	1	65	56 ping-lb	6.5	75	65 ping-lb	7.5
	8	1.25	160	12	15.5	175	13	17.5
	10	1.25	330	24	32	360	26	36
	12	1.25	600	43	59	670	48	65
	14	1.5	930	67	91	1,050	76	100
	16	1.5	1,400	101	140	—	—	—
6T	6	1	80	69 ping-lb	8	90	78 ping-lb	9
	8	1.25	195	14	19	210	15	21
	10	1.25	400	29	39	440	32	44
	12	1.25	730	53	71	810	59	80
	14	1.5	1,100	80	110	1,250	90	125
	16	1.5	1,750	127	170	—	—	—
7T	6	1	110	8	10.5	120	9	12
	8	1.25	260	19	25	290	21	28
	10	1.25	530	38	52	590	43	58
	12	1.25	970	70	95	1,050	76	105
	14	1.5	1,500	108	145	1,700	123	165
	16	1.5	2,300	166	230	—	—	—
8T	8	1.25	300	22	29	330	24	33
	10	1.25	620	45	61	690	50	68
	12	1.25	1,100	80	110	1,250	90	120
9T	8	1.25	340	25	34	380	27	37
	10	1.25	710	51	70	790	57	78
	12	1.25	1,300	94	125	1,450	105	140
10T	8	1.25	390	28	38	430	31	42
	10	1.25	800	58	78	890	64	88
	12	1.25	1,450	105	140	1,600	116	155
11T	8	1.25	430	31	42	480	35	47
	10	1.25	890	64	87	990	72	97
	12	1.25	1,600	116	155	1,800	130	175