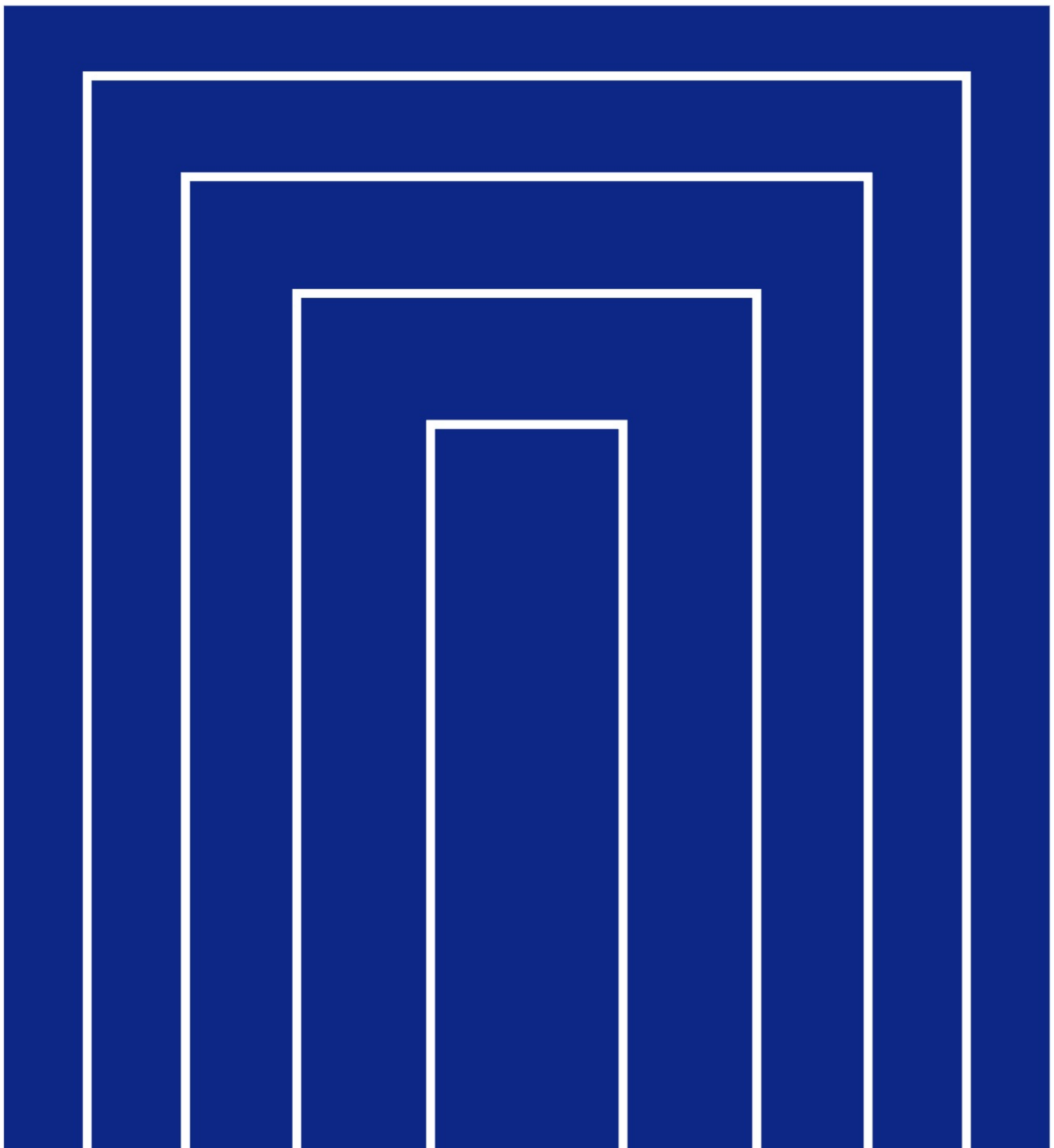
TOYOTA

1FZ-FE ENGINE

REPAIR MANUAL SUPPLEMENT

Jan., 1995



Pub. No. RM436E

FOREWORD

This supplement has been prepared to provide information covering general service repairs for the 1FZ-FE engine in the TOYOTA LAND CRUISER.

Applicable model: FZJ75, 80 series

For basic engine service repair, refer to the following repair manual.

1FZ-F, 1FZ-FE Engine Repair Manual (Pub. No. RM321E)

Please note that the publications below have also been prepared as relevant service manuals to the components and systems in this engine.

Manual Name	Pub. No.
• 1FZ-FE Engine Emission Control Repair Manual	ERM096E

All information in this manual is based on the latest product information at the time of publication. However, specifications and procedures are subject to change without notice.

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NOTE: The following screen toning letters section refer to 1FZ-FE Engine Repair Manual (Pub.No.RM321E).

INTRODUCTION IN
ENGINE EG
IGNITION SYSTEM IG
STARTING SYSTEM ST
CHARGING SYSTEM CH

INTRODUCTION

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HOW TO USE THIS MANUAL

IN002-16

INDEX

An INDEX is provided on the first page of each section to guide you to the item to be repaired. To assist you in finding your way through the manual, the Section Title and major heading are given at the top of every page.

IN

GENERAL DESCRIPTION

At the beginning of each section, a General Description (Precautions) is given that pertains to all repair operations contained in that section.
Read these precautions before starting any repair task.

TROUBLESHOOTING

TROUBLESHOOTING tables are included for each system to help you diagnose the problem and find the cause.

PREPARATION

Preparation lists the SST (Special Service Tools), recommended tools, equipment, lubricant and SSM (Special Service Materials) which should be prepared before beginning the operation and explains the purpose of each one.

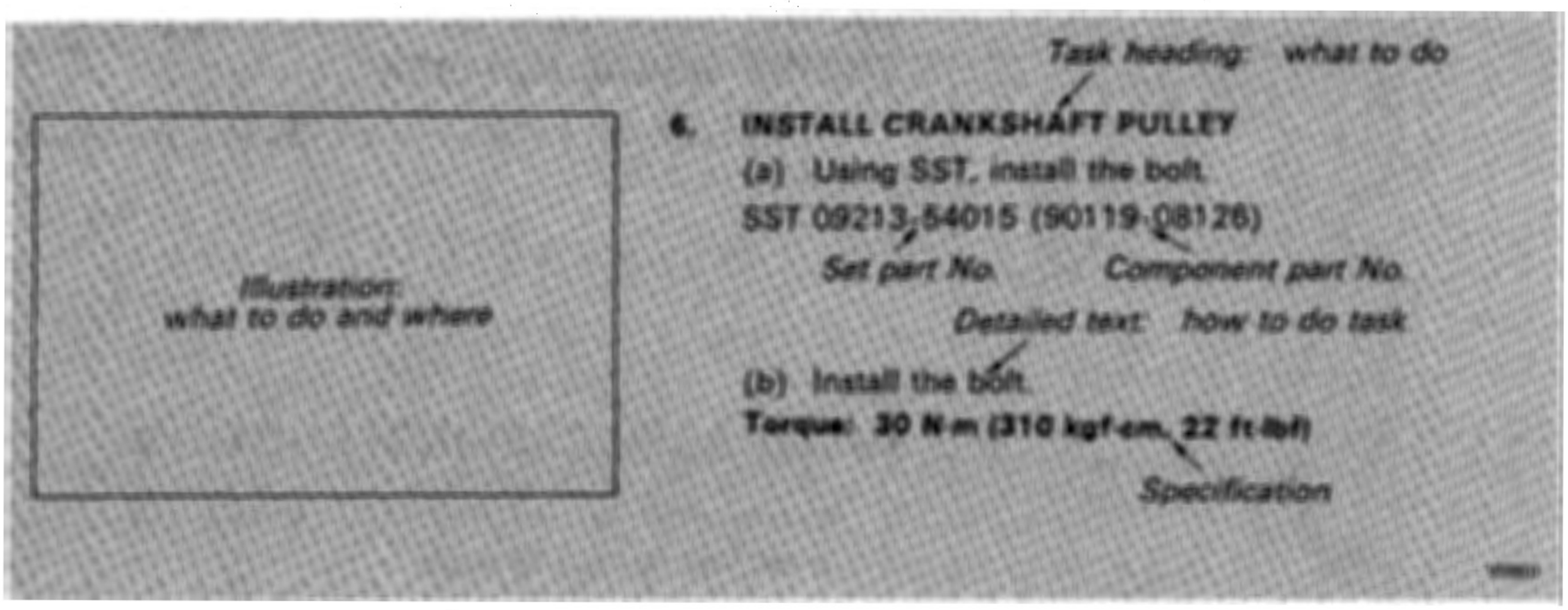
REPAIR PROCEDURES

Most repair operations begin with an overview illustration. It identifies the components and shows how the parts fit together.
Example:

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 TRACK to the information needed. The upper case task heading can be read at a glance when necessary, and the text below it provides detailed information. Important specifications and warnings always stand out in bold type.

REFERENCES

References have been kept to a minimum. However, when they are required you are given the page to refer to.

SPECIFICATIONS

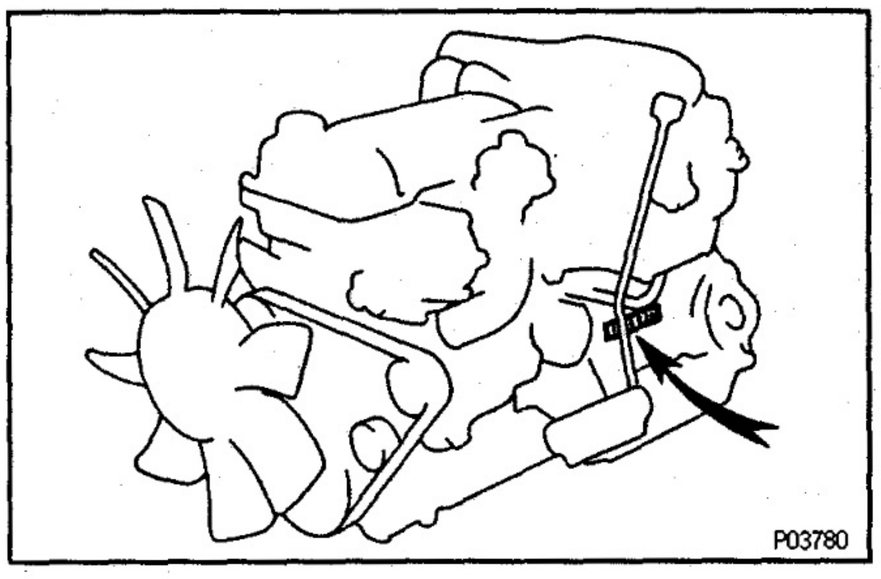
Specifications are presented in bold type throughout the text where needed. You never have to leave the procedure to look up your specifications. They are also found at the end of each section, for quick reference.

CAUTIONS, NOTICES, HINTS:

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

SI UNIT

The UNIT given in this manual are primarily expressed with the SI UNIT (International System of Unit), and alternately expressed in the metric system and in the yard/pound system.
Example:
Torque: 30 N·m (310 kgf·cm, 22 ft·lbf)

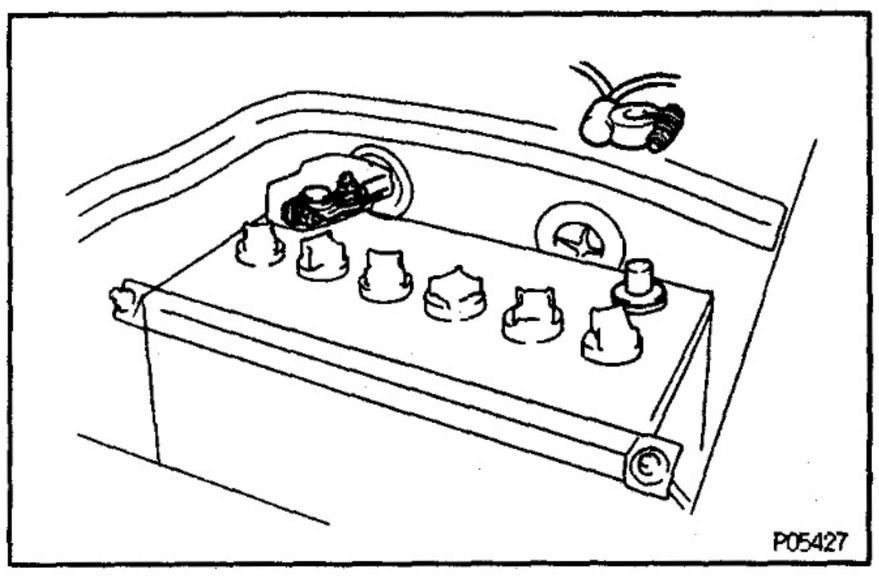

P03780

IDENTIFICATION INFORMATION

IN004-06

ENGINE SERIAL NUMBER

The engine serial number is stamped on the engine block as shown.


P05427

GENERAL REPAIR INSTRUCTIONS

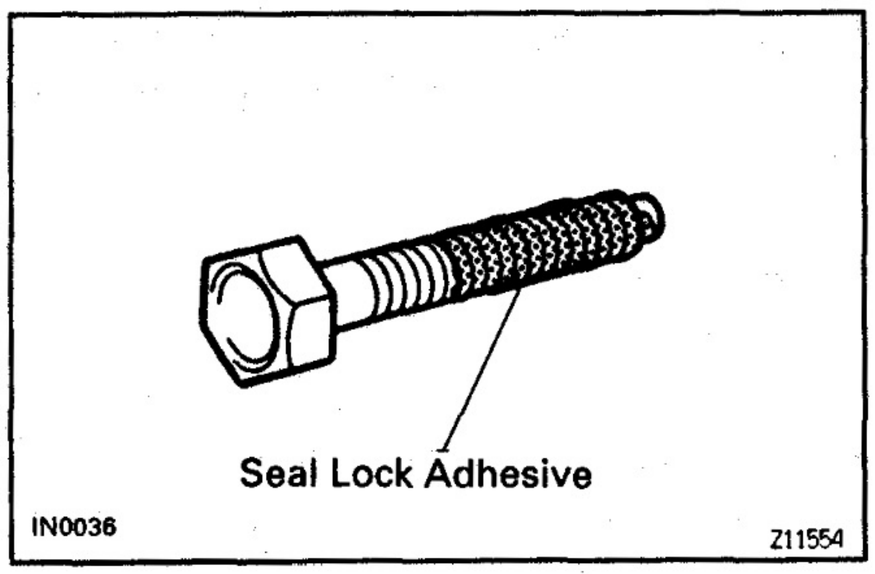
IN067-01

1. Use fender, seat and floor covers to keep the vehicle clean and prevent damage.
2. During disassembly, keep parts in the appropriate order to facilitate reassembly.
3. Observe the following:

(a) Before performing electrical work, disconnect the negative (−) terminal cable from the battery.
(b) If it is necessary to disconnect the battery for inspection or repair, always disconnect the cable from the negative (−) terminal which 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 objects.
(e) Install the cable terminal to the battery post with the nut loose, and tighten the nut 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. Check hose and wiring connectors to make sure that they are secure and correct.
5. Non−reusable parts.

(a) Always replace cotter pins, gaskets, O−rings and 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 bolts and nuts, etc. that are coated with a seal lock adhesive at the factory.

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

(b) When reusing precoated parts, clean off the old adhesive and dry with compressed air. Then apply the specified seal lock adhesive to the bolt, nut or threads.

(c) Precoated parts are indicated in the component illustrations by the "★" symbol.

7. When necessary, use a sealer on gaskets to prevent leaks.

8. Carefully observe all specifications for bolt tightening 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 in the preparation part at the front of each section in this manual.

10. When replacing fuses, be sure the new fuse has the correct amperage rating . DO NOT exceed the rating or use one with a lower rating.

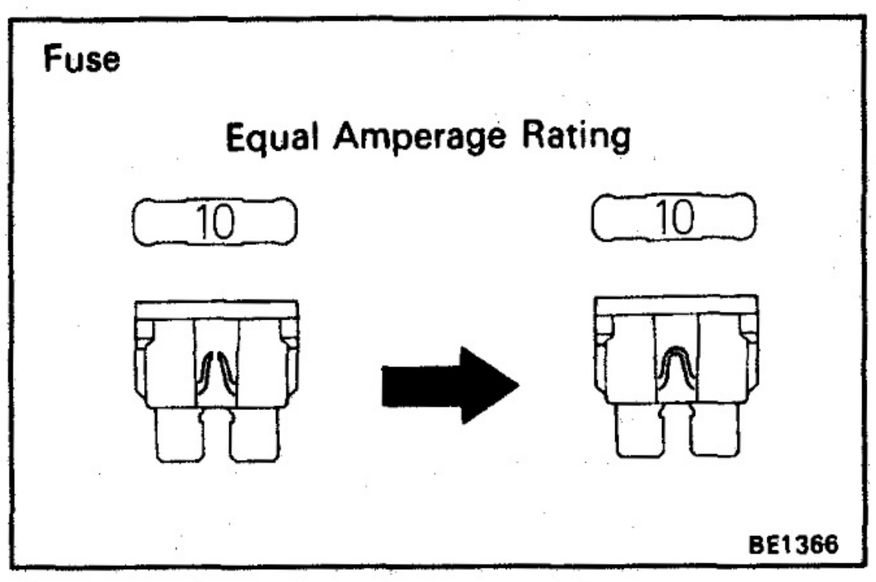
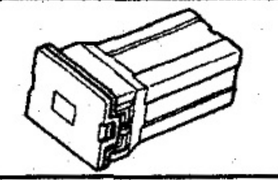
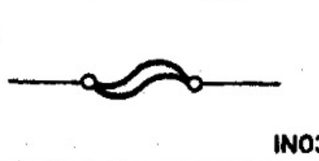
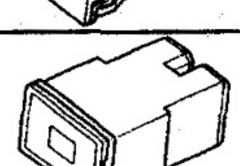
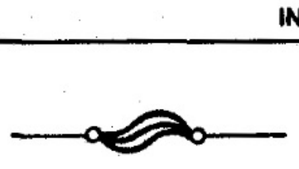
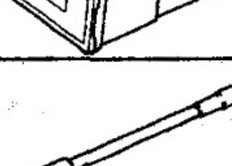
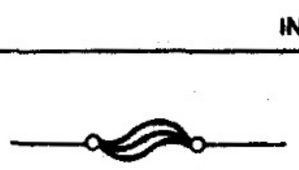
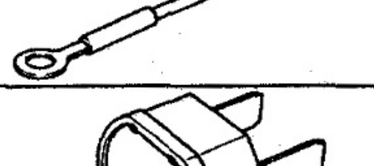
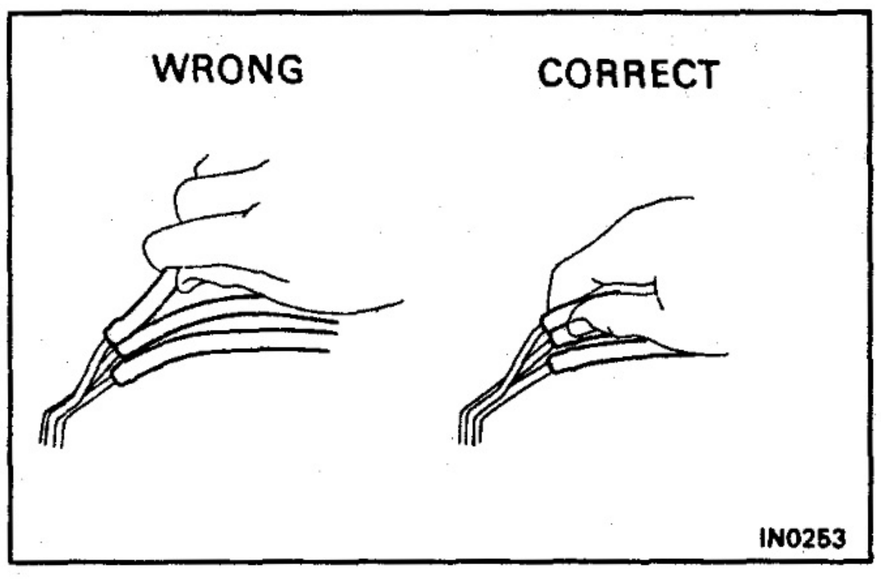
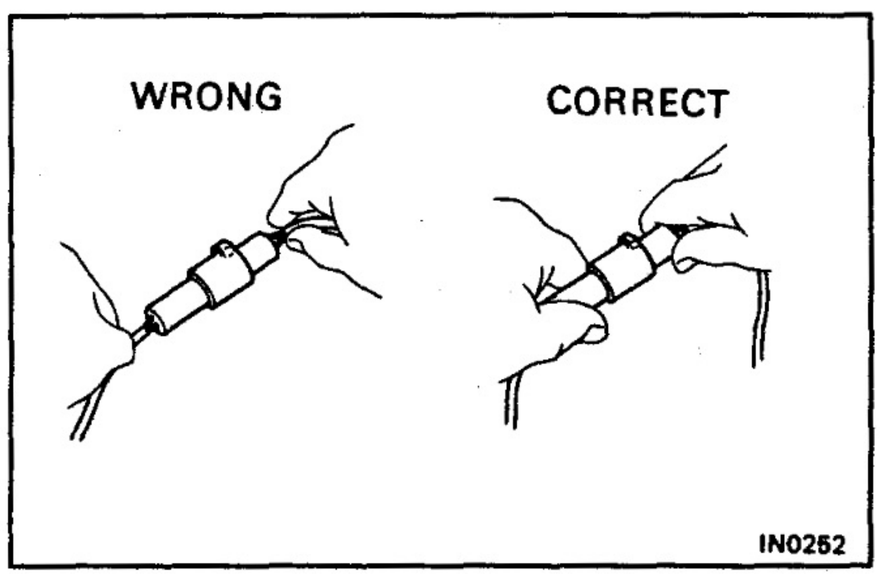


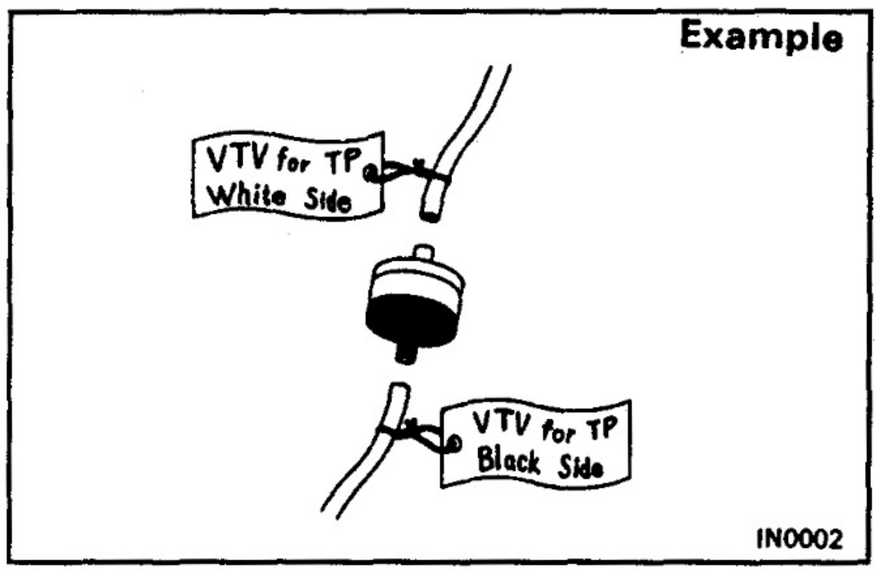
Illustration	Symbol	Part Name	Abbreviation
 BE5594	 IN0365	FUSE	FUSE
 BE5595	 IN0366	MEDIUM CURRENT FUSE	M-FUSE
 BE5596	 IN0367	HIGH CURRENT FUSE	H-FUSE
 BE5597	 IN0367	FUSIBLE LINK	FL
 BE5598	 IN0368	CIRCUIT BREAKER	CB

V00076

IN







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 end, be sure to block the wheels at the opposite end 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 a vehicle raised on a jack alone, even for a small job that can be finished quickly.
12. Observe the following precautions to avoid damage to the parts:
(a) Do not open the cover or case of the ECU unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)
(b) To disconnect vacuum hoses, pull on the end, not the middle of the hose.
(c) To pull apart electrical connectors, pull on the connector itself, not the wires.
(d) Be careful not to drop electrical components, such as sensors or relays. If they are dropped on a hard floor, they should be replaced and not reused.
(e) When steam cleaning an engine, protect the distributor, air filter, and VCV from water.
(f) Never use an impact wrench to remove or install temperature switches or temperature sensors.
(g) When checking continuity at the wire connector, insert the tester probe carefully to prevent terminals from bending.
(h) When using a vacuum gauge, never force the hose onto a connector that is too large. Use a step–down adapter instead. Once the hose has been stretched, it may leak.
13. Tag hoses before disconnecting them:
(a) When disconnecting vacuum hoses, use tags to identify how they should be reconnected.
(b) After completing a job, double check that the vacuum hoses are properly connected. A label under the hood shows the proper layout.
14. Unless otherwise stated, all resistance is measured at an ambient temperature of 20°C (68°F). Because the resistance may be outside specifications if measured at high temperatures immediately after the vehicle has been running, measurements should be made when the engine has cooled down.

PRECAUTION

FOR VEHICLES EQUIPPED WITH A CATALYTIC CONVERTER

IN007–07

CAUTION: If large amounts of unburned gasoline flow into the converter, it may overheat and create a fire hazard. To prevent this, observe the following precautions and explain them to your customer.

1. **Use only unleaded gasoline.**
2. **Avoid prolonged idling.**
   Avoid running the engine at idle speed for more than 20 minutes.
3. **Avoid spark jump test.**

(a) Perform spark jump test only when absolutely necessary. Perform this test as rapidly as possible.
(b) While testing, never race the engine.

4. **Avoid prolonged engine compression measurement.**
   Engine compression tests must be done as rapidly as possible.
5. **Do not run engine when fuel tank is nearly empty.**
   This may cause the engine to misfire and create an extra load on the converter.
6. **Avoid coasting with ignition turned off and prolonged braking.**
7. **Do not dispose of used catalyst along with parts contaminated with gasoline or oil.**

IF VEHICLE IS EQUIPPED WITH MOBILE COMMUNICATION SYSTEM

IN02R–0C

For vehicles with mobile communication systems such as two—way radios and cellular telephones, observe the following precautions.

(1) Install the antenna as far as possible away from the ECU and sensors of the vehicle's electronic system.
(2) Install the antenna feeder at least 20 cm (7.87 in.) away from the ECU and sensors of the vehicle's electronics systems. For details about ECU and sensors locations, refer to the section on the applicable component.
(3) Do not wind the antenna feeder together with the other wiring. As much as possible, also avoid running the antenna feeder parallel with other wire harnesses.
(4) Confirm that the antenna and feeder are correctly adjusted.
(5) Do not install powerful mobile communications system.

ABBREVIATIONS USED IN THIS MANUAL

IN024–02

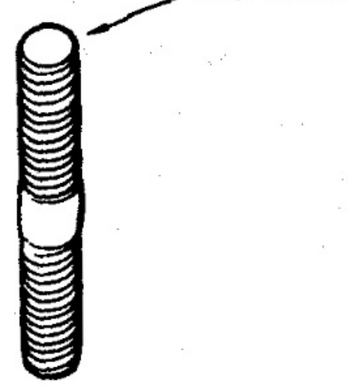
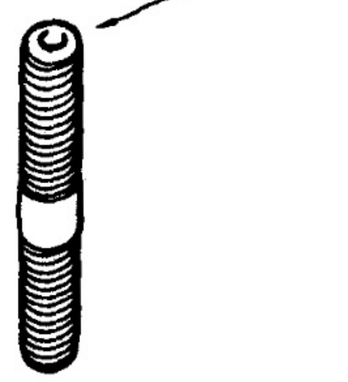
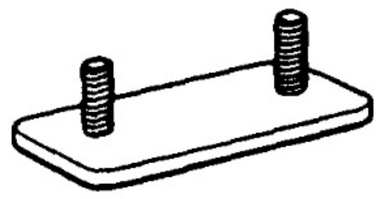
A/C	Air Conditioner
A/T	Automatic Transmission
ECT	Electronic Controlled Transmission
ECU	Electronic Control Unit
FL	Fusible Link
IC	Integrated Circuit
IG	Ignition
MP	Multipurpose
SST	Special Service Tools
TEMP.	Temperature
TP	Throttle Positioner
VCV	Vacuum Control Valve
w/	With
w/o	Without

STANDARD BOLT TORQUE SPECIFICATIONS

IN00V-02

IN

HOW TO DETERMINE BOLT STRENGTH

	Mark	Class		Mark	Class
Hexagon head bolt	 4– 5– 6– 7– 8– 9– 10– 11–	4T 5T 6T 7T 8T 9T 10T 11T	Stud bolt		4T
	 No mark	4T			6T
Hexagon flange bolt w/ washer hexagon bolt	 No mark	4T			
Hexagon head bolt	 2 protruding lines	5T			
Hexagon flange bolt w/ washer hexagon bolt	 2 protruding lines	6T	Welded bolt		4T
Hexagon head bolt	 3 protruding lines	7T			
Hexagon head bolt	 4 protruding lines	8T			

V00078

SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt			Hexagon flange bolt		
			N·m	kgf·cm	ft·lbf	N·m	kgf·cm	ft·lbf
4T	6	1	5	55	48 in.·lbf	6	60	52 in.·lbf
	8	1.25	12.5	130	9	14	145	10
	10	1.25	26	260	19	29	290	21
	12	1.25	47	480	35	53	540	39
	14	1.5	74	760	55	84	850	61
	16	1.5	115	1,150	83	–	–	–
5T	6	1	6.5	65	56 in.·lbf	7.5	75	65 in.·lbf
	8	1.25	15.5	160	12	17.5	175	13
	10	1.25	32	330	24	36	360	26
	12	1.25	59	600	43	65	670	48
	14	1.5	91	930	67	100	1,050	76
	16	1.5	140	1,400	101	–	–	–
6T	6	1	8	80	69 in.·lbf	9	90	78 in.·lbf
	8	1.25	19	195	14	21	210	15
	10	1.25	39	400	29	44	440	32
	12	1.25	71	730	53	80	810	59
	14	1.5	110	1,100	80	125	1,250	90
	16	1.5	170	1,750	127	–	–	–
7T	6	1	10.5	110	8	12	120	9
	8	1.25	25	260	19	28	290	21
	10	1.25	52	530	38	58	590	43
	12	1.25	95	970	70	105	1,050	76
	14	1.5	145	1,500	108	165	1,700	123
	16	1.5	230	2,300	166	–	–	–
8T	8	1.25	29	300	22	33	330	24
	10	1.25	61	620	45	68	690	50
	12	1.25	110	1,100	80	120	1,250	90
9T	8	1.25	34	340	25	37	380	27
	10	1.25	70	710	51	78	790	57
	12	1.25	125	1,300	94	140	1,450	105
10T	8	1.25	38	390	28	42	430	31
	10	1.25	78	800	58	88	890	64
	12	1.25	140	1,450	105	155	1,600	116
11T	8	1.25	42	430	31	47	480	35
	10	1.25	87	890	64	97	990	72
	12	1.25	155	1,600	116	175	1,800	130

ENGINE

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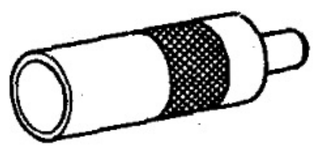
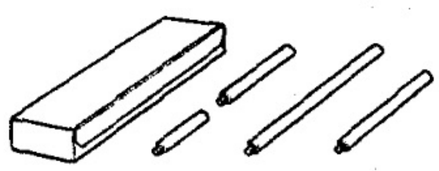
ENGINE MECHANICAL

PREPARATION

SST (SPECIAL SERVICE TOOLS)

EGOAY–1M

EG

	09223–15030 Oil Seal & Bearing Replacer	Crankshaft rear oil seal
	09243–00020 Idle Adjusting Screw Wrench	
	09316–60010 Transmission & Transfer Bearing Replacer	
	(09316–00010) Replacer Pipe	Crankshaft front oil seal
	(09316–00050) Replacer "D"	Crankshaft front oil seal
	09950–70010 Handle Set	
	(09951–07150) Handle 150	

EGOBO–12

EQUIPMENT

CO meter	
Tachometer	
Torque wrench	
Vernier calipers	

IDLE CO CHECK AND ADJUST (Hardtop)

EG5R5-01

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

1. INITIAL CONDITIONS

(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) All pipes and hoses of air induction system connected
(d) All accessories switched OFF
(e) All vacuum lines properly connected
(f) EFI system wiring connectors fully plugged
(g) Ignition timing set correctly

2. CONNECT TACHOMETER TO ENGINE

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

NOTICE:

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

3. CHECK IDLE SPEED

Idle speed:

650 ± 50 rpm

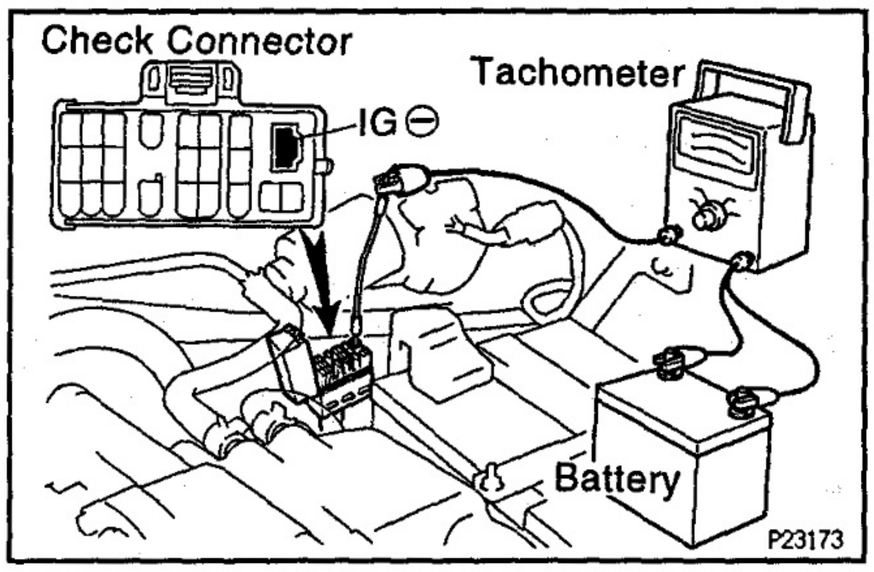
4. CHECK AND ADJUST CO CONCENTRATION AT IDLE

NOTICE:

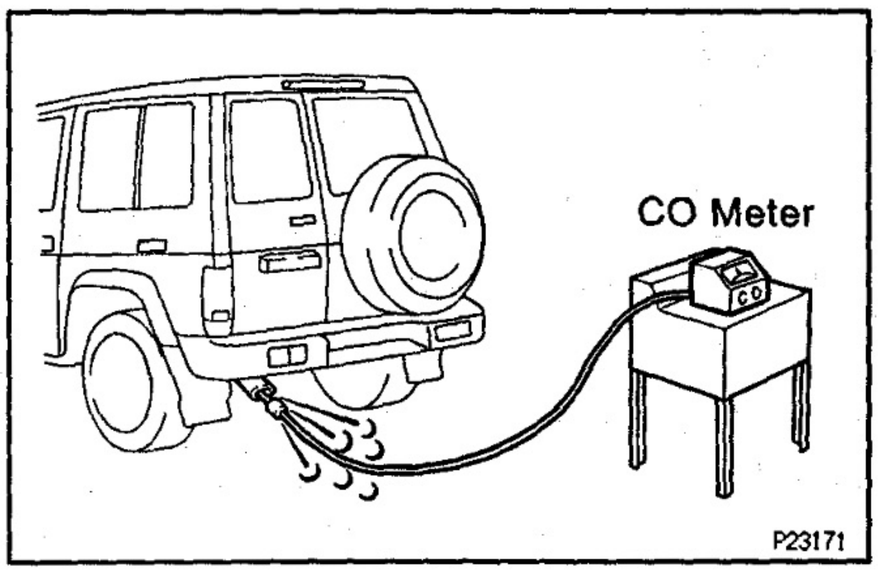
- **Always use a CO meter when adjusting the idle mixture. It is not necessary to adjust with the idle mixture adjusting screw in most vehicles if they are in good condition. If a CO meter is not available, DO NOT ATTEMPT TO ADJUST WITH THE SCREW.**
- **If a CO meter is not available and it is absolutely necessary to adjust with the idle mixture adjusting screw, or if the air flow meter is replaced, use the alternative method.**

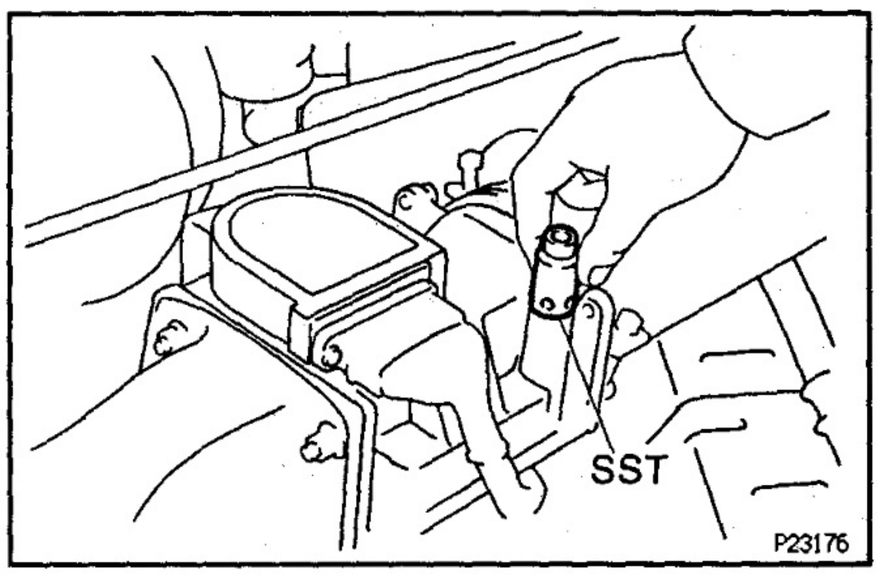
A. Method with CO meter

(a) Check that the CO meter is properly calibrated.
(b) Race the engine for approx. 120 seconds at approx. 2,500 rpm before measuring the concentration.
(c) Wait 1 — 3 minutes after racing the engine to allow the concentration to stabilize.



EG





(d) Insert a testing probe at least 40 cm (1.3 ft) into the tailpipe, and measure the concentration with a short time.

Idle CO concentration:

1.5 ± 0.5 %

If the CO concentration is not as specified, adjust the idle mixture by turning the idle mixture adjusting screw with SST.

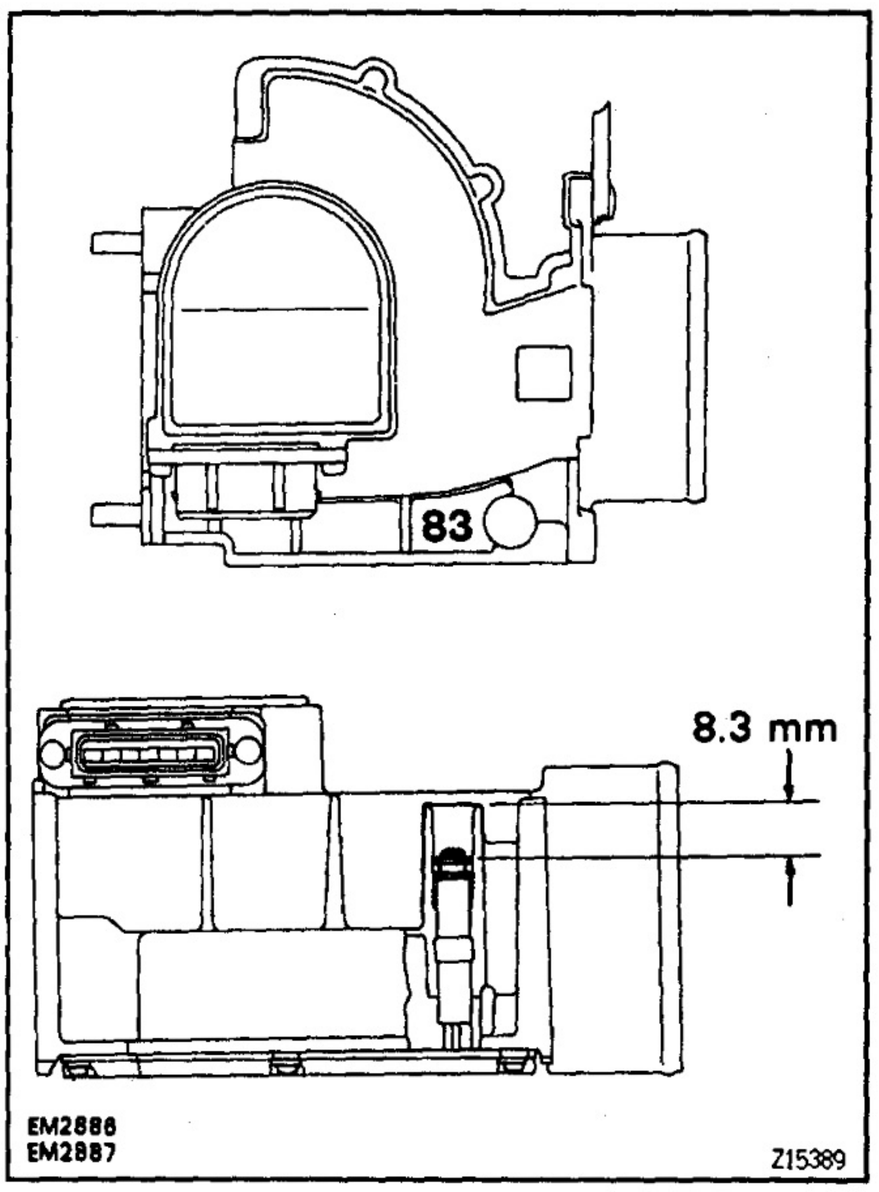
SST 09243–00020

- If the CO 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.

Troubleshooting

CO	Phenomenon	Causes
High	Rough idle (Black smoke from exhaust)	1. Clogged air filter 2. Plugged PCV valve 3. Faulty EFI systems: • Faulty pressure regulator • Clogged fuel return line • Defective water temperature sensor • Faulty engine ECU • Faulty injectors • Faulty throttle position sensor • Faulty air flow meter

V06536



(e) Reinstall the rubber plug into the hole of the idle mixture adjusting screw.

B. Alternative method

HINT:

- This method is to be used ONLY when it is absolutely necessary to adjust the idle mixture screw or if the air flow meter is replaced without the aid of a CO meter.
- The inscribed number shows the depth of the idle mixture screw positioned for presetting.

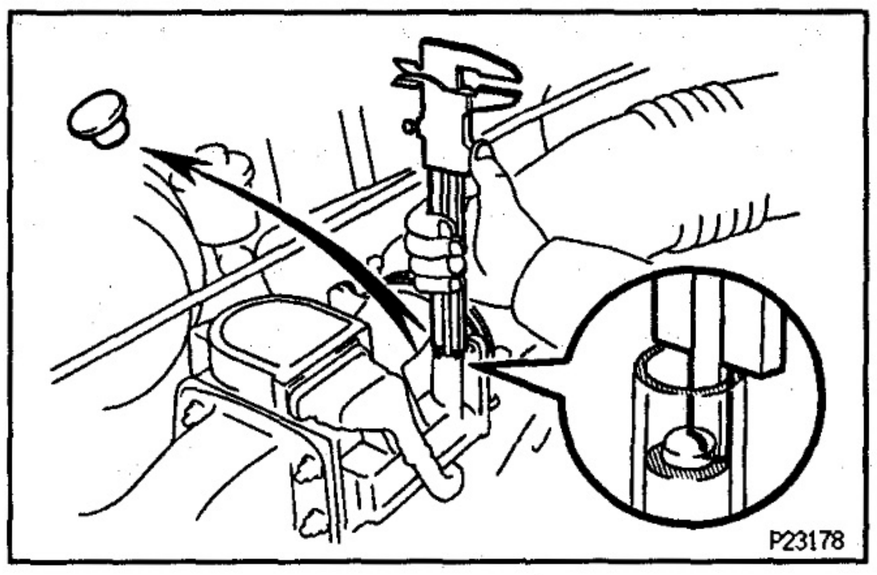
Example:

Inscribed number 83
Depth 8.3 mm (0.326 in.)

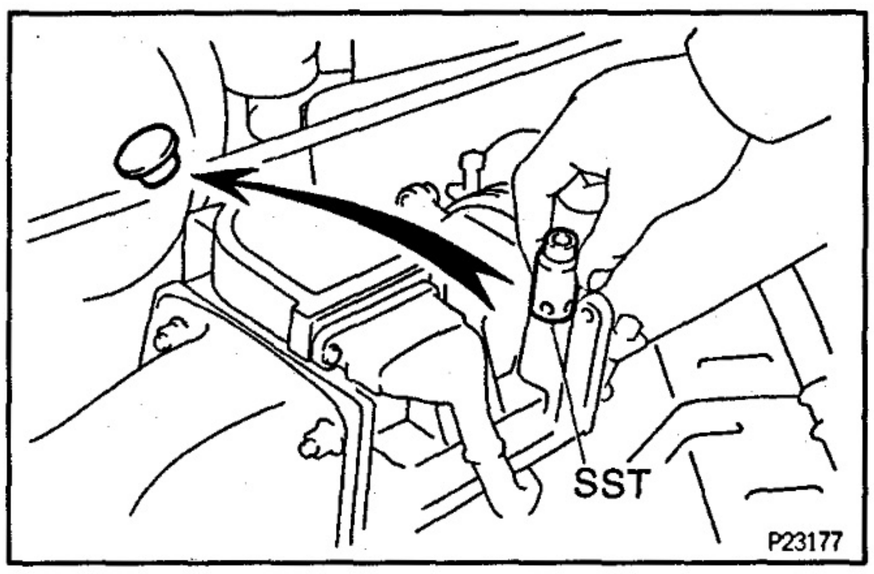
Depth over 10 mm with a decimal point are abbreviated.

Example:

Inscribed number 15
Depth 11.5 mm (0.453 in.)



(a) Remove the rubber plug from the air flow meter.
(b) Measure the depth of the idle mixture adjusting screw with vernier calipers.



(c) Adjust the depth of the idle mixture adjusting screw by turning the screw with SST.
SST 09243–00020
(d) Reinstall the rubber plug into the hole of the idle mixture adjusting screw.

IDLE CO CHECK AND ADJUST (Station Wagon Except Europe)

EG5R8–01

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

1. INITIAL CONDITIONS

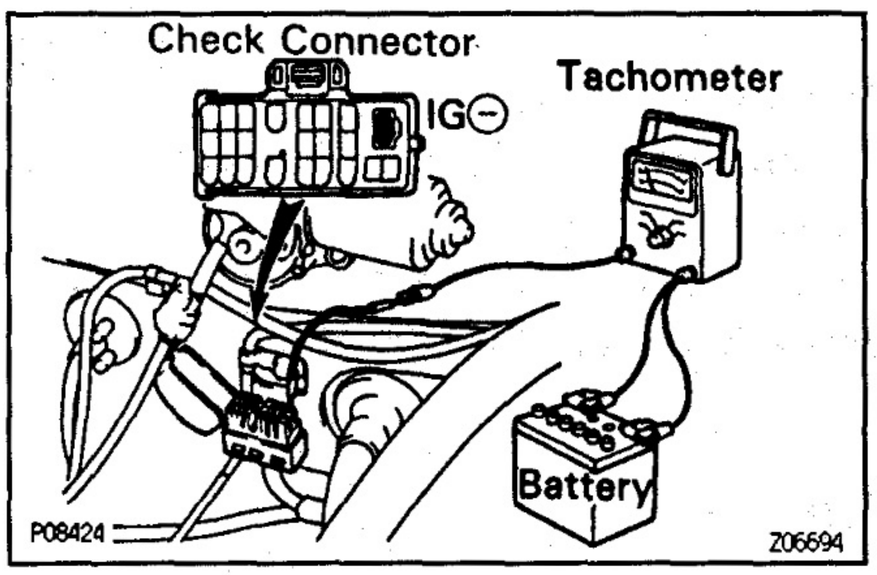
(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) All pipes and hoses of air induction system connected
(d) All accessories switched OFF
(e) All vacuum lines properly connected
(f) EFI system wiring connectors fully plugged
(g) Ignition timing set correctly
(h) Transmission in neutral position
(i) Tachometer and CO meter calibrated by hand

2. CONNECT TACHOMETER TO ENGINE

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

NOTICE:

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



3. CHECK IDLE SPEED

Idle speed:

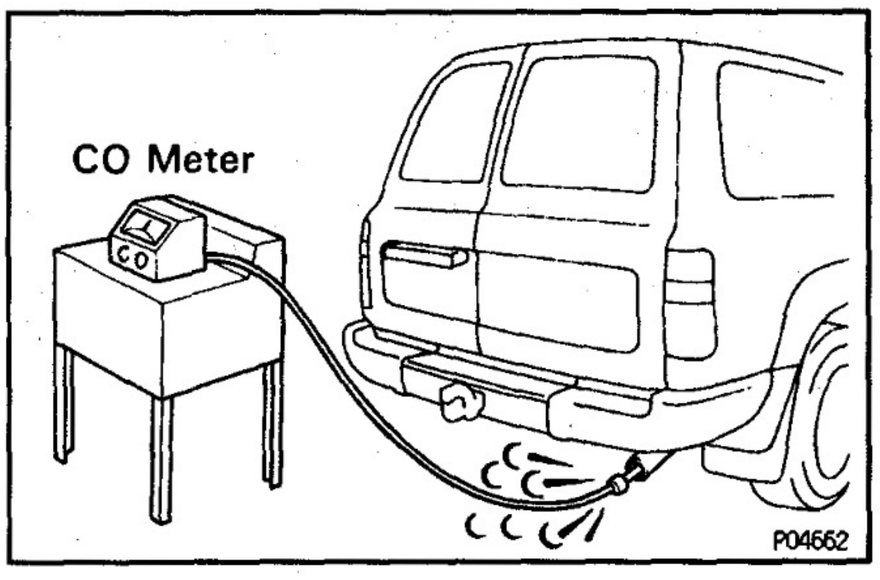
650 ± 50 rpm

EG

4. **CHECK AND ADJUST CO CONCENTRATION AT IDLE**

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

(a) Race the engine at 2,500 rpm for approx. 180 seconds.

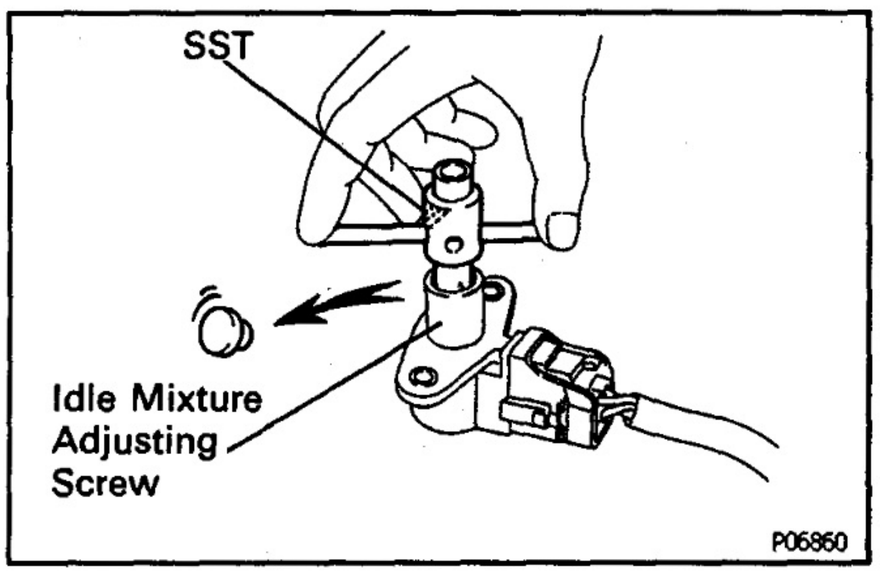


(b) Insert a tester probe at least 40 cm (1.3 ft) into the tailpipe.

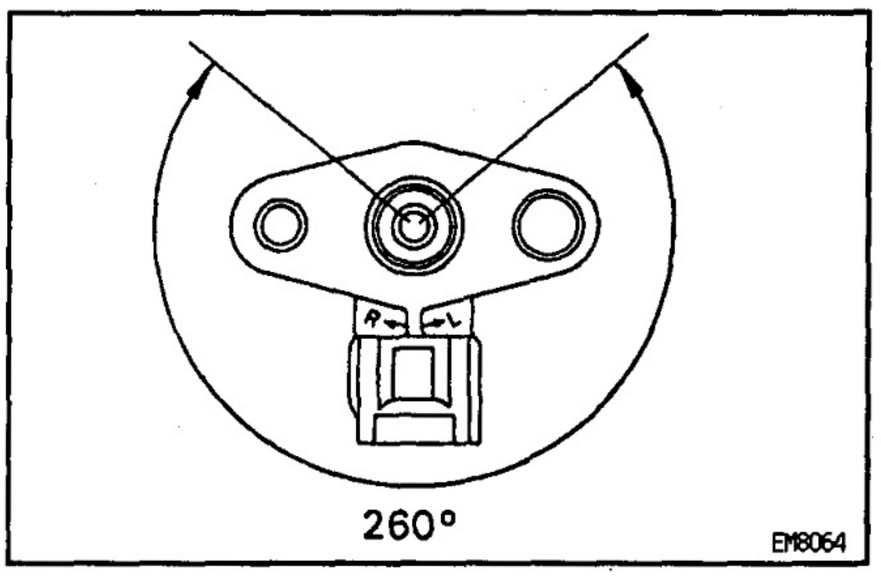
(c) Wait at least 1 minute before measuring to allow the concentration to stabilize. Complete the measuring within 3 minutes.

Idle CO concentration:

1.5 ± 0.5 %



If the CO concentration does not conform to regulations, adjust by turning the IDLE MIXTURE ADJUSTING SCREW in the variable resistor with SST.
SST 09243–00020



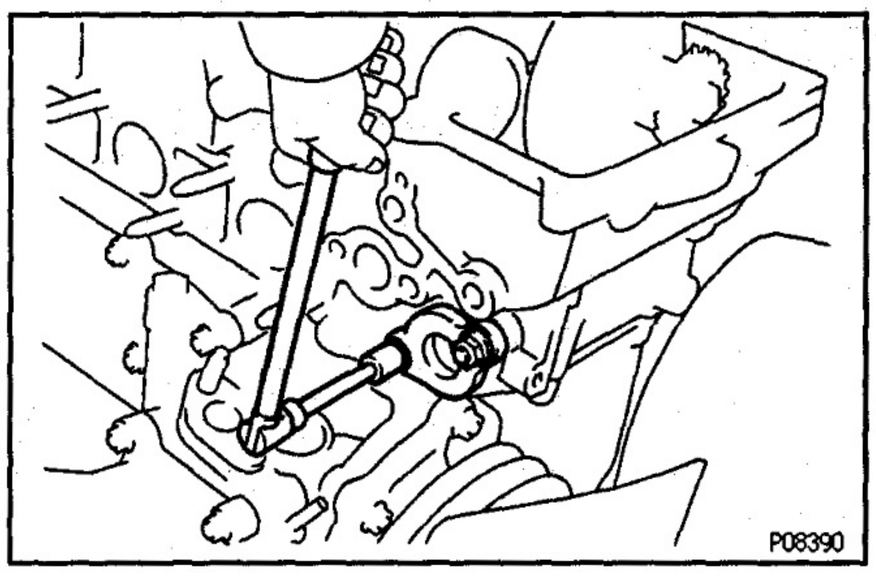
HINT: The idle mixture adjusting screw can be tightened through on angle of 260°.

- If the CO 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.

Troubleshooting

CO	Phenomenon	Causes
High	Rough idle (Black smoke from exhaust)	1. Clogged air filter 2. Plugged PCV valve 3. Faulty EFI systems: • Faulty pressure regulator • Clogged fuel return line • Defective water temperature sensor • Faulty engine ECU • Faulty injectors • Faulty throttle position sensor • Faulty air flow meter

V06536



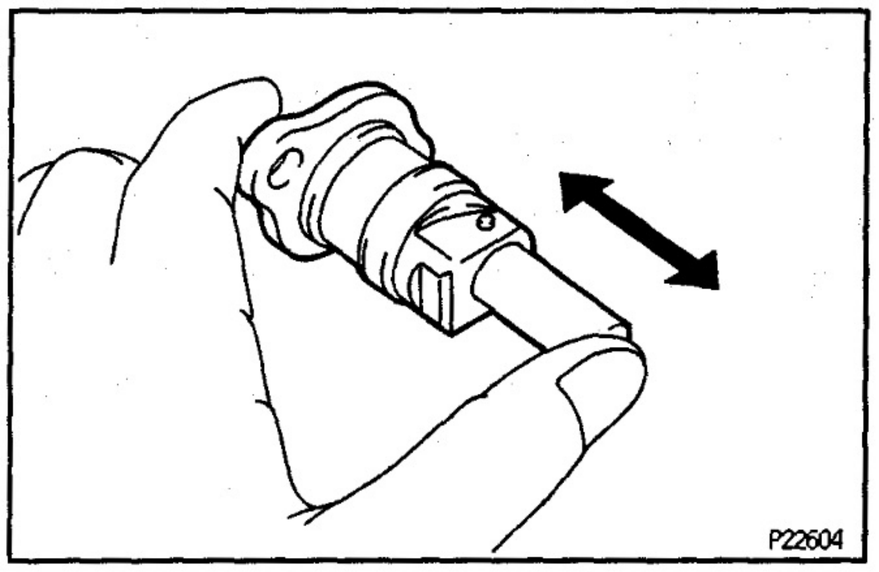
CYLINDER HEAD

CYLINDER HEAD REMOVAL AND INSTALLATION

EG5W7-01

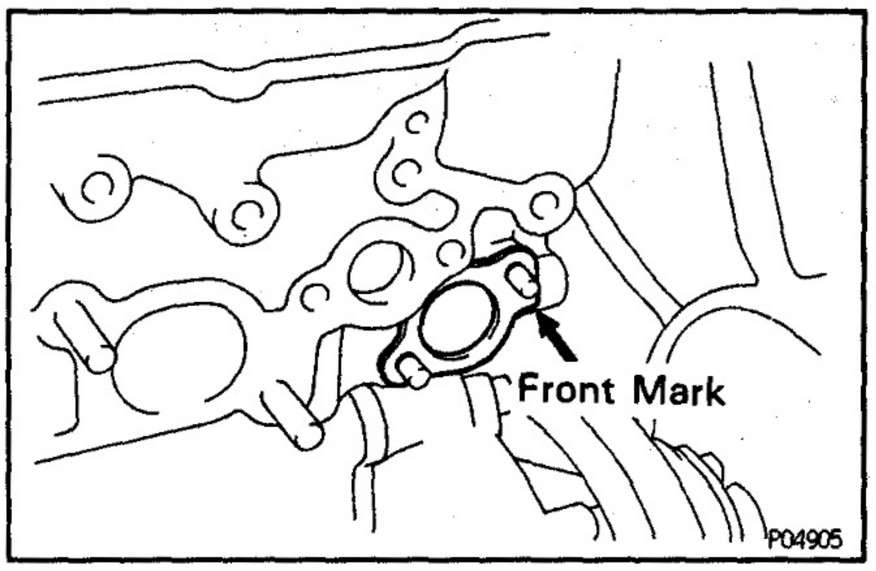
1. REMOVE CHAIN TENSIONER

Remove the 2 nuts, chain tensioner and gasket.



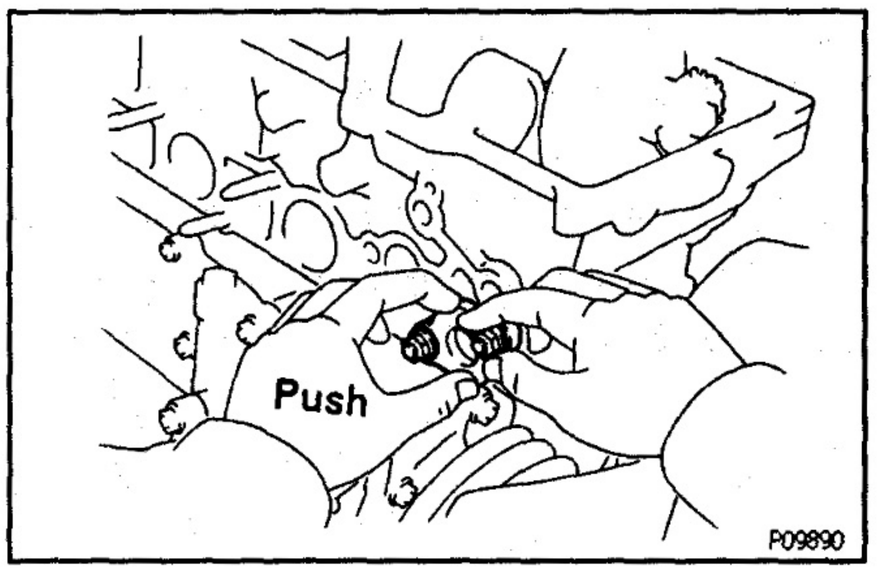
2. INSPECT CHAIN TENSIONER

Check that the plunger moves smoothly.



3. INSTALL CHAIN TENSIONER

(a) Place a new gasket so that the front mark is toward the front side.



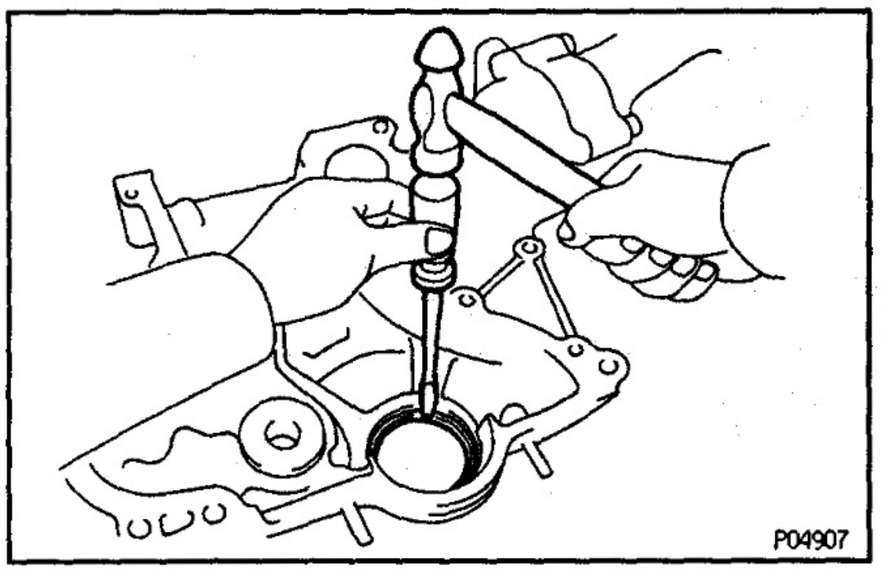
(b) Push the tensioner by hand until it touches the head installation surface, then install the 2 nuts.

(c) Tighten the 2 nuts.

Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

CYLINDER BLOCK

CRANKSHAFT OIL SEALS REPLACEMENT EG0C0-1G

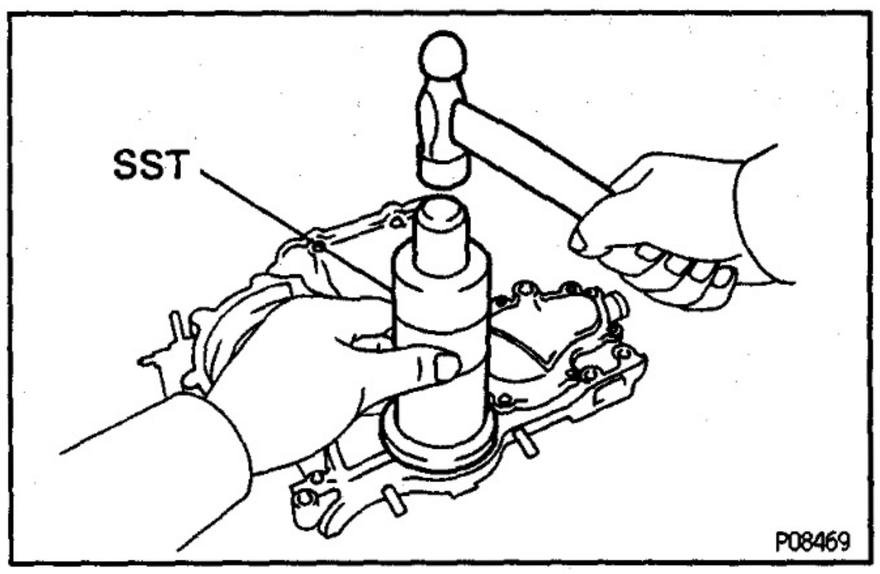


HINT: There are 2 methods (A and B) to replace the oil seal which are as follows:

1. REPLACE CRANKSHAFT FRONT OIL SEAL

A. If timing chain cover is removed from cylinder block:

(a) Using a screwdriver and a hammer, tap out the oil seal.

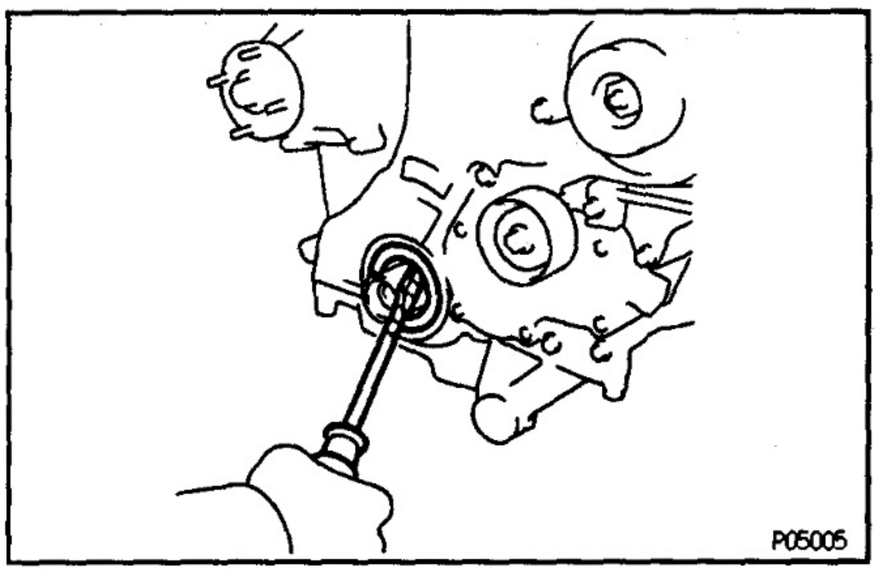


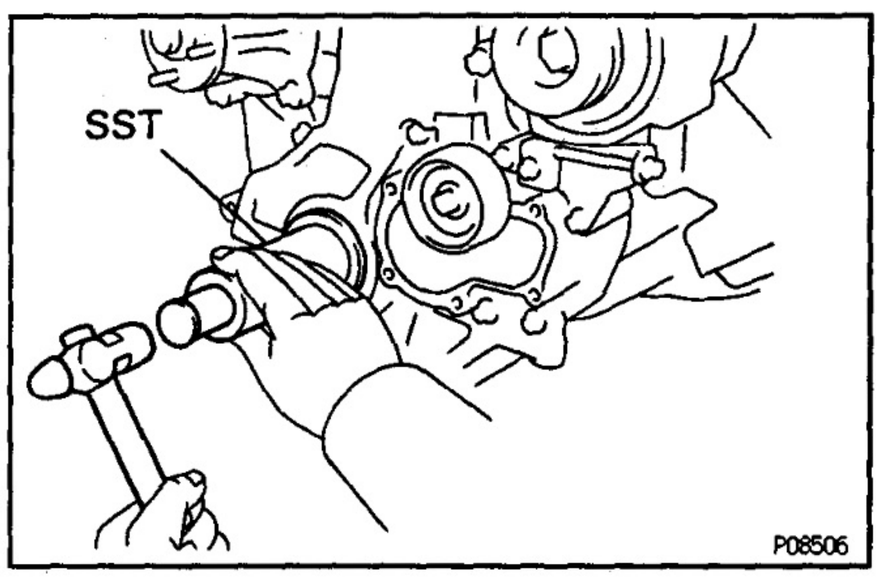
(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the timing chain cover edge.
SST 09316–60010 (09316–00010, 09316–00050)

(c) Apply MP grease to the oil seal lip.
NOTICE: Do not let foreign matter get onto the lip of the oil seal.

B. If timing chain cover is installed to cylinder block:

(a) Using a screwdriver, pry out the oil seal.
NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.





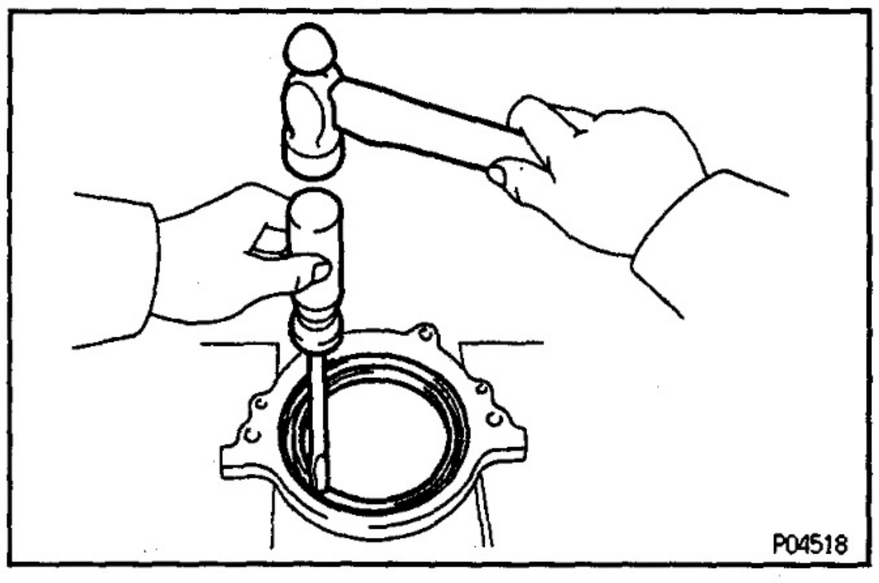
(b) Apply MP grease to a new oil seal lip.
NOTICE: Do not let foreign matter get onto the lip of the oil seal.

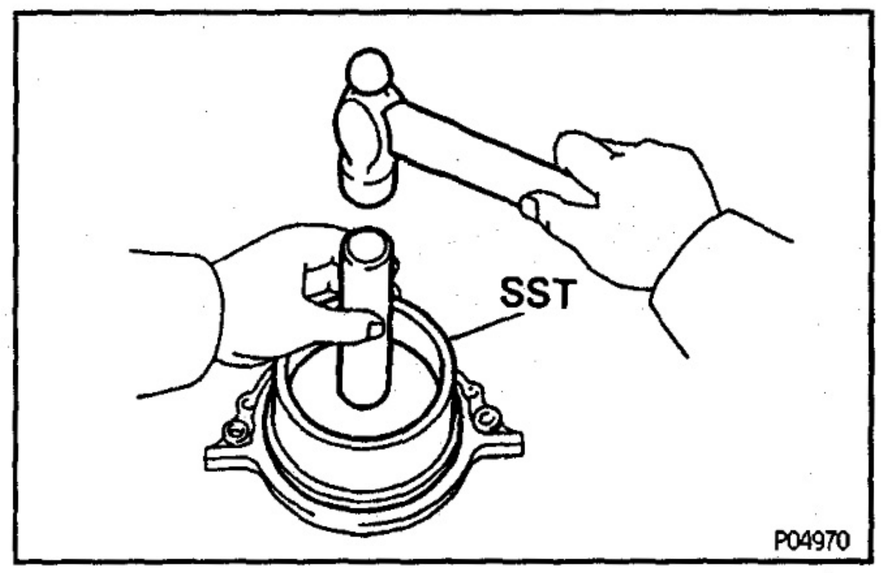
(c) Using SST and a hammer, tap in the oil seal until its surface is flush with the timing chain cover edge.
SST 09316–60010 (09316–00010, 09316–00050)

2. REPLACE CRANKSHAFT REAR OIL SEAL

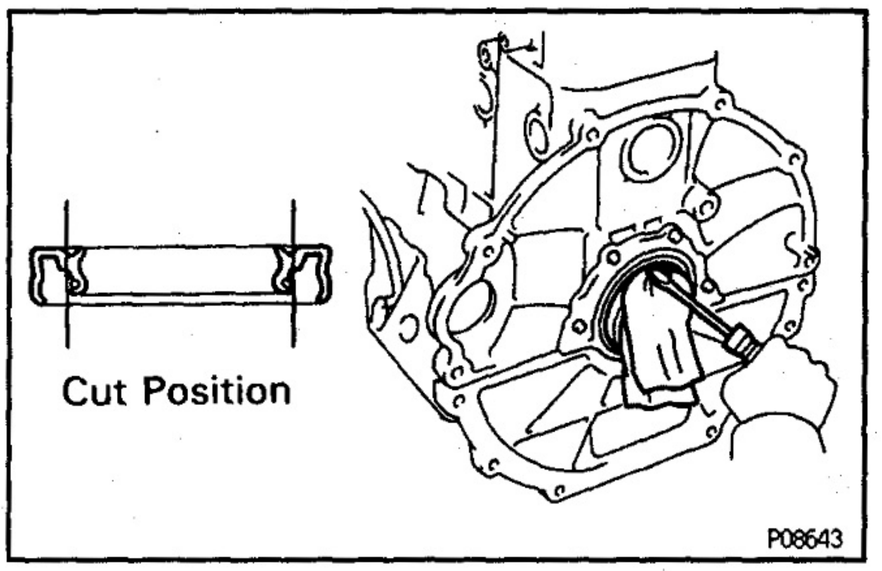
A. If rear oil seal retainer is removed from cylinder block:

(a) Using a screwdriver and a hammer, tap out the oil seal.





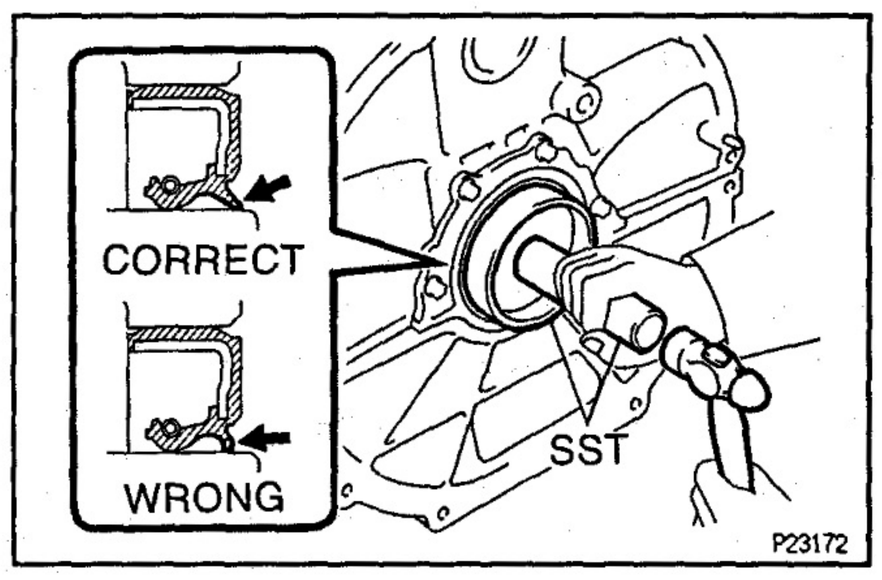
(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal edge.
SST 09223–15030, 09950–70010 (09951–07150)
NOTICE: Do not let foreign matter get onto the lip of the oil seal.



B. If rear oil seal retainer is installed to cylinder block:

(a) Using a knife, cut off the oil seal lip.

(b) Using a screwdriver, pry out the oil seal.
NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(c) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223–15030, 09950–70010 (09951–07150)
NOTICE: Do not let foreign matter get onto the lip of the oil seal.

(d) Check that the lip of the oil seal is not bent inward.

SERVICE SPECIFICATIONS

SERVICE DATA

EG0VT-0F

Compression pressure	at 250 rpm STD		1,176 kPa (12.0 kgf/cm², 171 psi) or more
	Minimum		883 kPa (9.0 kgf/cm², 128 psi)
	Difference of pressure between each cylinder		98 kPa (1.0 kgf/cm², 14 psi) or less
Valve clearance	at cold Intake		0.15 — 0.25 mm (0.006 — 0.010 in.)
	Exhaust		0.25 — 0.35 mm (0.010 — 0.014 in.)
Ignition timing	w/ Terminals TE1 and E1 connected		3° BTDC @ idle
Idle speed	—		650 ± 50 rpm
Intake manifold vacuum	at idle speed		63 kPa (473 mmHg, 18.6 in.Hg)
Cylinder head	Warpage		
	Cylinder block side	Maximum	0.15 mm (0.0059 in.)
	Manifold side	Maximum	0.10 mm (0.0039 in.)
	Valve seat		
	Refacing angle	Intake	30°, 45°, 75°
		Exhaust	45°, 75°
	Contacting angle		45°
	Contacting width	Intake	1.2 — 1.6 mm (0.047 — 0.063 in.)
		Exhaust	1.0 — 1.4 mm (0.039 — 0.055 in.)
	Cylinder head bolt outside diameter	STD	10.85 — 11.00 mm (0.4272 — 0.4331 in.)
		Limit	10.6 mm (0.417 in.)
Valve guide bushing	Inside diameter		7.010 — 7.030 mm (0.2760 — 0.2768 in.)
	Outside diameter (for repair part)	STD	11.492 — 11.513 mm (0.4524 — 0.4533 in.)
		O/S 0.05	11.542 — 11.563 mm (0.4544 — 0.4552 in.)
	Protrusion height		8.2 — 8.6 mm (0.323 — 0.339 in.)
Valve	Valve overall length	STD Intake	98.4 mm (3.874 in.)
		Exhaust	97.9 mm (3.854 in.)
		Minimum Intake	97.9 mm (3.854 in.)
		Exhaust	97.4 mm (3.835 in.)
	Vale face angle		44.5°
	Stem diameter	Intake	6.970 — 6.985 mm (0.2744 — 0.2750 in.)
		Exhaust	6.965 — 6.980 mm (0.2742 — 0.2748 in.)
	Stem oil clearance	STD Intake	0.025 — 0.060 mm (0.0010 — 0.0024 in.)
		Exhaust	0.030 — 0.065 mm (0.0012 — 0.0026 in.)
		Maximum Intake	0.08 mm (0.0031 in.)
		Exhaust	0.10 mm (0.0039 in.)
	Margin thickness	STD	1.2 mm (0.047 in.)
		Minimum	1.0 mm (0.039 in.)
Valve spring	Deviation	Maximum	2.0 mm (0.079 in.)
	Free length		43.94 — 45.06 mm (1.7299 — 1.7740 in.)
	Installed tension at 36.5 mm (1.437 in.)		214 — 238 N (21.8 — 24.2 kgf, 48.1 — 53.4 lbf)
Valve lifter	Lifter diameter		33.966 — 33.976 mm (1.3372 — 1.3376 in.)
	Lifter bore diameter		34.000 — 34.021 mm (1.3386 — 1.3394 in.)
	Oil clearance	STD	0.024 — 0.055 mm (0.0009 — 0.0022 in.)
		Maximum	0.07 mm (0.0028 in.)
Manifold	Warpage	Maximum	0.30 mm (0.0118 in.)

Air intake chamber	Warpage	Maximum	0.30 mm (0.0118 in.)
Camshaft	Thrust clearance	STD	0.030 – 0.080 mm (0.0012 – 0.0031 in.)
		Maximum	0.10 mm (0.0039 in.)
	Journal oil clearance	STD	0.025 – 0.062 mm (0.0010 – 0.0024 in.)
		Maximum	0.10 mm (0.0039 in.)
	Journal diameter		26.959 – 26.975 mm (1.0614 – 1.0620 in.)
	Circle runout	Maximum	0.06 mm (0.0024 in.)
	Cam lobe height	STD	50.61 – 50.71 mm (1.9925 – 1.9965 in.)
		Minimum	50.51 mm (1.9886 in.)
	Camshaft gear backlash	STD	0.020 – 0.200 mm (0.0008 – 0.0079 in.)
		Maximum	0.30 mm (0.0188 in.)
	Camshaft gear spring end free distance		18.2 – 18.8 mm (0.717 – 0.740 in.)
Spark plug tube	Protrusion		45.5 mm (1.791 in.)
Oil pump drive shaft gear	Thrust clearance	STD	0.040 – 0.160 mm (0.0016 – 0.0063 in.)
		Maximum	0.30 mm (0.0118 in.)
Chain and timing gear	Chain length at 16 links	Maximum	146.6 mm (5.772 in.)
	Camshaft timing gear wear (w/ chain)	Minimum	126.0 mm (4.961 in.)
	Crankshaft timing gear wear (w/ chain)	Minimum	65.4 mm (2.575 in.)
Chain tensioner slipper and vibration damper	Wear	Maximum	1.0 mm (0.039 in.)
Cylinder block	Cylinder head surface warpage	Maximum	0.05 mm (0.0020 in.)
	Cylinder bore diameter	STD Mark 1	100.000 – 100.010 mm (3.9370 – 3.9374 in.)
		Mark 2	100.010 – 100.020 mm (3.9374 – 3.9378 in.)
		Mark 3	100.020 – 100.030 mm (3.9378 – 3.9382 in.)
		Maximum STD	100.23 mm (3.9461 in.)
		O/S 0.50	100.73 mm (3.9658 in.)
		O/S 1.00	101.23 mm (3.9854 in.)
	Main bearing bolt outside diameter	STD	10.85 – 11.00 mm (0.4271 – 0.4331 in.)
		Minimum	10.6 mm (0.417 in.)
Piston and piston ring	Piston diameter	STD Mark 1	99.950 – 99.960 mm (3.9350 – 3.9354 in.)
		Mark 2	99.960 – 99.970 mm (3.9354 – 3.9358 in.)
		Mark 3	99.970 – 99.980 mm (3.9358 – 3.9362 in.)
		O/S 0.50	100.450 – 100.480 mm (3.9547 – 3.9559 in.)
		O/S 1.00	100.950 – 100.980 mm (3.9744 – 3.9756 in.)
	Piston oil clearance	STD	0.040 – 0.060 mm (0.0016 – 0.0024 in.)
	Piston ring groove clearance	No.1	0.040 – 0.080 mm (0.0016 – 0.0031 in.)
		No.2	0.030 – 0.070 mm (0.0012 – 0.0028 in.)
	Piston ring end gap	STD No.1	0.300 – 0.520 mm (0.0118 – 0.0205 in.)
		No.2	0.450 – 0.670 mm (0.0177 – 0.0264 in.)
		Oil	0.150 – 0.520 mm (0.0059 – 0.0205 in.)
		Maximum No.1	1.12 mm (0.0441 in.)
		No.2	1.17 mm (0.0461 in.)
		Oil	1.12 mm (0.0441 in.)

Connecting rod	Thrust clearance	STD	0.160 – 0.262 mm (0.0063 – 0.0103 in.)
		Maximum	0.362 mm (0.0143 in.)
	Connecting rod bearing center wall thickness		
	Reference	STD Mark 2	1.744 – 1.747 mm (0.0687 – 0.0688 in.)
		Mark 3	1.747 – 1.750 mm (0.0688 – 0.0689 in.)
		Mark 4	1.750 – 1.753 mm (0.0689 – 0.0690 in.)
		Mark 5	1.753 – 1.756 mm (0.0690 – 0.0691 in.)
		Mark 6	1.756 – 1.759 mm (0.0691 – 0.0693 in.)
	Connecting rod oil clearance	STD STD	0.032 – 0.050 mm (0.0013 – 0.0020 in.)
		U/S 0.25	0.033 – 0.073 mm (0.0013 – 0.0029 in.)
		Maximum	0.10 mm (0.0039 in.)
	Rod bend	Maximum per 100 mm (3.94 in.)	0.05 mm (0.0020 in.)
	Rod twist	Maximum per 100 mm (3.94 in.)	0.15 mm (0.0059 in.)
	Bushing inside diameter		26.008 – 26.020 mm (1.0239 – 1.0244 in.)
	Piston pin diameter		26.000 – 26.012 mm (1.0236 – 1.0241 in.)
	Piston pin oil clearance	STD	0.004 – 0.012 mm (0.0002 – 0.0005 in.)
		Limit	0.05 mm (0.0020 in.)
	Connecting rod bolt outside diameter	STD	8.40 – 8.60 mm (0.3307 – 0.3386 in.)
		Minimum	8.00 mm (0.3150 in.)
Crankshaft	Thrust clearance	STD	0.020 – 0.220 mm (0.0008 – 0.0087 in.)
		Maximum	0.30 mm (0.0118 in.)
	Thrust washer thickness	STD	2.440 – 2.490 mm (0.0961 – 0.0980 in.)
		O/S 0.125	2.503 – 2.553 mm (0.0985 – 0.1005 in.)
		O/S 0.250	2.565 – 2.615 mm (0.1010 – 0.1030 in.)
	Main journal oil clearance	STD STD	0.042 – 0.060 mm (0.0017 – 0.0024 in.)
		U/S 0.25	0.041 – 0.081 mm (0.0016 – 0.0032 in.)
		Maximum	0.10 mm (0.0039 in.)
	Main journal diameter	STD	68.982 – 69.000 mm (2.7158 – 2.7165 in.)
		U/S 0.25	68.745 – 68.755 mm (2.7065 – 2.7069 in.)
	Main bearing center wall thickness		
	Reference	STD Mark 2	2.489 – 2.492 mm (0.0980 – 0.0981 in.)
		Mark 3	2.492 – 2.495 mm (0.0981 – 0.0982 in.)
		Mark 4	2.495 – 2.498 mm (0.0982 – 0.0983 in.)
		Mark 5	2.498 – 2.501 mm (0.0983 – 0.0985 in.)
		Mark 6	2.501 – 2.504 mm (0.0985 – 0.0986 in.)
	Crank pin diameter	STD	56.982 – 57.000 mm (2.2434 – 2.2441 in.)
		U/S 0.25	56.745 – 56.755 mm (2.2341 – 2.2344 in.)
	Circle runout	Maximum	0.06 mm (0.0024 in.)
	Main journal taper and out–of–round	Maximum	0.02 mm (0.0008 in.)
	Crank pin taper and out–of –round	Maximum	0.02 mm (0.0008 in.)

EG

TORQUE SPECIFICATIONS

EG0VU–0F

Part tightened	N·m	kgf·cm	ft·lbf
Chain tensioner x Cylinder head	21	210	15

EFI SYSTEM

PREPARATION

SST (SPECIAL SERVICE TOOLS)

EG0CF-11

	09243–00020 Idle Adjusting Screw Wrench	
	09843–18020 Diagnosis Check Wire	

EG

RECOMMENDED TOOLS

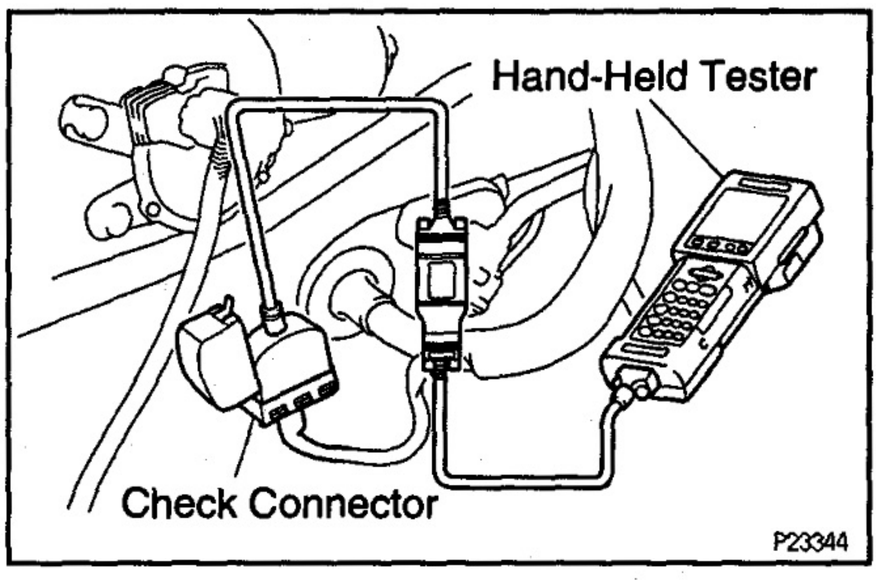
EG0CG-0V

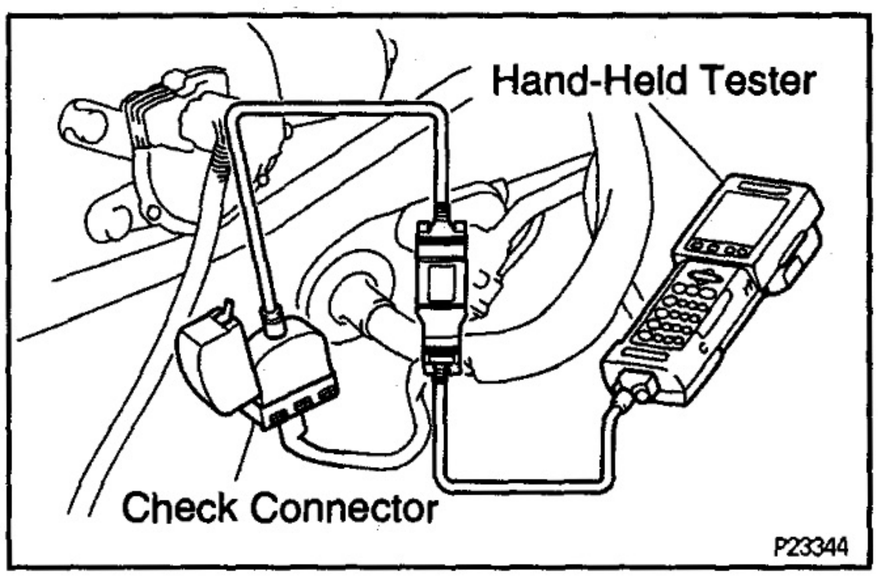
	09082–00050 TOYOTA Electrical Tester Set.	

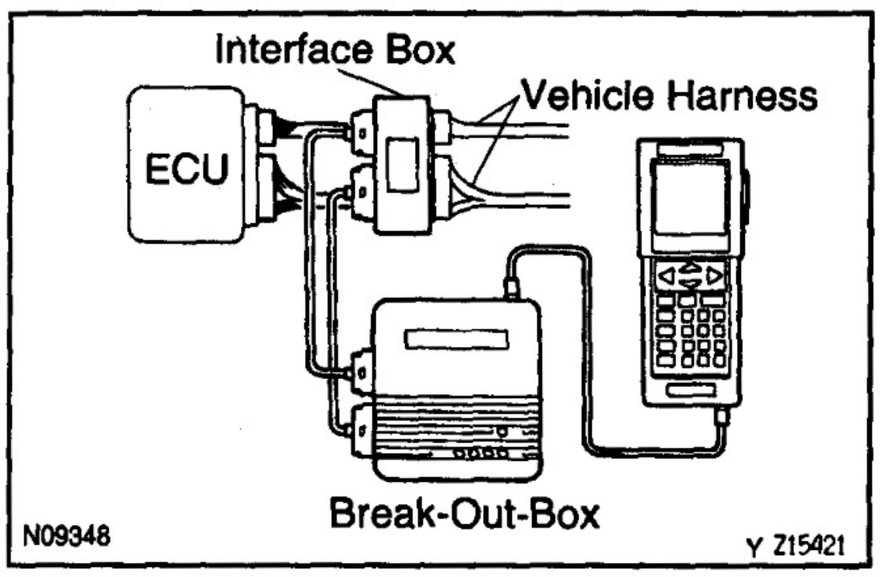
EQUIPMENT

EG0CH-0V

Torque wrench	







DIAGNOSIS SYSTEM

DIAGNOSTIC CODE CHECK USING HAND–HELD TESTER EG36V–06

1. Hook up the hand–held tester to the check connector.
2. Read the diagnostic codes by following the prompts on the tester screen.
   Please refer to the hand–held tester operator's manual for further details.

ECU DATA MONITOR USING HAND–HELD TESTER EG36X–06

1. Hook up the hand–held tester to the check connector.
2. Monitor the ECU data by following the prompts on the tester screen.
   HINT: Hand–held tester has a "Snapshot" function which records the monitored data.
   Please refer to the hand–held tester operator's manual for further details.

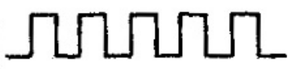
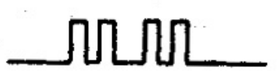
ECU TERMINAL VALUES MEASUREMENT USING BREAK–OUT–BOX AND HAND–HELD TESTER EG36Y–07

1. Hook up the break–out–box and hand–held tester to the vehicle.
2. Read the ECU input/output values by following the prompts on the tester screen.
   HINT: Hand–held tester has a "Snapshot" function. This records the measured values and is effective in the diagnosis of intermittent problems.
   Please refer to the hand–held tester/break–out–box operator's manual for further details.

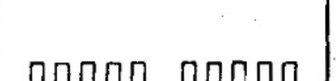
DIAGNOSTIC CODES (Station Wagon)

HINT:

- If a malfunction is detected during the diagnostic code check, refer to the circuit indicated in the table, and turn to the corresponding page.
- Your readings may vary from the parameters listed in the table, depending on the instruments used.

Code No.	Number of "CHECK" Engine Warning Light Blinks	System	"CHECK" Engine*1 Warning Light		Diagnosis	Trouble Area	Memory*2
			Normal Mode	Test Mode			
–	 FI1604	Normal	–	–	No malfunctions detected.	–	–
12	 FI1606	RPM Signal	ON	N.A.	No "NE" or "G1", "G2" signal to ECU for 2 sec. or more after cranking the engine.	• Distributor circuit • Distributor • Starter signal circuit • ECU	○
13	 FI1607	RPM Signal	ON	ON	No "NE" signal to ECU for 0.05 sec. or more when engine speed is above 1,000 rpm.	• Distributor circuit • Distributor • ECU	○
14	 FI1608	Ignition Signal	ON	N.A.	No "IGF" signal to ECU 6 times in succession, and no signal input within 256 msec.	• Igniter and Ignition coil circuit • Igniter and ignition coil • ECU	○
16*3	 FI3600	ECT Control Signal	ON	N.A.	Normal signal is not output from ECT CPU.	• ECU	○
21*4	 FI1609	Oxygen Sensor Signal	ON	ON	At normal driving speed (below 100 km/h and engine speed is above 1,400 rpm), amplitude of oxygen sensor signal (OX1) is reduced to between 0.35 – 0.70 V continuously for 60 seconds or more. (2 trip detection logic)	• Oxygen sensor circuit • Oxygen sensor • ECU	○
		Oxygen Sensor Heater Signal			Open or short circuit in oxygen sensor heater for 0.5 sec. or more. (HT1)	• Oxygen sensor circuit • Oxygen sensor • ECU	○
22	 FI1610	Water Temp. Sensor Signal	ON	ON	Open or short circuit in water temp. sensor signal for 0.5 sec. or more. (THW)	• Water temp. sensor circuit • Coolant temp. sensor • ECU	○
24	 FI1611	Intake Air Temp. Sensor Signal	OFF	ON	Open or short circuit in intake air temp. sensor signal for 0.5 sec. or more. (THA)	• Intake air temp. sensor circuit • Intake air temp. sensor • ECU	○
25*4	 FI2562	Air-Fuel Ratio Lean Malfunction	ON	ON	Oxygen sensor output in less than 0.45 V for at least 90 secs. when oxygen sensor is warmed up (racing at 1,500 rpm). (2 trip detection logic)	• Engine ground bolt loose • Open in E1 circuit • Injector circuit • Injector • Fuel line pressure • Air flow meter • Oxygen sensor circuit • Oxygen sensor • Ignition system • ECU	○
31	 FI1612	Air Flow Meter Signal	ON	N.A.	Open or short in air flow meter circuit for 16 sec. or more with engine speed less than 3,000 rpm.	• Air flow meter circuit • Air flow meter • ECU	○

DIAGNOSTIC CODES (Station Wagon) (Cont'd)

Code No.	Number of "CHECK" Engine Warning Light Blinks	System	"CHECK" Engine*1 Warning Light		Diagnosis	Trouble Area	Memory*2
			Normal Mode	Test Mode			
41	 FI1614	Throttle Position Sensor Signal	OFF	ON	Open or short circuit in throttle position sensor signal for 0.5 sec. or more.	• TP sensor circuit • TP sensor • ECU	○
42	 FI1615	Vehicle Speed Sensor Signal	OFF	OFF	For ECT All conditions below are detected continuously for 8 sec. or more. (a) No. 1 speed signal: 0 km/h (mph) (b) Engine speed: 2,450 rpm or more (c) Neutral start switch: OFF (d) Stop light switch: OFF For M/T All conditions below are detected continuously for 8 sec. or more. (a) No. 1 speed signal: 0 km/h (mph) (b) Engine speed: Between 2,300 rpm and 4,000 rpm (c) Water temp.: 80°C (176°F) or more (d) Load driving	• Vehicle speed sensor circuit • Vehicle speed sensor • ECU	○
43	 FI1616	Starter Signal	N.A.	OFF	Starter signal (STA) is not input to ECU until TE1 and E1 are connected.	• Ignition switch circuit • Ignition switch • ECU	X
52	 BE3935	No. 1 Knock Sensor Signal (front side)	ON	N.A.	No No. 1 Knock sensor signal to ECU for 8 crank revolutions with engine speed between 1,920 rpm and 5,200 rpm.	• Open or short in No. 1 knock sensor circuit. • No. 1 knock sensor (looseness) • ECU	○
53	 BE3935	Knock Control Signal	ON	N.A.	No knock control signal to ECU for 6 crank revolutions with engine speed between 1,800 rpm and 5,200 rpm.	• ECU	X
55	 BE3935	No. 2 Knock Sensor Signal (rear side)	ON	N.A.	No No. 2 knock sensor signal to ECU for 8 crank revolutions with engine speed between 1,920 rpm and 5,200 rpm.	• Open or short in No. 2 knock sensor circuit • No. 2 knock sensor (looseness) • ECU	○
51	FI1617	Switch Condition Signal	N.A.	OFF	No "IDL" signal, "NSW" signal or "A/C" signal to ECU with the check connector terminals E1 and TE1 connected.	• Throttle position sensor IDL circuit • Accelerator pedal and cable • Neutral start switch • A/C switch circuit • ECU	X

REMARKS:

*1 "ON" displayed in the diagnosis mode column indicates that the check engine warning light is lit up when a malfunction is detected. "OFF" indicates that the check engine warning light does not light up during malfunction diagnosis, even if a malfunction is detected. "N.A." indicates that the item is not included in malfunction diagnosis.

*2 "○" in the memory column indicates that a diagnostic code is recorded in the ECU memory when a malfunction occurs. "X" indicates that a diagnostic code is not recorded in the ECU memory even if a malfunction occurs. Accordingly, output of diagnostic results in normal or test mode is performed with the ignition switch ON.

*3 A/T only

*4 Europe only

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DIAGNOSTIC CODES (Hardtop)

HINT:

- If a malfunction is detected during the diagnostic code check, refer to the circuit indicated in the table, and turn to the corresponding page.
- Your readings may vary from the parameters listed in the table, depending on the instruments used.

Code No.	Number of "CHECK" Engine Warning Light Blinks	System	"CHECK" Engine*1 Warning Light		Diagnosis	Trouble Area	Memory*2
			Normal Mode	Test Mode			
–	 FI1604	Normal	–	–	No malfunctions detected.	–	–
12	 FI1606	RPM Signal	ON	N.A.	No "NE" or "G1", "G2" signal to ECU for 2 sec. or more after cranking the engine.	• Distributor circuit • Distributor • Starter signal circuit • ECU	○
13	 FI1607	RPM Signal	ON	ON	No "NE" signal to ECU for 0.05 sec. or more when engine speed is above 1,000 rpm.	• Distributor circuit • Distributor • ECU	○
14	 FI1608	Ignition Signal	ON	N.A.	No "IGF" signal to ECU 6 times in succession, and no signal input put within 256 msec.	• Igniter and ignition coil circuit • Igniter and ignition coil • ECU	○
22	 FI1610	Water Temp. Sensor Signal	ON	ON	Open or short circuit in water temp. sensor signal for 0.5 sec. or more. (THW)	• Water temp. sensor circuit • Coolant temp. sensor • ECU	○
24	 FI1611	Intake Air Temp. Sensor Signal	OFF	ON	Open or short circuit in intake air temp. sensor signal for 0.5 sec. or more. (THA)	• Intake air temp. sensor circuit • Intake air temp. sensor • ECU	○
31	 FI1612	Air Flow Meter Signal	ON	ON	When idle contacts are closed and engine speed is 1,500 rpm or less, there is an open circuit in VC and VS signal or a short circuit between VS and E2.	• Air flow meter circuit • Air flow meter • ECU	○
32	 FI1613	Air Flow Meter Signal	ON	ON	Open circuit in E2 or short circuit between VC and VS.	• Air flow meter circuit • Air flow meter • ECU	○
41	 FI1614	Throttle Position Sensor Signal	OFF	ON	Open or short circuit in throttle position sensor signal for 0.5 sec. or more.	• TP sensor circuit • TP sensor • ECU	○
42	 FI1615	Vehicle Speed Sensor Signal	OFF	OFF	No "SPD" signal for 8 seconds when engine speed 2,700 rpm or more and with vehicle not moving.	• Vehicle speed sensor circuit • Vehicle speed sensor • ECU	○
43	 FI1616	Starter Signal	N.A.	OFF	Starter signal (STA) is not input to ECU until TE1 and E1 are connected.	• Ignition switch circuit • Ignition switch • ECU	X

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DIAGNOSTIC CODES (Hardtop) (Cont'd)

Code No.	Number of "CHECK" Engine Warning Light Blinks	System	"CHECK" Engine*1 Warning Light		Diagnosis	Trouble Area	Memory*2
			Normal Mode	Test Mode			
52	 BE3935	No. 1 Knock Sensor Signal (front side)	ON	N.A.	No No. 1 knock sensor signal to ECU for 6 crank revolutions with engine speed between 1,800 rpm and 5,200 rpm.	• Open or short in No. 1 knock sensor circuit. • No. 1 knock sensor (looseness) • ECU	○
53	 BE3935	Knock Control Signal	ON	N.A.	No knock control signal to ECU for 12 crank revolutions with engine speed between 1,800 rpm and 5,200 rpm.	• ECU	X
55	 BE3935	No. 2 Knock Sensor Signal (rear side)	ON	N.A.	No No. 2 knock sensor signal to ECU for 6 crank revolutions with engine speed between 1,800 rpm and 5,200 rpm.	• Open or short in No. 2 knock sansor circuit • No. 2 knock sensor (looseness) • ECU	○
51	 FI1617	Switch Condition Signal	N.A.	OFF	No "IDL" signal, "NSW" signal or "A/C" signal to ECU with the check connector terminals E1 and TE1 connected.	• Throttle position sensor IDL circuit • Accelerator pedal and cable • Neutral start switch • A/C switch circuit • ECU	X

REMARKS:

*1 "ON" displayed in the diagnosis mode column indicates that the check engine warning light is lit up when a malfunction is detected. "OFF" indicates that the check engine warning light does not light up during malfunction diagnosis, even if a malfunction is detected. "N.A." indicates that the item is not included in malfunction diagnosis.

*2 "○" in the memory column indicates that a diagnostic code is recorded in the ECU memory when a malfunction occurs. "X" indicates that a diagnostic code is not recorded in the ECU memory even if a malfunction occurs. Accordingly, output of diagnostic results in normal or test mode is performed with the ignition switch ON.

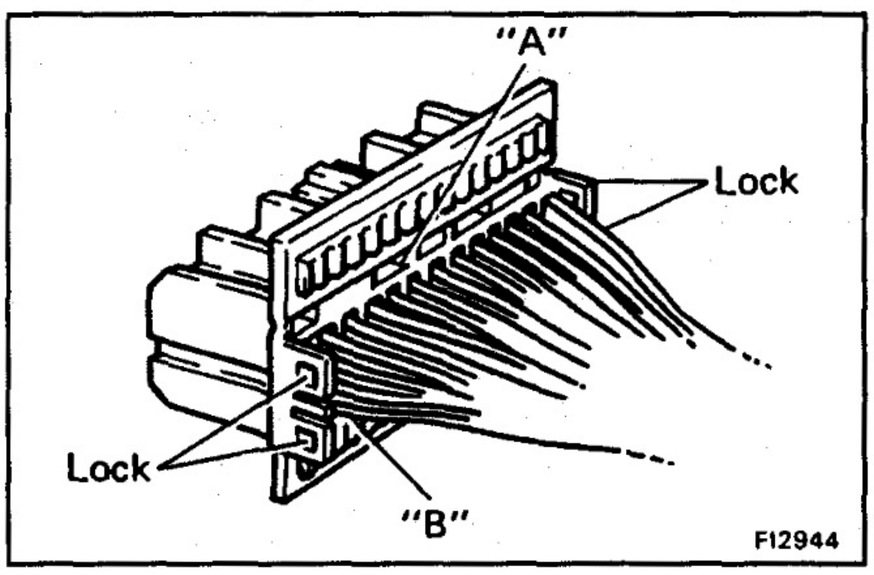
V06557

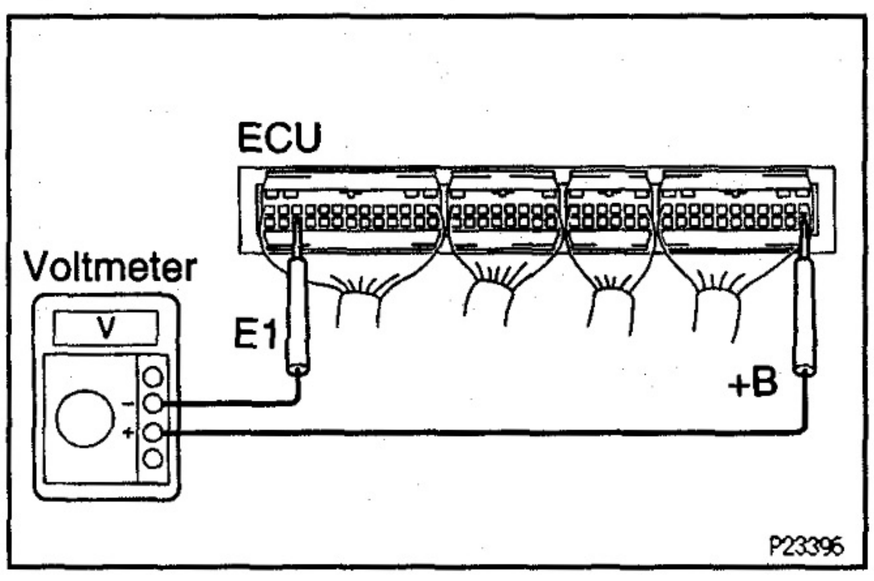
TROUBLESHOOTING w/ VOLT, OHMMETER (Station Wagon)

EG0GB–04

HINT:

- The following troubleshooting procedures are designed for inspection of each separate system, and therefore the actual procedure may vary somewhat. However, troubleshooting should be performed while referring to the inspection methods described in this manual.
- Before beginning inspection, it is best to first make a simple check of the fuses, H–fuses, fusible links and the condition of the connectors.
- The following troubleshooting procedures are based on the supposition that the trouble lies in either a short or open circuit within the computer.
- If engine trouble occurs even though proper operating voltage is detected in the computer connector, then it can be assumed that the ECU is faulty and should be replaced.





EFI SYSTEM CHECK PROCEDURE

EG0GA–04

PREPARATION

(a) Disconnect the connectors from the ECU.

(b) Remove the locks as shown in the illustration so that the tester probe(s) can easily come in.
NOTICE: Pay attention to sections "A" and "B" in the illustration which can be easily broken.

(c) Reconnect the connectors to the ECU.

(d) Using a voltmeter with high impedance (10 kΩ/V minimum), measure the voltage at each terminal of the wiring connectors.

HINT:

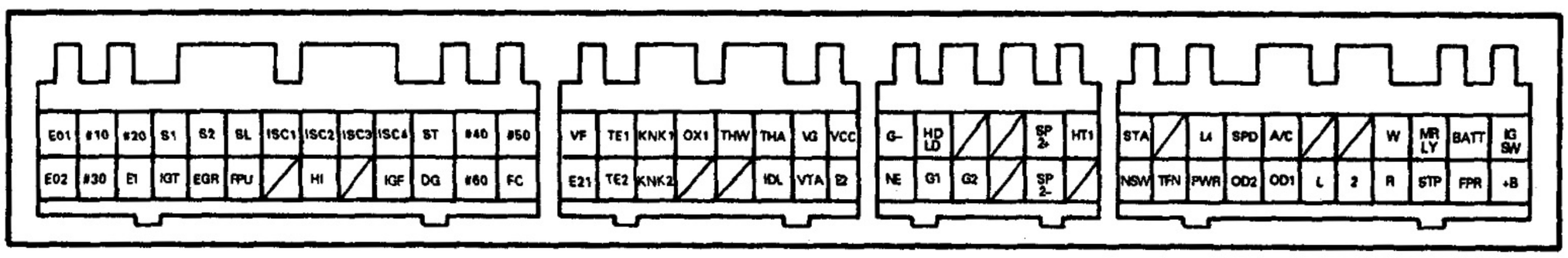
- Perform all voltage measurements with the connectors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is in "ON" position.

EG

ECU Terminals (Europe)

Symbol	Connection	Symbol	Connection	Symbol	Connection
E01	POWER GROUND	VF	CHECK CONNECTOR	HT1	OXYGEN SENSOR
E02	POWER GROUND	E21	AIR FLOW METER		–
#10	INJECTOR (No.1)	TE1	CHECK CONNECTOR	STA	NEUTRAL START SWITCH
#30	INJECTOR (No.3)	TE2	CHECK CONNECTOR	NSW	IGNITION SWITCH
#20	INJECTOR (No.2)	KNK1	NO.1 KNOCK SENSOR		–
E1	ECU GROUND	KNK2	NO.2 KNOCK SENSOR	TFN*	TRANSFER NEUTRAL POSITION SWITCH
S1*	ECT SOLENOID	OX1	OXYGEN SENSOR	L4*	L4 POSITION SENSOR
IGT	IGNITER		–	PWR*	PATERN SELECT SWITCH
S2*	ECT SOLENOID	THW	WATER TEMP. SENSOR	SPD	NO.1 VEHICLE SPEED SENSOR
EGR	VSV FOR EGR		–	OD2*	O/D MAIN SWITCH
SL*	ECT SOLENOID	THA	AIR FLOW METER	A/C	A/C AMPLIFIE
FPU	VSV FOR FUEL PRESSURE CONTROL	IDL	TP SENSOR	OD1*	CRUISE CONTROL ECU
ISC1	ISC VALVE (No.1 Motor Coil)	VG	AIR FLOW METER		–
	–	VTA	TP SENSOR	L*	NEUTRAL START SWITCH
ISC2	ISC VALVE (No.2 Motor Coil)	VCC	TP SENSOR		–
HI*	HOLD INDICATOR LIGHT	E2	SENSOR GROUND	2*	NEUTRAL START SWITCH
ISC3	ISC VALVE (No.3 Motor Coil)	G–	DISTRIBUTOR	W	"CHECK" ENGINE WARNING LIGHT
	–	NE	DISTRIBUTOR	R*	NEUTRAL START SWITCH
ISC4	ISC VALVE (No.4 Motor Coil)	HOLD*	PATTERN SELECT SWITCH	MRLY	EFI MAIN RELAY (COIL)
IGF	IGNITER	G1	DISTRIBUTOR	STP	STOP LIGHT SWITCH
ST*	ECT SOLENOID		–	BATT	BATTERY B +
DG*	CHECK CONNECTOR	G2	DISTRIBUTOR	FPR	FUEL PUMP RELAY
#40	INJECTOR (No.4)		–	IGSW	IGNITION SWITCH
#60	INJECTOR (No.6)		–	+B	EFI MAIN RELAY
#50	INJECTOR (No.5)	SP2+*	NO.2 VEHICLE SPEED SENSOR	* Only for ECT	
FC	CIRCUIT OPENING RELAY	SP2–*	NO.2 VEHICLE SPEED SENSOR		

ECU Terminals



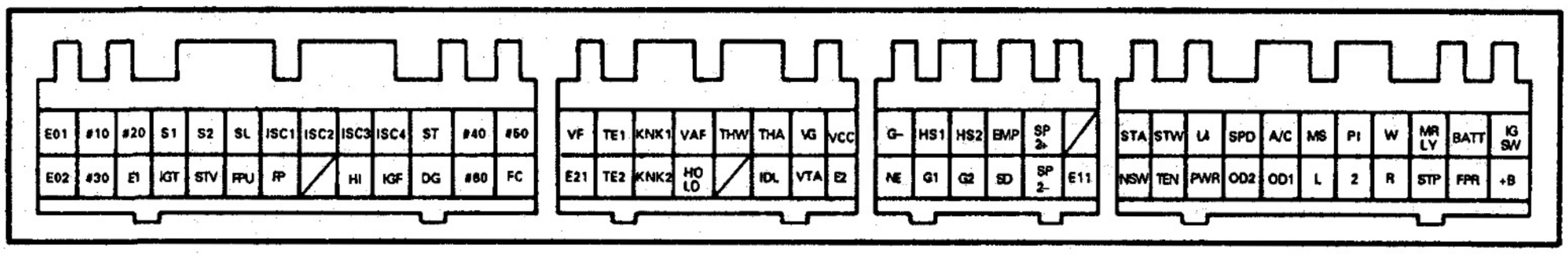
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ECU Terminals (Except Europe)

Symbol	Connection	Symbol	Connection	Symbol	Connection
E01	POWER GROUND	VF	CHECK CONNECTOR		–
E02	POWER GROUND	E21	AIR FLOW METER	E11	SENSOR GROUND
#10	INJECTOR (No.1)	TE1	CHECK CONNECTOR	STA	NEUTRAL START SWITCH
#30	INJECTOR (No.3)	TE2	CHECK CONNECTOR	NSW	IGNITION SWITCH
#20	INJECTOR (No.2)	KNK1	NO.1 KNOCK SENSOR	STW	SUB TANK WARNING LIGHT
E1	ECU GROUND	KNK2	NO.2 KNOCK SENSOR	TFN*	TRANSFER NEUTRAL POSITION SWITCH
S1*	ECT SOLENOID	VAF	VARIABL RESISTOR	L4*	L4 POSITION SENSOR
IGT	IGNITER	HOLD*	PATERN SELECT SWITCH	PWR*	PATERN SELECT SWITCH
S2*	ECT SOLENOID	THW	WATER TEMP. SENSOR	SPD	VEHICLE SPEED SENSOR
STV	SUB FUEL TANK VALVE		–	OD2*	O/D MAIN SWITCH
SL*	ECT SOLENOID	THA	AIR FLOW METER	A/C	A/C AMPLIFIE
FPU	VSV FOR FUEL PRESSURE CONTROL	IDL	TP SENSOR	OD1*	CRUISE CONTROL ECU
ISC1	ISC VALVE (No.1 Motor Coil)	VG	AIR FLOW METER	MS	FUEL MAIN SWITCH
FP	SUB FUEL TANK PUMP	VTA	TP SENSOR	L*	NEUTRAL START SWITCH
ISC2	ISC VALVE (No.2 Motor Coil)	VCC	TP SENSOR	PI	FUEL MAIN SWITCH
	–	E2	SENSOR GROUND	2*	NEUTRAL START SWITCH
ISC3	ISC VALVE (No.3 Motor Coil)	G–	DISTRIBUTOR	W	"CHECK" ENGINE WARNING LIGHT
HI*	HOLD INDICATOR LIGHT	NE	DISTRIBUTOR	R*	NEUTRAL START SWITCH
ISC4	ISC VALVE (No.4 Motor Coil)	HS1	TOP SWITCH	MRLY	EFI MAIN RELAY (COIL)
IGF	IGNITER	G1	DISTRIBUTOR	STP	STOP LIGHT SWITCH
ST*	ECT SOLENOID	HS2	TOP SWITCH	BATT	BATTERY B +
DG*	CHECK CONNECTOR	G2	DISTRIBUTOR	FPR	FUEL PUMP SWITCH
#40	INJECTOR (No.4)	EMP	SUB FUEL SWITCH	IGSW	IGNITION SWITCH
#60	INJECTOR (No.6)	SD	FUEL SENDER GAUGE	+B	EFI MAIN RELAY
#50	INJECTOR (No.5)	SP2+*	NO.2 VEHICLE SPEED SENSOR	* Only for ECT	
FC	CIRCUIT OPENING RELAY	SP2–*	NO.2 VEHICLE SPEED SENSOR		

ECU Terminals



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V06537

EG

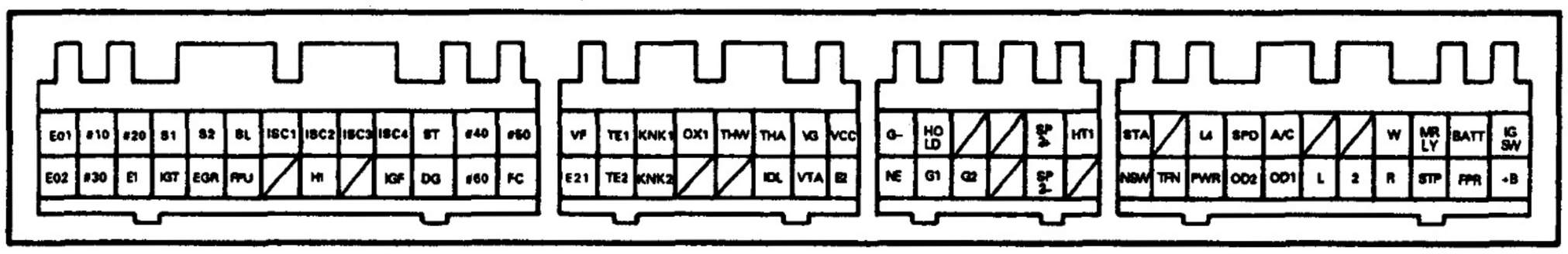
EGSM2-01

ECU Wiring Connectors Voltage

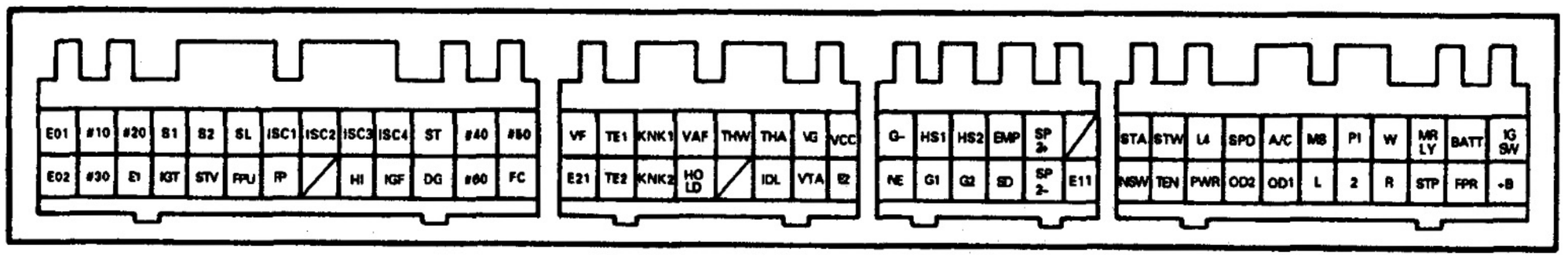
No.	Terminals	Condition		STD voltage (V)	See page
1	BATT – E1	–		9 – 14	EG-23
	IG SW – E1	IG SW ON			
	MRLY – E1				
	+B – E1				
2	IDL – E2	IG SW ON	Throttle valve open	9 – 14	EG-26
	VCC – E2		–	4.5 – 5.5	
	VTA – E2		Throttle valve fully closed (Throttle opener must be cancelled first)	0.3 – 0.8	
			Throttle valve fully open	3.2 – 4.9	
3	VG – E21	Idling	N position, A/C switch OFF	1.1 – 1.5	EG-28
4	#10 ~ #60 – E01 E02	IG SW ON		9 – 14	EG-29
5	THA – E2	IG SW ON	Intake air temp. 20°C (68°F)	0.5 – 3.4	EG-30
6	THW – E2		Engine coolant temp. 80°C (176°F)	0.2 – 1.0	EG-31
7	STA – E1	Cranking		6 or more	EG-32
8	IGT – E1	Idling		Pulse generation	EG-33
9	ISC1 ~ ISC4 – E1	IG SW ON		9 – 14	EG-34
10	W – E1	No trouble ("CHECK" engine warning light off) and engine running		9 – 14	EG-35

ECU Terminals

Europe



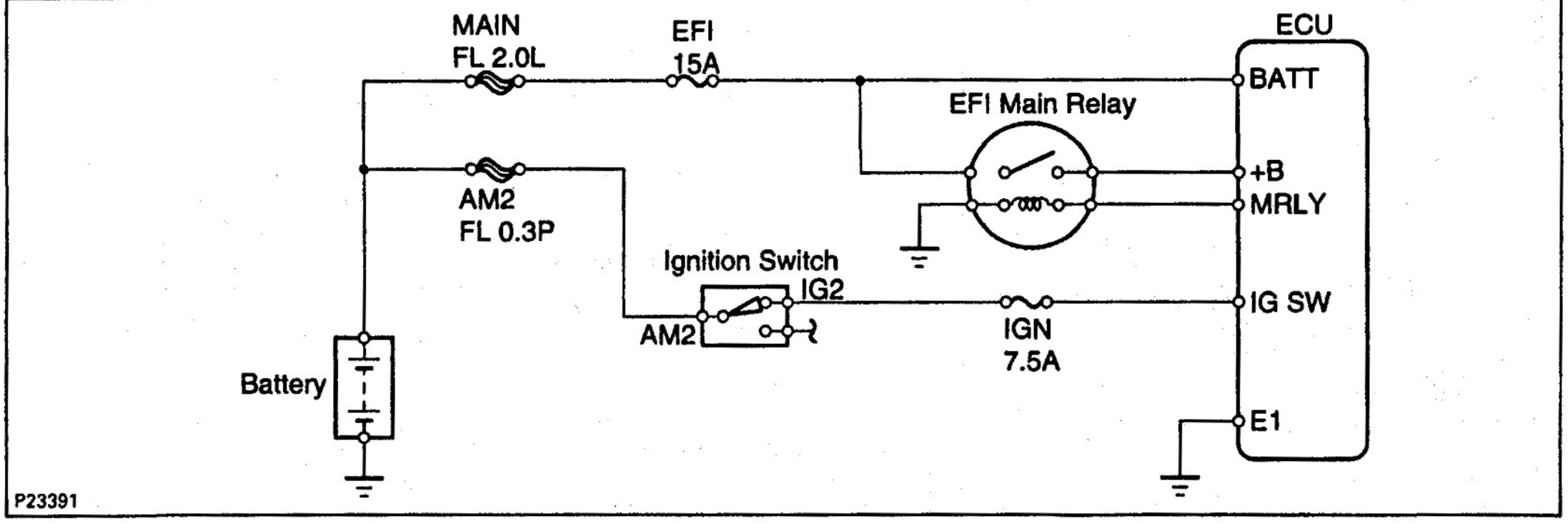
Except Europe

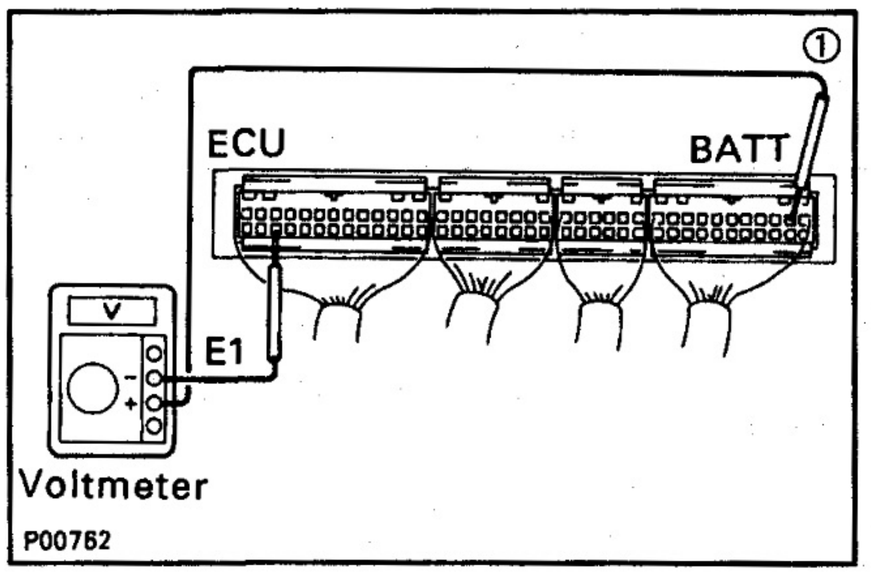


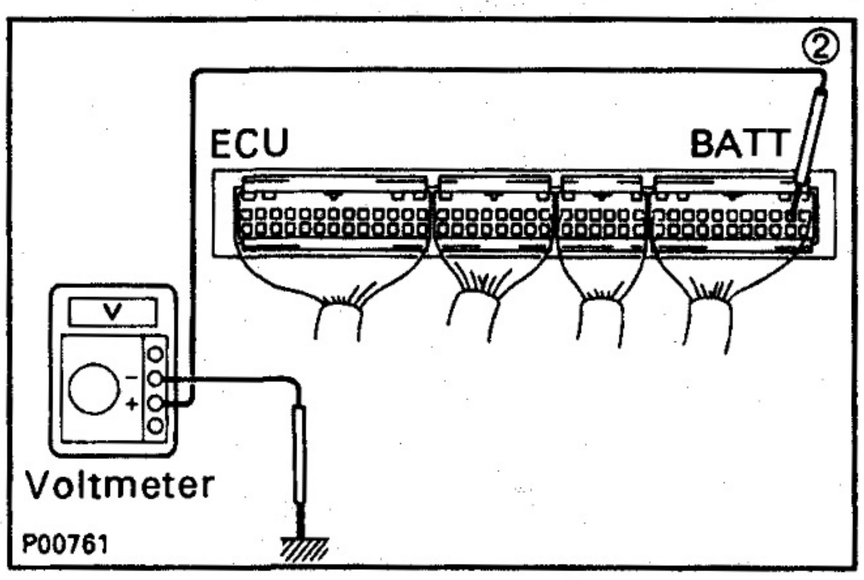
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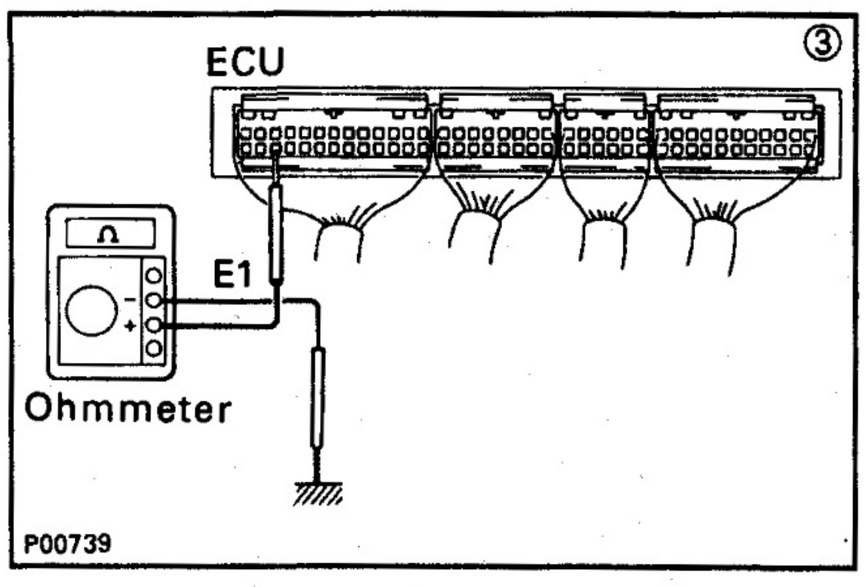
V06539

No.	Terminals	Trouble	Condition	STD voltage
1	BATT – E1	No voltage	—	9 – 14 V
	IG SW – E1	No voltage	IG SW ON	9 – 14 V
	MRLY – E1			
	+B – E1			









• **BATT – E1**

① There is no voltage between ECU terminals BATT and E1.

② Check that there is voltage between ECU terminal BATT and body ground.

NO

OK

③ Check wiring between ECU terminal E1 and body ground.

OK

Try another ECU.

BAD

Repair or replace.

Check fuse and fusible link.

BAD

Replace.

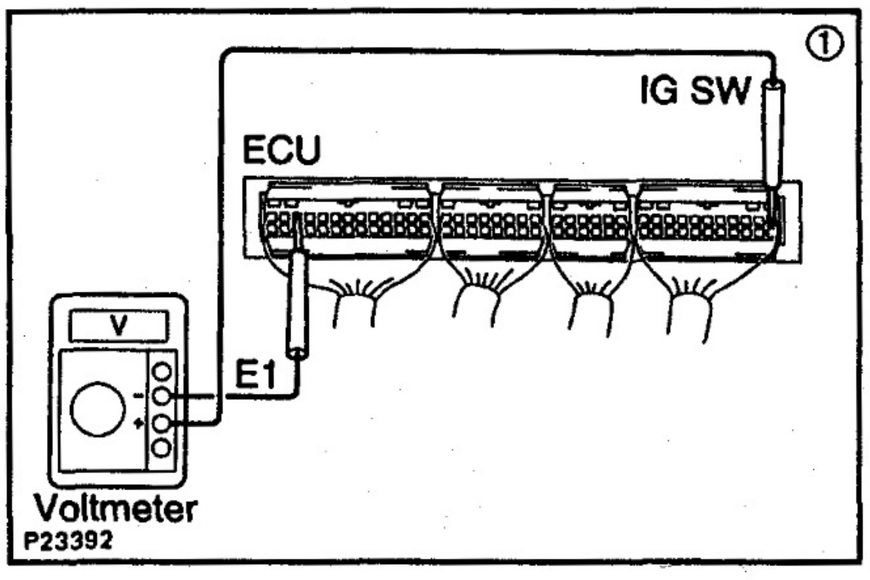
OK

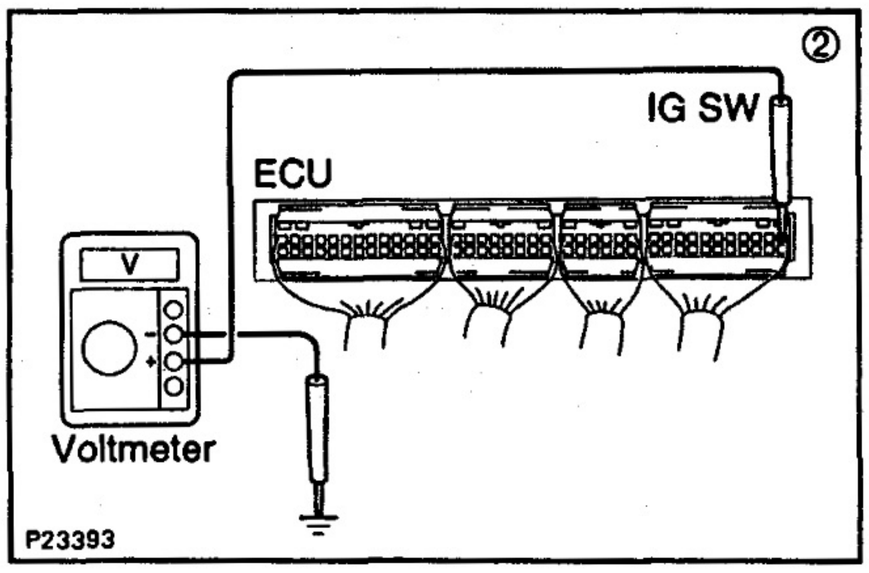
Check wiring between ECU terminal and battery.

BAD

Repair or replace.

V06540





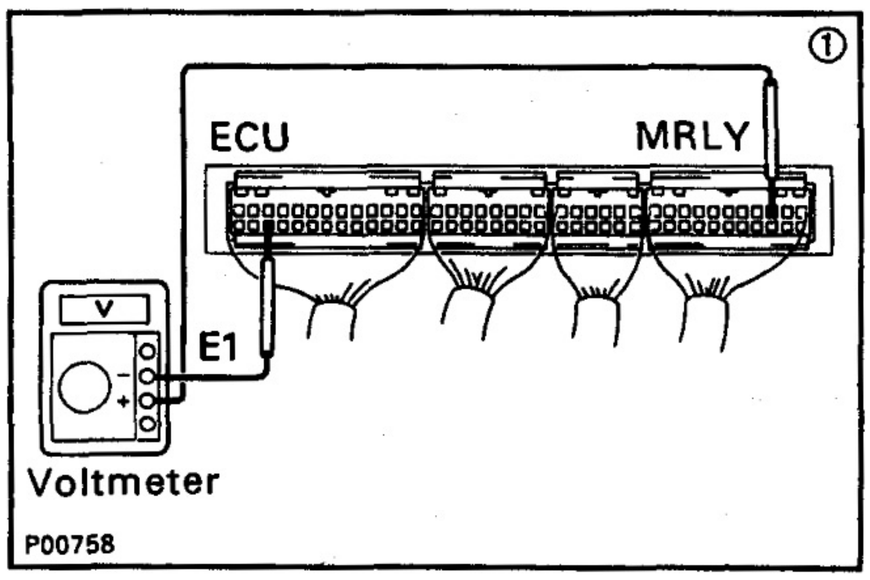
• **IG SW – E1**

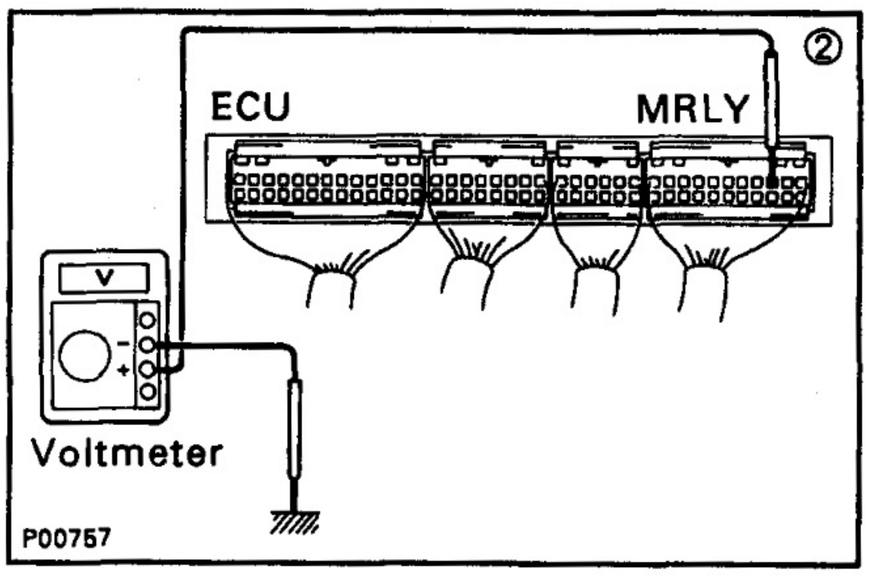
① There is no voltage between ECU terminals IG SW and E1. **(IG SW ON)**

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

NO → Check fuses, fusible link and ignition switch.
- BAD → Repair or replace.

OK → Check wiring between ECU terminal E1 and body ground.
- OK → Try another ECU.
- BAD → Repair or replace.





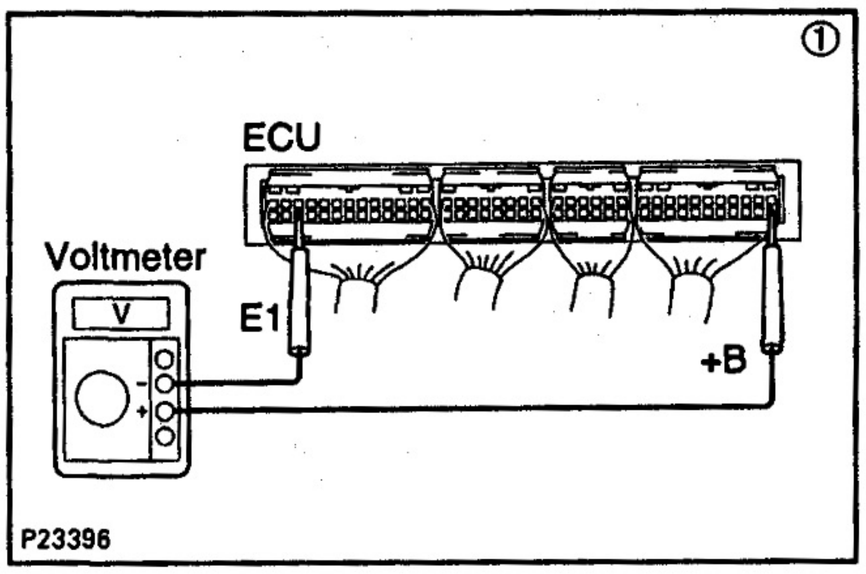
• **MRLY – E1**

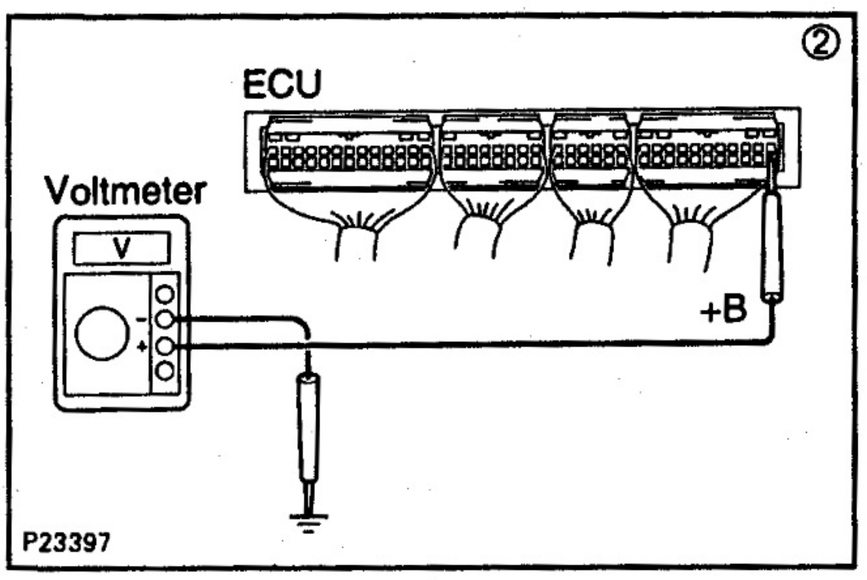
① There is no voltage between ECU terminals MRLY and E1. **(IG SW ON)**

② Check that there is voltage between ECU terminal MRLY and body ground. **(IG SW ON)**

NO → Check EFI main relay and wiring harness.
- BAD → Replace.
- OK → Try another ECU.

OK → Check wiring between ECU terminal E1 and body ground.
- OK → Try another ECU.
- BAD → Repair or replace.





• **+B – E1**

① There is no voltage between ECU terminals +B and E1. **(IG SW ON)**

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

NO

OK

Check wiring between ECU terminal E1 and body ground.

OK

Try another ECU.

BAD

Repair or replace.

Check fuse, fusible link and wiring harness.

BAD

Repair or replace.

OK

Check EFI main relay.

BAD

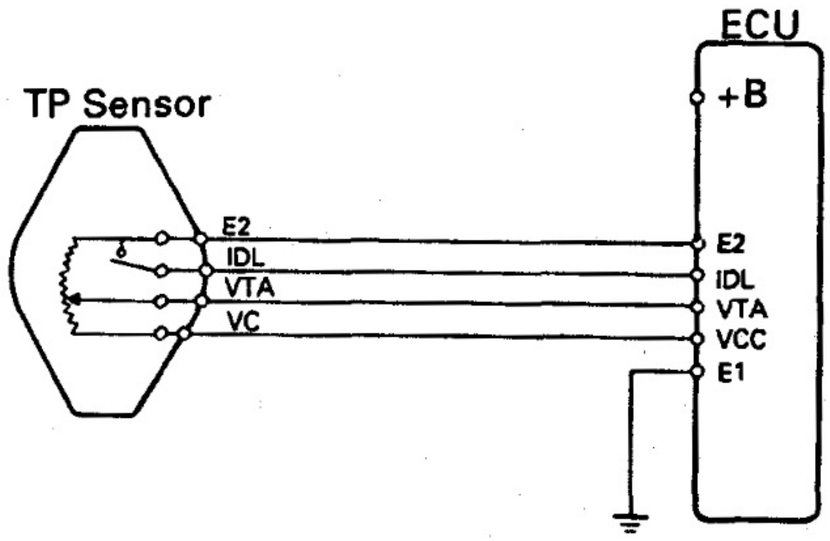
Replace.

OK

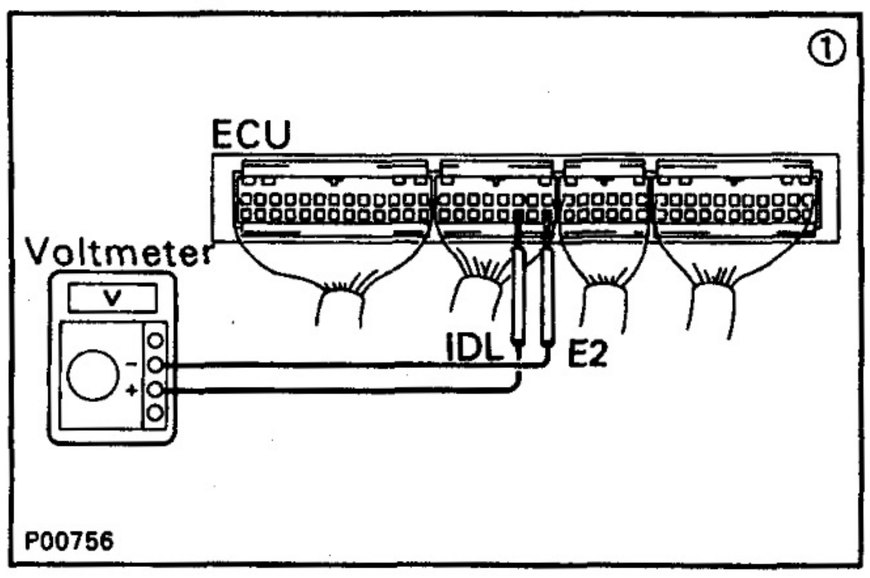
Refer to MRLY – E1 trouble section.

V06553

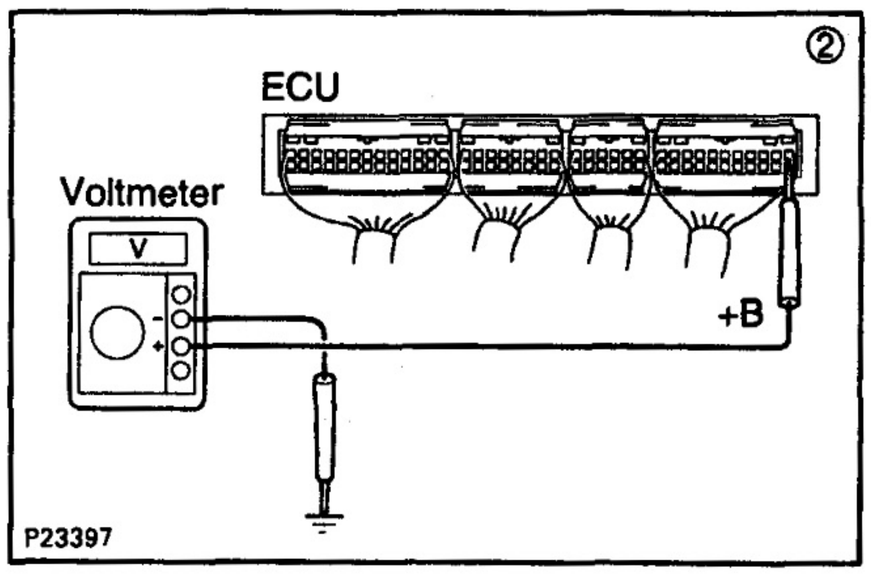
No.	Terminals	Trouble	Condition		STD voltage
2	IDL – E2	No voltage	IG SW ON	Throttle valve open	9 – 14 V
	VCC – E2			–	4.5 – 5.5 V
	VTA – E2			Throttle valve fully closed (Throttle opener must be cancelled first)	0.3 – 0.8 V
				Throttle valve fully open	3.2 – 4.9 V



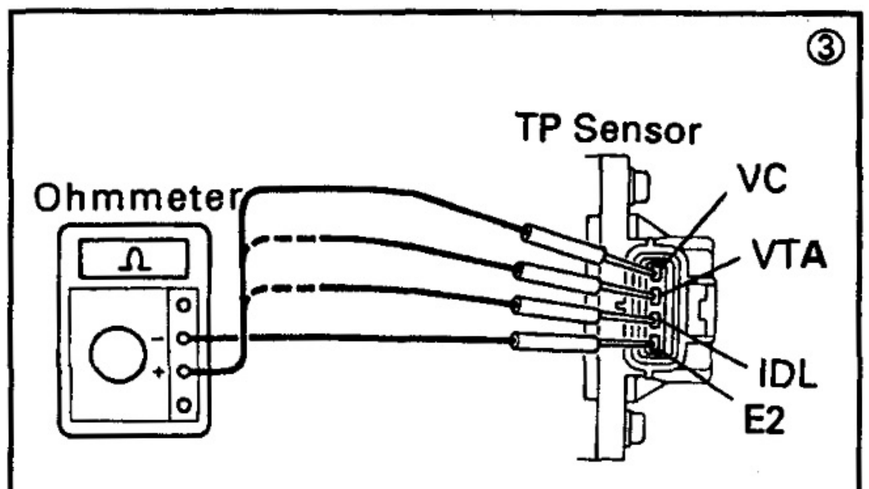
P01419



P00756



P23397



P09282

• **IDL – E2**

① There is no voltage between ECU terminals IDL and E2. **(IG SW ON)** (Throttle valve open)

↓

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

NO → ↓

OK → Check wiring between ECU terminal E1 and body ground.

OK → Try another ECU.

BAD → Repair or replace.

↓

Refer to No. 1. (See page EG-23)

BAD → Repair or replace.

↓

OK

↓

③ Check TP sensor.

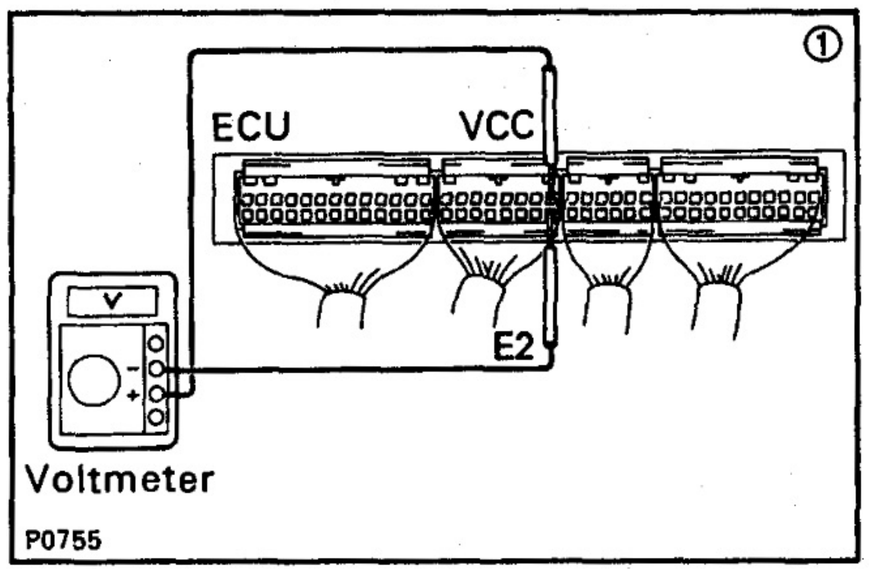
BAD → Repair or replace TP sensor.

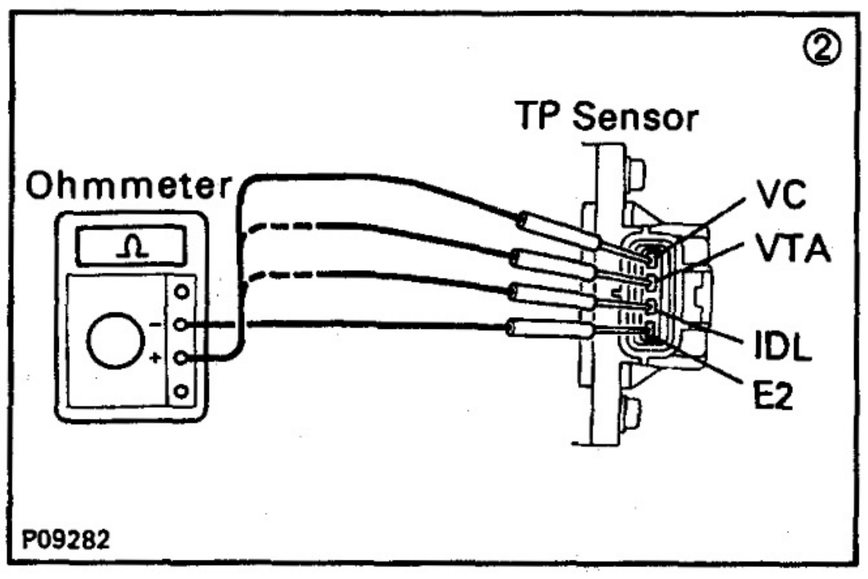
OK → Check wiring between ECU and TP sensor.

OK → Try another ECU.

BAD → Repair or replace.

V06542





• **VC – E2**

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

↓

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

↓ OK

② Check TP sensor.

↓ BAD

Repair or replace.

OK ↓

Check wiring between ECU and TP sensor.

↓ OK

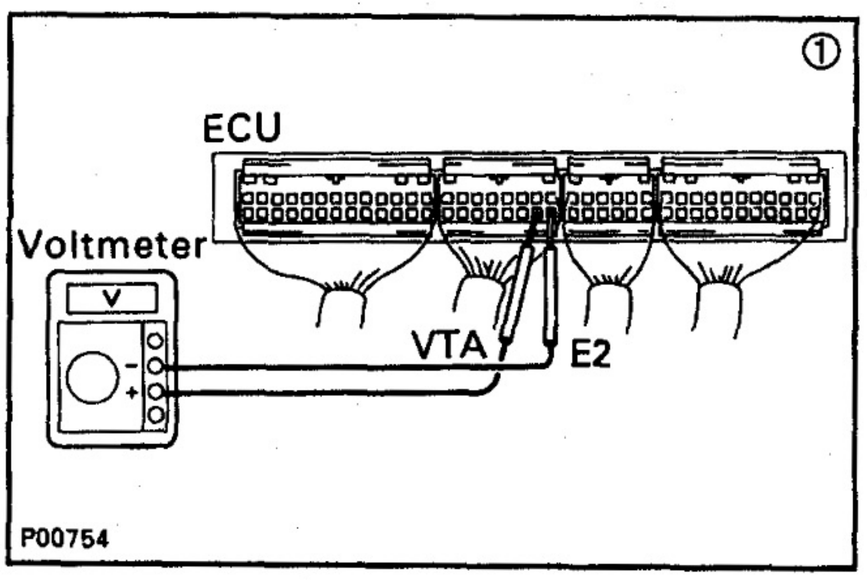
Try another ECU.

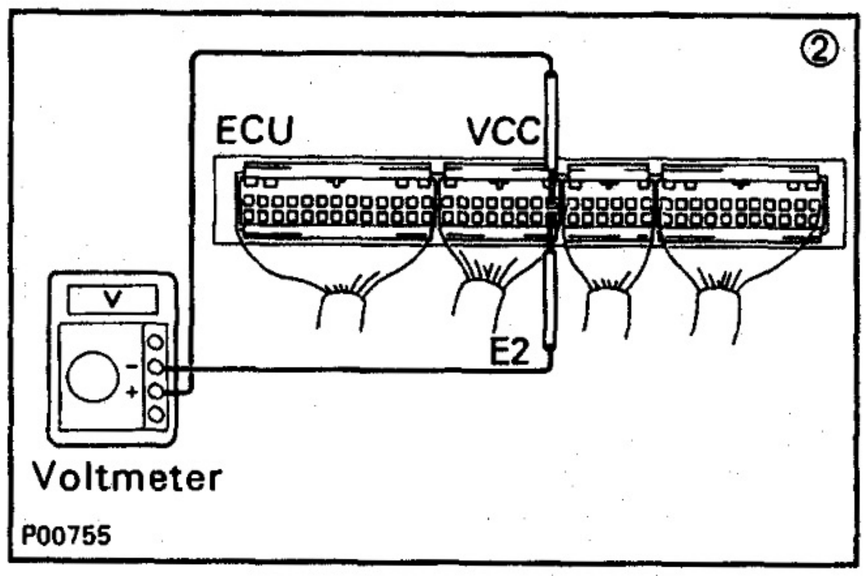
BAD ↓

Repair or replace wiring.

NO ↓

Refer to No. 1. (See page EG-23)





• **VTA – E2**

① There is no specified voltage at ECU terminals VTA and E2. **(IG SW ON)**

↓

② Check that there is voltage between ECU terminals VCC and E2. **(IG SW ON)**

↓ NO

Refer to VCC – E2 trouble section.

↓ OK

OK ↓

③ Check TP sensor.

↓ OK

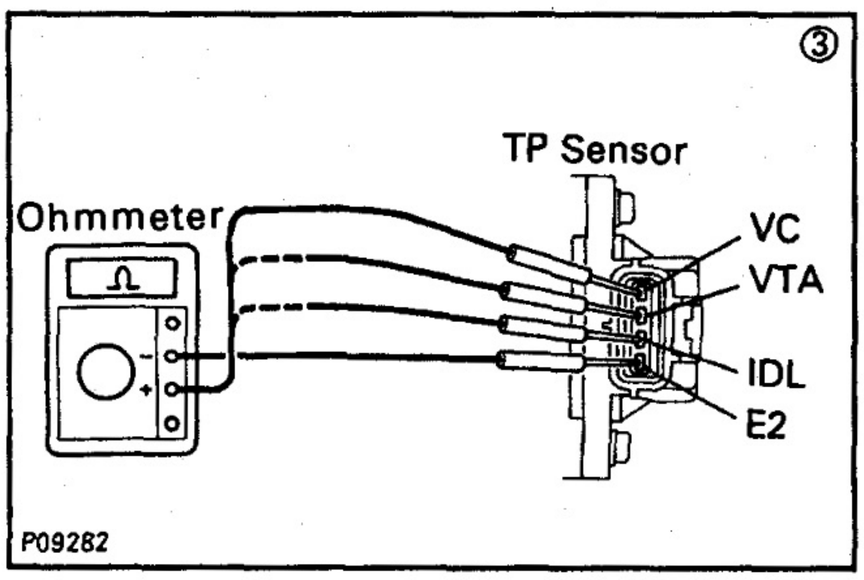
BAD → Repair or replace.

Check wiring between ECU and TP sensor.

↓ OK

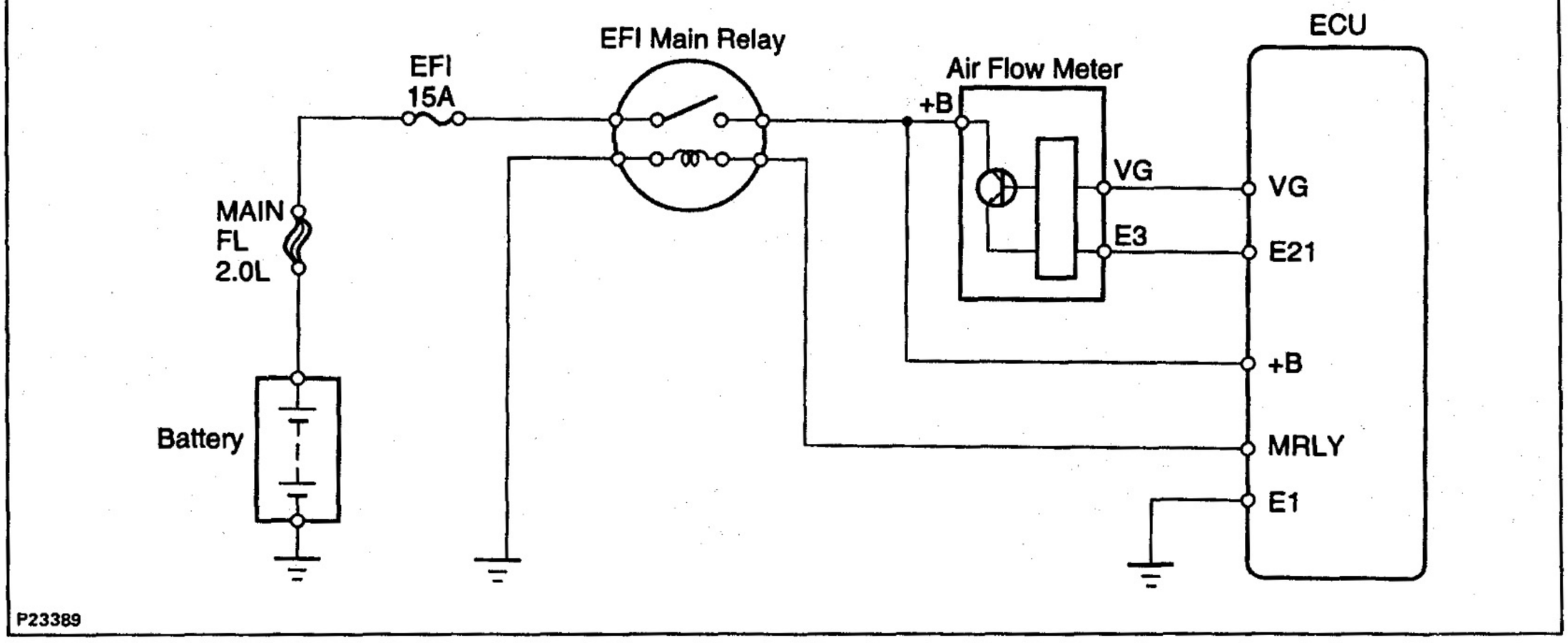
BAD → Repair or replace.

Try another ECU.

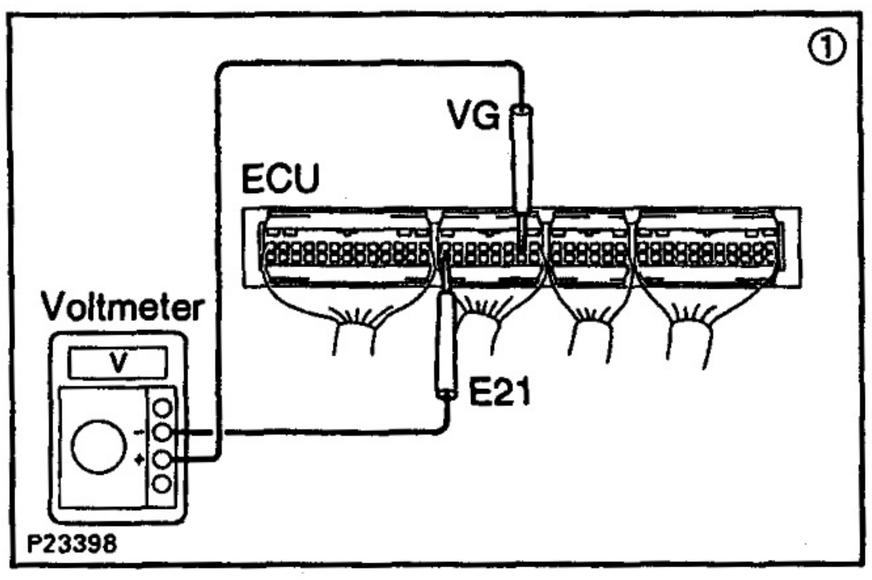


V06543

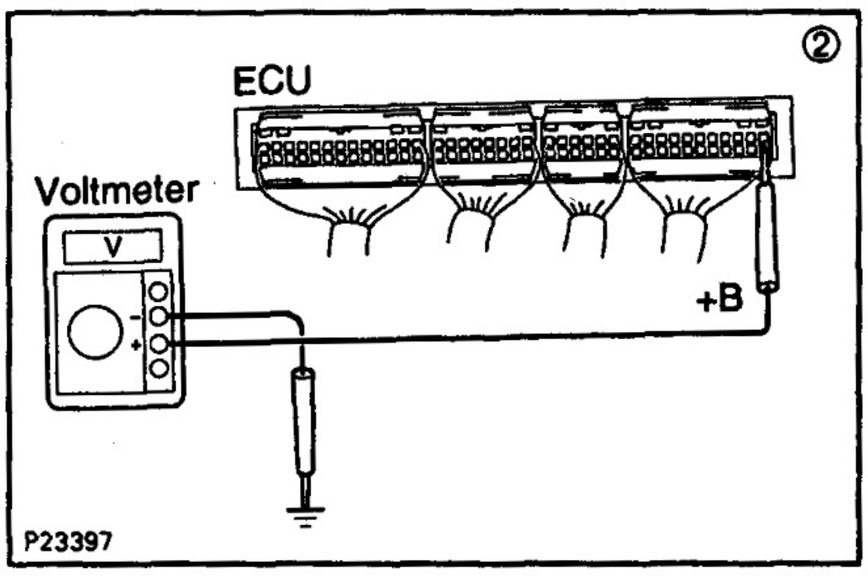
No.	Terminals	Trouble	Condition		STD voltage
3	VG – E21	No voltage	Idling	N position, A/C switch OFF	1.1 – 1.5 V



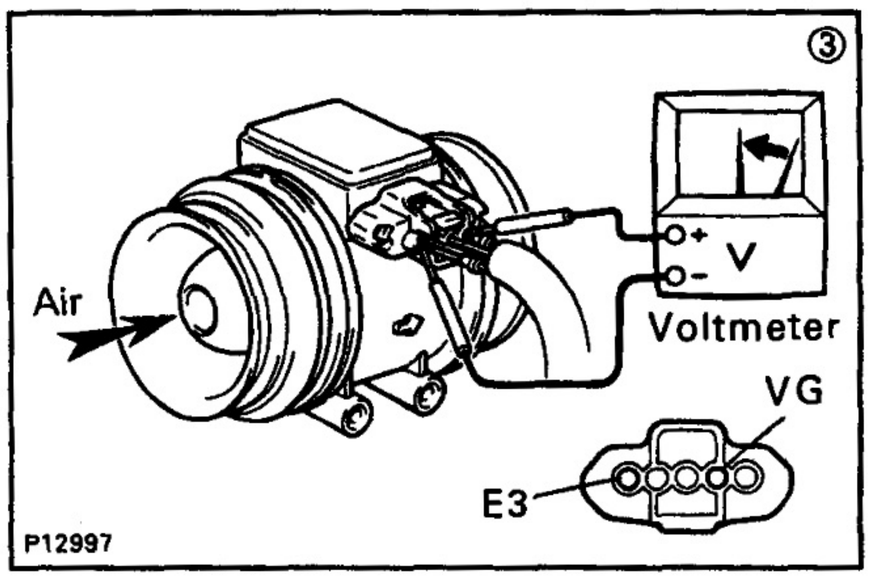
P23389



P23398



P23397



P12997

① There is no voltage between ECU terminals VG and E21. **(Idling)**

↓

② Check that there is voltage between ECU terminal +B and body ground. **(Idling)**

OK ↓

NO → Refer to No.1. (See page EG-23)

↓

Check wiring between ECU terminal E1 and body ground.

OK ↓

BAD → Repair or replace.

③ Check air flow meter. (See page EG-54)

BAD → Replace air flow meter.

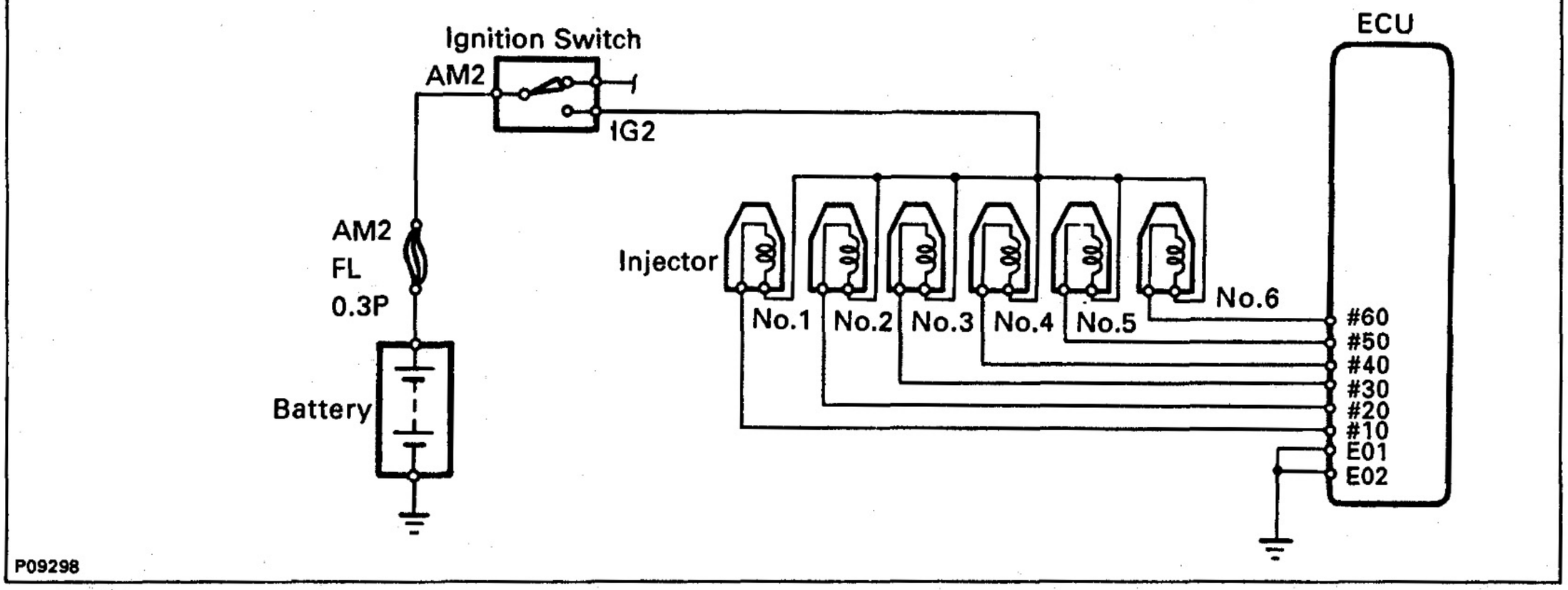
OK → Check wiring between ECU and air flow meter.

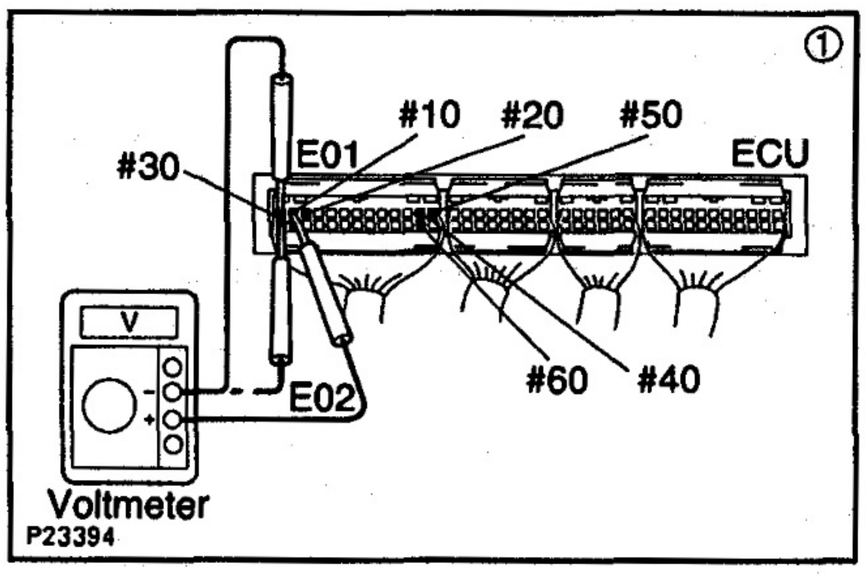
OK → Try another ECU.

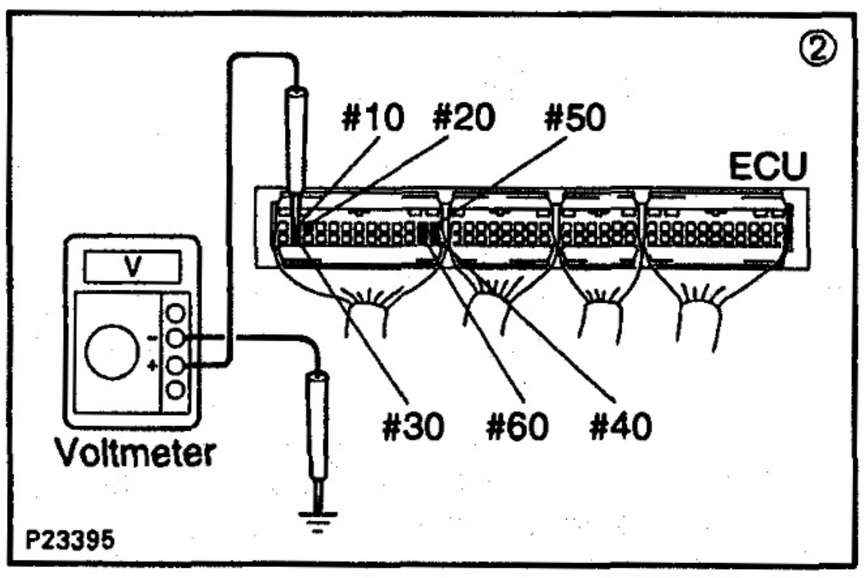
BAD → Repair or replace.

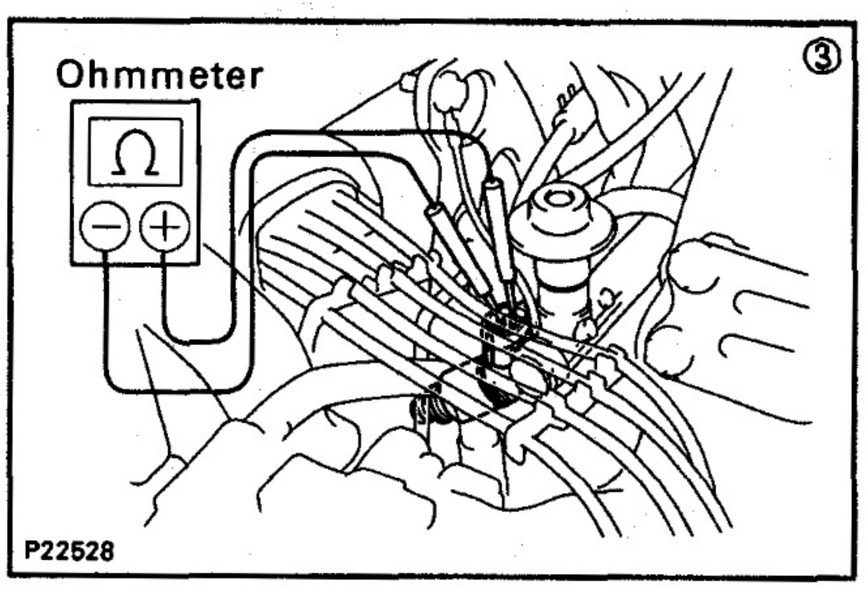
V06544

No.	Terminals	Trouble	Condition	STD voltage
4	#10 E01 S – #60 E02	No voltage	IG SW ON	9 – 14 V









① There is no voltage between ECU terminals #10 ~ #60 and E01 and/or E02. **(IG SW ON)**

② Check that there is voltage between ECU terminal #10 ~ #60 and body ground.

NO

OK

Check wiring between ECU terminal E01 and/or E02 and body ground.

OK

Try another ECU.

BAD

Repair or replace.

Check fusible link and ignition switch.

BAD

Repair or replace.

OK

③ Check resistance of each injector.
STD resistance: Approx. 13.8 Ω

OK

BAD

Replace injector.

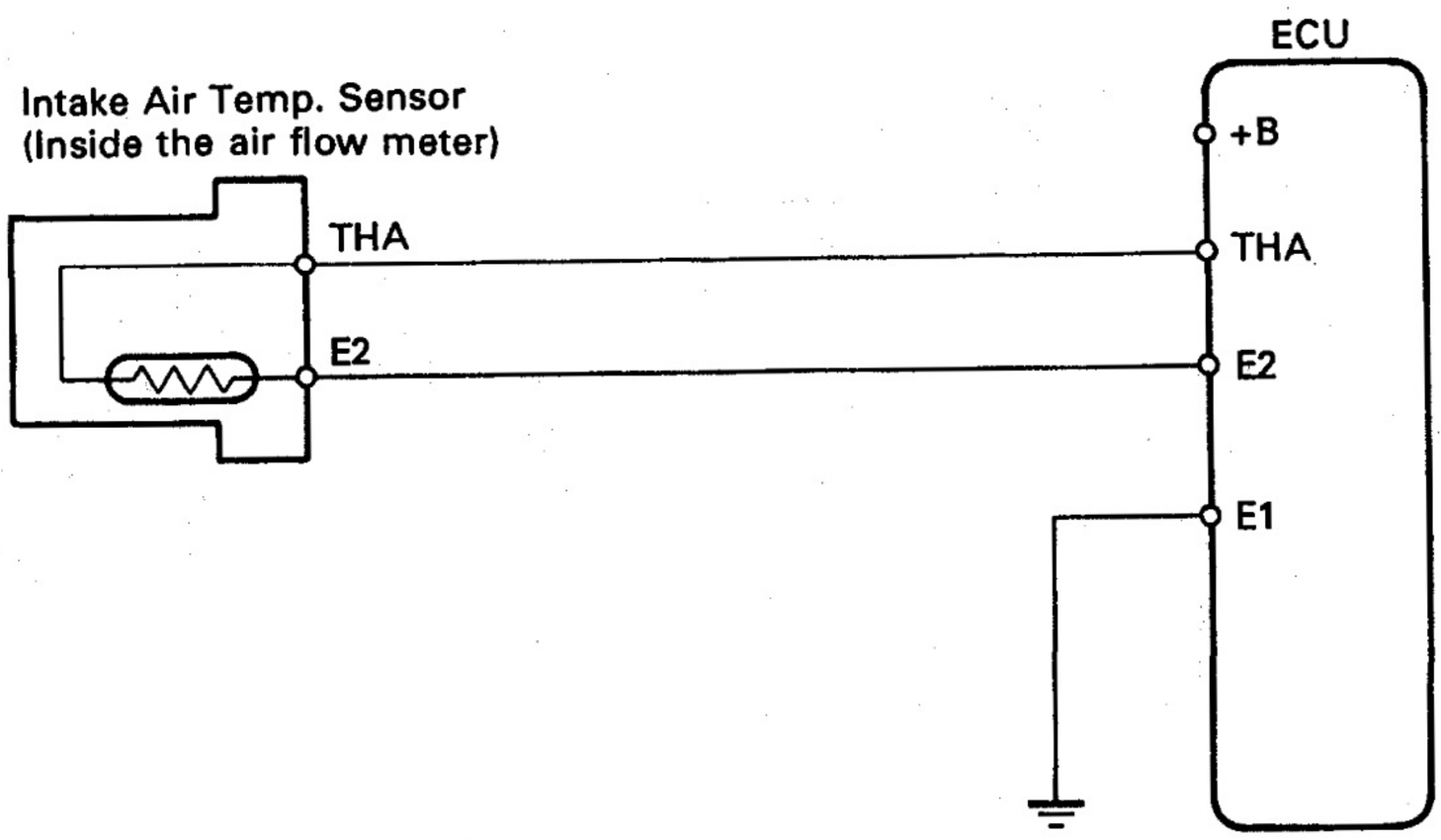
Check wiring between ECU terminal #10 ~ #60 and battery.

BAD

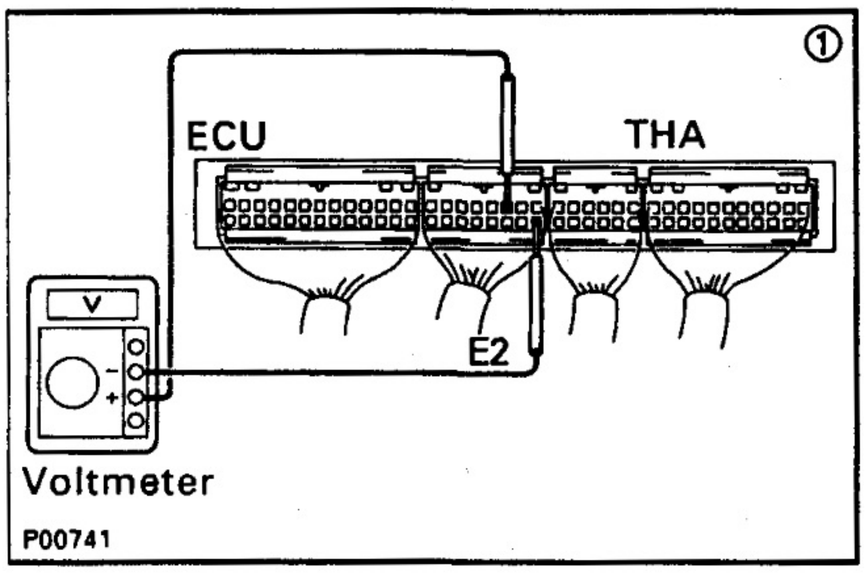
Repair or replace.

V06545

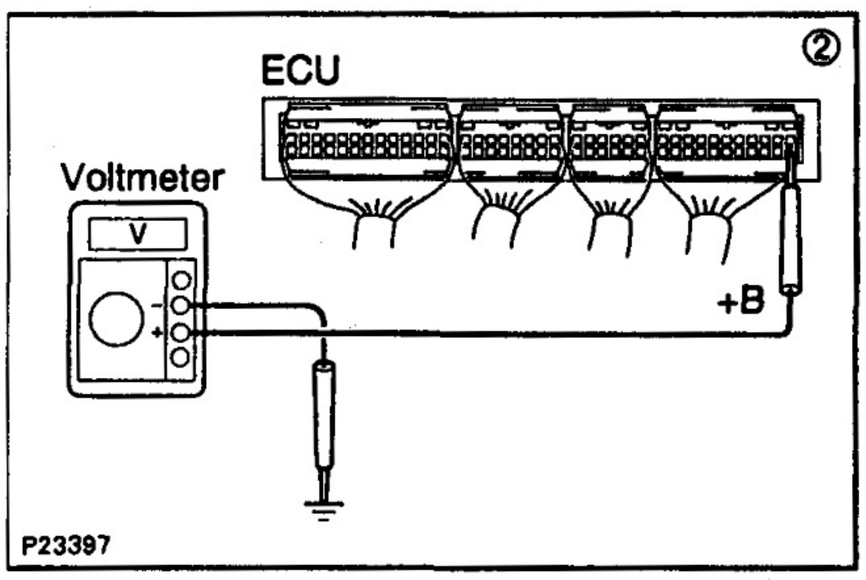
No.	Terminals	Trouble	Condition		STD voltage
5	THA – E2	No voltage	IG SW ON	Intake air temp. 20°C (68°F)	0.5 – 3.4 V



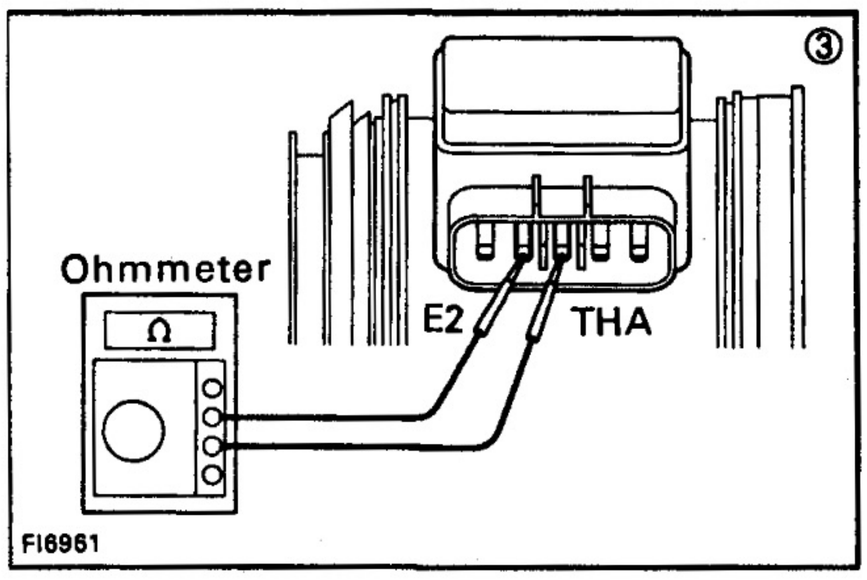
P13572



P00741



P23397



FI6961

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

↓

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

OK ↓

NO → Refer to No.1. (See page EG-23)

Check wiring between ECU terminal E1 and body ground.

OK ↓

BAD → Repair or replace.

③ Check intake air temp. sensor.

BAD → Replace air flow meter.

OK ↓

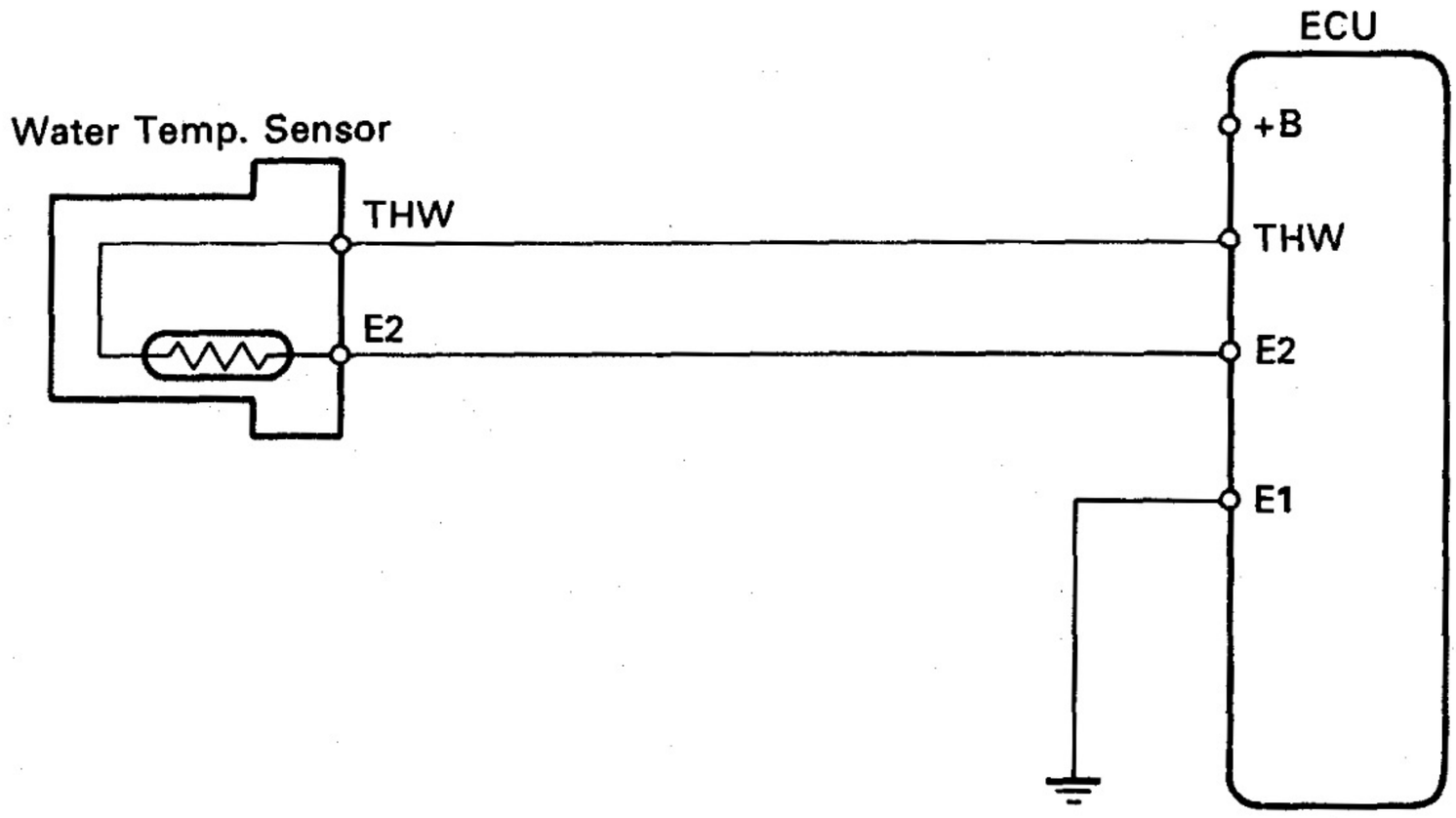
Check wiring between ECU and intake air temp. sensor.

OK → Try another ECU.

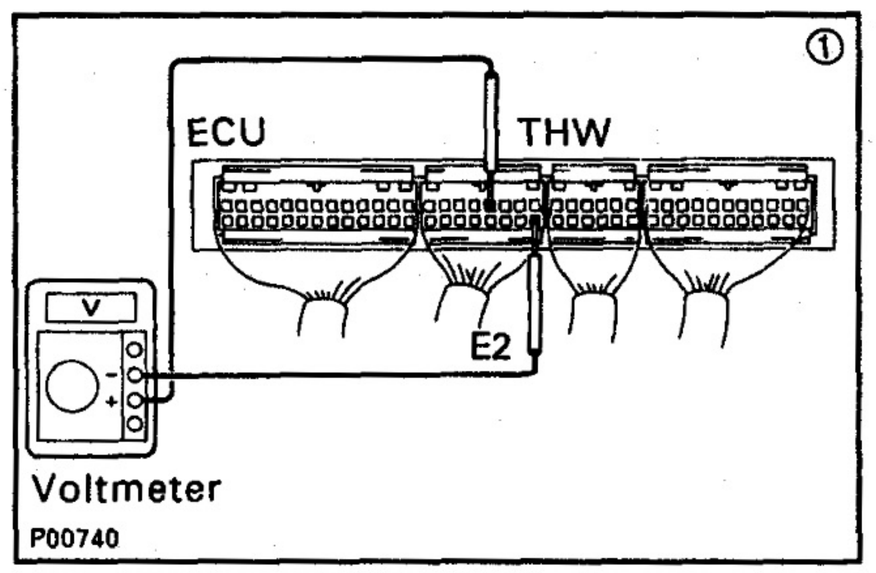
BAD → Repair or replace.

V06546

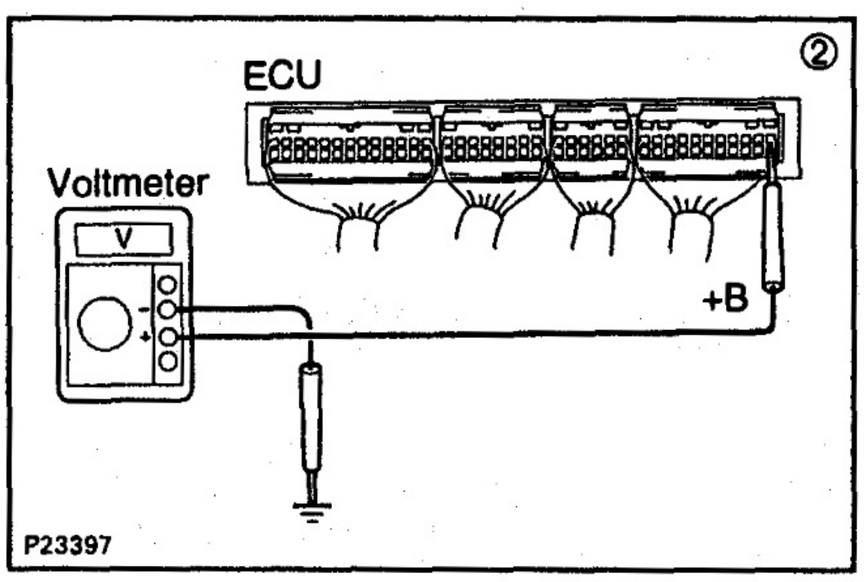
No.	Terminals	Trouble	Condition		STD voltage
6	THW – E2	No voltage	IG SW ON	Engine coolant temp. 80°C (176°F)	0.2 – 1.0 V



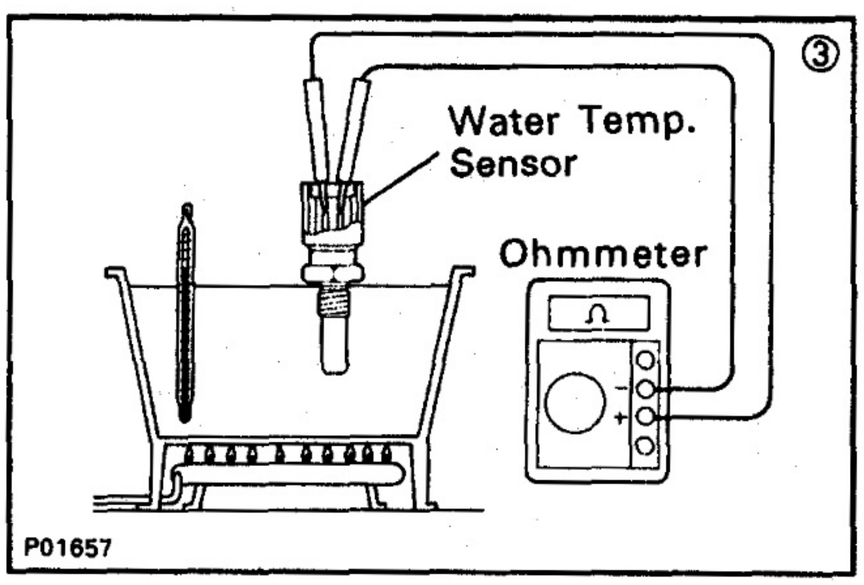
P13572



P00740



P23397



P01657

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

↓

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

OK ↓ / NO → Refer to No. 1. (See page EG-23)

↓

Check wiring between ECU terminal E1 and body ground.

OK ↓ / BAD → Repair or replace.

↓

③ Check water temp. sensor.

BAD ↓ Replace water temp. sensor.

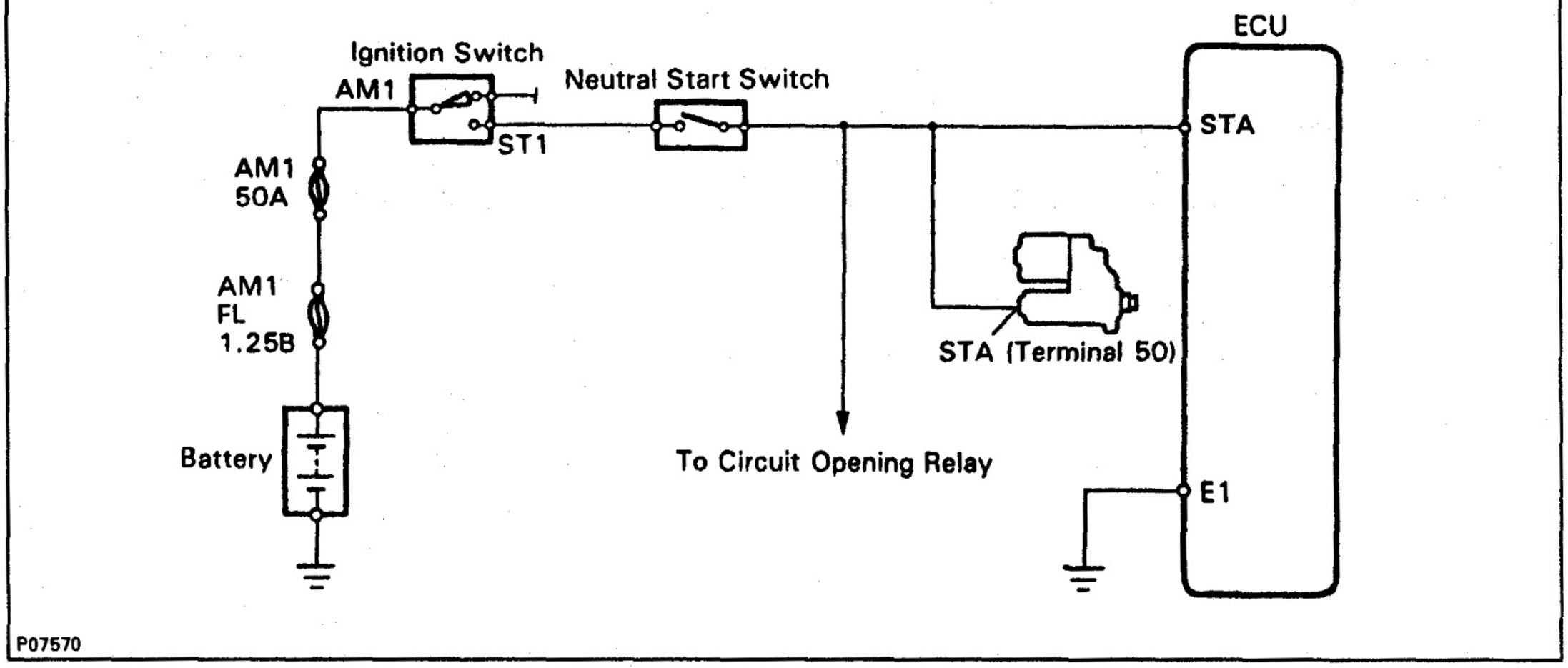
OK → Check wiring between ECU and water temp. sensor.

OK ↓ Try another ECU.

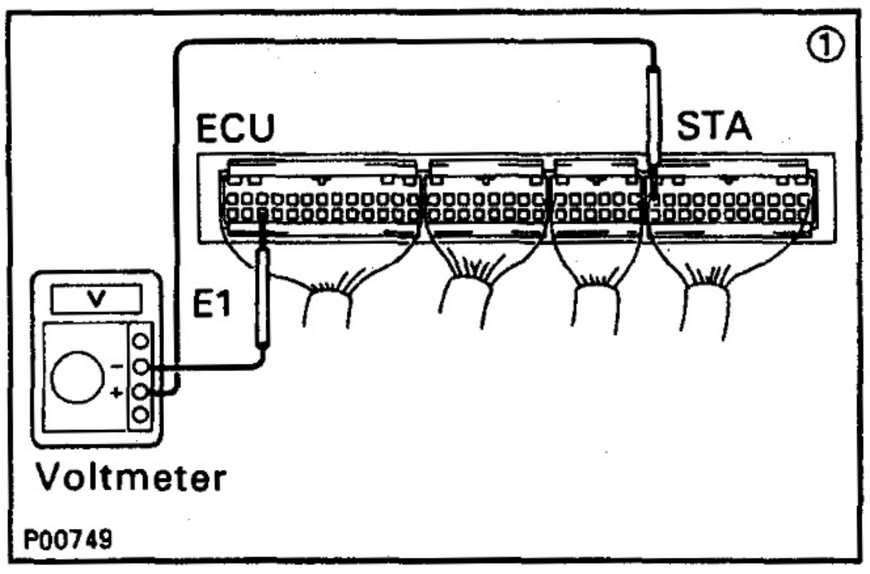
BAD → Repair or replace.

V06547

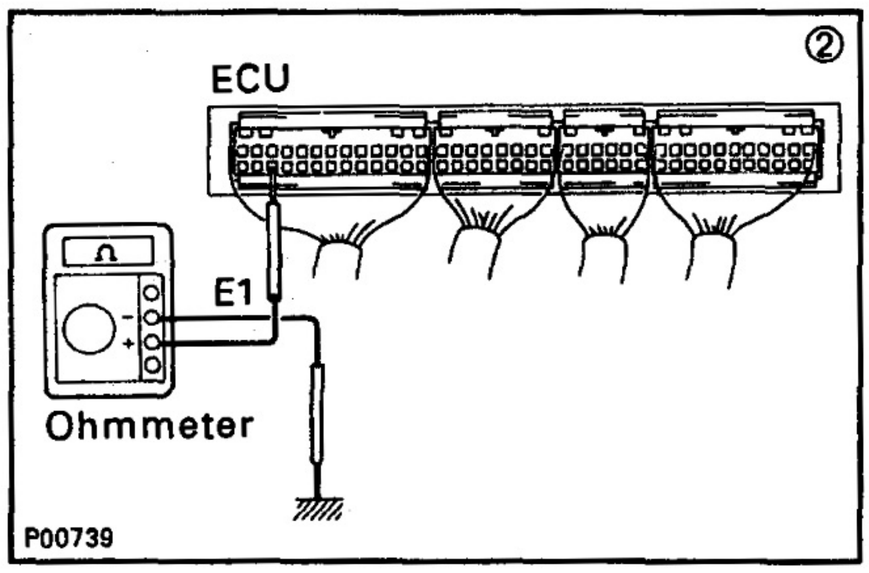
No.	Terminals	Trouble	Condition	STD voltage
7	STA – E1	No voltage	Cranking	6 V or more



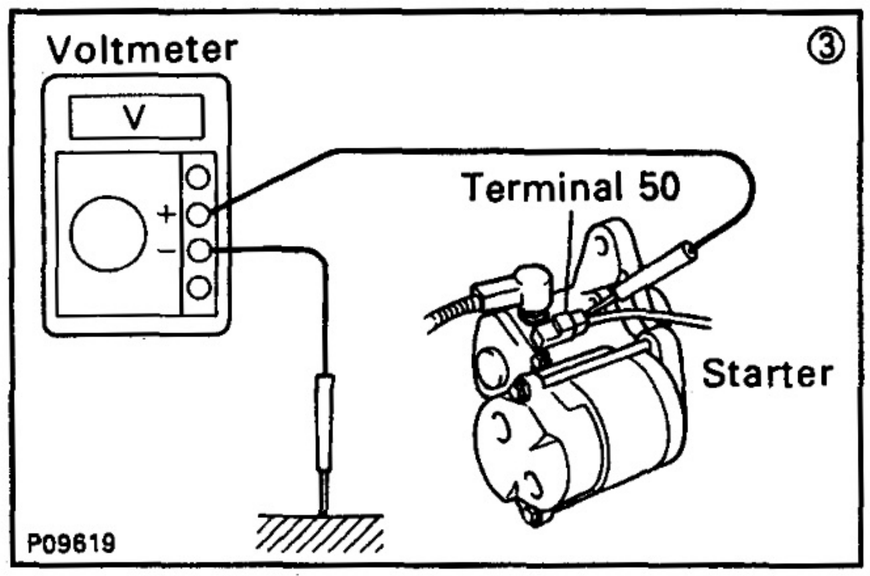
P07570



P00749



P00739



P09619

① There is no voltage between ECU terminals STA and E1. **(IG SW START)**

Check starter operation. — OK → Check wiring between ECU terminal STA and ignition switch terminal ST1. — OK → ② Check wiring between ECU terminal E1 and body ground. — OK → Try another ECU. / BAD → Repair or replace.

ST1 — BAD → Repair or replace.

BAD → Check H-fuse, fusible link,battery, wiring, ignition switch and neutral start switch. — BAD → Repair or replace.

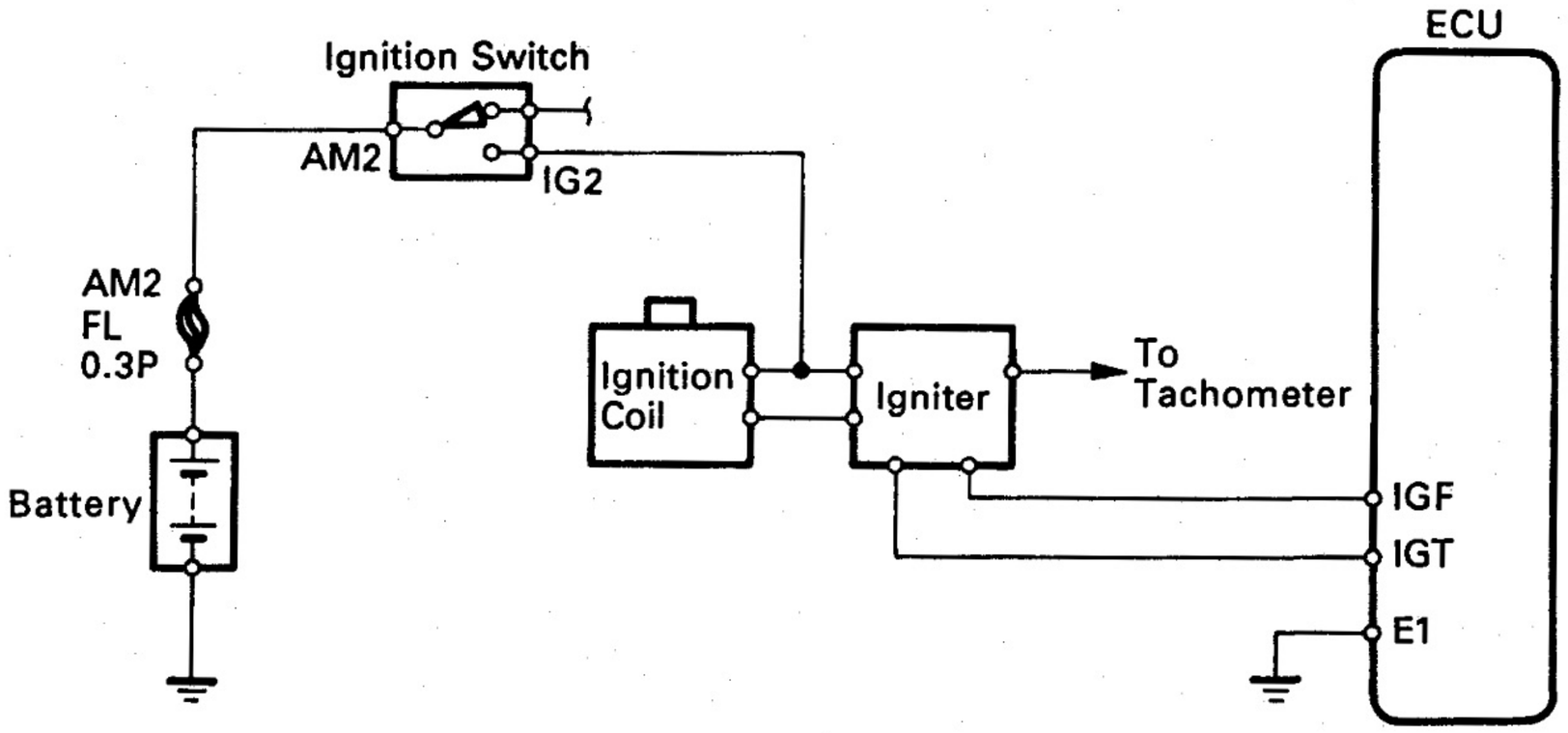
OK → ③ Check that there is voltage at starter terminal 50. **(IG SW START) STD voltage: 6 V or more**

OK → Check starter.

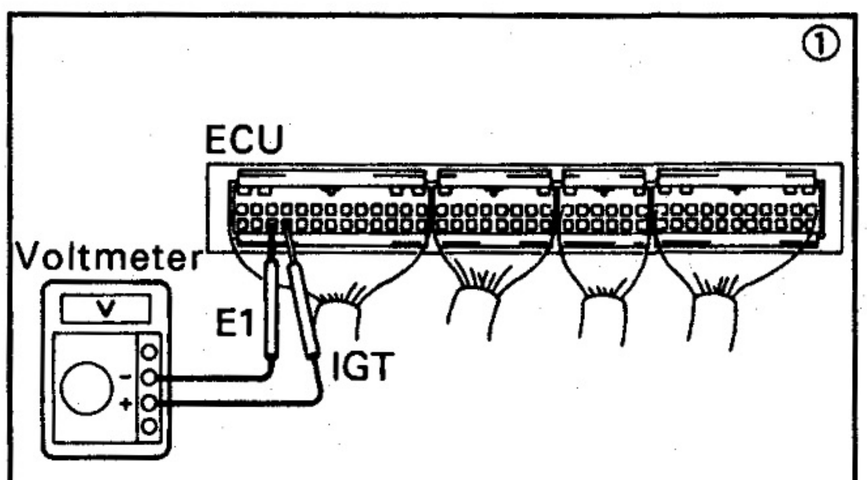
NO → Check wiring between ignition switch terminal ST1 and starter terminal 50.

V06548

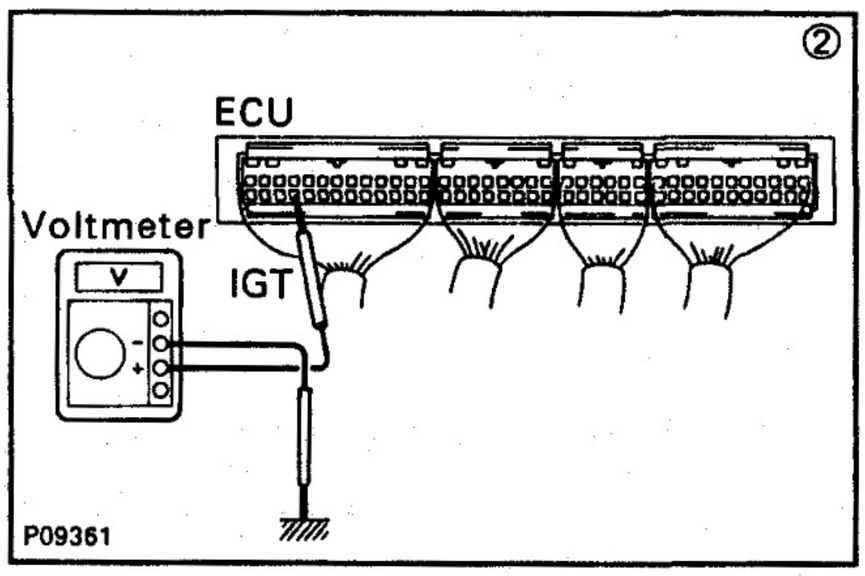
No.	Terminals	Trouble	Condition	STD voltage
8	IGT – E1	No voltage	Idling	Palse generation



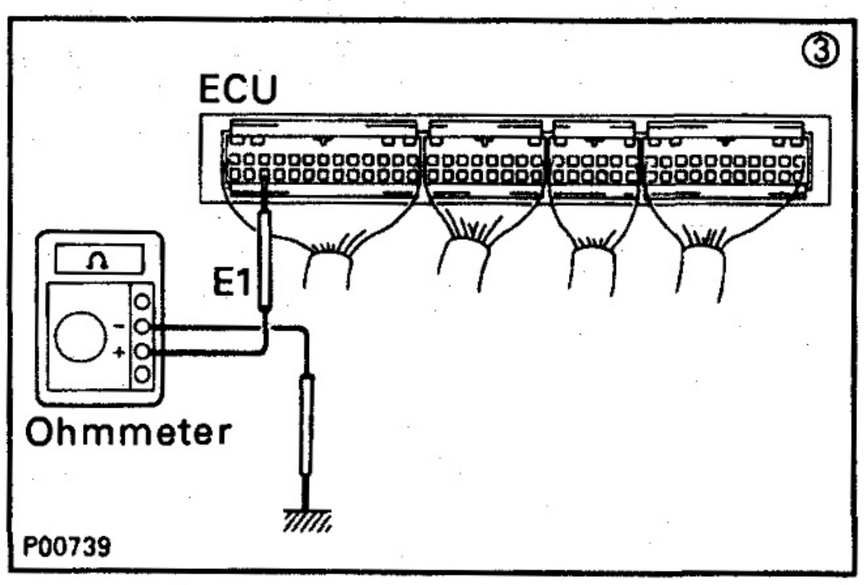
P04541



P09363



P09361



P00739

① There is no voltage between ECU terminals IGT and E1. **(Idling)**

② Check that there is voltage between ECU terminal IGT and body ground. **(Idling)**

NO

OK

③ Check wiring between ECU terminal E1 and body ground. — BAD → Repair or replace.

OK

Try another ECU.

Check fusible link and ignition switch. — BAD → Repair or replace.

OK

Check distributor. — BAD → Repair or replace.

OK

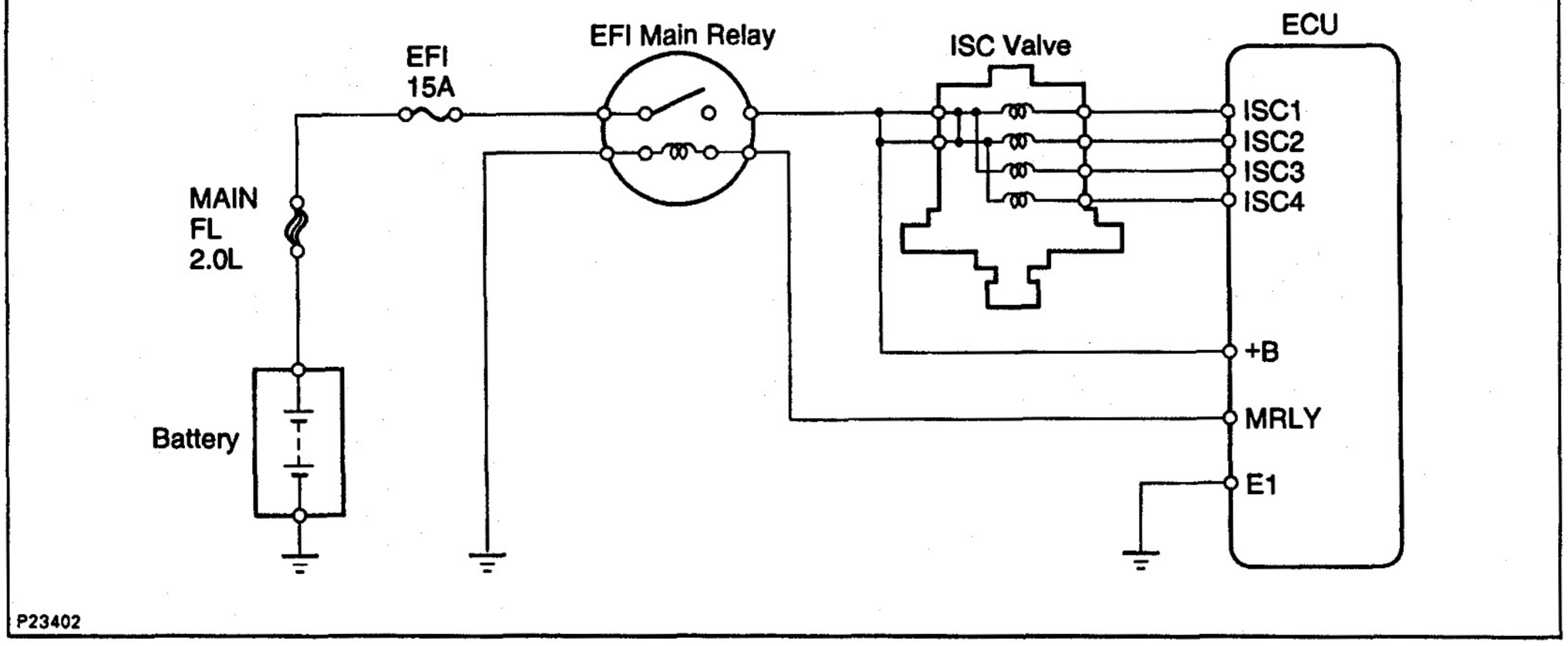
Check wiring between ECU and battery. — BAD → Repair or replace.

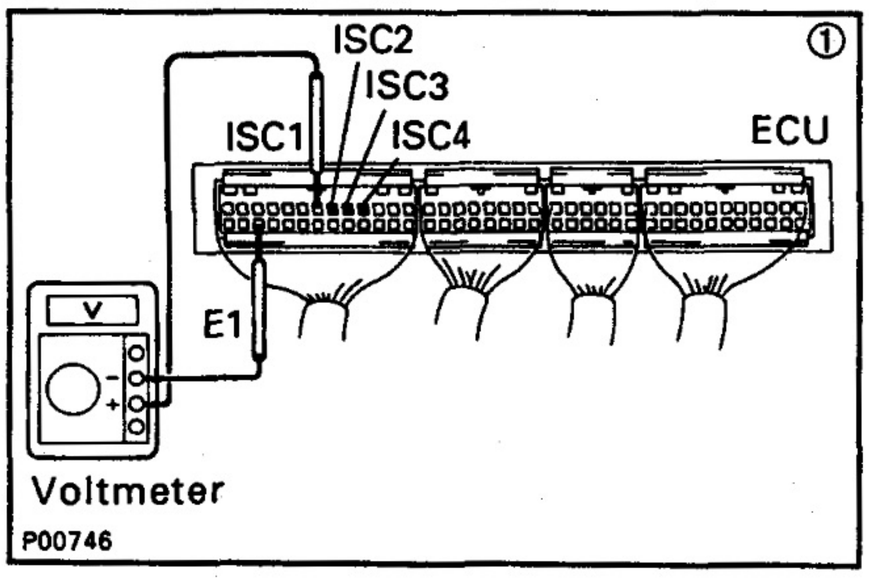
OK

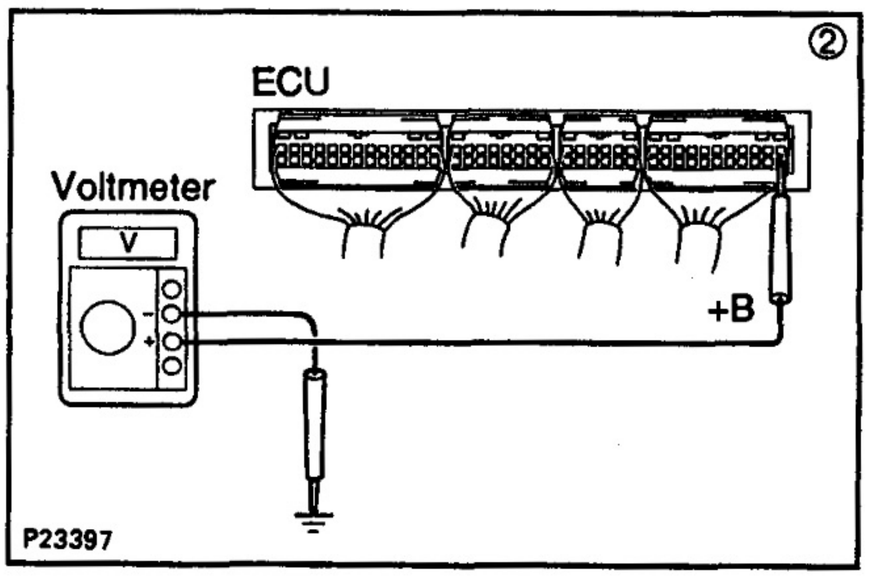
Check igniter. — BAD → Repair or replace.

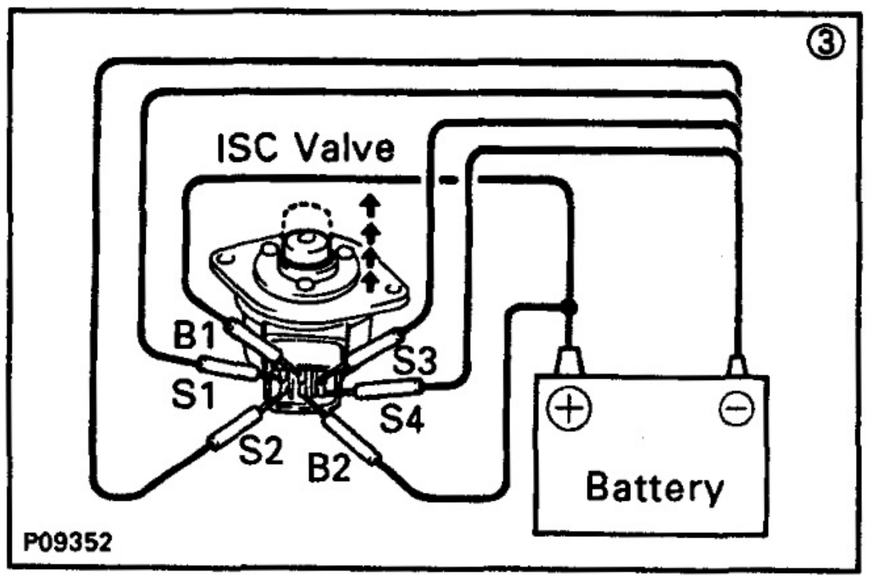
V06549

No.	Terminals	Trouble	Condition	STD voltage
9	ISC1 ~ ISC4 – E1	No voltage	IG SW ON	9 – 14 V









① There is no voltage between ECU terminals ISC1 ~ ISC4 and E1. **(IG SW ON)**

↓

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

OK ↓

NO → Refer to No.1. (See page EG-23)

↓

Check wiring between ECU terminal E1 and body ground.

OK ↓

BAD → Repair or replace.

↓

③ Check ISC valve.

BAD → Replace ISC valve.

OK ↓

Check wiring between ECU and EFI main relay.

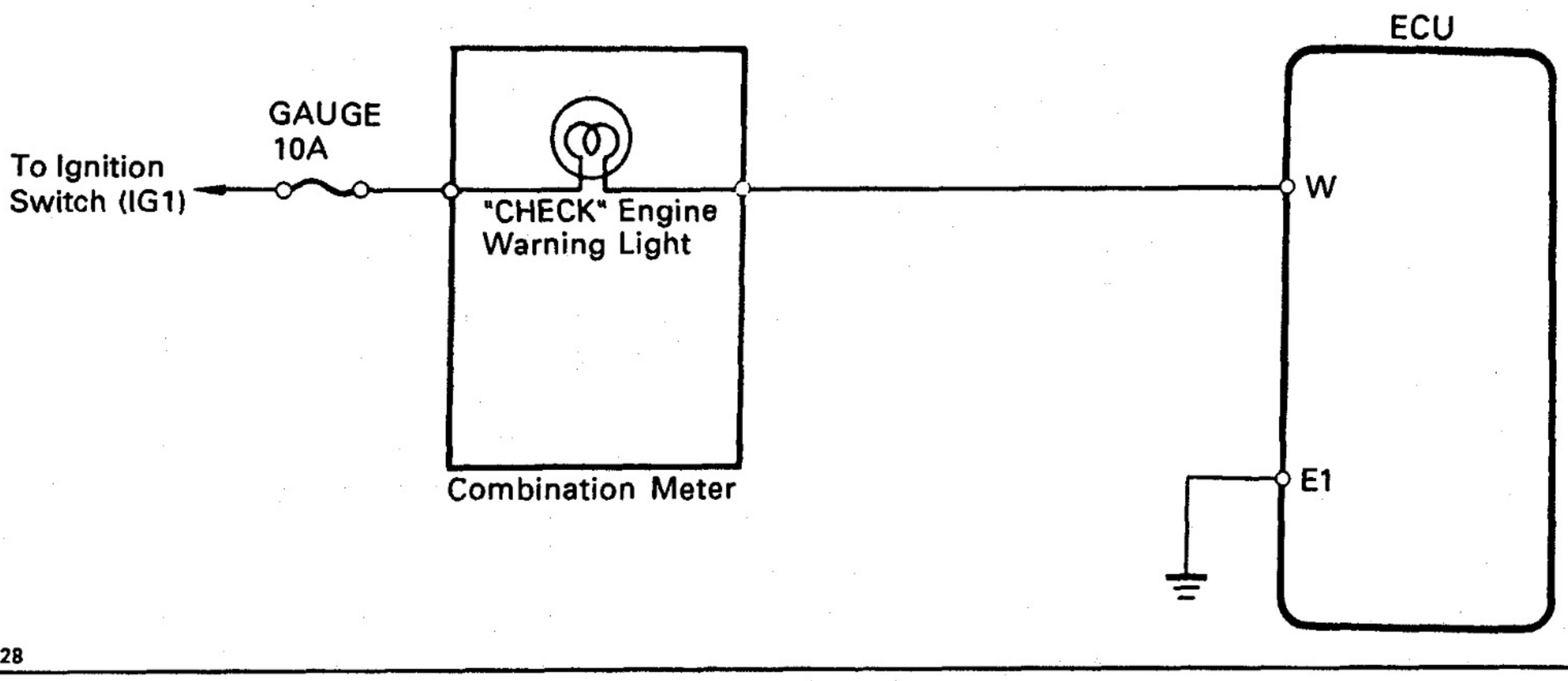
OK ↓

BAD → Repair or replace.

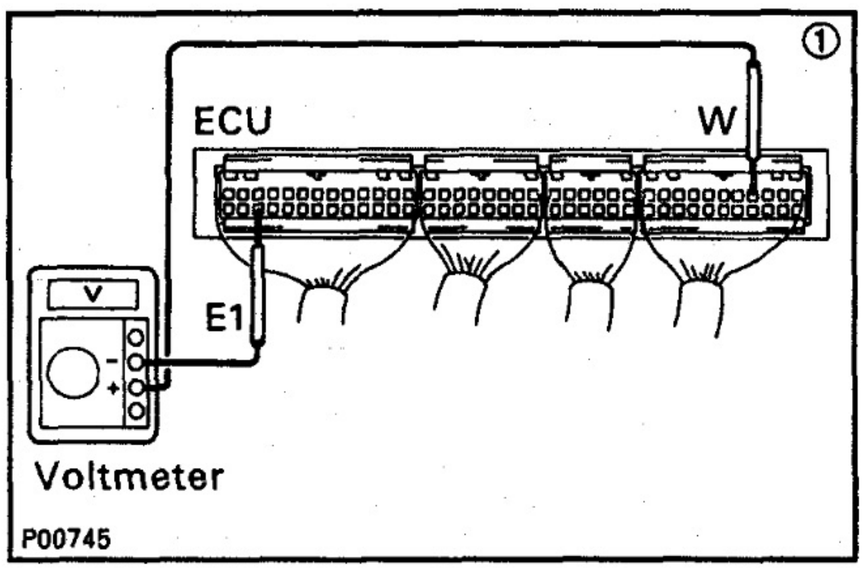
Try another ECU.

V06550

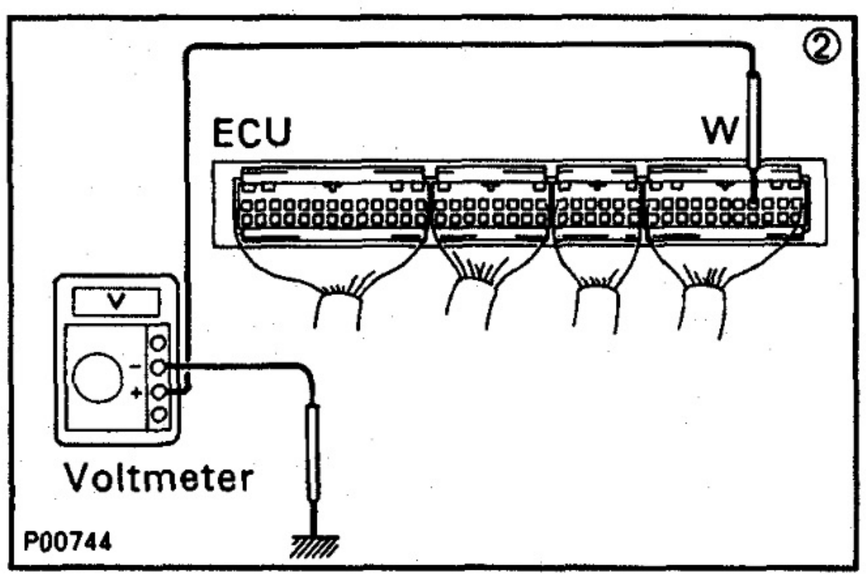
No.	Terminals	Trouble	Condition	STD voltage
10	W – E1	No voltage	No trouble ("CHECK" engine warning light off) and engine running.	9 – 14 V



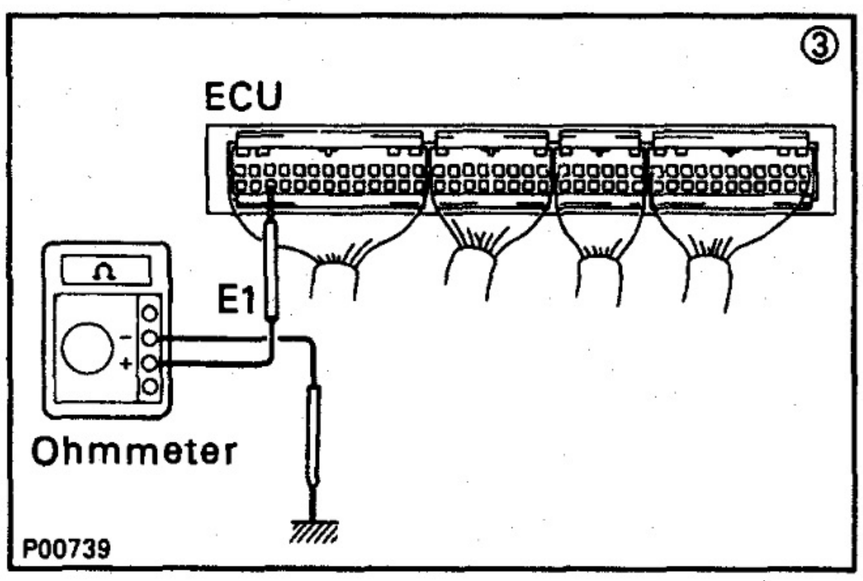
FI0728



P00745



P00744



P00739

① There is no voltage between ECU terminals W and E1. **(Idling)**

② Check that there is voltage between ECU terminal W and body ground.

NO

OK

③ Check wiring between ECU terminal E1 and body ground.

OK

Try another ECU.

BAD

Repair or replace.

Check GAUGE fuse (10 A) and "CHECK" engine warning light.

OK

BAD

Repair or replace.

Fuse blows again

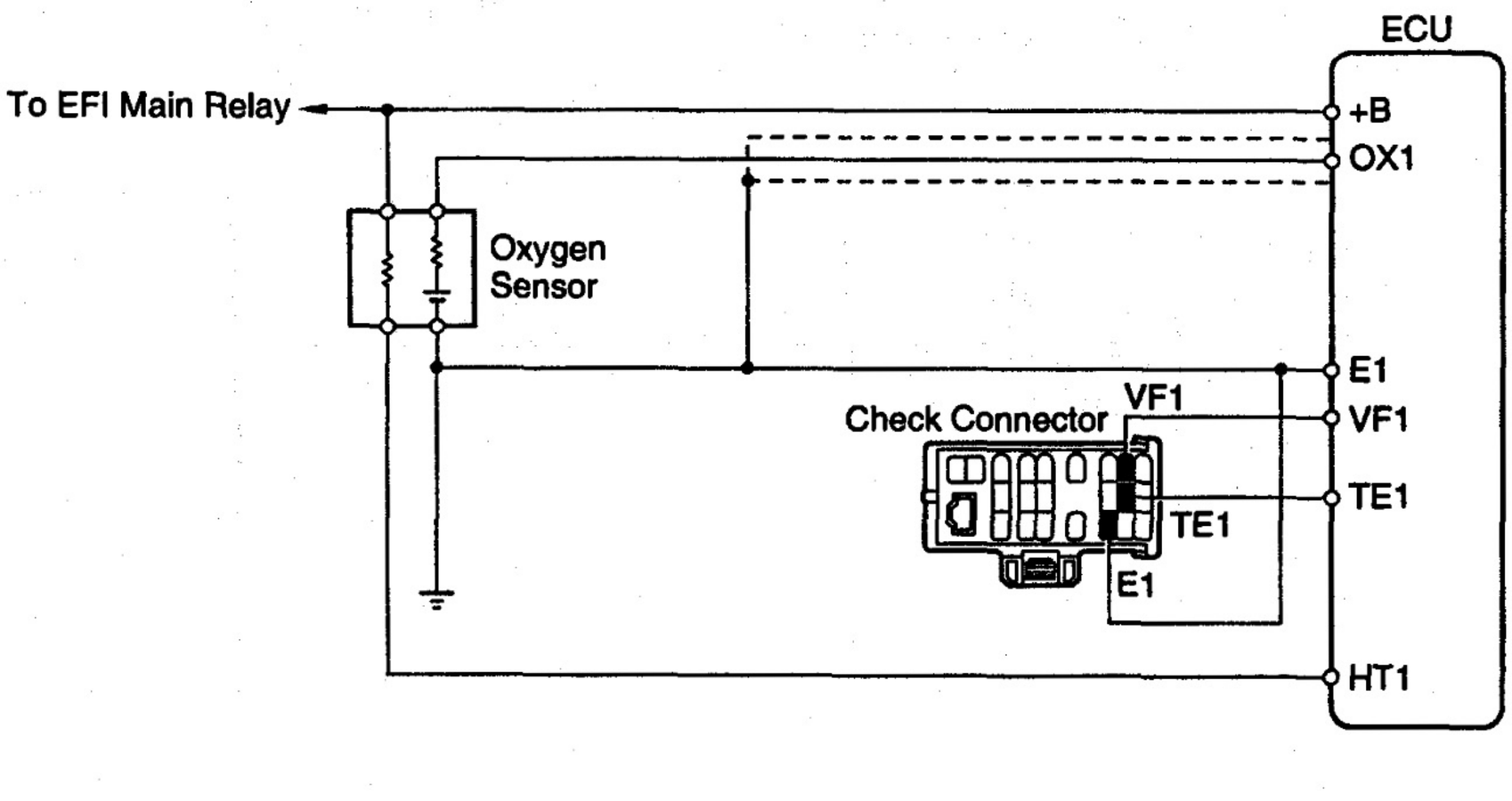
Check wiring between ECU terminal W and fuse.

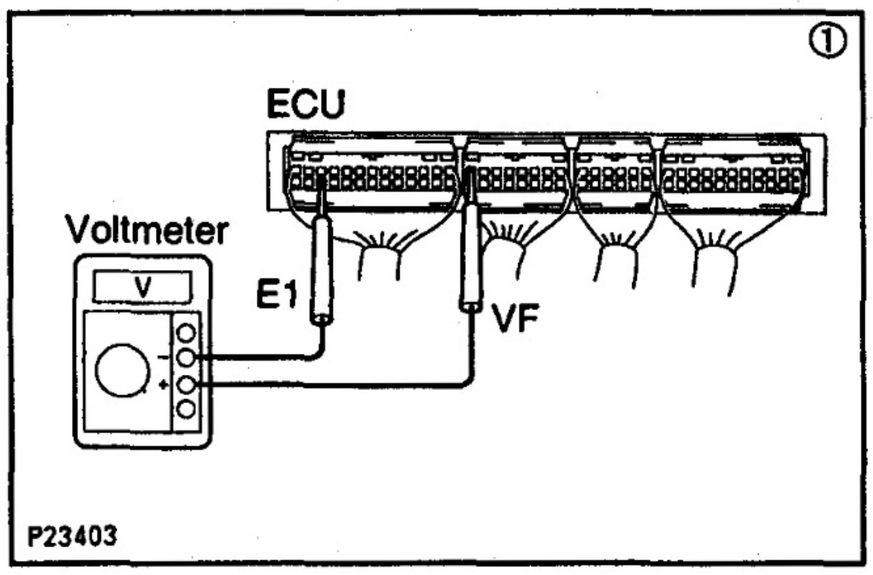
BAD

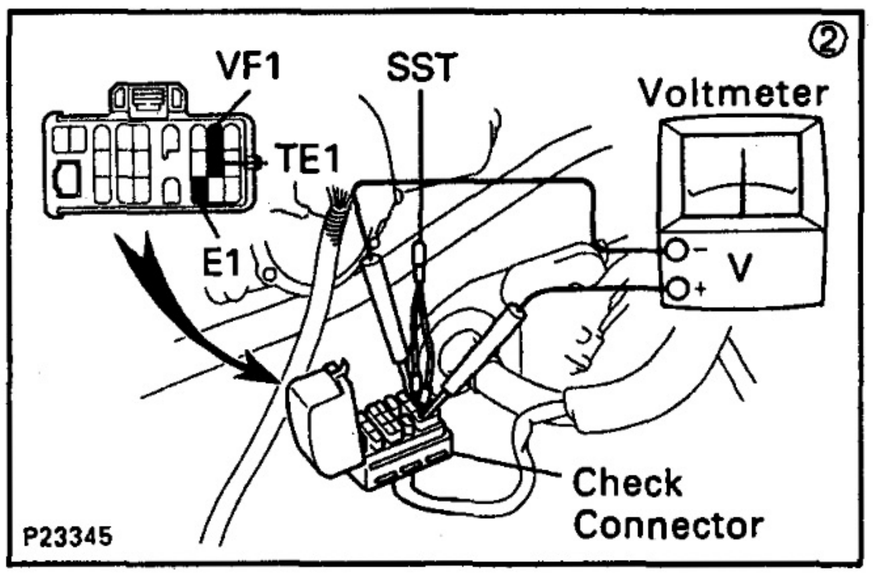
Repair or replace.

V06551

Oxygen Sensor







① There is no voltage between ECU terminals VF1 and E1.

Check that there is specified voltage between ECU terminal VF1 and body ground.

NO → OK → Check wiring between ECU terminal E1 and body ground.

OK → Try another ECU.

BAD → Repair or replace.

Check for air suction of air into exhaust system. BAD → Repair air suction.

OK

Check for air leak from air induction system. BAD → Repair air leak.

OK

Check spark plugs. BAD → Repair or replace.

OK

Check distributor and ignition system. BAD → Repair or replace.

OK

Check fuel pressure. BAD → Repair or replace.

OK

Check injectors. BAD → Repair or replace.

OK

Check air flow meter. BAD → Repair or replace.

OK

② Check operation of oxygen sensor. OK → System normal.

BAD

Check wiring between oxygen sensor and ECU connectors. BAD → Repair wiring.

OK

Repair oxygen sensor.

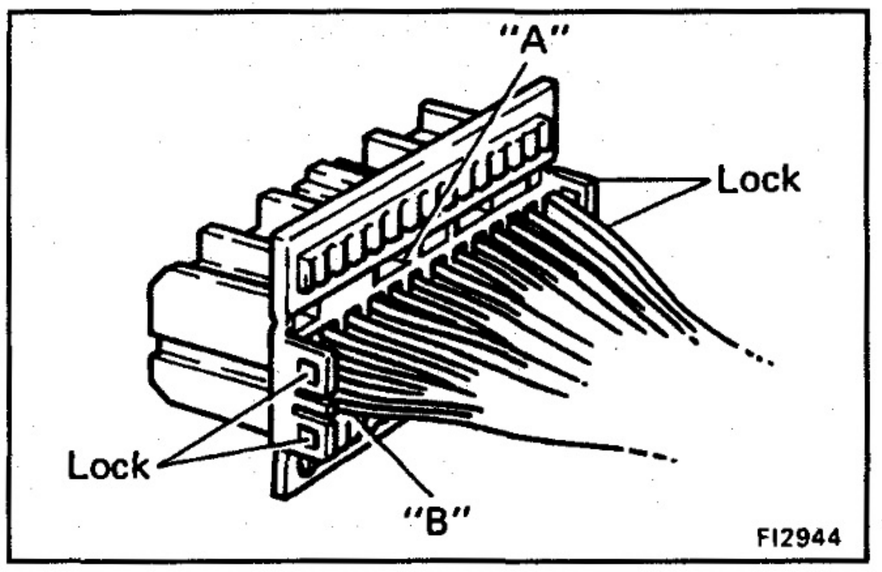
V06552

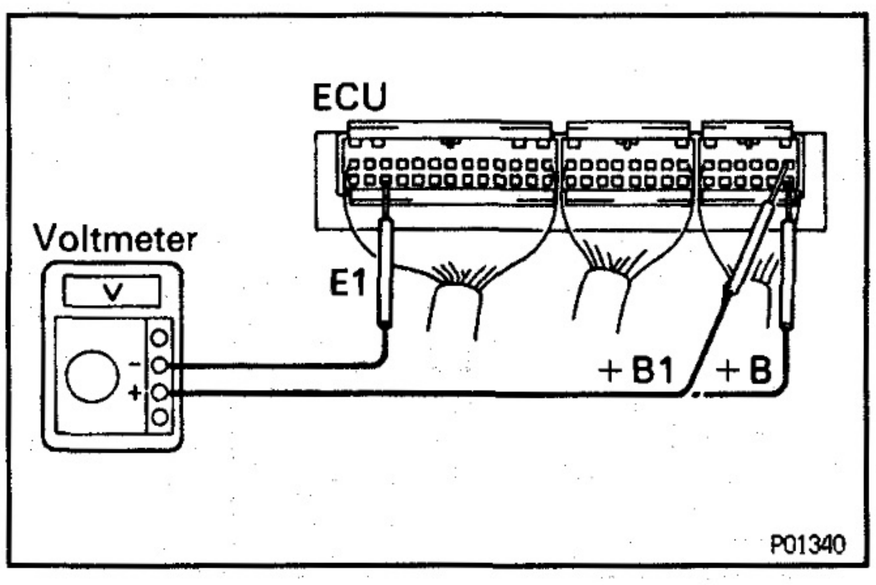
TROUBLESHOOTING w/ VOLT, OHMMETER (Hardtop)

EG27R-02

HINT:

- The following troubleshooting procedures are designed for inspection of each separate system, and therefore the actual procedure may vary somewhat. However, troubleshooting should be performed while referring to the inspection methods described in this manual.
- Before beginning inspection, it is best to first make a simple check of the fuses, H—fuses, fusible links and the condition of the connectors.
- The following troubleshooting procedures are based on the supposition that the trouble lies in either a short or open circuit within the computer.
- If engine trouble occurs even though proper operating voltage is detected in the computer connector, then it can be assumed that the ECU is faulty and should be replaced.





EFI SYSTEM CHECK PROCEDURE

EG27S-02

PREPARATION

(a) Disconnect the connectors from the ECU.

(b) Remove the locks as shown in the illustration so that the tester probe(s) can easily come in.
NOTICE: Pay attention to sections "A" and "B" in the illustration which can be easily broken.

(c) Reconnect the connectors to the ECU.

(d) Using a voltmeter with high impedance (10 kΩ/V minimum), measure the voltage at each terminal of the wiring connectors.

HINT:

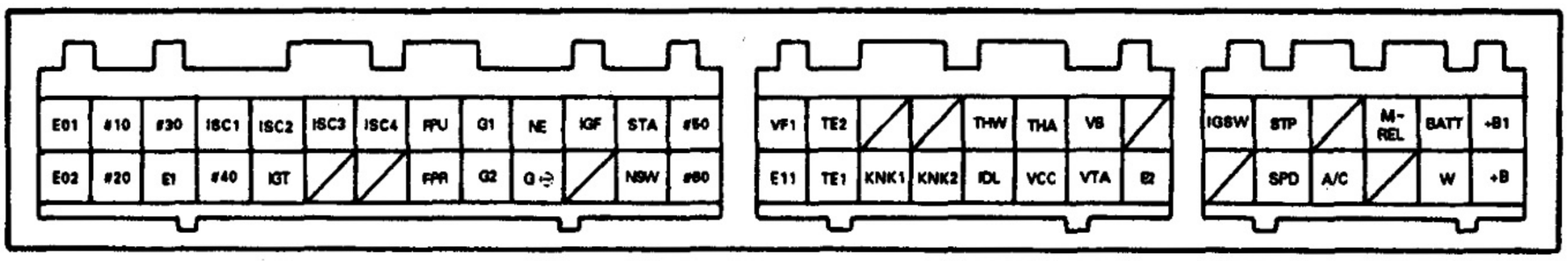
- Perform all voltage measurements with the connectors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is in "ON" position.

EG27T-02

Engine ECU Terminals

Symbol	Connection	Symbol	Connection	Symbol	Connection
E01	POWER GROUND	NE	DISTRIBUTOR	THA	INTAKE AIR TEMP. SENSOR
E02	POWER GROUND	G⊖	DISTRIBUTOR	VCC	VACUUM SENSOR THROTTLE POSITION SENSOR
#10	INJECTOR	IGF	IGNITER	VS	AIR FLOW METER
#20	INJECTOR		–	VTA	THROTTLE POSITION SENSOR
#30	INJECTOR	STA	STARTER RELAY		–
E1	ENGINE GROUND	NSW	IGNITION SWITCH	E2	SENSOR GROUND
ISC1	ISC VALVE	#50	INJECTOR	IGSW	IGNITION SWITCH
#40	INJECTOR	#60	INJECTOR		–
ISC2	ISC VALVE	VF1	CHECK CONNECTOR	STP	STOP LIGHT SWITCH
IGT	IGNITER	E11	SENSOR GROUND	SPD	SPEED SENSOR
ISC3	ISC VALVE	TE2	CHECK CONNECTOR		–
	–	TE1	CHECK CONNECTOR	A/C	A/C AMPLIFIER
ISC4	ISC VALVE		–	M-REL	EFI MAIN RELAY
	–	KNK1	No. 1 KNOCK SENSOR		–
FPU	VSV FOR FUEL PRESSURE CONTROL		–	BATT	BATTERY
FPR	FUEL PUMP RELAY	KNK2	No. 2 KNOCK SENSOR	W	WARNING LIGHT
G1	DISTRIBUTOR	THW	WATER TEMP. SENSOR	+B1	EFI MAIN RELAY
G2	DISTRIBUTOR	IDL	THROTTLE POSITION SENSOR	+B	EFI MAIN RELAY

ECU Terminals



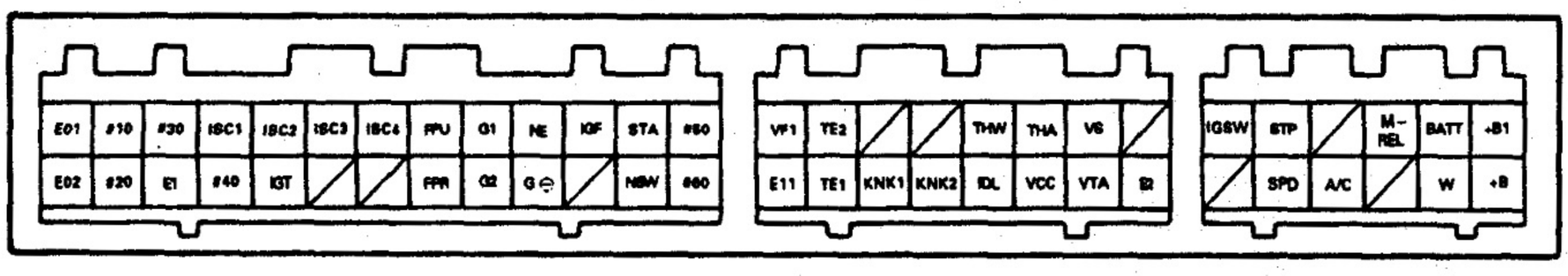
P01821

V06521

ECU Wiring Connectors Voltage

No.	Terminals	Condition		STD voltage (V)	See page
1	BATT – E1	–		9 – 14	EG-40
	IG SW – E1	IG SW ON			
	M-RL – E1				
	+B +B1 – E1				
2	IDL – E2	IG SW ON	Throttle valve open	9 – 14	EG-43
	VCC – E2		–	4.5 – 5.5	
	VTA – E2		Throttle valve fully closed (Throttle opener must be cancelled first)	0.3 – 0.8	
			Throttle valve fully open	3.2 – 4.9	
3	VCC – E2		–	4.5 – 5.5	EG-45
	VS – E2		Measuring plate fully closed	3.5 – 4.5	
			Measuring plate fully open	0.2 – 0.5	
		Idling		1.2 – 2.4	
		3,000 rpm		0.8 – 1.3	
4	#10 ⌇ #60 – E01 E02	IG SW ON		9 – 14	EG-46
5	THA – E2	IG SW ON	Intake air temp. 20°C (68°F)	0.5 – 3.4	EG-47
6	THW – E2		Engine coolant temp. 80°C (176°F)	0.2 – 1.0	EG-48
7	STA – E1	Cranking		6 or more	EG-49
8	IGT – E1	Idling		Pulse generation	EG-50
9	ISC1 ⌇ ISC4 – E1	IG SW ON		9 – 14	EG-51
10	W – E1	No trouble ("CHECK" engine warning light off) and engine running		9 – 14	EG-52

ECU Terminals



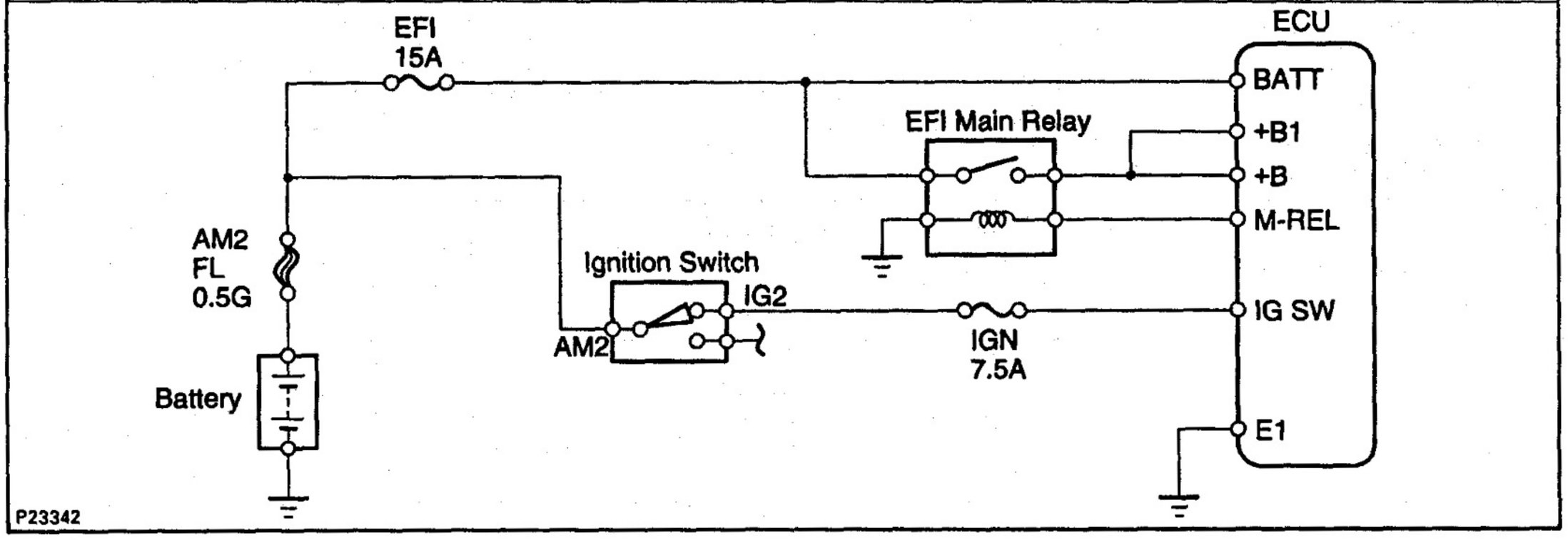
P01821

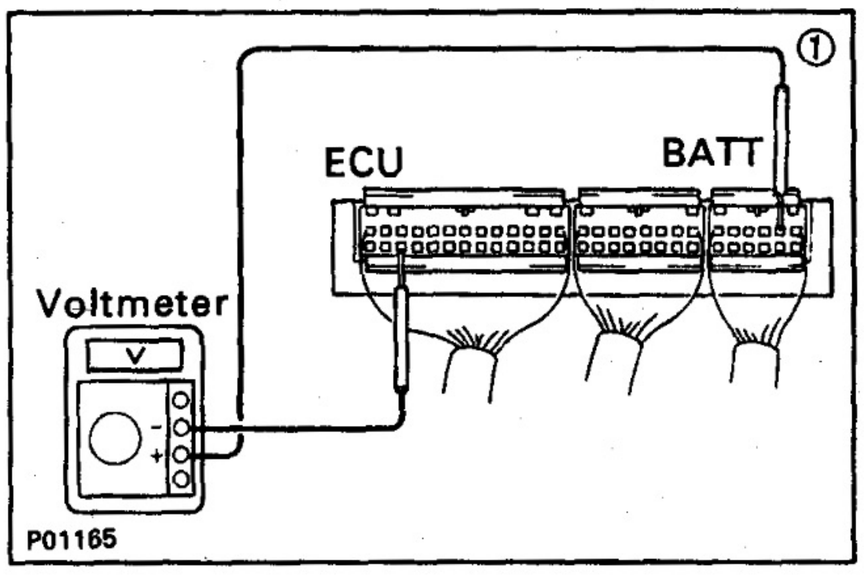
V06522

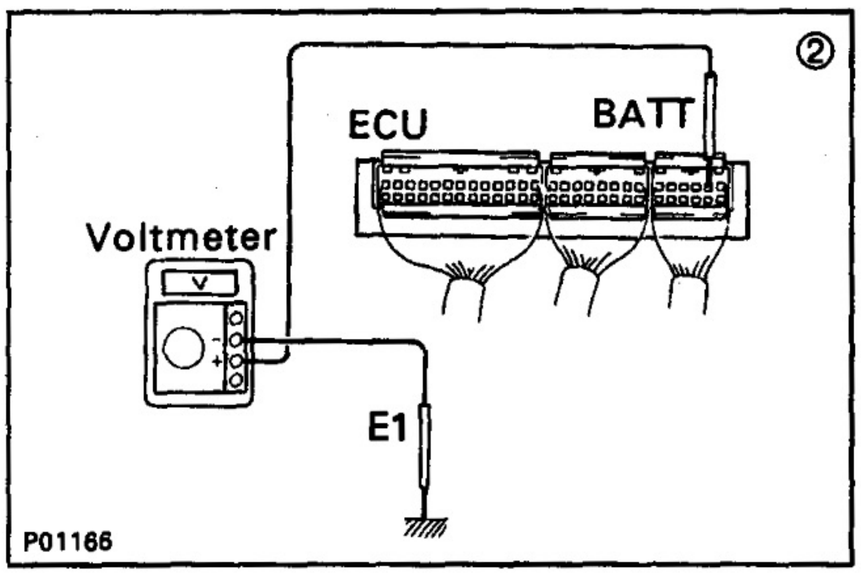
EG

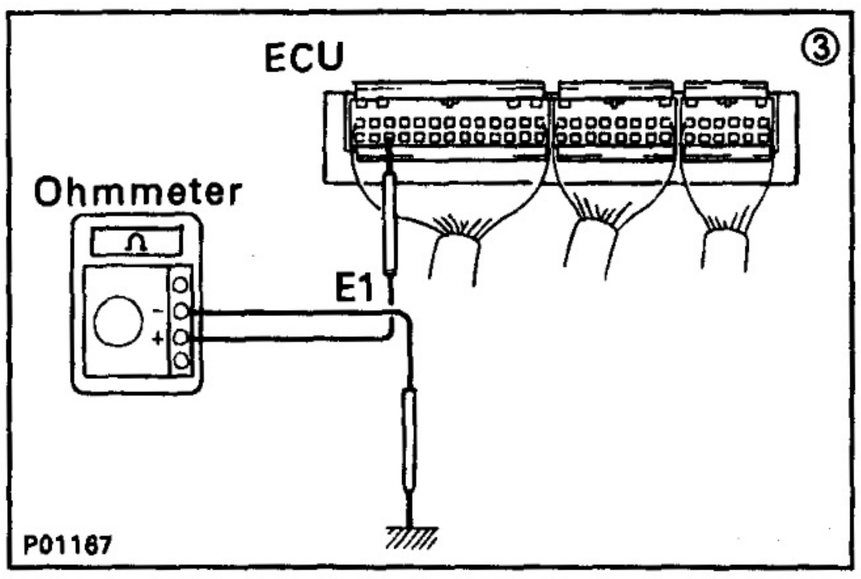
EG5M3-01

No.	Terminals	Trouble	Condition	STD voltage
1	BATT – E1	No voltage	–	9 – 14 V
	IG SW – E1	No voltage	IG SW ON	9 – 14 V
	M-REL – E1			
	+B (+B1) – E1			









• **BATT – E1**

① There is no voltage between ECU terminals BATT and E1.

② Check that there is voltage between ECU terminal BATT and body ground.

NO → ③ Check wiring between ECU terminal E1 and body ground.

③ OK → Try another ECU

③ BAD → Repair or replace.

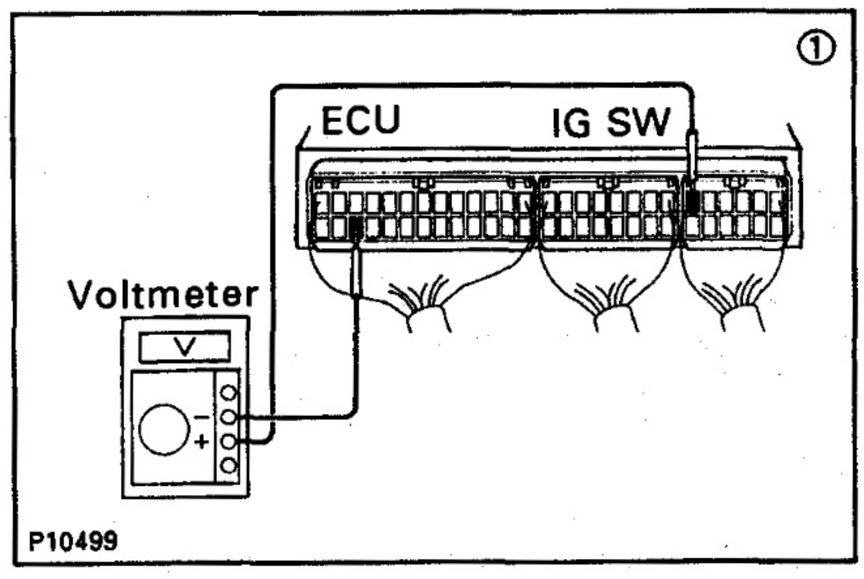
② OK

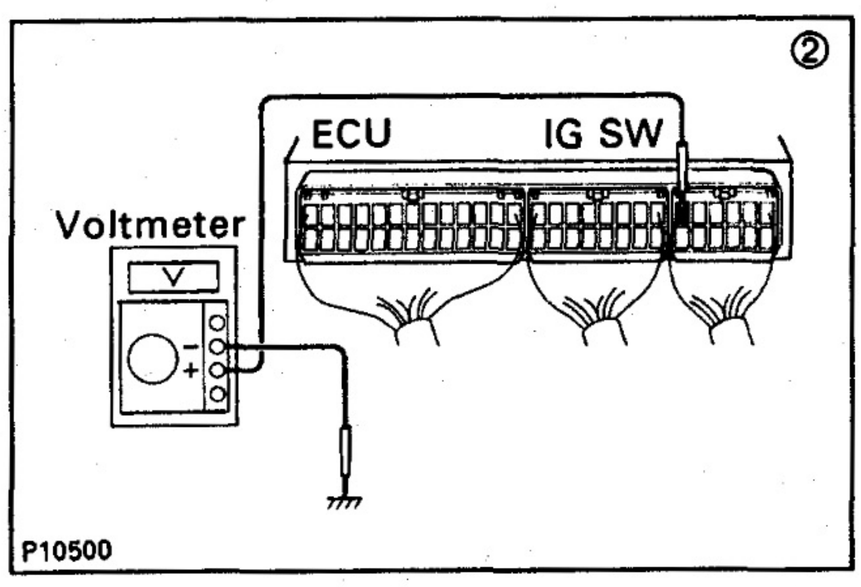
Check fuse and fusible link. BAD → Replace.

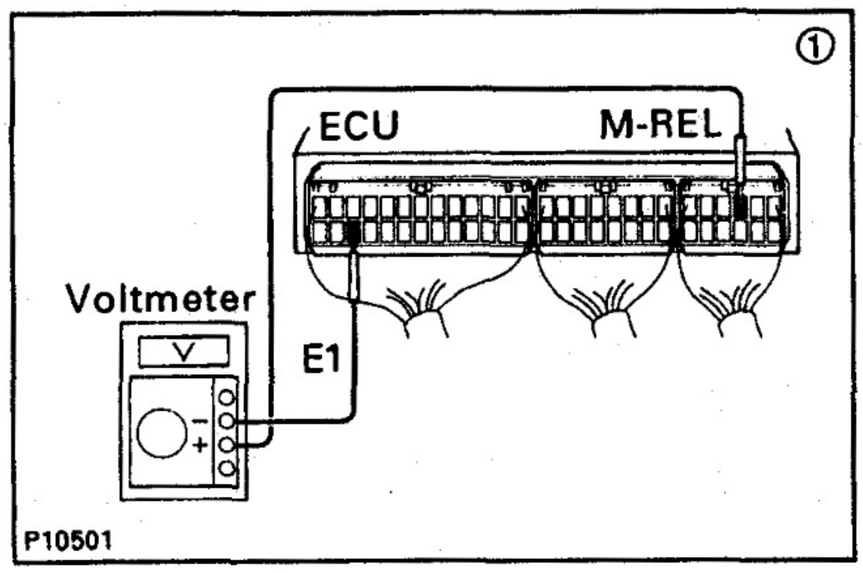
OK

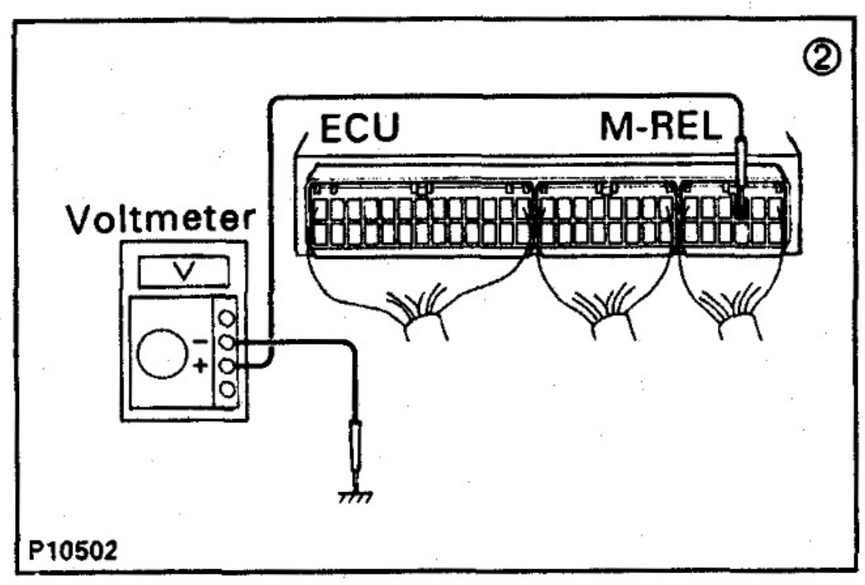
Check wiring between ECU terminal and battery. BAD → Repair or replace.

V06533









• IG SW – E1

① There is no voltage between ECU terminals IG SW and E1. **(IG SW ON)**

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

NO

OK → Check wiring between ECU terminal E1 and body ground.

OK → Try another ECU.

BAD → Repair or replace.

Check fuses, fusible link and ignition switch.

BAD → Repair or replace.

• M-REL – E1

① There is no voltage between ECU terminals M-REL and E1. **(IG SW ON)**

② Check that there is voltage between ECU terminals M-REL and body ground. **(IG SW ON)**

NO

OK → Check wiring between ECU terminal E1 and body ground.

OK → Try another ECU.

BAD → Repair or replace.

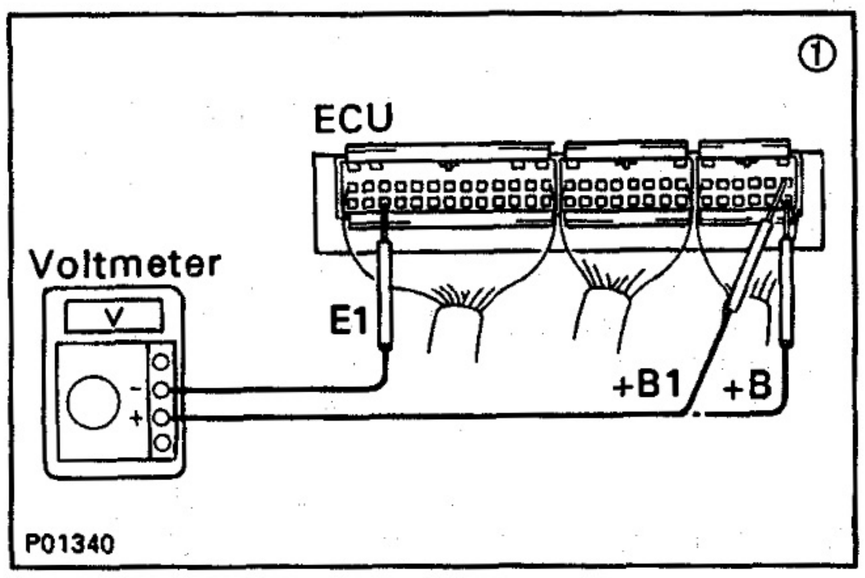
Check EFI main relay and wiring harness. (See page EG-56)

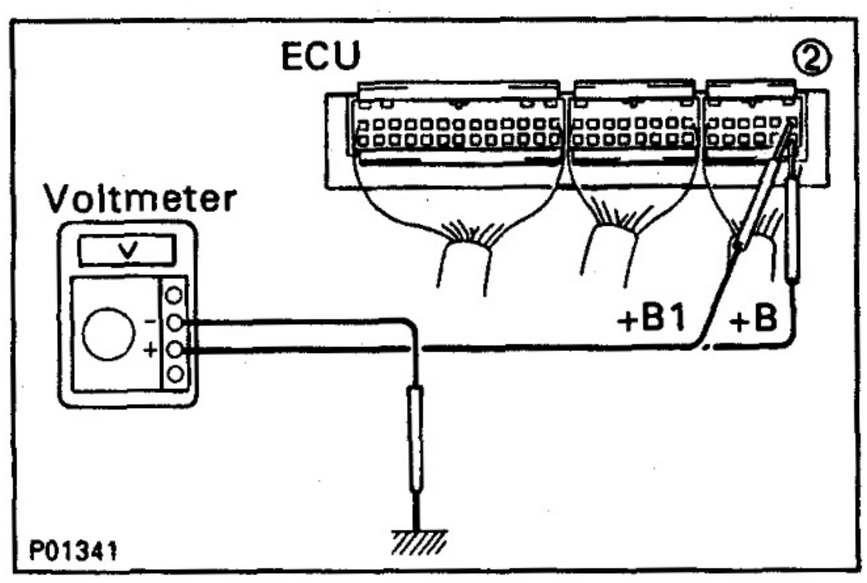
BAD → Replace.

OK

Try another ECU.

V06534





• **+B (+B1) – E1**

① **There is no voltage between ECU terminals +B (+B1) and E1. (IG SW ON)**

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

NO → Check wiring between ECU terminal E1 and body ground.
- OK → Try another ECU.
- BAD → Repair or replace.

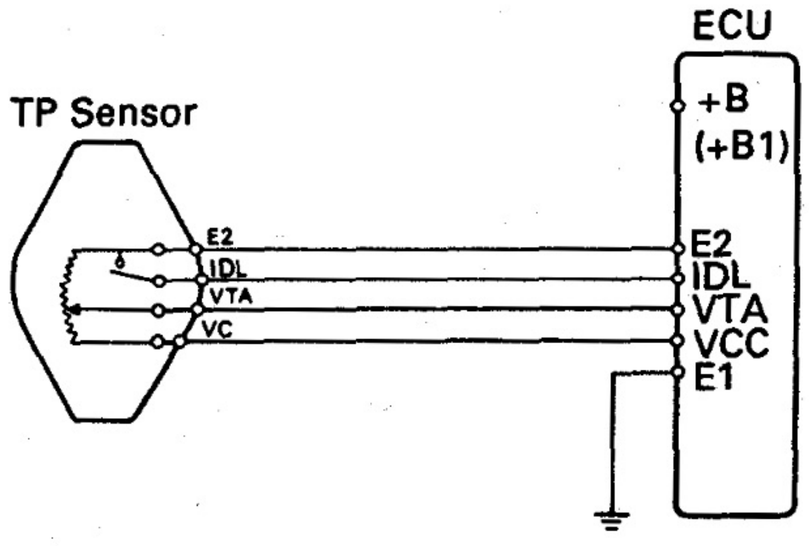
OK → Check fuse, fusible link and wiring harness.
- BAD → Repair or replace.

OK → Check EFI main relay. (See page EG-56)
- BAD → Replace.

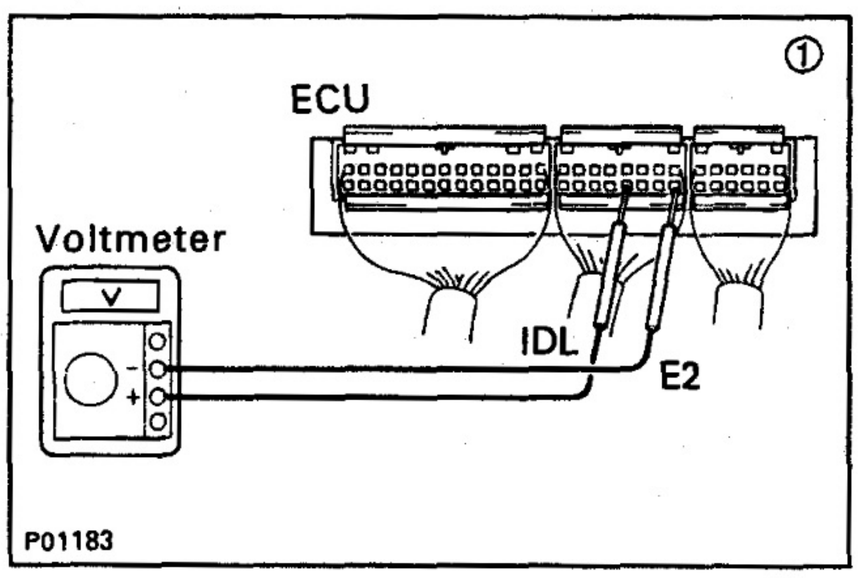
OK → Refer to M-REL – E1 trouble section.

V06535

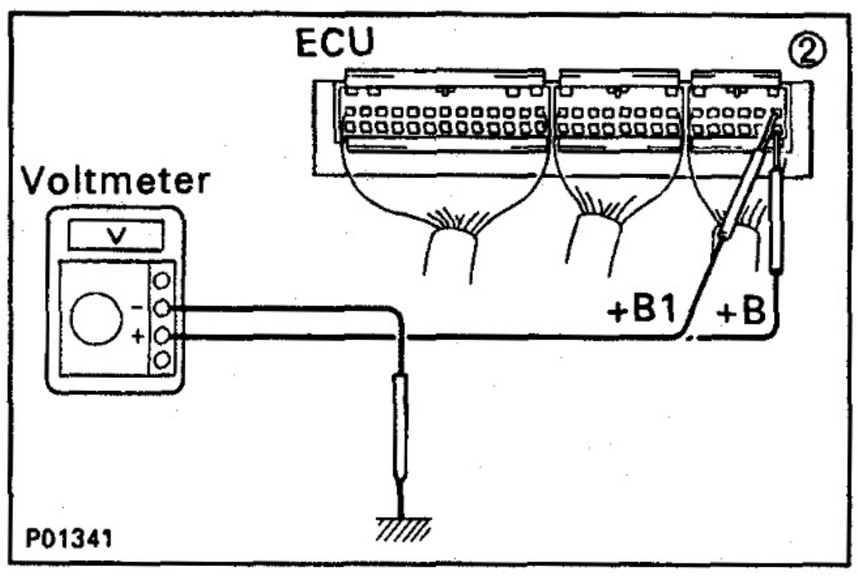
No.	Terminals	Trouble	Condition		STD voltage
2	IDL – E2	No voltage	IG SW ON	Throttle valve open	9 – 14 V
	VCC – E2			–	4.5 – 5.5 V
	VTA – E2			Throttle valve fully closed (Throttle opener must be cancelled first)	0.3 – 0.8 V
				Throttle valve fully open	3.2 – 4.9 V



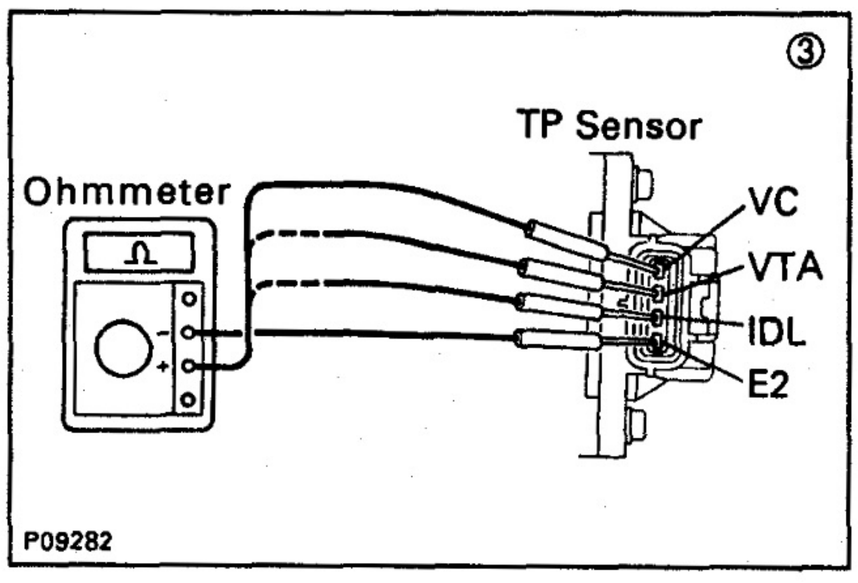
P01419



P01183



P01341



P09282

• **IDL – E2**

① There is no 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 → Check wiring between ECU terminal E1 and body ground.
- OK → Try another ECU.
- BAD → Repair or replace.

OK ↓

Refer to No. 1. (See page EG-40) — BAD → Repair or replace.

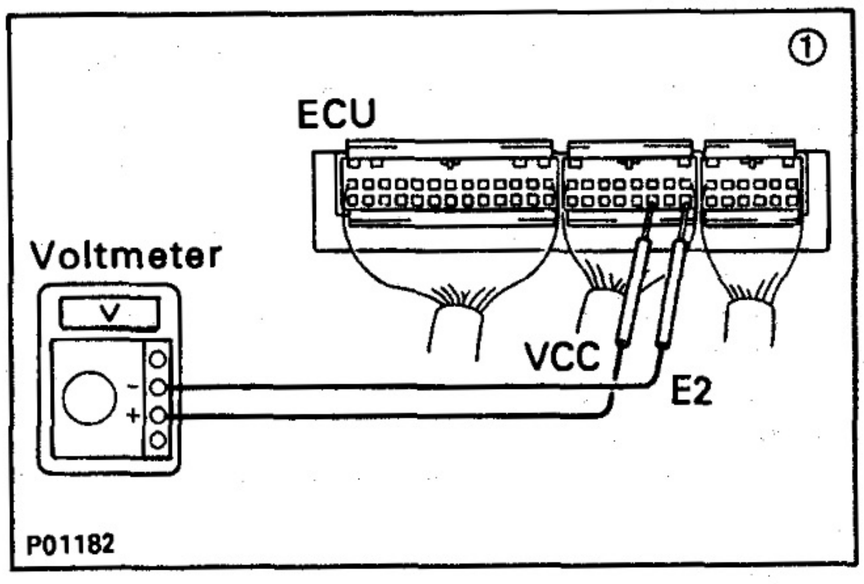
OK ↓

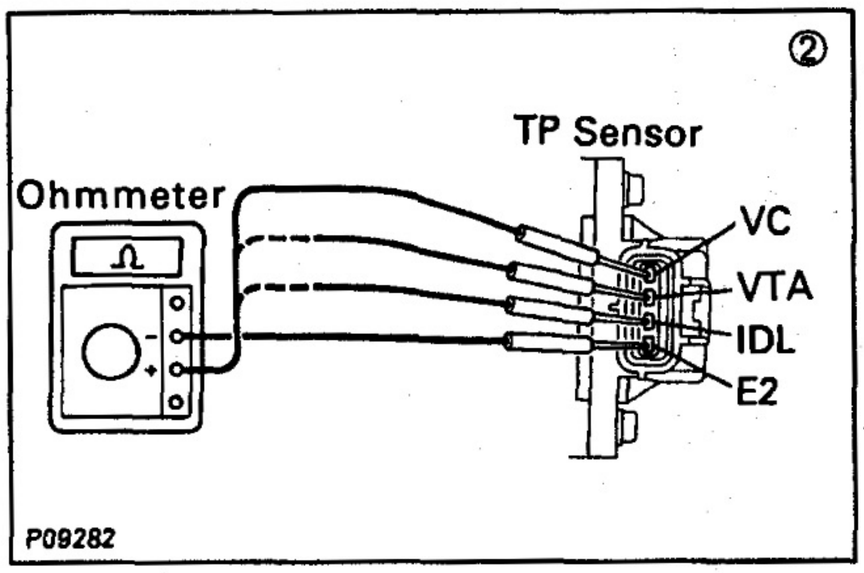
③ Check TP sensor.

BAD → Repair or replace TP sensor.

OK → Check wiring between ECU and TP sensor.
- BAD → Repair or replace.
- OK → Try another ECU.

V06524





• **VCC – E2**

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

↓

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

↓ OK → ② Check TP sensor.

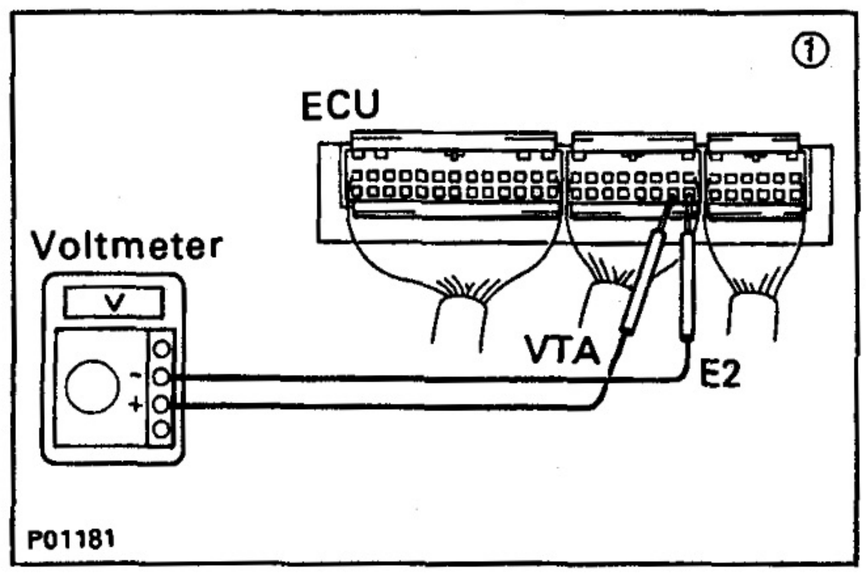
↓ BAD → Repair or replace.

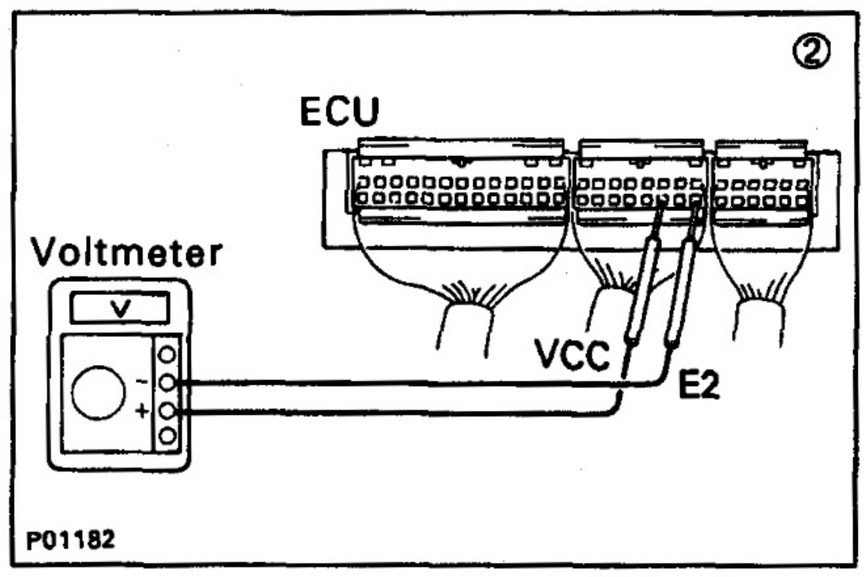
↓ OK → Check wiring between ECU and TP sensor.

↓ OK → Try another ECU.

↓ BAD → Repair or replace wiring.

NO → Refer to No. 1. (See page EG-40)





• **VTA – E2**

① There is no specified voltage at ECU terminals VTA and E2. **(IG SW ON)**

↓

② Check that there is voltage between ECU terminals VCC and E2. **(IG SW ON)**

↓ NO → Refer to VCC – E2 trouble section.

↓ OK

OK →

↓

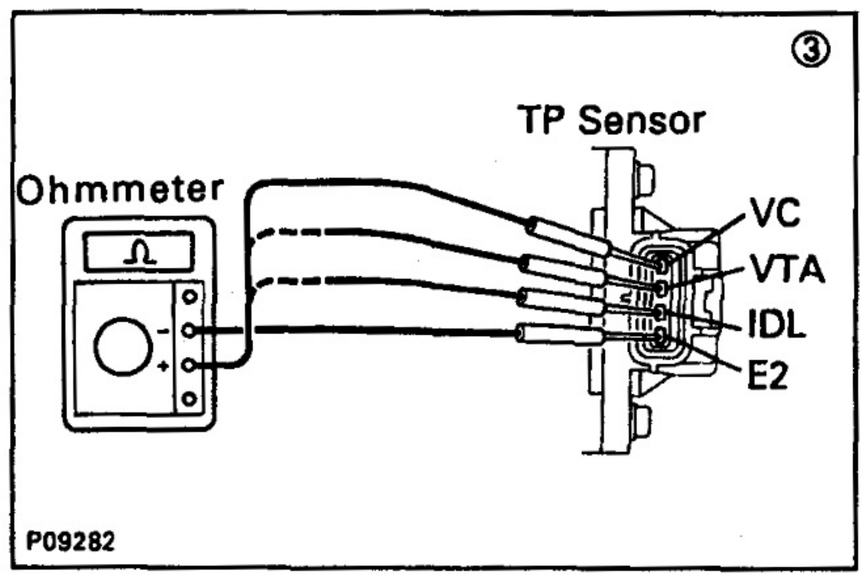
③ Check TP sensor. BAD → Repair or replace.

↓ OK

Check wiring between ECU and TP sensor. BAD → Repair or replace.

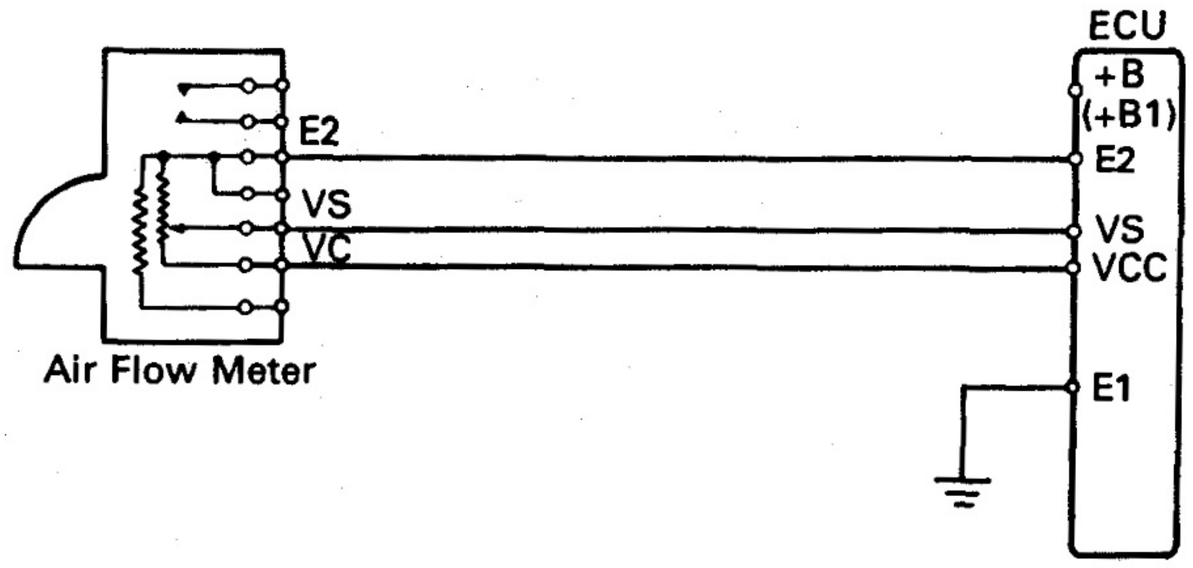
↓ OK

Try another ECU.

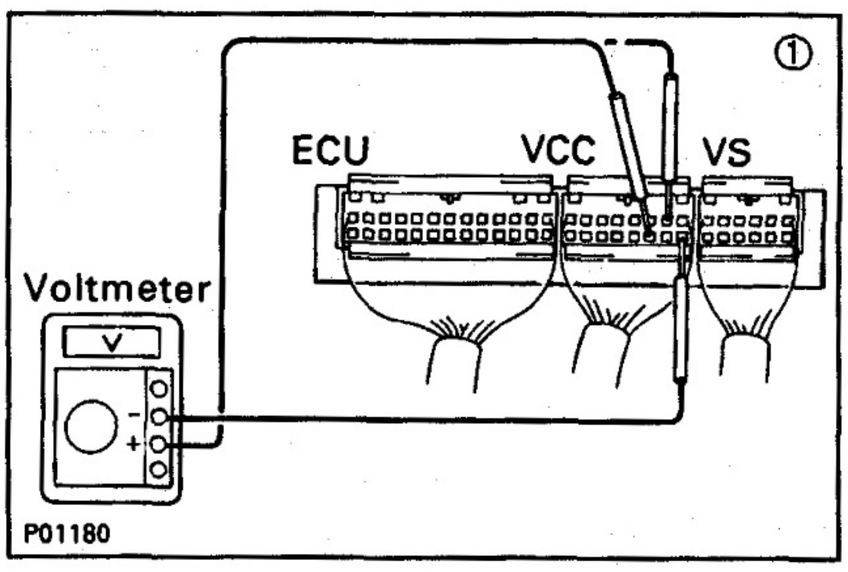


V06525

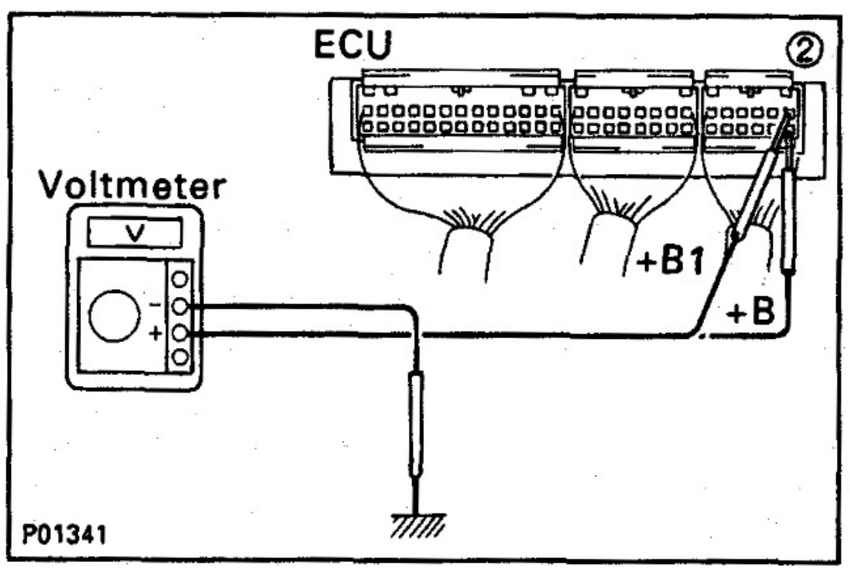
No.	Terminals	Trouble	Condition		STD voltage
3	VCC – E2	No voltage	IG SW ON	–	4.5 – 5.5 V
	VS – E2			Measuring plate fully closed	3.5 – 4.5 V
	VS – E2			Measuring plate fully open	0.2 – 0.5 V
	VS – E2		Idling		1.2 – 2.4 V
	VS – E2		3,000 rpm		0.8 – 1.3 V



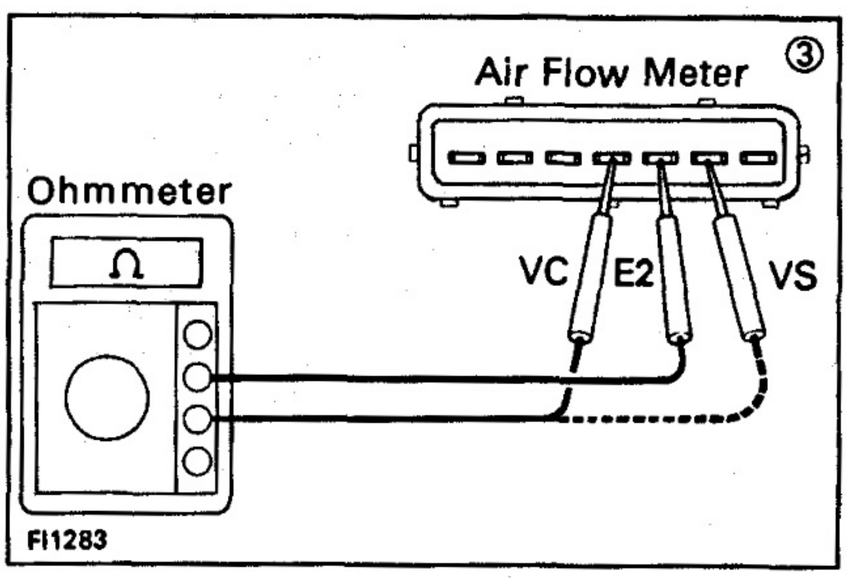
FI6032



P01180



P01341



FI1283

① There is no voltage between ECU terminals VCC or VS 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 No. 1. (See page EG-40)

↓

Check wiring between ECU terminal E1 and body ground.

OK ↓ / BAD → Repair or replace.

↓

③ Check air flow meter.

BAD ↓ → Replace air flow meter.

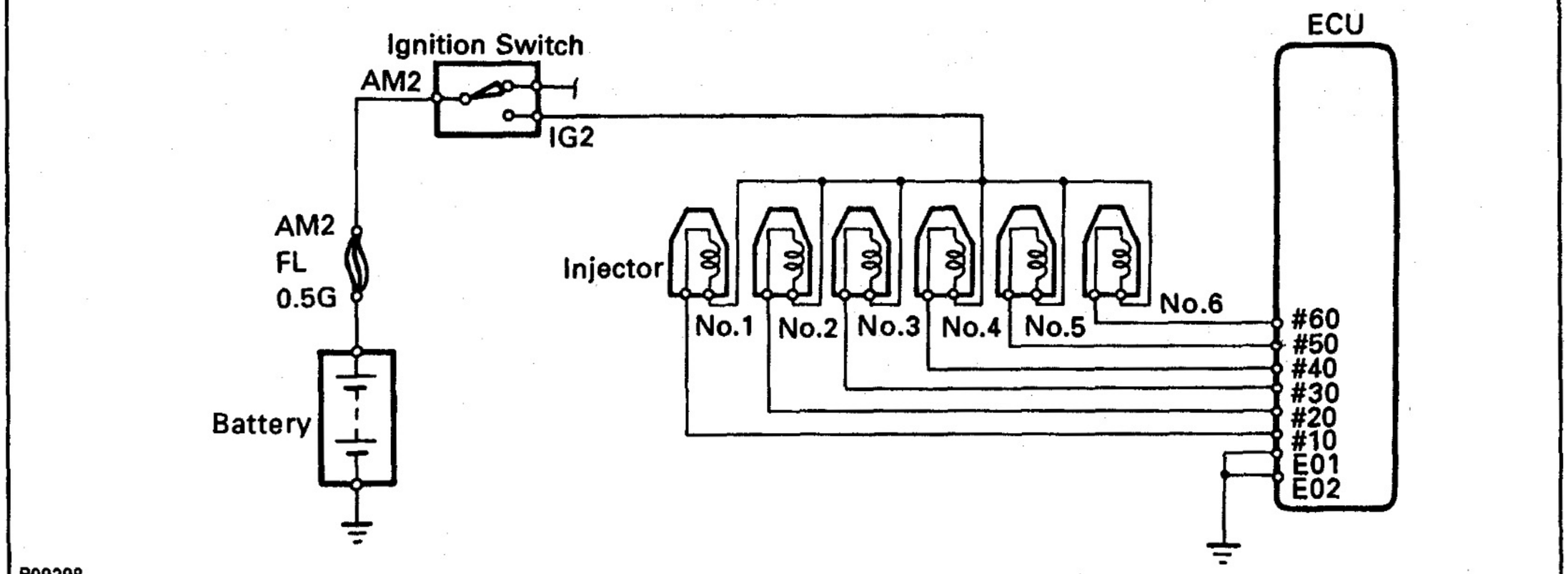
OK ↓ → Check wiring between ECU and air flow meter.

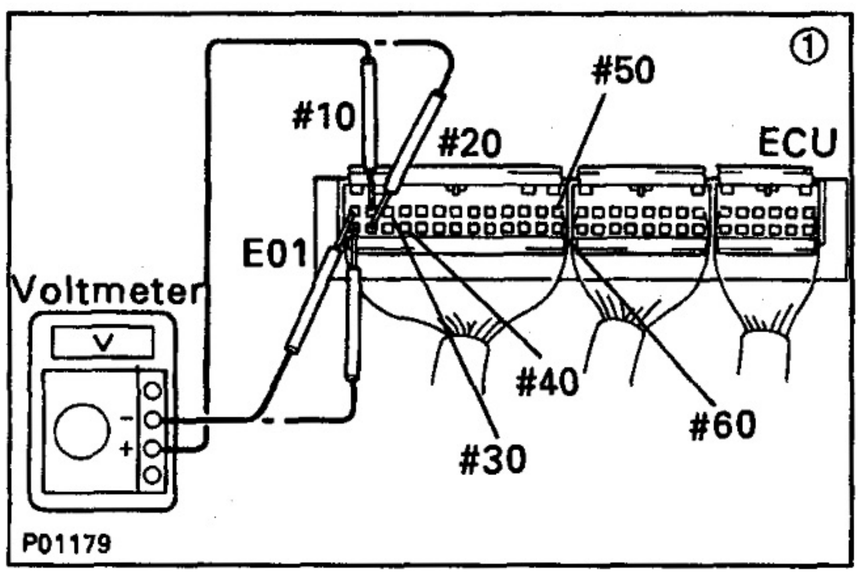
OK ↓ → Try another ECU.

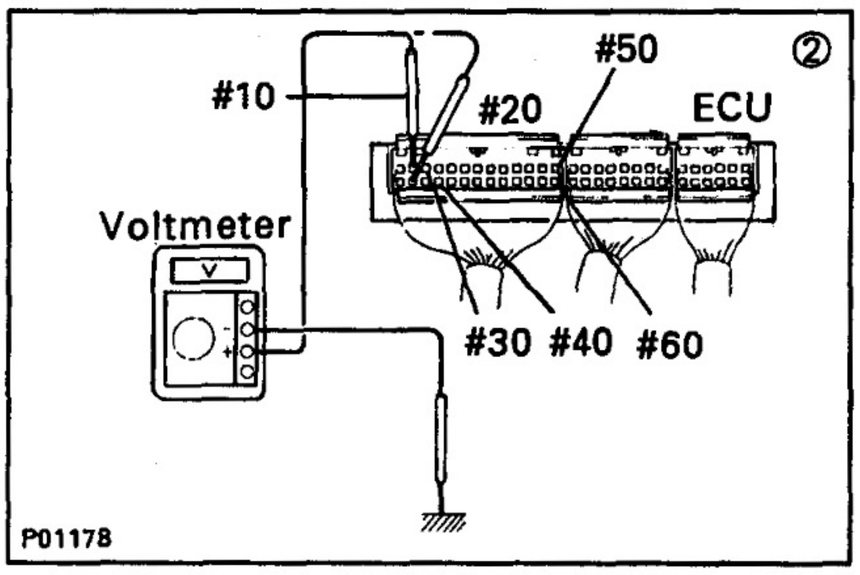
BAD → Repair or replace.

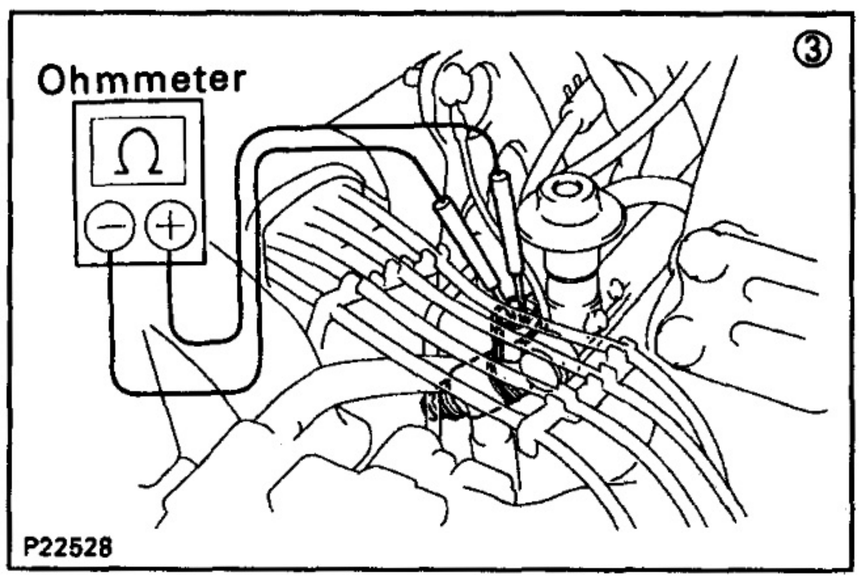
V06526

No.	Terminals	Trouble	Condition	STD voltage
4	#10 E01 〉 – #60 E02	No voltage	IG SW ON	9 – 14 V









① There is no voltage between ECU terminals #10 ~ #60 and E01 and/or E02. **(IG SW ON)**

② Check that there is voltage between ECU terminal #10 ~ #60 and body ground.

NO

OK

Check wiring between ECU terminal E01 and/or E02 and body ground.

OK

Try another ECU.

BAD

Repair or replace.

Check fusible link and ignition switch.

BAD

Repair or replace.

OK

③ Check resistance of each injector.
STD resistance: Approx. 13.8 Ω

OK

BAD

Repair or replace.

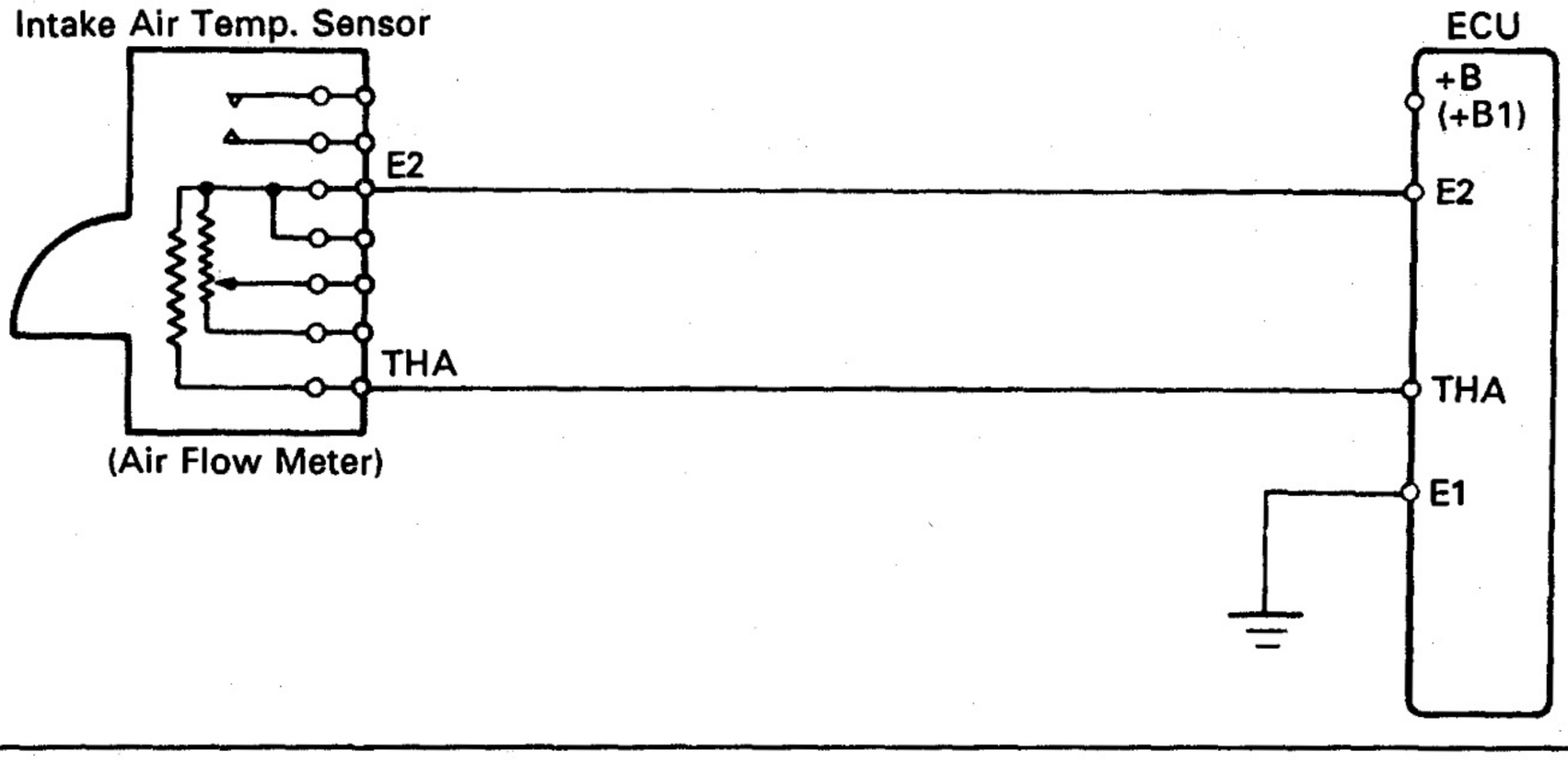
Check wiring between ECU terminal #10 ~ #60 and battery.

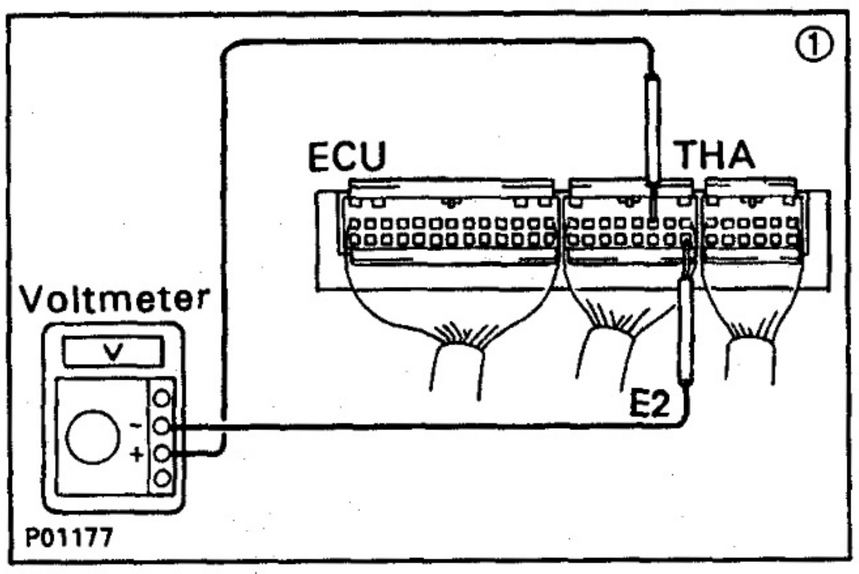
BAD

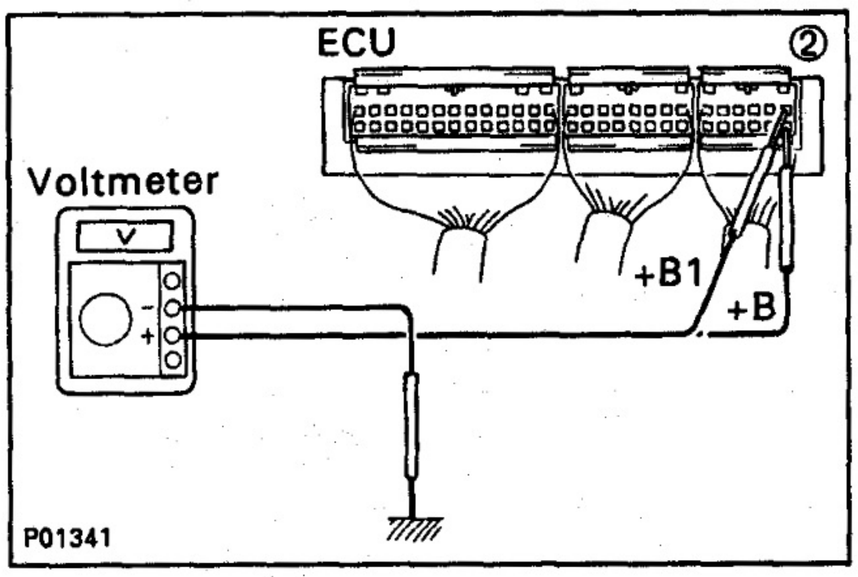
Repair or replace.

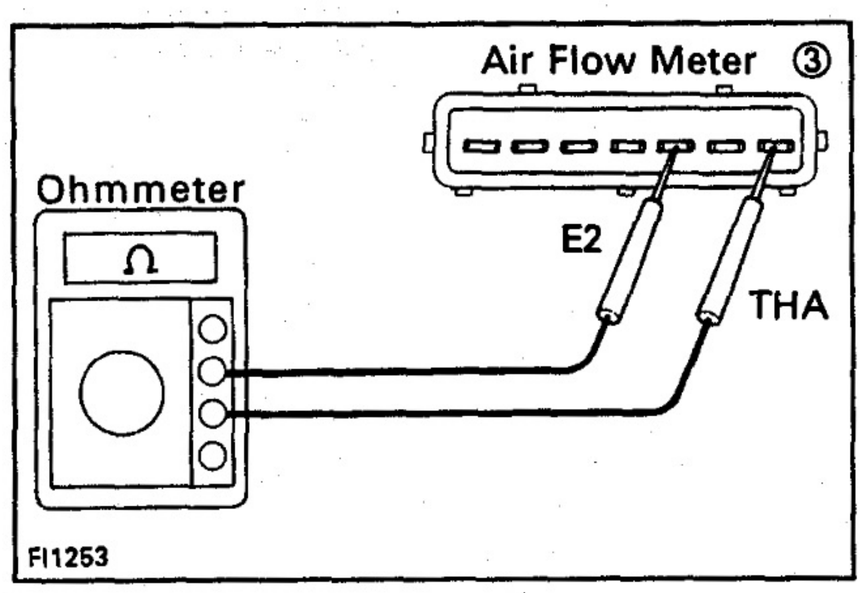
V06527

No.	Terminals	Trouble	Condition		STD voltage
5	THA – E2	No voltage	IG SW ON	Intake air temp. 20°C (68°F)	0.5 – 3.4 V









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 No.1. (See page EG-40)

↓

Check wiring between ECU terminal E1 and body ground.

OK ↓ / BAD → Repair or replace.

↓

③ Check intake air temp. sensor.

BAD ↓ / OK →

Replace air flow meter.

Check wiring between ECU and intake air temp. sensor.

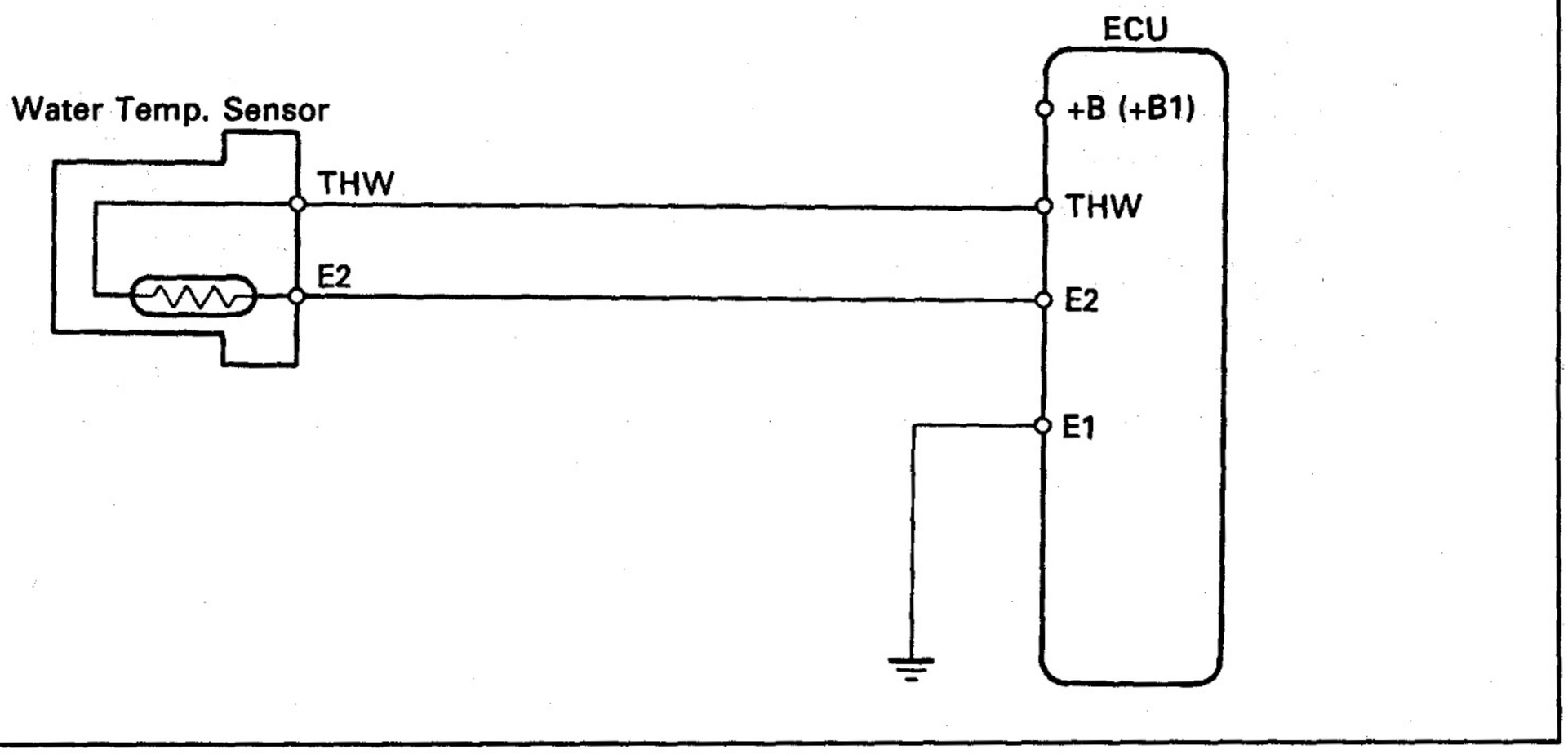
OK ↓ / BAD → Repair or replace.

↓

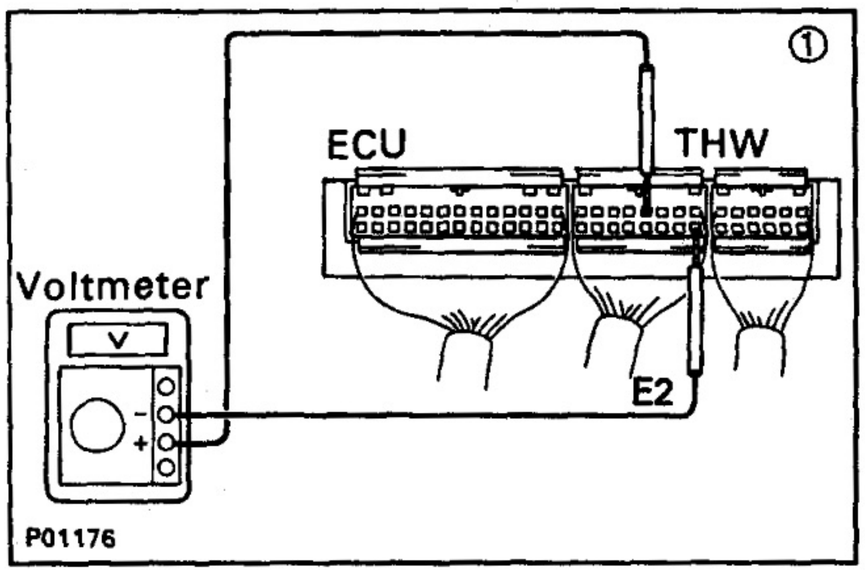
Try another ECU.

V06528

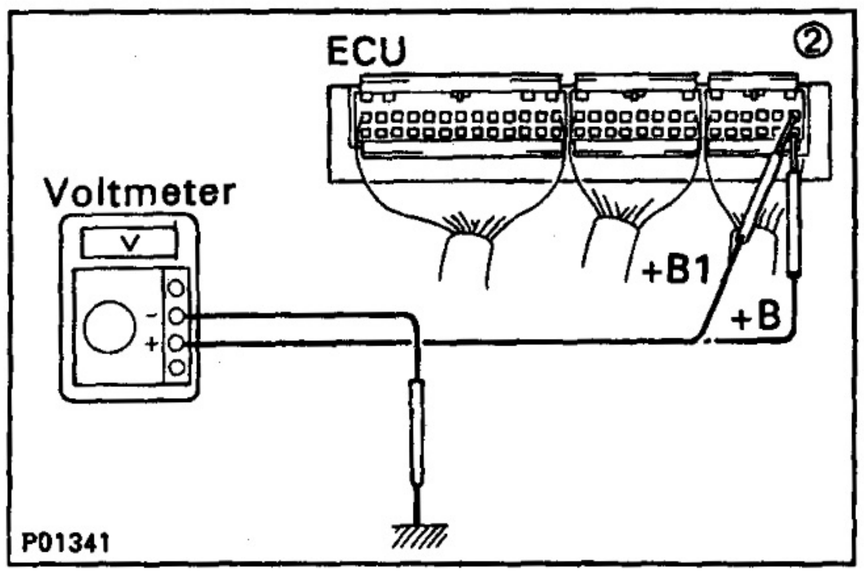
No.	Terminals	Trouble	Condition		STD voltage
6	THW – E2	No voltage	IG SW ON	Engine coolant temp. 80°C (176°F)	0.2 – 1.0 V



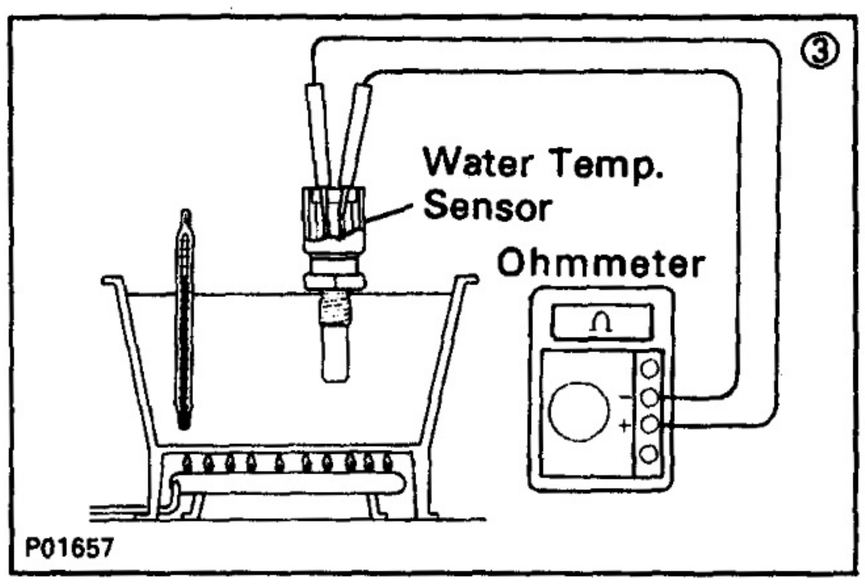
FI3572



P01176



P01341



P01657

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 ↓

NO → Refer to No. 1. (See page EG-40)

Check wiring between ECU terminal E1 and body ground.

OK ↓

BAD → Repair or replace.

③ Check water temp. sensor.

BAD → Replace water temp. sensor.

OK ↓

Check wiring between ECU and ECT sensor.

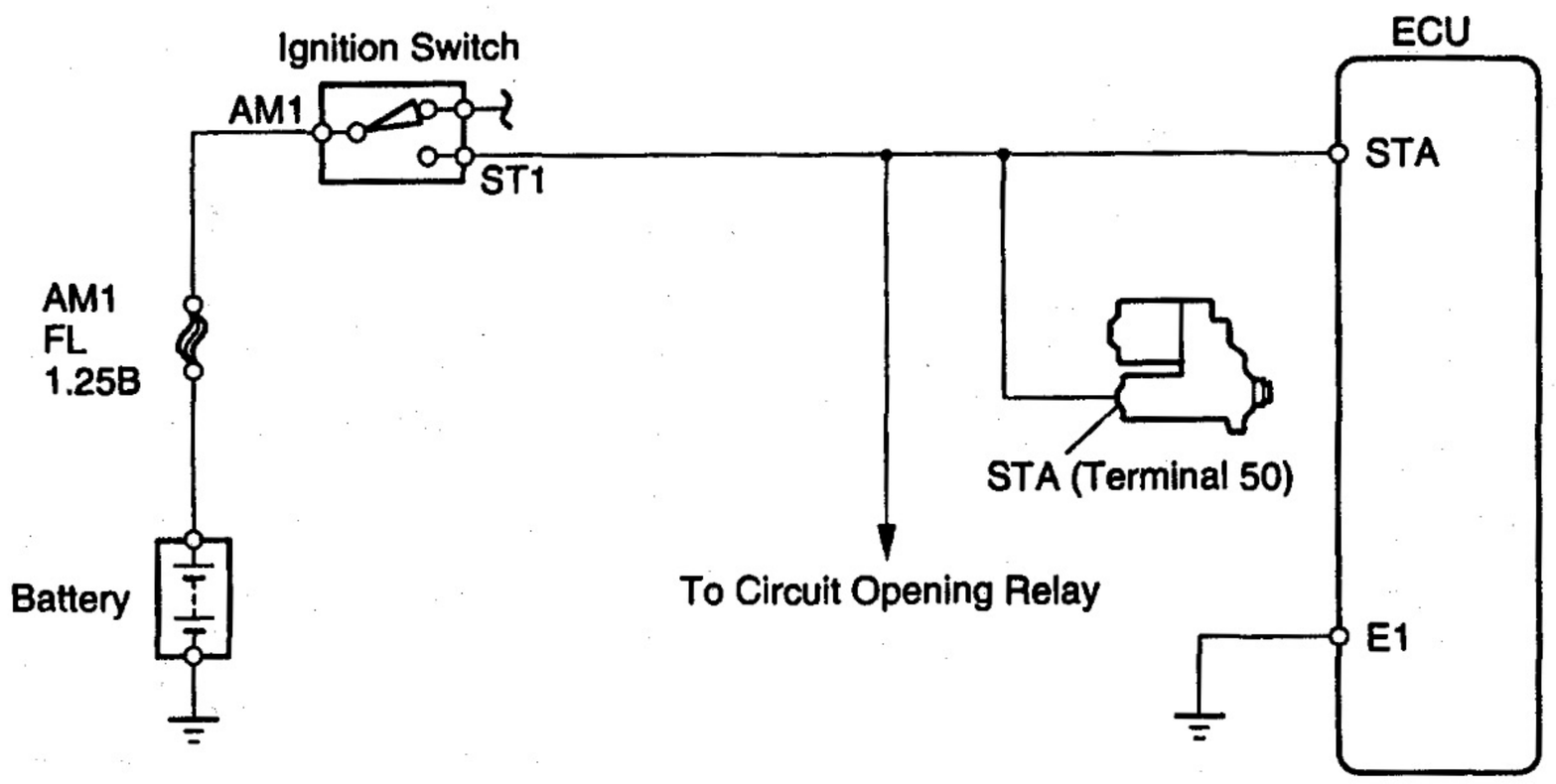
OK ↓

Try another ECU.

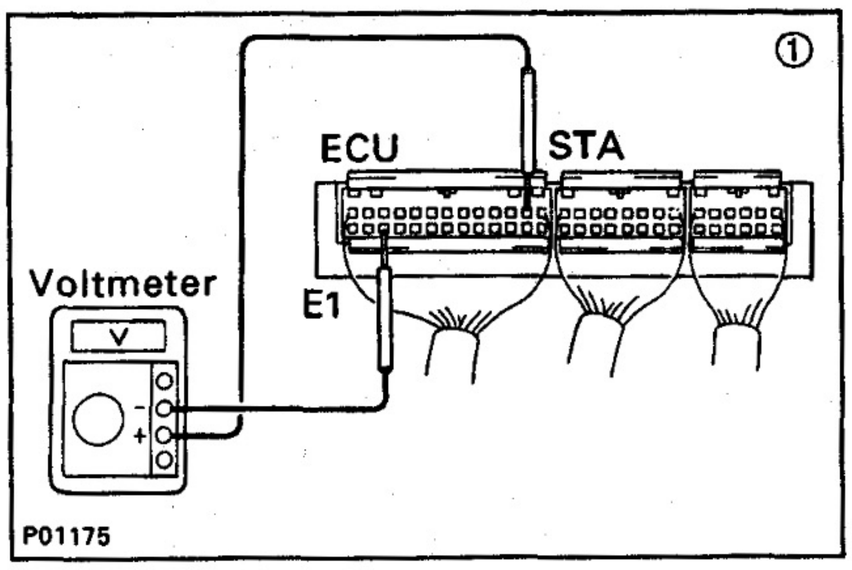
BAD → Repair or replace.

V06529

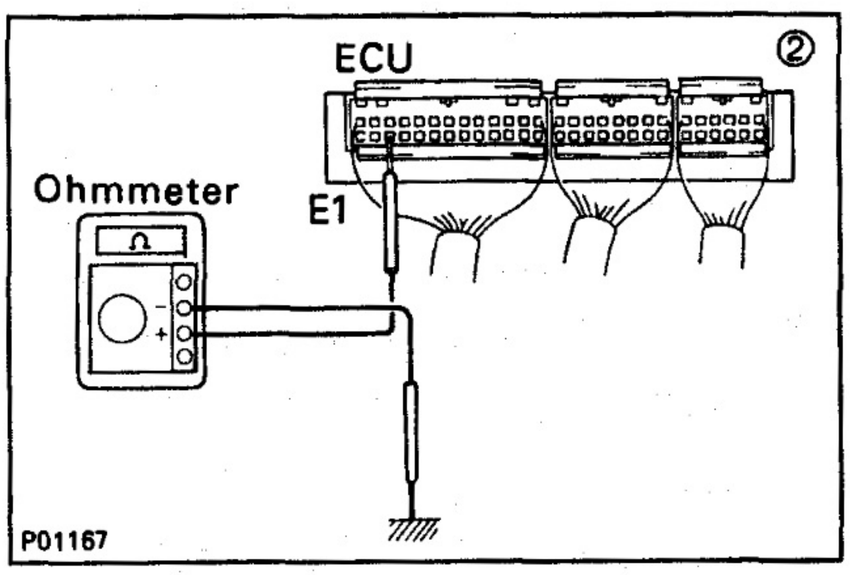
No.	Terminals	Trouble	Condition	STD voltage
7	STA – E1	No voltage	Cranking	6 V or more



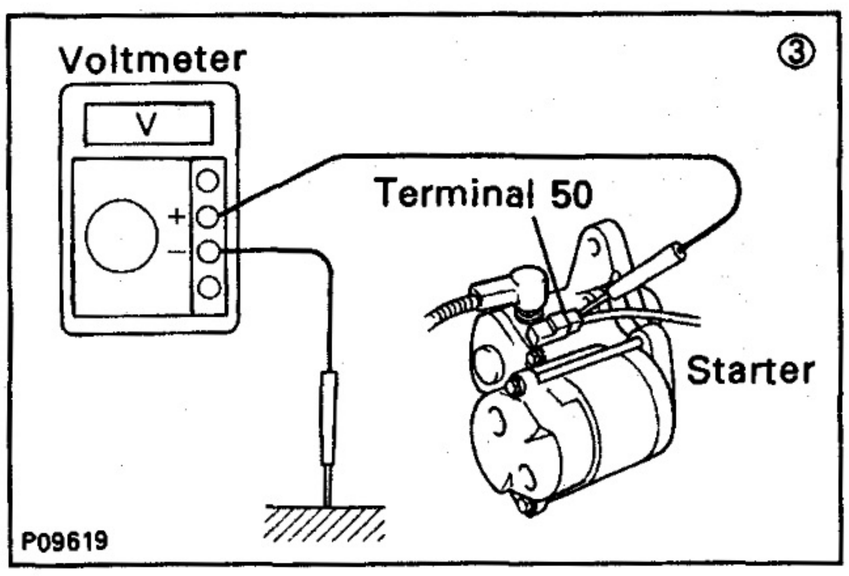
P23343



P01175



P01167



P09619

① There is no voltage between ECU terminals STA and E1. **(IG SW START)**

Check starter operation. — OK → Check wiring between ECU terminal STA and ignition switch terminal ST1. — OK → ② Check wiring between ECU terminal E1 and body ground. — OK → Try another ECU.

Check starter operation. — BAD → Repair or replace.

Check wiring between ECU terminal STA and ignition switch terminal ST1. — BAD → Repair or replace.

② Check wiring between ECU terminal E1 and body ground. — BAD → Repair or replace.

Check fusible link, battery, wiring, ignition switch and neutral start switch. — BAD → Repair or replace.

OK →

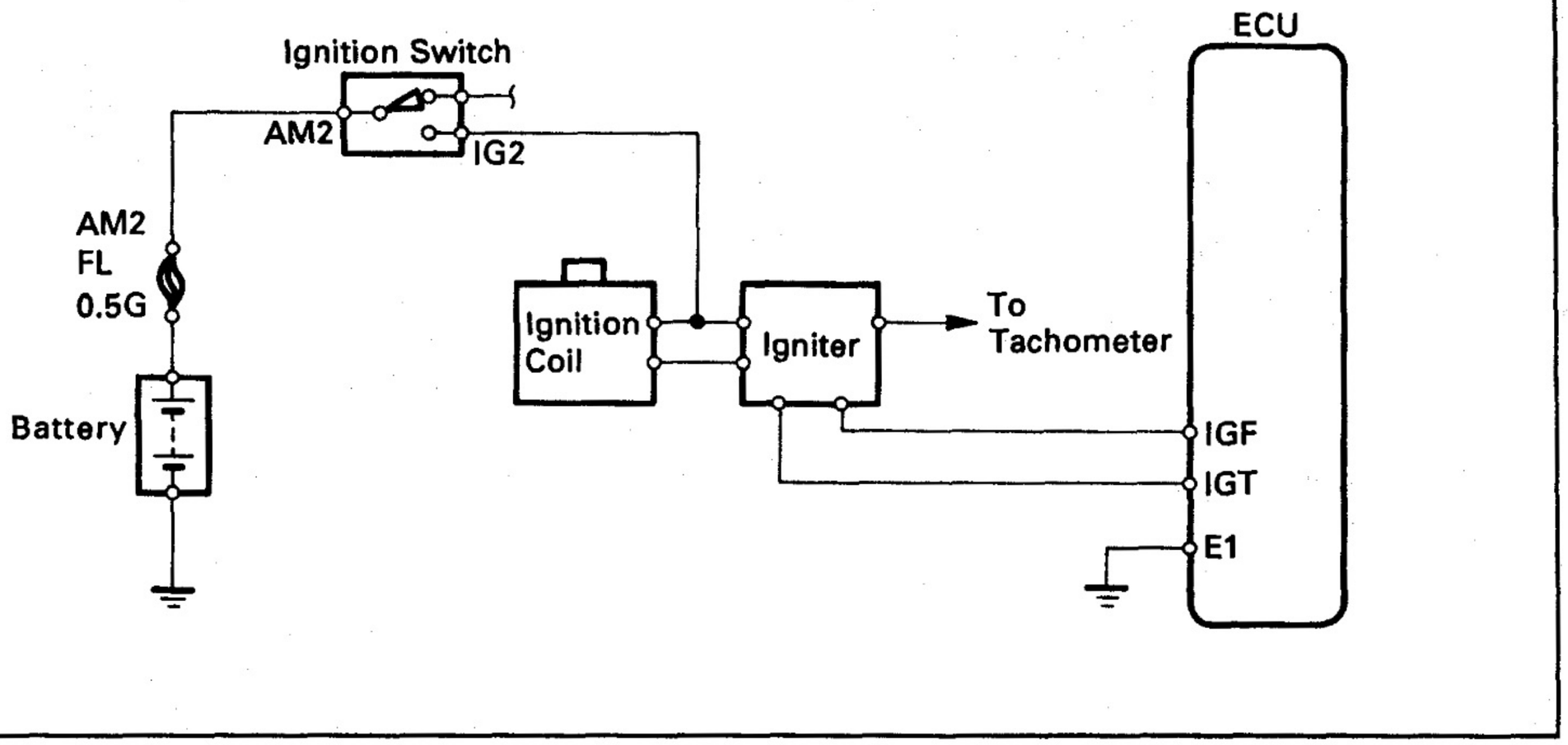
③ Check that there is voltage at starter terminal 50. **(IG SW START) STD voltage: 6 V or more.**

OK → Check starter.

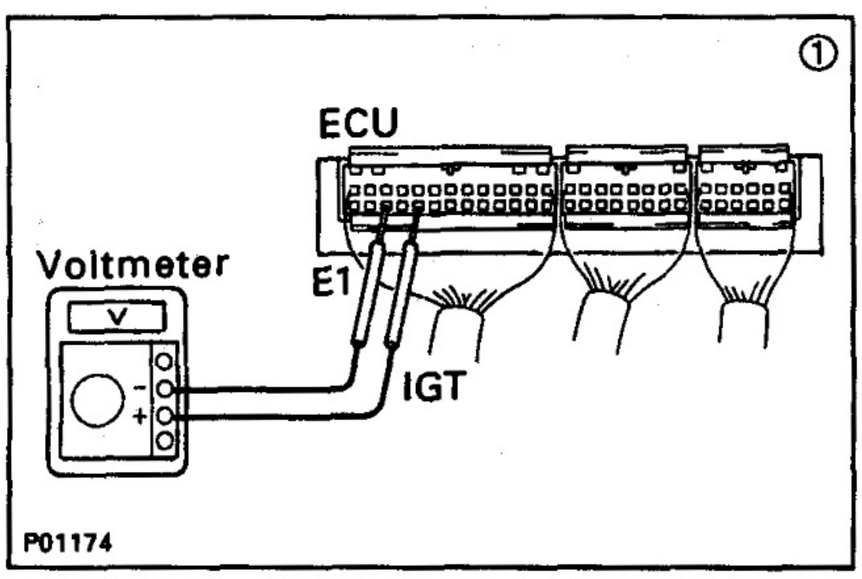
NO → Check wiring between ignition switch terminal ST1 and starter terminal 50.

V06530

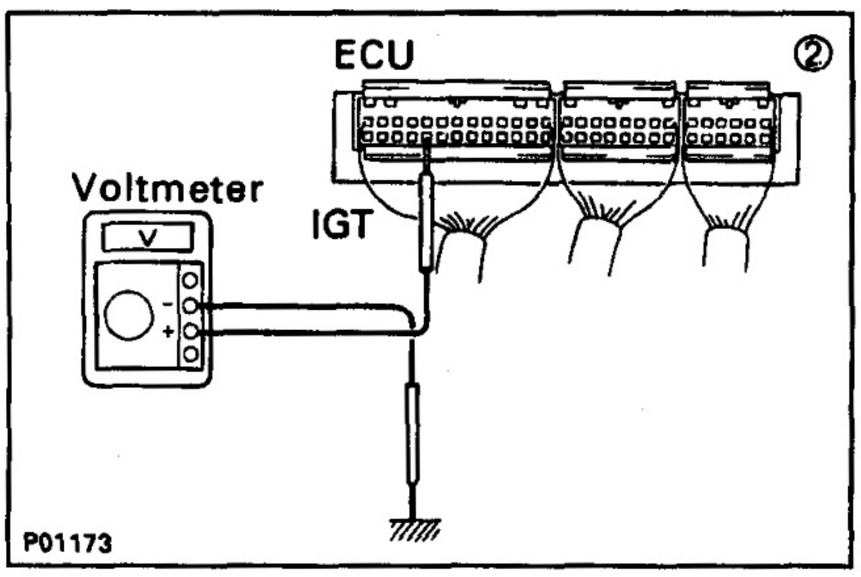
No.	Terminals	Trouble	Condition	STD voltage
8	IGT – E1	No voltage	Idling	Pulse generation



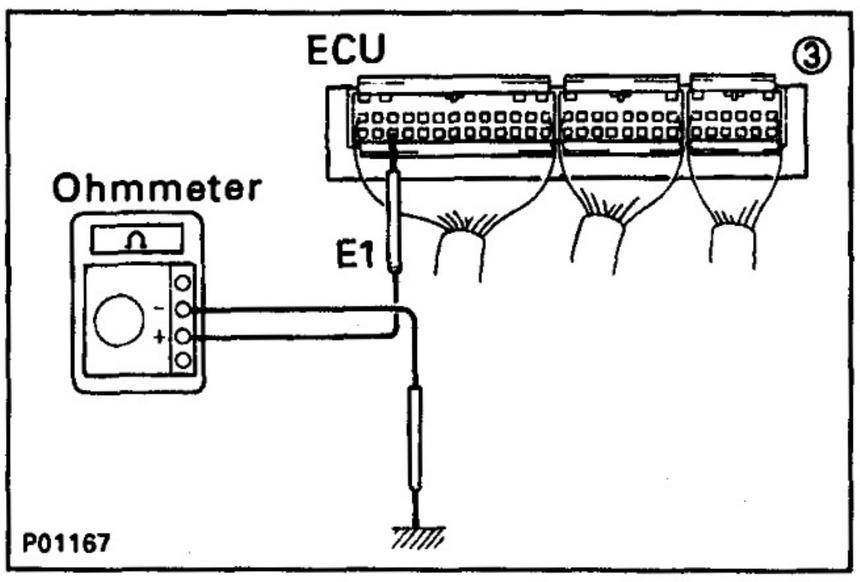
P04541



P01174



P01173



P01167

① There is no voltage between ECU terminals IGT and E1. **(Idling)**

↓

② Check that there is voltage between ECU terminal IGT and body ground **(Idling)**

NO → ③ Check wiring between ECU terminal E1 and body ground. — BAD → Repair or replace.

③ OK → Try another ECU.

② OK ↓

Check fusible link and ignition switch. — BAD → Repair or replace.

OK ↓

Check distributor. — BAD → Repair or replace.

OK ↓

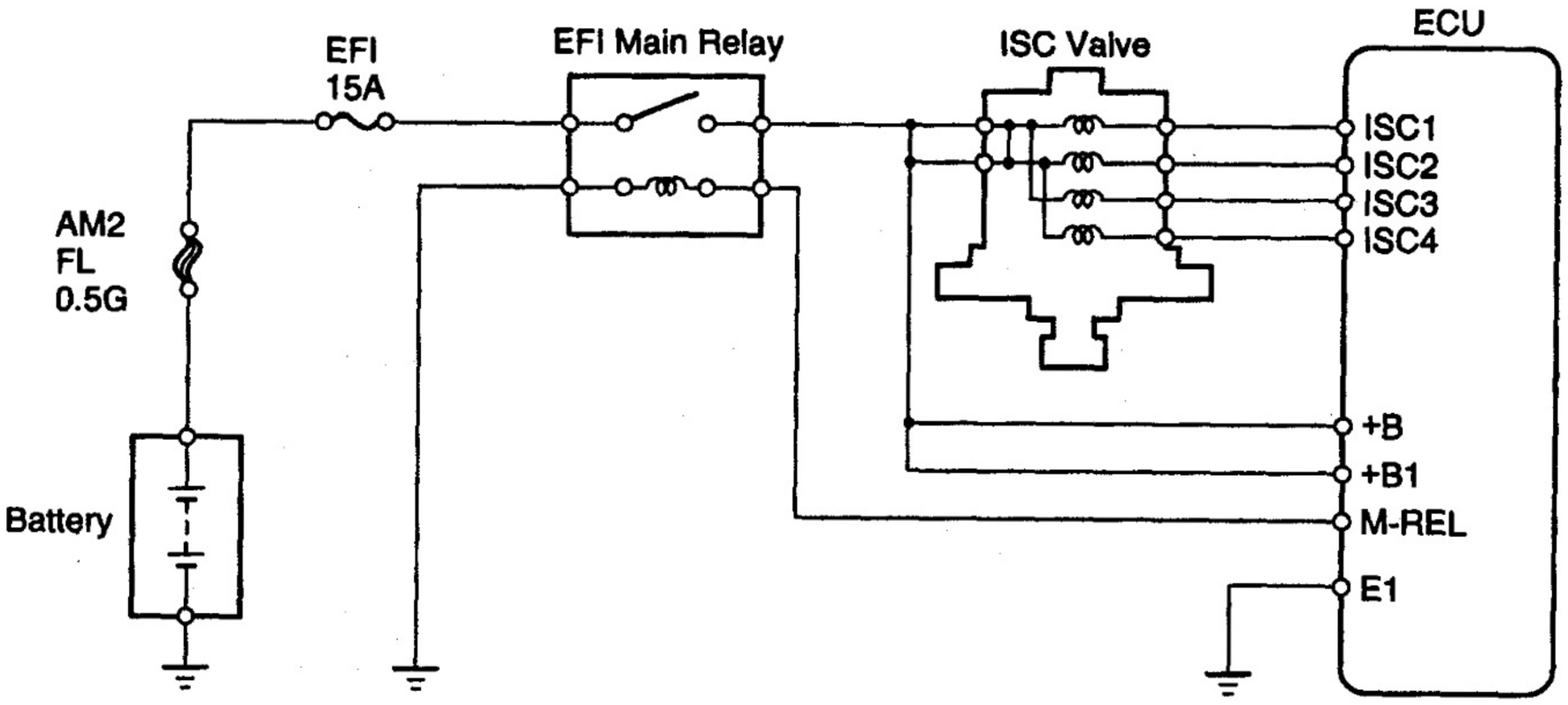
Check wiring between ECU and battery. — BAD → Repair or replace.

OK ↓

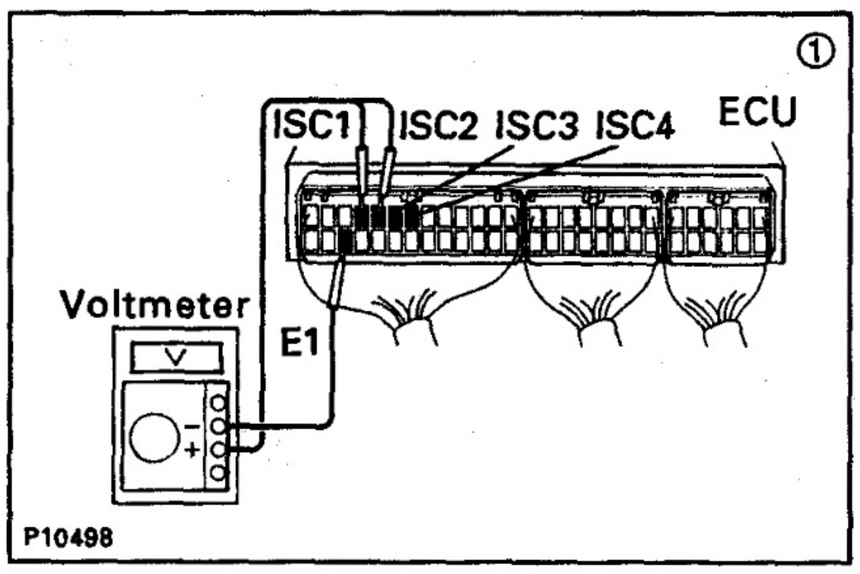
Check igniter. — BAD → Repair or replace.

V06531

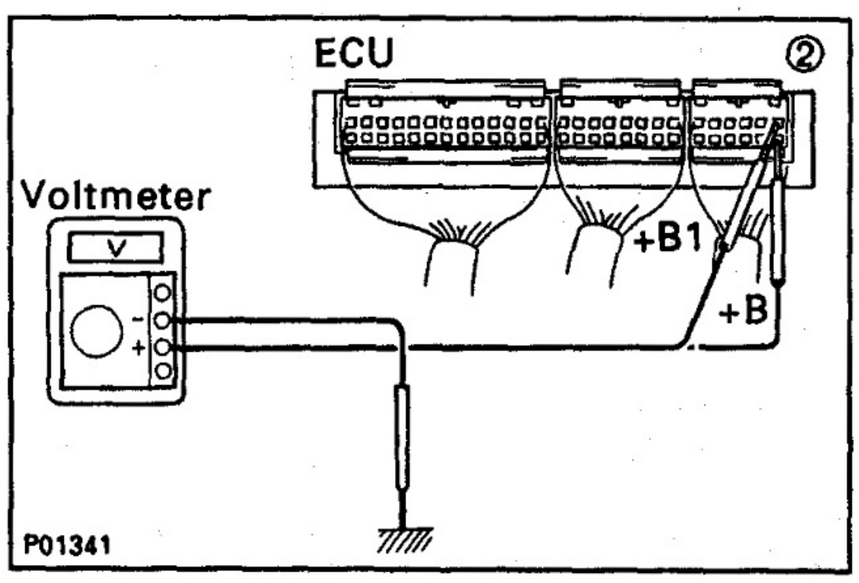
No.	Terminals	Trouble	Condition	STD voltage
9	ISC1 ~ ISC4 – E1	No voltage	IG SW ON	9 – 14 V



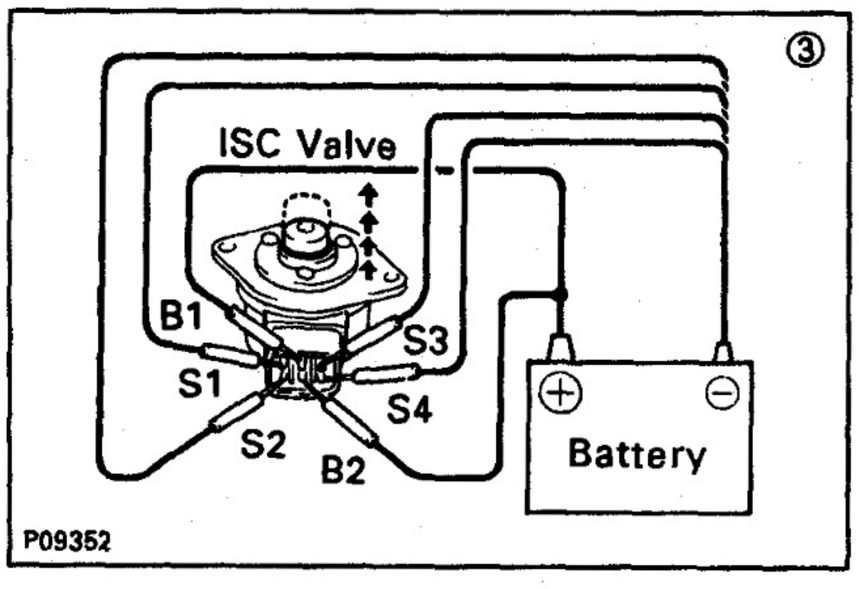
P23341



P10498



P01341



P09352

① There is no voltage between ECU terminals ISC1 ~ ISC4 and E1. **(IG SW ON)**

↓

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

OK ↓

NO → Refer to No.1. (See page EG-40)

↓

Check wiring between ECU terminal E1 and body ground.

OK ↓

BAD → Repair or replace.

↓

③ Check ISC valve.

BAD ↓

Replace ISC valve.

OK ↓

Check wiring between ECU and EFI main relay.

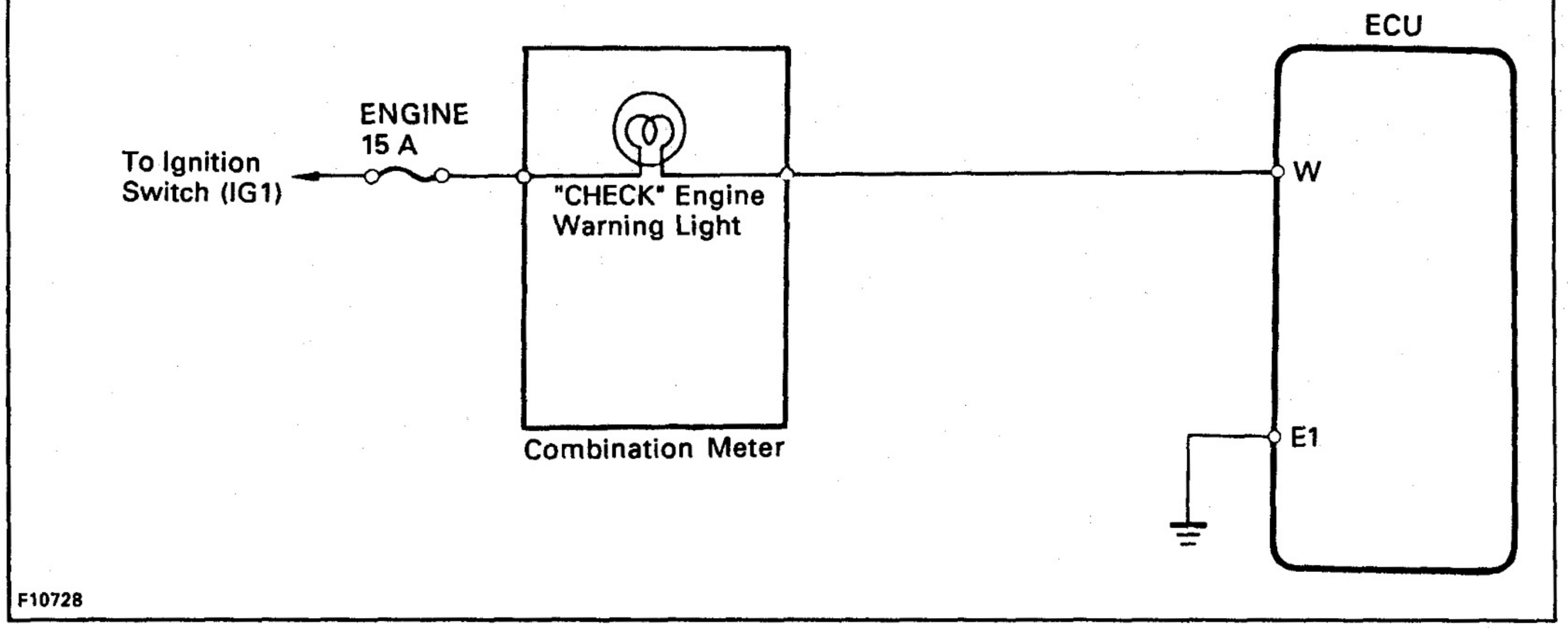
OK ↓

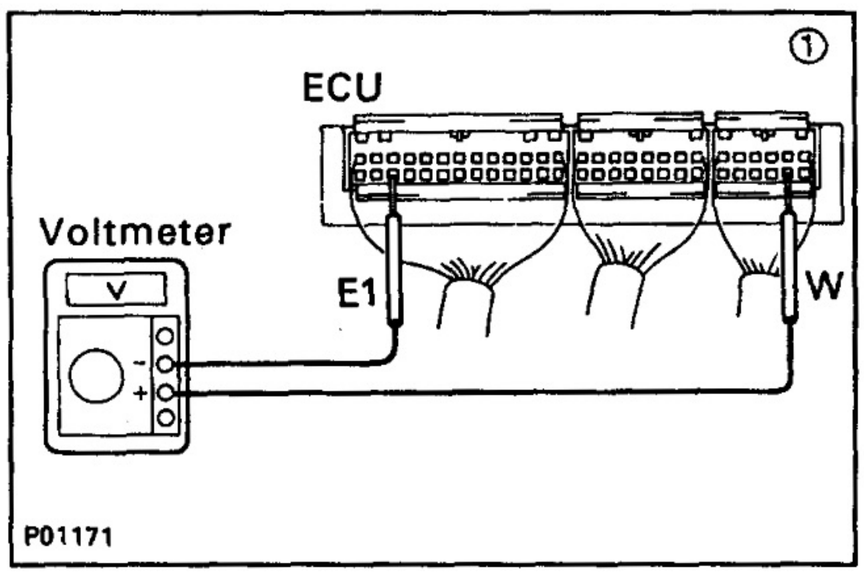
Try another ECU.

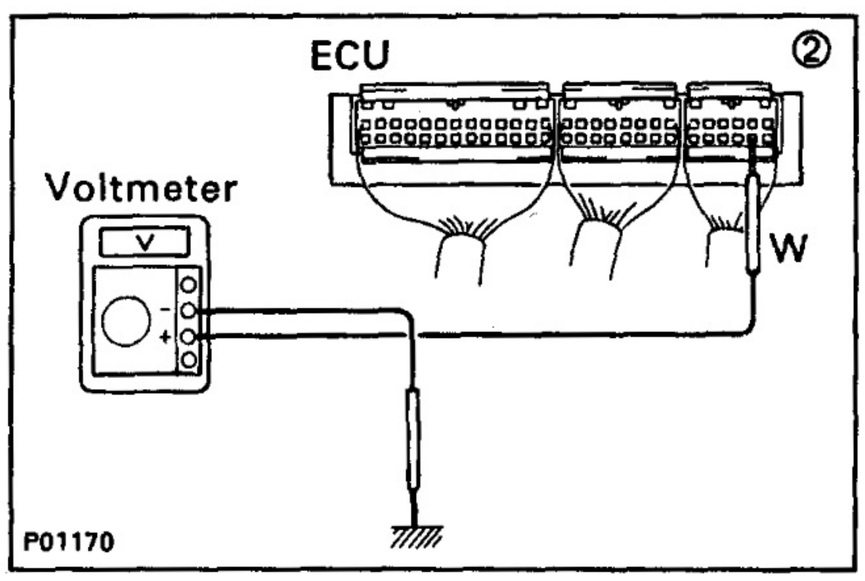
BAD → Repair or replace.

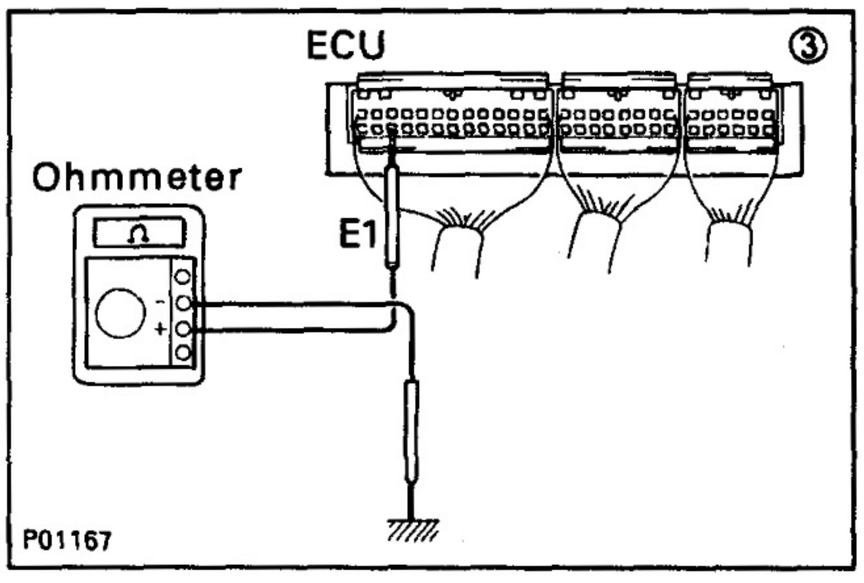
V06532

No.	Terminals	Trouble	Condition	STD voltage
10	W – E1	No voltage	No trouble ("CHECK" engine warning light off) and engine running.	9 – 14 V









① There is no voltage between ECU terminals W and E1. **(Idling)**

↓

② Check that there is voltage between ECU terminal W and body ground.

NO → OK

③ Check wiring between ECU terminal E1 and body ground.

OK → Try another ECU.

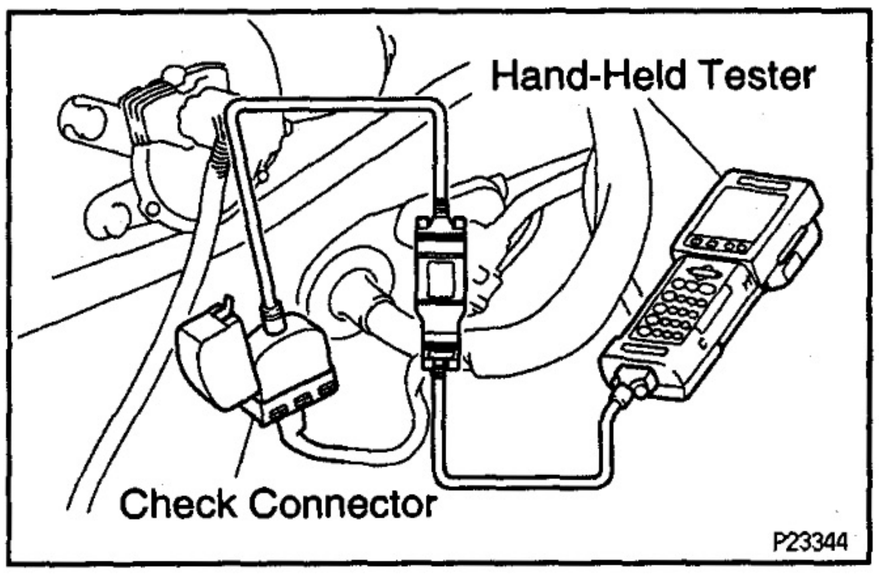
BAD → Repair or replace.

Check ENGINE fuse (15 A) and "CHECK" engine warning light.

OK → BAD → Repair or replace.

Fuse blows again → Check wiring between ECU terminal W and fuse. → BAD → Repair or replace.

V06523



REFERENCE VALUE OF ENGINE ECU DATA

EG382–0A

HINT: Engine ECU data can be monitored by hand–held tester.

1. Hook up the hand–held tester to the check connector.
2. Monitor engine ECU data by following the prompts on the tester screen.
   Please refer to the hand–held tester operator's manual for further details.

EG

EG388–03

REFERENCE VALUE FOR ENGINE ECU DATA (Engine at normal operating temp.)

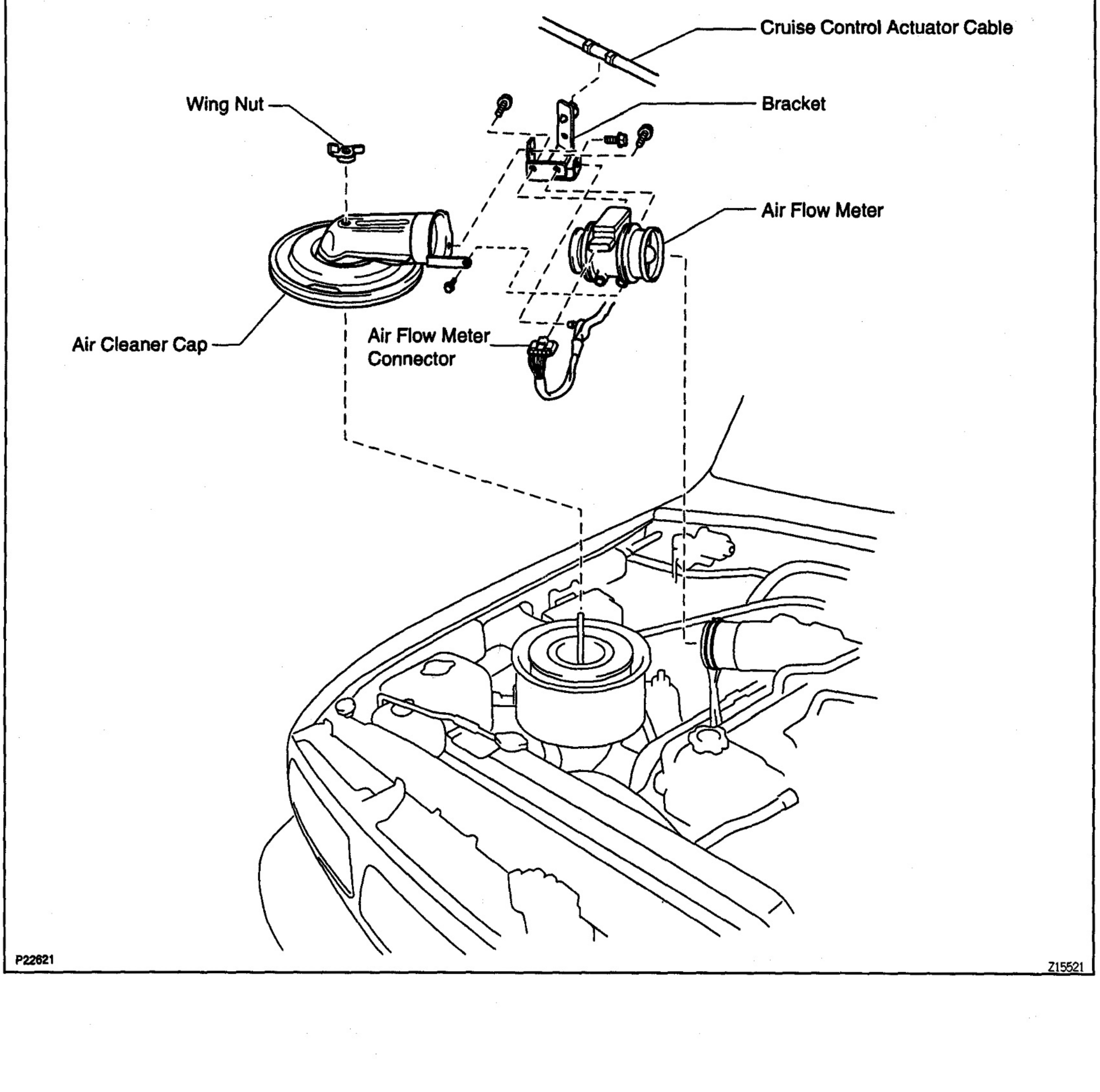
Item	Inspection condition	Reference value
INJECTOR	Engine cold to hot Engine idling at normal operating temp. *1	Gradually decreases Approx. 3 msecs
IGNITION	Increase engine speed	Gradually increases
ISC STEP	Engine idling at normal operating temp. *1 A/C switch ON A/T shifting in "D" position Ignition switch ON (Do not start engine.)	40 ±10 steps Step increases Step increases Approx. 125 steps
ENGINE SPED	RPM kept stable (Comparison with tachometer)	No great changes
AIRFLOW *2	Engine idling at normal operating temp. *1 Increase engine speed	Approx. 6 g/s Gradually increases
AIRFLOW *3	Engine idling at normal operating temp. *1 Increase engine speed	Approx. 1.2 – 2.4 V Gradually increases
COOLANT TEMP.	Engine at normal operating temp.	75 – 95°C (167 – 203°F) *4
THROTTLE	Closed throttle position Wide open throttle From closed throttle position to wide open throttle	Below 5° Above 70° Gradually increases
VEHICLE SPD	During driving (Comparison with speedometer)	No large differences
TARGET A/F L *5	Engine idling at normal operating temperature	2.50 ± 1.25 V *6
A/F FB LEFT *5	RPM stable at 2,500 rpm with normal operating temp.	ON
STA SIGNAL	During cranking	ON
IDL SIGNAL	Closed throttle position	ON
A/C SIGNAL	A/C switch ON	ON
NSW SIGNAL *7	When shifting from "P" or "N" position into a position other than "P" or "N".	GEAR
Ox L *5	RPM stable at 2,500 rpm	RICH LEAN is repeated.

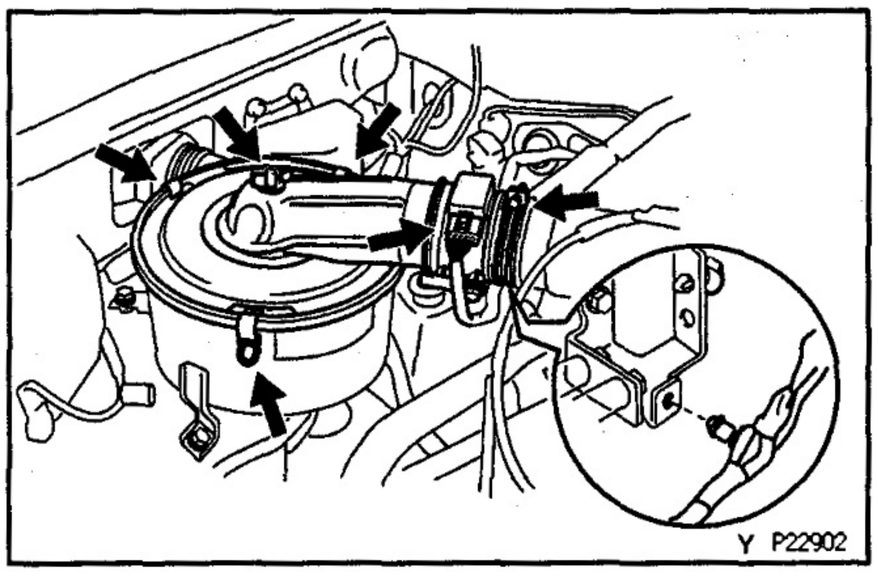
*1: All accessories and A/C are switch OFF.
*2: Station wagon only.
*3: Hardtop only.
*4: If the engine coolant temperature sensor circuit is open or shorted, the engine ECU assumes an engine coolant temp. value of 80°C (176°F).
*5: Europe only.
*6: When feedback control is forbidden, 0 V is displayed.
*7: A/T only.

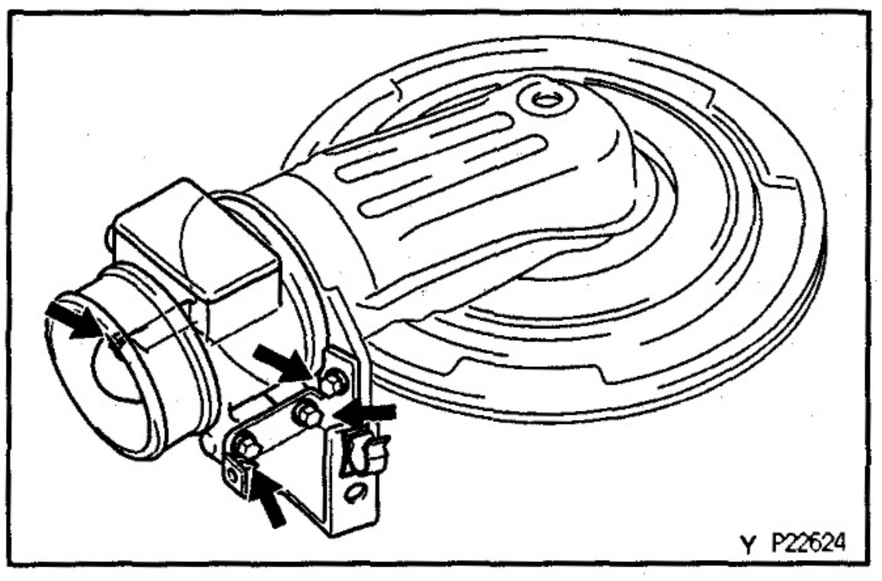
AIR FLOW METER (Station Wagon)

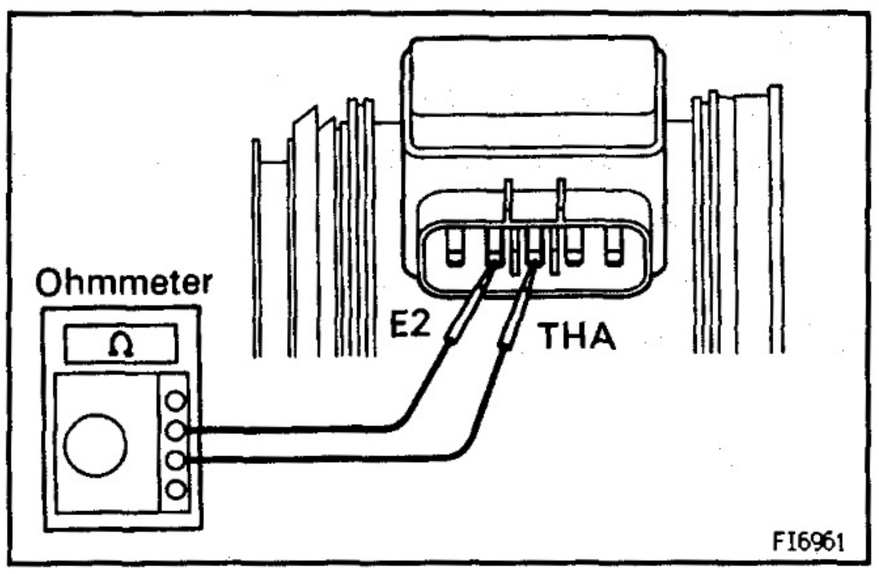
EG8KB-02

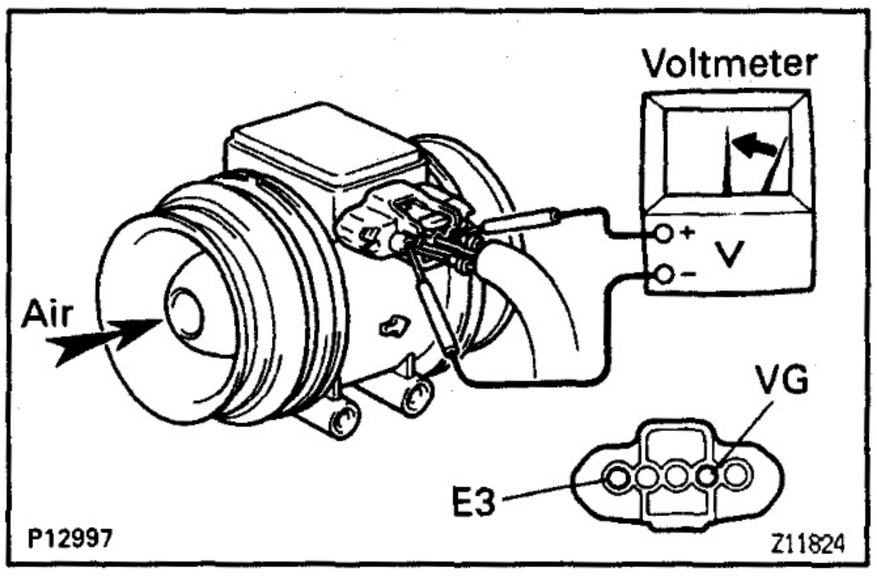
COMPONENTS FOR REMOVAL AND INSTALLATION











EG5KC-02

AIR FLOW METER REMOVAL

Installation is in the reverse order of removal.

1. **REMOVE AIR CLEANER CAP AND AIR FLOW METER**

(a) Disconnect the air flow meter connector and wire clamp.

(b) Disconnect the cruise control actuator cable.

(c) Loosen the air cleaner hose clamp.

(d) Disconnect the 3 clips, and remove the wing nut, air cleaner cap and air flow meter.

2. **REMOVE AIR FLOW METER**

Remove the 4 bolts, bracket and air flow meter.

Torque: 6.9 N·m (70 kgf·cm, 61 in.·lbf)

EG5M4-01

AIR FLOW METER INSPECTION

1. **INSPECT AIR FLOW METER RESISTANCE**

Using an ohmmeter, measure the resistance between terminals THA and E2.

Between terminals	Resistance	Temperature
THA – E2	10 – 20 kΩ	–20°C (–4°F)
THA – E2	4 – 7 kΩ	0°C (32°F)
THA – E2	2 – 3 kΩ	20°C (68°F)
THA – E2	0.9 – 1.3 kΩ	40°C (104°F)
THA – E2	0.4 – 0.7 kΩ	60°C (140°F)
THA – E2	0.2 – 0.4 kΩ	80°C (176°F)

If the resistance is not as specified, replace the air flow meter.

2. **INSPECT AIR FLOW METER OPERATION**

(a) Connect the air flow meter connector.

(b) Using a voltmeter, connect the positive (+) tester probe to terminal VG, and negative (–) tester probe to terminal E3.

(c) Blow air into the air flow meter, and check that the voltage fluctuates.

If operation is not as specified, replace the air flow meter.

(d) Disconnect the air flow meter connector.

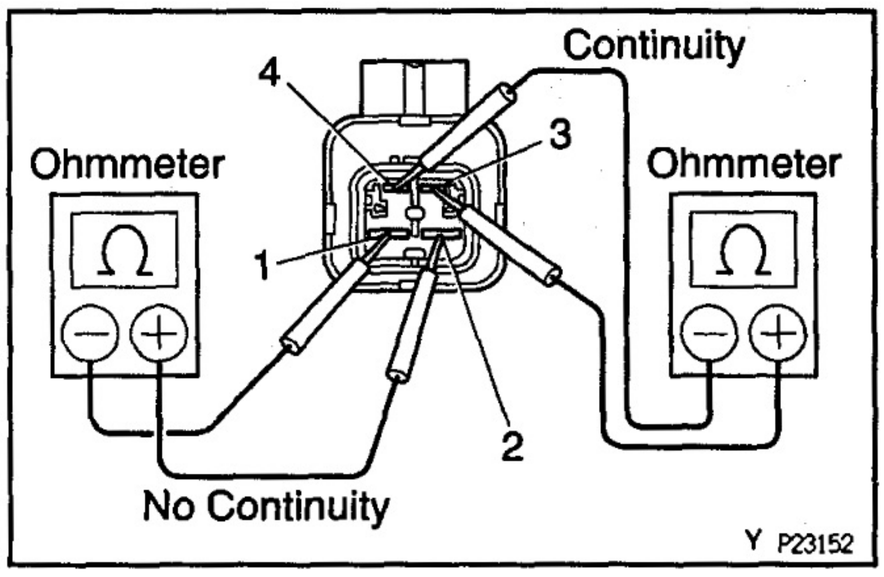
EFI MAIN RELAY
(Hardtop)

EG13W-01

EFI MAIN RELAY INSPECTION

1. REMOVE EFI MAIN RELAY

LOCATION: In the engine compartment on the left side.



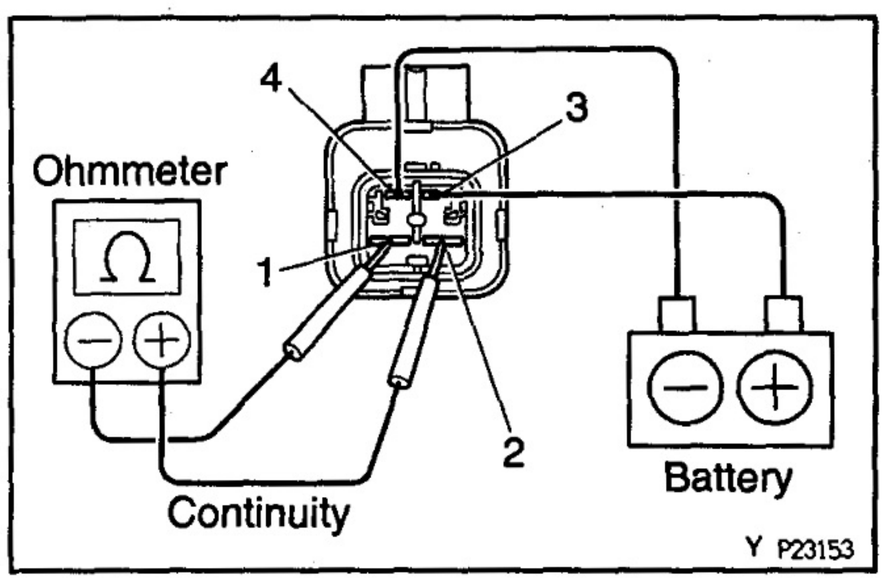
2. INSPECT EFI MAIN RELAY

A. Inspect relay continuity

(a) Using an ohmmeter, check that there is continuity between terminals 3 and 4.

(b) Check that there is no continuity between terminals 1 and 2.

If continuity is not as specified, replace the relay.



B. Inspect relay operation

(a) Apply battery voltage across terminals 3 and 4.

(b) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

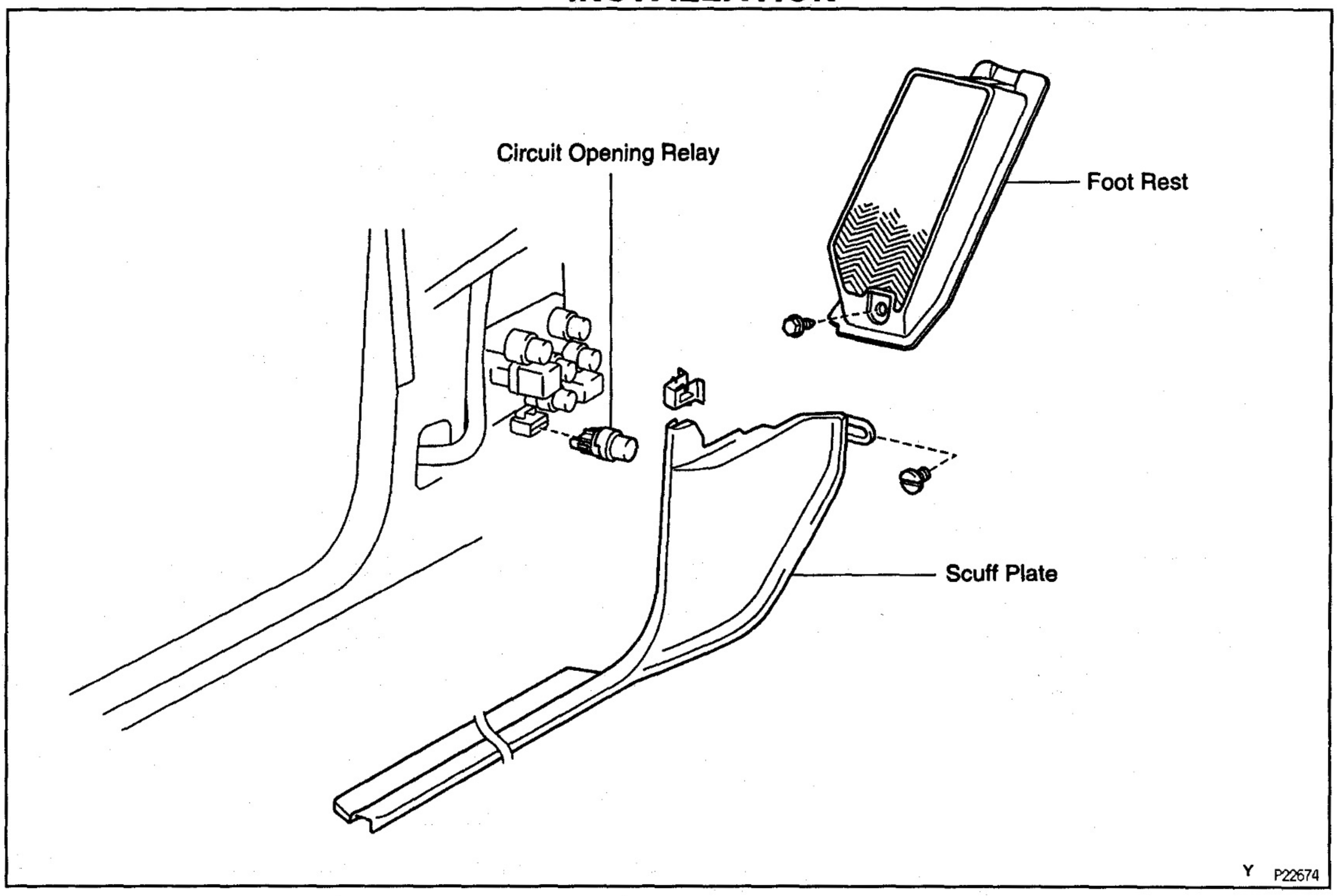
If operation is not as specified, replace the relay.

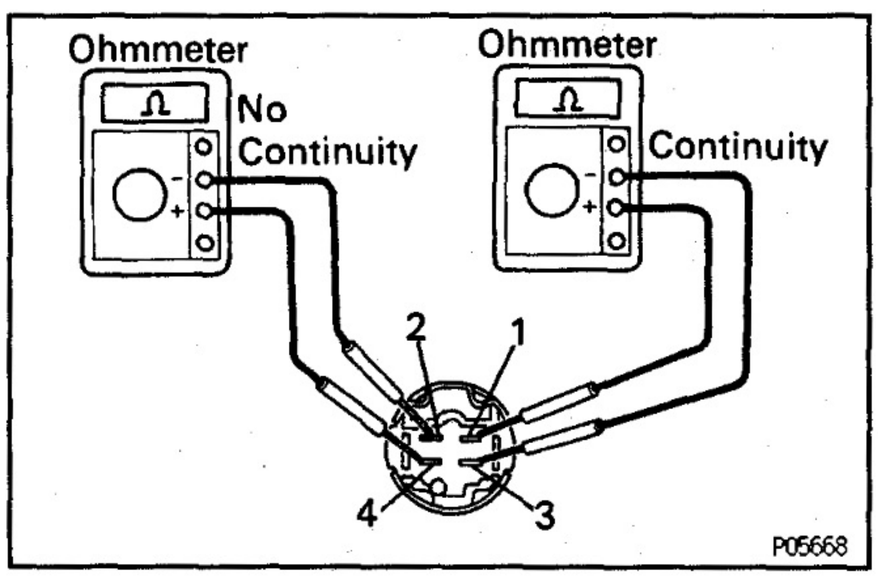
3. REINSTALL EFI MAIN RELAY

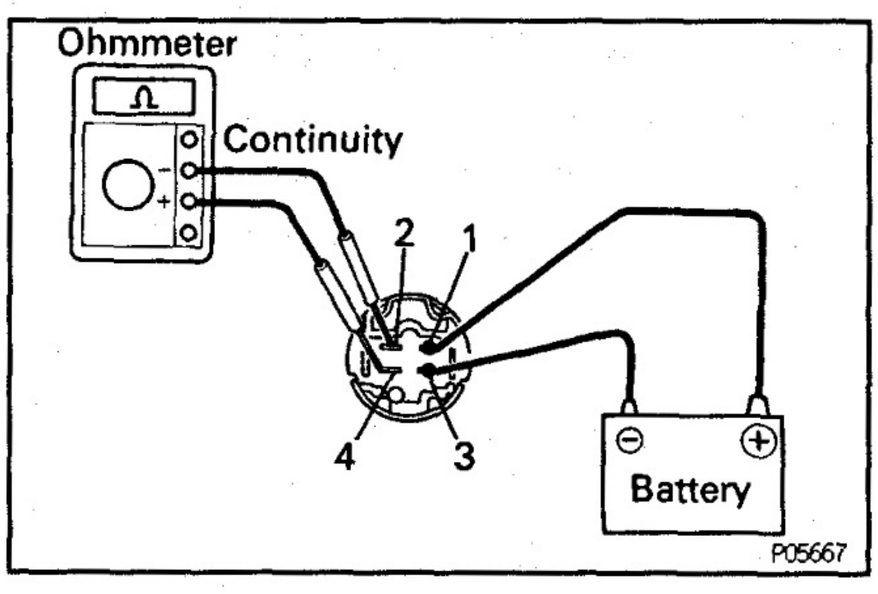
CIRCUIT OPENING RELAY (Station Wagon)

EG1T6–05

COMPONENTS FOR REMOVAL AND INSTALLATION







CIRCUIT OPENING RELAY INSPECTION

EG8KG–02

1. **REMOVE CIRCUIT OPENING RELAY**
2. **INSPECT CIRCUIT OPENING RELAY**

A. Inspect relay continuity

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 3.

(b) Check that there is no continuity between terminals 2 and 4.

If continuity is not as specified, replace the relay.

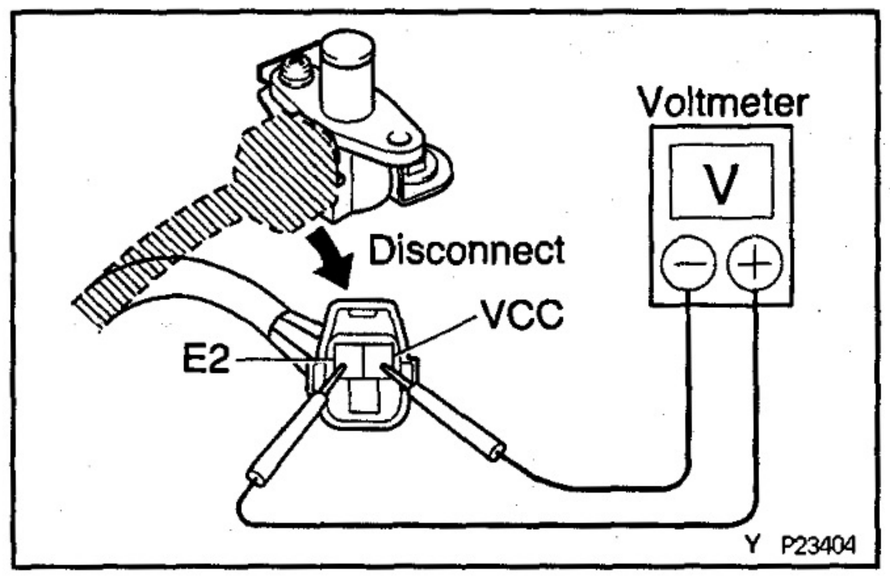
B. Inspect relay operation

(a) Apply battery voltage across terminals 1 and 3.

(b) Using an ohmmeter, check that there is continuity between terminals 2 and 4.

If operation is not as specified, replace the relay.

3. **REINSTALL CIRCUIT OPENING RELAY**



VARIABLE RESISTOR (Station Wagon Except Europe)

EG5M5–01

VARIABLE RESISTOR INSPECTION

1. INSPECT POWER SOURCE VOLTAGE OF VARIABLE RESISTOR

(a) Disconnect the variable resistor connector.

(b) Turn the ignition switch ON.

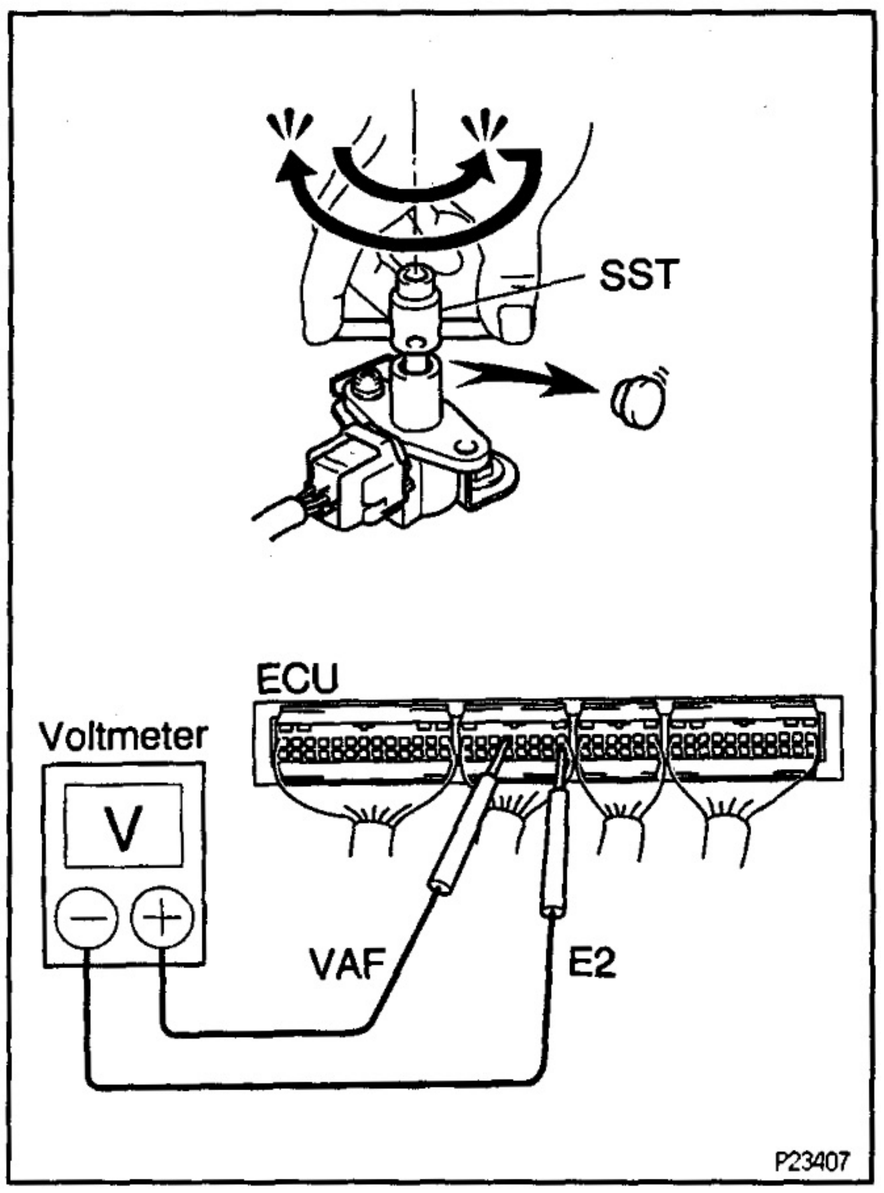
(c) Using a voltmeter, measure the voltage between connector terminals VCC and E2 of the wiring harness side.

Voltage:

4.5 – 5.5 V

(d) Turn the ignition switch to LOCK.

(e) Reconnect the variable resistor connector.

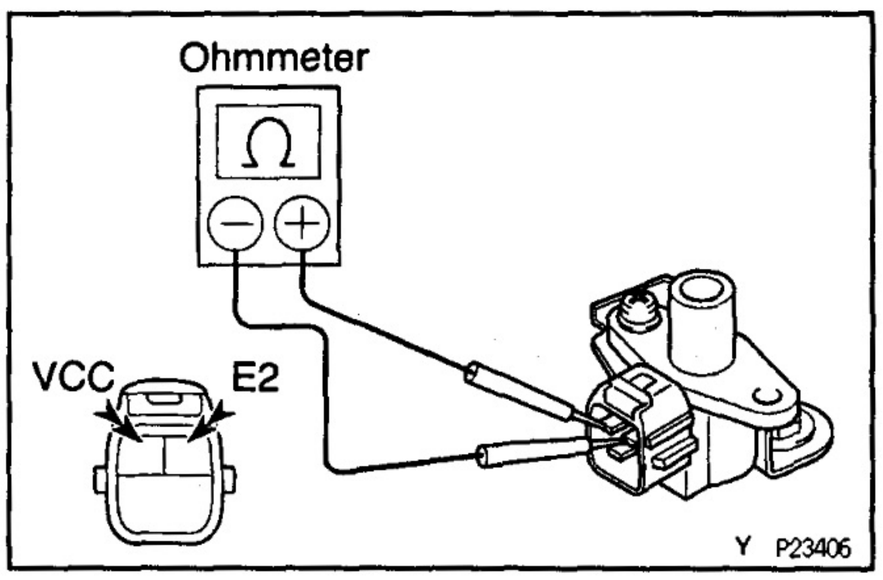


2. INSPECT POWER OUTPUT OF VARIABLE RESISTOR

(a) Turn the ignition switch ON.

(b) Connect a voltmeter to terminals VAF and E2 of the ECU, and measure the voltage while slowly turning the idle mixture adjusting screw first fully counter–clockwise, and then fully clockwise using SST.
SST 09243–00020

(c) Check that voltage changes smoothly from 0 V to approx. 5 V.
HINT: There is no sudden jump up to 5 V or down to 0 V.



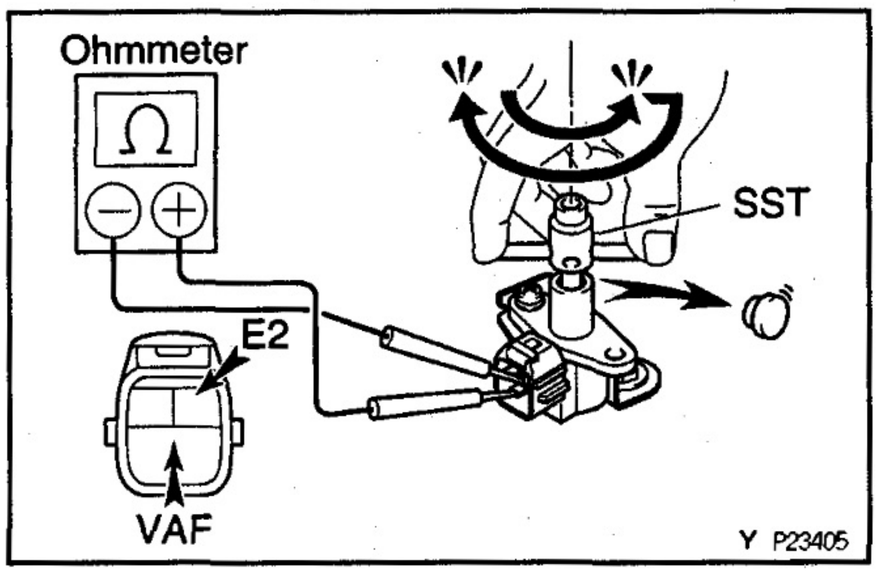
3. INSPECT RESISTANCE OF VARIABLE RESISTOR

(a) Disconnect the variable resistor connector.

(b) Using an ohmmeter, measure the resistance between terminals VCC and E2 of the variable resistor.

Resistance:

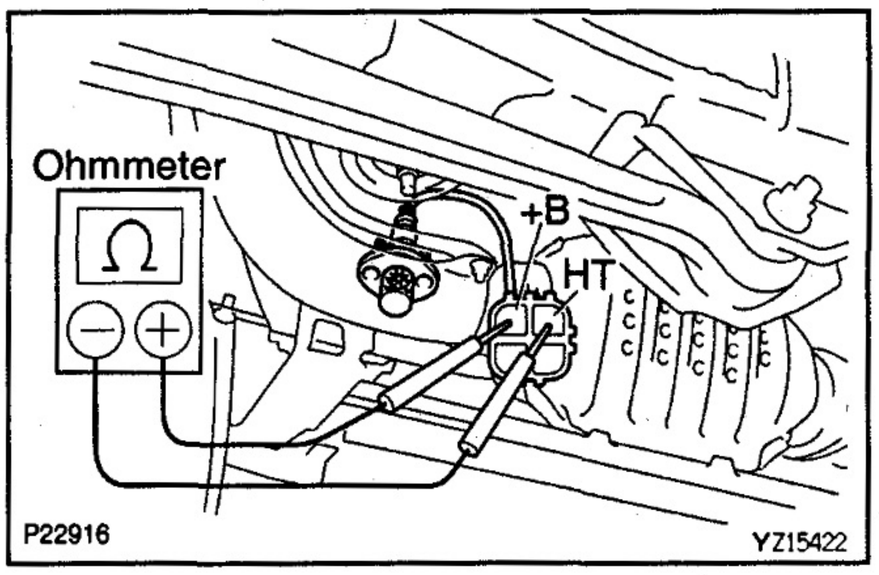
4 – 6 kΩ

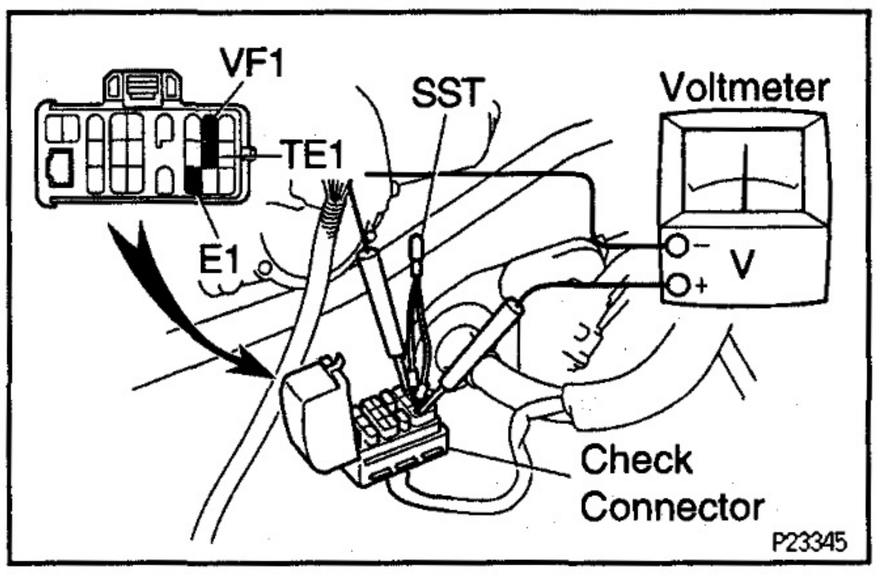


(c) Using SST, turn the idle mixture adjusting screw fully counterclockwise.
SST 09243–00020

(d) Connect the ohmmeter to terminals VAF and E2 of the variable resistor, and turn the idle mixture adjusting screw fully clockwise and check that the resistance value changes from approx. 5 kΩ to 0 kΩ accordingly.

(e) Reconnect the variable resistor connector.





OXYGEN SENSOR (Europe)

EGSM6–01

OXYGEN SENSOR INSPECTION

1. INSPECT HEATER RESISTANCE OF OXYGEN SENSOR

(a) Disconnect the oxygen sensor connector.

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

Resistance:

At 20°C (68°F): 11 – 16 Ω

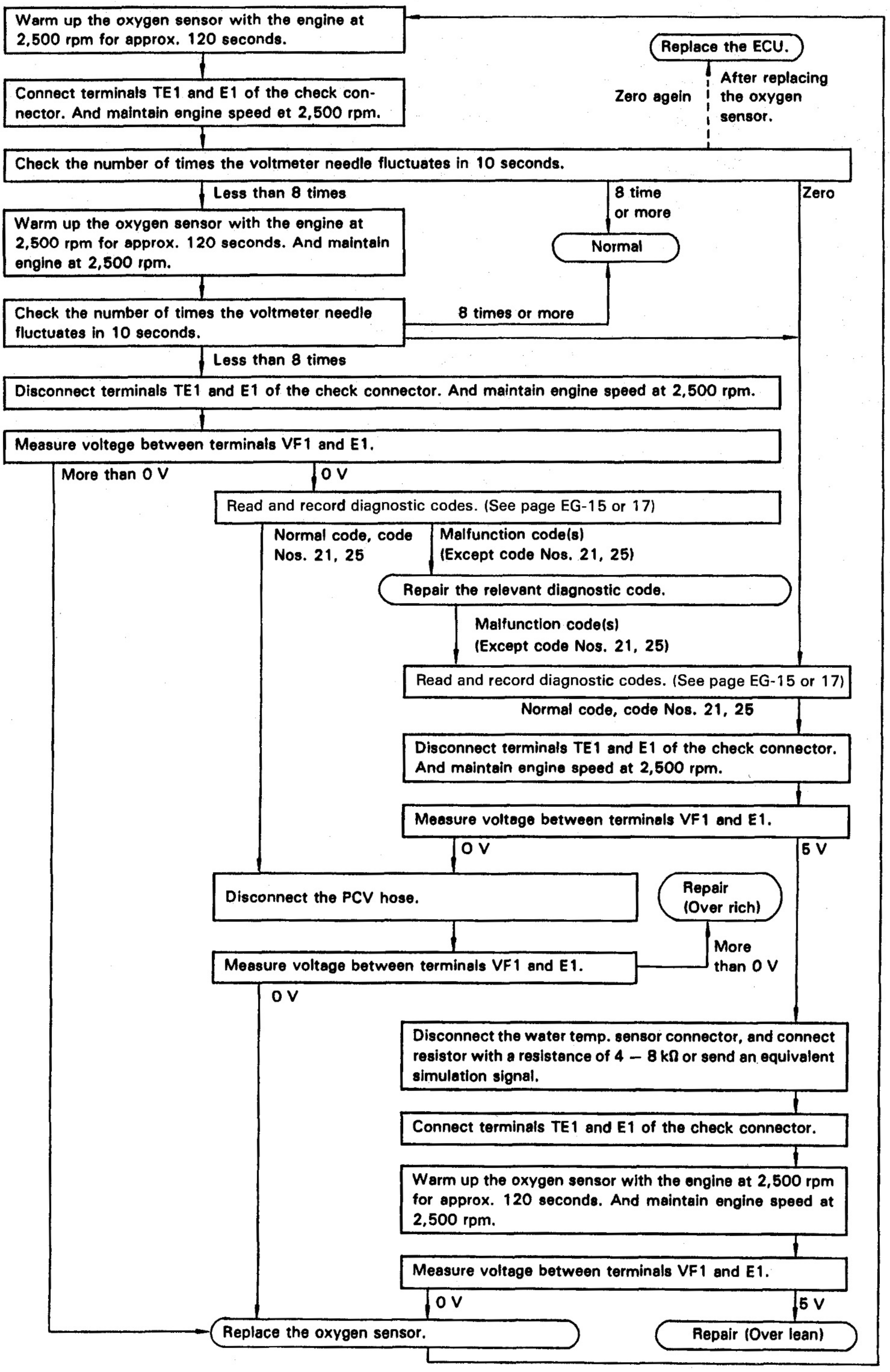
If resistance is not as specified, replace the oxygen sensor.

(c) Reconnect the oxygen sensor connector.

2. INSPECT FEEDBACK VOLTAGE

(a) Warm up the engine.

(b) Connect the positive (+) probe of a voltmeter to terminal VF1 of the check connector, and negative (–) probe to terminal E1. Do the test on the next page.
HINT: Use SST when connecting between terminals TE1 and E1 of the check connector.
SST 09843–18020


Warm up the oxygen sensor with the engine at 2,500 rpm for approx. 120 seconds.
Connect terminals TE1 and E1 of the check connector. And maintain engine speed et 2,500 rpm.
Replace the ECU.
Zero agein
After replacing the oxygen sensor.
Check the number of times the voltmeter needle fluctuates in 10 seconds.
Less than 8 times
8 time or more
Zero
Warm up the oxygen sensor with the engine at 2,500 rpm for approx. 120 seconds. And maintain engine at 2,500 rpm.
Normal
Check the number of times the voltmeter needle fluctuates in 10 seconds.
8 times or more
Less than 8 times
Disconnect terminals TE1 and E1 of the check connector. And maintain engine speed at 2,500 rpm.
Measure voltege between terminals VF1 and E1.
More than 0 V
0 V
Read and record diagnostic codes. (See page EG-15 or 17)
Normal code, code Nos. 21, 25
Malfunction code(s) (Except code Nos. 21, 25)
Repair the relevant diagnostic code.
Malfunction code(s) (Except code Nos. 21, 25)
Read and record diagnostic codes. (See page EG-15 or 17)
Normal code, code Nos. 21, 25
Disconnect terminals TE1 and E1 of the check connector. And maintain engine speed at 2,500 rpm.
Measure voltage between terminals VF1 and E1.
0 V
5 V
Disconnect the PCV hose.
Repair (Over rich)
Measure voltage between terminals VF1 and E1.
More than 0 V
0 V
Disconnect the water temp. sensor connector, and connect resistor with a resistance of 4 – 8 kΩ or send an equivalent simulation signal.
Connect terminals TE1 and E1 of the check connector.
Warm up the oxygen sensor with the engine at 2,500 rpm for approx. 120 seconds. And maintain engine speed at 2,500 rpm.
Measure voltage between terminals VF1 and E1.
0 V
5 V
Replace the oxygen sensor.
Repair (Over lean)

V06516

SERVICE SPECIFICATIONS

SERVICE DATA

EG0ZA–0P

Air flow meter (Station Wagon)	Resistance (THA – E2)	at –20°C (–4°F)	10 – 20 kΩ
		at 0°C (32°F)	4 – 7 kΩ
		at 20°C (68°F)	2 – 3 kΩ
		at 40°C (104°F)	0.9 – 1.3 kΩ
		at 60°C (140°F)	0.4 – 0.7 kΩ
		at 80°C (176°F)	0.2 – 0.4 kΩ
Oxygen sensor	Heater coil resistance	at 20°C (68°F)	11 – 16 Ω

EG

TORQUE SPECIFICATIONS

EG0EE–1C

Part tightened	N·m	kgf·cm	ft·lbf
Air flow meter x Bracket	6.9	70	61 in.·lbf
Air flow meter x Air cleaner cap	6.9	70	61 in.·lbf

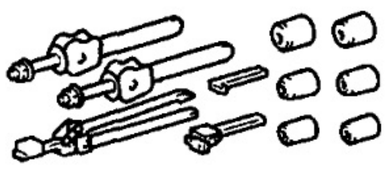
COOLING SYSTEM

PREPARATION

SST (SPECIAL SERVICE TOOLS)

EG18K–09

EG

	09230–00010 Radiator Service Tool Set	
	09230–01010 Radiator Service Tool Set	
	(09231–00060) No.3 Plug	

EG06V–0F

COOLANT

Hardtop:

Item	Capacity	Classification
Engine coolant		Ethylene–glycol base
w/ Heater	13.2 liters (14.0 US qts, 11.6 Imp. qts)	
w/o Heater	12.2 liters (12.9 US qts, 10.7 Imp. qts)	

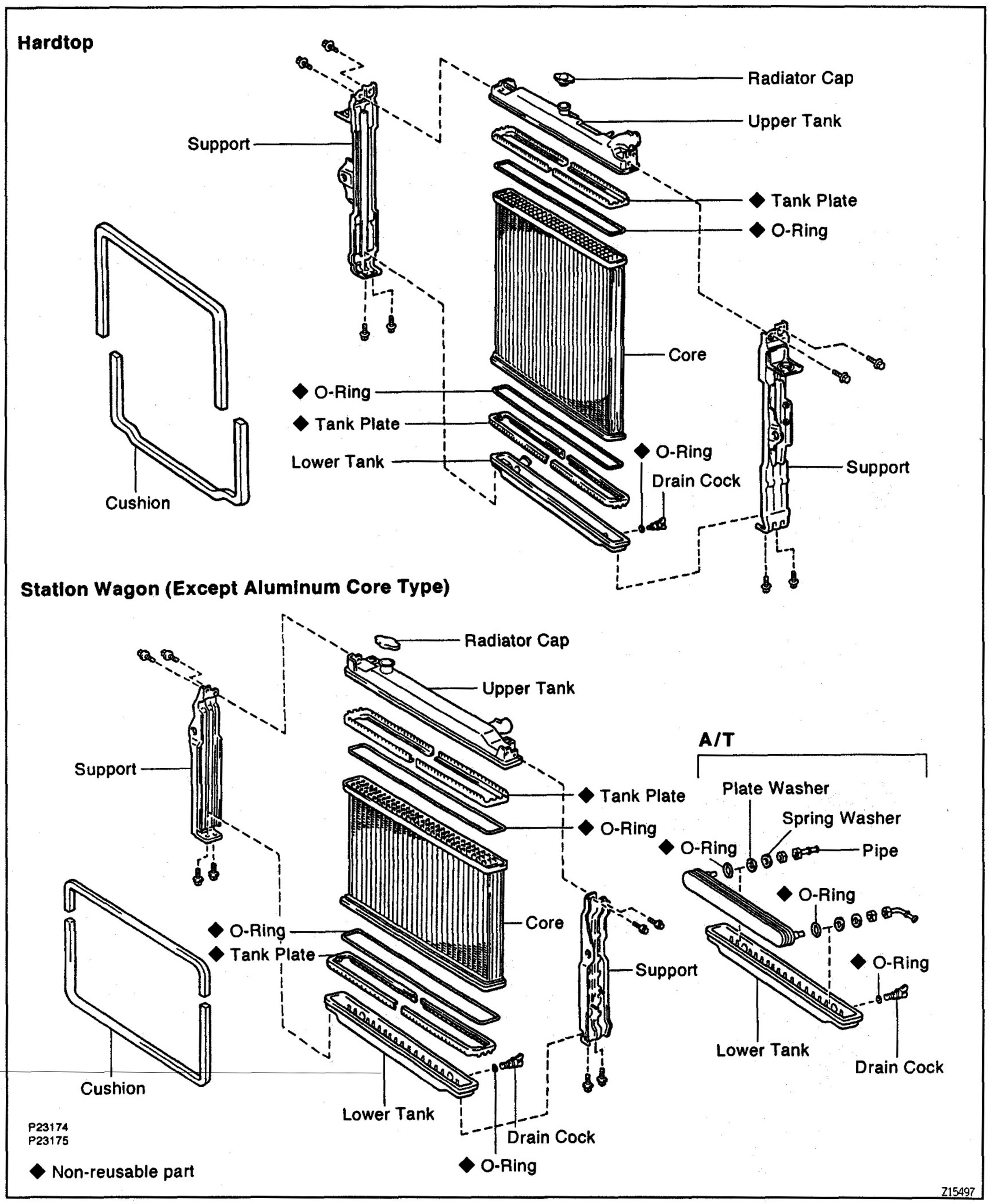
Station Wagon:

Item	Capacity	Classification
Engine coolant		Ethylene–glycol base
Europe (M/T)		
w/ Heater	13.6 liters (14.4 US qts, 12.0 Imp. qts)	
w/o Heater	11.7 liters (12.4 US qts, 10.3 Imp. qts)	
Europe (A/T)		
w/ Heater	13.4 liters (14.2 US qts, 11.8 Imp. qts)	
w/o Heater	11.5 liters (12.2 US qts, 10.1 Imp. qts)	
Others (M/T)		
w/ Front and rear heaters	14.2 liters (15.0 US qts, 12.5 Imp. qts)	
w/ Front heater	13.4 liters (14.2 US qts, 11.8 Imp. qts)	
w/o Heater	12.4 liters (13.1 US qts, 10.9 Imp. qts)	
Others (A/T)		
w/ Front and rear heaters	14.0 liters (14.8 US qts, 12.3 Imp. qts)	
w/ Front heater	13.2 liters (14.0 US qts, 11.6 Imp. qts)	
w/o Heater	12.2 liters (12.9 US qts, 10.7 Imp. qts)	

RADIATOR

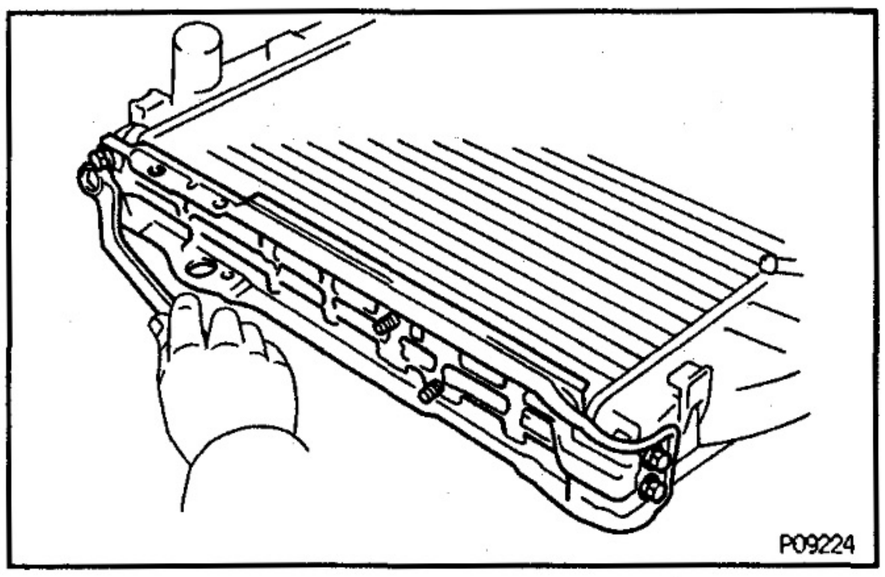
COMPONENTS FOR DISASSEMBLY AND ASSEMBLY

EG1J6-0A



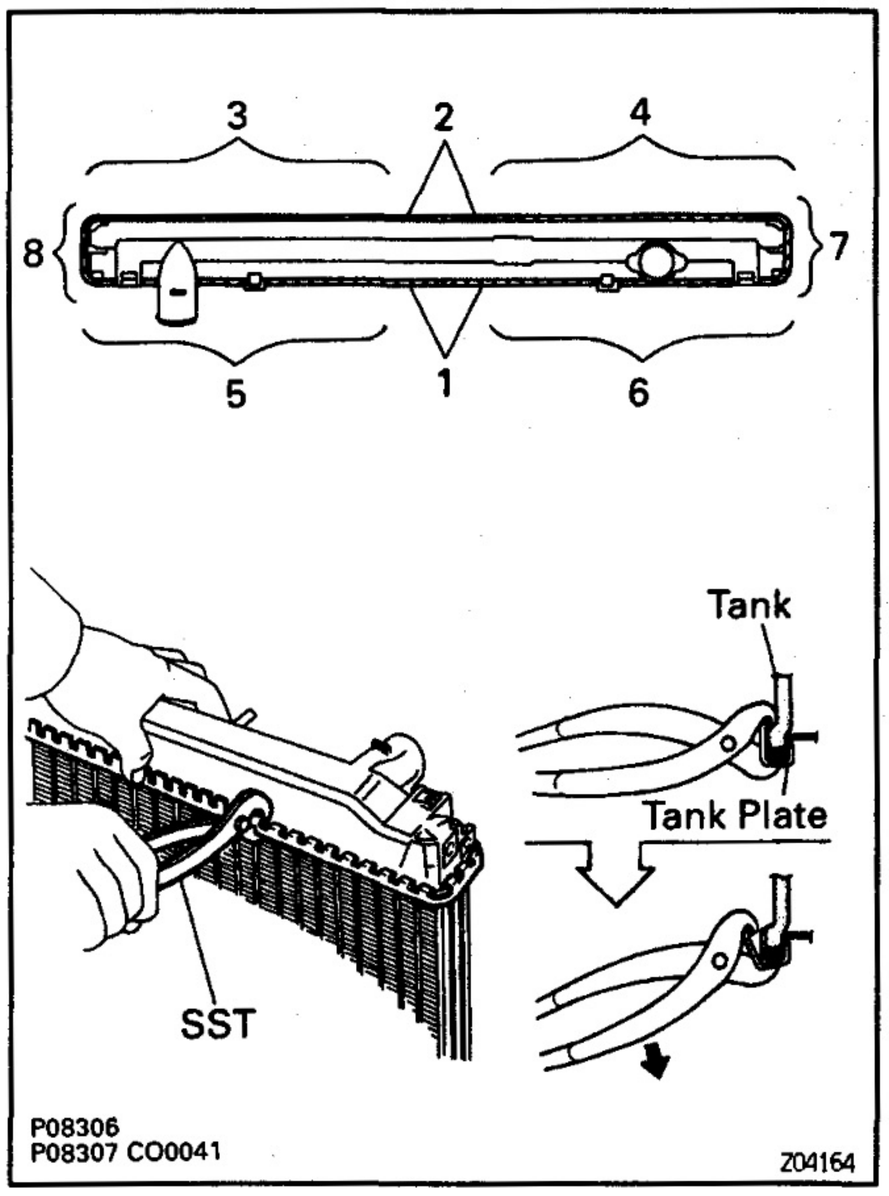
EG1J9—03

RADIATOR DISASSEMBLY



1. REMOVE SUPPORTS

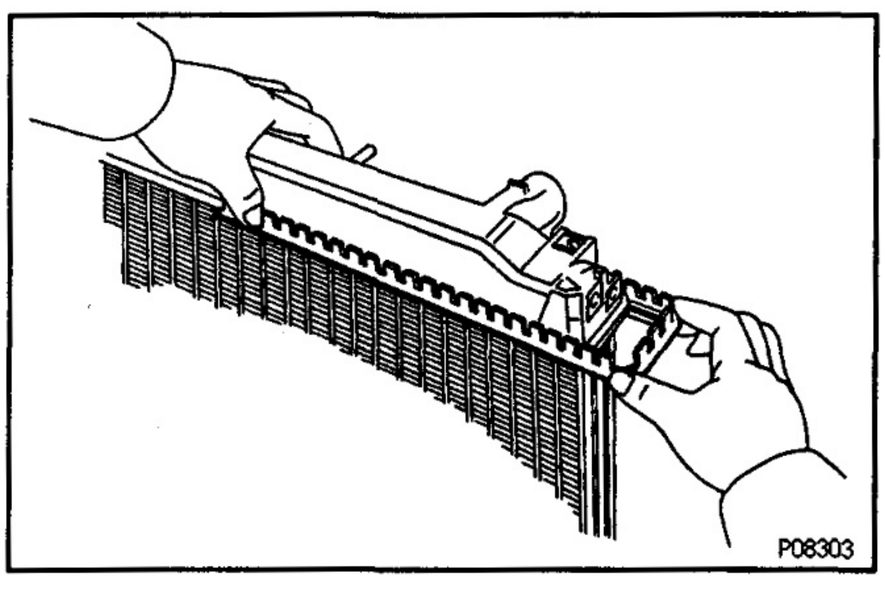
Remove the 8 bolts and 2 supports.



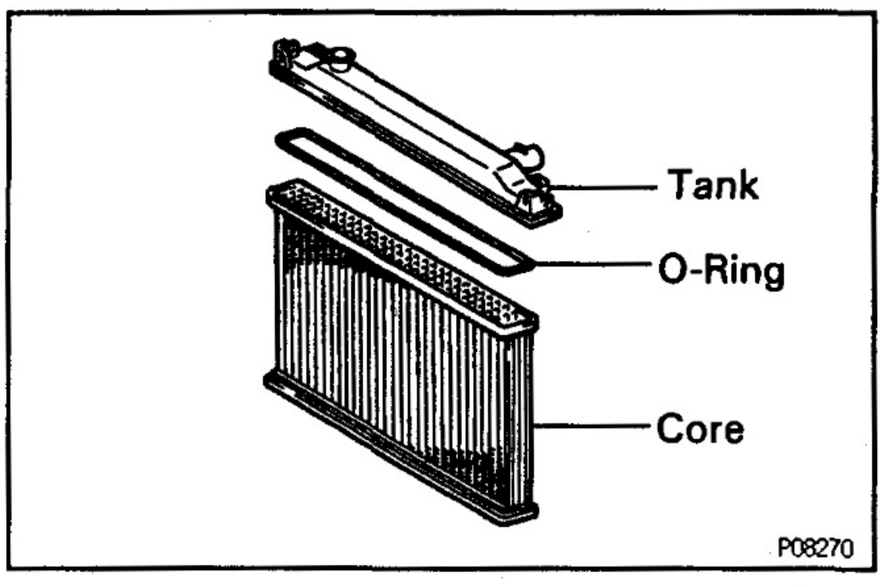
2. REMOVE TANK PLATE

(a) Raise the claws of the tank plates with SST in the numerical order shown in the illustration.
SST 09230—00010

NOTICE: Be careful not to damage the core plate.

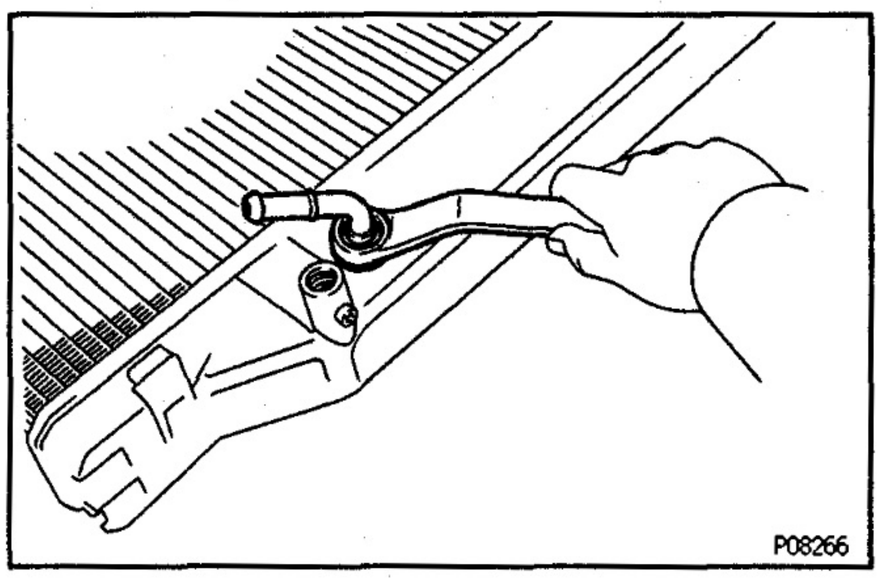


(b) Pull the tank plates outward.



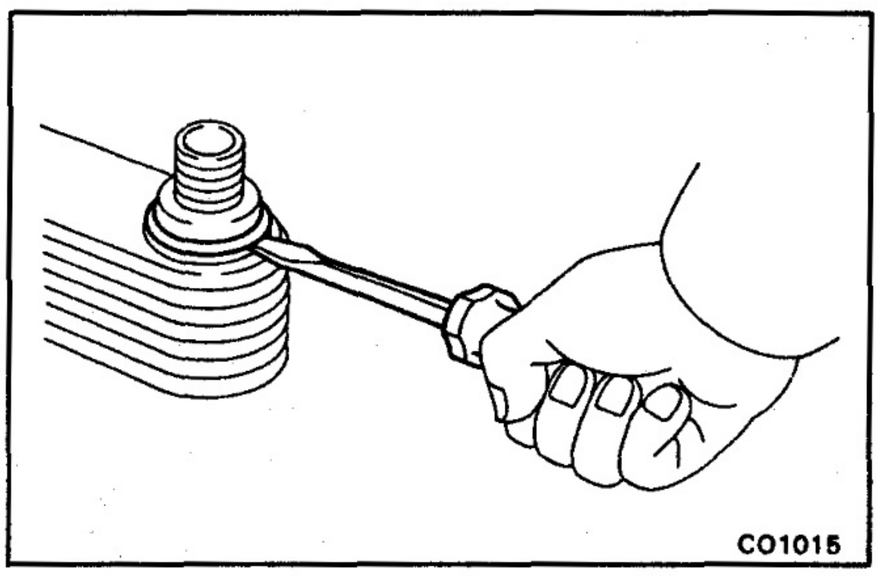
3. REMOVE TANK

(a) Pull the tank upward.
(b) Remove the O—ring.

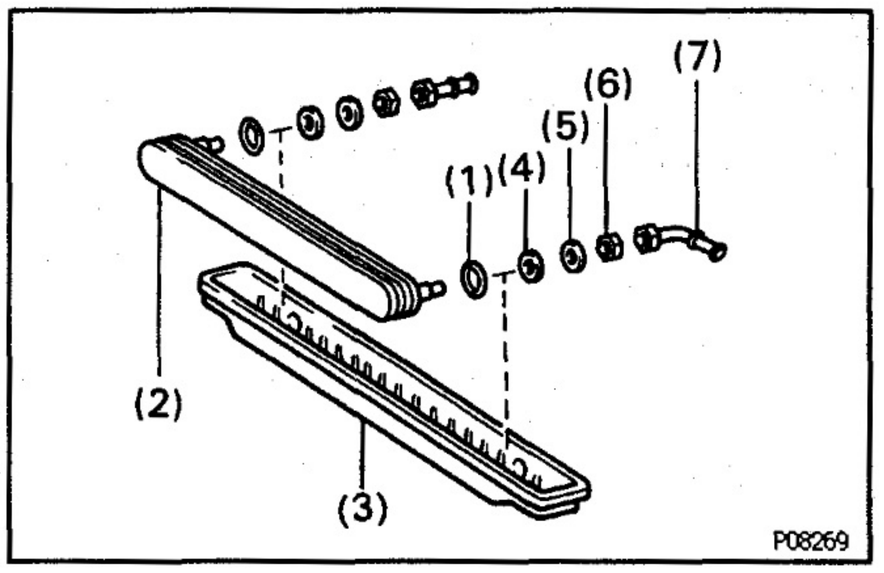


4. **A/T:**
REMOVE OIL COOLER FROM LOWER TANK

(a) Remove the pipes.
HINT: Make a note of the direction the pipes face.



(b) Remove the nuts, spring washers, plate washers and oil cooler.
(c) Remove the O–ring from the oil cooler.

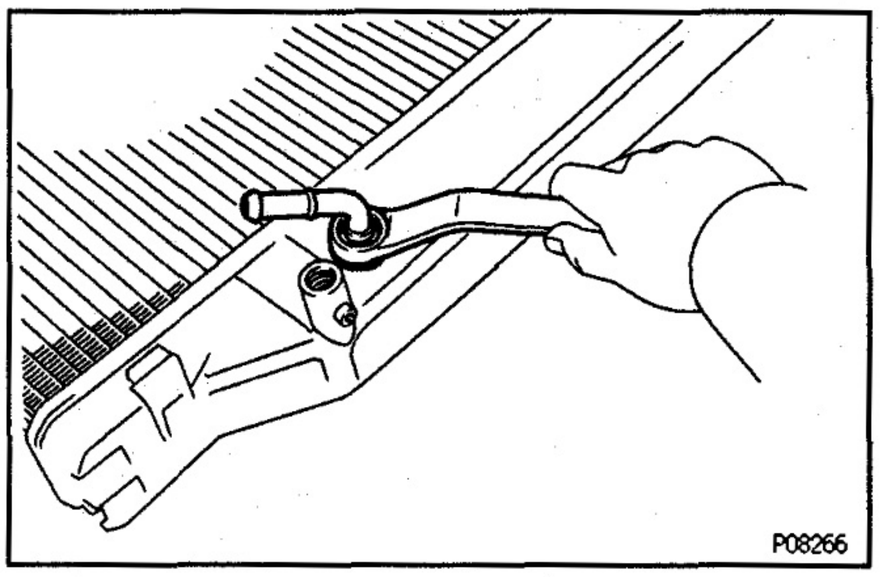


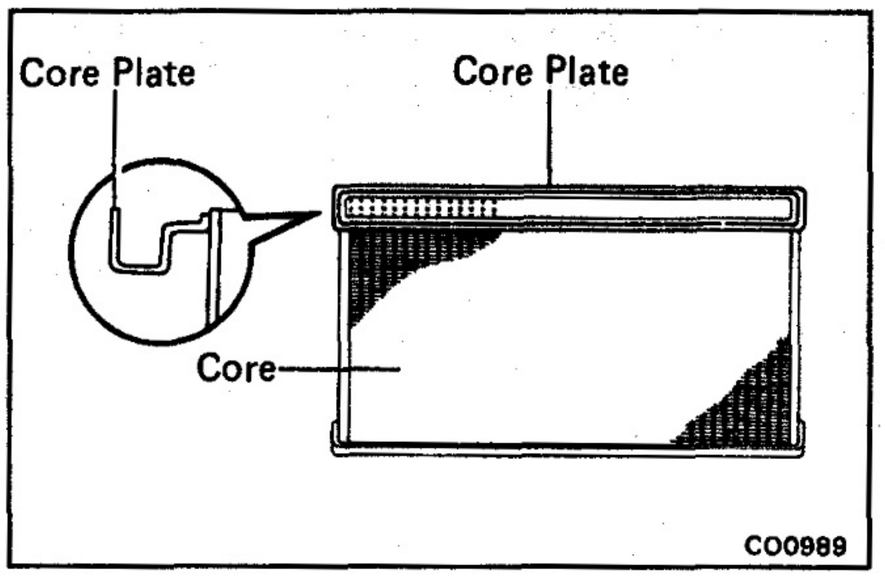
RADIATOR ASSEMBLY

EGSR8–01

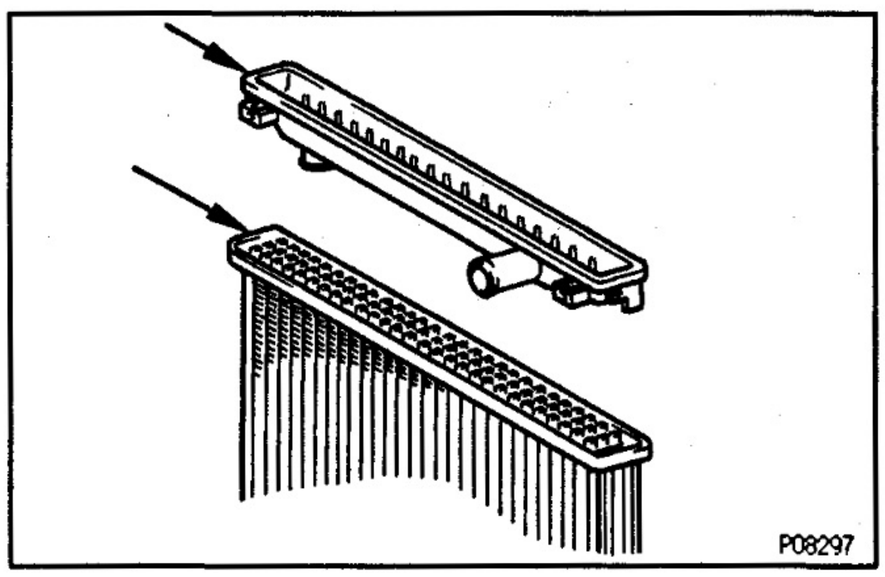
1. **A/T:**
INSTALL OIL COOLER TO LOWER TANK

(a) Clean the O–ring contact surface of the lower tank and oil cooler.
(b) Install new O–rings (1) to the oil cooler (2).
(c) Install the oil cooler (2) to the lower tank (3).
(d) Install the plate washers (4), spring washers (5) and nuts (6). Torque the nuts.
Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)
(e) Install the pipes (7).
Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)
HINT: Face the pipes in the same direction as they were before disassembly.





2. **CHECK CORE PLATE FOR DAMAGE**
HINT:
- If the sides of the core plate groove are deformed, reassembly of the tank will be impossible. Therefore, first correct any deformation with pliers.
- Water leakage will result if the bottom of the core plate groove is damaged or dented. Therefore, repair or replace if necessary.

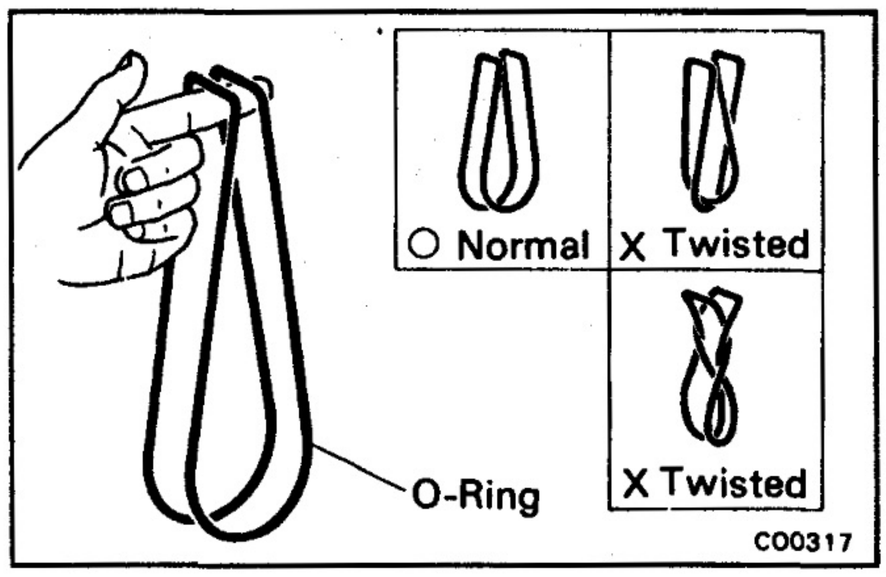


3. INSTALL TANK

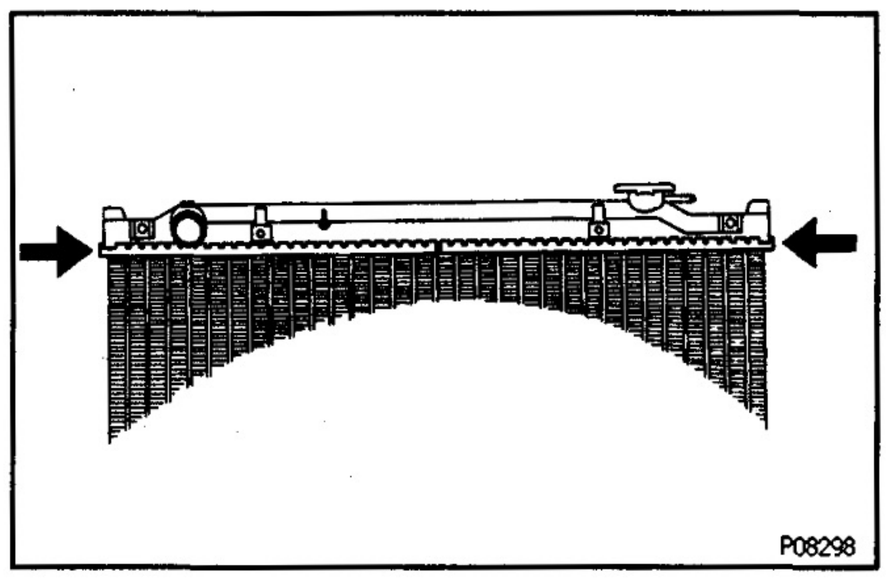
Install a new O–ring and the tank.

HINT:

- Clean the tank and core plate.

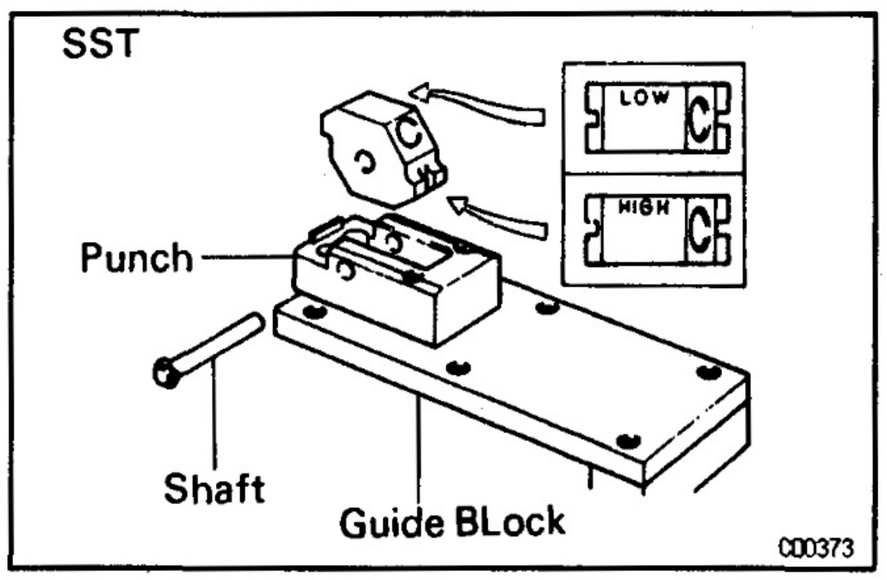


- Take out any twists.



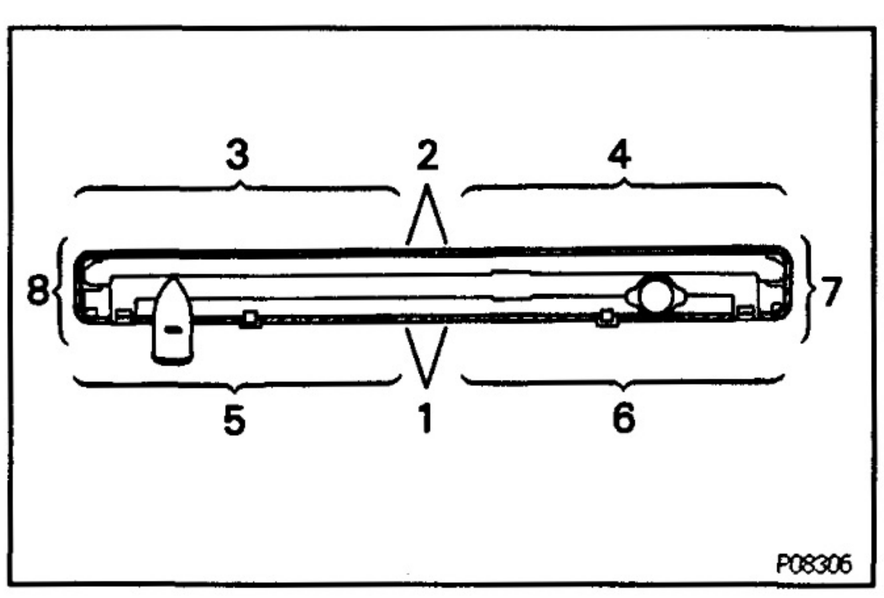
4. INSTALL TANK PLATE

Insert new tank plates from both ends in the direction of the arrows. Firmly set the tank plates in the core plate.

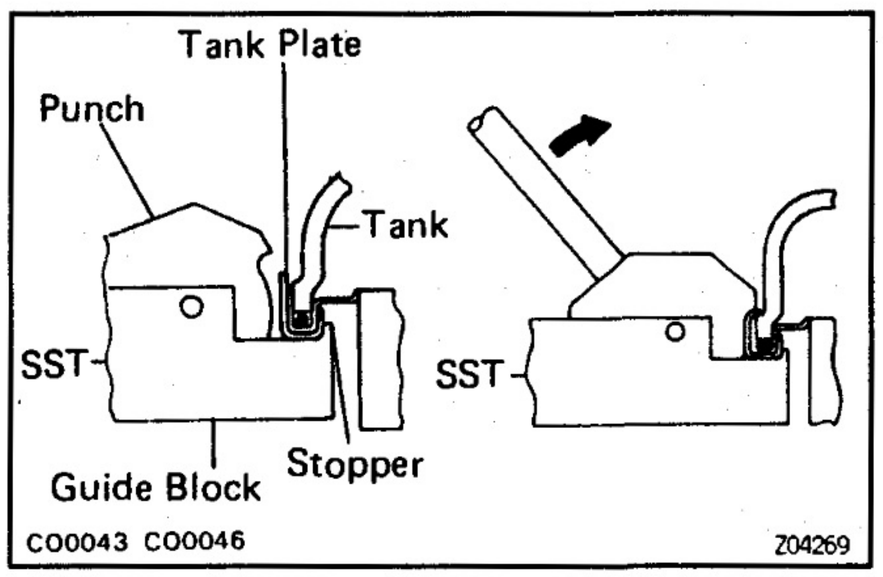


5. STAKE CLAWS OF TANK PLATES

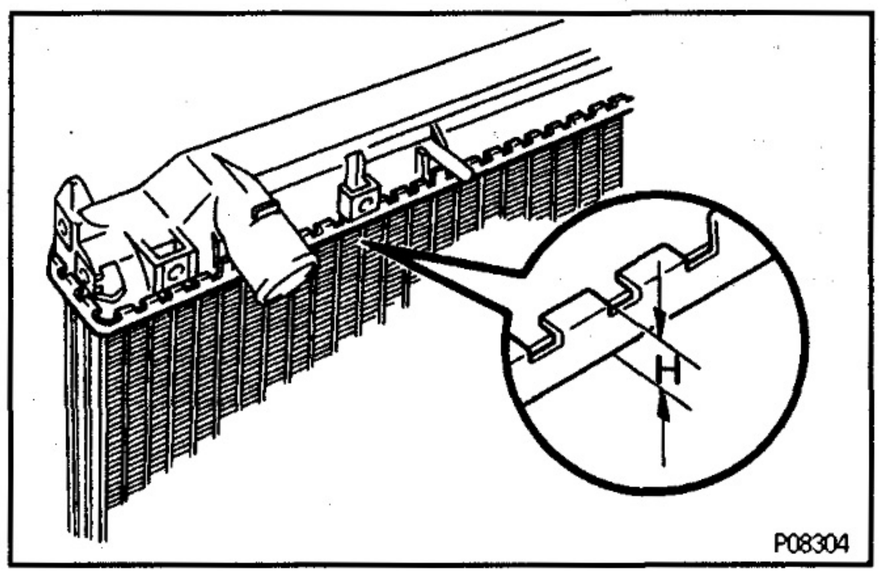
(a) Set the punch of SST to "LOW".
SST 09230–00010



(b) Stake the claws of the tank plates with SST in the numerical order shown in the illustration.



NOTICE: If the bottom of the core plate is staked with the SST on the guide block stopper, it may result in water leakage.

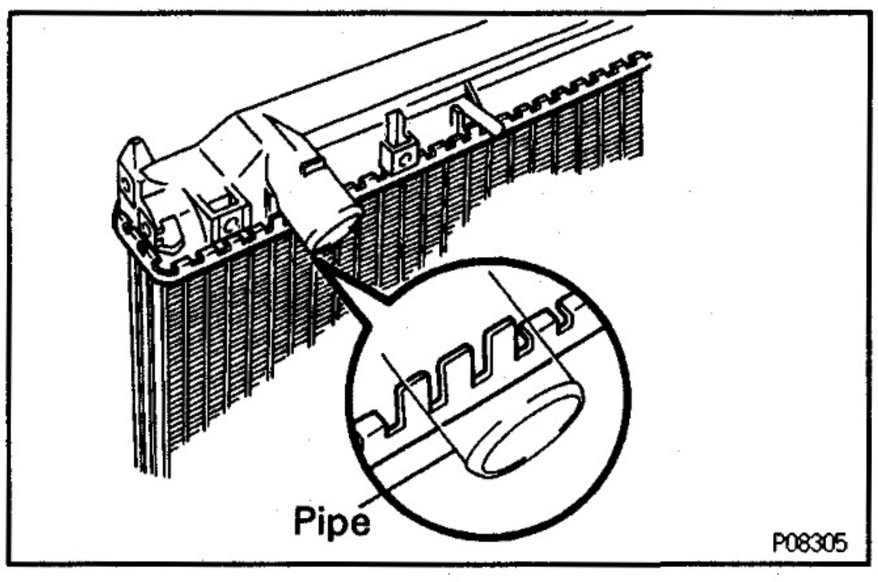


HINT:

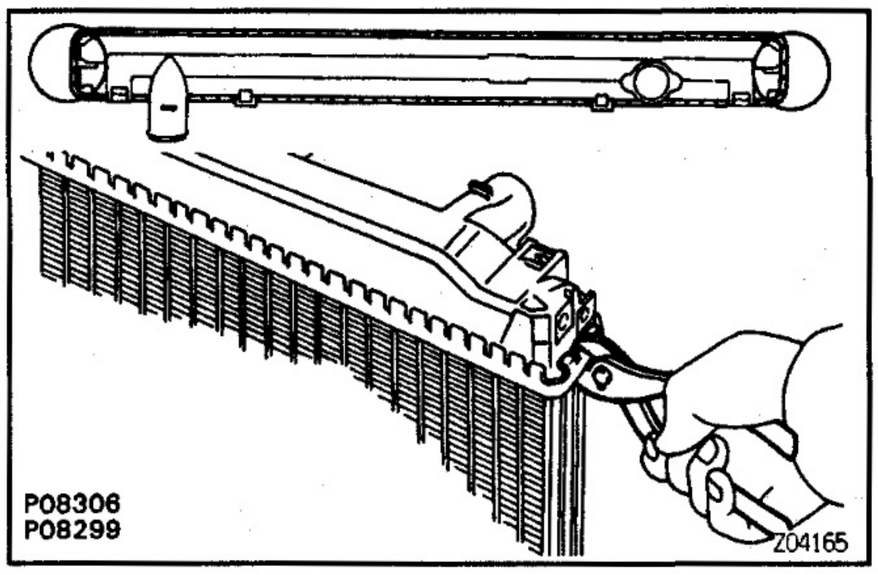
- Stake with just enough pressure to leave a mark on the claw. The staked plate height (H) should be as follows:

Plate height (H):

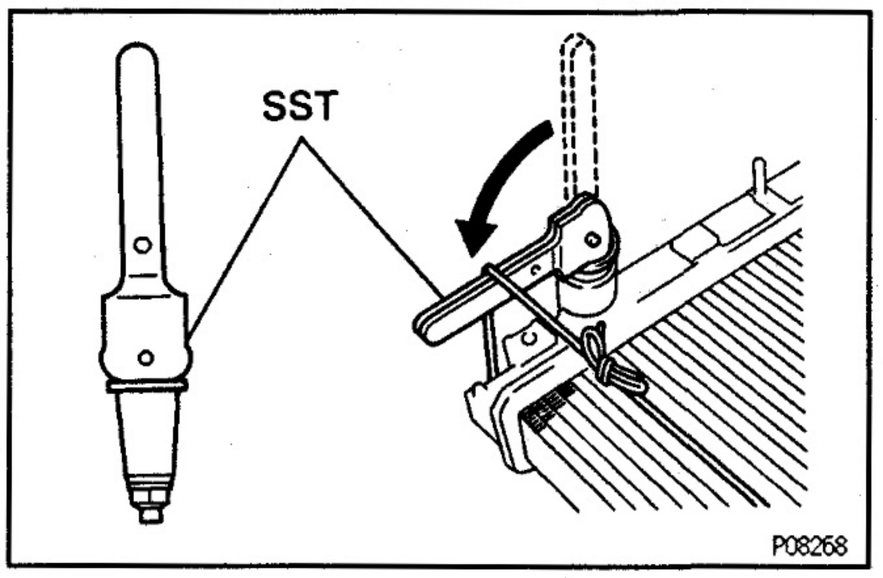
9.2 – 9.6 mm (0.362 – 0.378 in.)



- Do not stake the areas protruding around the pipes.



- The points shown in the illustration cannot be staked with the SST. Use pliers and be careful not to damage the core plates.



6. CHECK FOR WATER LEAKS

(a) Tighten the drain plug.

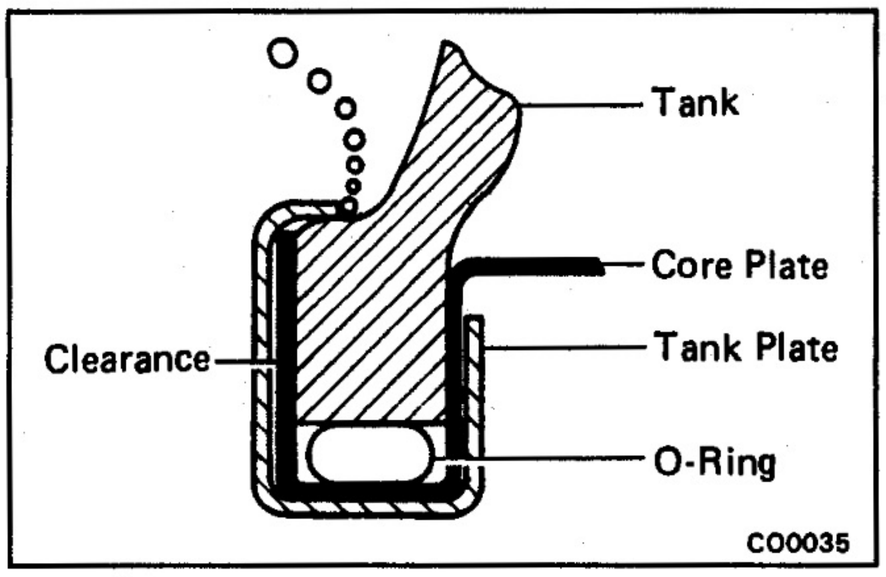
(b) Plug the inlet and outlet pipes of the radiator with SST.

SST 09230–00010, 09230–01010 (09231–00060)

(c) Using a radiator cap tester, apply pressure to the radiator.

Test pressure:

147 kPa (1.5 kgf/cm², 21 psi)



(d) Check for water leaks.
HINT: On radiators with resin tanks, there is a clearance between the core plate and tank plate where a minute amount of air will remain, giving the appearance of an air leak when the radiator is submerged in water. Therefore, before doing the water leak test, first swirl the radiator around in the water until all air bubbles disappear.

7. PAINT TANK PLATE
HINT: If the water leak test checks out okay, allow the radiator to dry completely and then paint the tank plate.

8. INSTALL SUPPORTS
Install the 2 supports with the 8 bolts.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

SERVICE SPECIFICATIONS

SERVICE DATA

EG07L-17

Radiator	Plate height	9.2 — 9.6 mm (0.362 — 0.378 in.)

TORQUE SPECIFICATIONS

EG07M-19

Part tightened	N·m	kgf·cm	ft·lbf
Radiator oil cooler x Radiator lower tank	10	100	7
Radiator oil cooler pipe	15	150	11
Radiator support x Radiator tank	13	130	9

LUBRICATION SYSTEM

PREPARATION

EQUIPMENT

EG07R–0E

Oil pressure gauge	

LUBRICANT

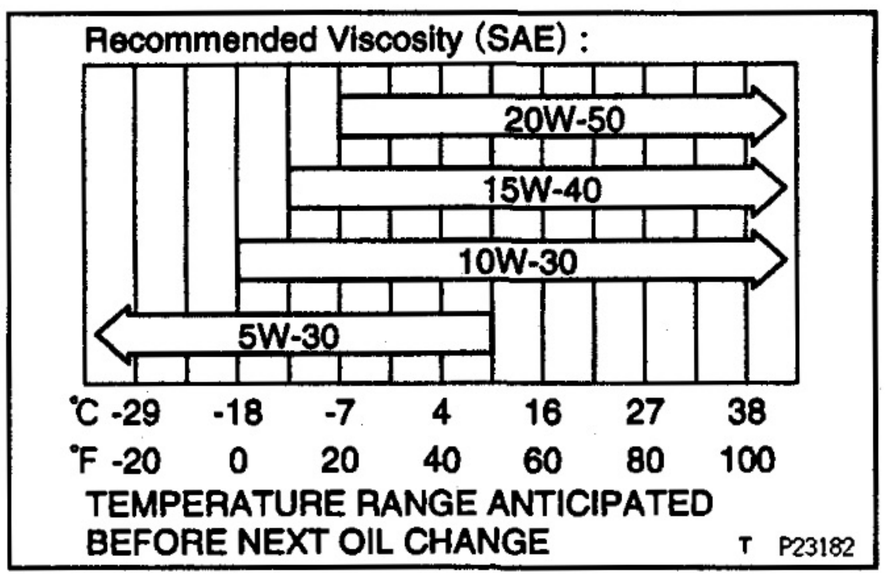
EG07S–0Q

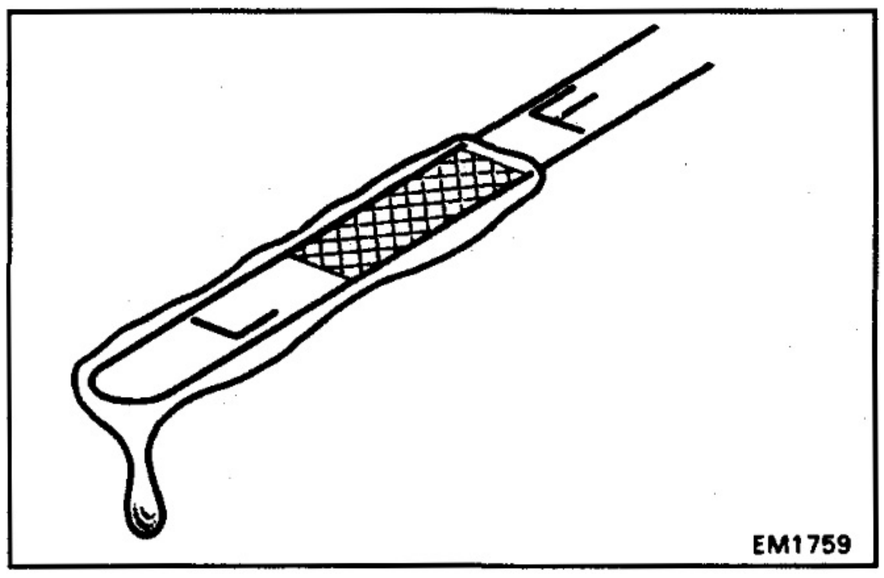
Item	Capacity	Classification
Engine oil		API grade SG, SH or ILSAC multigrade engine oil and recommended viscosity oil
Dry fill	8.0 liters (8.5 US qts, 7.0 Imp. qts)	
Drain and refill		
w/ Oil filter change	7.4 liters (7.8 US qts, 6.5 Imp. qts)	
w/o Oil filter change	6.9 liters (7.3 US qts, 6.1 Imp. qts)	

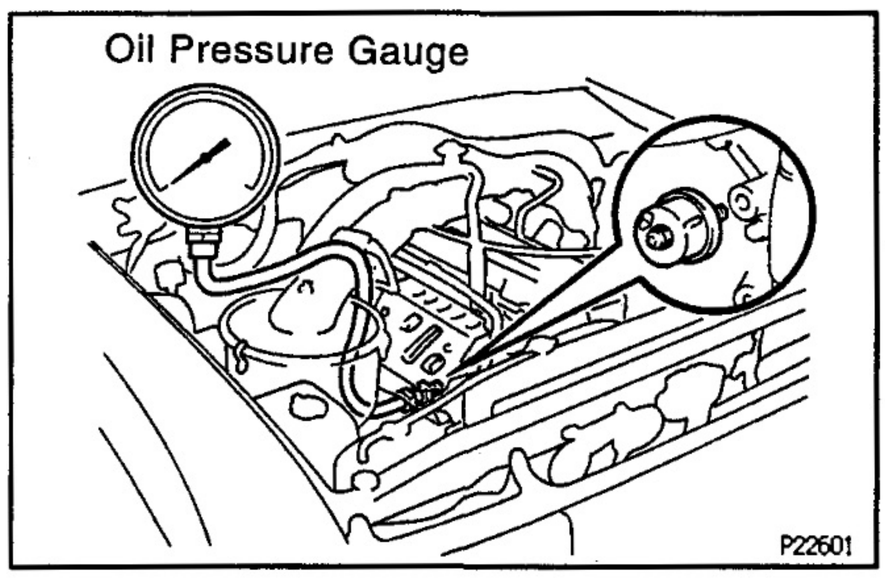
SSM (SPECIAL SERVICE MATERIALS)

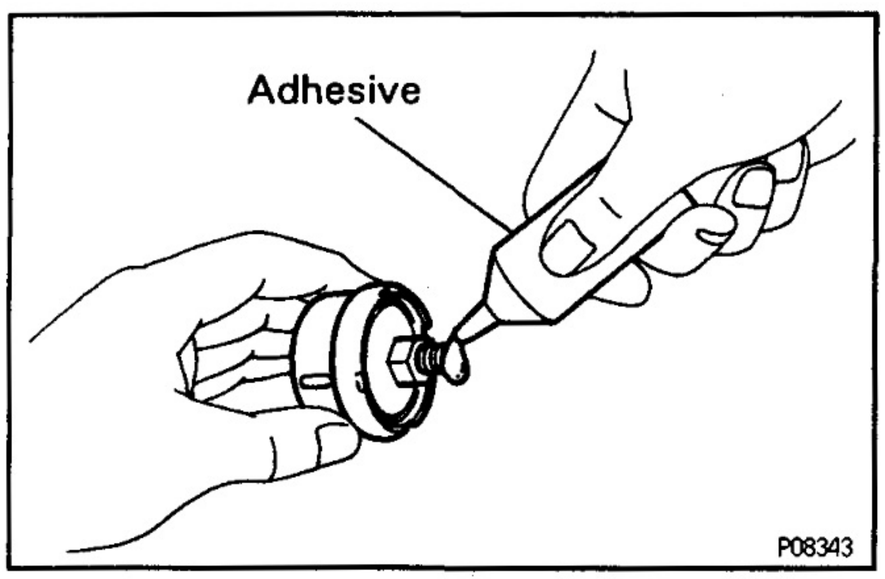
EG07T–0G

08833–00080	Adhesive 1344, THREE BOND 1344, LOCTITE 242 or equivalent	Oil pressure switch









OIL PRESSURE CHECK

EGONM-00

1. CHECK ENGINE OIL QUALITY

Check the oil for deterioration, entry of water, discoloring or thinning.

If the quality is poor, replace the oil.

Oil grade:

API grade SG, SH or ILSAC multigrade engine oil.

Recommended viscosity is as shown in the illustration.

2. CHECK ENGINE OIL LEVEL

The oil level should be between the "L" and "F" marks on the dipstick.

If low, check for leakage and add oil up to "F" mark.

3. REMOVE OIL PRESSURE SWITCH, AND INSTALL OIL PRESSURE GAUGE

4. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

5. CHECK OIL PRESSURE

Oil pressure:

At idle

29 kPa (0.3 kgf/cm², 4.3 psi) or more

At 3,000 rpm

245 — 490 kPa (2.5 — 5.0 kgf/cm², 36 — 71 psi)

6. REMOVE OIL PRESSURE GAUGE AND REINSTALL OIL PRESSURE SWITCH

(a) Remove the oil pressure gauge.

(b) Apply adhesive to two or three threads of the oil pressure switch.

Adhesive:

Part No. 08833—00080, THREE BOND 1344, LOCTITE 242 or equivalent

(c) Reinstall the oil pressure switch.

7. START ENGINE AND CHECK FOR LEAKS

STARTING SYSTEM

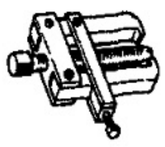
(2.0 kW Type)..... ST– 2
PREPARATION ..... ST– 2
STARTER ..... ST– 3
SERVICE SPECIFICATIONS ..... ST– 11

(2.0 kW Type)

PREPARATION

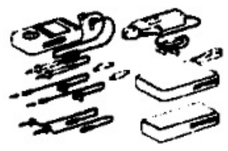
SST (SPECIAL SERVICE TOOLS)

ST00S-0L

	09286-46011	Injection Pump Spline Shaft Puller	Armature bearing
	09820-00030	Alternator Rear Bearing Replacer	Armature rear bearing

RECOMMENDED TOOLS

ST00T-0G

	09082-00050	TOYOTA Electrical Tester Set.	

EQUIPMENT

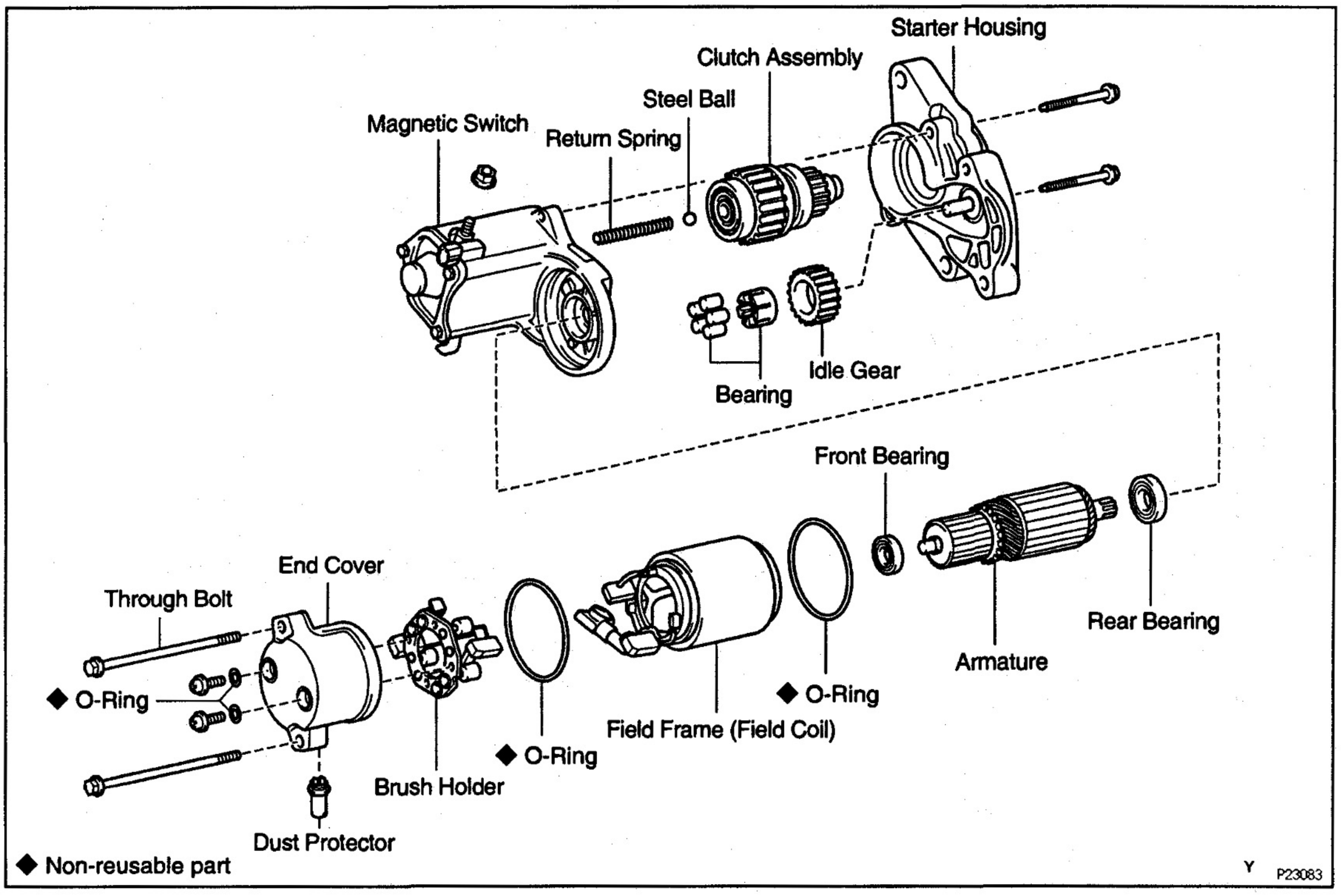
ST02D-0A

Dial indicator	Commutator
Magnetic finger	Steel ball
Pull scale	Brush spring
Sandpaper	Commutator
Torque wrench	
V-block	Commutator
Vernier calipers	Commutator, Brush

STARTER

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY

ST00W-15

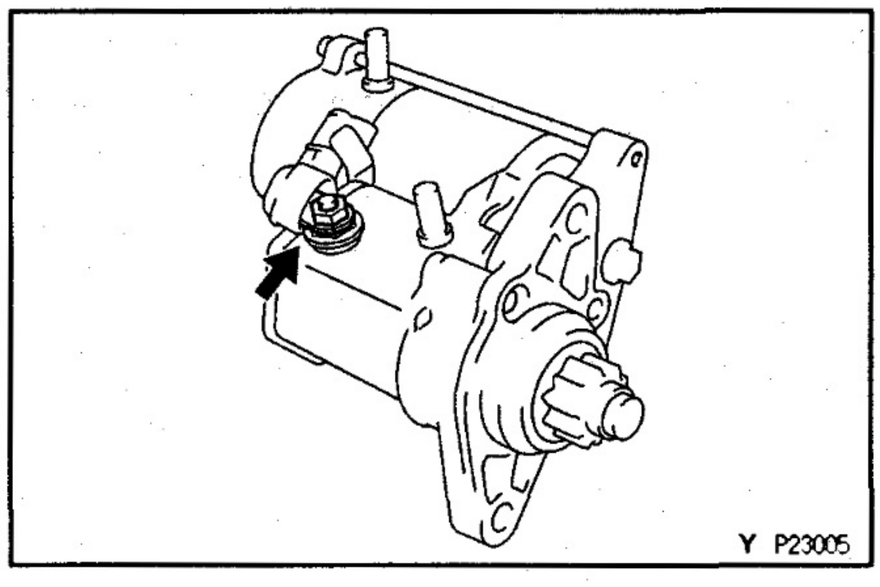


ST06W-02

STARTER DISASSEMBLY

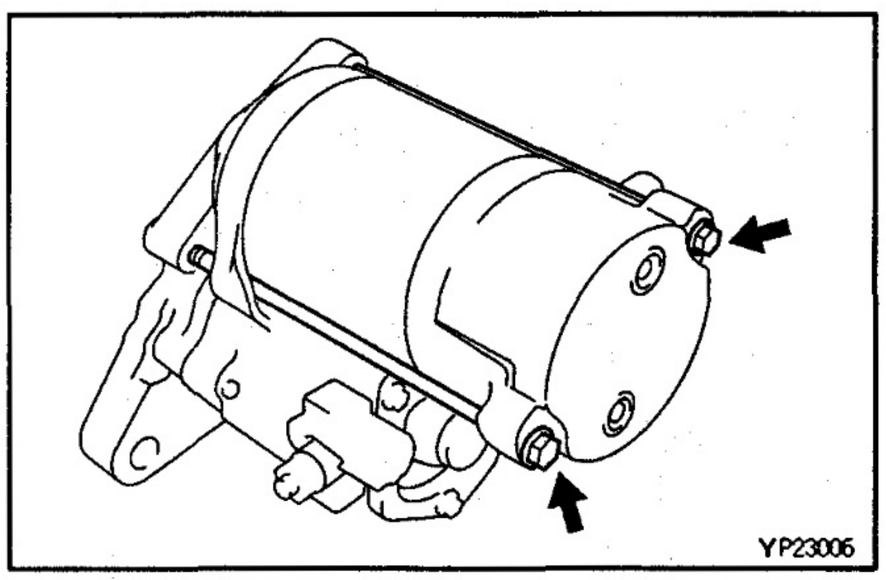
Assembly is in the reverse order of disassembly.

ASSEMBLY HINT: Use high—temperature grease to lubricate the bearings, gears, return spring and steel ball when assembling the starter.



1. REMOVE FIELD FRAME AND ARMATURE

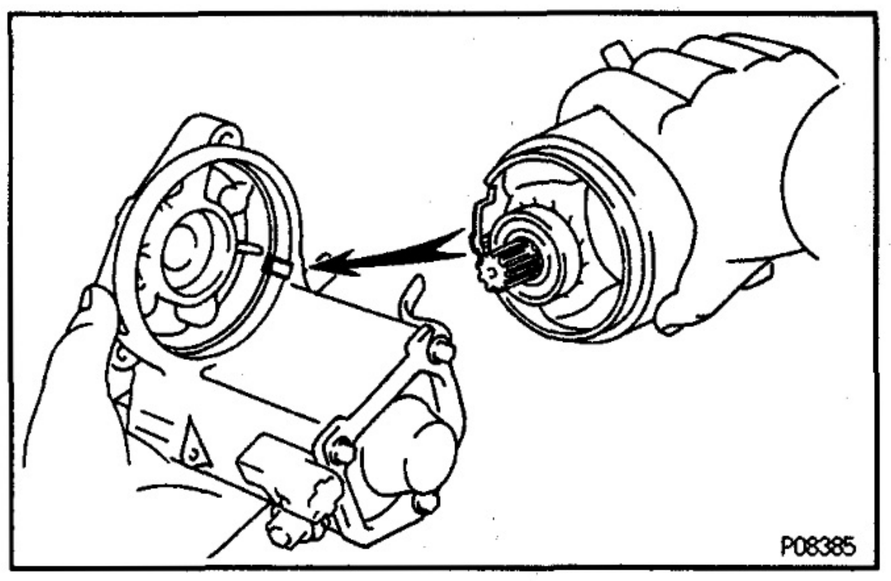
(a) Remove the nut, and disconnect the lead wire from the magnetic switch terminal.
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)



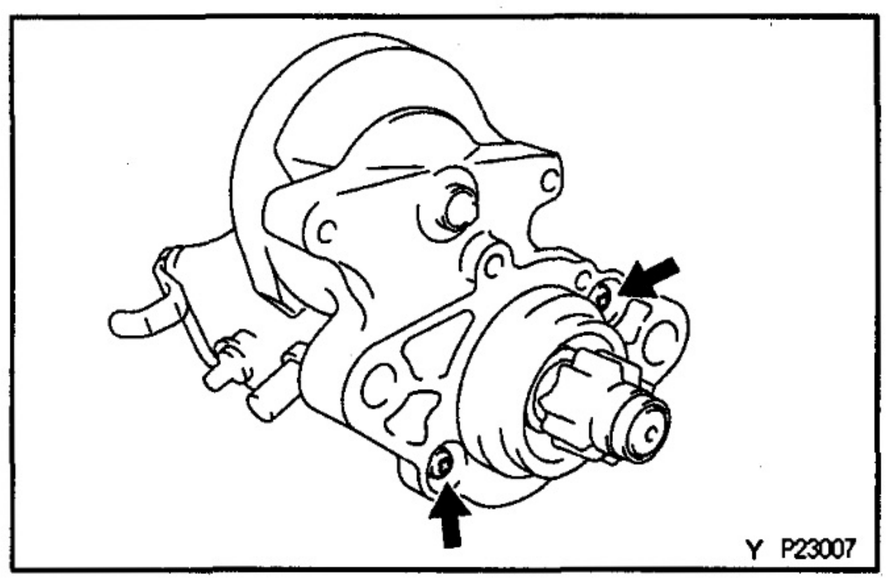
(b) Remove the 2 through bolts.
Torque: 9.3 N·m (95 kgf·cm, 82 in.·lbf)

(c) Pull out the field frame with the armature from the magnetic switch assembly.

(d) Remove the O—ring.
ASSEMBLY HINT: Use a new O—ring.

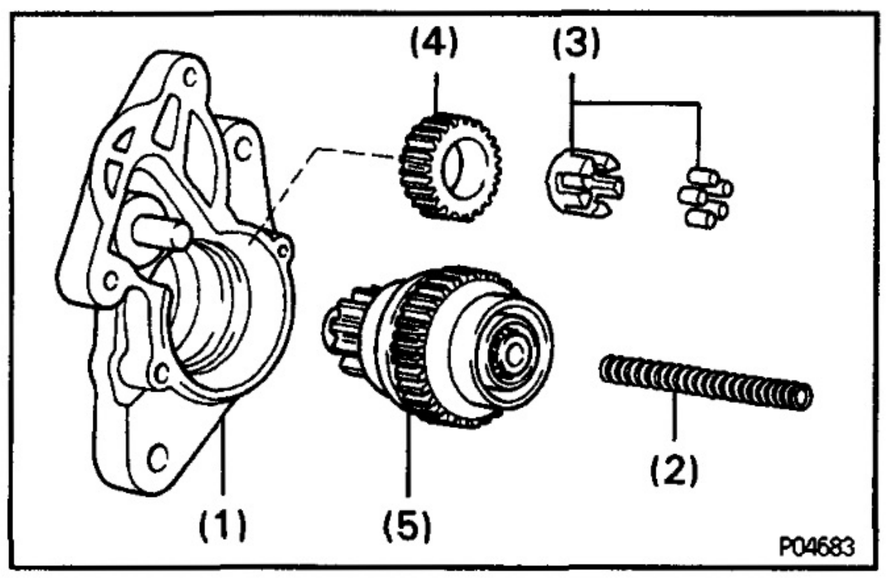


ASSEMBLY HINT: Align the protrusion of the field frame with cutout of the magnetic switch.

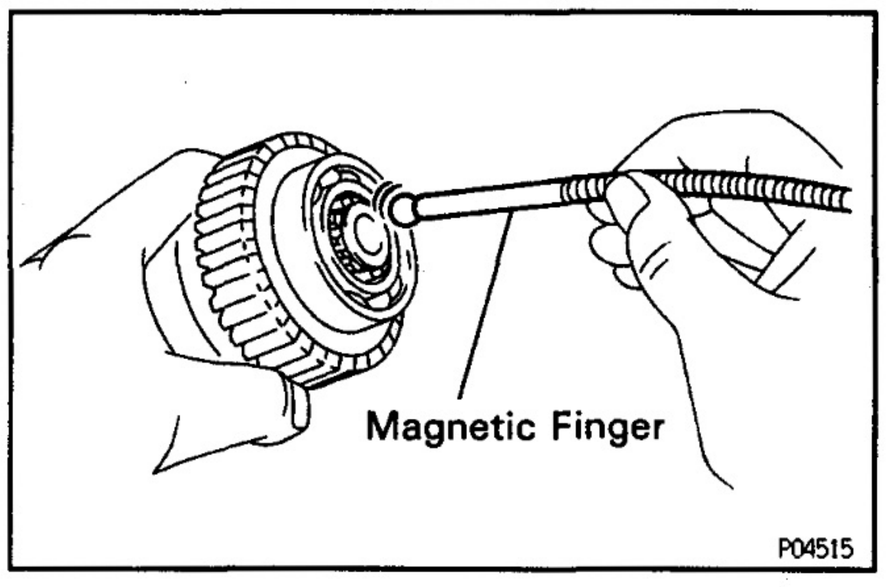


2. REMOVE STARTER HOUSING, CLUTCH ASSEMBLY AND GEAR

(a) Remove the 2 screws.
Torque: 9..3 N·m (95 kgf·cm, 82 in.·lbf)

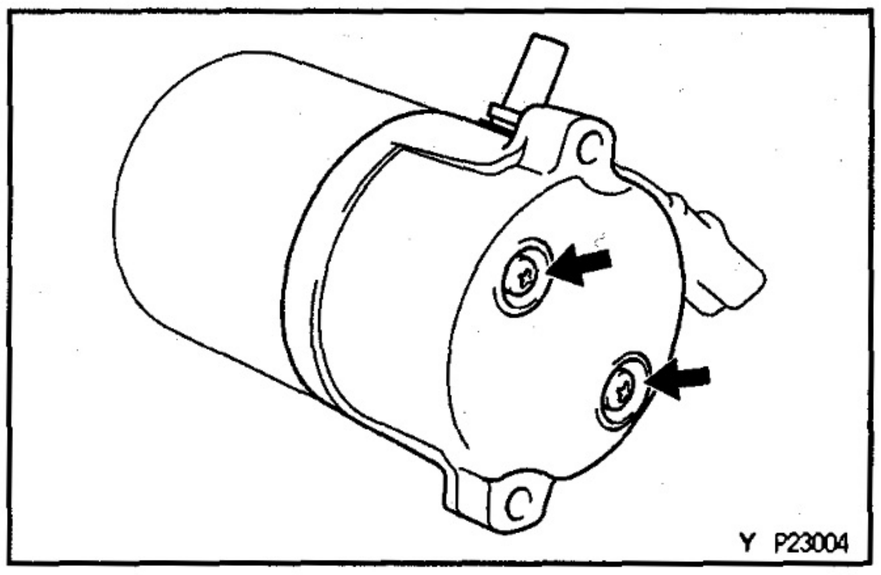


(b) Remove these parts from the magnetic switch assembly:
(1) Starter housing
(2) Return spring
(3) Bearing
(4) Idler gear
(5) Starter clutch assembly



3. REMOVE STEEL BALL

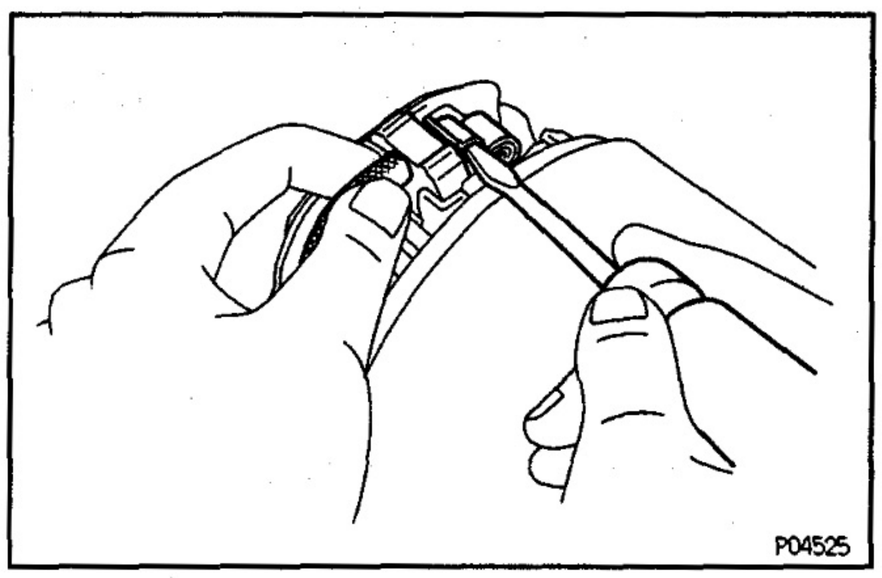
Using a magnetic finger, remove the steel ball from the clutch shaft hole.



4. REMOVE BRUSH HOLDER

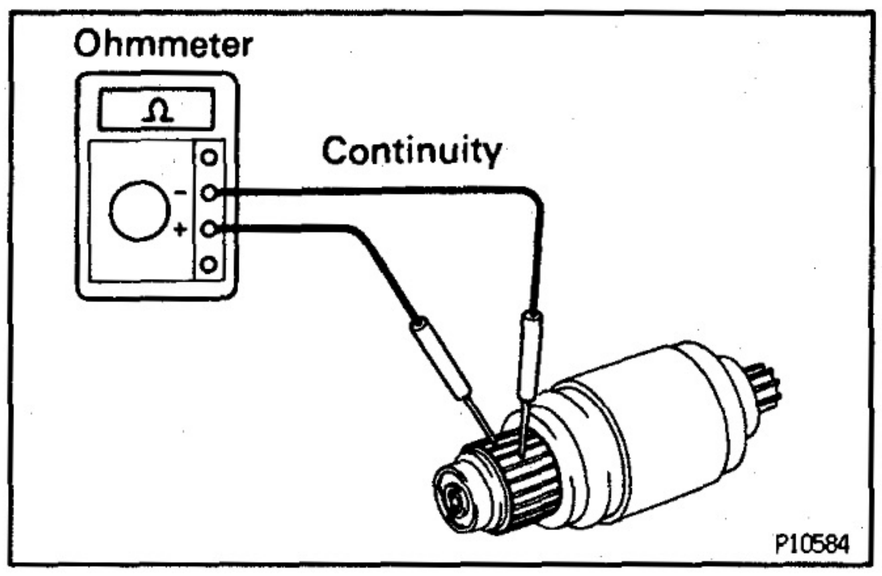
(a) Remove the 2 screws, 2 O–rings and end cover from the field frame.
Torque: 3.8 N·m (40 kgf·cm, 35 in.·lbf)
ASSEMBLY HINT: Use new O–rings.

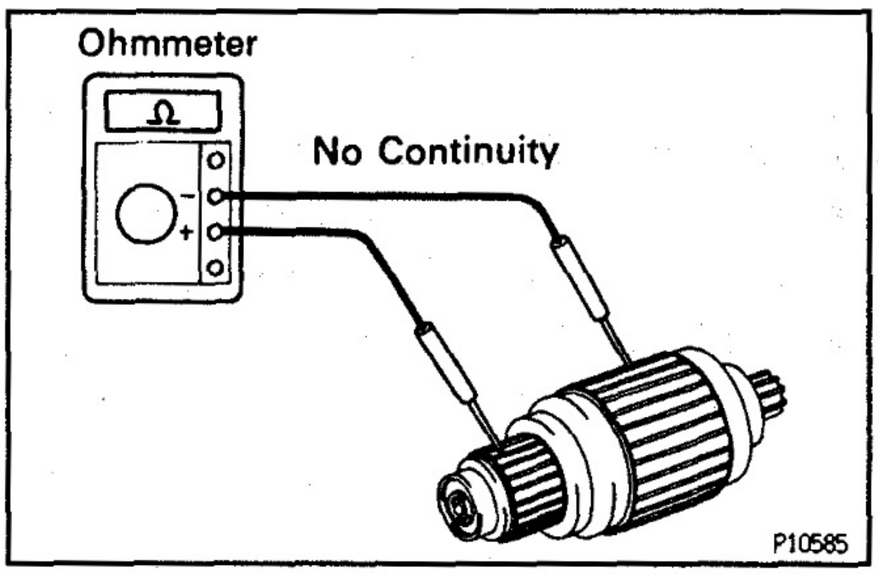
(b) Remove the O–ring from the field frame.
ASSEMBLY HINT: Use a new O–ring.



(c) Using a screwdriver, hold the spring back and disconnect the brush from the brush holder. Disconnect the four brushes and remove the brush holder.

5. REMOVE ARMATURE FROM FIELD FRAME





STARTER INSPECTION AND REPAIR

ST09X–02

Armature Coil

1. INSPECT COMMUTATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the segments of the commutator.
If there is no continuity between any segment, replace the armature.

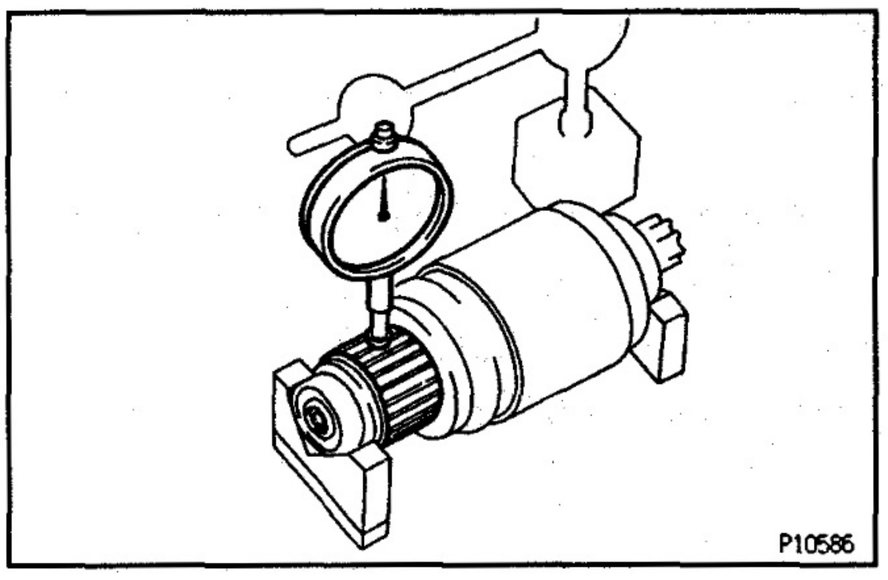
2. INSPECT COMMUTATOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.
If there is continuity, replace the armature.

Commutator

1. INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACES

If the surface is dirty or burnt, correct it with sandpaper (No. 400) or on a lathe.



2. INSPECT COMMUTATOR CIRCLE RUNOUT

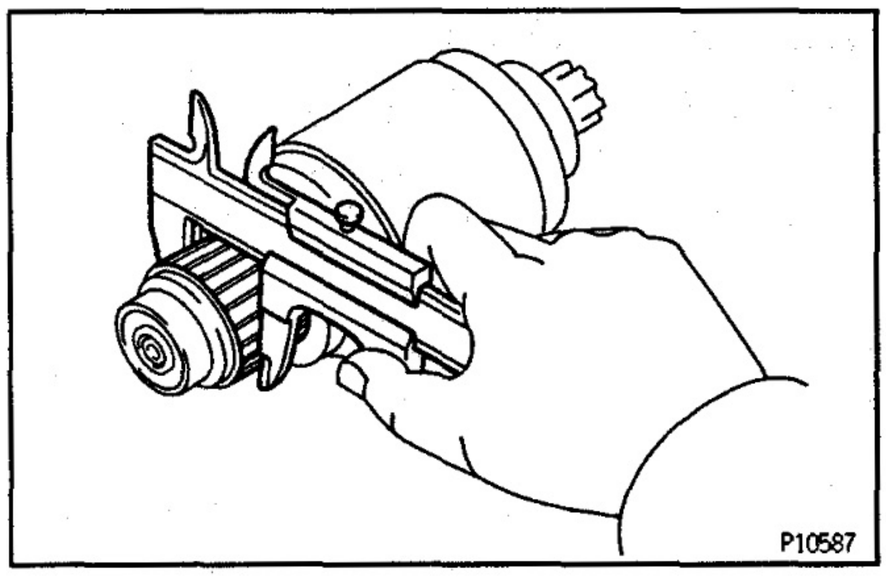
(a) Place the commutator on V—blocks.

(b) Using a dial gauge, measure the circle runout.

Maximum circle runout:

0.05 mm (0.0020 in.)

If the circle runout is greater than maximum, correct it on a lathe.



3. INSPECT COMMUTATOR DIAMETER

Using a vernier caliper, measure the commutator diameter.

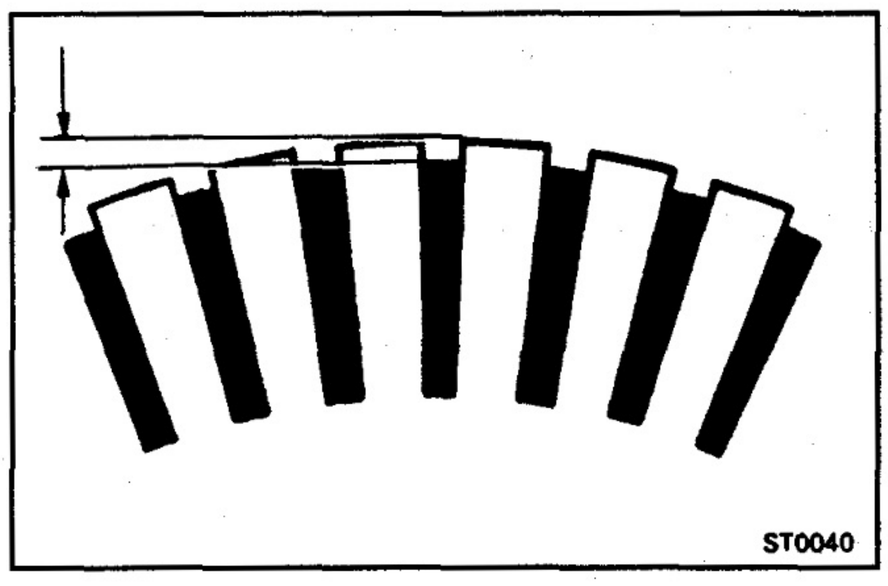
Standard diameter:

35 mm (1.38 in.)

Minimum diameter:

34 mm (1.34 in.)

If the diameter is less than minimum, replace the armature.



4. INSPECT UNDERCUT DEPTH

Check that the undercut depth is clean and free of foreign materials. Smooth out the edge.

Standard undercut depth:

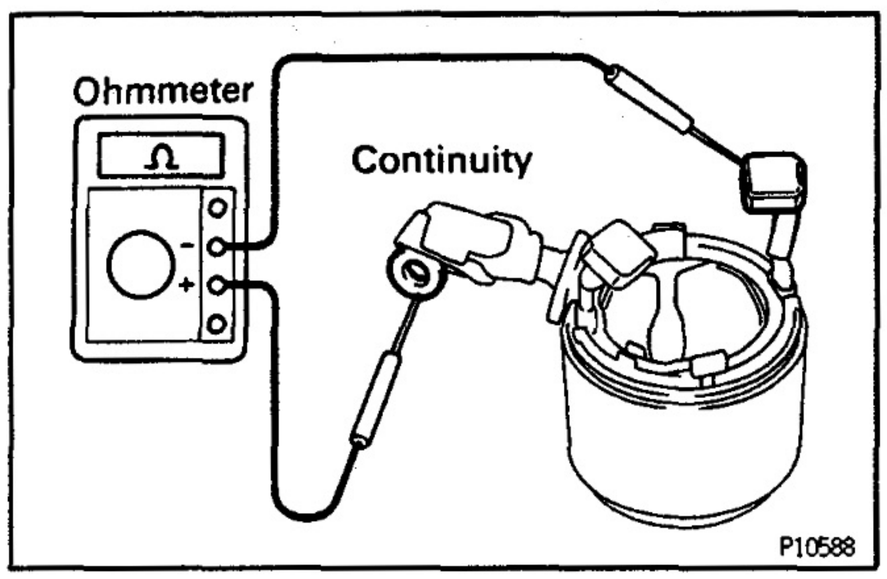
0.7 mm (0.028 in.)

Minimum undercut depth:

0.2 mm (0.008 in.)

If the undercut depth is less than minimum, correct it with a hacksaw blade.

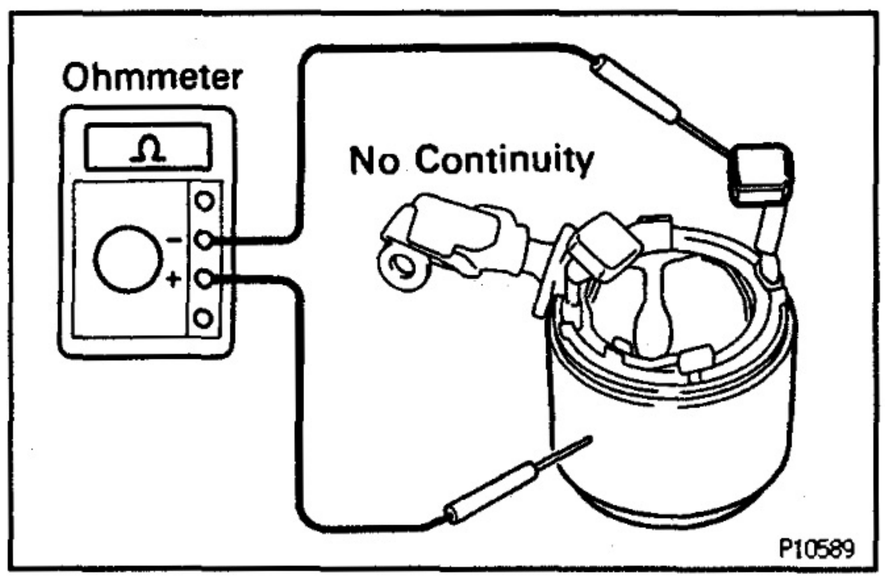
Field Frame (Field Coil)



1. INSPECT FIELD COIL FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the lead wire and field coil brush lead.

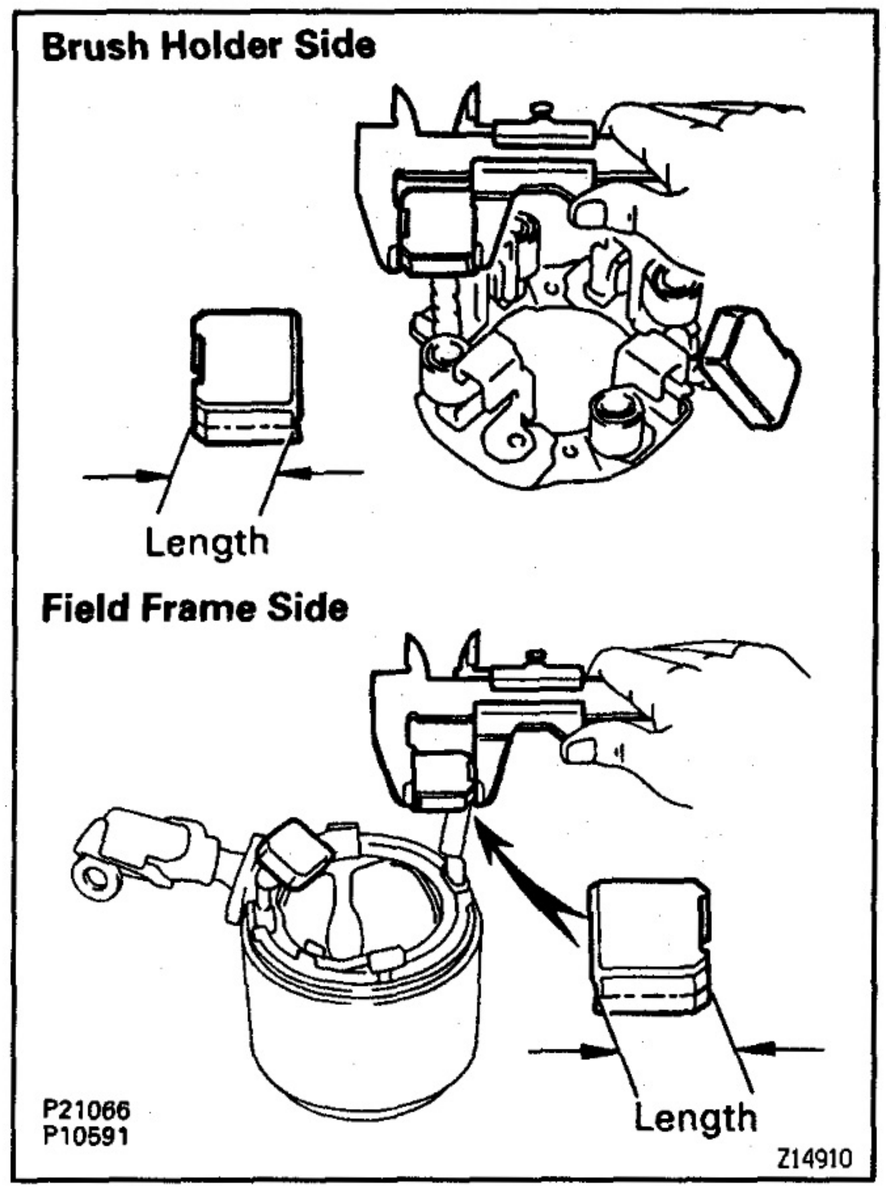
If there is no continuity, replace the field frame.



2. INSPECT FIELD COIL FOR GROUND

Using an ohmmeter, check that there is no continuity between the field coil end and field frame.

If there is continuity, repair or replace the field frame.



Brushes

INSPECT BRUSH LENGTH

Using a vernier caliper, measure the brush length.

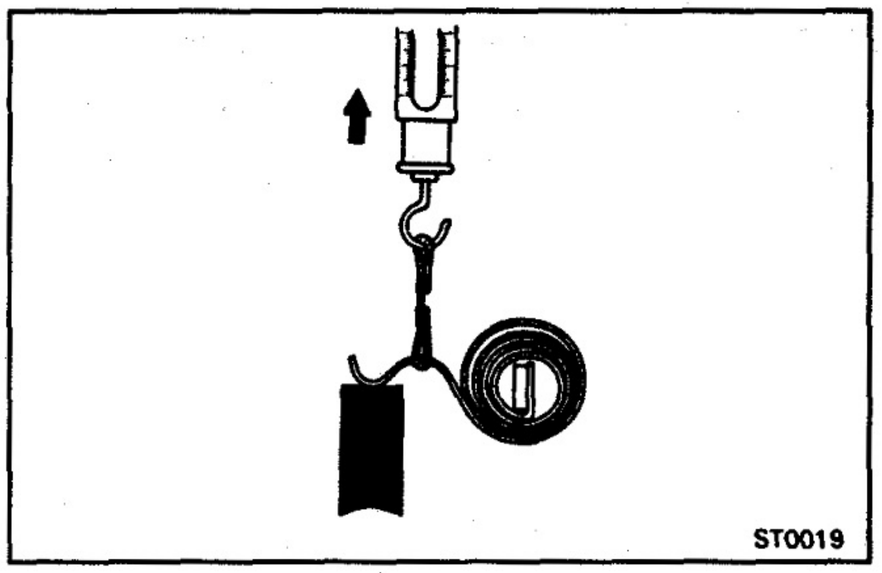
Standard length:

15.0 mm (0.591 in.)

Minimum length:

9.0 mm (0.354 in.)

If the length is less than minimum, replace the brush holder and field frame.



Brush Springs

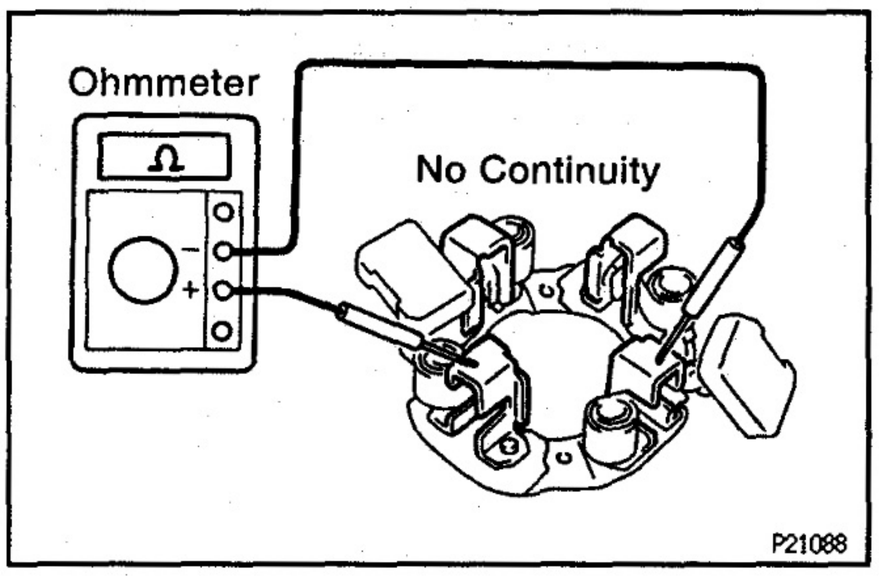
INSPECT BRUSH SPRING LOAD

Take the pull scale reading the instant the brush spring separates from the brush.

Spring installed load:

12.7 — 24.5 N (1.30 — 2.50 kgf, 2.7 — 5.3 lbf)

If the installed load is not within specification, replace the brush springs.



Brush Holder

INSPECT BRUSH HOLDER INSULATION

Using an ohmmeter, check that there is no continuity between the positive (+) and negative (—) brush holders.

If there is continuity, repair or replace the brush holder.

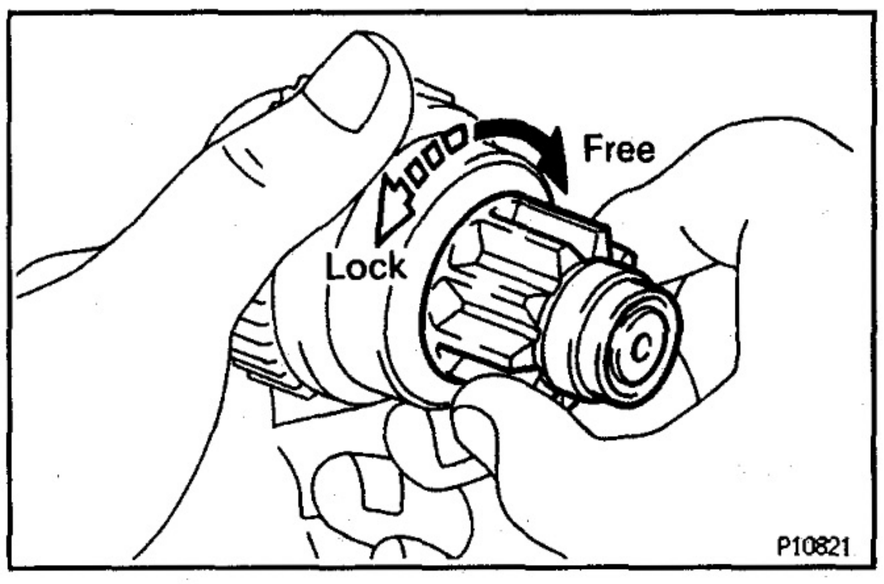
Clutch and Gears

1. **INSPECT GEAR TEETH**

   Check the gear teeth on the pinion gear, idle gear and clutch assembly for wear or damage.

   If damaged, replace the gear or clutch assembly.

   If damaged, also check the drive plate ring gear for wear or damage.



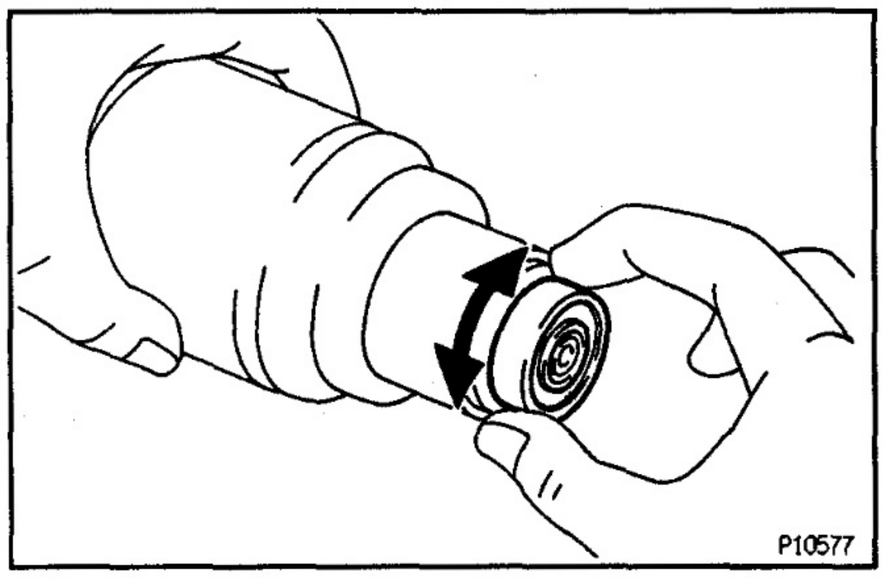
2. INSPECT CLUTCH PINION GEAR

Hold the starter clutch and rotate the pinion gear clockwise, and check that it turns freely. Try to rotate the pinion gear counterclockwise and check that it locks.

If necessary, replace the clutch assembly.

ST

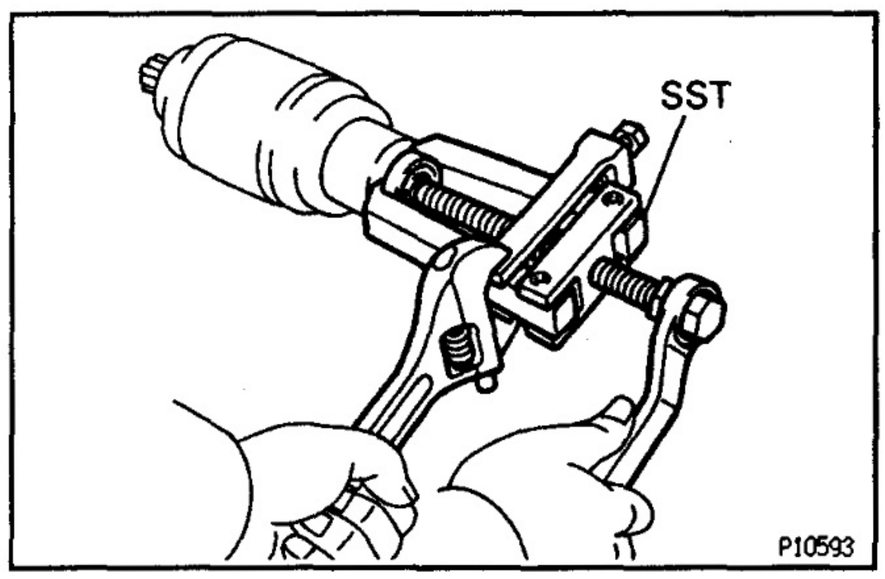
Bearings



1. INSPECT FRONT BEARING

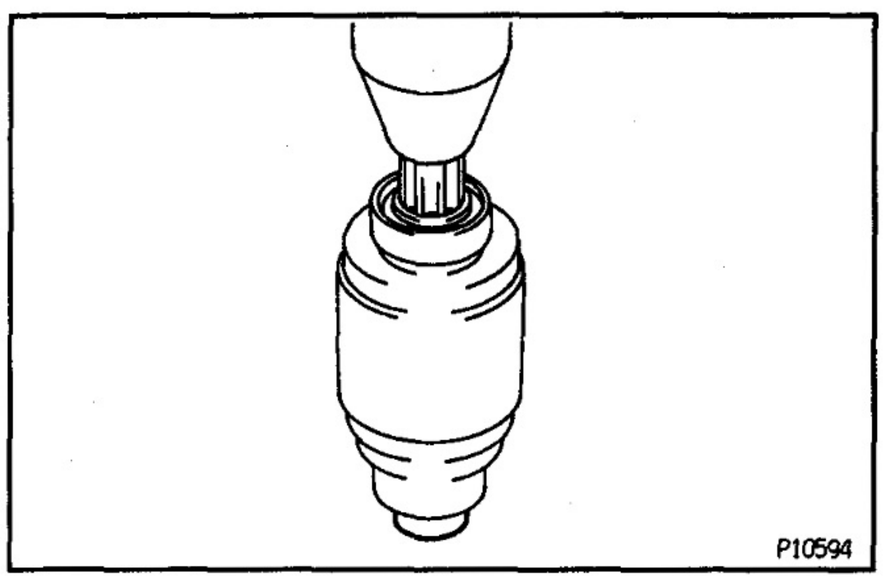
Turn each bearing by hand while applying inward force.

If resistance is felt or the bearing sticks, replace the bearing.

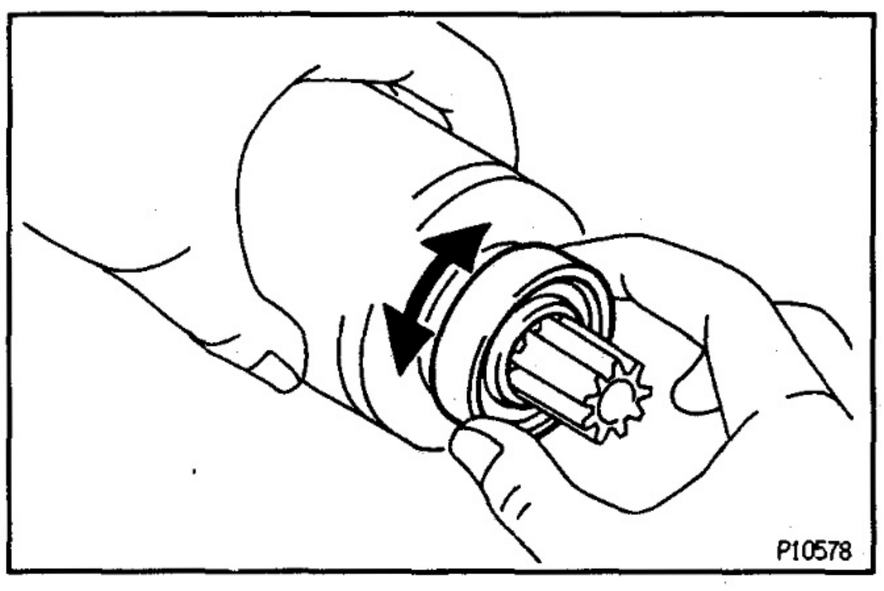


2. IF NECESSARY, REPLACE FRONT BEARING

(a) Using SST, remove the bearing.
SST 09286—46011



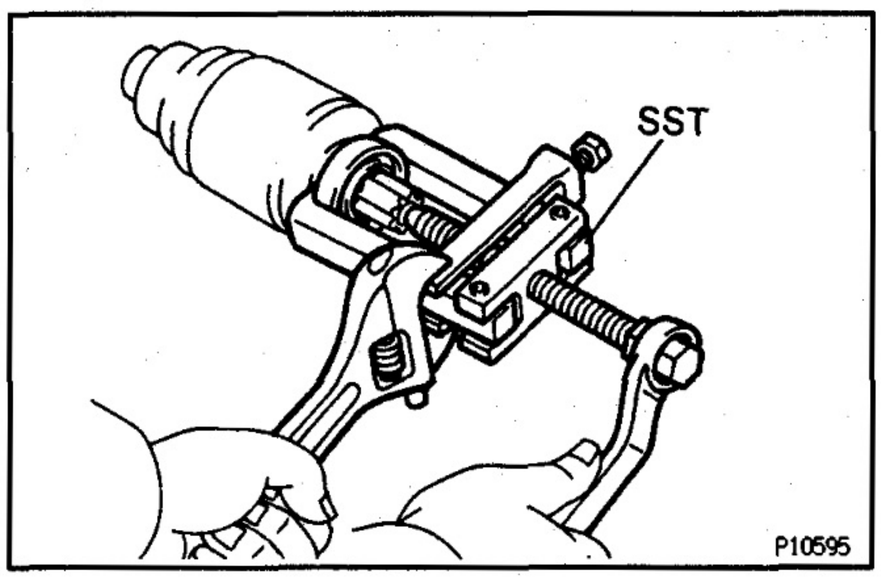
(b) Using a press, press in a new front bearing.



3. INSPECT REAR BEARING

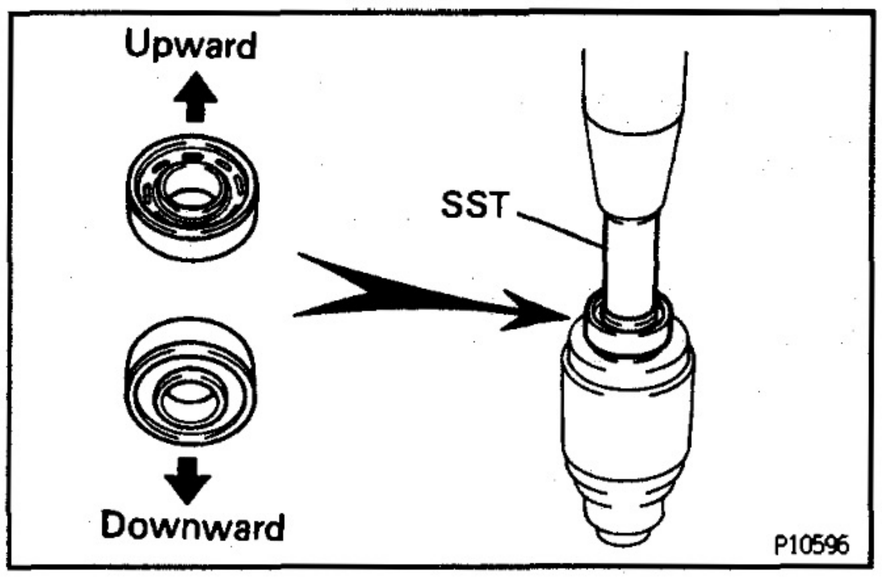
Turn each bearing by hand while applying inward force.

If resistance is felt or the bearing sticks, replace the bearing.

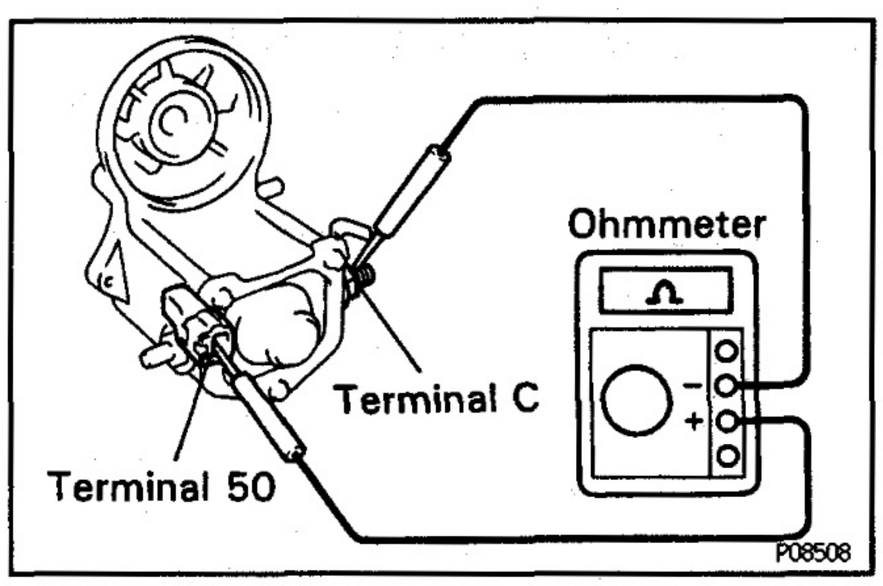


4. IF NECESSARY, REPLACE REAR BEARING

(a) Using SST, remove the bearing.
SST 09286–46011



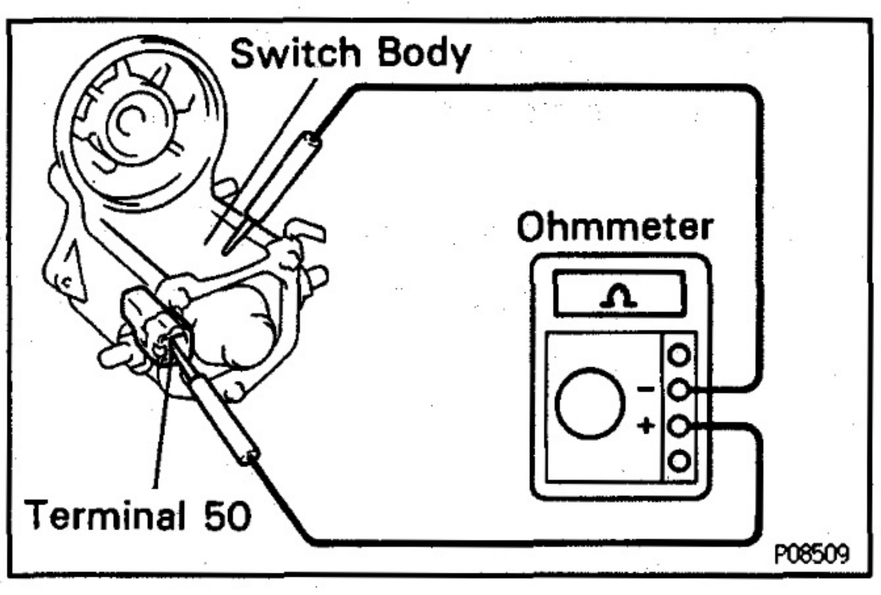
(b) Using a press, press in a new rear bearing.
NOTICE: Be careful of the bearing installation direction.
SST 09820–00030



Magnetic Switch

1. PERFORM PULL–IN COIL OPEN CIRCUIT TEST

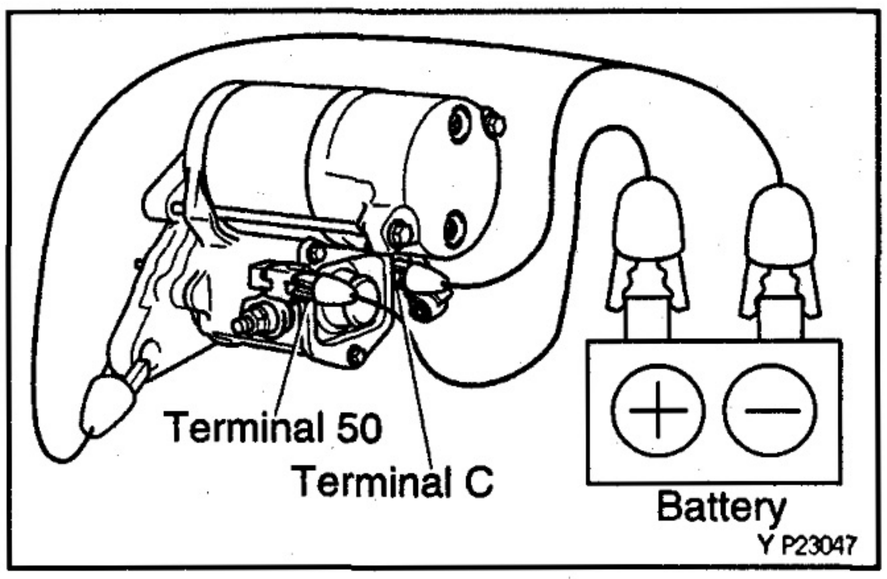
Using an ohmmeter, check that there is continuity between terminals 50 and C.
If there is no continuity, replace the magnetic switch.



2. PERFORM HOLD–IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.
If there is no continuity, replace the magnetic switch.

ST



STARTER PERFORMANCE TEST

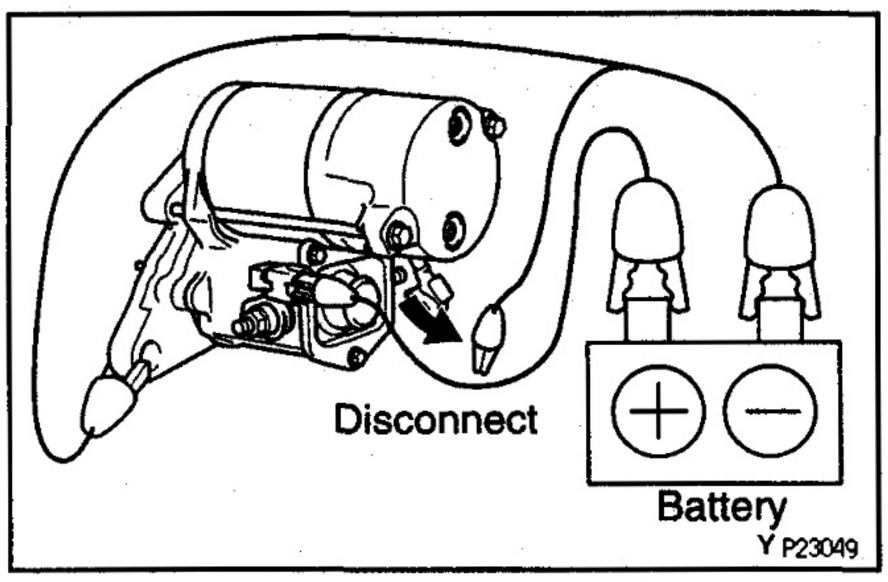
ST010-0W

NOTICE: These tests must be performed within 3 to 5 seconds to avoid burning out the coil.

1. PERFORM PULL—IN TEST

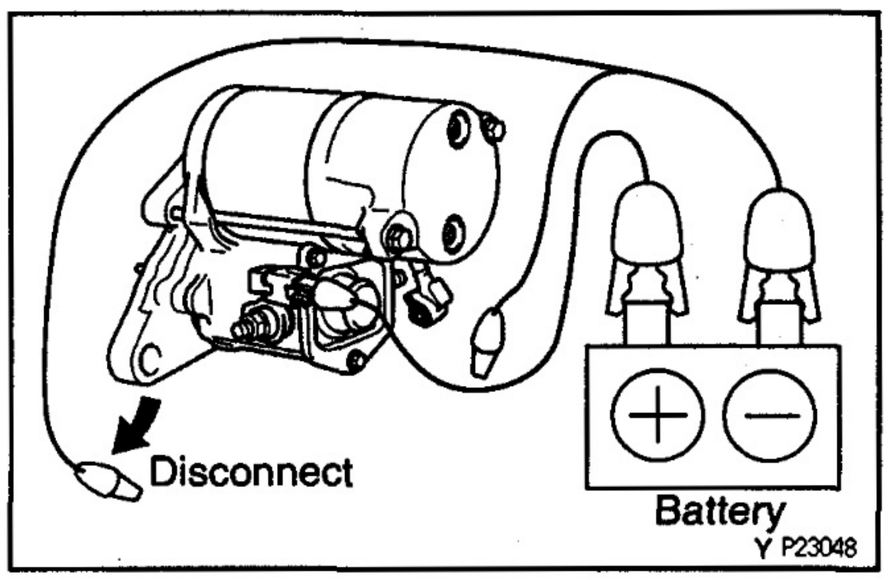
(a) Disconnect the field coil lead wire from terminal C.

(b) 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 assembly.



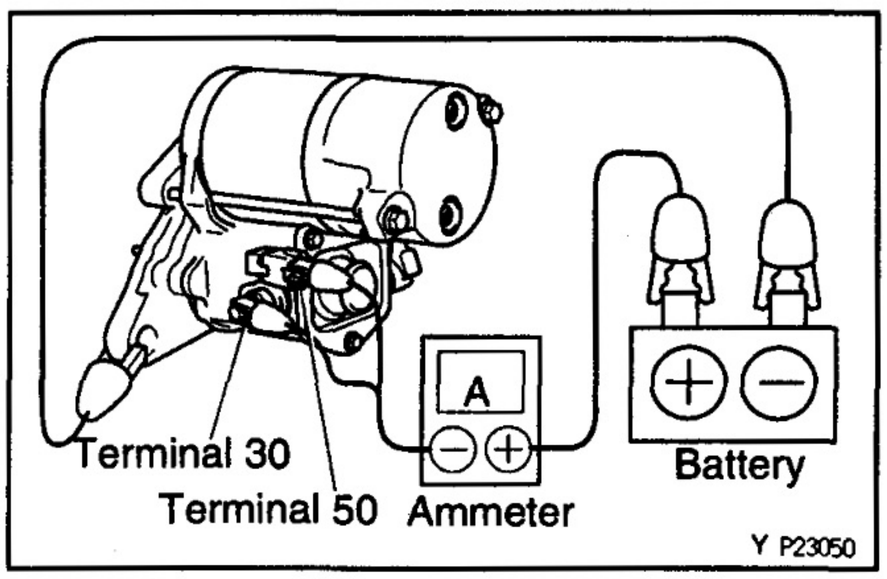
2. PERFORM HOLD—IN TEST

With battery connected as above with the clutch pinion gear out, disconnect the negative (—) lead from terminal C. Check that the pinion gear remains out.
If the clutch pinion gear returns inward, replace the magnetic switch assembly.



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 assembly.



4. PERFORM NO—LOAD PERFORMANCE TEST

(a) Connect the battery and ammeter to the starter as shown.

(b) Check that the starter rotates smoothly and steadily with the pinion gear moving out. Check that the ammeter shows the specified current.

Specified current:

At 11.5V: 100 A or less

SERVICE SPECIFICATIONS

SERVICE DATA

ST015-0V

Starter	Rated voltage and output power		12 V 2.0 kW
	No—load characteristics	Current	100 A or less at 11.5 V
		rpm	2,500 rpm or more
	Brush length	STD	15.0 mm (0.591 in.)
		Limit	9.0 mm (0.354 in.)
	Spring installed load		12.7 — 24.5 N (1.30 — 2.50 kgf, 2.7 — 5.3 lbf)
	Commutator		
	Diameter	STD	35.0 mm (1.38 in.)
		Limit	34.0 mm (1.34 in.)
	Undercut depth	STD	0.7 mm (0.024 in.)
		Limit	0.2 mm (0.008 in.)
	Circle runout	Limit	0.05 mm (0.0020 in.)

ST016-0S

TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
End cover x Field frame	3.8	40	35 in.·lbf
Starter housing x Magnetic switch	9.3	95	82 in.·lbf
Field frame x Armature assembly	9.3	95	82 in.·lbf
Lead wire x Terminal C of starter	5.4	55	48 in.·lbf

CHARGING SYSTEM

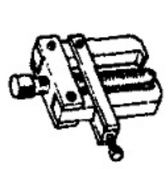
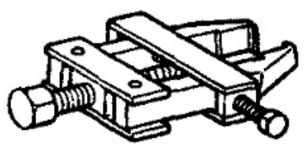
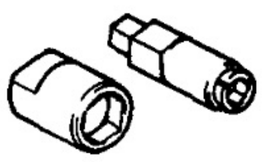
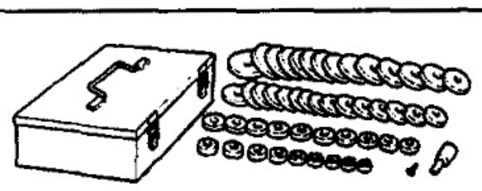
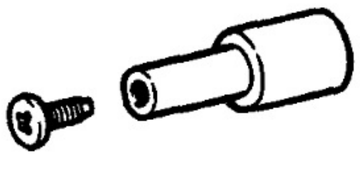
(55 A Type) ..... CH– 2
PREPARATION ..... CH– 2
ALTERNATOR ..... CH– 3
SERVICE SPECIFICATIONS ..... CH– 13

(55 A Type)

PREPARATION

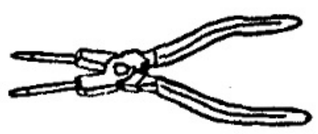
SST (SPECIAL SERVICE TOOLS)

CH00R–QC

	09285–76010	Injection Pump Camshaft Bearing Cone Replacer	Rotor rear bearing cover
	09286–46011	Injection Pump Spline Shaft Puller	Rectifier end frame
	09820–00021	Alternator Rear Bearing Puller	
	09820–00030	Alternator Rear Bearing Replacer	
	09820–63010	Alternator Pulley Set Nut Wrench Set	
	09950–60010	Replacer Set	Rotor front bearing
	(09951–00260)	Replacer 26	
	(09951–00500)	Replacer 50	
	(09952–06010)	Adapter	

RECOMMENDED TOOLS

CH00S–QL

	09082–00050	TOYOTA Electrical Tester Set.	
	09905–00013	Snap Ring Pliers .	Generator washer

CH00U–0M

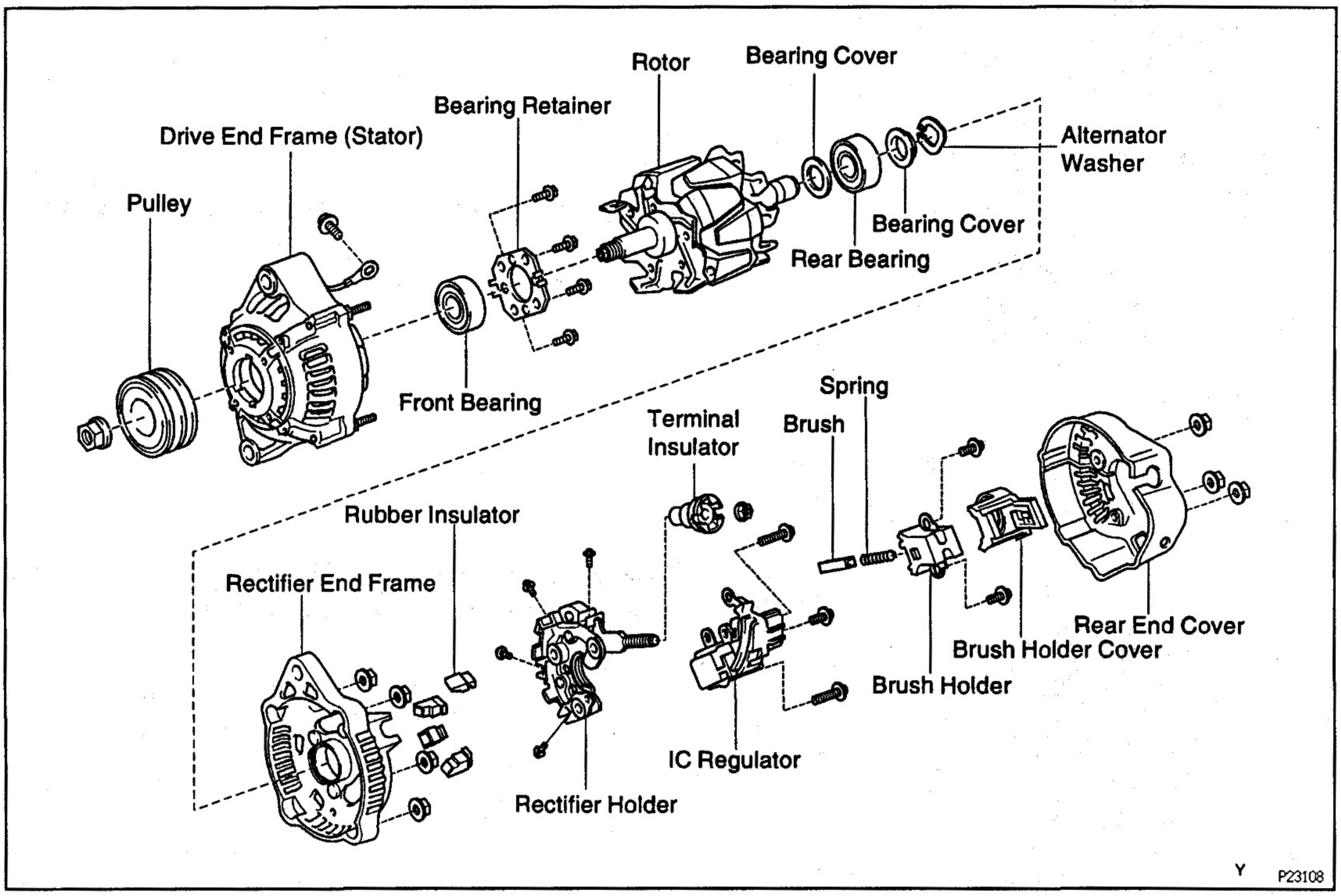
EQUIPMENT

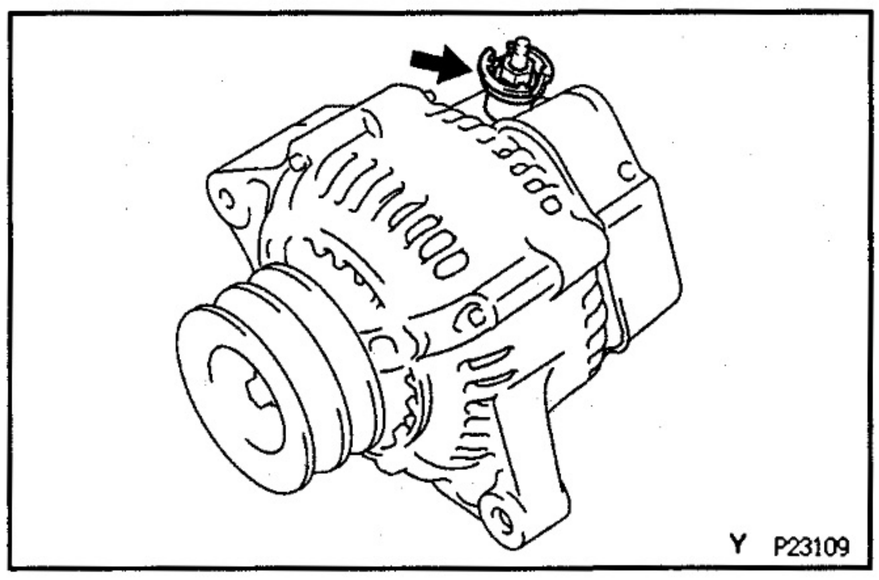
Ammeter(A)	
Torque wrench	
Vernier calipers	Rotor (Slip ring), Brush

ALTERNATOR

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY

CH011–0U



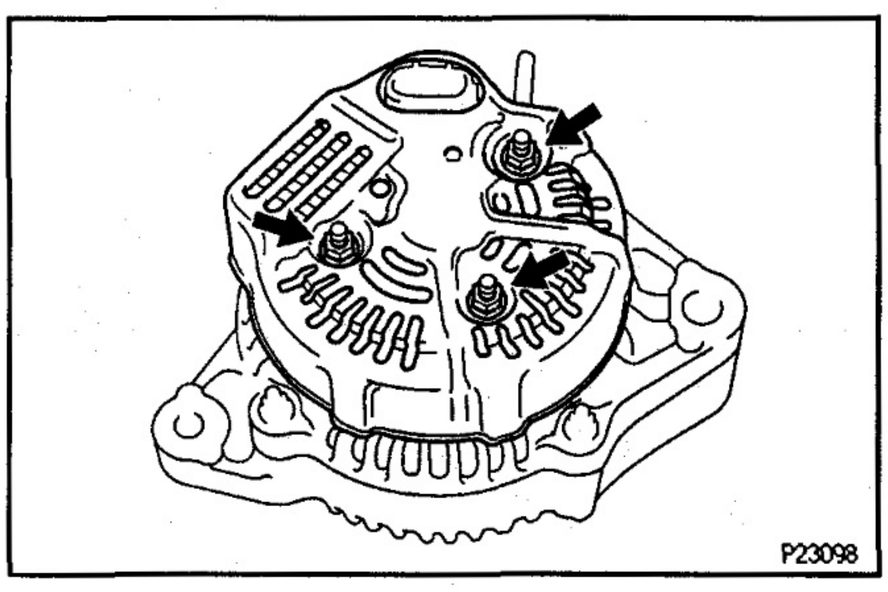


CH0AS–01

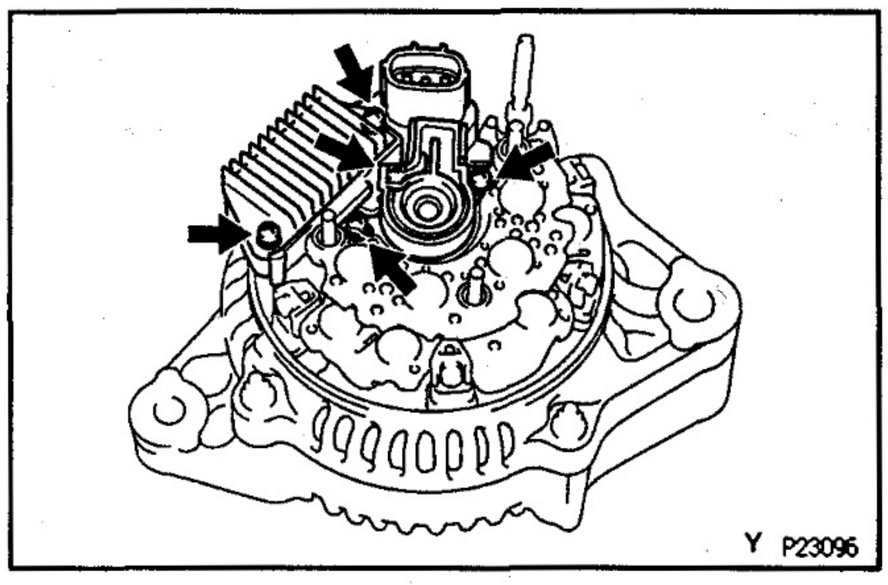
ALTERNATOR DISASSEMBLY

1. REMOVE REAR END COVER

(a) Remove the nut and terminal insulator.

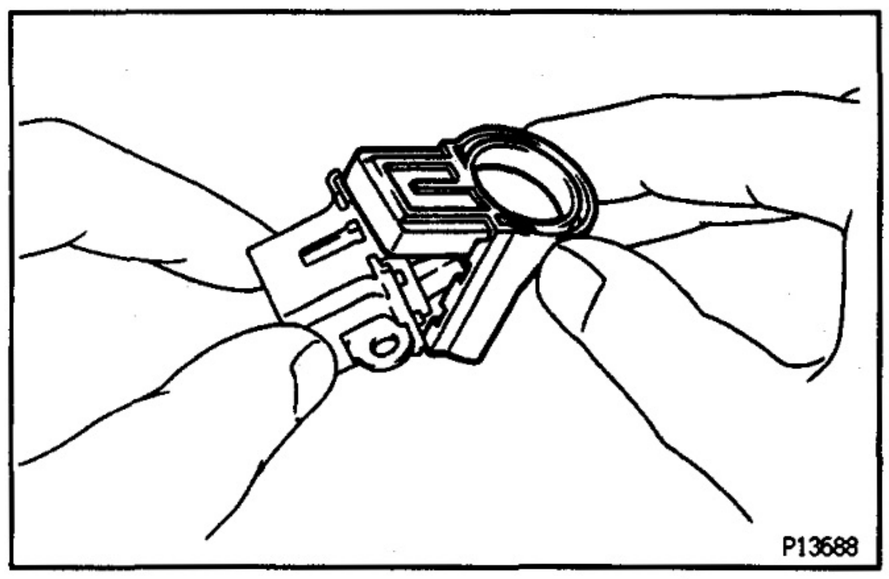


(b) Remove the 3 nuts and rear end cover.

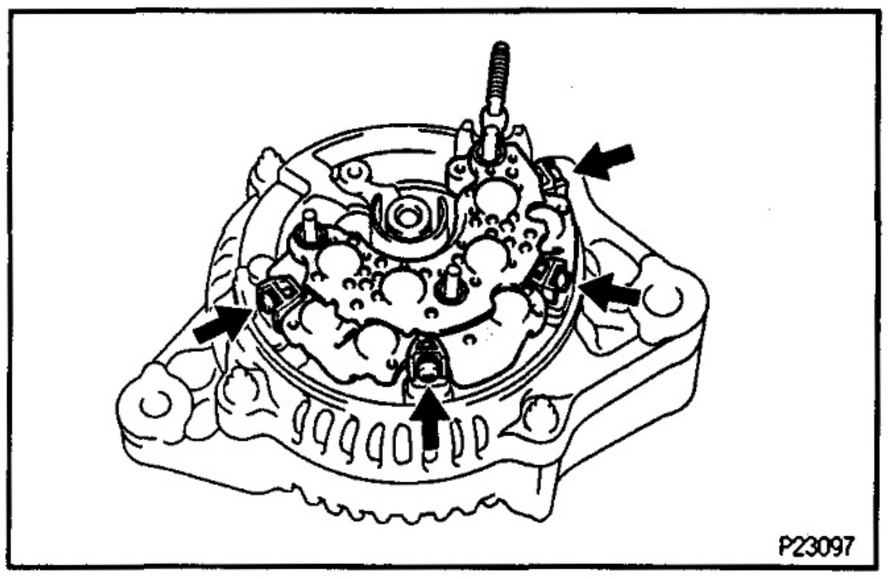


2. REMOVE BRUSH HOLDER AND IC REGULATOR

(a) Remove the 5 screws, brush holder and IC regulator.

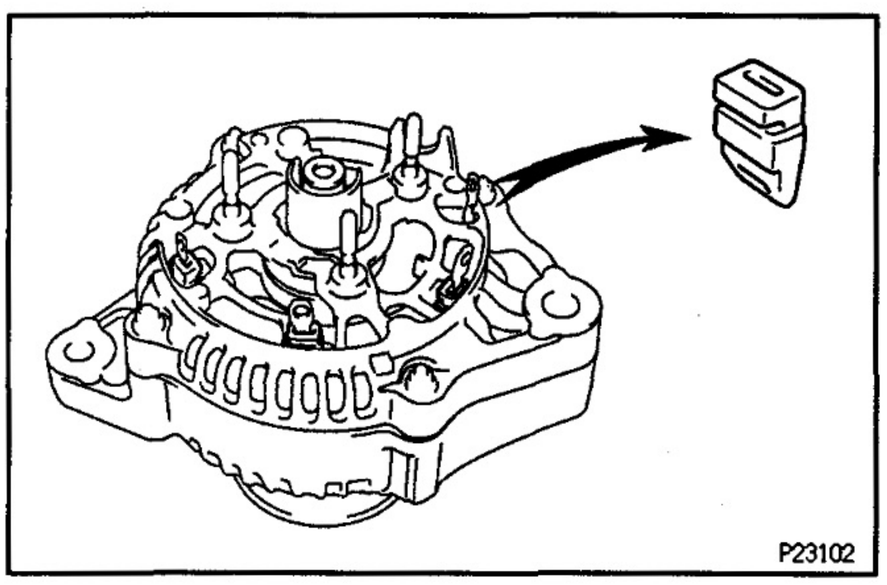


(b) Remove the brush holder cover from the brush holder.

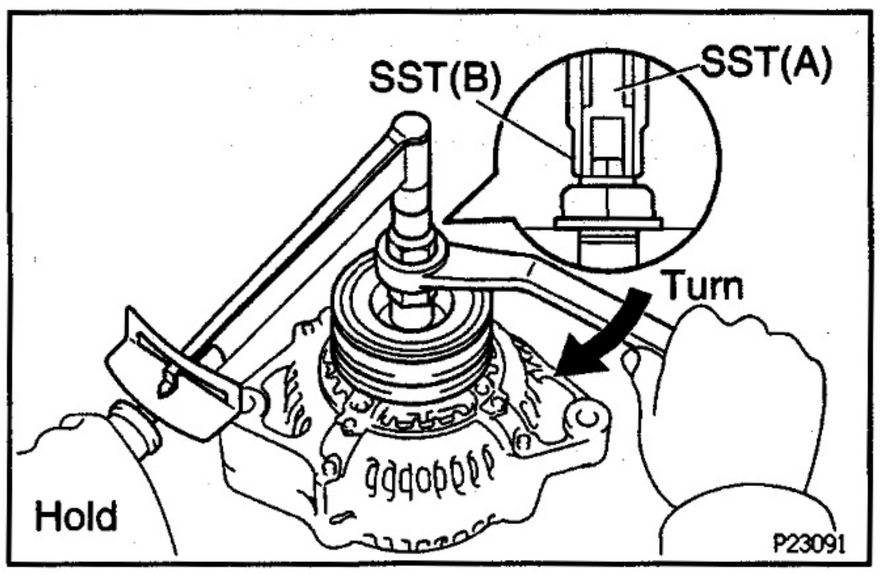


3. REMOVE RECTIFIER HOLDER

(a) Remove the 4 screws and rectifier holder.



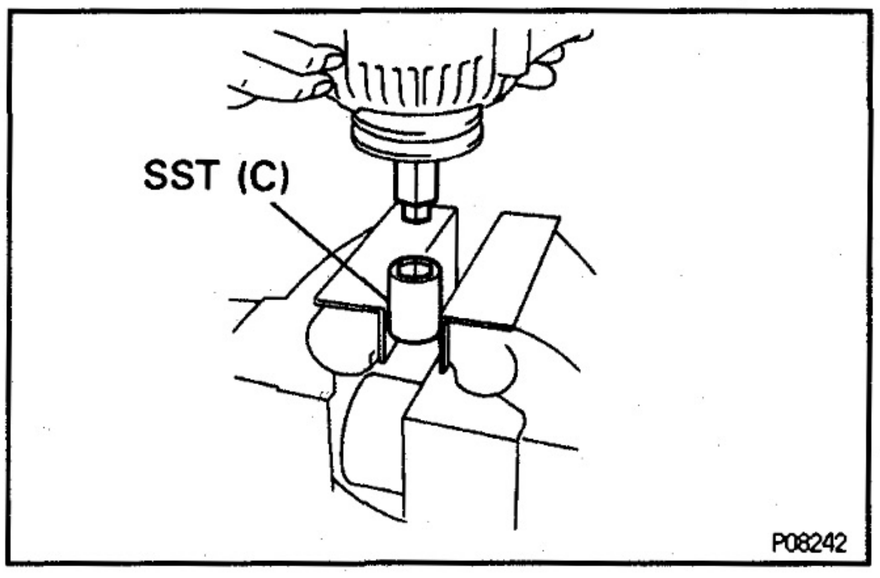
(b) Remove the 4 rubber insulators.



4. REMOVE PULLEY

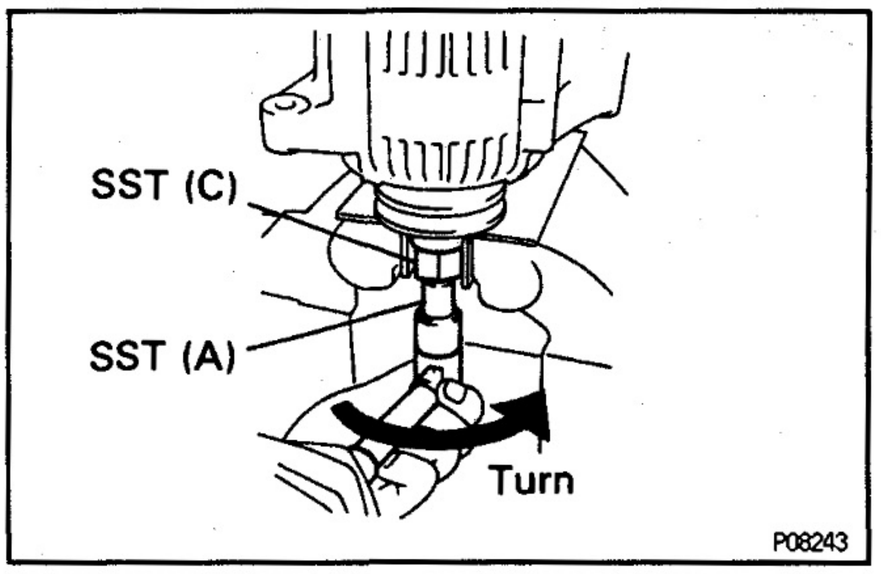
(a) Hold SST (A) with a torque wrench, and tighten SST (B) clockwise to the specified torque.
SST 09820–63010
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

(b) Check that SST (A) is secured to the rotor shaft.



(c) Mount SST (C) in a vise.

(d) Install the generator to SST (C).

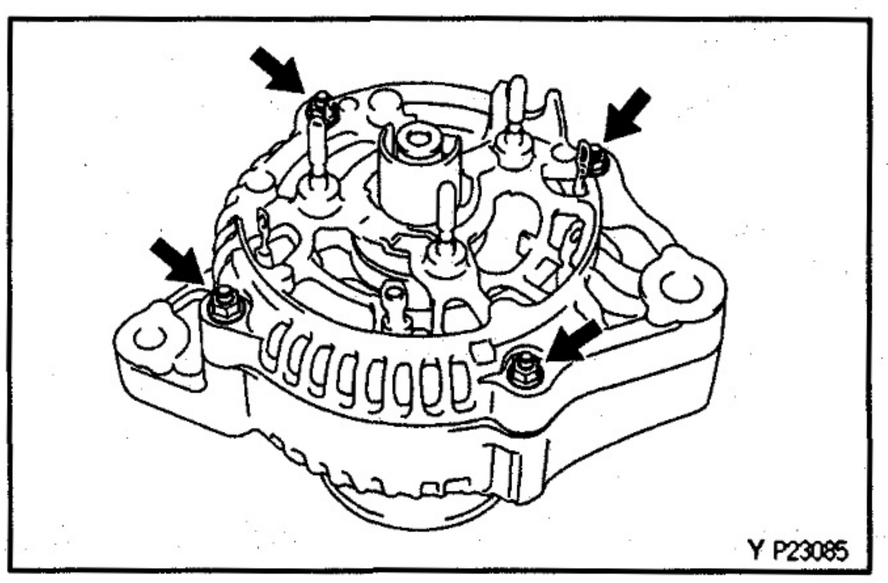


(e) To loosen the pulley nut, turn SST (A) in the direction shown in the illustration.
NOTICE: To prevent damage to the rotor shaft, do not loosen the pulley nut more than one–half of a turn.

(f) Remove the generator from SST (C).

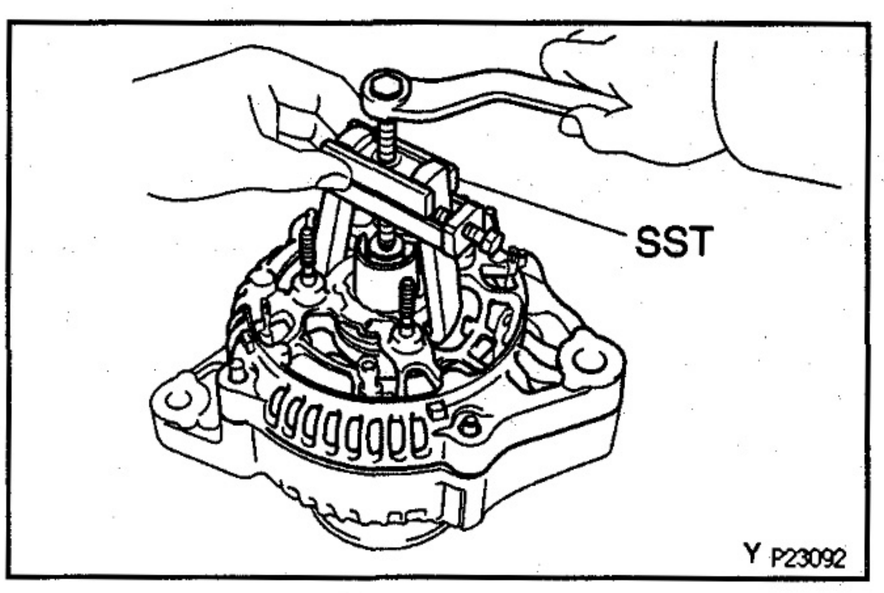
(g) Turn SST (B) and remove SST (A and B).

(h) Remove the pulley nut and pulley.

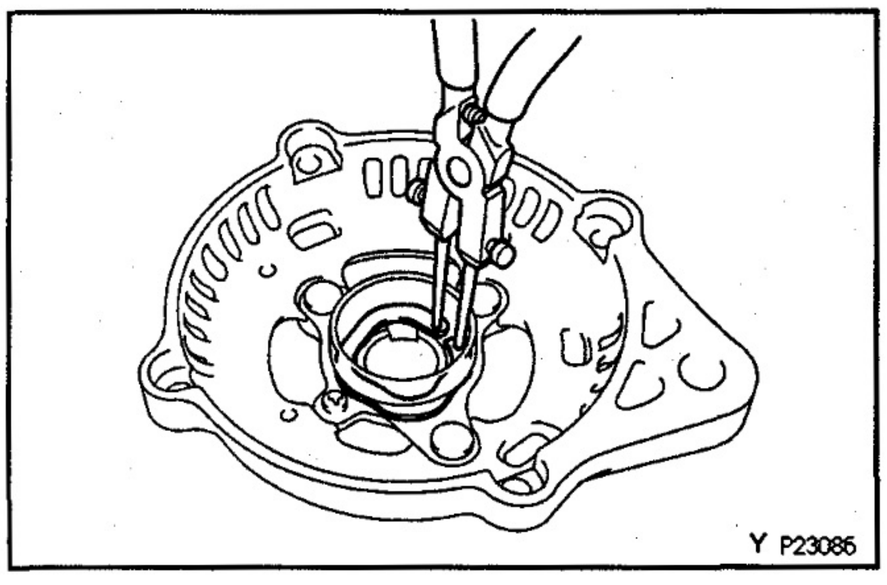


5. REMOVE RECTIFIER END FRAME

(a) Remove the 4 nuts.

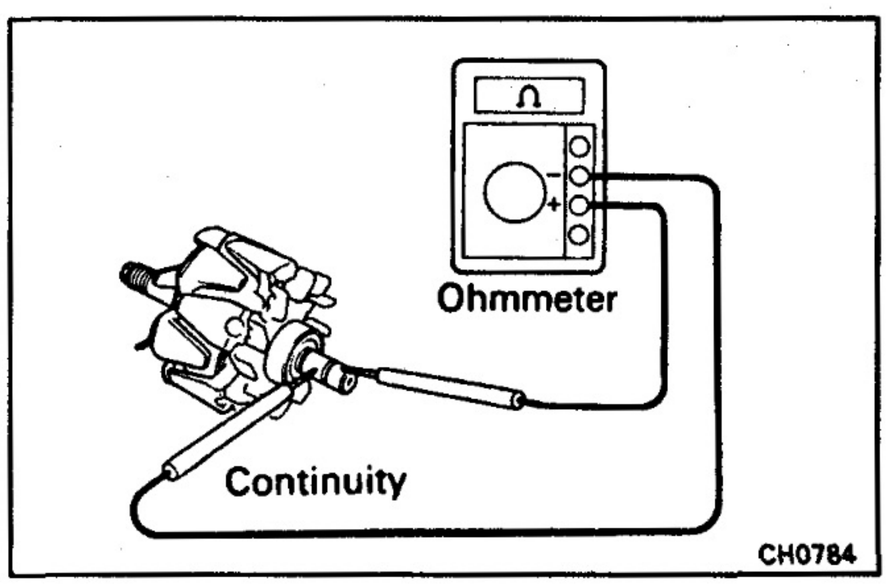


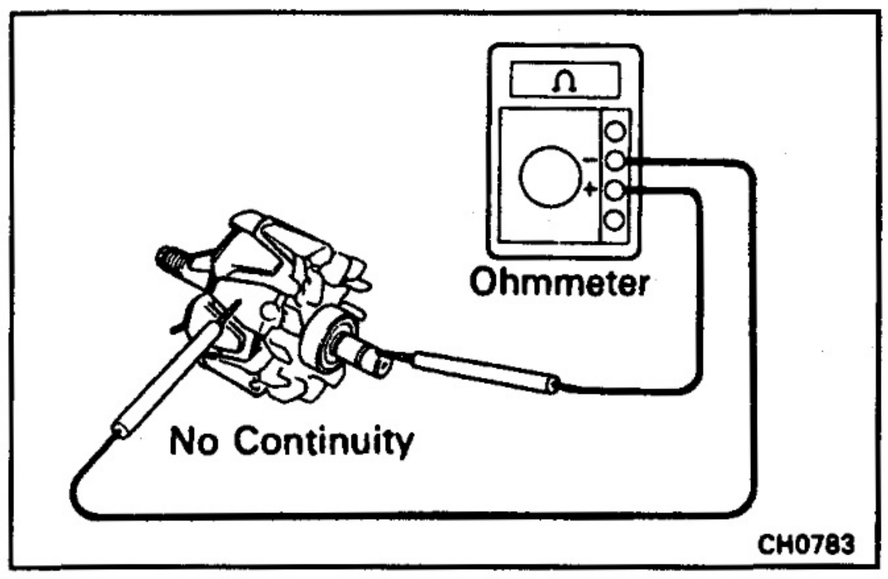
(b) Using SST, remove the rectifier end frame.
SST 09286–46011

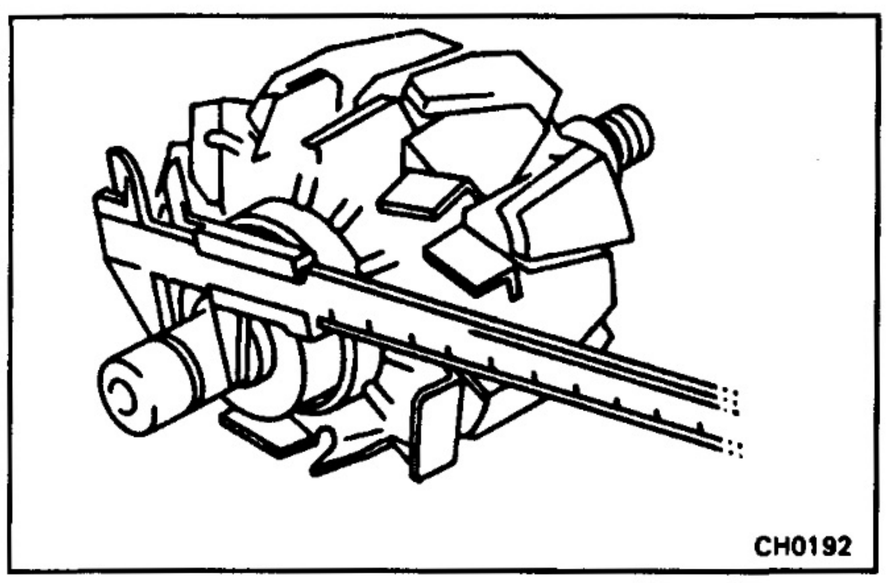


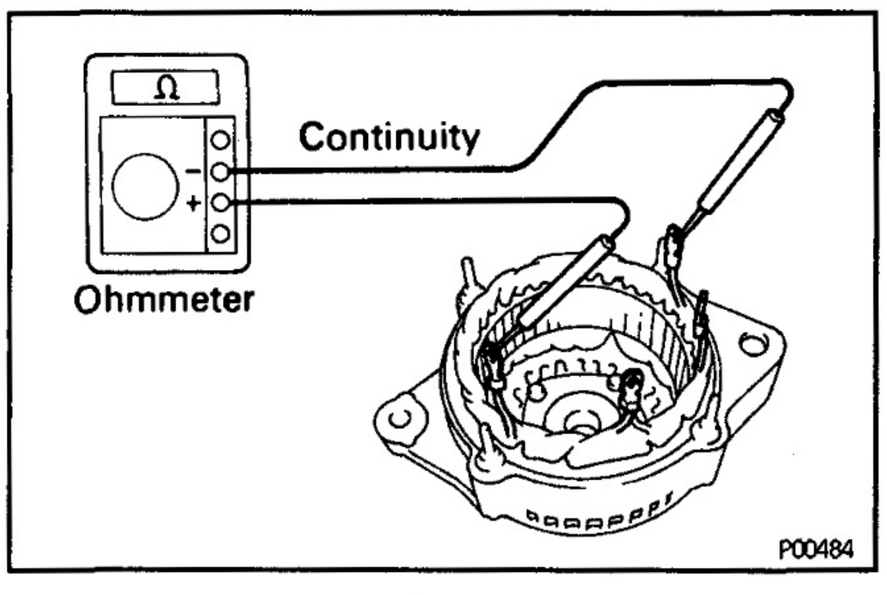
(c) Using snap ring pliers, remove the alternator washer from the rectifier end frame.

6. REMOVE ROTOR FROM DRIVE END FRAME









GENERATOR INSPECTION AND REPAIR CH0A4-01

Rotor

1. INSPECT ROTOR FOR OPEN CIRCUIT

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

Standard resistance (Cold):

2.8 – 3.0 Ω

If there is no continuity, replace the rotor.

2. INSPECT ROTOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the slip ring and rotor.

If there is continuity, replace the rotor.

3. INSPECT SLIP RINGS

(a) Check that the slip rings are not rough or scored.
If rough or scored, replace the rotor.

(b) Using a vernier caliper, measure the slip ring diameter.

Standard diameter:

14.2 – 14.4 mm (0.559 – 0.567 in.)

Minimum diameter:

12.8 mm (0.504 in.)

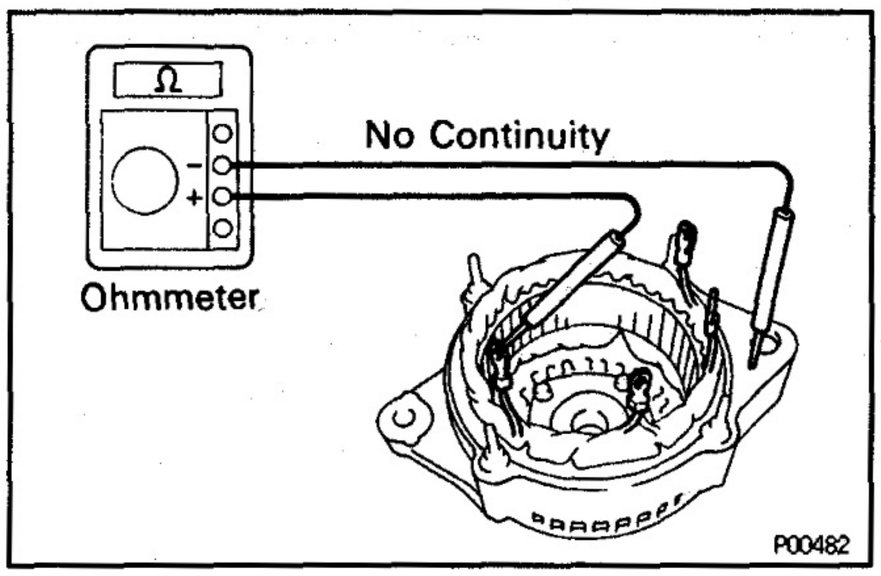
If the diameter is less than minimum, replace the rotor.

Stator (Drive End Frame)

1. INSPECT STATOR FOR OPEN CIRCUIT

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

If there is no continuity, replace the drive end frame assembly.

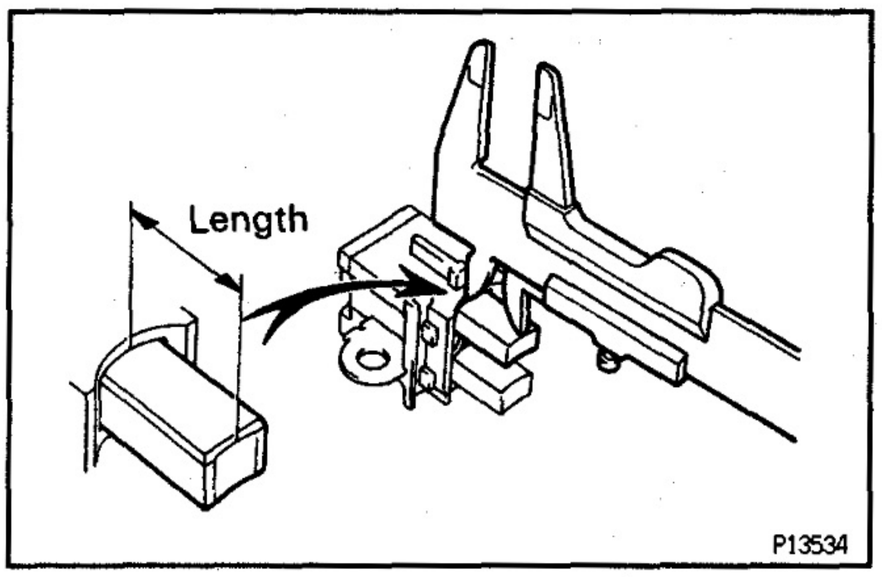


2. INSPECT STATOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the coil lead and drive end frame.

If there is continuity, replace the drive end frame assembly.

Brushes



1. INSPECT EXPOSED BRUSH LENGTH

Using vernier calipers, measure the exposed brush length.

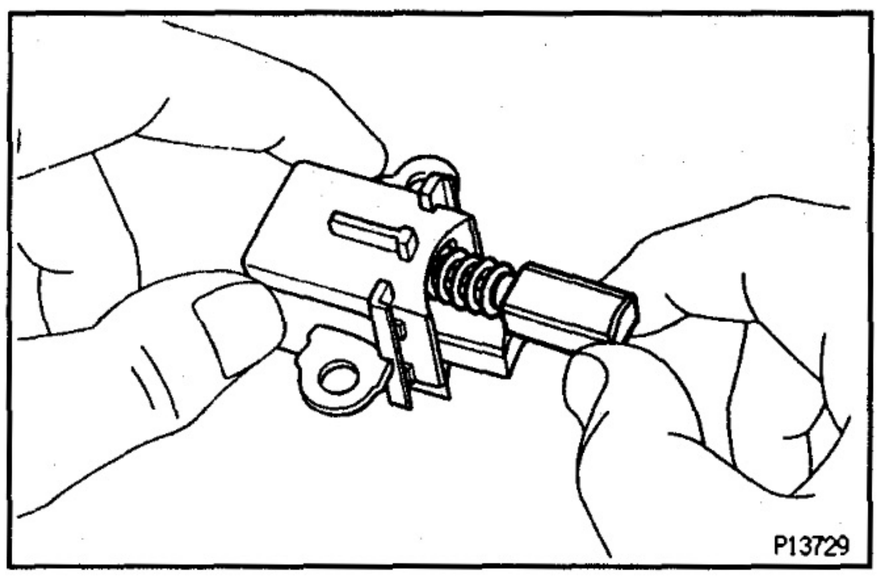
Standard exposed length:

10.5 mm (0.413 in.)

Minimum exposed length:

1.5 mm (0.059 in.)

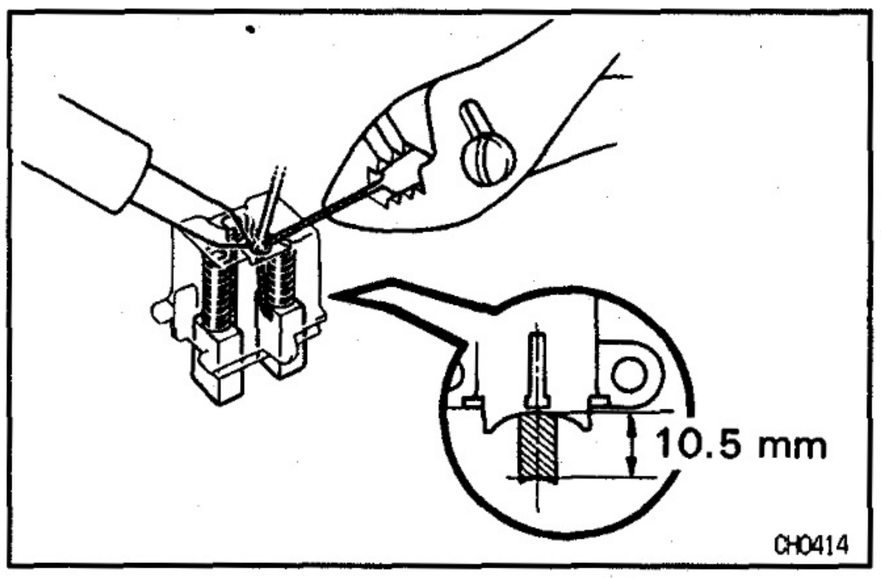
If the exposed length is less than minimum, replace the brushes.



2. IF NECESSARY, REPLACE BRUSHES

(a) Unsolder and remove the brush and spring.

(b) Run the wire of a new brush through the spring and the hole in the brush holder, and insert the spring and brush into the brush holder.



(c) Solder the brush wire to the brush holder at the specified exposed length.

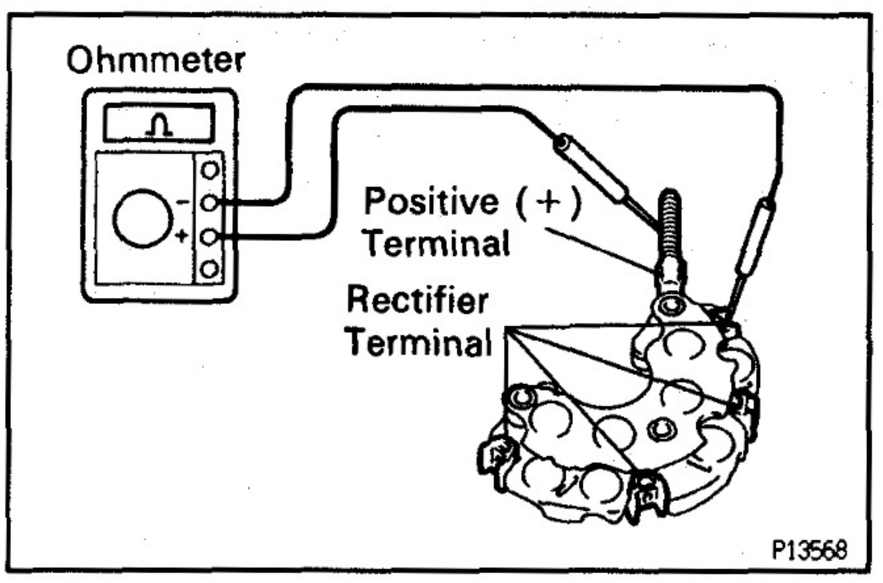
Exposed length:

10.5 mm (0.413 in.)

(d) Check that the brush moves smoothly in the brush holder.

(e) Cut off the excess wire.

(f) Apply insulation paint to the soldered area.

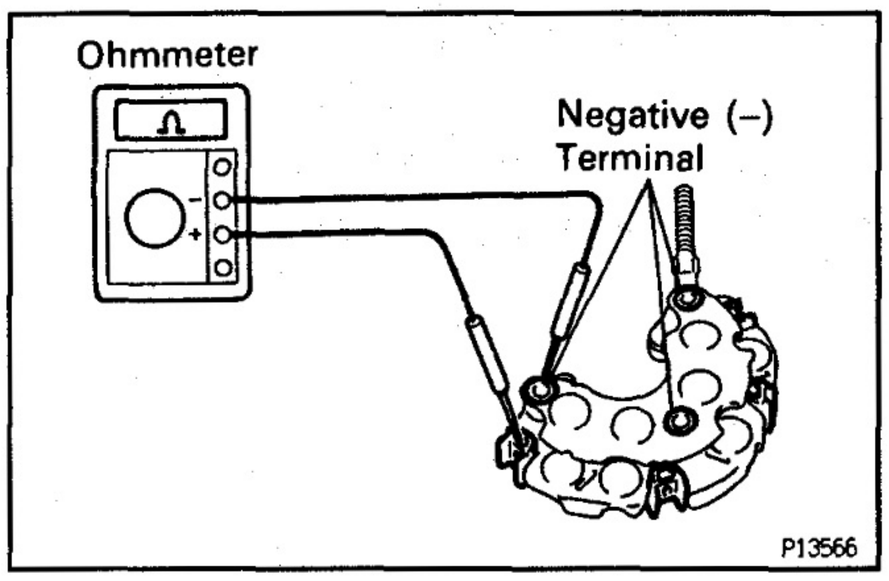


Rectifiers (Rectifier Holder)

1. INSPECT POSITIVE RECTIFIER

(a) Using an ohmmeter, connect one tester probe to the positive (+) terminal and the other to each rectifier terminal.

(b) Reverse the polarity of the tester probes and repeat step (a).



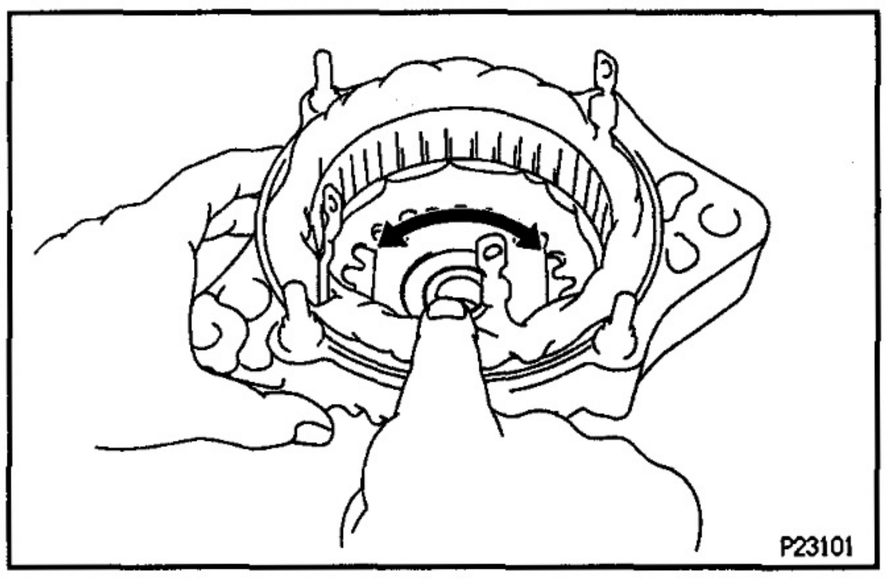
(c) Check that one shows continuity and the other shows no continuity.
If continuity is not as specified, replace the rectifier holder.

2. INSPECT NEGATIVE RECTIFIER

(a) Using an ohmmeter, connect one tester probe to each negative (—) terminal and the other to each rectifier terminal.

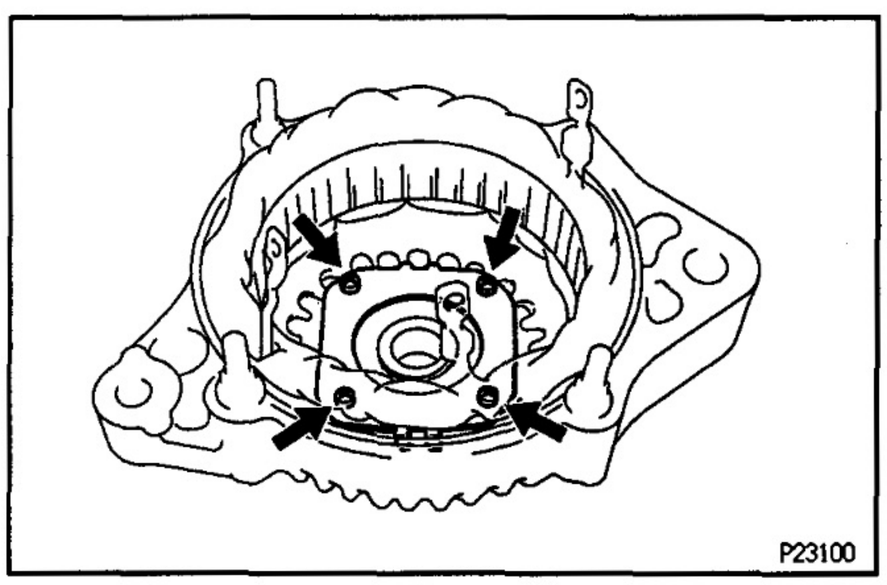
(b) Reverse the polarity of the tester probes and repeat step (a).

(c) Check that one shows continuity and the other shows no continuity.
If continuity is not as specified, replace the rectifier holder.



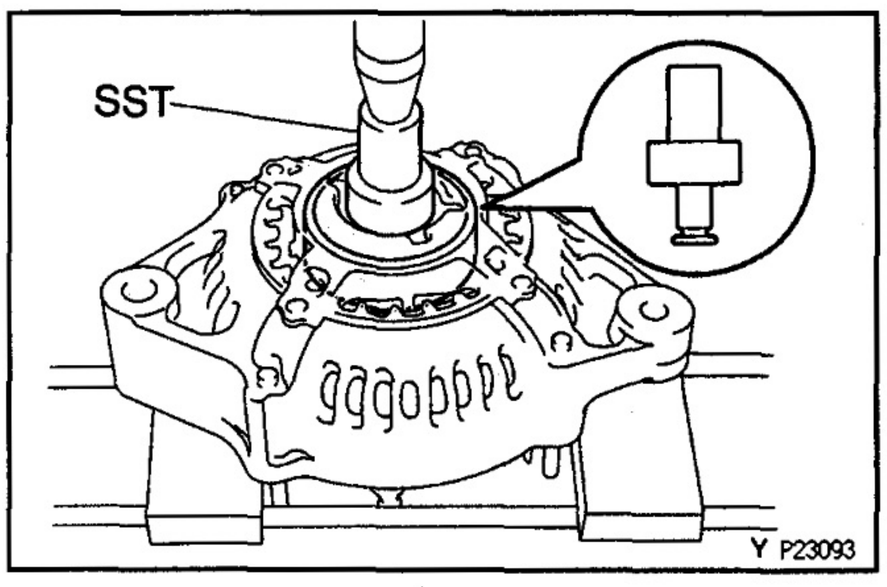
Bearings

1. INSPECT FRONT BEARING
Check that the bearing is not rough or worn.

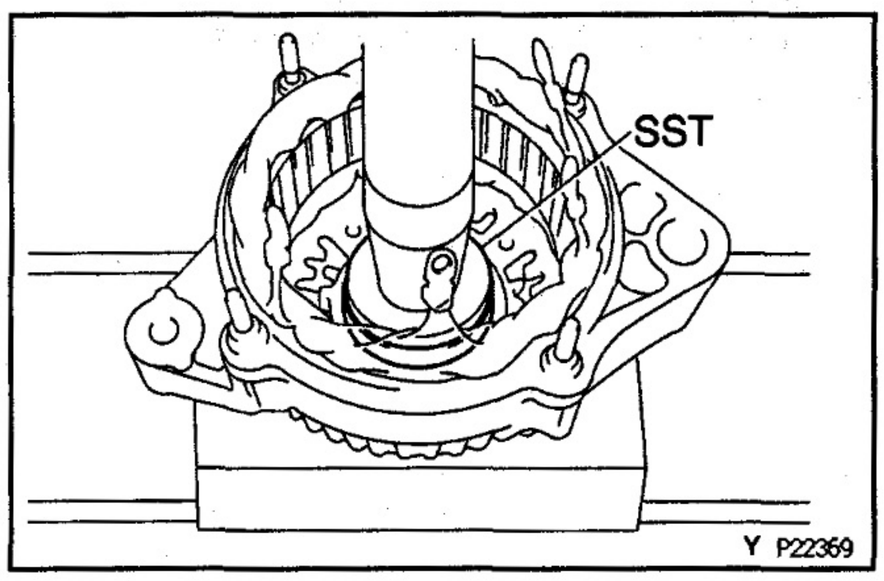


2. IF NECESSARY, REPLACE FRONT BEARING

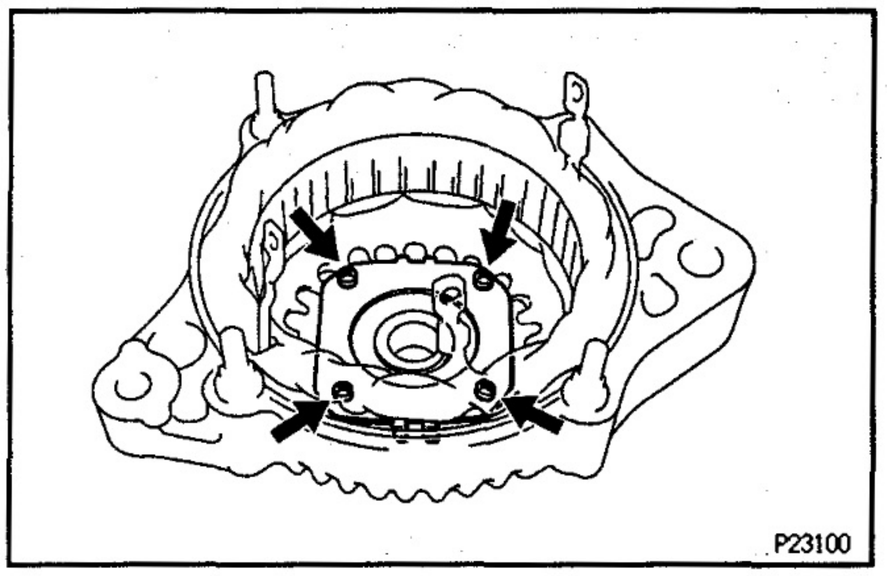
(a) Remove the 4 screws and bearing retainer.



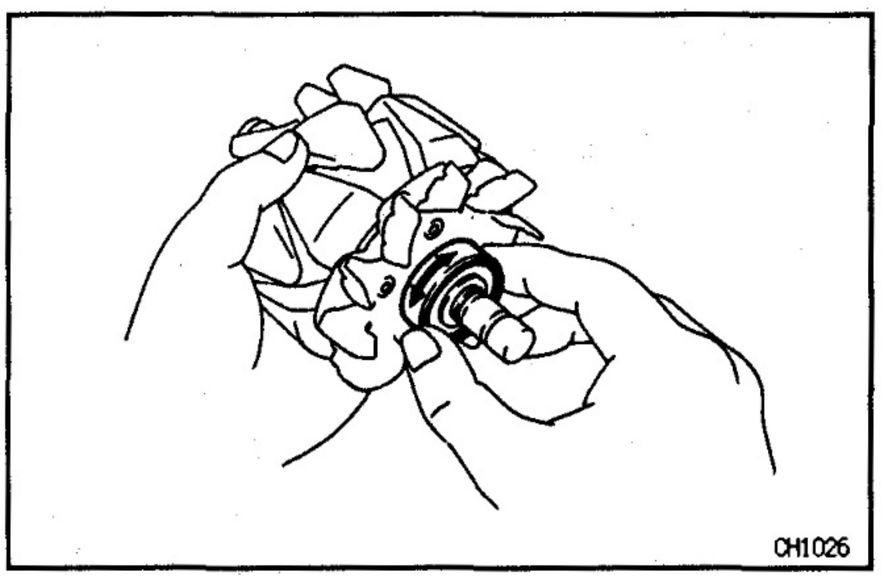
(b) Using SST and a press, press out the bearing.
SST 09950—60010 (09951—00260, 09952—06010)



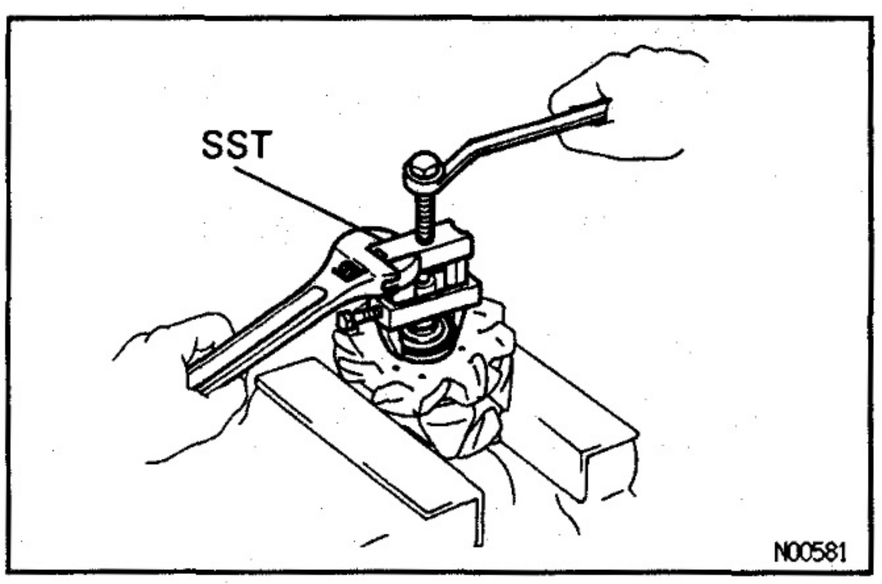
(c) Using SST and a press, press in a new bearing.
SST 09950–60010 (09951–00500)



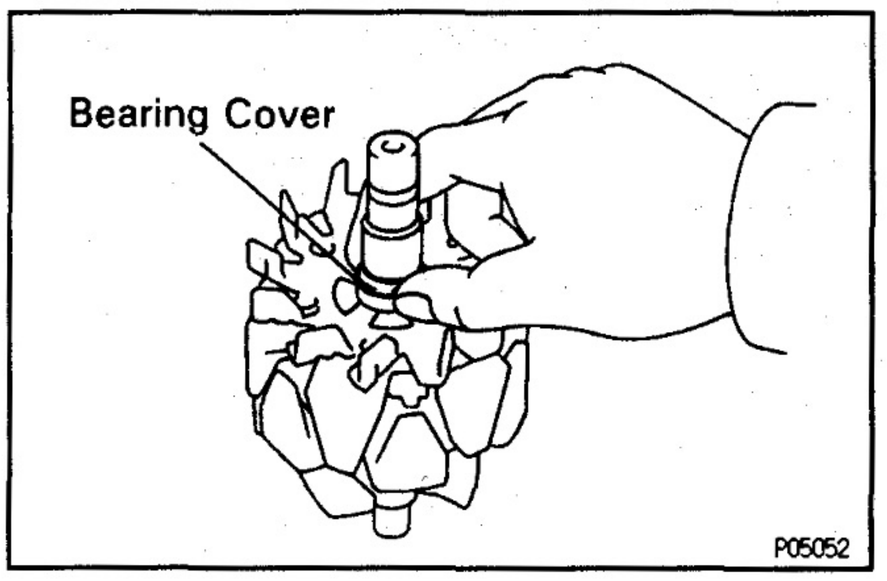
(d) Install the bearing retainer with the 4 screws.
Torque: 2.6 N·m (27 kgf·cm, 23 in.·lbf)



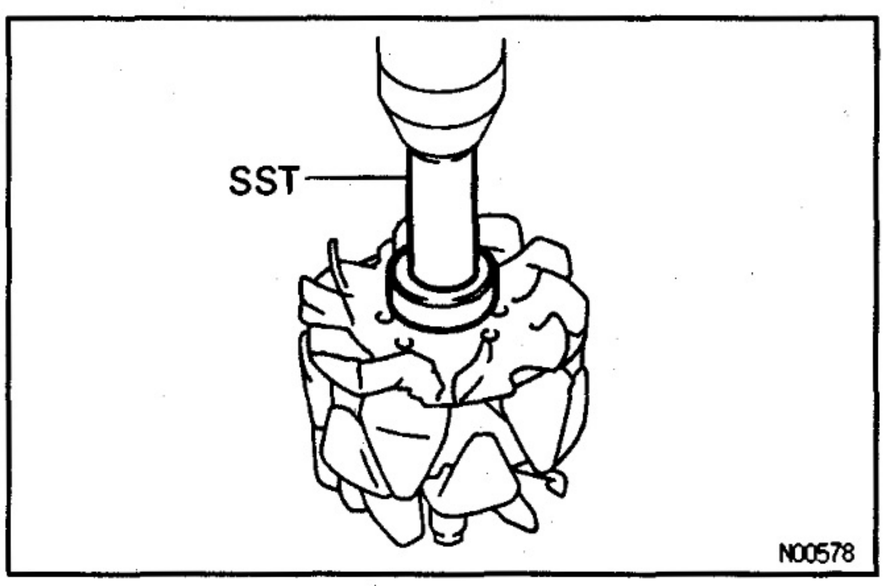
3. INSPECT REAR BEARING
Check that the bearing is not rough or worn.



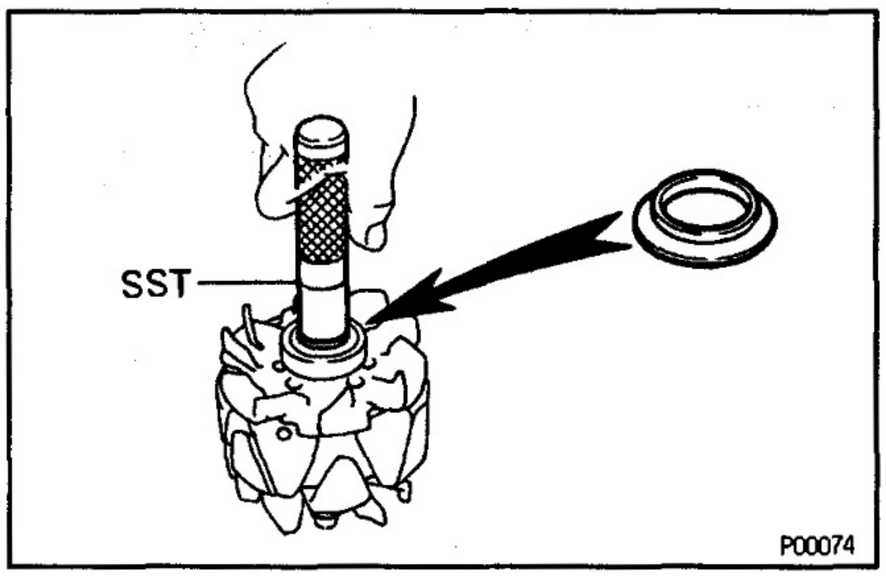
4. IF NECESSARY, REPLACE REAR BEARING
(a) Using SST, remove the bearing cover (outside) and bearing.
SST 09820–00021
NOTICE: Be careful not to damage the fan.
(b) Remove the bearing cover (inside).



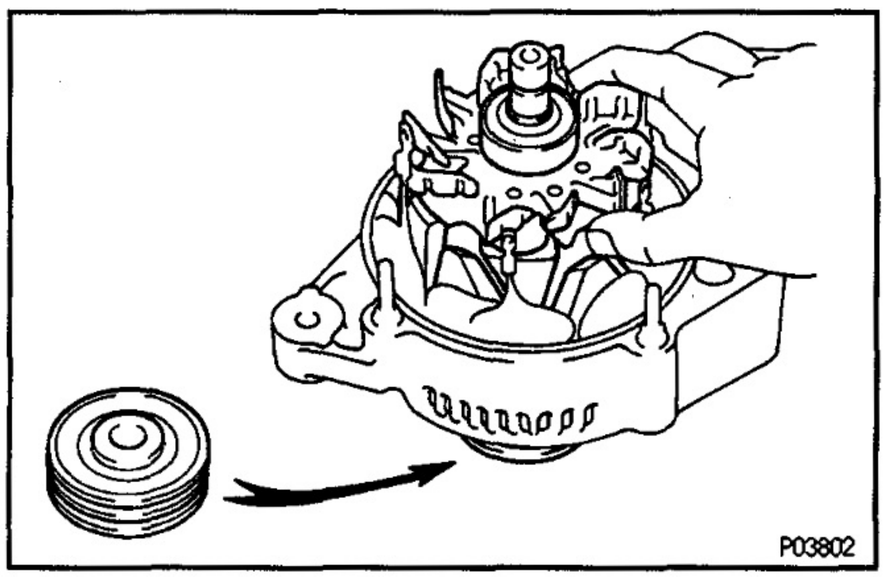
(c) Place the bearing cover (inside) on the rotor.



(d) Using SST and a press, press in a new bearing.
SST 09820–00030



(e) Using SST, push in the bearing cover (outside).
SST 09285–76010

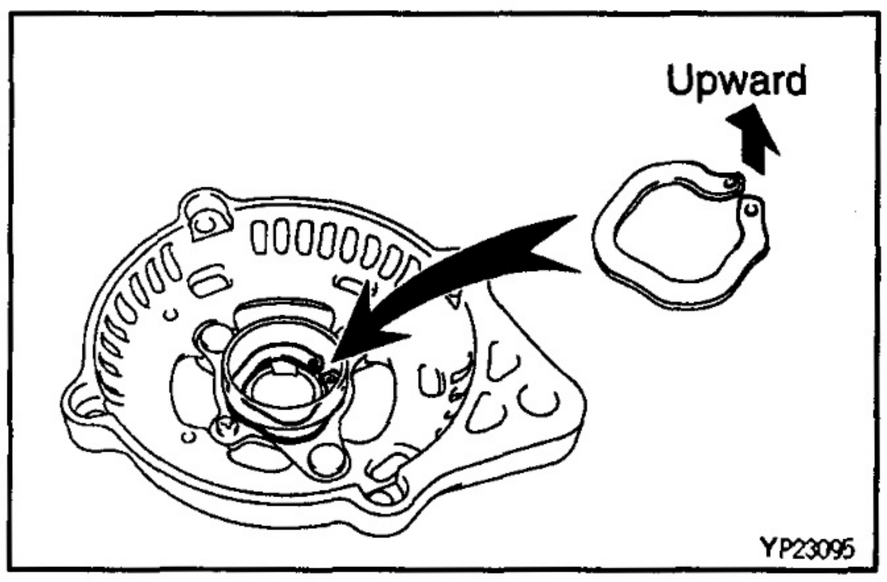


CHOA5–01

GENERATOR ASSEMBLY

1. PLACE RECTIFIER END FRAME ON PULLEY

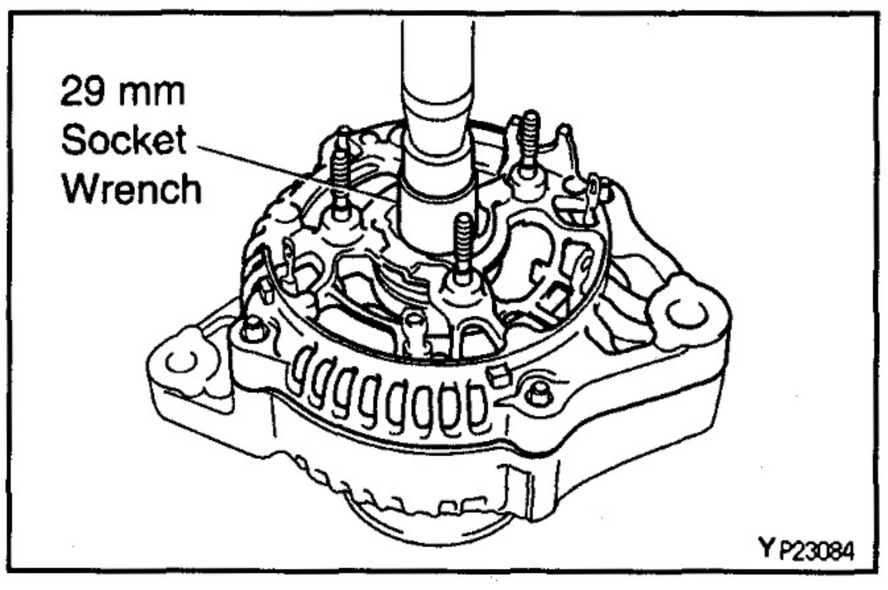
2. INSTALL ROTOR TO DRIVE END FRAME



3. INSTALL RECTIFIER END FRAME

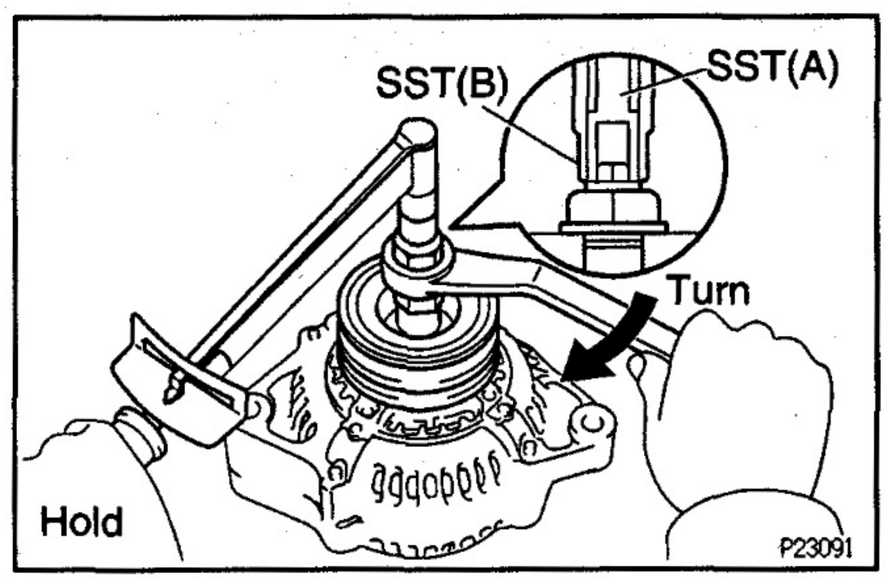
(a) Install the generator washer to the rectifier end frame.

NOTICE: Be careful of the generator washer installation direction.



(b) Using a 29 mm socket wrench and press, slowly press in the rectifier end frame.

(c) Install the 4 nuts.
Torque: 4.5 N·m (46 kgf·cm, 40 in.·lbf)

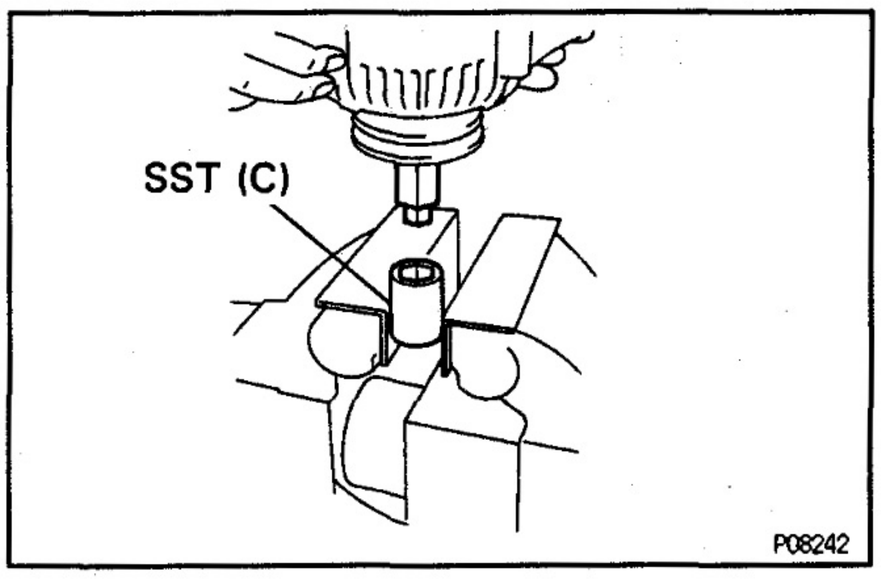


4. INSTALL PULLEY

(a) Install the pulley to the rotor shaft by tightening the pulley nut by hand.

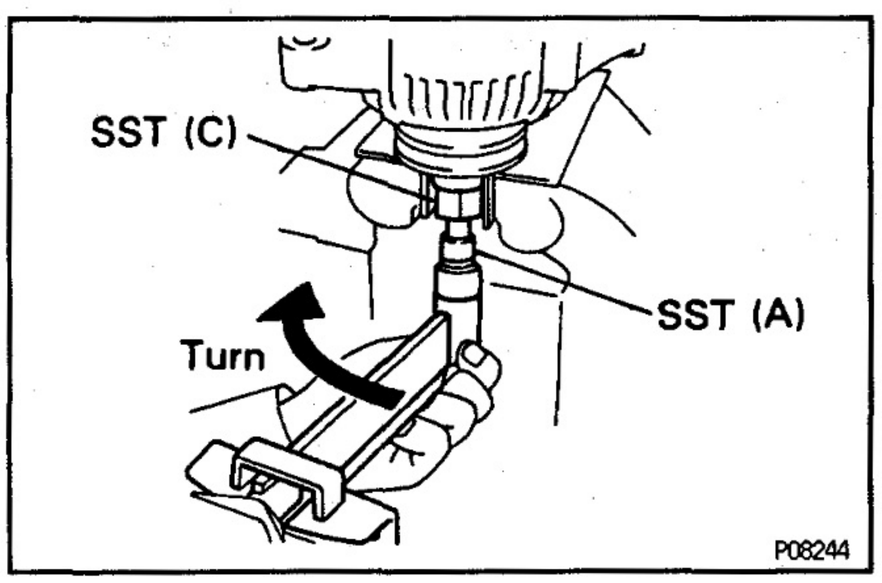
(b) Hold SST (A) with a torque wrench, and tighten SST (B) clockwise to the specified torque.
SST 09820–63010
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

(c) Check that SST (A) is secured to the pulley shaft.



(d) Mount SST (C) in a vise.

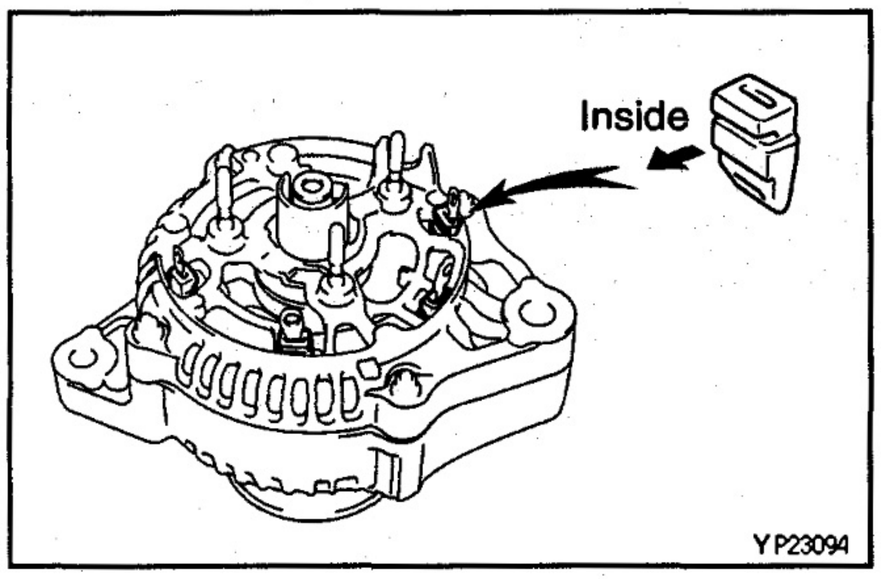
(e) Install the generator to SST (C).



(f) To torque the pulley nut turn SST (A) in the direction shown in the illustration.
Torque: 110 N·m (1,125 kgf·cm, 81 ft·lbf)

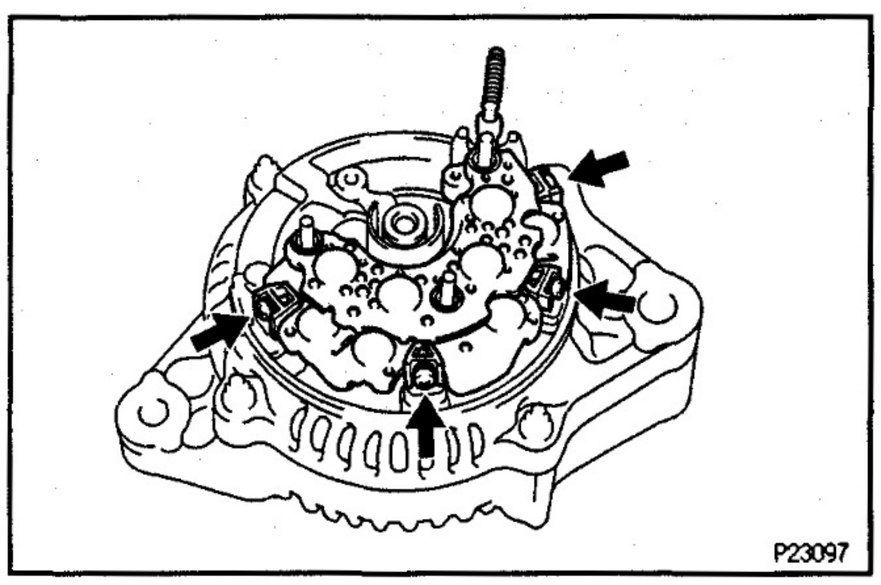
(g) Remove the generator from SST (C).

(h) Turn SST (B), and remove SST (A and B).

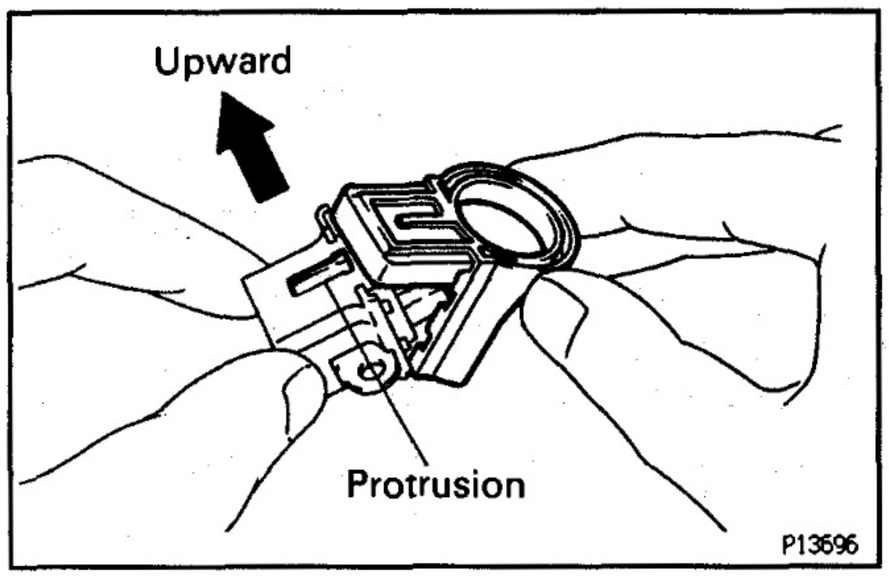


5. INSTALL RECTIFIER HOLDER

(a) Install the 4 rubber insulators on the lead wires.
NOTICE: Be careful of the rubber insulators installation direction.

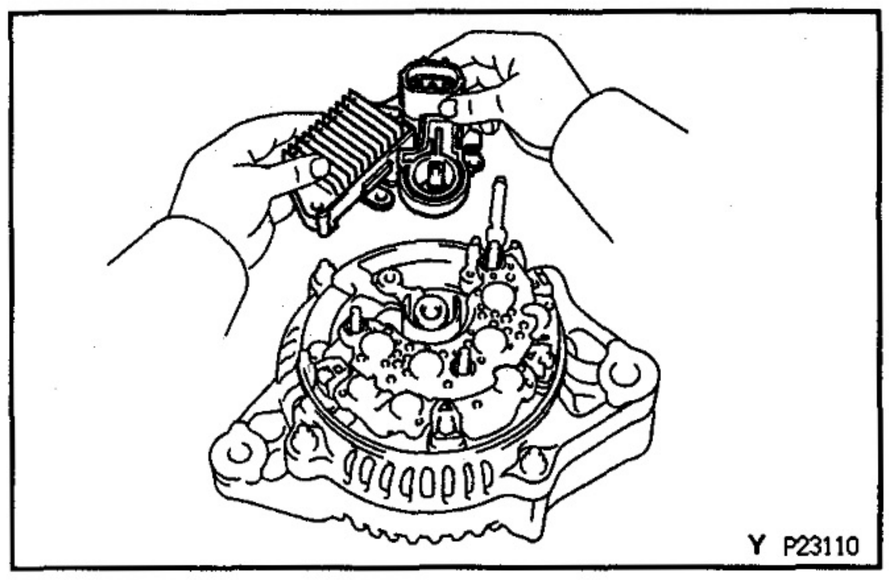


(b) Install the rectifier holder with the 4 screws.
Torque: 2.9 N·m (30 kgf·cm, 26 in.·lbf)

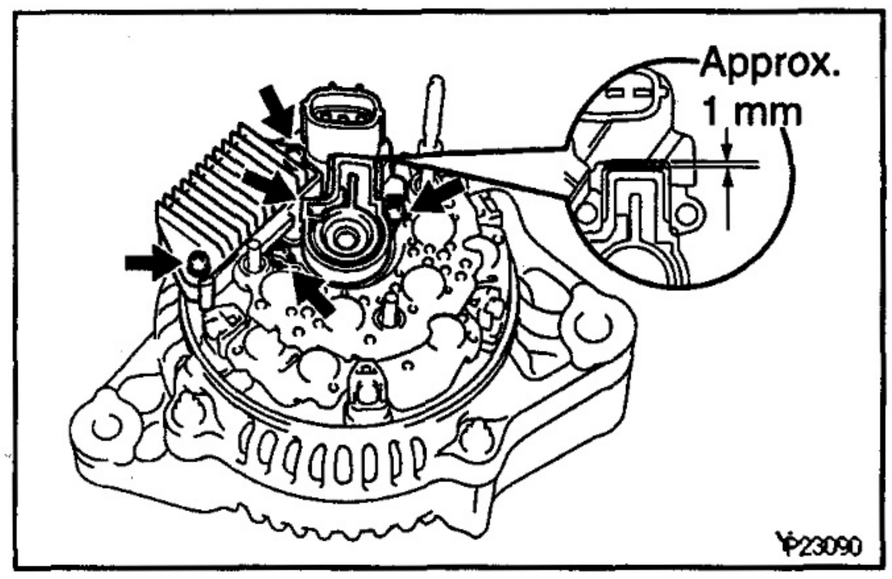


6. INSTALL IC REGULATOR AND BRUSH HOLDER

(a) Install the brush holder cover to the brush holder.
NOTICE: Be careful of the holder installation direction.

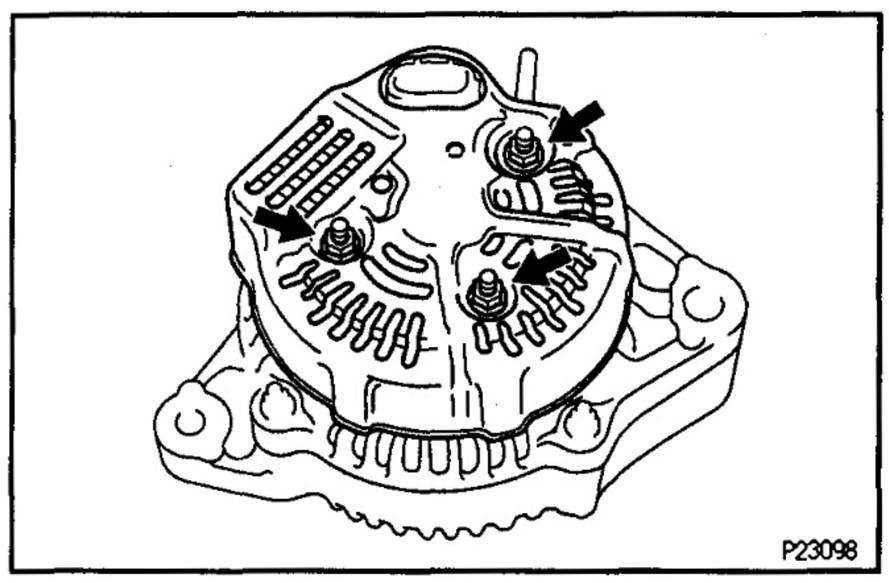


(b) **Place the IC regulator together with the brush holder horizontally on the rectifier end frame.**



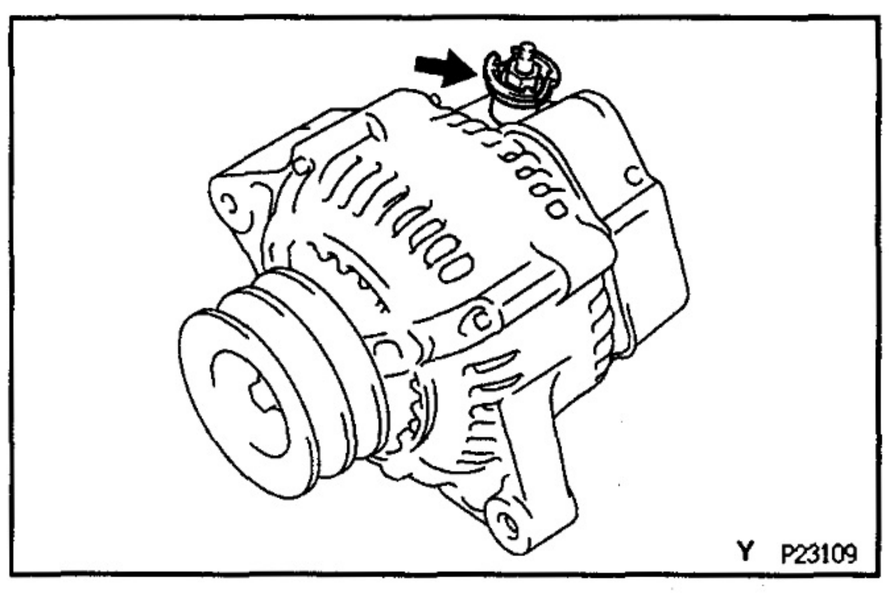
(c) **Install the 5 screws until there is a clearance of approx. 1 mm (0.04 in.) between the brush holder and IC regulator.**

(d) **Fit the brush holder cover.**

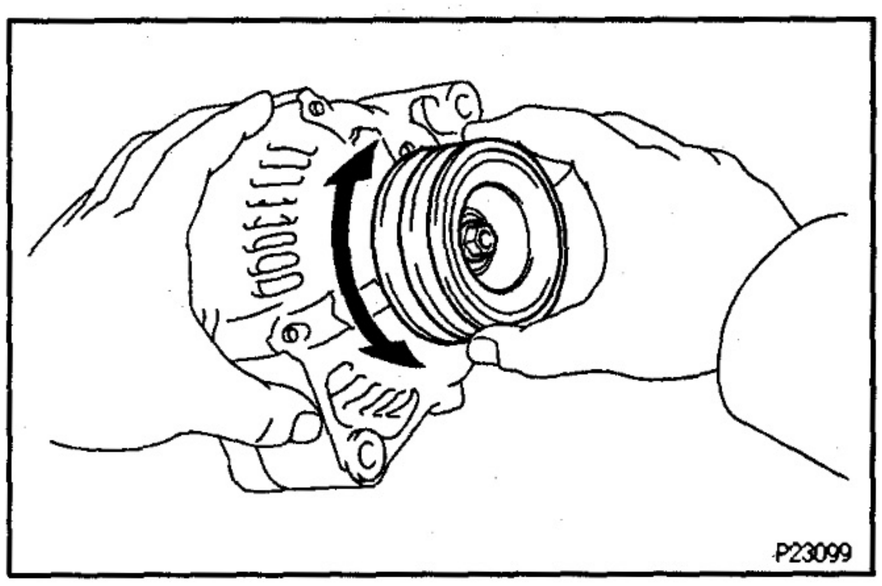


7. INSTALL REAR END COVER

(a) Install the end cover together with the rectifier plate.
Hand tighten the bolt first for positioning the plate.
Tighten the 3 nuts and retighten the bolt.
Torque: 4.4 N·m (45 kgf·cm, 39 in.·lbf)



(b) Install the terminal insulator with the nut.
Torque: 4.1 N·m (42 kgf·cm, 36 in.·lbf)



8. CHECK THAT ROTOR ROTATES SMOOTHLY

SERVICE SPECIFICATIONS

SERVICE DATA

CH01B–0V

CH

Alternator	Rated output		12 V – 55 A
	Rotor coil resistance		2.8 – 3.0 Ω
	Slip ring diameter	STD	14.2 mm – 14.4 mm (0.559 – 0.567 in.)
		Minimum	12.8 mm (0.504 in.)
	Brush exposed length	STD	10.5 mm (0.413 in.)
		Minimum	1.5 mm (0.059 in.)
Alternator regulator	Regulating voltage	at 25 °C (77°F)	14.0 – 15.0 V
		at 115°C (239°F)	13.5 – 14.3 V

TORQUE SPECIFICATIONS

CH03N–0A

Part tightened	N·m	kgf·cm	ft·lbf
Bearing retainer x Drive end frame	2.6	27	23 in.·lbf
Rectifier end frame x Drive end frame	4.5	46	40 in.·lbf
Alternator pulley x Rotor	110	1,125	81
Rectifier x Rectifier holder	2.9	30	26 in.·lbf
Rear end cover x Rectifier holder	4.4	45	39 in.·lbf
Rectifier plate x Rectifier holder	3.8	39	34 in.·lbf
Terminal insulator x Rectifier holder	4.1	42	36 in.·lbf